Appendix A Air Quality/Greenhouse Gas Emissions Technical Memorandum

HERITAGE SPECIFIC PLAN
INITIAL STUDY



MEMORANDUM

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Date: September 25, 2019

Subject: Heritage Residential Specific Plan Project – Air Quality/Greenhouse Gas Emissions

Technical Memorandum

PURPOSE

The purpose of this technical memorandum is to evaluate potential short- and long-term term air quality and greenhouse gas (GHG) impacts resulting from the construction and operation of the proposed Heritage Residential Specific Plan Project (project), located in the City of Redlands, California.

PROJECT LOCATION

The City of Redlands (City) is located in the southwestern portion of San Bernardino County. The City is bisected by Interstate 10 (I-10) and State Route 210 (SR-210) and is primarily surrounded by the cities of Loma Linda, San Bernardino, and Highland.

Regional access to the project site (site) provided via I-10 at the Alabama Street exit, approximately 1.2 miles to the southwest of the site, and via SR-210 at the San Bernardino Avenue exit, approximately 0.25 miles to the west of the site. Local access to the site is provided via West San Bernardino Avenue and Texas Street.

The site includes four parcels (Assessor's Parcel Number [APNs]: 0167-091-02-0000, 0167-091-04-0000, 0167-091-05-0000, and 0167-091-08-0000) totaling approximately 37.2 acres. The planned development encompasses property located within the East Valley Corridor Specific Plan, which will be amended to remove the site from the East Valley Corridor Specific Plan to establish the proposed Heritage Specific Plan.

EXISTING SITE CONDITIONS

The site consists of a former citrus orchard, most of which has been graded. The site's natural vegetation has been largely removed by past cultivation and weed abatement disking; however, the western parcel supports some non-native grassland. There is an existing water conveyance system on-site previously used for citrus irrigation that consists of a combination of rock-and-mortar flumes, brick flow control weirs, and concrete distribution standpipes. The site is otherwise unimproved and there are no other existing structures on-site.

The topography of the site is relatively flat; however, each parcel is separated by a small retaining wall step with a grade difference of approximately one to two feet, sloping down westerly. The elevation of the site is approximately 1,300 feet. The site generally drains to the west; however, there are north-south channels associated with citrus groves in the project area that intercept and divert the runoff north.

The site is bounded by public institutional uses (Citrus Valley High School) to the north, vacant land to the west, residential development to the south and east, and agricultural uses to the east. According to the City of Redlands General Plan 2035 (General Plan), there are City-owned citrus groves located within the agricultural uses immediately to the east of the site along Texas Street.

PROJECT DESCRIPTION

The proposed development is comprised of a new planned residential community that would include approximately 207 one- and two-story, single-family detached wood-framed residences with concrete slab-on-grade floors and associated underground utilities. The overall gross density of the development would be approximately 5.7 dwelling units per acre [du/ac] (maximum of 6 du/ac based on the City's Heritage Specific Plan zoning district). The proposed project would provide the following site access:

- West San Bernardino Avenue: Vehicular access to the site via West San Bernardino Avenue would be provided through a two-way access road located midway between future New York Street and Texas Street that connects to the internal roadway system of the project. Traffic exiting the site at this location would be restricted to right-turn only by a proposed raised median on West San Bernardino Avenue. A seven-foot-wide pedestrian sidewalk is proposed along the north side of West San Bernardino Avenue that would meander between the public right-of-way and adjacent landscape lot to be dedicated to the City.
- <u>Texas Street</u>: Vehicular access to the site via Texas Street would be provided through a two-way access road located midway between Pioneer Avenue and West San Bernardino Avenue that would connect to the internal roadway system of the project.
- <u>Pioneer Avenue</u>: No vehicular access to the site is proposed along Pioneer Avenue except for a restricted emergency vehicle access driveway at the northwest corner of the site.
- New York Street (Future): No vehicular access to the site is proposed along New York Street.
- <u>Internal Circulation</u>: Access to the site would be provided by two ingress/egress points on West San Bernardino Avenue and Texas Street. Internal roadways would provide access to the residential units and parks. The street design section would be a modified City standard for local residential streets with a 52-foot right-of-way, 36-foot curb-to-curb separation, and five-foot wide curb adjacent sidewalks.

A comprehensive sidewalk and trail system with connections to the public realm are planned throughout the project. This system includes landscaped nodes that connect the corners of the site to the public street network to create a walkable community, particularly for students to walk to Citrus Valley High School. The site's street network leads to an open space area at the center of the community. This publicly accessible space would include a mix of passive uses including, but not limited to: picnicking areas, shade structure(s), playgrounds, gardens, seating areas, informal play areas, and landscaping.

EXISTING SETTING

AIR QUALITY

Local Ambient Air Quality

The South Coast Air Quality Management District (SCAQMD) monitors air quality at 37 monitoring stations throughout the South Coast Air Basin (Basin). Each monitoring station is located within a Source Receptor Area (SRA). The communities within SRA are expected to have similar climatology and ambient air pollutant concentrations. The project site is located within SRA 35, East San Bernardino Valley. The closest monitoring station to the project site is the Redlands-Dearborn Monitoring Station, which is located approximately 2.76 miles southeast of the site. The air pollutants measured at the Redlands-Dearborn Monitoring Station include ozone (O_3) and particulate matter 10 microns in diameter or less (PM_{10}). Particulate matter 2.5 microns in diameter or less ($PM_{2.5}$), carbon monoxide (PM_{10}), and nitrogen dioxide (PM_{10}) are not measured at the Redlands-Dearborn Monitoring Station. The nearest station to the project site measuring $PM_{2.5}$, $PM_{2.5}$,

GREENHOUSE GAS EMISSIONS

Global Climate Change

California is a substantial contributor of GHGs, emitting over 440 million tons of carbon dioxide (CO₂) per year.¹ Methane (CH₄) is also an important GHG that potentially contributes to global climate change. GHGs are global in their effect, which is to increase the Earth's ability to absorb heat in the atmosphere. As primary GHGs have a long lifetime in the atmosphere, accumulate over time, and are generally well-mixed, their impact on the atmosphere is mostly independent of the point of emission. Every nation emits GHGs and as a result makes an incremental cumulative contribution to global climate change; therefore, global cooperation will be required to reduce the rate of GHG emissions enough to slow or stop the human-caused increase in average global temperatures and associated changes in climatic conditions.

The impact of human activities on global climate change is apparent in the observational record. Air trapped by ice has been extracted from core samples taken from polar ice sheets to determine the global atmospheric variation of CO_2 , CH_4 , and nitrous oxide (N_2O) from before the start of industrialization (approximately 1750), to over 650,000 years ago. For that period, it was found that CO_2 concentrations ranged from 180 to 300 parts per million (ppm). For the period from approximately 1750 to the present, global CO_2 concentrations increased from a pre-industrialization period concentration of 280 to 379 ppm in 2005, with the 2005 value far exceeding the upper end of the pre-industrial period range. As of April 2018, the highest monthly average concentration of CO_2 in the atmosphere was recorded at 410 ppm.²

average/, accessed September 9, 2019.

¹ California Energy Commission, California Greenhouse Gas Emissions for 2000 to 2016, https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2016/ghg_inventory_trends_00-16.pdf, accessed September 9, 2019.
² Scripps Institution of Oceanography, Carbon Dioxide in the Atmosphere Hits Record High Monthly Average, https://scripps.ucsd.edu/programs/keelingcurve/2018/05/02/carbon-dioxide-in-the-atmosphere-hits-record-high-monthly-

Table 1
Measured Air Quality Levels

	Primary St	tandard	.,	Maximum	Number of Days
Pollutant	California	Federal	Year	Concentration ¹	State/Federal Std. Exceeded
Carbon Monoxide (CO) ³ (1-Hour)	20 ppm for 1 hour	35 ppm for 1 hour	2016 2017 2018	2.155 ppm 2.496 2.735	0/0 0/0 0/0
Ozone (O ₃) ² (1-Hour)	0.09 ppm for 1 hour	N/A	2016 2017 2018	0.145 ppm 0.156 0.136	55/3 79/9 53/4
Ozone (O ₃) ² (8-Hour)	0.070 ppm for 8 hours	0.070 ppm for 8 hours	2016 2017 2018	0.120 ppm 0.135 0.115	100/97 115/114 98/94
Nitrogen Dioxide (NO _x) ³	0.18 ppm for 1 hour	0.100 ppm for 1 hour	2016 2017 2018	0.060 ppm 0.066 0.057	0/0 0/0 0/0
Particulate Matter (PM ₁₀) ^{2,4,5}	50 µg/m³ for 24 hours	150 µg/m³ for 24 hours	2016 2017 2018	72.8 µg/m3 77.0 74.2	4/0 2/0 2/0
Fine Particulate Matter (PM _{2.5}) ^{3,4,5}	No Separate State Standard	35 µg/m³ for 24 hours	2016 2017 2018	53.5 µg/m3 38.2 30.1	*/1 */1 */0

Notes:

ppm = parts per million

μg/m³ = micrograms per cubic meter

NM = Not Measured

* = insufficient data available to determine the value

 PM_{10} = particulate matter 10 microns in diameter or less $PM_{2.5}$ = particulate matter 2.5 microns in diameter or less

NA = Not Applicable

- 1. Maximum concentration is measured over the same period as the California Standard.
- 2. Measurements taken at the Redlands-Dearborn Monitoring Station located at 500 North Dearborn, Redlands California 92374.
- 3. Measurements taken at the San Bernardino-4th Street Monitoring Station located at 24302 4th Street, San Bernardino, California 92410.
- 4. PM₁₀ exceedances are based on State thresholds established prior to amendments adopted on June 20, 2002.
- 5. PM₁₀ and PM_{2.5} exceedances are derived from the number of samples exceeded, not days.

Sources

California Air Resources Board, ADAM Air Quality Data Statistics, http://www.arb.ca.gov/adam/, accessed on September 9,2019.

California Air Resources Board, AQMIS2: Air Quality Data, https://www.arb.ca.gov/agmis2/agdselect.php, accessed on September 9, 2019.

REGULATORY SETTING

AIR QUALITY

South Coast Air Quality Management District

Air Quality Thresholds

Under the California Environmental Quality Act (CEQA), the SCAQMD is an expert commenting agency on air quality within its jurisdiction or impacting its jurisdiction. Under the Federal Clean Air Act (FCAA), the SCAQMD has adopted Federal attainment plans for O_3 and PM_{10} . The SCAQMD reviews projects to ensure that they would not: (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any air quality standard; or (3) delay timely attainment of any air quality standard or any required interim emission reductions or other milestones of

any Federal attainment plan.

The CEQA Air Quality Handbook also provides significance thresholds for both construction and operation of projects within the SCAQMD jurisdictional boundaries. If the SCAQMD thresholds are exceeded, a potentially significant impact could result. However, the lead agency ultimately determines the thresholds of significance for impacts. If a project proposes development in excess of the established thresholds, as outlined in <u>Table 2</u>, <u>South Coast Air Quality Management District Emissions Thresholds</u>, a significant air quality impact may occur, and additional analysis is warranted to fully assess the significance of impacts.

Table 2
South Coast Air Quality Management District Emissions Thresholds

Phase			Pollutant	(lbs/day)		
	ROG	NOx	СО	SOx	PM ₁₀	PM _{2.5}
Construction	75	100	550	150	150	55
Operational	55	55	550	150	150	55

Notes: ROG = reactive organic gases; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter up to 10 microns; $PM_{2.5}$ = particulate matter up to 2.5 microns

Source: South Coast Air Quality Management District, CEQA Air Quality Handbook, November 1993.

Localized Significance Thresholds

Localized Significance Thresholds (LSTs) were developed in response to SCAQMD Governing Boards' Environmental Justice Enhancement Initiative (I-4). The SCAQMD provided the *Final Localized Significance Threshold Methodology* (dated July 2008) for guidance. The LST methodology assists lead agencies in analyzing localized impacts associated with project-specific level proposed projects. The SCAQMD provides the LST lookup tables for one-, two-, and five-acre projects emitting CO, nitrogen oxides (NO_X), PM_{10} , or $PM_{2.5}$. The LST methodology and associated mass rates are not designed to evaluate localized impacts from mobile sources traveling over the roadways. The SCAQMD recommends that any project over five acres should perform air quality dispersion modeling to assess impacts to nearby sensitive receptors.

Cumulative Emissions Thresholds

The SCAQMD's 2016 Air Quality Management Plan (2016 AQMP) was prepared to accommodate growth, meet State and Federal air quality standards, and minimize the fiscal impact that pollution control measures have on the local economy. According to the SCAQMD CEQA Air Quality Handbook, project-related emissions that fall below the established construction and operational thresholds should be considered less than significant unless there is pertinent information to the contrary. If a project exceeds these emission thresholds, the SCAQMD CEQA Air Quality Handbook states that the significance of a project's contribution to cumulative impacts should be determined based on whether the rate of growth in average daily trips exceeds the rate of growth in population.

GREENHOUSE GAS EMISSIONS

The State of California has adopted various administrative initiatives and legislation relating to climate change, much of which set aggressive goals for GHG emissions reductions Statewide. Although lead

agencies must evaluate climate change and GHG emissions of projects subject to CEQA, the CEQA Guidelines do not require or suggest specific methodologies for performing an assessment or specific thresholds of significance and do not specify GHG reduction mitigation measures. Instead, the guidelines allow lead agencies to choose methodologies and make significance determinations based on substantial evidence, as discussed in further detail below. No state agency has promulgated binding regulations for analyzing GHG emissions, determining their significance, or mitigating significant effects in CEQA documents. Thus, lead agencies exercise their discretion in determining how to analyze GHGs.

California Global Warming Solutions Act (Assembly Bill 32)

The primary act that has driven GHG regulation and analysis in California include the California Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32) (Health and Safety Code Sections 38500, 38501, 28510, 38530, 38550, 38560, 38561–38565, 38570, 38571, 38574, 38580, 38590, 38592–38599), which instructs the California Air Resources Board (CARB) to develop and enforce regulations for the reporting and verifying of Statewide GHG emissions. The act directed CARB to set a GHG emissions limit based on 1990 levels, to be achieved by 2020. The bill set a timeline for adopting a scoping plan for achieving GHG reductions in a technologically and economically feasible manner. The heart of the bill is the requirement that Statewide GHG emissions be reduced to 1990 levels by 2020.

CARB Scoping Plan

On December 11, 2008, CARB adopted its Scoping Plan, which functions as a roadmap to achieve GHG reductions in California required by AB 32 through subsequently enacted regulations. CARB's Scoping Plan contains the main strategies California will implement to reduce CO₂eq emissions by 174 million metric tons (MT), or approximately 30 percent, from the State's projected 2020 emissions level of 596 million MTCO₂eq under a business as usual (BAU)³ scenario. This is a reduction of 42 million MTCO₂eq, or almost ten percent, from 2002 to 2004 average emissions, but requires the reductions in the face of population and economic growth through 2020.

CARB's Scoping Plan calculates 2020 BAU emissions as the emissions that would be expected to occur in the absence of any GHG reduction measures. The 2020 BAU emissions estimate was derived by projecting emissions from a past baseline year using growth factors specific to each of the different economic sectors (e.g., transportation, electrical power, commercial and residential, industrial, etc.). CARB used three-year average emissions, by sector, for 2002 to 2004 to forecast emissions to 2020. The measures described in CARB's Scoping Plan are intended to reduce the projected 2020 BAU to 1990 levels, as required by AB 32.

AB 32 requires CARB to update the Scoping Plan at least once every five years. CARB adopted the first major update to the Scoping Plan on May 22, 2014. The updated Scoping Plan summarizes recent science related to climate change, including anticipated impacts to California and the levels of GHG reduction necessary to likely avoid risking irreparable damage. It identifies the actions California has already taken to reduce GHG emissions and focuses on areas where further reductions could be achieved to help meet the 2020 target established by AB 32. The Scoping Plan update also looks beyond 2020 toward the 2050 goal, established in Executive Order S-3-05, and observes that "a mid-term statewide emission limit will ensure that the State stays on course to meet our long-term goal." The Scoping Plan update did not

³ "Business as Usual" refers to emissions that would be expected to occur in the absence of GHG reductions. See http://www.arb.ca.gov/cc/inventory/data/bau.htm. Note that there is significant controversy as to what BAU means. In determining the GHG 2020 limit, CARB used the above as the definition. It is broad enough to allow for design features to be counted as reductions.

establish or propose any specific post-2020 goals, but identified such goals adopted by other governments or recommended by various scientific and policy organizations.

In December 2017, CARB approved the *California's 2017 Climate Change Scoping Plan: The Strategy for Achieving California's 2030 Greenhouse Gas Target* (2017 Scoping Plan). This update focuses on implementation of a 40 percent reduction in GHGs by 2030 compared to 1990 levels. To achieve this the 2017 Scoping Plan draws on a decade of successful programs that addresses the major sources of climate changing gases in every sector of the economy:

- <u>More Clean Cars and Trucks</u>: The plan sets out far-reaching programs to incentivize the sale of millions of zero-emission vehicles, drive the deployment of zero-emission trucks, and shift to a cleaner system of handling freight Statewide.
- <u>Increased Renewable Energy</u>: California's electric utilities are ahead of schedule meeting the requirement that 33 percent of electricity come from renewable sources by 2020. The 2017 Scoping Plan guides utilities to 50 percent renewables, as required under SB 350.
- <u>Slashing Super-Pollutants</u>: The plan calls for a significant cut in super-pollutants such as methane and hydrofluorocarbons refrigerants, which are responsible for as much as 40 percent of global warming.
- <u>Cleaner Industry and Electricity</u>: California's renewed cap-and-trade program extends the declining cap on emissions from utilities and industries and the carbon allowance auctions. The auctions will continue to fund investments in clean energy and efficiency, particularly in disadvantaged communities.
- <u>Cleaner Fuels</u>: The Low Carbon Fuel Standard will drive further development of cleaner, renewable transportation fuels to replace fossil fuels.
- <u>Smart Community Planning</u>: Local communities will continue developing plans which will further link transportation and housing policies to create sustainable communities.
- Improved Agriculture and Forests: The 2017 Scoping Plan also outlines innovative programs to account for and reduce emissions from agriculture, as well as forests and other natural lands.

Achieving the 2030 target under the 2017 Scoping Plan will also spur the transformation of the California economy and fix its course securely on achieving an 80 percent reduction in GHG emissions by 2050, consistent with the global consensus of the scale of reductions needed to stabilize atmospheric GHG concentrations at 450 ppm carbon dioxide equivalent and reduce the likelihood of catastrophic climate change. Currently, global levels are at just above 400 ppm. <u>Table 3</u>, <u>California State Climate Change Legislation</u>, provides a brief overview of other California legislation relating to climate change that may affect emissions associated with the proposed project.

Table 3 California State Climate Change Legislation

Legislation	Description
Assembly Bill 1493 and Advanced Clean Cars Program	Assembly Bill 1493 ("the Pavley Standard") (Health and Safety Code Sections 42823 and 43018.5) aims to reduce GHG emissions from noncommercial passenger vehicles and light-duty trucks of model years 2009 to 2016. By 2025, when all rules will be fully implemented, new automobiles will emit 34 percent fewer CO ₂ eq emissions and 75 percent fewer smog-forming emissions.
Low Carbon Fuel Standard	Executive Order S-01-07 (2007) requires a 10 percent or greater reduction in the average fuel carbon intensity for transportation fuels in California. The regulation took effect in 2010 and is codified at Title 17, California Code of Regulations, Sections 95480–95490. The Low Carbon Fuel Standard will reduce GHG emissions by reducing the carbon intensity of transportation fuels used in California by at least 10 percent by 2020.
Renewables Portfolio Standard (Senate Bill X1-2 and Senate Bill 350)	California's Renewables Portfolio Standard (RPS) requires retail sellers of electric services to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020. The 33 percent standard is consistent with the RPS goal established in the Scoping Plan. The passage of Senate Bill 350 in 2015 updates the RPS to require the amount of electricity generated and sold to retail customers per year from eligible renewable energy resources to be increased to 50 percent by December 31, 2030.
Senate Bill 375*	SB 375 took effect in 2008 and provides a new planning process to coordinate land use planning, regional transportation plans, and funding priorities to help California meet the GHG reduction goals established in AB 32.
California Building Energy Efficiency Standards	California's Energy Efficiency Standards for Residential and Nonresidential Buildings, located at Title 24, Part 6 of the CCR and commonly referred to as "Title 24," were established in 1978 in response to a legislative mandate to reduce California's energy consumption. Title 24 requires the design of building shells and building components to conserve energy. The California Energy Commission adopted the 2016 Title 24 standards, which became effective on January 1, 2017. The 2016 standards continue to improve upon the 2013 Title 24 standards for new construction of, and additions and alterations to, residential and non-residential buildings. Compliance with Title 24, Part 6 is enforced through the building permit process. Additionally, the 2019 Title 24 standards will take effect on January 1, 2020. Under 2019 Title 24 standards, nonresidential buildings will use about 30 percent less energy, mainly due to lighting upgrades, when compared to 2016 Title 24 standards. Further, 2019 Title 24 standards would require installation of solar photovoltaic panels within residential developments, which would reduce energy usage by 53 percent compared to the 2016 Title 24 standards. 1,2,3
California Green Building Standards	The California Green Building Standards Code (California Code of Regulations, Title 24, Part 11), commonly referred to as the CALGreen Code, is a Statewide mandatory construction code developed and adopted by the California Building Standards Commission and the Department of Housing and Community Development. CALGreen also provides voluntary tiers and measures that local governments may adopt that encourage or require additional measures in the five green building topics.
Senate Bill 32 (Amendments to California Global Warming Solutions Act of 2006: Emission Limit)	Signed into law in September 2016, SB 32 codifies the 2030 target in the recent Executive Order B-30-15. The bill authorizes the state board to adopt an interim GHG emissions level target to be achieved by 2030. SB 32 states that the intent is for the legislature and appropriate agencies to adopt complementary policies which ensure that the long-term emissions reductions advance specified criteria. CARB is tasked with updating the Scoping Plan to provide guidance for compliance with SB 32.

Notes

- *Senate Bill 375 is codified at Government Code Sections 65080, 65400, 65583, 65584.01, 65584.02, 65584.04, 65587, 65588, 14522.1, 14522.2, and 65080.01, as well as at Public Resources Code Sections 21061.3 and 21159.28 and Chapter 4.2.
- 1. California Energy Commission, 2016 Building Energy Efficiency Standards, www.energy.ca.gov/title24/2016standards/, accessed September 5, 2019
- 2. California Energy Commission, 2019 Building Energy Efficiency Standards, https://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_Standards_FAQ.pdf, accessed September 5, 2019.
- 3. California Energy Commission, 2019 Building Energy Efficiency Standards Fact Sheet, March 2018.

South Coast Air Quality Management District

In 2008, the SCAQMD released draft guidance regarding interim CEQA GHG significance thresholds.⁴ Within its October 2008 document, the SCAQMD proposed the use of a percent emission reduction target to determine significance for commercial/residential projects that emit greater than 3,000 MTCO₂eq per year. Under this proposal, commercial/residential projects that emit fewer than 3,000 MTCO₂eq per year would be assumed to have a less than significant impact on climate change. On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal for an interim GHG significance threshold of 10,000 MTCO₂eq per year for stationary source/industrial projects where the SCAQMD is the lead agency. However, the SCAQMD has yet to adopt a GHG significance threshold for application by local lead agencies in their review of land use development projects (e.g., residential/commercial projects).

City of Redlands Climate Action Plan

The City of Redlands adopted the City of Redlands Climate Action Plan (CAP) on December 5, 2017. The CAP was designed to reinforce the City's commitment to reducing GHG emissions and to show how the City is going to comply with the State of California's GHG emission reduction standards. The CAP includes goals and policies to promote energy efficiency, waste reduction, and resource conservation and recycling. The CAP's GHG emission targets and goals are based on meeting the goals in Executive Order B-30-15 and SB 32 and following the CAP guidelines established in the 2017 Scoping Plan. The CAP includes emissions targets of 6.0 MTCO₂eq per capita per year for 2030 and 5.0 MTCO₂eq per capita per year for 2035.

As stated on page 1-10 of the CAP:

The City's approach to addressing GHG emissions within the General Plan is parallel to the climate change planning process followed by numerous California jurisdictions. A General Plan is a project under CEQA, and projects under CEQA are required to estimate CO_2 and other GHG emissions, as described above. The CAP is designed to provide discrete actions to operationalize the General Plan policies that help with GHG reduction. The preparation of a CAP is also consistent with CEQA Guidelines Section 15183.5 that allows jurisdictions to analyze and mitigate the significant effects of GHG at a programmatic level, by adopting a plan to reduce GHG emissions. Project-specific environmental documents prepared for projects consistent with the General Plan may rely on the programmatic analysis contained in the CAP and the EIR certified for the Redlands General Plan.

In addition, the City of Redlands adopted the *Redlands Community Sustainability Plan* in March 2011. The Redlands *Community Sustainability Plan* which details goals and actions to reduce overall City energy consumption and increase the use of renewable energy. The goals relevant to the proposed project include:

- Promote energy efficiency and conservation technologies and practices that reduce the use of nonrenewable resources by both City government and the community.
- GB1 Adopt broadly accepted standards for green building.
- GB5 Provide assistance to the development community in adopting economically viable and ecologically responsible green building strategies.

⁴ South Coast Air Quality Management District, *Draft Guidance Document—Interim CEQA Greenhouse Gas (GHG)* Significance Threshold, October 2008.

- GB6 Encourage developers to consider the entire life-cycle of a built project.
- CF1 Commit to purchasing Products and Services that are Climate Friendly.
- LU4 Create pedestrian-friendly neighborhoods.
- RE1 Accelerate the adoption of solar power usage in Redlands.

CEQA THRESHOLDS

The environmental analysis in this memorandum is patterned after the Initial Study Checklist recommended by the *CEQA Guidelines*, as amended. The issues presented in the Initial Study Checklist have been utilized as thresholds of significance in this section. Accordingly, a project may create a significant environmental impact if it causes one or more of the following to occur:

- Conflict with or obstruct implementation of the applicable air quality plan (refer to Impact Statement AQ-1);
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable Federal or State ambient air quality standard (refer to Impact Statement AQ-2);
- Expose sensitive receptors to substantial pollutant concentrations (refer to Impact Statement AQ-3);
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people (refer to Impact Statement AQ-4);
- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment (refer to Impact Statement GHG-1); and/or
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases (refer to Impact Statement GHG-2).

AIR QUALITY IMPACT ANALYSIS

AQ-1 Would the project conflict with or obstruct implementation of the applicable air quality plan?

Less Than Significant Impact. The City is located within the Basin, which is bounded by the San Gabriel, San Bernardino, and San Jacinto mountains to the north and east and by the Pacific Ocean to the south and west. The SCAQMD has jurisdiction in the Basin, which has a history of recorded air quality violations and is an area where both State and Federal ambient air quality standards are exceeded. Areas that meet ambient air quality standards are classified as attainment areas, while areas that do not meet these standards are classified as nonattainment areas. The air quality in the San Bernardino County portion of the Basin does not meet the ambient air quality standards for O₃, PM₁₀, and PM_{2.5} and is therefore classified as a nonattainment area for these pollutants. The SCAQMD is required, pursuant to the FCAA, to reduce emissions of the air pollutants for which the Basin is in nonattainment.

In order to reduce emissions, the SCAQMD adopted the 2016 AQMP which establishes a program of rules and regulations directed at reducing air pollutant emissions and achieving State and Federal air quality standards. The 2016 AQMP is a regional and multi-agency effort including the SCAQMD, CARB, the Southern California Association of Governments (SCAG), and the U.S. Environmental Protection Agency (EPA).

The 2016 AQMP pollutant control strategies are based on the latest scientific and technical information and planning assumptions, including the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), updated emission inventory methodologies for various source categories, and SCAG's latest growth forecasts. SCAG's latest growth forecasts were defined in consultation with local governments and with reference to local general plans. The SCAQMD considers projects that are consistent with the 2016 AQMP, which is intended to bring the Basin into attainment for all criteria pollutants, to also have less than significant cumulative impacts.

Criteria for determining consistency with the 2016 AQMP are defined by the following indicators:

Criterion 1:

With respect to the first criterion, SCAQMD methodologies require that an air quality analysis for a project include forecasts of project emissions in relation to contributing to air quality violations and delay of attainment.

a) Would the project result in an increase in the frequency or severity of existing air quality violations?

Since the consistency criteria identified under the first criterion pertains to pollutant concentrations, rather than to total regional emissions, an analysis of the project's pollutant emissions relative to localized pollutant concentrations is used as the basis for evaluating project consistency. As discussed below under Impact Statement AQ-3, localized concentrations of CO, NO_x, PM₁₀, and PM_{2.5} would be less than significant. Therefore, the proposed project would not result in an increase in the frequency or severity of existing air quality violations. Because reactive organic gas (ROG) is not a criteria pollutant, there is no ambient standard or localized threshold for ROG. Due to the role ROG plays in ozone formation, it is classified as a precursor pollutant and only a regional emissions threshold has been established.

b) Would the project cause or contribute to new air quality violations?

As discussed below under Impact Statement AQ-2, the proposed project would result in emissions that are below the SCAQMD thresholds. Therefore, the proposed project would not have the potential to cause or affect a violation of the ambient air quality standards.

c) Would the project delay timely attainment of air quality standards or the interim emissions reductions specified in the AQMP?

The proposed project would result in less than significant impacts with regard to localized concentrations during project construction and operations. As such, the proposed project would not delay the timely attainment of air quality standards or 2016 AQMP emissions reductions.

Criterion 2:

With respect to the second criterion for determining consistency with SCAQMD and SCAG air quality policies, it is important to recognize that air quality planning within the Basin focuses on attainment of ambient air quality standards at the earliest feasible date. Projections for achieving air quality goals are based on assumptions regarding population, housing, and growth trends. Thus, the SCAQMD's second criterion for determining project consistency focuses on whether or not the proposed project exceeds the assumptions utilized in preparing the forecasts presented in the 2016 AQMP. Determining whether or not a project exceeds the assumptions reflected in the 2016 AQMP involves the evaluation of the three criteria outlined below. The following discussion provides an analysis of each of these criteria.

a) Would the project be consistent with the population, housing, and employment growth projections utilized in the preparation of the AQMP?

A project is consistent with the 2016 AQMP in part if it is consistent with the population, housing, and employment assumptions that were used in the development of the 2016 AQMP. In the case of the 2016 AQMP, three sources of data form the basis for the projections of air pollutant emissions: The General Plan, SCAG's *Growth Management* Chapter of the *Regional Comprehensive Plan and Guide* (RCPG), and SCAG's RTP/SCS. The population, housing, and employment forecasts, which are adopted by SCAG's Regional Council, are based on the local plans and policies applicable to the City; these are used by SCAG in all phases of implementation and review.

The proposed project would develop 207 single-family residences with associated utilities, infrastructure, open space, and recreational areas on approximately 37.2 acres. As a result, the project proposes to amend the General Plan designation on the project site from Commercial to Low Density Residential. The Low-Density Residential land use designation allows for the development of single-family residences, with a maximum density of 6 du/ac. The proposed development plans an overall gross density of approximately 5.7 du/ac and would be consistent with the General Plan land use designation. The current zoning designation of the project site is Specific Plan with an agricultural use; the project site is located within the East Valley Corridor Specific Plan area. A zoning amendment is proposed as part of the project to change the zoning designation from East Valley Corridor Specific Plan to Heritage Specific Plan. With approval of the zoning amendment, the project would be consistent with the City's zoning code. Therefore, with approval of the project's proposed General Plan amendment and zone change, the project would not conflict with the existing zoning or land use designation. As such, the proposed project is considered consistent with the General Plan, and is consistent with the types, intensity, and patterns of land use envisioned for the site vicinity.

The City's population estimate, as of July 2018, is 71,586 persons.⁵ The project would induce population growth directly through the construction of 207 residences. Assuming 100 percent occupancy and 2.84 persons per household, the maximum population growth associated with project implementation would be approximately 588 persons.⁶ This growth would not cause

⁵ U.S. Census Bureau, 2018 Population Estimate (as of July 1, 2018), https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml, accessed September 24, 2019.

⁶ U.S. Census Bureau, *American Community Survey, Redlands city, California*, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk, accessed September 24, 2019.

SCAG's 2035 population forecast of 83,400 to be exceeded.⁷ As the project would not cause SCAG's 2035 population forecast to be exceeded, the project would not cause the City's General Plan buildout population forecast to be exceeded. The population, housing, and employment forecasts, which are adopted by SCAG's Regional Council, are based on the local plans and policies applicable to the City. Additionally, as the SCAQMD has incorporated these same projections into the 2016 AQMP, it can be concluded that the proposed project would be consistent with the projections.

b) Would the project implement all feasible air quality mitigation measures?

The proposed project would not require mitigation and would result in less than significant air quality impacts. Compliance with all feasible emission reduction measures identified by the SCAQMD would be required as identified under Impact Statement AQ-2 and AQ-3. As such, the proposed project meets this AQMP consistency criterion.

In conclusion, the determination of 2016 AQMP consistency is primarily concerned with the long-term influence of a project on air quality in the Basin. The proposed project would not result in a long-term impact on the region's ability to meet State and Federal air quality standards. Also, the proposed project would be consistent with the goals and policies of the 2016 AQMP for control of fugitive dust. As discussed above, the proposed project's long-term influence would also be consistent with the SCAQMD and SCAG's goals and policies and is, therefore, considered consistent with the 2016 AQMP. Impacts would be less than significant in this regard.

Mitigation Measures: No mitigation is required.

AQ-2 Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard?

Less Than Significant Impact.

Short-Term Construction

The project involves construction activities associated with grading, paving, building construction, and architectural coating applications. It is anticipated that the project would be constructed over approximately 42 months. Exhaust emission factors for typical diesel-powered heavy equipment are based on the California Emissions Estimator Model version 2016.3.2 (CalEEMod) program defaults. Variables factored into estimating the total construction emissions include the level of activity, length of construction period, number of pieces and types of equipment in use, site characteristics, weather conditions, number of construction personnel, and the amount of materials to be transported on- or offsite. The analysis of daily construction emissions has been prepared utilizing CalEEMod. Refer to Appendix A, Air Quality/Greenhouse Gas Emissions Data, for the CalEEMod outputs and results. Table 4, Short-Term Construction Emissions, presents the anticipated daily short-term construction emissions.

Southern California Association of Governments, 2016-2040 RTP/SCS Final Growth Forecast by Jurisdiction, http://www.scag.ca.gov/Documents/2016 2040RTPSCS FinalGrowthForecastbyJurisdiction.pdf, accessed September 24, 2019.

Table 4
Short-Term Construction Emissions

Emissions		Pollutant (pounds/day) ^{1,2}									
Source	ROG	NOx	СО	SO ₂	PM ₁₀	PM _{2.5}					
Year 1	4.72	56.49	33.74	0.08	6.19	3.56					
Year 2	7.18	52.21	37.08	0.08	6.00	3.38					
Year 3	ear 3 6.78 30.4		36.46	0.07	2.49	1.66					
Year 4	6.52	27.70	36.01	0.07	2.31	1.49					
Year 5	6.34	25.99	35.75	0.07	2.17	1.36					
Maximum Daily Emissions	7.18	56.49	37.08	0.08	6.19	3.56					
SCAQMD Thresholds			550	150	150	55					
Is Threshold Exceeded?	No I		No	No	No	No					

Notes: ROG = reactive organic gas; NO_x = nitrous oxide; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter

- 1. Emissions were calculated using CalEEMod, version 2016.3.2.
- Modeling assumptions include compliance with SCAQMD Rule 403 which requires: properly maintain mobile and other construction equipment; replace ground cover in disturbed areas quickly; water exposed surfaces three times daily; cover stock piles with tarps; water all haul roads twice daily; and limit speeds on unpaved roads to 15 miles per hour.

Source: Refer to Appendix A for detailed model input/output data.

Fugitive Dust Emissions

Construction activities are a source of fugitive dust emissions that may have a substantial, temporary impact on local air quality. In addition, fugitive dust may be a nuisance to those living and working in the project area. Fugitive dust emissions are associated with land clearing, ground excavation, cut-and-fill, and truck travel on unpaved roadways (including demolition as well as construction activities). Fugitive dust emissions vary substantially from day to day, depending on the level of activity, specific operations, and weather conditions. Fugitive dust from demolition, grading, and construction is expected to be short-term and would cease upon project completion. It should be noted that most of this material is inert silicates, rather than the complex organic particulates released from combustion sources, which are more harmful to health.

Dust (larger than 10 microns) generated by such activities usually becomes more of a local nuisance than a serious health problem. Of particular health concern is the amount of PM_{10} (particulate matter smaller than 10 microns) generated as a part of fugitive dust emissions. PM_{10} poses a serious health hazard alone or in combination with other pollutants. $PM_{2.5}$ is mostly produced by mechanical processes. These include automobile tire wear, industrial processes such as cutting and grinding, and re-suspension of particles from the ground or road surfaces by wind and human activities such as construction or agriculture. $PM_{2.5}$ is mostly derived from combustion sources, such as automobiles, trucks, and other vehicle exhaust, as well as from stationary sources. These particles are either directly emitted or are formed in the atmosphere from the combustion of gases such as NO_X and sulfur oxides (SO_X) combining with ammonia.

PM_{2.5} components from material in the earth's crust, such as dust, are also present, with the amount varying in different locations.

Construction activities would comply with SCAQMD Rule 403, which requires that excessive fugitive dust emissions be controlled by regular watering or other dust prevention measures. Adherence to SCAQMD 403 would greatly reduce PM_{10} and $PM_{2.5}$ concentrations. It should be noted that these reductions were applied in CalEEMod. As depicted in <u>Table 4</u>, total PM_{10} and $PM_{2.5}$ emissions would not exceed the SCAQMD thresholds during construction. Thus, construction air quality impacts would be less than significant.

Construction Equipment and Worker Vehicle Exhaust

Exhaust emissions from construction activities include emissions associated with the transport of machinery and supplies to and from the project site, emissions produced on-site as the equipment is used, and emissions from trucks transporting materials to/from the site. As presented in <u>Table 4</u>, construction equipment and worker vehicle exhaust emissions would be below the established SCAQMD thresholds. Therefore, air quality impacts from equipment and vehicle exhaust emission would be less than significant.

ROG Emissions

In addition to gaseous and particulate emissions, the application of asphalt and surface coatings creates reactive organic gas (ROG) emissions, which are O_3 precursors. As required, all architectural coatings for the proposed project structures would comply with SCAQMD Regulation XI, Rule 1113 – Architectural Coating. Rule 1113 provides specifications on painting practices as well as regulates the ROG content of paint. ROG emissions associated with the proposed project would be less than significant; refer to Table 4.

Asbestos

Asbestos is a term used for several types of naturally occurring fibrous minerals that are a human health hazard when airborne. The most common type of asbestos is chrysotile, but other types such as tremolite and actinolite are also found in California. Asbestos is classified as a known human carcinogen by State, federal, and international agencies and was identified as a toxic air contaminant by the CARB in 1986.

Asbestos can be released from serpentinite and ultramafic rocks when the rock is broken or crushed. At the point of release, the asbestos fibers may become airborne, causing air quality and human health hazards. These rocks have been commonly used for unpaved gravel roads, landscaping, fill projects, and other improvement projects in some localities. Asbestos may be released to the atmosphere due to vehicular traffic on unpaved roads, during grading for development projects, and at quarry operations. All of these activities may have the effect of releasing potentially harmful asbestos into the air. Natural weathering and erosion processes can act on asbestos bearing rock and make it easier for asbestos fibers to become airborne if such rock is disturbed. According to the California Department of Conservation, serpentinite and ultramafic rocks are not known to occur within the project area. Thus, there would be no impact in this regard.

⁸ California Department of Conservation Division of Mines and Geology, A General Location Guide for Ultramafic Rocks in California – Areas More Likely to Contain Naturally Occurring Asbestos Report, August 2000.

Total Daily Construction Emissions

In accordance with the SCAQMD Guidelines, CalEEMod was utilized to model construction emissions for ROG, NO_X , CO, SO_X , PM_{10} , and $PM_{2.5}$. Adherence to SCAQMD Rules 403 (which require watering of inactive and perimeter areas, track out requirements, etc.) was taken into account in CalEEMod. As indicated in Table 4, impacts would be less than significant for all criteria pollutants during construction. Thus, total construction related air emissions would be less than significant.

Long-Term (Operational) Emissions

Mobile Source Emissions

Mobile sources are emissions from motor vehicles, including tailpipe and evaporative emissions. Depending upon the pollutant being discussed, the potential air quality impact may be of either regional or local concern. For example, ROG, NO_X , SO_X , PM_{10} , and $PM_{2.5}$ are all pollutants of regional concern (NO_X and ROG react with sunlight to form O_3 [photochemical smog], and wind currents readily transport SO_X , PM_{10} , and $PM_{2.5}$); however, CO tends to be a localized pollutant, dispersing rapidly at the source.

Based on the *Draft Pioneer & Texas Residential Traffic Impact Analysis* (Traffic Impact Analysis), prepared by Urban Crossroads and dated April 16, 2019, the proposed project would generate approximately 1,956 average daily vehicle trips. <u>Table 5</u>, <u>Long-Term Operational Air Emissions</u>, presents the anticipated mobile source emissions. As shown in <u>Table 5</u>, emissions generated by vehicle traffic associated with the project would not exceed established SCAQMD thresholds. Impacts from mobile source air emissions would be less than significant.

Table 5
Long-Term Operational Air Emissions

Fusianiana Cauras			Pollutant (po	ounds/day)1		
Emissions Source	ROG	NOx	СО	SOx	PM ₁₀	PM _{2.5}
Summer Emissions						
Area Source Emissions	8.89	3.29	18.39	0.02	0.34	0.34
Energy Emissions	0.11	0.92	0.39	0.01	0.07	0.07
Mobile Emissions	3.23	18.51	33.98	0.15	11.04	3.01
Total Daily Emissions ²	12.23	22.72	52.76	0.17	11.46	3.43
SCAQMD Threshold	55	55	550	150	150	55
Is Threshold Exceeded?	No	No	No	No	No	No
Winter Emissions						
Area Source Emissions	8.89	3.29	18.39	0.02	0.34	0.34
Energy Emissions	0.11	0.92	0.39	0.01	0.07	0.07
Mobile Emissions	2.78	18.42	30.10	0.13	11.04	3.01
Total Daily Emissions ²	11.78	22.63	48.88	0.16	11.46	3.43
SCAQMD Threshold	55	55	550	150	150	55
Is Threshold Exceeded?	No	No	No	No	No	No

Notes: ROG = reactive organic gas; NO_x = nitrous oxide; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter

Source: Refer to Appendix A for detailed model input/output data.

^{1.} Emissions were calculated using CalEEMod, version 2016.3.2.

^{2.} The numbers may be slightly off due to rounding.

Area Source Emissions

Area source emissions would be generated from consumer products, architectural coating, and landscaping. As shown in <u>Table 5</u>, area source emissions from the proposed project would not exceed SCAQMD thresholds for ROG, NO_X , CO, SO_X , PM_{10} , or $PM_{2.5}$.

Energy Source Emissions

Energy source emissions would be generated as a result of electricity and natural gas (non-hearth) usage associated with the proposed project. The primary use of electricity and natural gas by the project would be for space heating and cooling, water heating, ventilation, lighting, appliances, and electronics. As shown in <u>Table 5</u>, energy source emissions from the proposed project would not exceed SCAQMD thresholds for ROG, NO_x, CO, SO_x, PM₁₀, or PM_{2.5}.

Total Daily Operational Emissions

As indicated in <u>Table 5</u>, operational emissions from the proposed project would not exceed SCAQMD thresholds. Thus, operational air quality impacts would be less than significant.

Air Quality Health Impacts

Adverse health effects induced by criteria pollutant emissions are highly dependent on a multitude of interconnected variables (e.g., cumulative concentrations, local meteorology and atmospheric conditions, and the number and character of exposed individual [e.g., age, gender]). In particular, O_3 precursors, VOCs, and NO_X affect air quality on a regional scale. Health effects related to O_3 are therefore the product of emissions generated by numerous sources throughout a region. Existing models have limited sensitivity to small changes in criteria pollutant concentrations, and, as such, translating project-generated criteria pollutants to specific health effects or additional days of nonattainment would produce meaningless results. In other words, the project's less than significant increases in regional air pollution from criteria air pollutants would have nominal or negligible impacts on human health.

As noted in the Brief of Amicus Curiae by the SCAQMD (April 6, 2015) for the Sierra Club vs. County of Fresno, the SCAQMD acknowledged it would be extremely difficult, if not impossible to quantify health impacts of criteria pollutants for various reasons including modeling limitations as well as where in the atmosphere air pollutants interact and form. Further, as noted in the Brief of Amicus Curiae by the San Joaquin Valley Air Pollution Control District (SJVAPCD) (April 13, 2015) for the Sierra Club vs. County of Fresno, SJVAPCD has acknowledged that currently available modeling tools are not equipped to provide a meaningful analysis of the correlation between an individual development project's air emissions and specific human health impacts.

The SCAQMD acknowledges that health effects quantification from O₃, as an example is correlated with the increases in ambient level of O₃ in the air (concentration) that an individual person breathes. SCAQMD's Brief of Amicus Curiae states that it would take a large amount of additional emissions to cause a modeled increase in ambient O₃ levels over the entire region. The SCAQMD states that based on their own modeling in the SCAQMD's 2012 Air Quality Management Plan, a reduction of 432 tons (864,000 pounds) per day of NO_x and a reduction of 187 tons (374,000 pounds) per day of VOCs would reduce O₃ levels at highest monitored site by only nine parts per billion. As such, the SCAQMD concludes that it is not currently possible to accurately quantify O₃-related health impacts caused by NO_x or VOC emissions from relatively small projects (defined as projects with regional scope) due to photochemistry and

regional model limitations. Thus, as the project would not exceed SCAQMD thresholds for construction and operational air emissions, the project would have a less than significant impact for air quality health impacts.

Mitigation Measures: No mitigation is required.

AQ-3 Would the project expose sensitive receptors to substantial pollutant concentrations?

<u>Less Than Significant Impact.</u> Sensitive receptors are defined as facilities or land uses that include members of the population that are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples of these sensitive receptors are residences, schools, hospitals, and daycare centers. CARB has identified the following groups of individuals as the most likely to be affected by air pollution: the elderly over 65, children under 14, athletes, and persons with cardiovascular and chronic respiratory diseases such as asthma, emphysema, and bronchitis.

The closest sensitive receptors are residences, located approximately 67 feet east of the project site, and the Citrus Valley High School, located approximately 70 feet north of the project site. In order to identify impacts to sensitive receptors, the SCAQMD recommends addressing localized significance thresholds (LSTs) for construction and operations impacts (area sources only).

Localized Significance Thresholds

LSTs were developed in response to SCAQMD Governing Boards' Environmental Justice Enhancement Initiative (I-4). The SCAQMD provided the Final Localized Significance Threshold Methodology (dated June 2003 [revised 2008]) for guidance. The LST methodology assists lead agencies in analyzing localized air quality impacts. The SCAQMD provides the LST screening lookup tables for one, two, and five-acre projects emitting CO, NO_X, PM_{2.5}, or PM₁₀. The LST methodology and associated mass rates are not designed to evaluate localized impacts from mobile sources traveling over the roadways. The SCAQMD recommends that any project that disturbs five acres or more per day should perform air quality dispersion modeling to assess impacts to nearby sensitive receptors. The project is in SRA 35, East San Bernardino Valley.

Construction

Based on the CalEEMod run for the project, the project is anticipated to disturb up to 330 acres during the grading phase. The grading phase would take approximately 132 days to complete. As such, the project would actively disturb approximately 2.5 acres per day (330 acres divided by 132 days). Therefore, the LST thresholds for two acres was conservatively utilized for the construction LST analysis.

The closest sensitive receptors are residences, located approximately 67 feet east of the project site, and the Citrus Valley High School, located approximately 70 feet north of the project site. These sensitive land uses may be potentially affected by air pollutant emissions generated during on-site construction activities. LST thresholds are provided for distances to sensitive receptors of 25, 50, 100, 200, and 500 meters. As the nearest sensitive uses are located approximately 67 feet east of the project site (residences) and 70 feet north of the project site (Citrus Valley High School), the LST values for 25 meters (82 feet) were used.

<u>Table 6, Localized Significance of Construction Emissions</u>, shows the localized construction-related emissions for NO_x, CO, PM₁₀, and PM_{2.5} compared to the LSTs for SRA 35. It is noted that the localized emissions presented in <u>Table 6</u> are less than those in <u>Table 4</u> because localized emissions include only onsite emissions (i.e., from construction equipment and fugitive dust), and do not include off-site emissions (i.e., from hauling activities). As shown in <u>Table 6</u>, the project's localized construction emissions would not exceed the LSTs for SRA 35 with adherence to SCAQMD rules and requirements. Therefore, localized significance impacts from construction would be less than significant.

Table 6
Localized Significance of Construction Emissions

Saurae1	Pollutant (pounds/day)							
Source ¹	NOx	СО	PM ₁₀	PM _{2.5}				
Year 1 ²	50.20	31.96	5.40	3.33				
Year 2 ²	46.40	30.88	5.21	3.16				
Year 3 ³	15.62	16.36	0.81	0.76				
Year 4 ³	14.38	16.24	0.70	0.66				
Year 5 ³	13.44	16.17	0.61	0.58				
Maximum Daily Emissions	50.20	31.96	5.40	3.33				
SCAQMD Localized Significance Threshold ⁴	170	1,174	7	5				
Thresholds Exceeded?	No	No	No	No				

Notes: NOx = nitrous oxide; CO = carbon monoxide; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter

- 1. Modeling assumptions include compliance with SCAQMD Rule 403 which requires properly maintaining mobile and other construction equipment; replacing ground cover in disturbed areas quickly; watering exposed surfaces three times daily; covering stock piles with tarps; watering all haul roads twice daily; and limiting speeds on unpaved roads to 15 miles per hour.
- 2. Year 1 and Year 2 grading phase emissions present the worst-case scenario for NO_X and CO, PM₁₀, and PM_{2.5}.
- Year 3, Year 4, and Year 5 building construction phase emissions present the worst-case scenario for NOx, CO, PM₁₀, and PM_{2.5}.
- 4. The Localized Significance Threshold was determined using Appendix C of the SCAQMD Final Localized Significant Threshold Methodology guidance document for pollutants NOx, CO, PM₁₀, and PM_{2.5}. The Localized Significance Threshold was based on the anticipated daily acreage disturbance for construction (the thresholds for two acres was used), the distance to sensitive receptors (25 meters), and the source receptor area (SRA 35).

Source: Refer to Appendix A for detailed model input/output data.

Operations

According to SCAQMD localized significance threshold methodology, LSTs would apply to the operational phase of a proposed project if the project includes stationary sources or attracts mobile sources that may spend extended periods queuing and idling at the site (e.g., warehouse or transfer facilities). The proposed project does not include such uses. Thus, due to the lack of such emissions, no long-term localized significance threshold analysis is needed. Operational LST impacts would be less than significant in this regard.

Localized Air Quality Health Impacts

As evaluated above, the project's air emissions would not exceed the SCAQMD's LST thresholds. Therefore, the project would not exceed the most stringent applicable Federal or State ambient air quality standards for emissions of CO, NO_X , PM_{10} , or $PM_{2.5}$. It should be noted that the ambient air quality standards are developed and represent levels at which the most susceptible persons (e.g., children and the elderly) are protected. In other words, the ambient air quality standards are purposefully set in a stringent manner to protect children, elderly, and those with existing respiratory problems. Thus, air quality health impacts would be less than significant in this regard.

Carbon Monoxide Hotspot

CO emissions are a function of vehicle idling time, meteorological conditions, and traffic flow. Under certain extreme meteorological conditions, CO concentrations near a congested roadway or intersection may reach unhealthful levels (i.e., adversely affecting residents, school children, hospital patients, the elderly, etc.).

The Basin is designated as an attainment/maintenance area for the Federal CO standards and an attainment area for State standards. There has been a decline in CO emissions even though VMT on U.S. urban and rural roads have increased Nationwide estimated anthropogenic CO emissions have decreased 68 percent between 1990 and 2014. In 2014, mobile sources accounted for 82 percent of the nation's total anthropogenic CO emissions. Three major control programs have contributed to the reduced pervehicle CO emissions: exhaust standards, cleaner burning fuels, and motor vehicle inspection/maintenance programs.

According to the SCAQMD CEQA Air Quality Handbook, a potential CO hotspot may occur at any location where the background CO concentration already exceeds 9.0 ppm, which is the 8-hour California ambient air quality standard. As previously discussed, the site is located in SRA 35 East San Bernardino Valley. Communities within SRAs are expected to have similar climatology and ambient air pollutant concentrations. The monitoring station representative of SRA 35, which monitors CO, is the San Bernardino-4th Street Monitoring Station located approximately 5.24 miles northwest of the site. The highest CO concentration at the San Bernardino-4th Street Monitoring Station was measured at 2.735 ppm in 2018. As such, the background CO concentration does not exceed 9.0 ppm and a CO hotspot would not occur. Therefore, CO hotspot impacts would be less than significant in this regard.

Mitigation Measures: No mitigation is required.

AQ-4 Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

<u>Less Than Significant Impact</u>. According to the SCAQMD *CEQA Air Quality Handbook*, land uses associated with odor complaints typically include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding. The proposed project does not include any uses identified by the SCAQMD as being associated with odors.

⁹ EPA (U.S. Environmental Protection Agency), *Carbon Monoxide Emissions*, https://cfpub.epa.gov/roe/indicator_pdf.cfm?i=10, accessed September 6, 2019.

Construction activities associated with the project may generate detectable odors from heavy-duty equipment exhaust and architectural coatings. However, construction-related odors would be short-term in nature and cease upon project completion. In addition, the project would be required to comply with the California Code of Regulations, Title 13, sections 2449(d)(3) and 2485, which minimizes the idling time of construction equipment either by shutting it off when not in use or by reducing the time of idling to no more than five minutes. This would reduce the detectable odors from heavy-duty equipment exhaust. The project would also be required to comply with the SCAQMD Regulation XI, *Rule 1113 – Architectural Coating*, which would minimize odor impacts from ROG emissions during architectural coating. Any odor impacts to existing adjacent land uses would be short-term and not substantial. As such, the project would not result in other emissions (such as those leading to odors) adversely affecting a substantial number of people. Impacts would be less than significant in this regard.

Mitigation Measures: No mitigation is required.

GREENHOUSE GAS EMISSIONS IMPACT ANALYSIS

GHG-1 Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Less Than Significant Impact.

As discussed previously, the City of Redlands adopted a CAP in December 2017. The CAP states that the City of Redlands has GHG emissions targets of: 6.1 MTCO₂eq per capita per year for 2015, 6.0 MTCO₂eq per capita per year for 2030, and 5.0 MTCO₂eq per capita per year for 2035. The CAP states that "Project-specific environmental documents prepared for projects consistent with the General Plan may rely on the programmatic analysis contained in the CAP and the EIR certified for the Redlands General Plan." As the project is expected to be operational in 2024, the most applicable CAP emissions target is 6.0 MTCO₂eq per capita per year for 2030. As such, the project GHG emissions are compared to this local threshold.

Project-Related Sources of Greenhouse Gases

The proposed project would result in direct and indirect emissions of CO₂, N₂O, and CH₄, and would not result in other GHGs that would facilitate a meaningful analysis. Therefore, this analysis focuses on these three forms of GHG emissions. Direct project-related GHG emissions include emissions from construction activities, area sources, and mobile sources, while indirect sources include emissions from electricity consumption, water demand, and solid waste generation. Operational GHG estimations are based on energy emissions from natural gas usage and automobile emissions. The CalEEMod relies upon traffic data within the Traffic Impact Analysis and project-specific land use data to calculate emissions. Table 7, Estimated Greenhouse Gas Emissions, presents the estimated CO2, N2O, and CH4 emissions of the proposed project. CalEEMod outputs are contained within Appendix A. In accordance with the SCAQMD guidance, projected GHGs from construction have been quantified and amortized over 30 years, which is the number of years considered to represent the life of the project. The amortized construction emissions are added to the annual average operational emissions. As shown in Table 7, the total amount of proposed project-related GHG emissions from direct and indirect sources would total 3,151.68 MTCO₂eq per year, resulting in GHG emissions of 5.36 MTCO₂eq per service population per year. Therefore, as the proposed project does not exceed the CAP's year 2030 emissions target of 6.0 MTCO₂eq per capita per year, the project would not create a significant cumulative impact to global climate change and a less than significant impact would occur.

Table 7
Estimated Greenhouse Gas Emissions

	CO ₂	CH	14	N ₂ (0	Total		
Source	Metric Tons/year ¹	Metric Tons/year ¹	Metric Tons of CO₂eq²	Metric Tons/year ¹	Metric Tons of CO ₂ eq ²	Metric Tons of CO₂eq²		
Direct Emissions								
Construction (amortized over 30 years) ⁴	95.75	0.02	0.52	0.00	0.00	96.27		
Area Source ⁵	48.22	0.00	0.11	0.00	0.24	48.57		
Mobile Source	2,311.05	0.11	2.85	0.00	0.00	2,313.90		
Total Direct Emissions ³	2,455.02	0.14	3.48	0.00	0.24	2,458.74		
Energy	589.71	0.03	0.65	0.01	2.44	592.80		
Solid Waste	12.32	0.73	18.20	0.00	0.00	30.52		
Water Demand	58.10	0.35	8.87	0.01	2.66	69.63		
Total Indirect Emissions ³	660.12	1.11	27.72	0.02	5.10	692.94		
Total Project-Related Emissions ³			3,151.68 MT	「CO₂eq/year				
Total Service Population Emissions ^{6,7}			5.36 MTC	O₂eq/year				
City of Redlands Year 2030 GHG Emissions Target	6.0 MTCO₂eq per capita per year							
Project Exceed 2030 Emissions Target?	No							

Notes: CO₂ = carbon dioxide; CH₄ = methane; N₂O = nitrogen oxide

- 1. Emissions calculated using the CalEEMod version 2016.3.2.
- 2. Carbon dioxide equivalent values calculated using the EPA Website, *Greenhouse Gas Equivalencies Calculator*, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator, accessed September 5, 2019.
- 3. Totals may be slightly off due to rounding.
- 4. As a condition of approval, the proposed project would be required to adhere to standard SCAQMD regulations, such as implementing SCAQMD Rule 403 that would further reduce construction emissions. The reduction/credits for construction emission mitigations are based on mitigation included in the CalEEMod model and as typically required by the SCAQMD. Reduction credits are associated with activities involving: properly maintain mobile and other construction equipment; replace ground cover in disturbed areas quickly; water exposed surfaces twice daily; cover stock piles with tarps; water all haul roads twice daily; and limit speeds on unpaved roads to 15 miles per hour.
- 5. Mitigated area source emissions include application of SCAQMD Rule 445 (Wood-Burning Devices). Only natural gas hearths would be allowed on the project site per SCAQMD rules and regulations.
- 6. The service population of 588 is based on the most recent Census/American Community Survey average household size for the City of Redlands.
- 7. The project's total service population emissions were calculated by dividing the total proposed project-related emissions (3,151.68 MTCO₂eq/year) by the service population (588); therefore, 3,151.68/588= 5.36.

Refer to Appendix A for detailed model input/output data.

Mitigation Measures: No mitigation is required.

GHG-2 Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Consistency with Applicable GHG Plans, Policies, or Regulations

City of Redlands Climate Action Plan

The City's CAP is designed to demonstrate how the City will comply with the State's GHG emission reduction standards. The CAP's GHG emission targets and goals are based on meeting the goals in Executive Order B-30-15 and SB 32, as well as following the CAP guidelines established in the 2017 Scoping Plan. The CAP includes emissions targets of 6.0 MTCO₂eq per capita per year for 2030 and 5.0 MTCO₂eq per capita per year for 2035. As the project would result in 5.36 MTCO₂eq per service population per year, the project's GHG emissions would not exceed the most applicable CAP emissions target of 6.0 MTCO₂eq per capita per year for 2030. Therefore, the project would be in compliance with the reduction goals of the CAP, AB 32, and SB 32. Furthermore, the project would comply with applicable CALGreen, 2019 Title 24 standards, General Plan, and CAP policies regarding sustainability. Compliance with CALGreen measures would ensure the project installs water conserving plumbing fixtures and fittings, as well as electric vehicle charging spaces. Further, 2019 Title 24 standards would require installation of solar photovoltaic panels within residential developments, which would reduce energy usage by 53 percent compared to the 2016 Title 24 standards. Additionally, the CAP is designed to provide discrete actions to operationalize the General Plan policies that help with GHG reduction. As the project would be in compliance with the reduction goals of the CAP, the project would also be in compliance with the General Plan. Therefore, the project would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. Impacts would be less than significant in this regard.

Mitigation Measures: No mitigation is required.

REFERENCES

Documents

- 1. California Air Resources Board, *ADAM Air Quality Data Statistics*, http://www.arb.ca.gov/adam/, accessed September 5,2019.
- 2. California Air Resources Board, California's 2017 Climate Change Scoping Plan, November 2017.
- 3. California Air Resources Board, *AQMIS2: Air Quality Data*, https://www.arb.ca.gov/agmis2/agdselect.php, accessed September 5, 2019.
- 4. California Building Standards Commission, 2019 California Green Building Standards Code, https://codes.iccsafe.org/content/chapter/15761/, accessed September 5, 2019.
- 5. California Energy Commission, *2016 Building Energy Efficiency Standards*, www.energy.ca.gov/title24/2016standards/, accessed September 5, 2019.
- 6. California Energy Commission, 2019 Building Energy Efficiency Standards, https://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_S tandards FAQ.pdf, accessed September 5, 2019.
- 7. California Energy Commission, 2019 Building Energy Efficiency Standards Fact Sheet, March 2018.
- 8. City of Redlands, City of Redlands Climate Action Plan, adopted December 5, 2017.
- 9. U.S. Census Bureau, 2018 Population Estimate (as of July 1, 2018), https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml, accessed September 24, 2019.
- 10. U.S. Census Bureau, *American Community Survey, Redlands City, California*, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk, accessed September 24, 2019.
- 11. Urban Crossroads, Draft Pioneer & Texas Residential Traffic Impact Analysis, dated April 16, 2019.
- 12. San Joaquin Valley Air Pollution Control District, Application for Leave to File Brief of Amicus Curiae Brief of San Joaquin Valley Unified Air Pollution Control District in Support of Defendant and Respondent, County of Fresno and Real Party In Interest and Respondent, Friant Ranch, L.P. In the Supreme Court of California. Sierra Club, Revive the San Joaquin, and League of Women Voters of Fresno v. County of Fresno, 2014.
- 13. Scripps Institution of Oceanography, *Carbon Dioxide in the Atmosphere Hits Record High Monthly Average*, https://scripps.ucsd.edu/programs/keelingcurve/2018/05/02/carbon-dioxide-in-the-atmosphere-hits-record-high-monthly-average/, accessed September 5, 2019.
- 14. South Coast Air Quality Management District, Application of the South Coast Air Quality Management District for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae. In the Supreme Court of California. Sierra Club, Revive the San Joaquin, and

League of Women Voters of Fresno v. County of Fresno, 2014.

- 15. South Coast Air Quality Management District, CEQA Air Quality Handbook, November 1993.
- 16. South Coast Air Quality Management District, *SCAQMD Air Quality Significance Thresholds*, March 2015.
- 17. South Coast Air Quality Management District, *Final 2016 Air Quality Management Plan*, March 2017.
- 18. South Coast Air Quality Management District, *Final Localized Significance Threshold Methodology*, July 2008.
- 19. Southern California Association of Governments, 2016–2040 Regional Transportation Plan/Sustainable Communities Strategy, April 2016.
- 20. Southern California Association of Governments, 2016-2040 RTP/SCS Final Growth Forecast by Jurisdiction, http://www.scag.ca.gov/Documents/2016_2040RTPSCS_FinalGrowthForecastbyJurisdiction.pdf, accessed September 24, 2019.
- 21. Southern California Edison, *The Clean Power and Electrification Pathway*, https://newsroom.edison.com/internal_redirect/cms.ipressroom.com.s3.amazonaws.com/166/files/20187/g17-pathway-to-2030-white-paper.pdf, accessed September 5, 2019.

Websites / Programs

- 1. EPA Website, Greenhouse Gas Equivalencies Calculator, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.
- 2. Google Earth, 2019.
- 3. South Coast Air Quality Management District, California Emissions Estimator Model (CalEEMod), version 2016.3.2.

Appendix A

Air Quality/Greenhouse Gas Emissions Data

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

Heritage Residential Specific Plan Project San Bernardino-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	207.00	Dwelling Unit	37.20	372,600.00	592

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	32
Climate Zone	10			Operational Year	2024
Utility Company	Southern California Edisor	n			
CO2 Intensity (lb/MWhr)	513	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

Project Characteristics - CO2 Intensity Factor Source: Southern California Edison, 2018 Sustainability Report, dated May 2019.

Land Use - Per project description.

Construction Phase - Per project description.

Grading -

Vehicle Trips - Per TIA.

Energy Use -

Construction Off-road Equipment Mitigation - Per SCAQMD standards and regulations.

Mobile Land Use Mitigation - Site is approximatley 1.5 miles northwest of downtown Redlands and the nearest transit station.

Mobile Commute Mitigation -

Area Mitigation -

Energy Mitigation - % Improvement based on efficiency of 2019 Title 24 Standards compared to 2016 Title 24 Standards

Waste Mitigation -

Water Mitigation -

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

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Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	26
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	55.00	726.00
tblConstructionPhase	NumDays	740.00	792.00
tblConstructionPhase	NumDays	75.00	132.00
tblConstructionPhase	NumDays	55.00	792.00
tblGrading	MaterialExported	0.00	26,503.00
tblLandUse	LotAcreage	67.21	37.20
tblProjectCharacteristics	CO2IntensityFactor	702.44	513
tblVehicleTrips	ST_TR	9.91	9.45
tblVehicleTrips	SU_TR	8.62	9.45
tblVehicleTrips	WD_TR	9.52	9.45

2.0 Emissions Summary

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day								lb/d	lay						
2020	4.7223	56.4868	33.7414	0.0832	9.6907	2.1940	11.8847	3.8611	2.0192	5.8803	0.0000	8,244.091 7	8,244.091 7	2.0709	0.0000	8,295.863 2
2021	7.1818	52.2120	37.0783	0.0830	9.6907	2.0032	11.6938	3.8611	1.8435	5.7046	0.0000	8,220.166 2	8,220.166 2	2.0688	0.0000	8,271.887 0
2022	6.7819	30.4492	36.4609	0.0683	1.3145	1.4691	2.7836	0.3518	1.3751	1.7269	0.0000	6,633.659 0	6,633.659 0	1.4124	0.0000	6,668.969 5
2023	6.5207	27.6970	36.0059	0.0678	1.3145	1.2894	2.6040	0.3518	1.2066	1.5585	0.0000	6,580.983 6	6,580.983 6	1.3957	0.0000	6,615.876 3
2024	6.3369	25.9860	35.7488	0.0675	1.3145	1.1513	2.4659	0.3518	1.0768	1.4286	0.0000	6,549.926 5	6,549.926 5	1.3892	0.0000	6,584.656 7
Maximum	7.1818	56.4868	37.0783	0.0832	9.6907	2.1940	11.8847	3.8611	2.0192	5.8803	0.0000	8,244.091 7	8,244.091 7	2.0709	0.0000	8,295.863 2

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e			
Year		lb/day										lb/day							
2020	4.7223	56.4868	33.7414	0.0832	3.9934	2.1940	6.1875	1.5402	2.0192	3.5594	0.0000	8,244.091 6	8,244.091 6	2.0709	0.0000	8,295.863 2			
2021	7.1818	52.2120	37.0783	0.0830	3.9934	2.0032	5.9966	1.5402	1.8435	3.3837	0.0000	8,220.166 2	8,220.166 2	2.0688	0.0000	8,271.887 0			
2022	6.7819	30.4492	36.4609	0.0683	1.0232	1.4691	2.4923	0.2803	1.3751	1.6554	0.0000	6,633.659 0	6,633.659 0	1.4124	0.0000	6,668.969 5			
2023	6.5207	27.6970	36.0059	0.0678	1.0232	1.2894	2.3126	0.2803	1.2066	1.4870	0.0000	6,580.983 6	6,580.983 6	1.3957	0.0000	6,615.876 3			
2024	6.3369	25.9860	35.7488	0.0675	1.0232	1.1513	2.1745	0.2803	1.0768	1.3571	0.0000	6,549.926 5	6,549.926 5	1.3892	0.0000	6,584.656 7			
Maximum	7.1818	56.4868	37.0783	0.0832	3.9934	2.1940	6.1875	1.5402	2.0192	3.5594	0.0000	8,244.091 6	8,244.091 6	2.0709	0.0000	8,295.863 2			
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e			
Percent Reduction	0.00	0.00	0.00	0.00	52.60	0.00	39.03	55.33	0.00	29.80	0.00	0.00	0.00	0.00	0.00	0.00			

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

2.2 Overall Operational Unmitigated Operational

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day									lb/day						
Area	62.7710	4.4916	122.3408	0.2695		15.9070	15.9070		15.9070	15.9070	1,938.952 1	3,756.750 3	5,695.702 4	5.8118	0.1316	5,880.215 8
Energy	0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9
Mobile	3.0570	20.2553	36.9178	0.1683	14.2502	0.1044	14.3546	3.8126	0.0973	3.9099		17,218.33 83	17,218.33 83	0.8171		17,238.76 69
Total	66.0151	26.3459	159.9391	0.4479	14.2502	16.1407	30.3909	3.8126	16.1336	19.9462	1,938.952 1	23,016.47 56	24,955.42 77	6.6681	0.1690	25,172.50 06

Mitigated Operational

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day									lb/day						
Area	8.8912	3.2871	18.3856	0.0206		0.3445	0.3445		0.3445	0.3445	0.0000	3,975.926 8	3,975.926 8	0.1051	0.0723	4,000.108 6
Energy	0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743	1 	0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2
Mobile	2.7783	18.4195	30.0991	0.1337	10.9577	0.0829	11.0406	2.9318	0.0772	3.0090		13,692.72 47	13,692.72 47	0.7070		13,710.40 08
Total	11.7769	22.6252	48.8757	0.1602	10.9577	0.5016	11.4594	2.9318	0.4960	3.4277	0.0000	18,841.33 51	18,841.33 51	0.8346	0.0938	18,890.16 16

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

	ROG	NOx	со	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	82.16	14.12	69.44	64.23	23.10	96.89	62.29	23.10	96.93	82.82	100.00	18.14	24.50	87.48	44.49	24.96

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	10/1/2020	4/2/2021	5	132	
2	Building Construction	Building Construction	4/3/2021	4/16/2024	5	792	
3	Paving	Paving	4/3/2021	4/16/2024	5	792	
4	Architectural Coating	Architectural Coating	7/6/2021	4/16/2024	5	726	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 330

Acres of Paving: 0

Residential Indoor: 754,515; Residential Outdoor: 251,505; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	8	20.00	0.00	3,313.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	75.00	22.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2020

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Fugitive Dust		 	1		8.6960	0.0000	8.6960	3.5999	0.0000	3.5999			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000		6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	4.4501	50.1975	31.9583	0.0620	8.6960	2.1739	10.8699	3.5999	2.0000	5.5999		6,005.865 3	6,005.865 3	1.9424		6,054.425 7

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3.2 Grading - 2020
Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.1630	6.2156	1.0438	0.0192	0.7711	0.0187	0.7897	0.2019	0.0179	0.2197		2,035.476 4	2,035.476 4	0.1224		2,038.536 2
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	 	0.0000
Worker	0.1092	0.0737	0.7393	2.0400e- 003	0.2236	1.4600e- 003	0.2250	0.0593	1.3500e- 003	0.0606		202.7500	202.7500	6.0500e- 003	 	202.9013
Total	0.2722	6.2893	1.7831	0.0212	0.9946	0.0201	1.0148	0.2612	0.0192	0.2804		2,238.226 4	2,238.226 4	0.1284		2,241.437 5

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Fugitive Dust					3.2219	0.0000	3.2219	1.3338	0.0000	1.3338			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000	0.0000	6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	4.4501	50.1975	31.9583	0.0620	3.2219	2.1739	5.3958	1.3338	2.0000	3.3338	0.0000	6,005.865 3	6,005.865 3	1.9424		6,054.425 7

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.2 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Hauling	0.1630	6.2156	1.0438	0.0192	0.5985	0.0187	0.6172	0.1595	0.0179	0.1774		2,035.476 4	2,035.476 4	0.1224		2,038.536 2
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1092	0.0737	0.7393	2.0400e- 003	0.1730	1.4600e- 003	0.1745	0.0469	1.3500e- 003	0.0482		202.7500	202.7500	6.0500e- 003		202.9013
Total	0.2722	6.2893	1.7831	0.0212	0.7715	0.0201	0.7917	0.2064	0.0192	0.2256		2,238.226 4	2,238.226 4	0.1284		2,241.437 5

3.2 Grading - 2021

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Fugitive Dust					8.6960	0.0000	8.6960	3.5999	0.0000	3.5999			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265		6,007.043 4	6,007.043 4	1.9428	 	6,055.613 4
Total	4.1912	46.3998	30.8785	0.0620	8.6960	1.9853	10.6814	3.5999	1.8265	5.4265		6,007.043 4	6,007.043 4	1.9428		6,055.613 4

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.2 Grading - 2021

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Hauling	0.1559	5.7461	1.0126	0.0190	0.7711	0.0164	0.7875	0.2019	0.0157	0.2176		2,016.823 2	2,016.823 2	0.1206		2,019.837 4
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1018	0.0661	0.6791	1.9700e- 003	0.2236	1.4300e- 003	0.2250	0.0593	1.3200e- 003	0.0606		196.2995	196.2995	5.4600e- 003		196.4361
Total	0.2577	5.8122	1.6917	0.0210	0.9946	0.0179	1.0125	0.2612	0.0170	0.2782		2,213.122 8	2,213.122 8	0.1260		2,216.273 6

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Fugitive Dust					3.2219	0.0000	3.2219	1.3338	0.0000	1.3338			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265	0.0000	6,007.043 4	6,007.043 4	1.9428		6,055.613 4
Total	4.1912	46.3998	30.8785	0.0620	3.2219	1.9853	5.2072	1.3338	1.8265	3.1603	0.0000	6,007.043 4	6,007.043 4	1.9428		6,055.613 4

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3.2 Grading - 2021

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Hauling	0.1559	5.7461	1.0126	0.0190	0.5985	0.0164	0.6149	0.1595	0.0157	0.1752		2,016.823 2	2,016.823 2	0.1206		2,019.837 4
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1018	0.0661	0.6791	1.9700e- 003	0.1730	1.4300e- 003	0.1745	0.0469	1.3200e- 003	0.0482		196.2995	196.2995	5.4600e- 003		196.4361
Total	0.2577	5.8122	1.6917	0.0210	0.7715	0.0179	0.7894	0.2064	0.0170	0.2234		2,213.122 8	2,213.122 8	0.1260		2,216.273 6

3.3 Building Construction - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.363 9	2,553.363 9	0.6160		2,568.764 3
Total	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.363 9	2,553.363 9	0.6160		2,568.764 3

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3.3 Building Construction - 2021 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0604	2.0990	0.4670	5.7100e- 003	0.1409	3.7400e- 003	0.1446	0.0406	3.5800e- 003	0.0442	#	601.7773	601.7773	0.0439	,	602.8737
Worker	0.3819	0.2478	2.5467	7.3900e- 003	0.8383	5.3600e- 003	0.8437	0.2223	4.9400e- 003	0.2273		736.1233	736.1233	0.0205	,	736.6355
Total	0.4423	2.3468	3.0137	0.0131	0.9792	9.1000e- 003	0.9883	0.2629	8.5200e- 003	0.2714		1,337.900 5	1,337.900 5	0.0644		1,339.509 2

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
- Cirribad	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.363 9	2,553.363 9	0.6160		2,568.764 3
Total	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.363 9	2,553.363 9	0.6160		2,568.764 3

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3.3 Building Construction - 2021 Mitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/c	lay		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0604	2.0990	0.4670	5.7100e- 003	0.1148	3.7400e- 003	0.1186	0.0342	3.5800e- 003	0.0377		601.7773	601.7773	0.0439	 	602.8737
Worker	0.3819	0.2478	2.5467	7.3900e- 003	0.6488	5.3600e- 003	0.6542	0.1758	4.9400e- 003	0.1808		736.1233	736.1233	0.0205	 	736.6355
Total	0.4423	2.3468	3.0137	0.0131	0.7636	9.1000e- 003	0.7727	0.2100	8.5200e- 003	0.2185		1,337.900 5	1,337.900 5	0.0644		1,339.509 2

3.3 Building Construction - 2022

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
- Cil rioda	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.333 6	2,554.333 6	0.6120		2,569.632 2
Total	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.333 6	2,554.333 6	0.6120		2,569.632 2

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3.3 Building Construction - 2022 <u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0563	1.9885	0.4335	5.6600e- 003	0.1409	3.1500e- 003	0.1441	0.0406	3.0100e- 003	0.0436		596.7638	596.7638	0.0424		597.8238
Worker	0.3576	0.2227	2.3356	7.1200e- 003	0.8383	5.2100e- 003	0.8435	0.2223	4.7900e- 003	0.2271		709.6095	709.6095	0.0184		710.0693
Total	0.4139	2.2112	2.7692	0.0128	0.9792	8.3600e- 003	0.9876	0.2629	7.8000e- 003	0.2707		1,306.373 2	1,306.373	0.0608		1,307.893 1

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612	0.0000	2,554.333 6	2,554.333 6	0.6120		2,569.632 2
Total	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612	0.0000	2,554.333 6	2,554.333 6	0.6120		2,569.632 2

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3.3 Building Construction - 2022 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/c	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0563	1.9885	0.4335	5.6600e- 003	0.1148	3.1500e- 003	0.1180	0.0342	3.0100e- 003	0.0372		596.7638	596.7638	0.0424		597.8238
Worker	0.3576	0.2227	2.3356	7.1200e- 003	0.6488	5.2100e- 003	0.6540	0.1758	4.7900e- 003	0.1806		709.6095	709.6095	0.0184		710.0693
Total	0.4139	2.2112	2.7692	0.0128	0.7636	8.3600e- 003	0.7720	0.2100	7.8000e- 003	0.2178		1,306.373 2	1,306.373 2	0.0608		1,307.893 1

3.3 Building Construction - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.209 9	2,555.209 9	0.6079		2,570.406 1
Total	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.209 9	2,555.209 9	0.6079		2,570.406 1

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3.3 Building Construction - 2023 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0425	1.5369	0.3688	5.5000e- 003	0.1409	1.5600e- 003	0.1425	0.0406	1.4900e- 003	0.0421		580.5764	580.5764	0.0340	 	581.4257
Worker	0.3355	0.2004	2.1413	6.8500e- 003	0.8383	5.0600e- 003	0.8434	0.2223	4.6600e- 003	0.2270		682.9751	682.9751	0.0165	 	683.3871
Total	0.3780	1.7373	2.5101	0.0124	0.9792	6.6200e- 003	0.9859	0.2629	6.1500e- 003	0.2691		1,263.551 4	1,263.551 4	0.0505		1,264.812 8

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584	0.0000	2,555.209 9	2,555.209 9	0.6079		2,570.406 1
Total	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584	0.0000	2,555.209 9	2,555.209 9	0.6079		2,570.406 1

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3.3 Building Construction - 2023 Mitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0425	1.5369	0.3688	5.5000e- 003	0.1148	1.5600e- 003	0.1164	0.0342	1.4900e- 003	0.0357		580.5764	580.5764	0.0340	 	581.4257
Worker	0.3355	0.2004	2.1413	6.8500e- 003	0.6488	5.0600e- 003	0.6539	0.1758	4.6600e- 003	0.1805		682.9751	682.9751	0.0165	 	683.3871
Total	0.3780	1.7373	2.5101	0.0124	0.7636	6.6200e- 003	0.7703	0.2100	6.1500e- 003	0.2161		1,263.551 4	1,263.551 4	0.0505		1,264.812 8

3.3 Building Construction - 2024

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133	 	0.5769	0.5769		2,555.698 9	2,555.698 9	0.6044		2,570.807 7
Total	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.698 9	2,555.698 9	0.6044		2,570.807 7

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3.3 Building Construction - 2024 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0419	1.5448	0.3555	5.4900e- 003	0.1409	1.5500e- 003	0.1425	0.0406	1.4800e- 003	0.0421		580.0642	580.0642	0.0340	 	580.9135
Worker	0.3166	0.1815	1.9933	6.6300e- 003	0.8383	5.0200e- 003	0.8433	0.2223	4.6200e- 003	0.2270		660.8344	660.8344	0.0151	 	661.2107
Total	0.3584	1.7263	2.3487	0.0121	0.9792	6.5700e- 003	0.9858	0.2629	6.1000e- 003	0.2690		1,240.898 6	1,240.898 6	0.0490		1,242.124 2

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769	0.0000	2,555.698 9	2,555.698 9	0.6044		2,570.807 7
Total	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769	0.0000	2,555.698 9	2,555.698 9	0.6044		2,570.807 7

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3.3 Building Construction - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/o	day							lb/c	lay		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0419	1.5448	0.3555	5.4900e- 003	0.1148	1.5500e- 003	0.1164	0.0342	1.4800e- 003	0.0357		580.0642	580.0642	0.0340	 	580.9135
Worker	0.3166	0.1815	1.9933	6.6300e- 003	0.6488	5.0200e- 003	0.6539	0.1758	4.6200e- 003	0.1804		660.8344	660.8344	0.0151	 	661.2107
Total	0.3584	1.7263	2.3487	0.0121	0.7636	6.5700e- 003	0.7702	0.2100	6.1000e- 003	0.2161		1,240.898 6	1,240.898 6	0.0490		1,242.124 2

3.4 Paving - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/e	day							lb/c	day		
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.210 9	2,207.210 9	0.7139		2,225.057 3
Paving	0.0000		i i			0.0000	0.0000	 	0.0000	0.0000			0.0000		 	0.0000
Total	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.210 9	2,207.210 9	0.7139		2,225.057 3

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2021

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0764	0.0496	0.5093	1.4800e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		147.2247	147.2247	4.1000e- 003		147.3271
Total	0.0764	0.0496	0.5093	1.4800e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		147.2247	147.2247	4.1000e- 003		147.3271

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777	i i	0.6235	0.6235	0.0000	2,207.210 9	2,207.210 9	0.7139		2,225.057 3
Paving	0.0000	 			 	0.0000	0.0000] 	0.0000	0.0000			0.0000		 	0.0000
Total	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235	0.0000	2,207.210 9	2,207.210 9	0.7139		2,225.057 3

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2021

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0764	0.0496	0.5093	1.4800e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		147.2247	147.2247	4.1000e- 003		147.3271
Total	0.0764	0.0496	0.5093	1.4800e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		147.2247	147.2247	4.1000e- 003		147.3271

3.4 Paving - 2022

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/c	day		
Off-Road	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225		2,207.660 3	2,207.660 3	0.7140		2,225.510 4
Paving	0.0000		1		 	0.0000	0.0000		0.0000	0.0000			0.0000		 	0.0000
Total	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225		2,207.660 3	2,207.660	0.7140		2,225.510 4

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2022

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0715	0.0445	0.4671	1.4200e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		141.9219	141.9219	3.6800e- 003		142.0139
Total	0.0715	0.0445	0.4671	1.4200e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		141.9219	141.9219	3.6800e- 003		142.0139

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Off-Road	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225	0.0000	2,207.660 3	2,207.660 3	0.7140		2,225.510 4
Paving	0.0000		1 1 1		 	0.0000	0.0000	i i	0.0000	0.0000		i i i	0.0000			0.0000
Total	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225	0.0000	2,207.660 3	2,207.660 3	0.7140		2,225.510 4

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2022

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0715	0.0445	0.4671	1.4200e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		141.9219	141.9219	3.6800e- 003		142.0139
Total	0.0715	0.0445	0.4671	1.4200e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		141.9219	141.9219	3.6800e- 003		142.0139

3.4 Paving - 2023

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Off-Road	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694		2,207.584 1	2,207.584 1	0.7140		2,225.433 6
Paving	0.0000	 				0.0000	0.0000	 	0.0000	0.0000			0.0000		 	0.0000
Total	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694		2,207.584 1	2,207.584 1	0.7140		2,225.433 6

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2023
<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0671	0.0401	0.4283	1.3700e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		136.5950	136.5950	3.3000e- 003		136.6774
Total	0.0671	0.0401	0.4283	1.3700e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		136.5950	136.5950	3.3000e- 003		136.6774

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694	0.0000	2,207.584 1	2,207.584 1	0.7140		2,225.433 6
Paving	0.0000	 				0.0000	0.0000	1 1 1	0.0000	0.0000			0.0000		i i i	0.0000
Total	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694	0.0000	2,207.584 1	2,207.584 1	0.7140		2,225.433 6

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2023

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0671	0.0401	0.4283	1.3700e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		136.5950	136.5950	3.3000e- 003		136.6774
Total	0.0671	0.0401	0.4283	1.3700e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		136.5950	136.5950	3.3000e- 003		136.6774

3.4 Paving - 2024

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Off-Road	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310		2,207.547 2	2,207.547 2	0.7140		2,225.396 3
Paving	0.0000		1		 	0.0000	0.0000	 	0.0000	0.0000		 	0.0000		 	0.0000
Total	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310		2,207.547 2	2,207.547	0.7140		2,225.396 3

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.4 Paving - 2024

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0633	0.0363	0.3987	1.3300e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		132.1669	132.1669	3.0100e- 003		132.2421
Total	0.0633	0.0363	0.3987	1.3300e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		132.1669	132.1669	3.0100e- 003		132.2421

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Off-Road	0.9882	9.5246	14.6258	0.0228	! !	0.4685	0.4685		0.4310	0.4310	0.0000	2,207.547 2	2,207.547 2	0.7140		2,225.396 3
Paving	0.0000]		 	0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310	0.0000	2,207.547 2	2,207.547 2	0.7140		2,225.396 3

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3.4 Paving - 2024

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	 	0.0000
Worker	0.0633	0.0363	0.3987	1.3300e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		132.1669	132.1669	3.0100e- 003	 	132.2421
Total	0.0633	0.0363	0.3987	1.3300e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		132.1669	132.1669	3.0100e- 003		132.2421

3.5 Architectural Coating - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e- 003		0.0941	0.0941	1 1 1 1	0.0941	0.0941		281.4481	281.4481	0.0193	, , ,	281.9309
Total	3.4303	1.5268	1.8176	2.9700e- 003		0.0941	0.0941		0.0941	0.0941		281.4481	281.4481	0.0193		281.9309

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3.5 Architectural Coating - 2021 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0764	0.0496	0.5093	1.4800e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		147.2247	147.2247	4.1000e- 003		147.3271
Total	0.0764	0.0496	0.5093	1.4800e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		147.2247	147.2247	4.1000e- 003		147.3271

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e- 003		0.0941	0.0941		0.0941	0.0941	0.0000	281.4481	281.4481	0.0193		281.9309
Total	3.4303	1.5268	1.8176	2.9700e- 003		0.0941	0.0941		0.0941	0.0941	0.0000	281.4481	281.4481	0.0193		281.9309

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3.5 Architectural Coating - 2021 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0764	0.0496	0.5093	1.4800e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		147.2247	147.2247	4.1000e- 003		147.3271
Total	0.0764	0.0496	0.5093	1.4800e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		147.2247	147.2247	4.1000e- 003		147.3271

3.5 Architectural Coating - 2022

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000	! !	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e- 003		0.0817	0.0817	, 	0.0817	0.0817		281.4481	281.4481	0.0183	,	281.9062
Total	3.4159	1.4085	1.8136	2.9700e- 003		0.0817	0.0817		0.0817	0.0817		281.4481	281.4481	0.0183		281.9062

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3.5 Architectural Coating - 2022 <u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0715	0.0445	0.4671	1.4200e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		141.9219	141.9219	3.6800e- 003		142.0139
Total	0.0715	0.0445	0.4671	1.4200e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		141.9219	141.9219	3.6800e- 003		142.0139

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/e	day							lb/d	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e- 003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062
Total	3.4159	1.4085	1.8136	2.9700e- 003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.5 Architectural Coating - 2022 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0715	0.0445	0.4671	1.4200e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		141.9219	141.9219	3.6800e- 003		142.0139
Total	0.0715	0.0445	0.4671	1.4200e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		141.9219	141.9219	3.6800e- 003		142.0139

3.5 Architectural Coating - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1917	1.3030	1.8111	2.9700e- 003		0.0708	0.0708	1 1 1 1	0.0708	0.0708		281.4481	281.4481	0.0168	, , ,	281.8690
Total	3.4030	1.3030	1.8111	2.9700e- 003		0.0708	0.0708		0.0708	0.0708		281.4481	281.4481	0.0168		281.8690

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3.5 Architectural Coating - 2023 <u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0671	0.0401	0.4283	1.3700e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		136.5950	136.5950	3.3000e- 003		136.6774
Total	0.0671	0.0401	0.4283	1.3700e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		136.5950	136.5950	3.3000e- 003		136.6774

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1917	1.3030	1.8111	2.9700e- 003		0.0708	0.0708		0.0708	0.0708	0.0000	281.4481	281.4481	0.0168		281.8690
Total	3.4030	1.3030	1.8111	2.9700e- 003		0.0708	0.0708		0.0708	0.0708	0.0000	281.4481	281.4481	0.0168		281.8690

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.5 Architectural Coating - 2023 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0671	0.0401	0.4283	1.3700e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		136.5950	136.5950	3.3000e- 003		136.6774
Total	0.0671	0.0401	0.4283	1.3700e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		136.5950	136.5950	3.3000e- 003		136.6774

3.5 Architectural Coating - 2024

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1808	1.2188	1.8101	2.9700e- 003		0.0609	0.0609	,	0.0609	0.0609		281.4481	281.4481	0.0159	 	281.8443
Total	3.3921	1.2188	1.8101	2.9700e- 003		0.0609	0.0609		0.0609	0.0609		281.4481	281.4481	0.0159		281.8443

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.5 Architectural Coating - 2024 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0633	0.0363	0.3987	1.3300e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		132.1669	132.1669	3.0100e- 003		132.2421
Total	0.0633	0.0363	0.3987	1.3300e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		132.1669	132.1669	3.0100e- 003		132.2421

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1808	1.2188	1.8101	2.9700e- 003		0.0609	0.0609	1 1 1 1	0.0609	0.0609	0.0000	281.4481	281.4481	0.0159	;	281.8443
Total	3.3921	1.2188	1.8101	2.9700e- 003		0.0609	0.0609		0.0609	0.0609	0.0000	281.4481	281.4481	0.0159		281.8443

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

3.5 Architectural Coating - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	 	0.0000
Worker	0.0633	0.0363	0.3987	1.3300e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		132.1669	132.1669	3.0100e- 003	 	132.2421
Total	0.0633	0.0363	0.3987	1.3300e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		132.1669	132.1669	3.0100e- 003		132.2421

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Mitigated	2.7783	18.4195	30.0991	0.1337	10.9577	0.0829	11.0406	2.9318	0.0772	3.0090		13,692.72 47	13,692.72 47	0.7070		13,710.40 08
Unmitigated	3.0570	20.2553	36.9178	0.1683	14.2502	0.1044	14.3546	3.8126	0.0973	3.9099		17,218.33 83	17,218.33 83	0.8171	 	17,238.76 69

4.2 Trip Summary Information

	Ave	rage Daily Trip Ra	ate	Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	1,956.15	1,956.15	1956.15	6,684,462	5,140,059
Total	1,956.15	1,956.15	1,956.15	6,684,462	5,140,059

4.3 Trip Type Information

		Miles			Trip %			Trip Purpos	e %
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.558745	0.035303	0.181800	0.111169	0.014289	0.004794	0.018611	0.065078	0.001365	0.001491	0.005725	0.000799	0.000830

5.0 Energy Detail

Historical Energy Use: N

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

5.1 Mitigation Measures Energy

Exceed Title 24

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
NaturalGas Mitigated	0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2
NaturalGas Unmitigated	0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGa s Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					lb/d	day							lb/c	lay		
Single Family Housing	17351.8	0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9
Total		0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGa s Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					lb/d	day							lb/c	lay		
Single Family Housing	9.96781	0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2
Total		0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2

6.0 Area Detail

6.1 Mitigation Measures Area

Use only Natural Gas Hearths

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Mitigated	8.8912	3.2871	18.3856	0.0206		0.3445	0.3445		0.3445	0.3445	0.0000	3,975.926 8	3,975.926 8	0.1051	0.0723	4,000.108 6
Unmitigated	62.7710	4.4916	122.3408	0.2695		15.9070	15.9070		15.9070	15.9070	1,938.952 1	3,756.750 3	5,695.702 4	5.8118	0.1316	5,880.215 8

6.2 Area by SubCategory

<u>Unmitigated</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory					lb/d	day							lb/d	day		
Architectural Coating	0.6388					0.0000	0.0000	i i i	0.0000	0.0000			0.0000		1 1 1	0.0000
Consumer Products	7.3775		 	 		0.0000	0.0000	 	0.0000	0.0000			0.0000	 	 	0.0000
Hearth	54.2415	4.2949	105.2702	0.2686		15.8124	15.8124	 	15.8124	15.8124	1,938.952 1	3,726.000 0	5,664.952 1	5.7823	0.1316	5,848.727 8
Landscaping	0.5133	0.1967	17.0706	9.0000e- 004		0.0946	0.0946	 	0.0946	0.0946		30.7503	30.7503	0.0295	 	31.4879
Total	62.7710	4.4916	122.3408	0.2695		15.9070	15.9070		15.9070	15.9070	1,938.952 1	3,756.750 3	5,695.702 4	5.8118	0.1316	5,880.215 8

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory					lb/d	day							lb/d	day		
Architectural Coating	0.6388					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	7.3775			 		0.0000	0.0000	 	0.0000	0.0000			0.0000			0.0000
Hearth	0.3616	3.0904	1.3151	0.0197		0.2499	0.2499	 	0.2499	0.2499	0.0000	3,945.176 5	3,945.176 5	0.0756	0.0723	3,968.620 7
Landscaping	0.5133	0.1967	17.0706	9.0000e- 004		0.0946	0.0946	1 	0.0946	0.0946		30.7503	30.7503	0.0295		31.4879
Total	8.8911	3.2871	18.3856	0.0206		0.3445	0.3445		0.3445	0.3445	0.0000	3,975.926 8	3,975.926 8	0.1051	0.0723	4,000.108 6

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Winter

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
=90.6	110111001	1 10 a. 0, 2 a.y	2 4 4 7 . 6 4 .	1101001 01101	2000 1 00101	. 40) po

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number
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11.0 Vegetation

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

Heritage Residential Specific Plan Project

San Bernardino-South Coast County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	207.00	Dwelling Unit	37.20	372,600.00	592

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	32
Climate Zone	10			Operational Year	2024
Utility Company	Southern California Ediso	n			
CO2 Intensity (lb/MWhr)	513	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

Project Characteristics - CO2 Intensity Factor Source: Southern California Edison, 2018 Sustainability Report, dated May 2019.

Land Use - Per project description.

Construction Phase - Per project description.

Grading -

Vehicle Trips - Per TIA.

Energy Use -

Construction Off-road Equipment Mitigation - Per SCAQMD standards and regulations.

Mobile Land Use Mitigation - Site is approximatley 1.5 miles northwest of downtown Redlands and the nearest transit station.

Mobile Commute Mitigation -

Area Mitigation -

Energy Mitigation - % Improvement based on efficiency of 2019 Title 24 Standards compared to 2016 Title 24 Standards

Waste Mitigation -

Water Mitigation -

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Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	26
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	55.00	726.00
tblConstructionPhase	NumDays	740.00	792.00
tblConstructionPhase	NumDays	75.00	132.00
tblConstructionPhase	NumDays	55.00	792.00
tblGrading	MaterialExported	0.00	26,503.00
tblLandUse	LotAcreage	67.21	37.20
tblProjectCharacteristics	CO2IntensityFactor	702.44	513
tblVehicleTrips	ST_TR	9.91	9.45
tblVehicleTrips	SU_TR	8.62	9.45
tblVehicleTrips	WD_TR	9.52	9.45

2.0 Emissions Summary

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year					lb/d	day							lb/c	lay		
2020	4.7152	56.4503	33.7701	0.0840	9.6907	2.1938	11.8845	3.8611	2.0190	5.8801	0.0000	8,321.853 2	8,321.853 2	2.0621	0.0000	8,373.405 9
2021	7.1772	52.1873	37.7920	0.0837	9.6907	2.0030	11.6936	3.8611	1.8433	5.7044	0.0000	8,296.960 6	8,296.960 6	2.0601	0.0000	8,348.461 8
2022	6.7762	30.4577	37.1198	0.0697	1.3145	1.4690	2.7835	0.3518	1.3750	1.7268	0.0000	6,771.851 2	6,771.851 2	1.4118	0.0000	6,807.146 0
2023	6.5147	27.7046	36.6276	0.0691	1.3145	1.2893	2.6039	0.3518	1.2066	1.5584	0.0000	6,713.772 7	6,713.772 7	1.3957	0.0000	6,748.664 7
2024	6.3299	25.9944	36.3314	0.0688	1.3145	1.1513	2.4658	0.3518	1.0768	1.4286	0.0000	6,678.893 5	6,678.893 5	1.3889	0.0000	6,713.615 2
Maximum	7.1772	56.4503	37.7920	0.0840	9.6907	2.1938	11.8845	3.8611	2.0190	5.8801	0.0000	8,321.853 2	8,321.853 2	2.0621	0.0000	8,373.405 9

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year					lb/	day							lb/	day		
2020	4.7152	56.4503	33.7701	0.0840	3.9934	2.1938	6.1872	1.5402	2.0190	3.5592	0.0000	8,321.853 2	8,321.853 2	2.0621	0.0000	8,373.405 9
2021	7.1772	52.1873	37.7920	0.0837	3.9934	2.0030	5.9964	1.5402	1.8433	3.3835	0.0000	8,296.960 6	8,296.960 6	2.0601	0.0000	8,348.461 8
2022	6.7762	30.4577	37.1198	0.0697	1.0232	1.4690	2.4922	0.2803	1.3750	1.6553	0.0000	6,771.851 2	6,771.851 2	1.4118	0.0000	6,807.146 0
2023	6.5147	27.7046	36.6276	0.0691	1.0232	1.2893	2.3125	0.2803	1.2066	1.4869	0.0000	6,713.772 7	6,713.772 7	1.3957	0.0000	6,748.664 7
2024	6.3299	25.9944	36.3314	0.0688	1.0232	1.1513	2.1745	0.2803	1.0768	1.3571	0.0000	6,678.893 5	6,678.893 5	1.3889	0.0000	6,713.615 2
Maximum	7.1772	56.4503	37.7920	0.0840	3.9934	2.1938	6.1872	1.5402	2.0190	3.5592	0.0000	8,321.853 2	8,321.853 2	2.0621	0.0000	8,373.405 9
	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	52.60	0.00	39.03	55.33	0.00	29.80	0.00	0.00	0.00	0.00	0.00	0.00

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2.2 Overall Operational Unmitigated Operational

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Area	62.7710	4.4916	122.3408	0.2695		15.9070	15.9070		15.9070	15.9070	1,938.952 1	3,756.750 3	5,695.702 4	5.8118	0.1316	5,880.215 8
Energy	0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9
Mobile	3.5222	20.2584	42.3677	0.1824	14.2502	0.1039	14.3540	3.8126	0.0968	3.9094		18,634.50 19	18,634.50 19	0.8051		18,654.63 01
Total	66.4803	26.3490	165.3889	0.4620	14.2502	16.1401	30.3903	3.8126	16.1331	19.9457	1,938.952 1	24,432.63 92	26,371.59 13	6.6561	0.1690	26,588.36 38

Mitigated Operational

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Area	8.8912	3.2871	18.3856	0.0206		0.3445	0.3445		0.3445	0.3445	0.0000	3,975.926 8	3,975.926 8	0.1051	0.0723	4,000.108 6
Energy	0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2
Mobile	3.2274	18.5094	33.9834	0.1451	10.9577	0.0823	11.0400	2.9318	0.0767	3.0084		14,842.29 24	14,842.29 24	0.6883	 	14,859.49 93
Total	12.2260	22.7151	52.7600	0.1716	10.9577	0.5011	11.4588	2.9318	0.4954	3.4272	0.0000	19,990.90 27	19,990.90 27	0.8159	0.0938	20,039.26 01

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	81.61	13.79	68.10	62.86	23.10	96.90	62.29	23.10	96.93	82.82	100.00	18.18	24.20	87.74	44.49	24.63

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	10/1/2020	4/2/2021	5	132	
2	Building Construction	Building Construction	4/3/2021	4/16/2024	5	792	
3	Paving	Paving	4/3/2021	4/16/2024	5	792	
4	Architectural Coating	Architectural Coating	7/6/2021	4/16/2024	5	726	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 330

Acres of Paving: 0

Residential Indoor: 754,515; Residential Outdoor: 251,505; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

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Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.4

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	8	20.00	0.00	3,313.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	75.00	22.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2020

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Fugitive Dust		 	1		8.6960	0.0000	8.6960	3.5999	0.0000	3.5999			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000		6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	4.4501	50.1975	31.9583	0.0620	8.6960	2.1739	10.8699	3.5999	2.0000	5.5999		6,005.865 3	6,005.865 3	1.9424		6,054.425 7

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3.2 Grading - 2020
Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.1559	6.1827	0.9124	0.0197	0.7711	0.0184	0.7895	0.2019	0.0176	0.2195		2,089.971 1	2,089.971 1	0.1128		2,092.790 9
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1092	0.0701	0.8995	2.2700e- 003	0.2236	1.4600e- 003	0.2250	0.0593	1.3500e- 003	0.0606		226.0168	226.0168	6.9000e- 003		226.1893
Total	0.2651	6.2528	1.8118	0.0220	0.9946	0.0199	1.0145	0.2612	0.0190	0.2801		2,315.988 0	2,315.988 0	0.1197		2,318.980 2

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Fugitive Dust	 	i i			3.2219	0.0000	3.2219	1.3338	0.0000	1.3338			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000	0.0000	6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	4.4501	50.1975	31.9583	0.0620	3.2219	2.1739	5.3958	1.3338	2.0000	3.3338	0.0000	6,005.865 3	6,005.865 3	1.9424		6,054.425 7

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3.2 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Hauling	0.1559	6.1827	0.9124	0.0197	0.5985	0.0184	0.6169	0.1595	0.0176	0.1772		2,089.971 1	2,089.971 1	0.1128		2,092.790 9
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1092	0.0701	0.8995	2.2700e- 003	0.1730	1.4600e- 003	0.1745	0.0469	1.3500e- 003	0.0482		226.0168	226.0168	6.9000e- 003		226.1893
Total	0.2651	6.2528	1.8118	0.0220	0.7715	0.0199	0.7914	0.2064	0.0190	0.2254		2,315.988 0	2,315.988 0	0.1197		2,318.980 2

3.2 Grading - 2021

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Fugitive Dust					8.6960	0.0000	8.6960	3.5999	0.0000	3.5999			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265		6,007.043 4	6,007.043 4	1.9428	 	6,055.613 4
Total	4.1912	46.3998	30.8785	0.0620	8.6960	1.9853	10.6814	3.5999	1.8265	5.4265		6,007.043 4	6,007.043 4	1.9428		6,055.613 4

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3.2 Grading - 2021

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.1491	5.7246	0.8867	0.0195	0.7711	0.0162	0.7873	0.2019	0.0155	0.2174		2,071.101 1	2,071.101 1	0.1110		2,073.876 6
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	 	0.0000
Worker	0.1016	0.0628	0.8280	2.2000e- 003	0.2236	1.4300e- 003	0.2250	0.0593	1.3200e- 003	0.0606		218.8161	218.8161	6.2300e- 003	 	218.9718
Total	0.2508	5.7874	1.7146	0.0217	0.9946	0.0176	1.0122	0.2612	0.0168	0.2780		2,289.917 2	2,289.917 2	0.1173		2,292.848 4

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Fugitive Dust	 				3.2219	0.0000	3.2219	1.3338	0.0000	1.3338		1	0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265	0.0000	6,007.043 4	6,007.043 4	1.9428	 	6,055.613 4
Total	4.1912	46.3998	30.8785	0.0620	3.2219	1.9853	5.2072	1.3338	1.8265	3.1603	0.0000	6,007.043 4	6,007.043 4	1.9428		6,055.613 4

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3.2 Grading - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	lay		
Hauling	0.1491	5.7246	0.8867	0.0195	0.5985	0.0162	0.6147	0.1595	0.0155	0.1750		2,071.101 1	2,071.101 1	0.1110		2,073.876 6
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1016	0.0628	0.8280	2.2000e- 003	0.1730	1.4300e- 003	0.1745	0.0469	1.3200e- 003	0.0482		218.8161	218.8161	6.2300e- 003		218.9718
Total	0.2508	5.7874	1.7146	0.0217	0.7715	0.0176	0.7892	0.2064	0.0168	0.2232		2,289.917 2	2,289.917 2	0.1173		2,292.848 4

3.3 Building Construction - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.363 9	2,553.363 9	0.6160		2,568.764 3
Total	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.363 9	2,553.363 9	0.6160		2,568.764 3

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3.3 Building Construction - 2021 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0569	2.1216	0.3992	5.9300e- 003	0.1409	3.6400e- 003	0.1445	0.0406	3.4800e- 003	0.0441		626.0965	626.0965	0.0396		627.0856
Worker	0.3811	0.2356	3.1049	8.2400e- 003	0.8383	5.3600e- 003	0.8437	0.2223	4.9400e- 003	0.2273		820.5604	820.5604	0.0234		821.1442
Total	0.4380	2.3572	3.5041	0.0142	0.9792	9.0000e- 003	0.9882	0.2629	8.4200e- 003	0.2713		1,446.656 9	1,446.656 9	0.0629		1,448.229 9

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.363 9	2,553.363 9	0.6160		2,568.764 3
Total	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.363 9	2,553.363 9	0.6160		2,568.764 3

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3.3 Building Construction - 2021 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0569	2.1216	0.3992	5.9300e- 003	0.1148	3.6400e- 003	0.1185	0.0342	3.4800e- 003	0.0377		626.0965	626.0965	0.0396		627.0856
Worker	0.3811	0.2356	3.1049	8.2400e- 003	0.6488	5.3600e- 003	0.6542	0.1758	4.9400e- 003	0.1808		820.5604	820.5604	0.0234		821.1442
Total	0.4380	2.3572	3.5041	0.0142	0.7636	9.0000e- 003	0.7726	0.2100	8.4200e- 003	0.2184		1,446.656 9	1,446.656 9	0.0629		1,448.229 9

3.3 Building Construction - 2022

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.333 6	2,554.333 6	0.6120		2,569.632 2
Total	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.333 6	2,554.333 6	0.6120		2,569.632 2

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3.3 Building Construction - 2022 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0530	2.0122	0.3691	5.8900e- 003	0.1409	3.0600e- 003	0.1440	0.0406	2.9200e- 003	0.0435		621.0767	621.0767	0.0382		622.0316
Worker	0.3559	0.2118	2.8523	7.9400e- 003	0.8383	5.2100e- 003	0.8435	0.2223	4.7900e- 003	0.2271		790.9518	790.9518	0.0210		791.4755
Total	0.4089	2.2239	3.2214	0.0138	0.9792	8.2700e- 003	0.9875	0.2629	7.7100e- 003	0.2706		1,412.028 5	1,412.028 5	0.0592		1,413.507 1

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612	0.0000	2,554.333 6	2,554.333 6	0.6120		2,569.632 2
Total	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612	0.0000	2,554.333 6	2,554.333 6	0.6120		2,569.632 2

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3.3 Building Construction - 2022 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0530	2.0122	0.3691	5.8900e- 003	0.1148	3.0600e- 003	0.1179	0.0342	2.9200e- 003	0.0371		621.0767	621.0767	0.0382		622.0316
Worker	0.3559	0.2118	2.8523	7.9400e- 003	0.6488	5.2100e- 003	0.6540	0.1758	4.7900e- 003	0.1806		790.9518	790.9518	0.0210		791.4755
Total	0.4089	2.2239	3.2214	0.0138	0.7636	8.2700e- 003	0.7719	0.2100	7.7100e- 003	0.2177		1,412.028 5	1,412.028 5	0.0592		1,413.507 1

3.3 Building Construction - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
- Cil rioda	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.209 9	2,555.209 9	0.6079		2,570.406 1
Total	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.209 9	2,555.209 9	0.6079		2,570.406 1

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

3.3 Building Construction - 2023 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0401	1.5580	0.3216	5.7200e- 003	0.1409	1.5000e- 003	0.1424	0.0406	1.4400e- 003	0.0420		603.8329	603.8329	0.0308		604.6020
Worker	0.3329	0.1907	2.6190	7.6400e- 003	0.8383	5.0600e- 003	0.8434	0.2223	4.6600e- 003	0.2270		761.2126	761.2126	0.0188		761.6815
Total	0.3730	1.7488	2.9407	0.0134	0.9792	6.5600e- 003	0.9858	0.2629	6.1000e- 003	0.2690		1,365.045 5	1,365.045 5	0.0495		1,366.283 5

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584	0.0000	2,555.209 9	2,555.209 9	0.6079		2,570.406 1
Total	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584	0.0000	2,555.209 9	2,555.209 9	0.6079		2,570.406 1

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

3.3 Building Construction - 2023 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0401	1.5580	0.3216	5.7200e- 003	0.1148	1.5000e- 003	0.1163	0.0342	1.4400e- 003	0.0356		603.8329	603.8329	0.0308		604.6020
Worker	0.3329	0.1907	2.6190	7.6400e- 003	0.6488	5.0600e- 003	0.6539	0.1758	4.6600e- 003	0.1805		761.2126	761.2126	0.0188		761.6815
Total	0.3730	1.7488	2.9407	0.0134	0.7636	6.5600e- 003	0.7702	0.2100	6.1000e- 003	0.2161		1,365.045 5	1,365.045 5	0.0495		1,366.283 5

3.3 Building Construction - 2024

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.698 9	2,555.698 9	0.6044		2,570.807 7
Total	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.698 9	2,555.698 9	0.6044		2,570.807 7

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3.3 Building Construction - 2024 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0395	1.5653	0.3094	5.7100e- 003	0.1409	1.5000e- 003	0.1424	0.0406	1.4300e- 003	0.0420		603.0617	603.0617	0.0307		603.8302
Worker	0.3133	0.1728	2.4424	7.3900e- 003	0.8383	5.0200e- 003	0.8433	0.2223	4.6200e- 003	0.2270		736.5269	736.5269	0.0171		736.9548
Total	0.3527	1.7381	2.7517	0.0131	0.9792	6.5200e- 003	0.9857	0.2629	6.0500e- 003	0.2690		1,339.588 6	1,339.588 6	0.0479		1,340.785 0

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769	0.0000	2,555.698 9	2,555.698 9	0.6044		2,570.807 7
Total	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769	0.0000	2,555.698 9	2,555.698 9	0.6044		2,570.807 7

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3.3 Building Construction - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/c	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0395	1.5653	0.3094	5.7100e- 003	0.1148	1.5000e- 003	0.1163	0.0342	1.4300e- 003	0.0356		603.0617	603.0617	0.0307		603.8302
Worker	0.3133	0.1728	2.4424	7.3900e- 003	0.6488	5.0200e- 003	0.6539	0.1758	4.6200e- 003	0.1804		736.5269	736.5269	0.0171		736.9548
Total	0.3527	1.7381	2.7517	0.0131	0.7636	6.5200e- 003	0.7702	0.2100	6.0500e- 003	0.2160		1,339.588 6	1,339.588 6	0.0479		1,340.785 0

3.4 Paving - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/e	day							lb/c	day		
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.210 9	2,207.210 9	0.7139		2,225.057 3
Paving	0.0000		i i			0.0000	0.0000	 	0.0000	0.0000			0.0000		 	0.0000
Total	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.210 9	2,207.210 9	0.7139		2,225.057 3

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

3.4 Paving - 2021

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	 	0.0000
Worker	0.0762	0.0471	0.6210	1.6500e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		164.1121	164.1121	4.6700e- 003	 	164.2289
Total	0.0762	0.0471	0.6210	1.6500e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		164.1121	164.1121	4.6700e- 003		164.2289

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777	i i	0.6235	0.6235	0.0000	2,207.210 9	2,207.210 9	0.7139		2,225.057 3
Paving	0.0000	 				0.0000	0.0000] 	0.0000	0.0000			0.0000		 	0.0000
Total	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235	0.0000	2,207.210 9	2,207.210 9	0.7139		2,225.057 3

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

3.4 Paving - 2021

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0762	0.0471	0.6210	1.6500e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		164.1121	164.1121	4.6700e- 003		164.2289
Total	0.0762	0.0471	0.6210	1.6500e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		164.1121	164.1121	4.6700e- 003		164.2289

3.4 Paving - 2022

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Off-Road	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225		2,207.660 3	2,207.660 3	0.7140		2,225.510 4
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000		 	0.0000
Total	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225		2,207.660 3	2,207.660	0.7140		2,225.510 4

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3.4 Paving - 2022

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0712	0.0424	0.5705	1.5900e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		158.1904	158.1904	4.1900e- 003		158.2951
Total	0.0712	0.0424	0.5705	1.5900e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		158.1904	158.1904	4.1900e- 003		158.2951

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Off-Road	1.1028	11.1249	14.5805	0.0228	! !	0.5679	0.5679		0.5225	0.5225	0.0000	2,207.660 3	2,207.660 3	0.7140		2,225.510 4
Paving	0.0000	 			 	0.0000	0.0000		0.0000	0.0000			0.0000		 	0.0000
Total	1.1028	11.1249	14.5805	0.0228		0.5679	0.5679		0.5225	0.5225	0.0000	2,207.660	2,207.660	0.7140		2,225.510 4

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3.4 Paving - 2022

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0712	0.0424	0.5705	1.5900e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		158.1904	158.1904	4.1900e- 003		158.2951
Total	0.0712	0.0424	0.5705	1.5900e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		158.1904	158.1904	4.1900e- 003		158.2951

3.4 Paving - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694		2,207.584 1	2,207.584 1	0.7140		2,225.433 6
Paving	0.0000	 				0.0000	0.0000		0.0000	0.0000			0.0000		 	0.0000
Total	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694		2,207.584 1	2,207.584	0.7140		2,225.433 6

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3.4 Paving - 2023
<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0666	0.0381	0.5238	1.5300e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		152.2425	152.2425	3.7500e- 003		152.3363
Total	0.0666	0.0381	0.5238	1.5300e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		152.2425	152.2425	3.7500e- 003		152.3363

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	1.0327	10.1917	14.5842	0.0228	! !	0.5102	0.5102	 	0.4694	0.4694	0.0000	2,207.584 1	2,207.584 1	0.7140		2,225.433 6
Paving	0.0000	 				0.0000	0.0000	 	0.0000	0.0000			0.0000			0.0000
Total	1.0327	10.1917	14.5842	0.0228		0.5102	0.5102		0.4694	0.4694	0.0000	2,207.584 1	2,207.584 1	0.7140		2,225.433 6

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3.4 Paving - 2023

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0666	0.0381	0.5238	1.5300e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		152.2425	152.2425	3.7500e- 003		152.3363
Total	0.0666	0.0381	0.5238	1.5300e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		152.2425	152.2425	3.7500e- 003		152.3363

3.4 Paving - 2024

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Off-Road	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310		2,207.547 2	2,207.547 2	0.7140		2,225.396 3
Paving	0.0000				 	0.0000	0.0000		0.0000	0.0000			0.0000		i i	0.0000
Total	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310		2,207.547 2	2,207.547 2	0.7140		2,225.396 3

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3.4 Paving - 2024

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	 	0.0000
Worker	0.0627	0.0346	0.4885	1.4800e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		147.3054	147.3054	3.4200e- 003	 	147.3910
Total	0.0627	0.0346	0.4885	1.4800e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		147.3054	147.3054	3.4200e- 003		147.3910

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Off-Road	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310	0.0000	2,207.547 2	2,207.547 2	0.7140		2,225.396 3
Paving	0.0000				 	0.0000	0.0000	 	0.0000	0.0000		i i	0.0000			0.0000
Total	0.9882	9.5246	14.6258	0.0228		0.4685	0.4685		0.4310	0.4310	0.0000	2,207.547 2	2,207.547 2	0.7140		2,225.396 3

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Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

3.4 Paving - 2024 <u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/	day							lb/d	lay		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0627	0.0346	0.4885	1.4800e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		147.3054	147.3054	3.4200e- 003		147.3910
Total	0.0627	0.0346	0.4885	1.4800e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		147.3054	147.3054	3.4200e- 003		147.3910

3.5 Architectural Coating - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e- 003		0.0941	0.0941		0.0941	0.0941		281.4481	281.4481	0.0193		281.9309
Total	3.4303	1.5268	1.8176	2.9700e- 003		0.0941	0.0941		0.0941	0.0941		281.4481	281.4481	0.0193		281.9309

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3.5 Architectural Coating - 2021 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0762	0.0471	0.6210	1.6500e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		164.1121	164.1121	4.6700e- 003		164.2289
Total	0.0762	0.0471	0.6210	1.6500e- 003	0.1677	1.0700e- 003	0.1687	0.0445	9.9000e- 004	0.0455		164.1121	164.1121	4.6700e- 003		164.2289

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e- 003		0.0941	0.0941	1 1 1 1	0.0941	0.0941	0.0000	281.4481	281.4481	0.0193	, , ,	281.9309
Total	3.4303	1.5268	1.8176	2.9700e- 003		0.0941	0.0941		0.0941	0.0941	0.0000	281.4481	281.4481	0.0193		281.9309

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3.5 Architectural Coating - 2021 Mitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0762	0.0471	0.6210	1.6500e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		164.1121	164.1121	4.6700e- 003		164.2289
Total	0.0762	0.0471	0.6210	1.6500e- 003	0.1298	1.0700e- 003	0.1308	0.0352	9.9000e- 004	0.0362		164.1121	164.1121	4.6700e- 003		164.2289

3.5 Architectural Coating - 2022

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000	! !	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e- 003		0.0817	0.0817	, 	0.0817	0.0817		281.4481	281.4481	0.0183	,	281.9062
Total	3.4159	1.4085	1.8136	2.9700e- 003		0.0817	0.0817		0.0817	0.0817		281.4481	281.4481	0.0183		281.9062

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3.5 Architectural Coating - 2022 <u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0712	0.0424	0.5705	1.5900e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		158.1904	158.1904	4.1900e- 003		158.2951
Total	0.0712	0.0424	0.5705	1.5900e- 003	0.1677	1.0400e- 003	0.1687	0.0445	9.6000e- 004	0.0454		158.1904	158.1904	4.1900e- 003		158.2951

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e- 003		0.0817	0.0817	1 1 1 1	0.0817	0.0817	0.0000	281.4481	281.4481	0.0183	 	281.9062
Total	3.4159	1.4085	1.8136	2.9700e- 003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062

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3.5 Architectural Coating - 2022 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0712	0.0424	0.5705	1.5900e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		158.1904	158.1904	4.1900e- 003		158.2951
Total	0.0712	0.0424	0.5705	1.5900e- 003	0.1298	1.0400e- 003	0.1308	0.0352	9.6000e- 004	0.0361		158.1904	158.1904	4.1900e- 003		158.2951

3.5 Architectural Coating - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1917	1.3030	1.8111	2.9700e- 003		0.0708	0.0708	1 1 1 1	0.0708	0.0708		281.4481	281.4481	0.0168	, , ,	281.8690
Total	3.4030	1.3030	1.8111	2.9700e- 003		0.0708	0.0708		0.0708	0.0708		281.4481	281.4481	0.0168		281.8690

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3.5 Architectural Coating - 2023 <u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/d	day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0666	0.0381	0.5238	1.5300e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		152.2425	152.2425	3.7500e- 003		152.3363
Total	0.0666	0.0381	0.5238	1.5300e- 003	0.1677	1.0100e- 003	0.1687	0.0445	9.3000e- 004	0.0454		152.2425	152.2425	3.7500e- 003		152.3363

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Archit. Coating	3.2114					0.0000	0.0000	! !	0.0000	0.0000			0.0000			0.0000
Off-Road	0.1917	1.3030	1.8111	2.9700e- 003	 	0.0708	0.0708	1	0.0708	0.0708	0.0000	281.4481	281.4481	0.0168	 	281.8690
Total	3.4030	1.3030	1.8111	2.9700e- 003		0.0708	0.0708		0.0708	0.0708	0.0000	281.4481	281.4481	0.0168		281.8690

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3.5 Architectural Coating - 2023 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e	
Category	lb/day										lb/day						
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000	
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000	
Worker	0.0666	0.0381	0.5238	1.5300e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		152.2425	152.2425	3.7500e- 003		152.3363	
Total	0.0666	0.0381	0.5238	1.5300e- 003	0.1298	1.0100e- 003	0.1308	0.0352	9.3000e- 004	0.0361		152.2425	152.2425	3.7500e- 003		152.3363	

3.5 Architectural Coating - 2024

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e		
Category	lb/day											lb/day						
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000		
Off-Road	0.1808	1.2188	1.8101	2.9700e- 003		0.0609	0.0609	1 1 1 1	0.0609	0.0609		281.4481	281.4481	0.0159	 	281.8443		
Total	3.3921	1.2188	1.8101	2.9700e- 003		0.0609	0.0609		0.0609	0.0609		281.4481	281.4481	0.0159		281.8443		

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3.5 Architectural Coating - 2024 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e	
Category	lb/day										lb/day						
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000	
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000	
Worker	0.0627	0.0346	0.4885	1.4800e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		147.3054	147.3054	3.4200e- 003		147.3910	
Total	0.0627	0.0346	0.4885	1.4800e- 003	0.1677	1.0000e- 003	0.1687	0.0445	9.2000e- 004	0.0454		147.3054	147.3054	3.4200e- 003		147.3910	

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e		
Category	lb/day											lb/day						
Archit. Coating	3.2114					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000		
Off-Road	0.1808	1.2188	1.8101	2.9700e- 003		0.0609	0.0609	,	0.0609	0.0609	0.0000	281.4481	281.4481	0.0159	, , ,	281.8443		
Total	3.3921	1.2188	1.8101	2.9700e- 003		0.0609	0.0609		0.0609	0.0609	0.0000	281.4481	281.4481	0.0159		281.8443		

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3.5 Architectural Coating - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e	
Category	lb/day										lb/day						
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000	
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	, ! ! !	0.0000	
Worker	0.0627	0.0346	0.4885	1.4800e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		147.3054	147.3054	3.4200e- 003	,	147.3910	
Total	0.0627	0.0346	0.4885	1.4800e- 003	0.1298	1.0000e- 003	0.1308	0.0352	9.2000e- 004	0.0361		147.3054	147.3054	3.4200e- 003		147.3910	

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

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	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Mitigated	3.2274	18.5094	33.9834	0.1451	10.9577	0.0823	11.0400	2.9318	0.0767	3.0084		14,842.29 24	14,842.29 24	0.6883		14,859.49 93
Unmitigated	3.5222	20.2584	42.3677	0.1824	14.2502	0.1039	14.3540	3.8126	0.0968	3.9094		18,634.50 19	18,634.50 19	0.8051		18,654.63 01

4.2 Trip Summary Information

	Ave	rage Daily Trip Ra	ate	Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	1,956.15	1,956.15	1956.15	6,684,462	5,140,059
Total	1,956.15	1,956.15	1,956.15	6,684,462	5,140,059

4.3 Trip Type Information

		Miles			Trip %			Trip Purpos	e %
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.558745	0.035303	0.181800	0.111169	0.014289	0.004794	0.018611	0.065078	0.001365	0.001491	0.005725	0.000799	0.000830

5.0 Energy Detail

Historical Energy Use: N

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Summer

5.1 Mitigation Measures Energy

Exceed Title 24

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	day		
NaturalGas Mitigated	0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2
NaturalGas Unmitigated	0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGa s Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					lb/d	day							lb/c	lay		
Single Family Housing	17351.8	0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9
Total		0.1871	1.5991	0.6805	0.0102		0.1293	0.1293		0.1293	0.1293		2,041.387 0	2,041.387 0	0.0391	0.0374	2,053.517 9

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5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGa s Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					lb/d	day							lb/c	lay		
Single Family Housing	9.96781	0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2
Total		0.1075	0.9186	0.3909	5.8600e- 003		0.0743	0.0743		0.0743	0.0743		1,172.683 6	1,172.683 6	0.0225	0.0215	1,179.652 2

6.0 Area Detail

6.1 Mitigation Measures Area

Use only Natural Gas Hearths

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	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/d	day							lb/c	lay		
Mitigated	8.8912	3.2871	18.3856	0.0206		0.3445	0.3445		0.3445	0.3445	0.0000	3,975.926 8	3,975.926 8	0.1051	0.0723	4,000.108 6
Unmitigated	62.7710	4.4916	122.3408	0.2695		15.9070	15.9070		15.9070	15.9070	1,938.952 1	3,756.750 3	5,695.702 4	5.8118	0.1316	5,880.215 8

6.2 Area by SubCategory

<u>Unmitigated</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory					lb/d	day							lb/d	lay		
Architectural Coating	0.6388					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	7.3775		i i	 		0.0000	0.0000	 	0.0000	0.0000			0.0000			0.0000
Hearth	54.2415	4.2949	105.2702	0.2686		15.8124	15.8124	 	15.8124	15.8124	1,938.952 1	3,726.000 0	5,664.952 1	5.7823	0.1316	5,848.727 8
Landscaping	0.5133	0.1967	17.0706	9.0000e- 004		0.0946	0.0946	 	0.0946	0.0946		30.7503	30.7503	0.0295		31.4879
Total	62.7710	4.4916	122.3408	0.2695		15.9070	15.9070		15.9070	15.9070	1,938.952 1	3,756.750 3	5,695.702 4	5.8118	0.1316	5,880.215 8

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6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory					lb/d	day							lb/d	day		
Architectural Coating	0.6388					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	7.3775			 		0.0000	0.0000	 	0.0000	0.0000			0.0000			0.0000
Hearth	0.3616	3.0904	1.3151	0.0197		0.2499	0.2499	 	0.2499	0.2499	0.0000	3,945.176 5	3,945.176 5	0.0756	0.0723	3,968.620 7
Landscaping	0.5133	0.1967	17.0706	9.0000e- 004		0.0946	0.0946	1 	0.0946	0.0946		30.7503	30.7503	0.0295		31.4879
Total	8.8911	3.2871	18.3856	0.0206		0.3445	0.3445		0.3445	0.3445	0.0000	3,975.926 8	3,975.926 8	0.1051	0.0723	4,000.108 6

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

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9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
=90.6	110111001	1 10 a. 0, 2 a.y	2 4 4 7 . 6 4 .	1101001 01101	2000 1 00101	. 40) po

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
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Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number
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11.0 Vegetation

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Heritage Residential Specific Plan Project

San Bernardino-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	207.00	Dwelling Unit	37.20	372,600.00	592

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	32
Climate Zone	10			Operational Year	2024
Utility Company	Southern California Edisor	า			
CO2 Intensity (lb/MWhr)	513	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

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Project Characteristics - CO2 Intensity Factor Source: Southern California Edison, 2018 Sustainability Report, dated May 2019.

Land Use - Per project description.

Construction Phase - Per project description.

Grading -

Vehicle Trips - Per TIA.

Energy Use -

Construction Off-road Equipment Mitigation - Per SCAQMD standards and regulations.

Mobile Land Use Mitigation - Site is approximatley 1.5 miles northwest of downtown Redlands and the nearest transit station.

Mobile Commute Mitigation -

Area Mitigation -

Energy Mitigation - % Improvement based on efficiency of 2019 Title 24 Standards compared to 2016 Title 24 Standards

Waste Mitigation -

Water Mitigation -

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Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	26
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	12
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	55.00	726.00
tblConstructionPhase	NumDays	740.00	792.00
tblConstructionPhase	NumDays	75.00	132.00
tblConstructionPhase	NumDays	55.00	792.00
tblGrading	MaterialExported	0.00	26,503.00
tblLandUse	LotAcreage	67.21	37.20
tblProjectCharacteristics	CO2IntensityFactor	702.44	513
tblVehicleTrips	ST_TR	9.91	9.45
tblVehicleTrips	SU_TR	8.62	9.45
tblVehicleTrips	WD_TR	9.52	9.45

2.0 Emissions Summary

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2.1 Overall Construction <u>Unmitigated Construction</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e		
Year	tons/yr											MT/yr						
2020	0.1554	1.8683	1.1122	2.7600e- 003	0.4074	0.0724	0.4798	0.1368	0.0666	0.2035	0.0000	247.8835	247.8835	0.0618	0.0000	249.4295		
2021	0.7259	5.0272	4.6252	9.3400e- 003	0.5278	0.2328	0.7605	0.1691	0.2166	0.3857	0.0000	827.8250	827.8250	0.1867	0.0000	832.4922		
2022	0.8751	3.9656	4.7569	8.9300e- 003	0.1677	0.1910	0.3587	0.0450	0.1788	0.2237	0.0000	786.5612	786.5612	0.1664	0.0000	790.7207		
2023	0.8415	3.6059	4.6972	8.8600e- 003	0.1677	0.1676	0.3353	0.0450	0.1569	0.2018	0.0000	780.1787	780.1787	0.1645	0.0000	784.2904		
2024	0.2422	1.0020	1.3808	2.6100e- 003	0.0497	0.0443	0.0940	0.0133	0.0415	0.0548	0.0000	229.9386	229.9386	0.0485	0.0000	231.1505		
Maximum	0.8751	5.0272	4.7569	9.3400e- 003	0.5278	0.2328	0.7605	0.1691	0.2166	0.3857	0.0000	827.8250	827.8250	0.1867	0.0000	832.4922		

Heritage Residential Specific Plan Project - San Bernardino-South Coast County, Annual

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive	Exhaust	PM10	Fugitive	Exhaust	PM2.5	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
					PM10	PM10	Total	PM2.5	PM2.5	Total						
Year					tor	ns/yr							M	T/yr		
2020	0.1554	1.8683	1.1122	2.7600e- 003	0.1640	0.0724	0.2364	0.0543	0.0666	0.1209	0.0000	247.8832	247.8832	0.0618	0.0000	249.4293
2021	0.7259	5.0272	4.6252	9.3400e- 003	0.2578	0.2328	0.4906	0.0800	0.2166	0.2966	0.0000	827.8243	827.8243	0.1867	0.0000	832.4915
2022	0.8751	3.9656	4.7569	8.9300e- 003	0.1307	0.1910	0.3216	0.0359	0.1788	0.2146	0.0000	786.5605	786.5605	0.1664	0.0000	790.7200
2023	0.8415	3.6059	4.6972	8.8600e- 003	0.1307	0.1676	0.2983	0.0359	0.1569	0.1927	0.0000	780.1780	780.1780	0.1645	0.0000	784.2897
2024	0.2422	1.0020	1.3808	2.6100e- 003	0.0387	0.0443	0.0830	0.0106	0.0415	0.0521	0.0000	229.9384	229.9384	0.0485	0.0000	231.1503
Maximum	0.8751	5.0272	4.7569	9.3400e- 003	0.2578	0.2328	0.4906	0.0800	0.2166	0.2966	0.0000	827.8243	827.8243	0.1867	0.0000	832.4915
	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	Fugitive PM10 45.33						Bio- CO2	NBio-CO2	Total CO2	CH4 0.00	N20 0.00	0.00
	0.00		0.00		PM10 45.33	PM10	Total 29.50	PM2.5 47.06	PM2.5 0.00	Total 18.00	0.00	0.00		0.00		
Reduction	0.00	0.00	0.00 End	0.00	PM10 45.33	PM10 0.00	Total 29.50	PM2.5 47.06	PM2.5 0.00	Total 18.00	0.00	0.00	0.00	0.00		
Reduction Quarter	0.00 Sta	0.00 art Date	0.00 End	0.00	PM10 45.33	PM10 0.00	Total 29.50 ated ROG +	PM2.5 47.06	PM2.5 0.00	Total 18.00	0.00	0.00 ted ROG + N	0.00	0.00		
Reduction Quarter	0.00 Sta	0.00 art Date	0.00 End 12-3 3-31	0.00	PM10 45.33	PM10 0.00	Total 29.50 ated ROG + 2.0112	PM2.5 47.06	PM2.5 0.00	Total 18.00	0.00	0.00 eed ROG + N	0.00	0.00		
Quarter 1 2	0.00 Str	0.00 art Date 0-1-2020	0.00 End 12-3 3-31 6-30	0.00 I Date 1-2020	PM10 45.33	PM10 0.00	29.50 ated ROG + 2.0112 1.8212	PM2.5 47.06	PM2.5 0.00	Total 18.00	0.00	0.00 eed ROG + N 2.0112 1.8212	0.00	0.00		
Quarter 1 2 3	0.00 Sti	0.00 art Date 0-1-2020 -1-2021 -1-2021	0.00 End 12-3 3-31 6-30 9-30	0.00 I Date 1-2020 -2021	PM10 45.33	PM10 0.00	Total 29.50 ated ROG + 2.0112 1.8212 1.1983	PM2.5 47.06	PM2.5 0.00	Total 18.00	0.00	0.00 red ROG + N 2.0112 1.8212 1.1983	0.00	0.00		

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		Highest	2.0112	2.0112
15	4-1-2024	6-30-2024	0.1847	0.1847
14	1-1-2024	3-31-2024	1.0505	1.0505
13	10-1-2023	12-31-2023	1.1243	1.1243
12	7-1-2023	9-30-2023	1.1243	1.1243
11	4-1-2023	6-30-2023	1.1121	1.1121
10	1-1-2023	3-31-2023	1.0999	1.0999
9	10-1-2022	12-31-2022	1.2233	1.2233
8	7-1-2022	9-30-2022	1.2234	1.2234
7	4-1-2022	6-30-2022	1.2101	1.2101

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr		MT/yr								
Area	2.2051	0.0783	3.4497	3.4700e- 003		0.2095	0.2095		0.2095	0.2095	21.9874	45.7392	67.7265	0.0689	1.4900e- 003	69.8941
Energy	0.0342	0.2918	0.1242	1.8600e- 003		0.0236	0.0236		0.0236	0.0236	0.0000	757.8249	757.8249	0.0302	0.0111	761.8900
Mobile	0.5440	3.7672	6.9464	0.0313	2.5451	0.0189	2.5640	0.6820	0.0176	0.6996	0.0000	2,900.836 2	2,900.836 2	0.1325	0.0000	2,904.147 3
Waste	1					0.0000	0.0000		0.0000	0.0000	49.2700	0.0000	49.2700	2.9118	0.0000	122.0643
Water						0.0000	0.0000		0.0000	0.0000	4.2788	62.8449	67.1237	0.4430	0.0111	81.5106
Total	2.7833	4.1373	10.5203	0.0366	2.5451	0.2520	2.7971	0.6820	0.2507	0.9327	75.5361	3,767.245 2	3,842.781	3.5864	0.0237	3,939.506 3

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2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e	
Category		tons/yr										MT/yr					
Area	1.5316	0.0632	2.1503	3.6000e- 004		0.0150	0.0150		0.0150	0.0150	0.0000	48.2246	48.2246	4.2000e- 003	8.2000e- 004	48.5741	
Energy	0.0196	0.1676	0.0713	1.0700e- 003		0.0136	0.0136	 	0.0136	0.0136	0.0000	589.7064	589.7064	0.0261	8.1900e- 003	592.7978	
Mobile	0.4924	3.4241	5.6466	0.0249	1.9571	0.0150	1.9721	0.5244	0.0140	0.5384	0.0000	2,311.047 3	2,311.047 3	0.1141	0.0000	2,313.898 7	
Waste						0.0000	0.0000		0.0000	0.0000	12.3175	0.0000	12.3175	0.7279	0.0000	30.5161	
Water						0.0000	0.0000		0.0000	0.0000	3.4230	54.6721	58.0952	0.3547	8.9400e- 003	69.6262	
Total	2.0437	3.6549	7.8682	0.0263	1.9571	0.0435	2.0006	0.5244	0.0425	0.5669	15.7405	3,003.650 4	3,019.390 9	1.2270	0.0180	3,055.412 8	

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	26.57	11.66	25.21	28.08	23.10	82.73	28.48	23.10	83.06	39.22	79.16	20.27	21.43	65.79	24.29	22.44

3.0 Construction Detail

Construction Phase

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Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	10/1/2020	4/2/2021	5	132	
2	Building Construction	Building Construction	4/3/2021	4/16/2024	5	792	
3	Paving	Paving	4/3/2021	4/16/2024	5	792	
4	Architectural Coating	Architectural Coating	7/6/2021	4/16/2024	5	726	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 330

Acres of Paving: 0

Residential Indoor: 754,515; Residential Outdoor: 251,505; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

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Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	8	20.00	0.00	3,313.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	75.00	22.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

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Replace Ground Cover

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2020

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Fugitive Dust					0.3752	0.0000	0.3752	0.1284	0.0000	0.1284	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1469	1.6565	1.0546	2.0500e- 003		0.0717	0.0717		0.0660	0.0660	0.0000	179.7982	179.7982	0.0582	0.0000	181.2519
Total	0.1469	1.6565	1.0546	2.0500e- 003	0.3752	0.0717	0.4470	0.1284	0.0660	0.1944	0.0000	179.7982	179.7982	0.0582	0.0000	181.2519

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3.2 Grading - 2020
Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	5.2400e- 003	0.2092	0.0320	6.4000e- 004	0.0250	6.1000e- 004	0.0256	6.5400e- 003	5.8000e- 004	7.1300e- 003	0.0000	61.8825	61.8825	3.5000e- 003	0.0000	61.9701
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.2600e- 003	2.5600e- 003	0.0256	7.0000e- 005	7.2400e- 003	5.0000e- 005	7.2900e- 003	1.9200e- 003	4.0000e- 005	1.9700e- 003	0.0000	6.2028	6.2028	1.9000e- 004	0.0000	6.2075
Total	8.5000e- 003	0.2118	0.0576	7.1000e- 004	0.0322	6.6000e- 004	0.0329	8.4600e- 003	6.2000e- 004	9.1000e- 003	0.0000	68.0853	68.0853	3.6900e- 003	0.0000	68.1776

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Fugitive Dust					0.1390	0.0000	0.1390	0.0476	0.0000	0.0476	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1469	1.6565	1.0546	2.0500e- 003		0.0717	0.0717	 	0.0660	0.0660	0.0000	179.7980	179.7980	0.0582	0.0000	181.2517
Total	0.1469	1.6565	1.0546	2.0500e- 003	0.1390	0.0717	0.2108	0.0476	0.0660	0.1136	0.0000	179.7980	179.7980	0.0582	0.0000	181.2517

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3.2 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							МТ	/yr		
Hauling	5.2400e- 003	0.2092	0.0320	6.4000e- 004	0.0194	6.1000e- 004	0.0200	5.1800e- 003	5.8000e- 004	5.7600e- 003	0.0000	61.8825	61.8825	3.5000e- 003	0.0000	61.9701
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.2600e- 003	2.5600e- 003	0.0256	7.0000e- 005	5.6100e- 003	5.0000e- 005	5.6500e- 003	1.5200e- 003	4.0000e- 005	1.5700e- 003	0.0000	6.2028	6.2028	1.9000e- 004	0.0000	6.2075
Total	8.5000e- 003	0.2118	0.0576	7.1000e- 004	0.0250	6.6000e- 004	0.0257	6.7000e- 003	6.2000e- 004	7.3300e- 003	0.0000	68.0853	68.0853	3.6900e- 003	0.0000	68.1776

3.2 Grading - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Fugitive Dust					0.3752	0.0000	0.3752	0.1284	0.0000	0.1284	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1383	1.5312	1.0190	2.0500e- 003		0.0655	0.0655	 	0.0603	0.0603	0.0000	179.8334	179.8334	0.0582	0.0000	181.2875
Total	0.1383	1.5312	1.0190	2.0500e- 003	0.3752	0.0655	0.4407	0.1284	0.0603	0.1886	0.0000	179.8334	179.8334	0.0582	0.0000	181.2875

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3.2 Grading - 2021

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	5.0200e- 003	0.1934	0.0311	6.4000e- 004	0.0250	5.4000e- 004	0.0255	6.5400e- 003	5.1000e- 004	7.0600e- 003	0.0000	61.3203	61.3203	3.4500e- 003	0.0000	61.4065
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0400e- 003	2.3000e- 003	0.0235	7.0000e- 005	7.2400e- 003	5.0000e- 005	7.2800e- 003	1.9200e- 003	4.0000e- 005	1.9700e- 003	0.0000	6.0053	6.0053	1.7000e- 004	0.0000	6.0096
Total	8.0600e- 003	0.1957	0.0546	7.1000e- 004	0.0322	5.9000e- 004	0.0328	8.4600e- 003	5.5000e- 004	9.0300e- 003	0.0000	67.3256	67.3256	3.6200e- 003	0.0000	67.4161

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Fugitive Dust	 				0.1390	0.0000	0.1390	0.0476	0.0000	0.0476	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1383	1.5312	1.0190	2.0500e- 003		0.0655	0.0655	 	0.0603	0.0603	0.0000	179.8332	179.8332	0.0582	0.0000	181.2873
Total	0.1383	1.5312	1.0190	2.0500e- 003	0.1390	0.0655	0.2045	0.0476	0.0603	0.1078	0.0000	179.8332	179.8332	0.0582	0.0000	181.2873

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3.2 Grading - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	5.0200e- 003	0.1934	0.0311	6.4000e- 004	0.0194	5.4000e- 004	0.0199	5.1800e- 003	5.1000e- 004	5.6900e- 003	0.0000	61.3203	61.3203	3.4500e- 003	0.0000	61.4065
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0400e- 003	2.3000e- 003	0.0235	7.0000e- 005	5.6100e- 003	5.0000e- 005	5.6500e- 003	1.5200e- 003	4.0000e- 005	1.5700e- 003	0.0000	6.0053	6.0053	1.7000e- 004	0.0000	6.0096
Total	8.0600e- 003	0.1957	0.0546	7.1000e- 004	0.0250	5.9000e- 004	0.0256	6.7000e- 003	5.5000e- 004	7.2600e- 003	0.0000	67.3256	67.3256	3.6200e- 003	0.0000	67.4161

3.3 Building Construction - 2021

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.1853	1.6996	1.6161	2.6200e- 003		0.0935	0.0935		0.0879	0.0879	0.0000	225.8463	225.8463	0.0545	0.0000	227.2085
Total	0.1853	1.6996	1.6161	2.6200e- 003		0.0935	0.0935		0.0879	0.0879	0.0000	225.8463	225.8463	0.0545	0.0000	227.2085

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3.3 Building Construction - 2021 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							МТ	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	5.6900e- 003	0.2087	0.0425	5.7000e- 004	0.0135	3.6000e- 004	0.0139	3.9000e- 003	3.4000e- 004	4.2500e- 003	0.0000	54.4751	54.4751	3.6700e- 003	0.0000	54.5669
Worker	0.0337	0.0254	0.2606	7.4000e- 004	0.0802	5.2000e- 004	0.0807	0.0213	4.8000e- 004	0.0218	0.0000	66.5365	66.5365	1.8600e- 003	0.0000	66.5830
Total	0.0394	0.2341	0.3030	1.3100e- 003	0.0937	8.8000e- 004	0.0946	0.0252	8.2000e- 004	0.0260	0.0000	121.0116	121.0116	5.5300e- 003	0.0000	121.1499

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.1853	1.6996	1.6161	2.6200e- 003		0.0935	0.0935		0.0879	0.0879	0.0000	225.8461	225.8461	0.0545	0.0000	227.2082
Total	0.1853	1.6996	1.6161	2.6200e- 003		0.0935	0.0935		0.0879	0.0879	0.0000	225.8461	225.8461	0.0545	0.0000	227.2082

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3.3 Building Construction - 2021 Mitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.6900e- 003	0.2087	0.0425	5.7000e- 004	0.0110	3.6000e- 004	0.0114	3.2900e- 003	3.4000e- 004	3.6400e- 003	0.0000	54.4751	54.4751	3.6700e- 003	0.0000	54.5669
Worker	0.0337	0.0254	0.2606	7.4000e- 004	0.0621	5.2000e- 004	0.0626	0.0169	4.8000e- 004	0.0173	0.0000	66.5365	66.5365	1.8600e- 003	0.0000	66.5830
Total	0.0394	0.2341	0.3030	1.3100e- 003	0.0732	8.8000e- 004	0.0740	0.0202	8.2000e- 004	0.0210	0.0000	121.0116	121.0116	5.5300e- 003	0.0000	121.1499

3.3 Building Construction - 2022

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.2218	2.0300	2.1272	3.5000e- 003		0.1052	0.1052		0.0990	0.0990	0.0000	301.2428	301.2428	0.0722	0.0000	303.0471
Total	0.2218	2.0300	2.1272	3.5000e- 003		0.1052	0.1052		0.0990	0.0990	0.0000	301.2428	301.2428	0.0722	0.0000	303.0471

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3.3 Building Construction - 2022 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							МТ	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.0700e- 003	0.2635	0.0524	7.5000e- 004	0.0180	4.0000e- 004	0.0184	5.2000e- 003	3.8000e- 004	5.5900e- 003	0.0000	72.0418	72.0418	4.7300e- 003	0.0000	72.1600
Worker	0.0420	0.0305	0.3186	9.5000e- 004	0.1069	6.8000e- 004	0.1076	0.0284	6.2000e- 004	0.0290	0.0000	85.5186	85.5186	2.2300e- 003	0.0000	85.5743
Total	0.0490	0.2940	0.3710	1.7000e- 003	0.1249	1.0800e- 003	0.1260	0.0336	1.0000e- 003	0.0346	0.0000	157.5604	157.5604	6.9600e- 003	0.0000	157.7343

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.2218	2.0300	2.1272	3.5000e- 003		0.1052	0.1052		0.0990	0.0990	0.0000	301.2425	301.2425	0.0722	0.0000	303.0467
Total	0.2218	2.0300	2.1272	3.5000e- 003		0.1052	0.1052		0.0990	0.0990	0.0000	301.2425	301.2425	0.0722	0.0000	303.0467

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3.3 Building Construction - 2022 Mitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.0700e- 003	0.2635	0.0524	7.5000e- 004	0.0147	4.0000e- 004	0.0151	4.3900e- 003	3.8000e- 004	4.7700e- 003	0.0000	72.0418	72.0418	4.7300e- 003	0.0000	72.1600
Worker	0.0420	0.0305	0.3186	9.5000e- 004	0.0828	6.8000e- 004	0.0835	0.0225	6.2000e- 004	0.0231	0.0000	85.5186	85.5186	2.2300e- 003	0.0000	85.5743
Total	0.0490	0.2940	0.3710	1.7000e- 003	0.0975	1.0800e- 003	0.0986	0.0269	1.0000e- 003	0.0279	0.0000	157.5604	157.5604	6.9600e- 003	0.0000	157.7343

3.3 Building Construction - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.2045	1.8700	2.1117	3.5000e- 003		0.0910	0.0910		0.0856	0.0856	0.0000	301.3462	301.3462	0.0717	0.0000	303.1383
Total	0.2045	1.8700	2.1117	3.5000e- 003		0.0910	0.0910		0.0856	0.0856	0.0000	301.3462	301.3462	0.0717	0.0000	303.1383

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3.3 Building Construction - 2023 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	5.3300e- 003	0.2032	0.0452	7.3000e- 004	0.0180	2.0000e- 004	0.0182	5.2000e- 003	1.9000e- 004	5.3900e- 003	0.0000	70.0605	70.0605	3.8000e- 003	0.0000	70.1555
Worker	0.0393	0.0275	0.2920	9.1000e- 004	0.1069	6.6000e- 004	0.1076	0.0284	6.1000e- 004	0.0290	0.0000	82.3075	82.3075	1.9900e- 003	0.0000	82.3574
Total	0.0446	0.2306	0.3373	1.6400e- 003	0.1249	8.6000e- 004	0.1258	0.0336	8.0000e- 004	0.0344	0.0000	152.3680	152.3680	5.7900e- 003	0.0000	152.5129

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.2045	1.8700	2.1117	3.5000e- 003		0.0910	0.0910	 	0.0856	0.0856	0.0000	301.3458	301.3458	0.0717	0.0000	303.1380
Total	0.2045	1.8700	2.1117	3.5000e- 003	·	0.0910	0.0910		0.0856	0.0856	0.0000	301.3458	301.3458	0.0717	0.0000	303.1380

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3.3 Building Construction - 2023 Mitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	ıs/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.3300e- 003	0.2032	0.0452	7.3000e- 004	0.0147	2.0000e- 004	0.0149	4.3900e- 003	1.9000e- 004	4.5800e- 003	0.0000	70.0605	70.0605	3.8000e- 003	0.0000	70.1555
Worker	0.0393	0.0275	0.2920	9.1000e- 004	0.0828	6.6000e- 004	0.0835	0.0225	6.1000e- 004	0.0231	0.0000	82.3075	82.3075	1.9900e- 003	0.0000	82.3574
Total	0.0446	0.2306	0.3373	1.6400e- 003	0.0975	8.6000e- 004	0.0984	0.0269	8.0000e- 004	0.0277	0.0000	152.3680	152.3680	5.7900e- 003	0.0000	152.5129

3.3 Building Construction - 2024

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
- Cil rioda	0.0567	0.5176	0.6224	1.0400e- 003		0.0236	0.0236	 	0.0222	0.0222	0.0000	89.2619	89.2619	0.0211	0.0000	89.7896
Total	0.0567	0.5176	0.6224	1.0400e- 003		0.0236	0.0236		0.0222	0.0222	0.0000	89.2619	89.2619	0.0211	0.0000	89.7896

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3.3 Building Construction - 2024 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							МТ	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vollagi	1.5600e- 003	0.0605	0.0129	2.2000e- 004	5.3400e- 003	6.0000e- 005	5.4000e- 003	1.5400e- 003	6.0000e- 005	1.6000e- 003	0.0000	20.7256	20.7256	1.1200e- 003	0.0000	20.7537
Worker	0.0110	7.3600e- 003	0.0805	2.6000e- 004	0.0317	1.9000e- 004	0.0319	8.4100e- 003	1.8000e- 004	8.5900e- 003	0.0000	23.5850	23.5850	5.4000e- 004	0.0000	23.5985
Total	0.0125	0.0678	0.0934	4.8000e- 004	0.0370	2.5000e- 004	0.0373	9.9500e- 003	2.4000e- 004	0.0102	0.0000	44.3105	44.3105	1.6600e- 003	0.0000	44.3521

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.0567	0.5176	0.6224	1.0400e- 003		0.0236	0.0236		0.0222	0.0222	0.0000	89.2618	89.2618	0.0211	0.0000	89.7895
Total	0.0567	0.5176	0.6224	1.0400e- 003		0.0236	0.0236		0.0222	0.0222	0.0000	89.2618	89.2618	0.0211	0.0000	89.7895

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3.3 Building Construction - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5600e- 003	0.0605	0.0129	2.2000e- 004	4.3600e- 003	6.0000e- 005	4.4200e- 003	1.3000e- 003	6.0000e- 005	1.3600e- 003	0.0000	20.7256	20.7256	1.1200e- 003	0.0000	20.7537
Worker	0.0110	7.3600e- 003	0.0805	2.6000e- 004	0.0245	1.9000e- 004	0.0247	6.6600e- 003	1.8000e- 004	6.8300e- 003	0.0000	23.5850	23.5850	5.4000e- 004	0.0000	23.5985
Total	0.0125	0.0678	0.0934	4.8000e- 004	0.0289	2.5000e- 004	0.0291	7.9600e- 003	2.4000e- 004	8.1900e- 003	0.0000	44.3105	44.3105	1.6600e- 003	0.0000	44.3521

3.4 Paving - 2021

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
	0.1224	1.2596	1.4287	2.2200e- 003		0.0661	0.0661		0.0608	0.0608	0.0000	195.2289	195.2289	0.0631	0.0000	196.8075
Paving	0.0000	 				0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.1224	1.2596	1.4287	2.2200e- 003		0.0661	0.0661		0.0608	0.0608	0.0000	195.2289	195.2289	0.0631	0.0000	196.8075

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3.4 Paving - 2021

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7300e- 003	5.0900e- 003	0.0521	1.5000e- 004	0.0160	1.0000e- 004	0.0161	4.2600e- 003	1.0000e- 004	4.3600e- 003	0.0000	13.3073	13.3073	3.7000e- 004	0.0000	13.3166
Total	6.7300e- 003	5.0900e- 003	0.0521	1.5000e- 004	0.0160	1.0000e- 004	0.0161	4.2600e- 003	1.0000e- 004	4.3600e- 003	0.0000	13.3073	13.3073	3.7000e- 004	0.0000	13.3166

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.1224	1.2596	1.4287	2.2200e- 003		0.0661	0.0661		0.0608	0.0608	0.0000	195.2287	195.2287	0.0631	0.0000	196.8072
Paving	0.0000	 				0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.1224	1.2596	1.4287	2.2200e- 003		0.0661	0.0661		0.0608	0.0608	0.0000	195.2287	195.2287	0.0631	0.0000	196.8072

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3.4 Paving - 2021

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7300e- 003	5.0900e- 003	0.0521	1.5000e- 004	0.0124	1.0000e- 004	0.0125	3.3700e- 003	1.0000e- 004	3.4700e- 003	0.0000	13.3073	13.3073	3.7000e- 004	0.0000	13.3166
Total	6.7300e- 003	5.0900e- 003	0.0521	1.5000e- 004	0.0124	1.0000e- 004	0.0125	3.3700e- 003	1.0000e- 004	3.4700e- 003	0.0000	13.3073	13.3073	3.7000e- 004	0.0000	13.3166

3.4 Paving - 2022

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.1434	1.4462	1.8955	2.9600e- 003		0.0738	0.0738		0.0679	0.0679	0.0000	260.3583	260.3583	0.0842	0.0000	262.4634
Paving	0.0000	 				0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.1434	1.4462	1.8955	2.9600e- 003		0.0738	0.0738		0.0679	0.0679	0.0000	260.3583	260.3583	0.0842	0.0000	262.4634

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3.4 Paving - 2022

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0214	1.4000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149
Total	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0214	1.4000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.1434	1.4462	1.8955	2.9600e- 003		0.0738	0.0738		0.0679	0.0679	0.0000	260.3579	260.3579	0.0842	0.0000	262.4631
Paving	0.0000					0.0000	0.0000	 	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.1434	1.4462	1.8955	2.9600e- 003		0.0738	0.0738		0.0679	0.0679	0.0000	260.3579	260.3579	0.0842	0.0000	262.4631

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3.4 Paving - 2022

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0166	1.4000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149
Total	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0166	1.4000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149

3.4 Paving - 2023

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
	0.1343	1.3249	1.8960	2.9600e- 003		0.0663	0.0663		0.0610	0.0610	0.0000	260.3493	260.3493	0.0842	0.0000	262.4543
Paving	0.0000	 				0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.1343	1.3249	1.8960	2.9600e- 003		0.0663	0.0663		0.0610	0.0610	0.0000	260.3493	260.3493	0.0842	0.0000	262.4543

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3.4 Paving - 2023
<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0214	1.3000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715
Total	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0214	1.3000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.1343	1.3249	1.8960	2.9600e- 003		0.0663	0.0663	 	0.0610	0.0610	0.0000	260.3490	260.3490	0.0842	0.0000	262.4540
Paving	0.0000	 				0.0000	0.0000	 	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.1343	1.3249	1.8960	2.9600e- 003		0.0663	0.0663		0.0610	0.0610	0.0000	260.3490	260.3490	0.0842	0.0000	262.4540

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3.4 Paving - 2023

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e			
Category	tons/yr											MT/yr							
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Worker	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0166	1.3000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715			
Total	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0166	1.3000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715			

3.4 Paving - 2024

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
	0.0380	0.3667	0.5631	8.8000e- 004		0.0180	0.0180		0.0166	0.0166	0.0000	77.1022	77.1022	0.0249	0.0000	77.7256
Paving	0.0000		i i	 		0.0000	0.0000	 	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.0380	0.3667	0.5631	8.8000e- 004		0.0180	0.0180		0.0166	0.0166	0.0000	77.1022	77.1022	0.0249	0.0000	77.7256

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3.4 Paving - 2024

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e			
Category	tons/yr											MT/yr							
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Worker	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	6.3300e- 003	4.0000e- 005	6.3700e- 003	1.6800e- 003	4.0000e- 005	1.7200e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197			
Total	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	6.3300e- 003	4.0000e- 005	6.3700e- 003	1.6800e- 003	4.0000e- 005	1.7200e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197			

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Off-Road	0.0380	0.3667	0.5631	8.8000e- 004		0.0180	0.0180		0.0166	0.0166	0.0000	77.1021	77.1021	0.0249	0.0000	77.7255
Paving	0.0000		1 1 1 1			0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	0.0380	0.3667	0.5631	8.8000e- 004		0.0180	0.0180		0.0166	0.0166	0.0000	77.1021	77.1021	0.0249	0.0000	77.7255

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3.4 Paving - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e			
Category	tons/yr											MT/yr							
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Worker	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	4.9000e- 003	4.0000e- 005	4.9400e- 003	1.3300e- 003	4.0000e- 005	1.3700e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197			
Total	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	4.9000e- 003	4.0000e- 005	4.9400e- 003	1.3300e- 003	4.0000e- 005	1.3700e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197			

3.5 Architectural Coating - 2021 <u>Unmitigated Construction On-Site</u>

ROG NOV CO SO2 Funitive Exhaust PM10 Funitive Exhaust PM2.5 Rio-CO2 NRio-CO2

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.2071	i i	i !			0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0141	0.0985	0.1172	1.9000e- 004		6.0700e- 003	6.0700e- 003		6.0700e- 003	6.0700e- 003	0.0000	16.4685	16.4685	1.1300e- 003	0.0000	16.4967
Total	0.2213	0.0985	0.1172	1.9000e- 004		6.0700e- 003	6.0700e- 003		6.0700e- 003	6.0700e- 003	0.0000	16.4685	16.4685	1.1300e- 003	0.0000	16.4967

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3.5 Architectural Coating - 2021 Unmitigated Construction Off-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.4500e- 003	3.3700e- 003	0.0345	1.0000e- 004	0.0106	7.0000e- 005	0.0107	2.8200e- 003	6.0000e- 005	2.8800e- 003	0.0000	8.8033	8.8033	2.5000e- 004	0.0000	8.8095
Total	4.4500e- 003	3.3700e- 003	0.0345	1.0000e- 004	0.0106	7.0000e- 005	0.0107	2.8200e- 003	6.0000e- 005	2.8800e- 003	0.0000	8.8033	8.8033	2.5000e- 004	0.0000	8.8095

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.2071					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0141	0.0985	0.1172	1.9000e- 004		6.0700e- 003	6.0700e- 003		6.0700e- 003	6.0700e- 003	0.0000	16.4685	16.4685	1.1300e- 003	0.0000	16.4967
Total	0.2213	0.0985	0.1172	1.9000e- 004		6.0700e- 003	6.0700e- 003		6.0700e- 003	6.0700e- 003	0.0000	16.4685	16.4685	1.1300e- 003	0.0000	16.4967

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3.5 Architectural Coating - 2021 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.4500e- 003	3.3700e- 003	0.0345	1.0000e- 004	8.2200e- 003	7.0000e- 005	8.2900e- 003	2.2300e- 003	6.0000e- 005	2.2900e- 003	0.0000	8.8033	8.8033	2.5000e- 004	0.0000	8.8095
Total	4.4500e- 003	3.3700e- 003	0.0345	1.0000e- 004	8.2200e- 003	7.0000e- 005	8.2900e- 003	2.2300e- 003	6.0000e- 005	2.2900e- 003	0.0000	8.8033	8.8033	2.5000e- 004	0.0000	8.8095

3.5 Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.4175					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0266	0.1831	0.2358	3.9000e- 004		0.0106	0.0106	1	0.0106	0.0106	0.0000	33.1923	33.1923	2.1600e- 003	0.0000	33.2463
Total	0.4441	0.1831	0.2358	3.9000e- 004		0.0106	0.0106		0.0106	0.0106	0.0000	33.1923	33.1923	2.1600e- 003	0.0000	33.2463

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3.5 Architectural Coating - 2022 <u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0214	1.4000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149
Total	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0214	1.4000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149

Mitigated Construction On-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	√yr		
Archit. Coating	0.4175		i i			0.0000	0.0000	 	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0266	0.1831	0.2358	3.9000e- 004		0.0106	0.0106	 	0.0106	0.0106	0.0000	33.1923	33.1923	2.1600e- 003	0.0000	33.2463
Total	0.4441	0.1831	0.2358	3.9000e- 004		0.0106	0.0106		0.0106	0.0106	0.0000	33.1923	33.1923	2.1600e- 003	0.0000	33.2463

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3.5 Architectural Coating - 2022 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0166	1.4000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149
Total	8.3900e- 003	6.1000e- 003	0.0637	1.9000e- 004	0.0166	1.4000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	17.1037	17.1037	4.5000e- 004	0.0000	17.1149

3.5 Architectural Coating - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.4175					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0249	0.1694	0.2355	3.9000e- 004		9.2100e- 003	9.2100e- 003	1	9.2100e- 003	9.2100e- 003	0.0000	33.1923	33.1923	1.9900e- 003	0.0000	33.2419
Total	0.4424	0.1694	0.2355	3.9000e- 004		9.2100e- 003	9.2100e- 003		9.2100e- 003	9.2100e- 003	0.0000	33.1923	33.1923	1.9900e- 003	0.0000	33.2419

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3.5 Architectural Coating - 2023 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0214	1.3000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715
Total	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0214	1.3000e- 004	0.0215	5.6800e- 003	1.2000e- 004	5.8000e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715

Mitigated Construction On-Site

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.4175					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0249	0.1694	0.2354	3.9000e- 004		9.2100e- 003	9.2100e- 003	1	9.2100e- 003	9.2100e- 003	0.0000	33.1923	33.1923	1.9900e- 003	0.0000	33.2419
Total	0.4424	0.1694	0.2354	3.9000e- 004		9.2100e- 003	9.2100e- 003		9.2100e- 003	9.2100e- 003	0.0000	33.1923	33.1923	1.9900e- 003	0.0000	33.2419

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3.5 Architectural Coating - 2023 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0166	1.3000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715
Total	7.8600e- 003	5.4900e- 003	0.0584	1.8000e- 004	0.0166	1.3000e- 004	0.0167	4.5000e- 003	1.2000e- 004	4.6200e- 003	0.0000	16.4615	16.4615	4.0000e- 004	0.0000	16.4715

3.5 Architectural Coating - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.1236					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.9600e- 003	0.0469	0.0697	1.1000e- 004		2.3500e- 003	2.3500e- 003	 	2.3500e- 003	2.3500e- 003	0.0000	9.8300	9.8300	5.5000e- 004	0.0000	9.8439
Total	0.1306	0.0469	0.0697	1.1000e- 004		2.3500e- 003	2.3500e- 003		2.3500e- 003	2.3500e- 003	0.0000	9.8300	9.8300	5.5000e- 004	0.0000	9.8439

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3.5 Architectural Coating - 2024 Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	6.3300e- 003	4.0000e- 005	6.3700e- 003	1.6800e- 003	4.0000e- 005	1.7200e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197
Total	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	6.3300e- 003	4.0000e- 005	6.3700e- 003	1.6800e- 003	4.0000e- 005	1.7200e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Archit. Coating	0.1236					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.9600e- 003	0.0469	0.0697	1.1000e- 004		2.3500e- 003	2.3500e- 003	 	2.3500e- 003	2.3500e- 003	0.0000	9.8300	9.8300	5.5000e- 004	0.0000	9.8439
Total	0.1306	0.0469	0.0697	1.1000e- 004		2.3500e- 003	2.3500e- 003		2.3500e- 003	2.3500e- 003	0.0000	9.8300	9.8300	5.5000e- 004	0.0000	9.8439

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3.5 Architectural Coating - 2024 Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							МТ	/yr		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	4.9000e- 003	4.0000e- 005	4.9400e- 003	1.3300e- 003	4.0000e- 005	1.3700e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197
Total	2.1900e- 003	1.4700e- 003	0.0161	5.0000e- 005	4.9000e- 003	4.0000e- 005	4.9400e- 003	1.3300e- 003	4.0000e- 005	1.3700e- 003	0.0000	4.7170	4.7170	1.1000e- 004	0.0000	4.7197

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Mitigated	0.4924	3.4241	5.6466	0.0249	1.9571	0.0150	1.9721	0.5244	0.0140	0.5384	0.0000	2,311.047 3	2,311.047 3	0.1141	0.0000	2,313.898 7
Unmitigated	0.5440	3.7672	6.9464	0.0313	2.5451	0.0189	2.5640	0.6820	0.0176	0.6996	0.0000	2,900.836 2	2,900.836 2	0.1325	0.0000	2,904.147 3

4.2 Trip Summary Information

	Ave	rage Daily Trip Ra	ate	Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	1,956.15	1,956.15	1956.15	6,684,462	5,140,059
Total	1,956.15	1,956.15	1,956.15	6,684,462	5,140,059

4.3 Trip Type Information

		Miles			Trip %			Trip Purpos	e %
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.558745	0.035303	0.181800	0.111169	0.014289	0.004794	0.018611	0.065078	0.001365	0.001491	0.005725	0.000799	0.000830

5.0 Energy Detail

Historical Energy Use: N

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5.1 Mitigation Measures Energy

Exceed Title 24

	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	395.5555	395.5555	0.0224	4.6300e- 003	397.4932
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	419.8504	419.8504	0.0237	4.9100e- 003	421.9071
NaturalGas Mitigated	0.0196	0.1676	0.0713	1.0700e- 003		0.0136	0.0136		0.0136	0.0136	0.0000	194.1509	194.1509	3.7200e- 003	3.5600e- 003	195.3047
NaturalGas Unmitigated	0.0342	0.2918	0.1242	1.8600e- 003		0.0236	0.0236		0.0236	0.0236	0.0000	337.9745	337.9745	6.4800e- 003	6.2000e- 003	339.9829

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5.2 Energy by Land Use - NaturalGas <u>Unmitigated</u>

	NaturalGa s Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					ton	s/yr							MT	/yr		
Single Family Housing	6.3334e +006	0.0342	0.2918	0.1242	1.8600e- 003		0.0236	0.0236		0.0236	0.0236	0.0000	337.9745	337.9745	6.4800e- 003	6.2000e- 003	339.9829
Total		0.0342	0.2918	0.1242	1.8600e- 003		0.0236	0.0236		0.0236	0.0236	0.0000	337.9745	337.9745	6.4800e- 003	6.2000e- 003	339.9829

Mitigated

	NaturalGa s Use	ROG	NOx	СО	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					ton	s/yr							MT	/yr		
Single Family Housing	3.63825e +006	0.0196	0.1676	0.0713	1.0700e- 003		0.0136	0.0136		0.0136	0.0136	0.0000	194.1509	194.1509	3.7200e- 003	3.5600e- 003	195.3047
Total		0.0196	0.1676	0.0713	1.0700e- 003		0.0136	0.0136		0.0136	0.0136	0.0000	194.1509	194.1509	3.7200e- 003	3.5600e- 003	195.3047

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5.3 Energy by Land Use - Electricity Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr		МТ	/yr	
Single Family Housing	1.80431e +006		0.0237	4.9100e- 003	421.9071
Total		419.8504	0.0237	4.9100e- 003	421.9071

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr		MT	/yr	
Single Family Housing		395.5555	0.0224	4.6300e- 003	397.4932
Total		395.5555	0.0224	4.6300e- 003	397.4932

6.0 Area Detail

6.1 Mitigation Measures Area

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					ton	s/yr							MT	/yr		
Mitigated	1.5316	0.0632	2.1503	3.6000e- 004		0.0150	0.0150		0.0150	0.0150	0.0000	48.2246	48.2246	4.2000e- 003	8.2000e- 004	48.5741
Unmitigated	2.2051	0.0783	3.4497	3.4700e- 003		0.2095	0.2095		0.2095	0.2095	21.9874	45.7392	67.7265	0.0689	1.4900e- 003	69.8941

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr						MT/yr									
Architectural Coating	0.1166					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.3464					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.6780	0.0537	1.3159	3.3600e- 003		0.1977	0.1977		0.1977	0.1977	21.9874	42.2521	64.2395	0.0656	1.4900e- 003	66.3235
Landscaping	0.0642	0.0246	2.1338	1.1000e- 004		0.0118	0.0118		0.0118	0.0118	0.0000	3.4870	3.4870	3.3500e- 003	0.0000	3.5707
Total	2.2051	0.0783	3.4497	3.4700e- 003		0.2095	0.2095		0.2095	0.2095	21.9874	45.7392	67.7265	0.0689	1.4900e- 003	69.8941

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6.2 Area by SubCategory

<u>Mitigated</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory					ton	s/yr							МТ	/yr		
Architectural Coating	0.1166					0.0000	0.0000	! !	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.3464					0.0000	0.0000	i i	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	4.5200e- 003	0.0386	0.0164	2.5000e- 004		3.1200e- 003	3.1200e- 003	i i	3.1200e- 003	3.1200e- 003	0.0000	44.7376	44.7376	8.6000e- 004	8.2000e- 004	45.0034
Landscaping	0.0642	0.0246	2.1338	1.1000e- 004		0.0118	0.0118	i i	0.0118	0.0118	0.0000	3.4870	3.4870	3.3500e- 003	0.0000	3.5707
Total	1.5316	0.0632	2.1503	3.6000e- 004		0.0150	0.0150		0.0150	0.0150	0.0000	48.2246	48.2246	4.2100e- 003	8.2000e- 004	48.5741

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

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	Total CO2	CH4	N2O	CO2e		
Category	MT/yr					
ga.ea	ii	0.3547	8.9400e- 003	69.6262		
Unmitigated	67.1237	0.4430	0.0111	81.5106		

7.2 Water by Land Use <u>Unmitigated</u>

	Indoor/Out door Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal		МТ	-/yr	
Single Family Housing	13.4869 / 8.5026	67.1237	0.4430	0.0111	81.5106
Total		67.1237	0.4430	0.0111	81.5106

7.2 Water by Land Use

Mitigated

	Indoor/Out door Use	Total CO2	CH4	N2O	CO2e		
Land Use	Mgal	MT/yr					
Single Family Housing	10.7895 / 8.5026	58.0952	0.3547	8.9400e- 003	69.6262		
Total		58.0952	0.3547	8.9400e- 003	69.6262		

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e			
	MT/yr						
gatea	12.0170	0.7279	0.0000	30.5161			
Unmitigated	49.2700	2.9118	0.0000	122.0643			

8.2 Waste by Land Use

<u>Unmitigated</u>

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons		МТ	-/yr	
Single Family Housing	242.72	49.2700	2.9118	0.0000	122.0643
Total		49.2700	2.9118	0.0000	122.0643

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons		МТ	-/yr	
Single Family Housing	60.68	12.3175	0.7279	0.0000	30.5161
Total		12.3175	0.7279	0.0000	30.5161

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
----------------	--------	-----------	------------	-------------	-------------	-----------

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

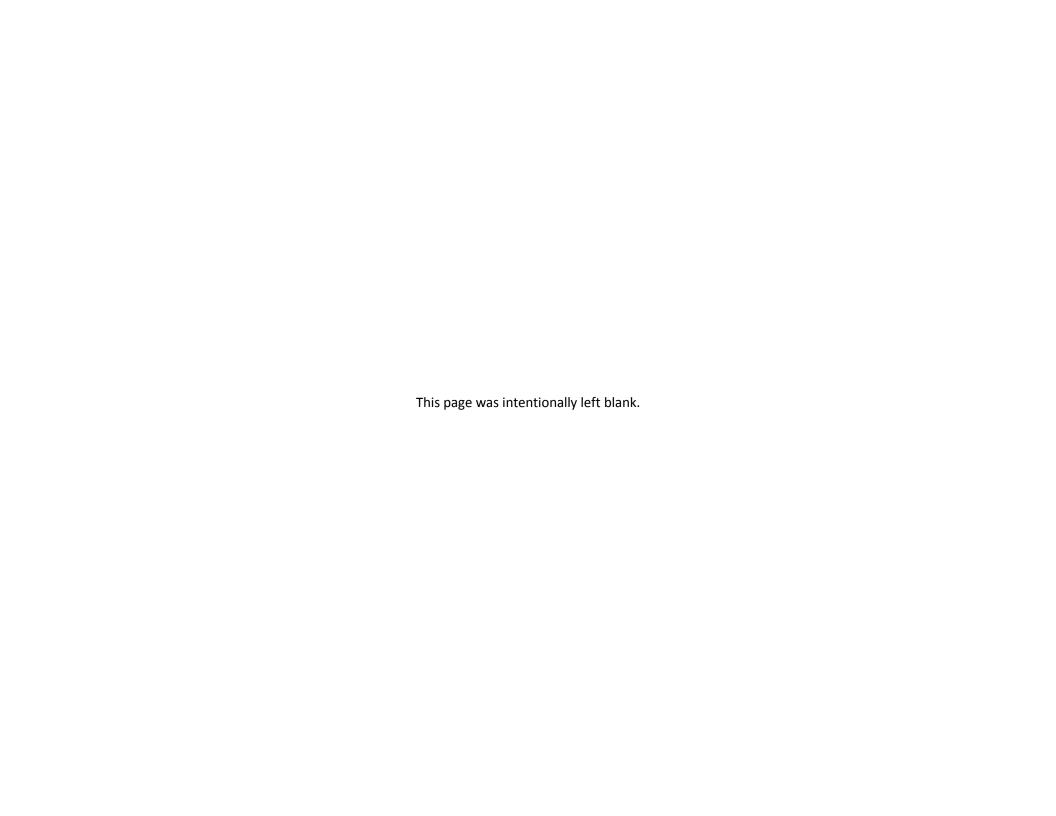
User Defined Equipment

Equipment Type	Number

11.0 Vegetation

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Appendix B1 Biological Resources Constraints Analysis Summary

HERITAGE SPECIFIC PLAN
INITIAL STUDY



BERKELEY
CARLSBAD
FRESNO
IRVINE
LOS ANGELES
PALM SPRINGS
POINT RICHMOND
RIVERSIDE
ROSEVILLE
SAN LUIS OBISPO

May 8, 2018

George Schader, Director of Community Development Griffin Residential 110 N. Lincoln Avenue, Suite 100 Corona, California 92882

Subject: Biological Resources Constraints Analysis Summary for the Redlands Entitlement Project

(LSA Project No. GFC1803)

Dear Mr. Schader:

This letter documents the findings of a biological resources constraints analysis for the Redlands Entitlement Project (project) in the City of Redlands, San Bernardino County, California (see Figure 1, all figures attached). The study area consists of four agricultural parcels (Assessor's Parcel Numbers 0167-091-02, 0167-091-08, 0167-091-04, and 0167-091-05) totaling 37.9 acres. Specifically, this letter will provide information for project compliance with applicable State and federal regulations.

LSA conducted a literature review and site visit of the study area, compiled an inventory of plant and wildlife species observed and/or detected during the survey, and recorded general observations pertaining to aquatic resources potentially subject to the jurisdiction of the City, the U.S. Army Corps of Engineers (USACE), the California Department of Fish and Wildlife (CDFW), and the Regional Water Quality Control Board (RWQCB).

METHODS

A literature review was conducted to determine the existence or potential occurrence of special-status plant and animal species on or in the vicinity of the project site. Database records for the *Redlands, California* U.S. Geological Survey (USGS) 7.5-minute quadrangle were searched on May 3, 2018, using the 2018 CDFW Natural Diversity Data Base application Rarefind 5 and the California Native Plant Society's (CNPS) Rare and Endangered Plant Inventory (CNPS 2018). A current aerial photograph (Google 2018) was also reviewed.

A general, reconnaissance-level field survey was conducted on May 7, 2018, by LSA Biologist Anthony Greco. Notes were made on general site conditions, vegetation, and suitability of habitat for various special status elements. Weather conditions were sunny during the site survey. The temperature was 85 degrees Fahrenheit. Wind speed was less than five miles per hour.

EXISTING SETTING

The study area consists of a former citrus orchard located north of San Bernardino Avenue and east of Texas Street in Redlands, California, approximately 37.9 acres in size. The citrus trees that were visible in the recent aerial imagery (Figure 2) have been recently removed and chipped on site. Most

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of the orchard appears to have been graded; however, the western parcel supports some nonnative grassland.

Species observed included wild oat (*Avena fatua*), Italian rye grass (*Festuca perennis*), hare barley (*Hordeum murinum* ssp. *leporinum*), sweet fennel (*Foeniculum vulgare*), short-pod mustard (*Hirschfeldia incana*), ripgut brome (*Bromus diandrus*), and Russian thistle (*Salsola tragus*).

The following wildlife species were observed within the study area during the survey: American crow (*Corvus brachyrhynchos*) and California ground squirrel (*Otospermophilus beecheyi*).

The topography of the study area is relatively flat. However, each parcel is separated by a small retaining wall step with a grade difference of approximately 1–2 feet, sloping down westerly. The elevation of the site is approximately 1,300 feet. Mapped soils on the site consist of the following (http://websoilsurvey.nrcs.usda.gov):

- HbA Hanford sandy loam, 0 to 2 percent slopes; and
- TuB Tujunga loamy sand, 0 to 5 percent slopes.

RESULTS

Special-Status Species

No special-status plant or animal species were observed during the survey. Furthermore, due to the lack of suitable habitat or vegetation, it is unlikely that special-status plant and animal species occur in the study area.

The U.S. Fish and Wildlife Service (USFWS) and CDFW may list species as threatened or endangered under the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA), respectively. The USFWS can designate critical habitat that identifies specific areas, either occupied or unoccupied, that are essential to the conservation of a listed species. Critical habitat areas may require special management considerations or protections. The federal threatened or endangered species listed below have been reported to occur within three miles of the project site.

- San Bernardino kangaroo rat (SBKR) (*Dipodomys merriami parvus*); federally listed as endangered; California Species of Special Concern¹ (CSC).
- San Bernardino kangaroo rat USFWS Designated Critical Habitat (USFWS 2002).
- Coastal California gnatcatcher (*Polioptila californica californica*); federally listed as threatened;
 CSC.
- Least Bell's vireo (Vireo bellii pusillus); federally and State listed as endangered.
- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*); federally listed as threatened and State listed as endangered.
- Santa Ana River woollystar (Eriastrum densifolium ssp. sanctorum)

5/10/18

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¹ Refers to species with vulnerable of seriously declining populations.

Slender-horned spineflower (Dodecahema leptoceras)

With the exception of SBKR, no other threatened or endangered species have the potential to occur due to the lack of suitable habitat and disturbed nature of the study area. Furthermore, the study area is not within designated critical habitat of any species.

San Bernardino Kangaroo Rat

Although the study area does not support alluvial fan sage scrub habitat and is unlikely to support SBKR, occupancy cannot be entirely ruled out since previous trapping efforts in nearby abandoned orchards have successfully captured SBKR. The study area is located approximately 0.5 mile south of USFWS Designated Critical Habitat for the SBKR (USFWS 2002), and there is potential connectivity to known occupied habitat along an undeveloped corridor to the west of the study area. Focused trapping would be required to determine the potential project effects to this species.

Other Special-Interest Species

The CDFW, USFWS, local agencies, and special interest groups, such as the CNPS, maintain lists of species that they consider to be in need of monitoring. Legal protection for these special interest species varies widely.

Special-interest species known to occur in the region are listed below.

- Northwestern San Diego pocket mouse (Chaetodipus fallax fallax; CSC).
- Coast horned lizard (*Phrynosoma blainvillii*; CSC, USFWS Species of Concern).
- Parry's spineflower (Chorizanthe parryi var. parryi; CNPS 1B¹).
- Burrowing owl (Athene cunicularia; CSC).

Nesting Birds

Although the study area no longer contains any large trees or shrubs for nesting or roosting, there is foraging habitat for raptors, such as hawks and owls, among other resident and migratory bird species. Under Sections 3503 and 3503.5 of the California Fish and Game Code and the Migratory Bird Treaty Act (MBTA), it is unlawful to take, possess, or needlessly destroy any bird of prey or the nests or eggs of any bird species. Disturbance of any active bird nest during the breeding season, including active owl burrows, would be prohibited by law.

Burrowing Owl

Burrowing owls have the potential to occupy the project site, specifically the open, flat areas of the study area. This ground-dwelling species is found in open, dry grasslands; agricultural and range lands; desert habitats; and grass, forb, and shrub stages of pinyon and ponderosa pine habitats. They nest in abandoned burrows of ground squirrels or other animals, in pipes, rock and debris piles, and in other similar features. The site contains ground squirrel burrows and debris piles that are

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California Rare Plant Rank 1B: Rare, threatened, or endangered in California and elsewhere.

considered potentially suitable habitat for burrowing owl. A burrowing owl preconstruction survey may be required as part of the City of Redland's Conditions of Approval for the project.

Potential Jurisdictional Waters of the U.S./Streambeds

No drainage features, ponded areas, or riparian habitat subject to jurisdiction by the CDFW, USACE, and/or RWQCB were found within the study area. Moreover, the *Redlands, California* USGS quadrangle does not depict any drainages or streams within the study area.

CONCLUSIONS AND RECOMMENDATIONS

LSA recommends further analysis and documentation of the study area if the site is to be developed. The following analyses/reports should be conducted for proper assessment of the study area and to comply with the requirements of the California Environmental Quality Act:

A focused trapping survey for San Bernardino kangaroo rat estimated at approximately \$13,500. If San Bernardino kangaroo rats are found, the study area has the potential to be considered fully occupied by resource agencies. For compliance with Section 10 of the Federal Endangered Species Act, a Habitat Conservation Plan (HCP) would be required to be prepared to analyze effects and determine mitigation measures for the SBKR. Mitigation measures may be in the form of avoidance, minimization, and/or compensatory mitigation. Compensatory mitigation may include offsite purchase of lands occupied by the SBKR to be preserved in perpetuity, or purchase of of credits from an established mitigation bank (e.g., Cajon Creek Conservation Bank). Mitigation compensation is typically required at a ratio of up to 3:1 (i.e., 3 acres of land would need to be purchased for each 1 acre of land affected). Current mitigation bank credit costs are in the range of \$200,000 to \$250,000 per acre. Therefore, for example, mitigation for the entire approximately 40 acre project site, could result in a requirement to purchase up to 120 acres of mitigation credits, and at \$200,000 per acre, the total cost of mitigation would be \$24,000,000.

LSA would be pleased to provide you with a proposal for the surveys and reports described above. If you have any questions about this letter, please contact me at (760) 931-5471 or at Anthony.Greco@LSA.net.

Sincerely,

LSA ASSOCIATES, INC.

Anthony Greco Senior Biologist

anthony Drew

Attachments: List of References

Figure 1 - Project Location Map

Figure 2 – Project Area Figure 3 – Site Photographs

5/10/18

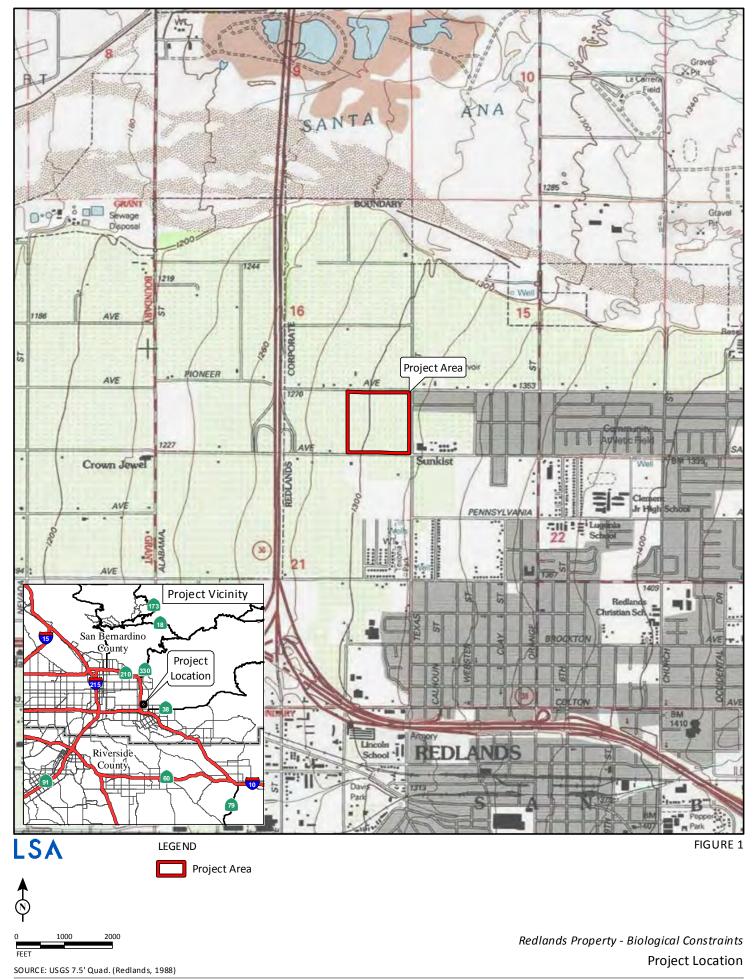
LIST OF REFERENCES

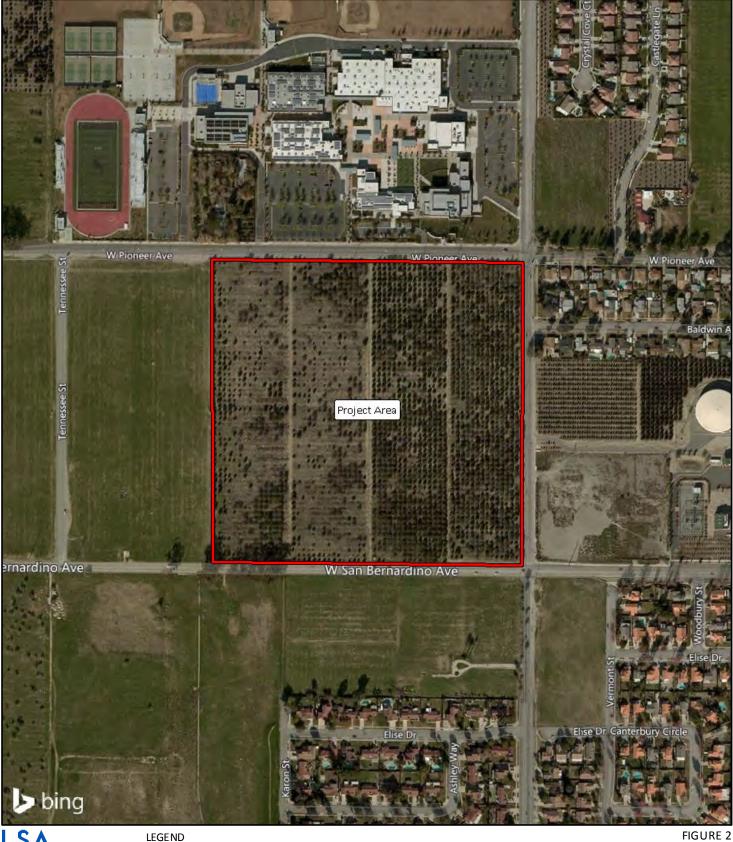
- California Department of Fish and Wildlife, 2014. *RareFind Version* 5. Records search executed May 3, 2018, covering the United States Geological Survey 7.5-minute series topographic map *Redlands, California* topographic quadrangle. Resource Management and Planning Division. Biogeographic Data Branch, Natural Diversity Data Base. Sacramento, California.
- California Native Plant Society. 2018. Inventory of Rare and Endangered Plants (online 8th edition, December 2010). California Native Plant Society. Sacramento, California. Accessed on May 3, 2018, from http://www.rareplants.cnps.org/.

Google Earth. 2018.

- Hickman, J.C., ed. 1993. *The Jepson Manual: Higher Plants of California*. Berkeley and Los Angeles, California: University of California Press.
- United States Department of Agriculture. 2018. Natural Resources Conservation Service Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov.
- United States Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the San Bernardino Kangaroo Rat; Final Rule. *Federal Register* Vol. 67, No. 78, 19812-19845.

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LEGEND

Project Area



Redlands Property - Biological Constraints Project Area



Photograph 1. Southeast corner of study area.



Photograph 2. Eastern boundary of the study area.



Photograph 3. Northwest boundary of study area.



Photograph 4. Recently cleared area within the study area.





Photograph 5. Western parcel with nonnative grassland.



Photograph 6: Western parcel with nonnative grassland.

Appendix B2 San Bernardino Kangaroo Rat Survey Results

HERITAGE SPECIFIC PLAN
INITIAL STUDY



CARLSBAD
FRESNO
IRVINE
LOS ANGELES
PALM SPRINGS
POINT RICHMOND
RIVERSIDE
ROSEVILLE
SAN LUIS OBISPO

June 4, 2018

Ms. Stacy Love United States Fish and Wildlife Service Carlsbad Field Office 2177 Salk Avenue, Suite 250 Carlsbad, California 92008 Dr. Scott Osborn Wildlife Branch California Department of Fish and Wildlife 1812 Ninth Street Sacramento, California 95811

Subject: San Bernardino Kangaroo Rat Survey Results for the Redlands Entitlement Project,

Redlands, San Bernardino County, California—May-June 2018 (LSA Project Number

GFC1803)

Dear Ms. Love and Dr. Osborn:

This letter report documents the results of a protocol presence/absence survey for the federally endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus*) conducted by LSA. This survey was conducted for the Redlands Entitlement Project (project) in Redlands, San Bernardino County, California.

No San Bernardino kangaroo rats were captured during the survey.

STUDY AREA

The project site is not within Designated Critical Habitat for the San Bernardino kangaroo rat and consists of four agricultural parcels (Assessor's Parcel Numbers 0167-091-02, 0167-091-08, 0167-091-04, and 0167-091-05) totaling 37.9 acres (Figure 1; all figures provided in Attachment A). The project site consists of a former citrus orchard located north of San Bernardino Avenue and west of Texas Street in Redlands. The citrus trees that were visible in the recent aerial imagery (Figure 2) have been recently removed and chipped on site. Most of the orchard appears to have been graded; however, the western parcel supports some nonnative grassland. The elevation of the relatively flat site is approximately 1,300 feet.

METHODS

LSA biologists Leo Simone and Richard Erickson conducted five nights of protocol trapping from May 27 to June 1, 2018. Trapping was conducted pursuant to LSA's Federal Fish and Wildlife Permit TE-777965-10 (March 22, 2013–March 21, 2017; renewal underway) and a California Department of Fish and Wildlife attachment to Scientific Collecting Permit SC-000777 providing Conditions for Research on Listed Mammals (February 14, 2018–February 14, 2021). As Figure 2 shows, a total of 100 traps were set in five traplines. The traplines were placed in the most suitable-appearing habitat in the project area. Traps were baited with birdseed and wild oats each evening. Trap checks occurred at midnight and at dawn. All animals were identified and released unharmed at their capture sites, and the traps were closed during the day.

RESULTS

No San Bernardino kangaroo rats were captured. There were 449 total rodent captures involving two species. Complete capture results are shown in Table A, provided as Attachment B.

A California Native Species Field Survey Form is provided as Attachment C.

If you have any questions or comments, please contact Richard Erickson or me by phone at (949) 553 0666 or via email at richard.erickson@lsa.net or leo.simone@lsa.net.

Sincerely,

LSA ASSOCIATES, INC.

Leo Simone

Associate/Biologist

Attachments: A: Figures

B: Table B-1: Trapping Results

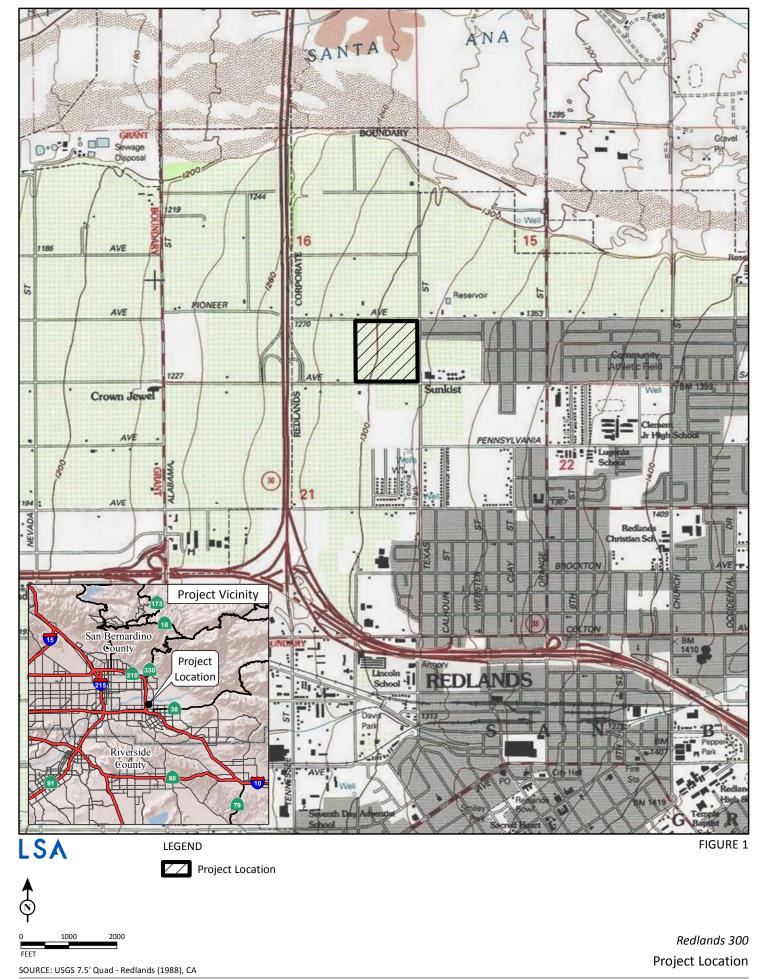
C: California Native Species Field Survey Form

I CERTIFY THAT THE INFORMATION IN THIS SURVEY REPORT AND ATTACHED EXHIBITS FULLY AND ACCURATELY REPRESENTS MY WORK:

SURVEYOR:	PERMIT NUMBER:	DATE:
To I Senow	TE-777965-10	JUNE 4, 2018
LEO SIMONE		
Richard a. Einstean	TE-777965-10	JUNE 4, 2018
RICHARD ERICKSON		

ATTACHMENT A

FIGURES





ATTACHMENT B

TABLE B-1: TRAPPING RESULTS



Table B-1: Trapping Results

Date and Time	May 27 PM	May 28 AM	May 28 PM	May 29 AM	May 29 PM	May 30 AM	May 30 PM	May 31 AM	May 31 PM	June 1 AM	Total
Number of Traps	1	00	1	00	10	00	10	00	10	0	500
Species											
North American deermouse Peromyscus maniculatus	26	39	38	47	43	51	40	46	62	54	446
California ground squirrel Otospermpphilus beecheyi	_	_	_	_	_	_	3	_	_	_	3
Total Rodent Captures	26	39	38	47	43	51	43	46	62	54	449
California towhee Melozone crissalis	_	_	_	_	_	_	1	_	_	_	1

ATTACHMENT C

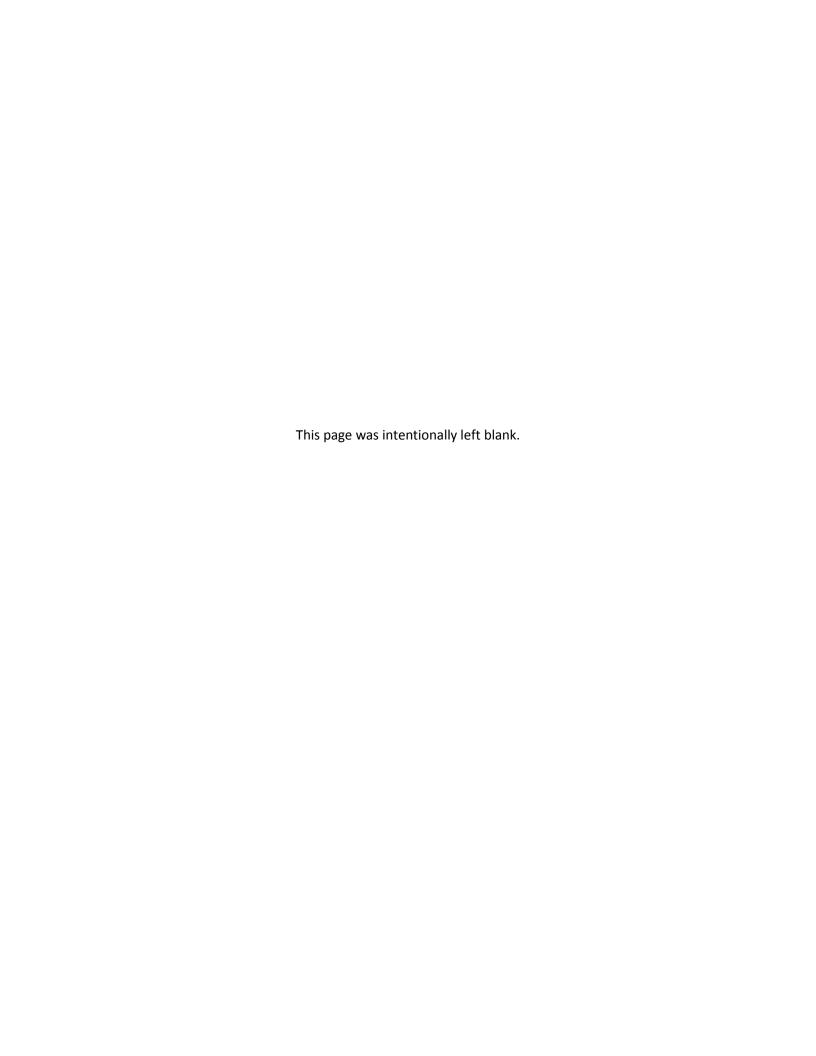
CALIFORNIA NATIVE SPECIES FIELD SURVEY FORM

Mail to: California Natural Diversity Database Department of Fish and Game 1807 13th Street, Suite 202 Sacramento, CA 95811 Fax: (916) 324-0475 email: CNDDB@dfg.ca.gov

Date of Field Work	(mm/dd/yyyy):

	For Office Use Only
Source Code	Quad Code
Elm Code	Occ. No
EO Index No.	Map Index No

California Nati	ve Specie	s Field	Surv	ey For	m	
Scientific Name:						
Common Name:						
Species Found? 9 9		Reporter:	-			
Yes No If not, why? Total No. Individuals Subsequent Visit? 9 yes	oc @ no	Address:				
Is this an existing NDDB occurrence? Yes, Occ. #						
Yes, Occ. # Collection? If yes:						
Number Museum / Herbariu	ım	Phone: _				
Plant Information An	imal Information	on				
Phenology:%% —						
vegetative flowering fruiting	# adults	# juveniles		larvae	# egg masses	# unknown
	-	9 eding r		⑨ rookery	9burrow site	9 other
Quad Name:	:H M S	GPS Mak	ke & Mode al Accurac	ates (GPS, tel	evation:topo. map & type):
Habitat Description (plants & animals) plant commun Animal Behavior (Describe observed behavior, such as territ						ally for avifauna):
Site Information Overall site/occurrence quality/viabili	ity (site + nonula	ntion). @	Excellen	t	ood ⑨ Fair	Poor
Immediate AND surrounding land use:	., (onto i popula		- EXOCITED	. • 0	JUJ GIAII	© 1 00i
Visible disturbances:						
Threats:						
Comments:						
Determination: (check one or more, and fill in blanks) Keyed (cite reference): Compared with specimen housed at: Compared with photo / drawing in: By another person (name):			Plan Hab	t / animal	•	de Print Digital
Other:			May we c	btain duplica	tes at our expense	? yes no
						DFG/BDB/1747 Rev. 6/16/09



Appendix B3 Biological Resources Peer Review Letter

HERITAGE SPECIFIC PLAN
INITIAL STUDY



To: Emily Elliott, Michael Baker International (Michael Baker)

From: Dan Rosie, Michael Baker

Date: July 10, 2019

Project: Griffin Homes Heritage Specific Plan IS/MND (aka Redlands Entitlement

Project)

Subject: Review of the LSA Biological Resources Constraints Analysis Summary

(May 2018) and San Bernardino Kangaroo Rat Survey Results (June 2018)

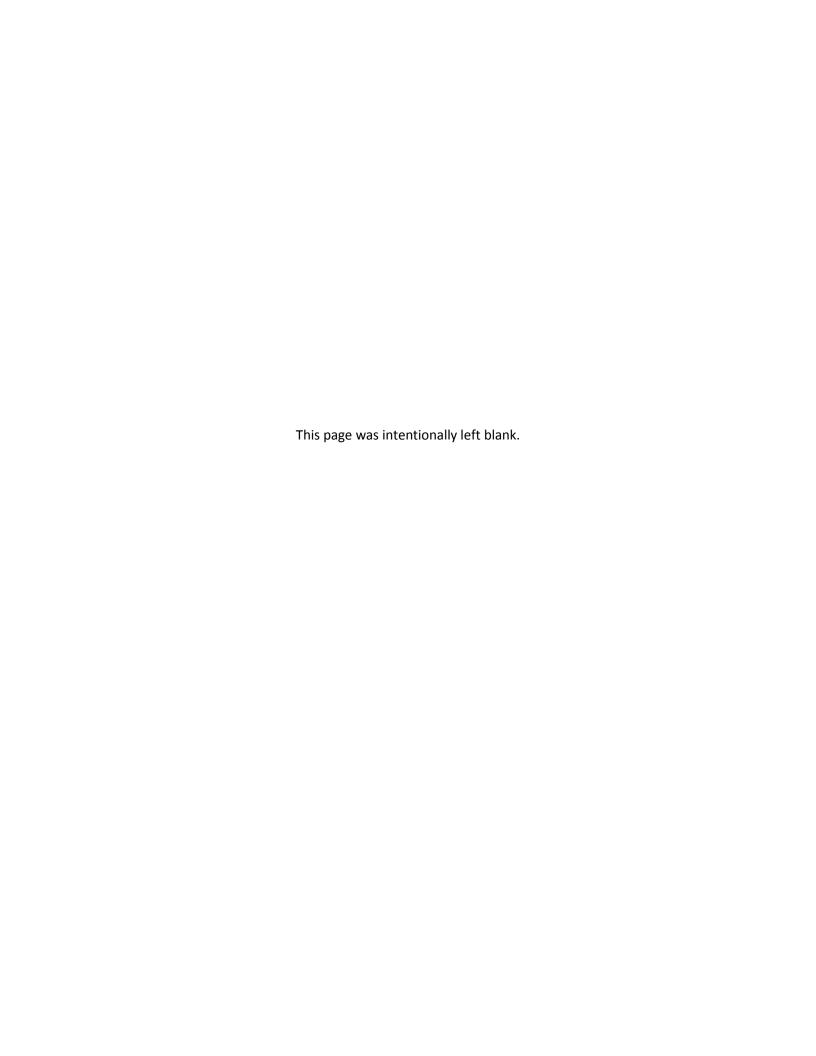
Introduction

As requested, Michael Baker International (Michael Baker) reviewed the Biological Resources Constraints Analysis Summary (dated May 8, 2018) and San Bernardino Kangaroo Rat Survey Results (dated June 4, 2018) letter reports prepared by LSA for the proposed Redlands Entitlement Project (project). Specifically, the area discussed in this memorandum consists of an approximately 37.2-acre study area. The project site is situated within Assessor's Parcel Numbers 0167-091-02-0000, 0167-091-04-0000, 0167-091-05-0000, and 0167-091-08-0000, located west of Texas Street, north of San Bernardino Avenue and south of Pioneer Avenue, in the City of Redlands, San Bernardino County, California.

Findings and Opinions

Based upon a review of the Biological Resources Constraints Analysis Summary and San Bernardino Kangaroo Rat Survey Results prepared by LSA (dated May 8 and June 4, 2018, respectively), it is our professional opinion that the research, methods, and analysis applied are consistent with current industry standards. Therefore, the information and results provided in these reports appears to be adequate for incorporating into the California Environmental Quality Act document.

Please do not hesitate to contact me at (949) 472-3407 or dan.rosie@mbakerintl.com if you have any further questions or if above statement needs further clarification.



Appendix C1 Cultural Resources Assessment

HERITAGE SPECIFIC PLAN
INITIAL STUDY

CULTURAL RESOURCES ASSESSMENT

GRIFFIN REDLANDS PROJECT CITY OF REDLANDS SAN BERNARDINO COUNTY, CALIFORNIA



CULTURAL RESOURCES ASSESSMENT

GRIFFIN REDLANDS PROJECT CITY OF REDLANDS SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

Mr. Jed Solomon Griffin Residential 110 North Lincoln Avenue, Suite 100 Corona, California 92882

Prepared by:

Riordan Goodwin LSA Associates, Inc. 1500 Iowa Avenue, Suite 200 Riverside, California 92507 (951) 781-9310

LSA Project No. GFC1804

National Archaeological Data Base Information:

Type of Study: Records Search, Survey, Archaeological Assessment USGS Quadrangle: Redlands, California
Acreage: 37.9



MANAGEMENT SUMMARY

LSA was retained by Griffin Residential to conduct a cultural resources assessment for the proposed Griffin Redlands Project in the City of Redlands, San Bernardino County, California. The City required this study as part of the environmental review process to comply with the California Environmental Quality Act (CEQA).

A cultural resources records search, additional research, and a field survey were conducted for the project area. A previously documented historic period cultural resource was identified within the project area that was previously evaluated as not a "historical resource" as defined by CEQA. The resources adjacent to the project area are a cobblestone curb and unremarkable remnants of local agriculture. No prehistoric or historic-period resources related to Native American cultural heritage are documented within a mile. Considering these factors, the project parcels have little or no potential for subsurface resources. Therefore, the findings and recommendations of the previous cultural resources assessment are carried forward: no impact to cultural resources and no further cultural resources investigation or archaeological monitoring is necessary.

In the event buried cultural materials are encountered during earthmoving operations associated with the project, all work in that area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

In the event human remains are encountered, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be Native American, the County Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC. The MLD will have the opportunity to offer recommendations for the disposition of the remains.

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INTRODUCTION

LSA was retained by Griffin Residential to conduct a cultural resources assessment for the proposed Griffin Redlands Project in the City of Redlands, San Bernardino County, California. This assessment was completed pursuant to the California Environmental Quality Act (CEQA), Public Resources Code Chapter 2.6, Section 21083.2, and California Code of Regulations Title 14, Chapter 3, Article 5, Section 15064.5. The research and field survey were conducted to determine whether the proposed project could adversely affect any resources considered historical resources per CEQA.

The project is bounded by commercial development to the north, vacant land to the south and west, and suburban development and vacant land to east. The project is depicted on the United States Geological Survey (USGS) *Redlands, California* topographic quadrangle map in Section 16 of Township 1 North, Range 4 West, San Bernardino Baseline and Meridian (USGS 1988; Figure 1). The project area is approximately 38 acres (Assessor's Parcel Numbers 0167-091-02, 0167-091-08, 0167-091-04, and 0167-091-05), which were previously cultivated in citrus. The proposed project is residential development comprising 214 single-family detached homes with associated recreational amenities.

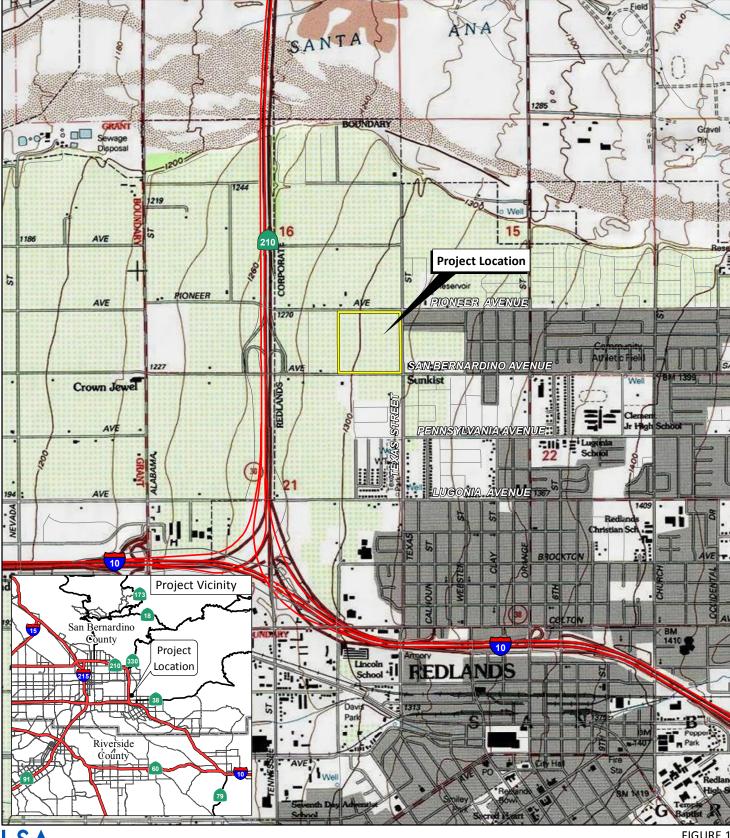




FIGURE 1

Griffin Redlands Project Regional and Project Location

SETTING

NATURAL SETTING

The natural setting of the project vicinity is presented based on the underlying theoretical assumption that humans and human societies are in continual interaction with the physical environment. Being an integral and major part of the ecological system, humans adapt to the environment through technological and behavioral changes. Locations of archaeological sites are based on the constraints of these adaptations, whether it is proximity to a particular resource, topographical restrictions, or shelter and protection. Sites will also contain an assemblage of artifacts and ecofacts consistent with the particular interaction.

Hydrology

The project region is characterized by a temperate climate, with dry, hot summers and moderate winters. Rainfall ranges from 12 to 16 inches annually (Beck and Haase 1974). Precipitation usually occurs in the form of winter rain, with warm monsoonal showers in summer. An ephemeral drainage bounds the western edge of the project parcel and the nearest natural reliable source of water is Lytle Creek, which drains south-southeast approximately 3 miles east of the project.

Biology

At an average elevation of approximately 1,220 feet above mean sea level (amsl), the project is within the Lower Sonoran Life Zone of California (Schoenherr 1992), which ranges from below sea level to 3,500 feet amsl. Although the natural vegetation has been largely removed from the project by past cultivation and weed abatement disking, pioneer species such as hare oat, mustard, Russian thistle, telegraph weed, and xeric grasses were noted on the property. Extensive fauna are known locally, including many endemic species of reptiles, birds, and insects.

Geology

The project area is located at the northern end of the Peninsular Ranges Geomorphic Province that extends from the Transverse Ranges to the tip of Baja California and includes the Los Angeles Basin (California Geological Survey 2002; Norris and Webb 1976). This region is characterized by a series of mountain ranges separated by northwest-trending valleys subparallel to faults branching from the San Andreas Fault. The geology of this province is similar to that of the Sierra Nevada, with numerous rock outcroppings useful to the Native Americans for resource milling, shelter and ceremonial art.

CULTURAL SETTING

Prehistory

Chronologies of prehistoric cultural change in Southern California have been attempted numerous times, and several are reviewed in Moratto (1984). No single description is universally accepted as the various chronologies are based primarily on material developments identified by researchers familiar with sites in a particular region and variation exists essentially due to the differences in

those items found at the sites. Small differences occur over time and space, which combine to form patterns that are variously interpreted.

Currently, two primary regional culture chronology syntheses are commonly referenced in the archaeological literature. The first, Wallace (1955), describes four cultural horizons or time periods: Horizon I – Early Man (9000–6000 BC), Horizon II – Milling Stone Assemblages (6000–3000 BC), Horizon III – Intermediate Cultures (3000 BC–AD 500), and Horizon IV – Late Prehistoric Cultures (AD 500–historic contact). This chronology was refined (Wallace 1978) using absolute chronological dates obtained after 1955.

The second cultural chronology (Warren 1968) is based broadly on Southern California prehistoric cultures and was also revised (Warren 1984; Warren and Crabtree 1986). Warren's (1984) chronology includes five periods in prehistory: Lake Mojave (7000–5000 BC), Pinto (5000–2000 BC), Gypsum (2000 BC–AD 500), Saratoga Springs (AD 500–1200), and Protohistoric (AD 1200–historic contact). Changes in settlement pattern and subsistence focus are viewed as cultural adaptations to a changing environment, which begins with gradual environmental warming in the late Pleistocene, continues with the desiccation of the desert lakes, followed by a brief return to pluvial conditions, and concludes with a general warming and drying trend, with periodic reversals that continue to the present (Warren and Crabtree 1986).

After AD 500, there was an influx of Native American groups from the eastern deserts into southern California. These groups brought changes in subsistence focus and associated technologies, as well as burial practices. These cultural changes along with the group migrations are known as the Shoshonean Intrusion or Shoshonean Wedge (Kroeber 1925; Koerper 1979) and the Takic Wedge (Bergin and Ferraro 1999). The term Takic Wedge refers to the wedge of Takic culture groups that moved to the coast, displacing tribes of the Hokan and Yuman language stocks to the north and south (Shipley 1978). The ethnographically recorded Luiseño, Juaneño, and Gabrielino are thought to be the descendants of prehistoric Takic populations that settled along the coast during the Late Prehistoric Period, or perhaps even earlier. The Serrano and Cahuilla, more distant from the coast, are also Takic-speaking tribes within this wedge.

Ethnography

The project is located near the intersection of the traditional cultural territories of the Cahuilla and the Serrano (Bean 1978; Bean and Smith 1978; Kroeber 1925). Tribal territories were somewhat fluid and changed over time. Like other Native American groups in Southern California, they were semi-nomadic hunter-gatherers who subsisted by exploitation of seasonably available plant and animal resources. The first written accounts of Native American groups in Southern California were by Spanish missionaries in the late 18th century. Later documentation of the Serrano was by Benedict (1924), Bright (1975), Strong (1929), and many others. The Cahuilla were studied by Barrows (1900), Kroeber (1908), Hooper (1920), and others.

Cahuilla

The territory of the Cahuilla ranged from the San Bernardino Mountains south to Borrego Springs and the Chocolate Mountains, from Orocopia Mountain to the east, to the San Jacinto Plain and Palomar Mountain to the west (Bean 1978). Cahuilla territory lies within the geographic center of

Southern California and encompassed diverse environments ranging from inland river valleys and foothills to mountains and desert (Bean and Shipek 1978).

Cahuilla villages, generally located near water sources within canyons or near alluvial fans, comprised groups of related individuals, generally from a single lineage, and the territory around the village was owned by the villagers (Bean 1978). Like other Native American groups in Southern California, the Cahuilla were semi-nomadic peoples leaving their villages and utilizing temporary campsites to exploit seasonably available plant and animal resources (James 1960).

Cahuilla subsistence was based primarily on acorns, honey mesquite, screw beans, piñon nuts, and cactus fruit, supplemented by a variety of wild fruits and berries, tubers, roots, and greens (Kroeber 1925; Heizer and Elsasser 1980). Hunting deer, rabbit, antelope, bighorn sheep, reptiles, small rodents, quail, doves, ducks, and reptiles by means of bows, throwing sticks, traps, and communal drives is documented (James 1960).

Serrano

The Serrano lived in the area generally north of Cahuilla territory (western Riverside County), occupying much of present-day San Bernardino County and northeastern Los Angeles County, but there is some overlap in the perceived ancestral areas. The term Serrano is Spanish for "mountaineer" or "highlander" and was given to people who inhabited the areas of the San Bernardino Mountains that had no associated mission.

The Serrano, like the Cahuilla, were hunter-gatherers who relied on the women to do much of the collecting while the men hunted and captured various animals. Although they exploited whatever flora was available in the area they happened to be, generally they collected acorns, pinion nuts, honey, mesquite, yucca, and cactus fruits, in addition to various seeds, bulbs, and roots. Plants were consumed both raw and cooked. Food processing involved the use of manos, metates, mortars, and pestles. Antelope, deer, mountain sheep, rabbits, and rodents were killed and captured, and the most common hunting implements were the bow and arrow, throwing stick, traps, snares, and deadfalls. Meat was prepared in earth ovens, by boiling in watertight baskets, or by parching (Bean and Smith 1978).

Most of the Serrano lived in small villages near reliable sources of water (springs, perennial seeps, streams, and small lakes) (Benedict 1924). They lived in tule-covered, dome-shaped structures and had ceremonial houses and sweat houses for their religious activities. The basic settlement unit was a village with a number of small satellite resource-gathering camps. The project area is in the vicinity of the ethnohistorically known village of *Kaawchama* (or *Wa'aachnga*), which developed around the San Bernardino Asistencia (see below; McCawley 1996).

The Serrano had a patrilineal society composed of clans and families linked by both ancestry and ceremony. Three clans divided this group: the Mohineyam, the Yuhevatam, and the Maringayam. The Serrano were also divided by moieties: the Wildcats and the Coyotes.

With the Spanish intrusion came a drastic change in lifestyle for the natives of Southern California. Incorporation of the indigenous populations into the mission system led to the disruption of native

cultures and changes in subsistence and land use practices. Mission San Gabriel, established in 1771, probably had a limited effect on the Serrano population until the San Bernardino Asistencia (and the the Mill Creek Zanja that served it) were established in what would become Redlands around 1820 (Harley 1988). Within a short time, the missions controlled many ranchos where Indians lived and worked.

History

In California, the historic era is generally divided into three periods: the Spanish Period (1769–1821), the Mexican Period (1821–1848), and the American Period (1848–present). As the resource identified within the project area most likely dates to the 20th century, this historic context is limited to a summary addressing San Bernardino County and the City of Redlands.

San Bernardino County

In 1820, an asistencia of the Mission San Gabriel was established at the Native American village of *Kaawchama* (Hispanicized to *Guachama*) in the area that would become the western portion of Redlands (McCawley 1996). The 35,500-acre Rancho San Bernardino (which includes the project area) was granted to Antonio Maria Lugo in 1842 (Richards 1966). San Bernardino County was created in 1853 from portions of Los Angeles and San Diego Counties due to mineral wealth and the City of San Bernardino was incorporated as the County Seat the following year. Agriculture ultimately replaced mining as the county's economic base, with thousands of acres under cultivation by the beginning of World War I (McGroarty 1914).

Redlands

After the Mormons left the San Bernardino Valley in the late 1850s, prominent individuals such as Ben Barton and Anson Van Leuven established ranches along what would become Barton Road. By the end of the decade, the area around the mouth of the Santa Ana Canyon was acquired by the Crafts family and would later become known as Crafton. The community that subsequently developed in the area between Crafton and the Old San Bernardino Mission district became known as Lugonia (after the Lugo family, original owners of Rancho San Bernardino). By the early 1880s, two Lugonia entrepreneurs, E.G. Judson and F.E. Brown, formed the Redlands Water Company and began buying up land and constructing reservoirs and canals to provide water to their acquisitions. Judson and Brown platted the town of Redlands (named for the color of the soil) in 1887 (Gudde 1998). The town was incorporated the following year, fourth in the County of San Bernardino. Redlands prospered during the regional citrus boom, but from its founding it also developed with the substantial contributions of "gentlemen ranchers," prosperous industrialists from the East Coast and the Midwest who established winter homes in the community.

METHODS

RECORDS SEARCH

On October 3, 2018, the cultural resources records search was conducted for the project area by Archaeological Technician Allegria Garcia at the South Central Coastal Information Center (SCCIC) located at California State University, Fullerton. It included a review of all recorded historic and prehistoric archaeological sites within one mile of the project, as well as a review of known cultural resource survey and excavation reports. In addition, the California State Historic Property Data File (HPD), which includes the National Register of Historic Places (National Register), California Historical Landmarks (CHL), and California Points of Historical Interest (CPHI), was searched.

ADDITIONAL RESEARCH

In June and July 2018, LSA Archaeologist Riordan Goodwin conducted additional research, including review of historic period aerial photographs and maps.

ARCHAEOLOGICAL FIELD SURVEY

On September 29, 2018, LSA Archaeologist Riordan Goodwin and Archaeological Technician Melissa Jenkins completed an intensive pedestrian survey of the project parcel. The property was surveyed in systematic parallel transects spaced by approximately 10 meters (approximately 35 feet). Special attention was paid to areas of exposed soil for surface artifacts and features and rodent burrows for evidence of archaeosols. The purpose of this survey was to identify and document, prior to the beginning of ground-disturbing activities, any cultural resources and thus also to identify any area(s) that might be sensitive for buried cultural resources.

RESULTS

RECORDS SEARCH

Data from the SCCIC indicate there have been 33 cultural resource studies previously conducted within one mile of the proposed project, one of which specifically addressed the project area (Tang and Hogan 2006). One water conveyance (36-012468) was previously documented within the project area. Although no prehistoric resources were documented within the study area, an additional 78 resources have been recorded within one mile, including historic period foundations and refuse scatters, water conveyance features, orchards, landscaping, and a preponderance of built environment properties (Table A). One built environment resource has been evaluated as eligible for the National Register of Historic Places (National Register) and most others have been designated as historically significant by the City.

Table A: Resources Within One Mile of the Project Area with DPR Documentation

		Site Description	Status Code
36-006084		Historic period refuse scatters	
36-006095	_	Historic period refuse scatter	_
36-007765	_	Water conveyance features, refuse scatter	-
36-007766	_	Orange grove, water conveyance, driveway and foundation features	
36-007767	_	Driveway, retaining wall, and landscaping	
36-007768	_	Orange grove, foundation, water conveyance, and driveway features, landscaping	_
36-008135	_	Water conveyance system	_
36-008136	_	9949 Alabama Street; early 20 th century farm complex (house and reservoir)	_
36-012468*	_	Water conveyance (orchard irrigation) system	_
36-012531	_	1042 Pioneer Avenue; c. 1915 residence	_
36-012532	_	1074 Pioneer Avenue; c. 1915 residence	-
36-012852	_	Water conveyance system, refuse scatter	_
36-013514	_	1660 West San Bernardino Avenue; c. 1901 residence	_
36-013622	_	Cobble curb feature	_
36-013775	_	Water conveyance system	_
36-013783	_	Water conveyance system	_
36-016703	61805	833 Calhoun Street; c. 1910 residence	5\$2
36-016704	61804	907 Calhoun Street; c. 1910 residence	5S2
36-016705	61803	922 Calhoun Street; c. 1910 residence	5S2
36-016707	61807	731 Cedar Avenue; c. 1895 residence	3\$
36-016740	61746	837 Clay Street; c. 1895 residence	5S2
36-016741	61745	838 Clay Street; c. 1895 residence	5S2
36-016742	61744	904 Clay Street, c. 1900 residence	5S2

Table A: Resources Within One Mile of the Project Area with DPR Documentation

Primary #	OHP#	Site Description	Status Code
36-016743	61743	908 Clay Street, c. 1915 residence	5S2
36-016744	61742	911 Clay Street, c. 1925 residence	5S2
36-016745	61741	914 Clay Street, c. 1900 residence	5S2
36-016746	61740	917 Clay Street, c. 1915 residence	5S2
36-016747	61739	920 Clay Street, c. 1895 residence	5S2
36-016748	61738	924 Clay Street, c. 1925 residence	5S2
36-016749	61737	930 Clay Street, c. 1900 residence	5S2
36-016750	61736	936 Clay Street, c. 1915 residence	5S2
36-016751	61735	937 Clay Street, c. 1895 residence	5S2
36-016752	61756	910 Columbia Street ; c. 1910 residence	5S2
36-016753	61755	913 Columbia Street; c. 1905 residence	5S2
36-016754	61754	914 Columbia Street; c. 1905 residence	5S2
36-016755	61754	936 Columbia Street ; c. 1905 residence	5S2
36-017118	_	928 Orange Street; c. 1900 residence	5\$
36-017119	_	930 Orange Street; c. 1900 residence	5\$
36-017120	_	931 Orange Street; "prior to 1895" residence	5\$
36-017121	_	1001 Orange Street; c. 1895 residence	_
36-017122	_	1101 Orange Street; c. 1890 residence	5\$
36-017123	_	1157 Orange Street; c. 1890 residence	5\$
36-017124	_	1234 Orange Street; "early" residence	5S?
36-017413	61950	106 West Lugonia Avenue; c. 1895 residence	5S2
36-017414	61951	706 West Lugonia Avenue; c. 1895 residence	5S2
36-017503	62052	911 Washington Street, c. 1895 residence	5S2
36-017504	62051	917 Washington Street, c. 1895 residence	5S2
36-017505	62050	922 Washington Street, c. 1895 residence	5S2
36-017506	62049	923 Washington Street, c. 1895 residence	5S2
36-017507	62048	926 Washington Street, c. 1895 residence	5S2
36-017508	62047	927 Washington Street, c. 1895 residence	5S2
36-017509	62046	929 Washington Street, c. 1900 residence	5S2
36-017510	62045	937 Washington Street, c. 1900 residence	5S2
36-017511	62044	940 Washington Street, c. 1900 residence	5S2
36-017512	62043	1033 Washington Street, c. 1895 residence	5S2
36-017513	62042	1101 Washington Street, c. 1920 residence	5S2
36-017514	62041	1102 Washington Street, c. 1895 residence	5S2
36-017515	62040	1033 Washington Street, c. 1900 residence	5S2
36-017516	62039	1108 Washington Street, c. 1920 residence	5S2

Table A: Resources Within One Mile of the Project Area with DPR Documentation

Primary #	OHP#	Site Description	Status Code
36-017517	62038	1114 Washington Street, c. 1895 residence	5S2
36-017518	62037	1115 Washington Street, c. 1915 residence	5S2
36-017519	62036	1117 Washington Street, c. 1910 residence	5S2
36-017520	62035	1118 Washington Street, c. 1900 residence	5S2
36-017521	62034	1121 Washington Street, c. 1920 residence	5S2
36-017522	62033	1122 Washington Street, c. 1900 residence	5S2
36-017523	62032	1126 Washington Street, c. 1920 residence	5S2
36-017524	62031	1127 Washington Street, c. 1920 residence	5S2
36-017525	62030	1131 Washington Street, c. 1910 residence	5S2
36-017526	62029	1136 Washington Street, c. 1915 residence	5S2
36-017527	62028	1140 Washington Street, c. 1915 residence	5S2
36-017528	62027	1141 Washington Street, c. 1900 residence	5S2
36-017529	62026	1144 Washington Street, c. 1900 residence	5S2
36-017530	62025	1145 Washington Street, c. 1900 residence	5S2
36-017531	62024	1155 Washington Street, c. 1925 residence	5S2
36-017532	62023	1211 Washington Street, c. 1900 residence	5S2
36-017536	62126	Bridge over SR-30 (#54-341) c. 1916	7R
36-017537	62127	Bridge over SR-30 (#54-341) c. 1932	7R
36-020771	_	Residential complex c. 1943	6Z
36-031678	_	Historic period refuse scatter	_

^{*}Within project area

ADDITIONAL RESEARCH

Review of the Phase I ESA and historic period aerial photographs indicates that although there were never any buildings within the project area, the parcel was under cultivation with a citrus orchard prior to 1930 until at least 2017 (Converse Consultants 2017; HistoricAerials.com var.).

ARCHAEOLOGICAL FIELD SURVEY

Mr. Goodwin and Archaeological Technician Melissa Jenkins conducted the pedestrian survey of the entire project area. Visibility was good at approximately 80 percent with the surface partially obscured by vegetation and piles of chipped/mulched trees. The project parcel has been subjected to surface disturbance from decades of citriculture. Soils are silty alluvium.

Smudge pots and smudge pot elements, as well as trace, extremely fragmentary historic refuse (lacking any concentrations or apparent depth) was noted on the surface throughout the project parcel. The refuse is likely the result of the historic period practice of using kitchen garbage as a 'soil amendment' or fertilizer in orchards. The eastern portion of a cobble masonry curb (36-013622 was noted in the Texas Street right-of-way on the southern edge of the project and appeared to be in

good condition. With the exception of the above and the previously documented historic period water conveyance system (see below), no cultural resources were identified within or on the periphery of the project area.

Site 36-012468

This water conveyance (citrus irrigation) system documented by CRM Tech in the mid-2000s is a somewhat unusual combination of rock-and-mortar flumes, brick flow control weirs and concrete distribution standpipes (Tang and Hogan 2006). Rock-and-mortar flumes are generally associated with late-19th to early 20th century agriculture, and the combination of materials and technology (field stone, some quarried stone, cement-surfaced brick-and-mortar, and pre-cast concrete pipes) suggests a 1900s to 1910s flume irrigation system that may have been later enhanced with or superseded by a concrete standpipe system supplied by underground pipelines. There are indications of repair and resurfacing of the flumes. It has been severely damaged by orchard-removal activities with most of the standpipes displaced or destroyed; one of the flumes has been destroyed and the other three are disrupted to varying degrees.

DISCUSSION

The water conveyance system within the project area was previously evaluated by CRM Tech as "not eligible for the California Register of Historical Resources (California Register) or local designation under the City Ordnance, and does not constitute a 'historical resource' as defined by CEQA" (Tang and Hogan 2006). The resources adjacent to the project are a cobblestone curb and unremarkable remnants of local agriculture (a citrus orchard, associated residential foundation, water conveyance, wall, and driveway features) and there are no prehistoric or known Native American heritage-related resources documented within a mile of the project area. Therefore, sensitivity for undocumented subsurface cultural resources is low.

RECOMMENDATIONS

A cultural resources records search, additional research, and a field survey were conducted for the project area. A previously documented historic period cultural resource was identified within the project area that was previously evaluated as not a "historical resource" as defined by CEQA. The resources adjacent to the project area are a cobblestone curb and unremarkable remnants of local agriculture, and no prehistoric or historic-period resources related to Native American cultural heritage are documented within a mile. Considering these factors, the project parcels have little or no potential for subsurface resources. Therefore, the findings and recommendations of the previous cultural resources assessment are carried forward: no impact to cultural resources and no further cultural resources investigation or archaeological monitoring is necessary.

In the event that archaeological materials are encountered during construction, all construction work should be halted and a qualified archaeologist consulted to determine the appropriate treatment of the discovery (California Code of Regulations, Title 14, Chapter 3, Section 15064.5(f)).

In the event human remains are encountered, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be Native American, the County Coroner will notify the NAHC, which will determine and notify an MLD. With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC. The MLD will have the opportunity to offer recommendations for the disposition of the remains.

REFERENCES

Barrows, David Prescott

1900 *The Ethno-botany of the Coahilla* [sic] *Indians of Southern California*. Chicago: University of Chicago Press.

Bean, Lowell John

1978 Cahuilla. In *California*, edited by R. F. Heizer, pp. 575–587. *Handbook of North American Indians*, vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Bean, Lowell John, and Charles R. Smith

1978 Serrano. In *California*, edited by R.F. Heizer, pp. 570–574. *Handbook of North American Indians*, vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Bean, Lowell John, and Florence C. Shipek

1978 Luiseño. In *California*, edited by R.F. Heizer, pp. 550–563. *Handbook of North American Indians*, vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Beck, Warren A., and Ynez D. Haase

1974 Historical Atlas of California. Norman, Oklahoma: University of Oklahoma Press.

Benedict, Ruth F.

1924 A Brief Sketch of Serrano Culture. American Anthropologist 26 (3).

Bergin, Kathleen Ann, and David D. Ferraro

Historic Properties Treatment Plan: Geotechnical Investigations of the CP Alignment of the Foothill Transportation Corridor—South, Orange and San Diego Counties, California. LSA Associates, Inc. Ms. on file, LSA Associates, Inc., 20 Executive Park, Suite 200, Irvine, California, 92614; Southwest Division, Naval Facilities Engineering Command, 1220 Pacific Highway, San Diego, California; and AC/S Environmental Security Office, MCB Camp Pendleton, California.

Bright, William

1975 Two Notes on Takic Classification: Paper read at the Third Annual Uto-Aztecan Conference, Flagstaff, June 19–20, 1975. (Copy, Manuscript No. 76–66 in National Anthropological Archives, Smithsonian Institution, Washington.)

California Geological Survey

2002 *California Geomorphic Provinces.* California Geologic Survey Note 36. California Department of Conservation.

Converse Consultants

2017 Phase I Environmental Site Assessment Report Citrus Valley Redlands—37.9 Acres Assessor Parcel Numbers (APN) 0167-091-02,0167-091-04, 0167-091-05, 0167-091-08

Redlands, California Converse Project No. 17-16-178-01. Prepared By: Converse Consultants.

Gudde, Erwin G.

1998 California Place Names: The Origin and Etymology of Current Geographical Names. Fourth edition, revised and enlarged by William Bright. Berkeley and Los Angeles: University of California Press.

Harley, R. Bruce

1988 Rev. Juan Caballeria: Historian or Storyteller? Rethinking the 1810 Dumetz Expedition. *San Bernardino County Museum Quarterly* 35(2), 42p.

Heizer, Robert F., and Albert B. Elsasser

1980 *The Natural World of the California Indians*. University of California Press, Berkeley and Los Angeles.

HistoricAerials.com

Var. 1938 and 2012 Aerial photographs of project area.

Hooper, Lucile

The Cahuilla Indians. University of California Publication in *American Archaeology and Ethnology*. Vol. 16, No. 6. Reprinted by Malki Museum Press. Banning, California.

James, Harry C.

1960 *The Cahuilla Indians.* Los Angeles: Westernlore Press. Reprinted in 1969 and 1985 by Malki Museum Press. Banning, California.

Koerper, Henry C.

On the Question of the Chronological Placement of Shoshonean Presence in Orange County, California. *Pacific Coast Archaeological Society Quarterly* 15(3):69-84.

Kroeber, Alfred L.

- 1908 Ethnography of the Cahuilla Indians. University of California Publications in American Archaeology and Ethnology. Vol. 8. No. 2. Reprinted by Malki Museum Press, Banning, California.
- 1925 *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin No. 78 Washington D.C.: Smithsonian Institute. Reprinted in 1976, New York: Dover Publications.

McCawley, William

1996 *The First Angelinos: The Gabrielino Indians of Los Angeles.* Banning and Novato: Malki Museum Press and Ballena Press.

McGroarty, John Steve

1914 Southern California. Southern California Panama Exposition Commission.

Moratto, Michael J.

1984 California Archaeology. San Diego: Academic Press.

Norris, R.M., and R.W. Webb

1976 Geology of California. New York: John Wiley and Sons, Inc. 379 pp.

Richards, Elizabeth W.

1966 Guideposts to History: Concerning Origins of Place and Street Names in San Bernardino County. Santa Fe Federal Savings.

Schoenherr, Allan A.

1992 A Natural History of California. University of California Press, Berkeley and Los Angeles.

Shipley, William F.

Native Languages of California. In R. Heizer ed., *Handbook of North American Indians*, vol. 8, California, pp. 80–90. Smithsonian Institution, Washington D.C.

Strong, William D.

Aboriginal Society in Southern California. *University of California Publications in American Archaeology and Ethnology* 26(1): 1–358. Berkeley.

Tang, Bai, and Michael Hogan

2006 Historical/Archaeological Resources Survey Report Redlands Commons Project Assessor's Parcel Nos. 0167-091-02, -04, -04, and -08 City of Redlands, San Bernardino County, California. Unpublished report on file at SCCIC.

United States Geological Survey Topographic Maps

1988 *Redlands, California* 7.5 minute topographic quadrangle.

Wallace, William J.

- 1955 A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11(3):214-230.
- 1978 Post-Pleistocene Archaeology. In California, edited by R. Heizer, pp. 550–563. *Handbook of North American Indians*, Vol. 8. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Warren, Claude N.

- 1968 Cultural Tradition and Ecological Adaptation on the Southern California Coast. Eastern New Mexico University Contributions in Anthropology 1(3). Portales.
- The Desert Region. In *California Archaeology*, by M. Moratto with contributions by D.A. Fredrickson, C. Raven, and C. N. Warren, pp. 339–430. Academic Press, Orlando, Florida.

Warren, Claude N., and Robert H. Crabtree

1986 Prehistory of the Southwestern Area. *In* W.L. D'Azevedo ed., *Handbook of the North American Indians*, Vol. 11, *Great Basin*, pp. 183–193. Washington D.C.: Smithsonian Institution.

APPENDIX A DEPARTMENT OF PARKS AND RECREATION (DPR) 523 FORMS

State of California C The Resources Agency

DEPARTMENT OF PARKS AND RECREATION

CONTINUATION SHEET

Primary #	36-012468
HRI#	
Trinomial	

Page	1	of	1	*Resource Name	e or #: (A	Assigned by recorder)	N/A			
*Record	ded by	M	lelissa J	Jenkins and Rory Goodwin	*Date:	9/29/2018		Continuation	Χ	Update

This water conveyance (citrus irrigation) system documented by CRM Tech in the mid-2000s is a somewhat unusual combination of rock-and-mortar flumes, brick flow control weirs and concrete distribution standpipes (Tang and Hogan 2006). Rock-and-mortar flumes are generally associated with late-19th to early 20th century agriculture, and the combination of materials and technology (field stone, some quarried stone, cement-surfaced brick-and-mortar, and precast concrete pipes) suggests a 1900s to 1910s flume irrigation system that may have been later enhanced with, or superseded by a concrete standpipe system supplied by underground pipelines, and there are indications of repair and resurfacing of the flumes. It has been severely damaged by orchard-removal activities with most of the standpipes displaced or destroyed, one of the flumes destroyed and the other three disrupted to varying degrees. The irrigation system will be completely removed by the current project.

Reference

Tang, Bai, and Michael Hogan

2006 Historical/Archaeological Resources Survey Report Redlands Commons Project Assessor's Parcel Nos. 0167-091-02, -04, -04, and -08 City of Redlands, San Bernardino County, California.



View south of flume showing brick-and-mortar weir (flow control structure)

Appendix C2 Cultural Resources Assessment Peer Review Letter

HERITAGE SPECIFIC PLAN
INITIAL STUDY



July 19, 2019

Emily Elliott, Project Manager

MICHAEL BAKER INTERNATIONAL
3536 Concours, Suite 100

Ontario, CA 91764

RE: PEER REVIEW OF "CULTURAL RESOURCES ASSESSMENT: GRIFFIN REDLANDS PROJECT, CITY OF REDLANDS, SAN BERNARDINO COUNTY, CALIFORNIA"

Dear Ms. Elliott:

Michael Baker International (Michael Baker) has reviewed LSA's *Cultural Resources Assessment: Griffin Redlands Project, City of Redlands, San Bernardino County, California* report dated October 2018 (see **Attachment 1**). The intent of the peer review is to determine if the report is compliant with the California Environmental Quality Act (CEQA) and if all cultural resources identification efforts have been completed.

Michael Baker has determined the report is adequate for purposes of CEQA and is a legally defensible document. The report summarizes the methods and results of cultural resources identification efforts, including a records search at the South Central Coastal Information Center, historical aerial research, geoarchaeological sensitivity assessment, and an intensive level archaeological field survey to examine the soils for cultural resources.

One historic-period water conveyance feature (P36-012468/CA-SBR-12260H) had been previously evaluated and recommended ineligible for listing in the California Register of Historical Resources and National Register of Historic Places because the irrigation system is a minor, fragmented, and ubiquitous irrigation feature, and therefore does not demonstrate historic significance. LSA agreed with the finding and the resource was not reevaluated.

No historical resources were identified within the project area, and the project area was determined to have low archaeological sensitivity. LSA recommended standard late discovery mitigation measures for archaeological resources.

Recommendations

No recommendations are required. The report is a legally defensible document for the purposes of CEQA.

Preparer's Qualifications

Michael Baker Cultural Resources Manager Margo Nayyar is a senior architectural historian with nine years of cultural management experience in California. Her experience includes built environment surveys, evaluation of historic-era resources using guidelines outlined in the

CITY OF FORT BRAGG, COMMUNITY DEVELOPMENT DEPARTMENT

RE: Peer Review of "Cultural Resources Assessment: Griffin Redlands Project, City of Redlands, San Bernardino County, California"

Page 2

National Register and the California Register, and preparation of cultural resources technical studies pursuant to CEQA and Section 106 of the National Historic Preservation Act, including identification studies, finding of effect documents, memorandum of agreements, programmatic agreements, and Historic American Buildings Survey, Historic American Engineering Record, and Historic American Landscapes Survey mitigation documentation. She prepares cultural resources environmental document sections for CEQA environmental documents including infill checklists, initial studies, and environmental impact reports, as well as National Environmental Policy Act environmental documents, such as environmental impact statements and environmental assessments. She also specializes in municipal preservation planning, historic preservation ordinance updates, Native American consultation, and provision of Certified Local Government training to interested local governments. She develops Survey 123 and ESRI Collector applications for large-scale historic resources surveys. Ms. Nayyar has a master of arts degree in public history from California State University, Sacramento, and a bachelor of arts degree in history from University of California, Santa Cruz. She meets the Secretary of the Interior's Professional Qualification Standards for history and architectural history.

Sincerely,

Margo Nayyun Margo Nayyar, M.A.

Cultural Resources Manager

Attachment 1

Cultural Resources Assessment: Griffin Redlands Project, City of Redlands, San Bernardino County, California

CULTURAL RESOURCES ASSESSMENT

GRIFFIN REDLANDS PROJECT CITY OF REDLANDS SAN BERNARDINO COUNTY, CALIFORNIA



CULTURAL RESOURCES ASSESSMENT

GRIFFIN REDLANDS PROJECT CITY OF REDLANDS SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

Mr. Jed Solomon Griffin Residential 110 North Lincoln Avenue, Suite 100 Corona, California 92882

Prepared by:

Riordan Goodwin LSA Associates, Inc. 1500 Iowa Avenue, Suite 200 Riverside, California 92507 (951) 781-9310

LSA Project No. GFC1804

National Archaeological Data Base Information:

Type of Study: Records Search, Survey, Archaeological Assessment USGS Quadrangle: Redlands, California
Acreage: 37.9



MANAGEMENT SUMMARY

LSA was retained by Griffin Residential to conduct a cultural resources assessment for the proposed Griffin Redlands Project in the City of Redlands, San Bernardino County, California. The City required this study as part of the environmental review process to comply with the California Environmental Quality Act (CEQA).

A cultural resources records search, additional research, and a field survey were conducted for the project area. A previously documented historic period cultural resource was identified within the project area that was previously evaluated as not a "historical resource" as defined by CEQA. The resources adjacent to the project area are a cobblestone curb and unremarkable remnants of local agriculture. No prehistoric or historic-period resources related to Native American cultural heritage are documented within a mile. Considering these factors, the project parcels have little or no potential for subsurface resources. Therefore, the findings and recommendations of the previous cultural resources assessment are carried forward: no impact to cultural resources and no further cultural resources investigation or archaeological monitoring is necessary.

In the event buried cultural materials are encountered during earthmoving operations associated with the project, all work in that area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

In the event human remains are encountered, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be Native American, the County Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC. The MLD will have the opportunity to offer recommendations for the disposition of the remains.

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INTRODUCTION

LSA was retained by Griffin Residential to conduct a cultural resources assessment for the proposed Griffin Redlands Project in the City of Redlands, San Bernardino County, California. This assessment was completed pursuant to the California Environmental Quality Act (CEQA), Public Resources Code Chapter 2.6, Section 21083.2, and California Code of Regulations Title 14, Chapter 3, Article 5, Section 15064.5. The research and field survey were conducted to determine whether the proposed project could adversely affect any resources considered historical resources per CEQA.

The project is bounded by commercial development to the north, vacant land to the south and west, and suburban development and vacant land to east. The project is depicted on the United States Geological Survey (USGS) *Redlands, California* topographic quadrangle map in Section 16 of Township 1 North, Range 4 West, San Bernardino Baseline and Meridian (USGS 1988; Figure 1). The project area is approximately 38 acres (Assessor's Parcel Numbers 0167-091-02, 0167-091-08, 0167-091-04, and 0167-091-05), which were previously cultivated in citrus. The proposed project is residential development comprising 214 single-family detached homes with associated recreational amenities.

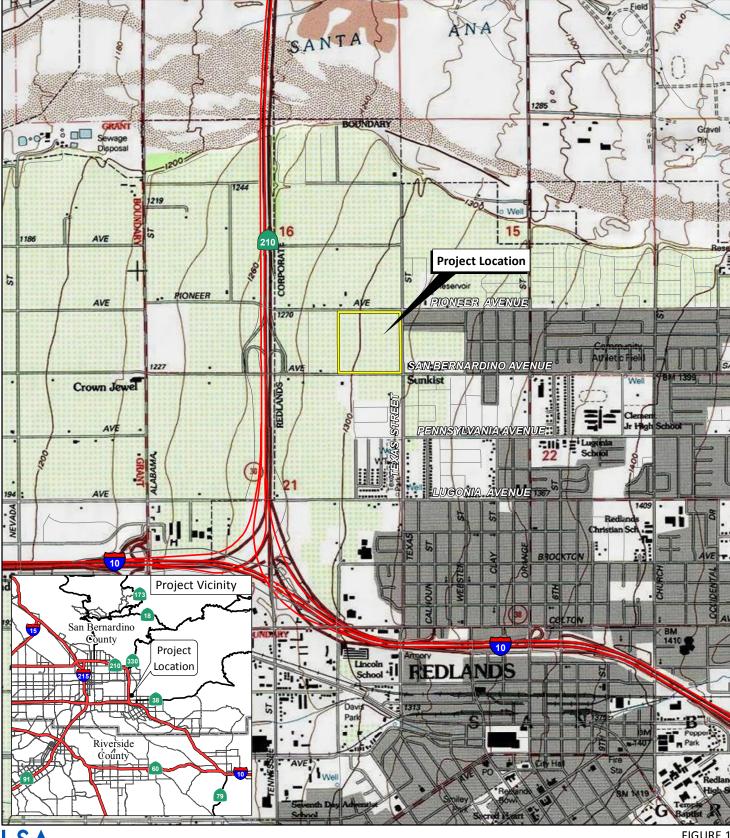




FIGURE 1

Griffin Redlands Project Regional and Project Location

SETTING

NATURAL SETTING

The natural setting of the project vicinity is presented based on the underlying theoretical assumption that humans and human societies are in continual interaction with the physical environment. Being an integral and major part of the ecological system, humans adapt to the environment through technological and behavioral changes. Locations of archaeological sites are based on the constraints of these adaptations, whether it is proximity to a particular resource, topographical restrictions, or shelter and protection. Sites will also contain an assemblage of artifacts and ecofacts consistent with the particular interaction.

Hydrology

The project region is characterized by a temperate climate, with dry, hot summers and moderate winters. Rainfall ranges from 12 to 16 inches annually (Beck and Haase 1974). Precipitation usually occurs in the form of winter rain, with warm monsoonal showers in summer. An ephemeral drainage bounds the western edge of the project parcel and the nearest natural reliable source of water is Lytle Creek, which drains south-southeast approximately 3 miles east of the project.

Biology

At an average elevation of approximately 1,220 feet above mean sea level (amsl), the project is within the Lower Sonoran Life Zone of California (Schoenherr 1992), which ranges from below sea level to 3,500 feet amsl. Although the natural vegetation has been largely removed from the project by past cultivation and weed abatement disking, pioneer species such as hare oat, mustard, Russian thistle, telegraph weed, and xeric grasses were noted on the property. Extensive fauna are known locally, including many endemic species of reptiles, birds, and insects.

Geology

The project area is located at the northern end of the Peninsular Ranges Geomorphic Province that extends from the Transverse Ranges to the tip of Baja California and includes the Los Angeles Basin (California Geological Survey 2002; Norris and Webb 1976). This region is characterized by a series of mountain ranges separated by northwest-trending valleys subparallel to faults branching from the San Andreas Fault. The geology of this province is similar to that of the Sierra Nevada, with numerous rock outcroppings useful to the Native Americans for resource milling, shelter and ceremonial art.

CULTURAL SETTING

Prehistory

Chronologies of prehistoric cultural change in Southern California have been attempted numerous times, and several are reviewed in Moratto (1984). No single description is universally accepted as the various chronologies are based primarily on material developments identified by researchers familiar with sites in a particular region and variation exists essentially due to the differences in

those items found at the sites. Small differences occur over time and space, which combine to form patterns that are variously interpreted.

Currently, two primary regional culture chronology syntheses are commonly referenced in the archaeological literature. The first, Wallace (1955), describes four cultural horizons or time periods: Horizon I – Early Man (9000–6000 BC), Horizon II – Milling Stone Assemblages (6000–3000 BC), Horizon III – Intermediate Cultures (3000 BC–AD 500), and Horizon IV – Late Prehistoric Cultures (AD 500–historic contact). This chronology was refined (Wallace 1978) using absolute chronological dates obtained after 1955.

The second cultural chronology (Warren 1968) is based broadly on Southern California prehistoric cultures and was also revised (Warren 1984; Warren and Crabtree 1986). Warren's (1984) chronology includes five periods in prehistory: Lake Mojave (7000–5000 BC), Pinto (5000–2000 BC), Gypsum (2000 BC–AD 500), Saratoga Springs (AD 500–1200), and Protohistoric (AD 1200–historic contact). Changes in settlement pattern and subsistence focus are viewed as cultural adaptations to a changing environment, which begins with gradual environmental warming in the late Pleistocene, continues with the desiccation of the desert lakes, followed by a brief return to pluvial conditions, and concludes with a general warming and drying trend, with periodic reversals that continue to the present (Warren and Crabtree 1986).

After AD 500, there was an influx of Native American groups from the eastern deserts into southern California. These groups brought changes in subsistence focus and associated technologies, as well as burial practices. These cultural changes along with the group migrations are known as the Shoshonean Intrusion or Shoshonean Wedge (Kroeber 1925; Koerper 1979) and the Takic Wedge (Bergin and Ferraro 1999). The term Takic Wedge refers to the wedge of Takic culture groups that moved to the coast, displacing tribes of the Hokan and Yuman language stocks to the north and south (Shipley 1978). The ethnographically recorded Luiseño, Juaneño, and Gabrielino are thought to be the descendants of prehistoric Takic populations that settled along the coast during the Late Prehistoric Period, or perhaps even earlier. The Serrano and Cahuilla, more distant from the coast, are also Takic-speaking tribes within this wedge.

Ethnography

The project is located near the intersection of the traditional cultural territories of the Cahuilla and the Serrano (Bean 1978; Bean and Smith 1978; Kroeber 1925). Tribal territories were somewhat fluid and changed over time. Like other Native American groups in Southern California, they were semi-nomadic hunter-gatherers who subsisted by exploitation of seasonably available plant and animal resources. The first written accounts of Native American groups in Southern California were by Spanish missionaries in the late 18th century. Later documentation of the Serrano was by Benedict (1924), Bright (1975), Strong (1929), and many others. The Cahuilla were studied by Barrows (1900), Kroeber (1908), Hooper (1920), and others.

Cahuilla

The territory of the Cahuilla ranged from the San Bernardino Mountains south to Borrego Springs and the Chocolate Mountains, from Orocopia Mountain to the east, to the San Jacinto Plain and Palomar Mountain to the west (Bean 1978). Cahuilla territory lies within the geographic center of

Southern California and encompassed diverse environments ranging from inland river valleys and foothills to mountains and desert (Bean and Shipek 1978).

Cahuilla villages, generally located near water sources within canyons or near alluvial fans, comprised groups of related individuals, generally from a single lineage, and the territory around the village was owned by the villagers (Bean 1978). Like other Native American groups in Southern California, the Cahuilla were semi-nomadic peoples leaving their villages and utilizing temporary campsites to exploit seasonably available plant and animal resources (James 1960).

Cahuilla subsistence was based primarily on acorns, honey mesquite, screw beans, piñon nuts, and cactus fruit, supplemented by a variety of wild fruits and berries, tubers, roots, and greens (Kroeber 1925; Heizer and Elsasser 1980). Hunting deer, rabbit, antelope, bighorn sheep, reptiles, small rodents, quail, doves, ducks, and reptiles by means of bows, throwing sticks, traps, and communal drives is documented (James 1960).

Serrano

The Serrano lived in the area generally north of Cahuilla territory (western Riverside County), occupying much of present-day San Bernardino County and northeastern Los Angeles County, but there is some overlap in the perceived ancestral areas. The term Serrano is Spanish for "mountaineer" or "highlander" and was given to people who inhabited the areas of the San Bernardino Mountains that had no associated mission.

The Serrano, like the Cahuilla, were hunter-gatherers who relied on the women to do much of the collecting while the men hunted and captured various animals. Although they exploited whatever flora was available in the area they happened to be, generally they collected acorns, pinion nuts, honey, mesquite, yucca, and cactus fruits, in addition to various seeds, bulbs, and roots. Plants were consumed both raw and cooked. Food processing involved the use of manos, metates, mortars, and pestles. Antelope, deer, mountain sheep, rabbits, and rodents were killed and captured, and the most common hunting implements were the bow and arrow, throwing stick, traps, snares, and deadfalls. Meat was prepared in earth ovens, by boiling in watertight baskets, or by parching (Bean and Smith 1978).

Most of the Serrano lived in small villages near reliable sources of water (springs, perennial seeps, streams, and small lakes) (Benedict 1924). They lived in tule-covered, dome-shaped structures and had ceremonial houses and sweat houses for their religious activities. The basic settlement unit was a village with a number of small satellite resource-gathering camps. The project area is in the vicinity of the ethnohistorically known village of *Kaawchama* (or *Wa'aachnga*), which developed around the San Bernardino Asistencia (see below; McCawley 1996).

The Serrano had a patrilineal society composed of clans and families linked by both ancestry and ceremony. Three clans divided this group: the Mohineyam, the Yuhevatam, and the Maringayam. The Serrano were also divided by moieties: the Wildcats and the Coyotes.

With the Spanish intrusion came a drastic change in lifestyle for the natives of Southern California. Incorporation of the indigenous populations into the mission system led to the disruption of native

cultures and changes in subsistence and land use practices. Mission San Gabriel, established in 1771, probably had a limited effect on the Serrano population until the San Bernardino Asistencia (and the the Mill Creek Zanja that served it) were established in what would become Redlands around 1820 (Harley 1988). Within a short time, the missions controlled many ranchos where Indians lived and worked.

History

In California, the historic era is generally divided into three periods: the Spanish Period (1769–1821), the Mexican Period (1821–1848), and the American Period (1848–present). As the resource identified within the project area most likely dates to the 20th century, this historic context is limited to a summary addressing San Bernardino County and the City of Redlands.

San Bernardino County

In 1820, an asistencia of the Mission San Gabriel was established at the Native American village of *Kaawchama* (Hispanicized to *Guachama*) in the area that would become the western portion of Redlands (McCawley 1996). The 35,500-acre Rancho San Bernardino (which includes the project area) was granted to Antonio Maria Lugo in 1842 (Richards 1966). San Bernardino County was created in 1853 from portions of Los Angeles and San Diego Counties due to mineral wealth and the City of San Bernardino was incorporated as the County Seat the following year. Agriculture ultimately replaced mining as the county's economic base, with thousands of acres under cultivation by the beginning of World War I (McGroarty 1914).

Redlands

After the Mormons left the San Bernardino Valley in the late 1850s, prominent individuals such as Ben Barton and Anson Van Leuven established ranches along what would become Barton Road. By the end of the decade, the area around the mouth of the Santa Ana Canyon was acquired by the Crafts family and would later become known as Crafton. The community that subsequently developed in the area between Crafton and the Old San Bernardino Mission district became known as Lugonia (after the Lugo family, original owners of Rancho San Bernardino). By the early 1880s, two Lugonia entrepreneurs, E.G. Judson and F.E. Brown, formed the Redlands Water Company and began buying up land and constructing reservoirs and canals to provide water to their acquisitions. Judson and Brown platted the town of Redlands (named for the color of the soil) in 1887 (Gudde 1998). The town was incorporated the following year, fourth in the County of San Bernardino. Redlands prospered during the regional citrus boom, but from its founding it also developed with the substantial contributions of "gentlemen ranchers," prosperous industrialists from the East Coast and the Midwest who established winter homes in the community.

METHODS

RECORDS SEARCH

On October 3, 2018, the cultural resources records search was conducted for the project area by Archaeological Technician Allegria Garcia at the South Central Coastal Information Center (SCCIC) located at California State University, Fullerton. It included a review of all recorded historic and prehistoric archaeological sites within one mile of the project, as well as a review of known cultural resource survey and excavation reports. In addition, the California State Historic Property Data File (HPD), which includes the National Register of Historic Places (National Register), California Historical Landmarks (CHL), and California Points of Historical Interest (CPHI), was searched.

ADDITIONAL RESEARCH

In June and July 2018, LSA Archaeologist Riordan Goodwin conducted additional research, including review of historic period aerial photographs and maps.

ARCHAEOLOGICAL FIELD SURVEY

On September 29, 2018, LSA Archaeologist Riordan Goodwin and Archaeological Technician Melissa Jenkins completed an intensive pedestrian survey of the project parcel. The property was surveyed in systematic parallel transects spaced by approximately 10 meters (approximately 35 feet). Special attention was paid to areas of exposed soil for surface artifacts and features and rodent burrows for evidence of archaeosols. The purpose of this survey was to identify and document, prior to the beginning of ground-disturbing activities, any cultural resources and thus also to identify any area(s) that might be sensitive for buried cultural resources.

RESULTS

RECORDS SEARCH

Data from the SCCIC indicate there have been 33 cultural resource studies previously conducted within one mile of the proposed project, one of which specifically addressed the project area (Tang and Hogan 2006). One water conveyance (36-012468) was previously documented within the project area. Although no prehistoric resources were documented within the study area, an additional 78 resources have been recorded within one mile, including historic period foundations and refuse scatters, water conveyance features, orchards, landscaping, and a preponderance of built environment properties (Table A). One built environment resource has been evaluated as eligible for the National Register of Historic Places (National Register) and most others have been designated as historically significant by the City.

Table A: Resources Within One Mile of the Project Area with DPR Documentation

		Site Description	Status Code
36-006084		Historic period refuse scatters	
36-006095	_	Historic period refuse scatter	_
36-007765	_	Water conveyance features, refuse scatter	-
36-007766	_	Orange grove, water conveyance, driveway and foundation features	
36-007767	_	Driveway, retaining wall, and landscaping	
36-007768	_	Orange grove, foundation, water conveyance, and driveway features, landscaping	_
36-008135	_	Water conveyance system	_
36-008136	_	9949 Alabama Street; early 20 th century farm complex (house and reservoir)	_
36-012468*	_	Water conveyance (orchard irrigation) system	_
36-012531	_	1042 Pioneer Avenue; c. 1915 residence	_
36-012532	_	1074 Pioneer Avenue; c. 1915 residence	-
36-012852	_	Water conveyance system, refuse scatter	_
36-013514	_	1660 West San Bernardino Avenue; c. 1901 residence	_
36-013622	_	Cobble curb feature	_
36-013775	_	Water conveyance system	_
36-013783	_	Water conveyance system	_
36-016703	61805	833 Calhoun Street; c. 1910 residence	5\$2
36-016704	61804	907 Calhoun Street; c. 1910 residence	5S2
36-016705	61803	922 Calhoun Street; c. 1910 residence	5S2
36-016707	61807	731 Cedar Avenue; c. 1895 residence	3\$
36-016740	61746	837 Clay Street; c. 1895 residence	5S2
36-016741	61745	838 Clay Street; c. 1895 residence	5S2
36-016742	61744	904 Clay Street, c. 1900 residence	5S2

Table A: Resources Within One Mile of the Project Area with DPR Documentation

Primary #	OHP#	Site Description	Status Code
36-016743	61743	908 Clay Street, c. 1915 residence	5S2
36-016744	61742	911 Clay Street, c. 1925 residence	5S2
36-016745	61741	914 Clay Street, c. 1900 residence	5S2
36-016746	61740	917 Clay Street, c. 1915 residence	5S2
36-016747	61739	920 Clay Street, c. 1895 residence	5S2
36-016748	61738	924 Clay Street, c. 1925 residence	5S2
36-016749	61737	930 Clay Street, c. 1900 residence	5S2
36-016750	61736	936 Clay Street, c. 1915 residence	5S2
36-016751	61735	937 Clay Street, c. 1895 residence	5S2
36-016752	61756	910 Columbia Street ; c. 1910 residence	5S2
36-016753	61755	913 Columbia Street; c. 1905 residence	5S2
36-016754	61754	914 Columbia Street; c. 1905 residence	5S2
36-016755	61754	936 Columbia Street ; c. 1905 residence	5S2
36-017118	_	928 Orange Street; c. 1900 residence	5\$
36-017119	_	930 Orange Street; c. 1900 residence	5\$
36-017120	_	931 Orange Street; "prior to 1895" residence	5\$
36-017121	_	1001 Orange Street; c. 1895 residence	_
36-017122	_	1101 Orange Street; c. 1890 residence	5\$
36-017123	_	1157 Orange Street; c. 1890 residence	5\$
36-017124	_	1234 Orange Street; "early" residence	5S?
36-017413	61950	106 West Lugonia Avenue; c. 1895 residence	5S2
36-017414	61951	706 West Lugonia Avenue; c. 1895 residence	5S2
36-017503	62052	911 Washington Street, c. 1895 residence	5S2
36-017504	62051	917 Washington Street, c. 1895 residence	5S2
36-017505	62050	922 Washington Street, c. 1895 residence	5S2
36-017506	62049	923 Washington Street, c. 1895 residence	5S2
36-017507	62048	926 Washington Street, c. 1895 residence	5S2
36-017508	62047	927 Washington Street, c. 1895 residence	5S2
36-017509	62046	929 Washington Street, c. 1900 residence	5S2
36-017510	62045	937 Washington Street, c. 1900 residence	5S2
36-017511	62044	940 Washington Street, c. 1900 residence	5S2
36-017512	62043	1033 Washington Street, c. 1895 residence	5S2
36-017513	62042	1101 Washington Street, c. 1920 residence	5S2
36-017514	62041	1102 Washington Street, c. 1895 residence	5S2
36-017515	62040	1033 Washington Street, c. 1900 residence	5S2
36-017516	62039	1108 Washington Street, c. 1920 residence	5S2

Table A: Resources Within One Mile of the Project Area with DPR Documentation

Primary #	OHP#	Site Description	Status Code
36-017517	62038	1114 Washington Street, c. 1895 residence	5S2
36-017518	62037	1115 Washington Street, c. 1915 residence	5S2
36-017519	62036	1117 Washington Street, c. 1910 residence	5S2
36-017520	62035	1118 Washington Street, c. 1900 residence	5S2
36-017521	62034	1121 Washington Street, c. 1920 residence	5S2
36-017522	62033	1122 Washington Street, c. 1900 residence	5S2
36-017523	62032	1126 Washington Street, c. 1920 residence	5S2
36-017524	62031	1127 Washington Street, c. 1920 residence	5S2
36-017525	62030	1131 Washington Street, c. 1910 residence	5S2
36-017526	62029	1136 Washington Street, c. 1915 residence	5S2
36-017527	62028	1140 Washington Street, c. 1915 residence	5S2
36-017528	62027	1141 Washington Street, c. 1900 residence	5S2
36-017529	62026	1144 Washington Street, c. 1900 residence	5S2
36-017530	62025	1145 Washington Street, c. 1900 residence	5S2
36-017531	62024	1155 Washington Street, c. 1925 residence	5S2
36-017532	62023	1211 Washington Street, c. 1900 residence	5S2
36-017536	62126	Bridge over SR-30 (#54-341) c. 1916	7R
36-017537	62127	Bridge over SR-30 (#54-341) c. 1932	7R
36-020771	_	Residential complex c. 1943	6Z
36-031678	_	Historic period refuse scatter	_

^{*}Within project area

ADDITIONAL RESEARCH

Review of the Phase I ESA and historic period aerial photographs indicates that although there were never any buildings within the project area, the parcel was under cultivation with a citrus orchard prior to 1930 until at least 2017 (Converse Consultants 2017; HistoricAerials.com var.).

ARCHAEOLOGICAL FIELD SURVEY

Mr. Goodwin and Archaeological Technician Melissa Jenkins conducted the pedestrian survey of the entire project area. Visibility was good at approximately 80 percent with the surface partially obscured by vegetation and piles of chipped/mulched trees. The project parcel has been subjected to surface disturbance from decades of citriculture. Soils are silty alluvium.

Smudge pots and smudge pot elements, as well as trace, extremely fragmentary historic refuse (lacking any concentrations or apparent depth) was noted on the surface throughout the project parcel. The refuse is likely the result of the historic period practice of using kitchen garbage as a 'soil amendment' or fertilizer in orchards. The eastern portion of a cobble masonry curb (36-013622 was noted in the Texas Street right-of-way on the southern edge of the project and appeared to be in

good condition. With the exception of the above and the previously documented historic period water conveyance system (see below), no cultural resources were identified within or on the periphery of the project area.

Site 36-012468

This water conveyance (citrus irrigation) system documented by CRM Tech in the mid-2000s is a somewhat unusual combination of rock-and-mortar flumes, brick flow control weirs and concrete distribution standpipes (Tang and Hogan 2006). Rock-and-mortar flumes are generally associated with late-19th to early 20th century agriculture, and the combination of materials and technology (field stone, some quarried stone, cement-surfaced brick-and-mortar, and pre-cast concrete pipes) suggests a 1900s to 1910s flume irrigation system that may have been later enhanced with or superseded by a concrete standpipe system supplied by underground pipelines. There are indications of repair and resurfacing of the flumes. It has been severely damaged by orchard-removal activities with most of the standpipes displaced or destroyed; one of the flumes has been destroyed and the other three are disrupted to varying degrees.

DISCUSSION

The water conveyance system within the project area was previously evaluated by CRM Tech as "not eligible for the California Register of Historical Resources (California Register) or local designation under the City Ordnance, and does not constitute a 'historical resource' as defined by CEQA" (Tang and Hogan 2006). The resources adjacent to the project are a cobblestone curb and unremarkable remnants of local agriculture (a citrus orchard, associated residential foundation, water conveyance, wall, and driveway features) and there are no prehistoric or known Native American heritage-related resources documented within a mile of the project area. Therefore, sensitivity for undocumented subsurface cultural resources is low.

RECOMMENDATIONS

A cultural resources records search, additional research, and a field survey were conducted for the project area. A previously documented historic period cultural resource was identified within the project area that was previously evaluated as not a "historical resource" as defined by CEQA. The resources adjacent to the project area are a cobblestone curb and unremarkable remnants of local agriculture, and no prehistoric or historic-period resources related to Native American cultural heritage are documented within a mile. Considering these factors, the project parcels have little or no potential for subsurface resources. Therefore, the findings and recommendations of the previous cultural resources assessment are carried forward: no impact to cultural resources and no further cultural resources investigation or archaeological monitoring is necessary.

In the event that archaeological materials are encountered during construction, all construction work should be halted and a qualified archaeologist consulted to determine the appropriate treatment of the discovery (California Code of Regulations, Title 14, Chapter 3, Section 15064.5(f)).

In the event human remains are encountered, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be Native American, the County Coroner will notify the NAHC, which will determine and notify an MLD. With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC. The MLD will have the opportunity to offer recommendations for the disposition of the remains.

REFERENCES

Barrows, David Prescott

1900 *The Ethno-botany of the Coahilla* [sic] *Indians of Southern California*. Chicago: University of Chicago Press.

Bean, Lowell John

1978 Cahuilla. In *California*, edited by R. F. Heizer, pp. 575–587. *Handbook of North American Indians*, vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Bean, Lowell John, and Charles R. Smith

1978 Serrano. In *California*, edited by R.F. Heizer, pp. 570–574. *Handbook of North American Indians*, vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Bean, Lowell John, and Florence C. Shipek

1978 Luiseño. In *California*, edited by R.F. Heizer, pp. 550–563. *Handbook of North American Indians*, vol. 8, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Beck, Warren A., and Ynez D. Haase

1974 Historical Atlas of California. Norman, Oklahoma: University of Oklahoma Press.

Benedict, Ruth F.

1924 A Brief Sketch of Serrano Culture. American Anthropologist 26 (3).

Bergin, Kathleen Ann, and David D. Ferraro

Historic Properties Treatment Plan: Geotechnical Investigations of the CP Alignment of the Foothill Transportation Corridor—South, Orange and San Diego Counties, California. LSA Associates, Inc. Ms. on file, LSA Associates, Inc., 20 Executive Park, Suite 200, Irvine, California, 92614; Southwest Division, Naval Facilities Engineering Command, 1220 Pacific Highway, San Diego, California; and AC/S Environmental Security Office, MCB Camp Pendleton, California.

Bright, William

1975 Two Notes on Takic Classification: Paper read at the Third Annual Uto-Aztecan Conference, Flagstaff, June 19–20, 1975. (Copy, Manuscript No. 76–66 in National Anthropological Archives, Smithsonian Institution, Washington.)

California Geological Survey

2002 *California Geomorphic Provinces.* California Geologic Survey Note 36. California Department of Conservation.

Converse Consultants

2017 Phase I Environmental Site Assessment Report Citrus Valley Redlands—37.9 Acres Assessor Parcel Numbers (APN) 0167-091-02,0167-091-04, 0167-091-05, 0167-091-08

Redlands, California Converse Project No. 17-16-178-01. Prepared By: Converse Consultants.

Gudde, Erwin G.

1998 California Place Names: The Origin and Etymology of Current Geographical Names. Fourth edition, revised and enlarged by William Bright. Berkeley and Los Angeles: University of California Press.

Harley, R. Bruce

1988 Rev. Juan Caballeria: Historian or Storyteller? Rethinking the 1810 Dumetz Expedition. *San Bernardino County Museum Quarterly* 35(2), 42p.

Heizer, Robert F., and Albert B. Elsasser

1980 *The Natural World of the California Indians*. University of California Press, Berkeley and Los Angeles.

HistoricAerials.com

Var. 1938 and 2012 Aerial photographs of project area.

Hooper, Lucile

The Cahuilla Indians. University of California Publication in *American Archaeology and Ethnology*. Vol. 16, No. 6. Reprinted by Malki Museum Press. Banning, California.

James, Harry C.

1960 *The Cahuilla Indians.* Los Angeles: Westernlore Press. Reprinted in 1969 and 1985 by Malki Museum Press. Banning, California.

Koerper, Henry C.

On the Question of the Chronological Placement of Shoshonean Presence in Orange County, California. *Pacific Coast Archaeological Society Quarterly* 15(3):69-84.

Kroeber, Alfred L.

- 1908 Ethnography of the Cahuilla Indians. University of California Publications in American Archaeology and Ethnology. Vol. 8. No. 2. Reprinted by Malki Museum Press, Banning, California.
- 1925 *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin No. 78 Washington D.C.: Smithsonian Institute. Reprinted in 1976, New York: Dover Publications.

McCawley, William

1996 *The First Angelinos: The Gabrielino Indians of Los Angeles.* Banning and Novato: Malki Museum Press and Ballena Press.

McGroarty, John Steve

1914 Southern California. Southern California Panama Exposition Commission.

Moratto, Michael J.

1984 California Archaeology. San Diego: Academic Press.

Norris, R.M., and R.W. Webb

1976 Geology of California. New York: John Wiley and Sons, Inc. 379 pp.

Richards, Elizabeth W.

1966 Guideposts to History: Concerning Origins of Place and Street Names in San Bernardino County. Santa Fe Federal Savings.

Schoenherr, Allan A.

1992 A Natural History of California. University of California Press, Berkeley and Los Angeles.

Shipley, William F.

Native Languages of California. In R. Heizer ed., *Handbook of North American Indians*, vol. 8, California, pp. 80–90. Smithsonian Institution, Washington D.C.

Strong, William D.

Aboriginal Society in Southern California. *University of California Publications in American Archaeology and Ethnology* 26(1): 1–358. Berkeley.

Tang, Bai, and Michael Hogan

2006 Historical/Archaeological Resources Survey Report Redlands Commons Project Assessor's Parcel Nos. 0167-091-02, -04, -04, and -08 City of Redlands, San Bernardino County, California. Unpublished report on file at SCCIC.

United States Geological Survey Topographic Maps

1988 *Redlands, California* 7.5 minute topographic quadrangle.

Wallace, William J.

- 1955 A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11(3):214-230.
- 1978 Post-Pleistocene Archaeology. In California, edited by R. Heizer, pp. 550–563. *Handbook of North American Indians*, Vol. 8. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Warren, Claude N.

- 1968 Cultural Tradition and Ecological Adaptation on the Southern California Coast. Eastern New Mexico University Contributions in Anthropology 1(3). Portales.
- The Desert Region. In *California Archaeology*, by M. Moratto with contributions by D.A. Fredrickson, C. Raven, and C. N. Warren, pp. 339–430. Academic Press, Orlando, Florida.

Warren, Claude N., and Robert H. Crabtree

1986 Prehistory of the Southwestern Area. *In* W.L. D'Azevedo ed., *Handbook of the North American Indians*, Vol. 11, *Great Basin*, pp. 183–193. Washington D.C.: Smithsonian Institution.

APPENDIX A DEPARTMENT OF PARKS AND RECREATION (DPR) 523 FORMS

State of California C The Resources Agency

DEPARTMENT OF PARKS AND RECREATION

CONTINUATION SHEET

Primary #	36-012468
HRI#	
Trinomial	

Page	1	of	1	*Resource Name	e or #: (A	Assigned by recorder)	N/A			
*Record	ded by	M	lelissa J	Jenkins and Rory Goodwin	*Date:	9/29/2018		Continuation	Χ	Update

This water conveyance (citrus irrigation) system documented by CRM Tech in the mid-2000s is a somewhat unusual combination of rock-and-mortar flumes, brick flow control weirs and concrete distribution standpipes (Tang and Hogan 2006). Rock-and-mortar flumes are generally associated with late-19th to early 20th century agriculture, and the combination of materials and technology (field stone, some quarried stone, cement-surfaced brick-and-mortar, and precast concrete pipes) suggests a 1900s to 1910s flume irrigation system that may have been later enhanced with, or superseded by a concrete standpipe system supplied by underground pipelines, and there are indications of repair and resurfacing of the flumes. It has been severely damaged by orchard-removal activities with most of the standpipes displaced or destroyed, one of the flumes destroyed and the other three disrupted to varying degrees. The irrigation system will be completely removed by the current project.

Reference

Tang, Bai, and Michael Hogan

2006 Historical/Archaeological Resources Survey Report Redlands Commons Project Assessor's Parcel Nos. 0167-091-02, -04, -04, and -08 City of Redlands, San Bernardino County, California.



View south of flume showing brick-and-mortar weir (flow control structure)

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State of California--The Resources Agency DEPARTMENT OF PARKS AND RECREATION

36-012468 Primary # Trinomial CA-SBR-12260H

ARCHAEOLOGICAL SITE RECORD

-	-			
Page	4	of	4	

Page_2	*Resource Name or # (Assigned by recorder) CRM TECH 1872-1H
A1.	Dimensions: a. Length 1,230 feet (N-S) b. Width 990 feet (E-W)
	Method of Measurement: Paced Taped Visual estimate Other: Measured from map
	Method of Determination (Check any that apply.):Artifacts _ √ FeaturesSoilVegetation
	Topography Cut bank Animal burrow Excavation Property boundary Other (Explain):
	Reliability of Determination: High √ Medium Low Explain:
	Limitations (Check any that apply): Restricted access Paved/built over Site limits incompletely defined
	Disturbances √ Vegetation Other (Explain):
A2.	Depth: None √ Unknown Method of Determination:
*A3.	Human Remains:Present √ AbsentPossibleUnknown (Explain):
*A4.	Features: (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each
	feature on sketch map.) The main features at the site are four north-south trending
	rock-and-concrete flumes with associated weir boxes.
*A5.	Cultural Constituents: (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with
	features.) Citrus trees and scattered smudge pots are found throughout the site
	area.
***	Were Specimens Collected? √ No Yes (If yes, attach Artifact Record or catalog and identify where
*A6.	The state of the s
* 4 7	specimens are curated.)
*A7.	Site Condition:Good _√ FairPoor (Describe disturbances.):
*A8.	- 1940 M.
*A9.	approximately 1 mile north of the site. Elevation: Ca. 1,300 feet above mean sea level
A10.	Environmental Setting: (Describe vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.): The
AIU.	site is located in a semi-rural setting, on relatively level land that has
	been under cultivation as citrus groves for more than 100 years.
	been under curtivation as citius groves for more than 100 years.
A11.	Historical Information: Gravity-flow irrigation was the standard practice in citrus
	cultivation in southern California throughout the historic period and well
	into modern times, supplanted by the mini-sprinkler drip system only in the
	1970s. None of the irrigation features found at this site bears any
	distinctive characteristics associated with a particular time period.
	Coupled with the usual lack of specific documentation in historical sources,
	the precise age of this irrigation system is difficult to ascertain.
*A12.	Age:PrehistoricProtohistoric1542-17691769-18481848-1880 _ √ _1880-1914 _ √ _1914-1945
	Post 1945Undetermined Describe position in regional prehistoric chronology or factual historic dates if
	known:
A13.	Interpretations: (Discuss scientific, interpretive, ethnic, and other values of site, if known) The site
A10.	represents a localized irrigation system built for the surrounding groves.
	In the citrus-growing areas of southern California, such minor, fragmented
	elements of the historic infrastructure are virtually ubiquitous, and these
	specimens do not demonstrate any particular potential for important
	archaeological data for the study of local history.
A14.	Remarks: The site does not appear eligible for listing in the National
	Register or the California Register.
A15.	References: (Documents, informants, maps, and other references.):
A16.	Photographs: (List subjects, direction of view, and accession numbers or attach a Photograph Record.):
	Original Media/Negatives Kept at: CRM TECH, 4472 Orange Street, Riverside, CA 92501
*A17.	Form Prepared by: Adrián Sánchez Moreno Date: June 30, 2006
	Affiliation and Address: CRM TECH, 4472 Orange Street, Riverside, CA 92501

Primary # 36-012468

HRI#

Trinomial CA-SBR-12260H

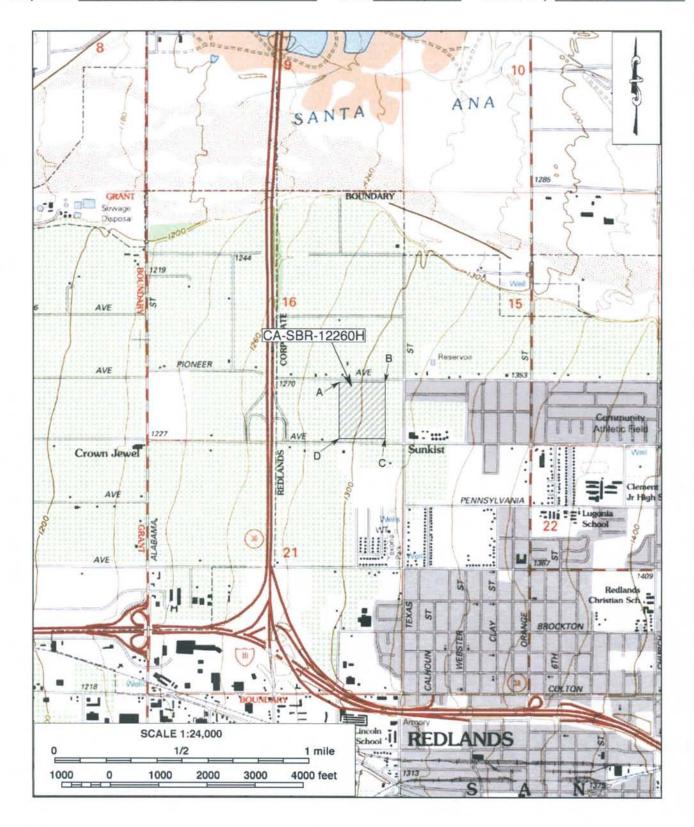
Page 3 of 4

*Resource Name or # (Assigned by recorder) CRM TECH 1872-1H

*Map Name: Redlands, Calif

*Scale: 1:24,000

*Date of Map: 1967/1996



State of California--The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 36-012468

HRI#_

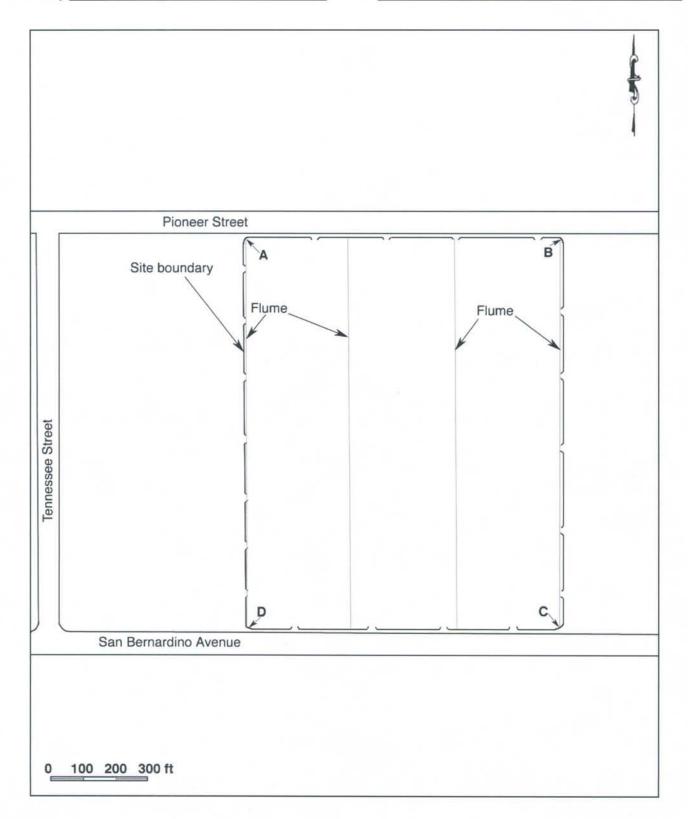
Trinomial CA-SBR-12260H

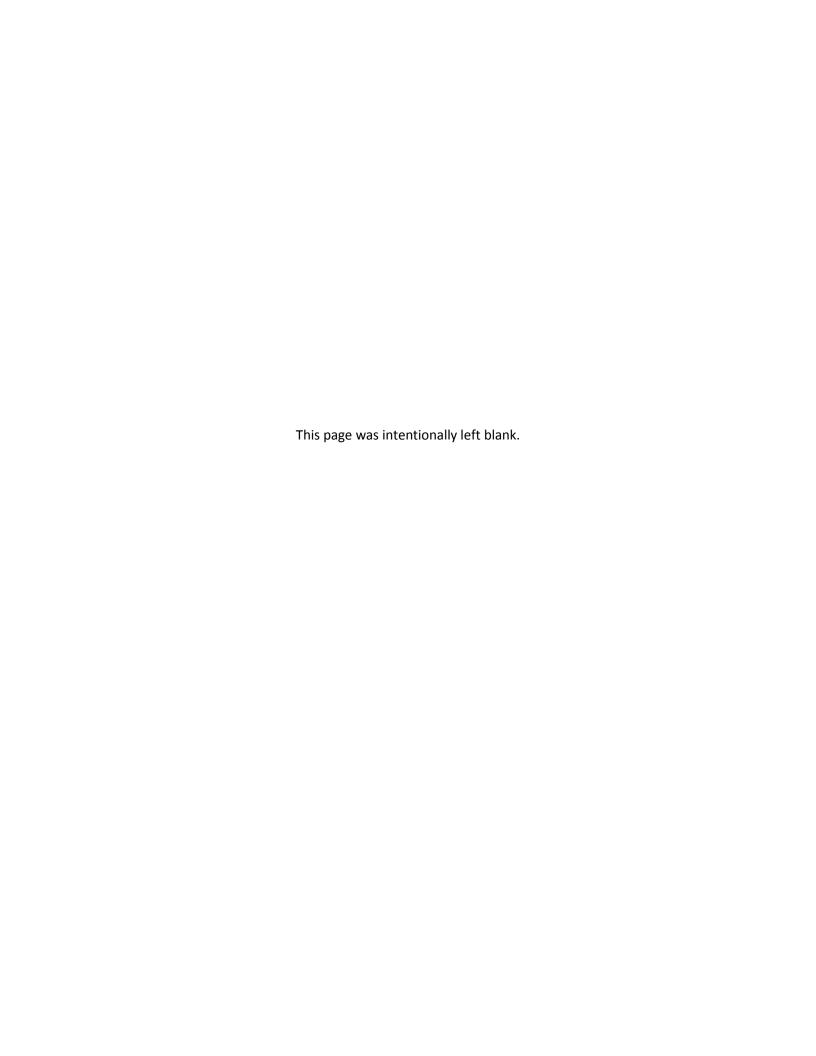
Page 4 of 4

*Resource Name or # (Assigned by recorder) CRM TECH 1872-1H

*Drawn by: Laurie Taylor

*Date: June 26, 2006





Appendix D1 Geotechnical Evaluation

HERITAGE SPECIFIC PLAN
INITIAL STUDY

UPDATED GEOTECHNICAL AND INFILTRATION EVALUATION FOR

PROPOSED RESIDENTIAL DEVELOPMENT CITRUS VALLEY PROJECT NORTH OF SAN BERNARDINO AVENUE AND WEST OF TEXAS STREET CITY OF REDLANDS, SAN BERNARDINO COUNTY, CALIFORNIA

PREPARED FOR

RSI COMMUNITIES
620 NEWPORT CENTER DRIVE, 12TH FLOOR
NEWPORT BEACH, CALIFORNIA 92660

PREPARED BY

GEOTEK, INC. 1548 NORTH MAPLE STREET CORONA, CALIFORNIA 92880





October 24, 2017 Project No. 1776-CR

RSI Communities

620 Newport Center Drive, 12th Floor Newport Beach, California 92660

Attention:

Mr. Jim Holas

Subject:

Updated Geotechnical and Infiltration Evaluation

Proposed Residential Development

North of San Bernardino Avenue and West of Texas Street

City of Redlands, San Bernardino County, California

Dear Mr. Holas:

We are pleased to provide the results of our updated geotechnical and infiltration evaluation for the subject site located in the city of Redlands, County of San Bernardino, California. This report presents a discussion of our evaluation and provides preliminary geotechnical recommendations for earthwork, foundation design, and construction. In our opinion, the site development appears feasible from a geotechnical viewpoint provided that the recommendations presented in this report are incorporated into the design and construction.

GeoTek, Inc. (GeoTek) has reviewed the referenced report by Leighton and Associates, Inc, (L&A, 2006). GeoTek has reviewed the boring logs and results of the laboratory testing in the referenced report and now assumes responsibility as geotechnical consultant of record henceforth for the subject project.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted, **GeoTek**, **Inc.**

Jaly Bogdan

Edward H. LaMont CEG 1892, Exp. 7/31/18 Principal Geologist Gaby M. Bogdanoff CE 66619, Exp. 06/30/18 Project Engineer

Distribution: (1) Addressee via email (one PDF file)

G:\Projects\1751 to 1800\1776CR RSI Communities Citrus Valley Redlands\Geo Investigation\1776-CR Updated Geotechnical Evaluation Citrus Valley Project Redlands.doc

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I. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the geotechnical conditions in the area of proposed construction. Services provided for this study included the following:

- Research and review of available geologic data and general information pertinent to the site,
- Site exploration consisting of the excavation, logging, and sampling of 12 exploratory trenches,
- Evaluation of water infiltration potential by performing four infiltration tests,
- Laboratory testing of soil samples obtained during the field investigation,
- Review and evaluation of site seismicity, and
- Compilation of this geotechnical report which presents our findings, conclusions, and recommendations for the proposed development.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The square-shaped project site consists of approximately 37.3 acres and is located north of West San Bernardino Avenue, south of West Pioneer Avenue, west of Texas Street, and approximately 1/3-mile east of the 210 Freeway in the city of Redlands, San Bernardino County, California. Based on our recent site reconnaissance, the site is occupied by a citrus grove which has mostly been abandoned. The property is relatively planar with a topographic relief of 25 feet to the west-northwest. Surface drainage is directed to the west and northwest. Surrounding properties include vacant land to the west, West Pioneer Avenue followed by a school site to the north, and scattered residential and agricultural properties to the east and south.

The general location of the site is shown on Figure 1.



2.2 PROPOSED DEVELOPMENT

Based on the Conceptual Plan 3 prepared for the site, it is our understanding that the construction of the project will include the razing of all the existing citrus trees and related improvements to build approximately 138 residential units, with associated underground utilities, paved streets, and landscape areas. We also anticipate that the residences will consist of one- to two-story wood-frame houses with concrete slab-on-grade floors and conventional shallow foundations. Cuts and fills of less than 5 feet, and cut and fill slopes up to 5 feet in height are also expected.

If the site development differs from that described above, the recommendations should be subject to further review and evaluation. Final site development plans should be reviewed by GeoTek, Inc.

3. REVIEW OF PREVIOUS REPORTS, FIELD EXPLORATION, LABORATORY TESTING, AND INFILTRATION TESTING

3.1 REVIEW OF PREVIOUS REPORTS

On June 21, 2006, Leighton and Associates (L&A) completed a Geotechnical Study to Support the Environmental Impact Report, Redlands Commons and Trojan Groves Project, West of Texas Street, North of San Bernardino Avenue, City of Redlands, California. This study placed four exploratory borings to a maximum depth of 51.5 feet below the ground surface (bgs) within the subject project site. L&A described that the upper one to two feet of the onsite soil had being disturbed due to the agricultural activities on site. Native materials, below the disturbed upper soil, consisted of loose to medium dense sand with varying amounts of silt, gravel, and scarce cobbles. Groundwater was not encountered by L&A up to 51.5 feet bgs. L&A stated that groundwater was at 150 to 200 feet bgs below the site and that the risk of soil liquefaction at the site was very low. Surficial soils were also reported to have "negligible" soluble sulfate concentrations; "very low" expansion potential; and being "mildly to moderately" corrosive to ferrous metals. Potential cut slopes exposing unconsolidated alluvial materials and fill slopes were noted to likely be moderately to highly susceptible to erosion. Also, to mitigate loose surficial site soils, L&A recommended that residential pad areas be over-excavated and recompacted to a minimum depth of 2 feet below the bottom of footings or 4 feet below existing grade, whichever was greater.



The logs of the exploratory borings and laboratory test results by L&A are included in Appendix A. The approximate exploratory boring locations by L&A are shown on the Exploration Location Map in Figure 2.

3.2 FIELD EXPLORATION

GeoTek conducted a field exploration at the site on October 9, 2017 which consisted of excavating 12 exploratory trenches to depths ranging from approximately 3 to 12 feet bgs. The approximate locations of the recent exploratory trenches and the previous borings by L&A are shown on the Exploration Location Map, presented as Figure 2. Logs of the exploratory trenches performed by GeoTek are included in Appendix B.

3.3 LABORATORY TESTING

Laboratory testing was performed on selected bulk and relatively undisturbed soil samples collected during our field exploration. The purpose of the laboratory testing was to confirm the field classification of the soils encountered and to evaluate their physical properties for use in the engineering design and analysis. Results of the laboratory testing program along with a brief description and relevant information regarding testing procedures are included in Appendix C and on the trench logs included in Appendix B.

3.4 INFILTRATION TESTING

Four shallow trenches were excavated at the site for infiltration testing purposes. The trenches were excavated to 3 feet bgs and were placed in each of the four quadrants of the site so that representative testing of the site soils was more likely to occur. The approximate locations of the infiltration trenches are shown on the Exploratory Location Map (Figure 2).

An 8-inch diameter, 12-inch deep hole was excavated at the bottom of each trench to perform percolation testing in general accordance with the *Orange County Technical Guidance Document Appendix VII*, which is also the guideline adopted by San Bernardino County. The percolation rates obtained were then converted to field infiltration rates using the Porchet Method outlined in the referenced *Guidance Document*.

The field infiltration rates are presented in the following table for each of the trenches after the rates had stabilized.



SUMMARY	OF FIELD INFILTRATION	RATES
Trench No.	Approximate Depth of Testing (feet)	Field Infiltration Rate (inches per hour)
1-1	3	17.3
I-2	3	20.5
I-3	3	16.7
I-4	3	10.0

Copies of the data conversion sheets (Porchet Method) are included in Appendix D. Given the nature of the materials encountered and infiltration rates attained in the trenches excavations tested, the number of test performed should be considered adequate for preliminary design purposes.

Over the lifetime of the storm water disposal areas, the infiltration rates may be affected by silt build up and biological activities, as well as local variations in near surface soil conditions. A suitable factor of safety should be applied to the field rates to design the infiltration system.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is situated in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. Basically, it extends from the point of contact with the Transverse Ranges geomorphic province, southerly to the tip of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zone trend northwest-southeast and are found near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province, and the San Jacinto fault borders the province adjacent the Colorado Desert province.



More specific to the subject property, the site is located in an area geologically mapped to be underlain by younger alluvium deposits (Morton, D.M. and Miller F.K., 2006). The San Andres Fault zone, San Bernardino Mountains section, located approximately 3.5 miles northeast of the site, is the closest known active fault to the subject site.

4.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the earth materials underlying the site is presented in the following section. Based on our recent subsurface exploration and review of readily available regional geologic maps for the project site area (Morton, D.M. and Miller F.K., 2006), Quaternary age younger alluvial fan deposits underlie the site.

4.2.1 Younger Alluvial Fan Deposits

The alluvial deposits encountered in our trenches generally consist of grayish brown to gray, dry to slightly moist, silty fine to coarse sands along with poorly sorted fine to coarse sands with gravel. Based on our field observations and in-place density tests, the upper 5 to 7 feet of the site soils are loose to medium dense, becoming denser with depth.

A "very low" (0≤EI≤20) expansion potential for the surficial soils was found when tested in accordance with ASTM Test Method D 4829. In addition, results of direct shear testing confirmed our observations that the site soils are mostly granular with no to little cohesion. These soils are relatively more susceptible to erosion.

Detailed trench logs are provided in Appendix B.

4.3 SURFACE AND GROUNDWATER

4.3.1 Surface Water

If encountered during the earthwork construction, surface water on this site is the result of precipitation or surface run-off from surrounding sites. Overall area drainage is towards the west-northwest. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

Groundwater was not encountered within the trenches at the time of our investigation. L&A noted the absence of groundwater in their borings drilled up to 51.5 feet bgs at the site (L&A, 2006). As noted within the Seismic Hazard Zone Report for the Redlands Quadrangle, historic high groundwater is mapped at approximately 150 feet bgs (California Department of



Conservation, 1997). The California Water Data Library (http://www.water.ca.gov/) indicates groundwater at a depth of 227 to 233 feet bgs from 2015 to 2017, based on a well approximately 0.5 miles south of the project site.

It is possible that seasonal variations (temperature, rainfall, etc.) will cause fluctuations in the groundwater level. The groundwater levels presented in this report are the levels that were measured at the time of our field activities or as stated in the referenced source. It is recommended that the contractor determine the actual groundwater levels at the site at the time of the construction activities to determine the impact, if any, on the construction procedures.

Based on the above data, groundwater is not anticipated to adversely affect the proposed improvements.

4.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an "Alquist-Priolo" Earthquake Fault Zone or a Special Studies Zone (Bryant and Hart, 2007; CGS, 1980). The nearest zoned fault to the subject site is the San Andres Fault zone, San Bernardino Mountains section, located approximately 3.5 miles northeast of the site.

4.4.1 Seismic Design Parameters

The site is located at approximately 34.079067 Latitude and -117.193333 Longitude. Site spectral accelerations (Ss and S1), for 0.2 and 1.0 second periods for a Class "D" site, were determined from the USGS Website, Earthquake Hazards Program, Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude/Longitude. The results are presented in the following table:



2016 CBC SITE SEISMIC P	ARAMETERS
Mapped 0.2 sec Period Spectral Acceleration, Ss	1.821g
Mapped 1.0 sec Period Spectral Acceleration, S1	0.870g
Site Coefficient for Site Class "D", Fa	1.0
Site Coefficient for Site Class "D", Fv	1.5
Maximum Considered Earthquake (MCE Spectral Response Acceleration for 0.2 Second, Sms	1.821g
Maximum Considered Earthquake (MCE Spectral Response Acceleration for 1.0 Second, Smi	1.305g
Design Spectral Response Acceleration for Parameter at 0.2 Second, SDS	1.214g
Design Spectral Response Acceleration for Parameter at 1.0 second, SDI	0.870g
Peak Ground Acceleration (PGA _M)	0.724g

4.4.2 Liquefaction and Seismically-Induced Settlement

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction occurs, the liquefied soil/water matrix can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures and some low-plastic silts and clays.

The subject site is not mapped within a zone of potentially liquefiable soils by the Department of Conservation (CGS) or by the County of San Bernardino. Liquefaction is not considered a hazard at the site due to the lack of shallow groundwater.

Total and differential seismically-induced settlement is anticipated to be less than 2-inches and I inch, respectively (L&A, 2006).



4.4.3 Other Seismic Hazards

Evidence of ancient landslides or slope instabilities at this site was not observed during our investigation. The site vicinity is located in an area that has relatively flat to gently sloping terrain. Thus, the potential for landslides is considered negligible. Additionally, the project site is not located in an area identified by the State of California as an earthquake-induced landslide hazard zone (CGS, 2000).

The potential for secondary seismic hazards such as a seiche or tsunami are considered to be negligible due to site elevation and distance from an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations are incorporated into the design and construction phases of development.

5.2 EARTHWORK CONSIDERATIONS

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Redlands, the 2016 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix E outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix E.

5.2.1 Site Clearing and Demolition

In areas of planned grading or improvements, the site should be cleared of existing improvements, vegetation, trash and debris, and properly disposed of off-site. Voids resulting from the removal of trees and demolition of the existing structures and improvements should be backfilled with engineered fill materials with expansion characteristics similar to the on-site soils.



5.2.2 Removals/Overexcavations

It is recommended that the upper loose portions of the native alluvial soils below the planned structural areas and structural fill areas be removed until competent native soils are encountered. Competent native soil should have a relative compaction of at least 85 percent (ASTM D 1557) and little to no visible porosity. Loose alluvium was noted in all our trenches to depths of approximately 5 feet bgs. A representative of this firm should observe and approve the bottom of all excavations.

Cut lots should be over-excavated to a minimum of 5 feet below the existing grade or 2 feet below the deepest planned footing, whichever is greater. In addition, the cut portions of transition lots should be excavated to at least 5 feet below the existing ground surface, at least 2 feet below the deepest footing, or to a minimum of one-third of the maximum fill thickness, whichever is greater.

As a minimum, removals/over-excavations should laterally 5 feet away from foundation elements or at a 1:1 (h:v) projection to the recommended removal depth, whichever is greater.

Development plans should be reviewed by this firm when available. Depending on actual field conditions encountered during grading, locally deeper areas of removal may be recommended.

All footings should rest on at least 2 feet of engineered compacted fill.

Street and flatwork areas and areas to receive fills located beyond the limits of the remedial grading of the building pads should be excavated a minimum depth of 3 feet from the original ground surface or a minimum of 2 feet below the proposed finish grade, whichever is greater. Removals/over-excavations for street and flatwork improvements should extend laterally a minimum of 2 feet from the edges of the improvements.

5.2.3 Preparation of Areas to Receive Engineered Fill

A representative of this firm should observe the bottom of all excavations. Upon approval, the exposed soils and all soils in areas to receive engineered fill should be scarified to a depth of approximately 8 inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

5.2.4 Engineered Fills

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. Rock fragments greater than six inches in maximum dimension should not be incorporated into the fill. The organic content of



the existing surficial soils across the site should be verified prior their use as compacted fill. Organic content of engineered fill shall be less than I percent by weight, per local industry standards.

Engineered fill should be placed in horizontal lifts not exceeding eight inches in loose thickness, moisture conditioned to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

5.2.5 Slope Construction

Fill and cut slopes constructed at gradients of 2:1 (h:v), in accordance to industry standards, are anticipated to be globally stable. However, granular soils with no to little cohesion were noted to be predominant at the site. Surficially, proposed 2:1 cut slopes and 2:1 fill slopes built with the on-site materials may be unstable. To reduce this potential, slopes should be properly planted with light-weight, deep-rooted plants approved by the City. Slopes should not be over-irrigated. Drainage should not be allowed to flow uncontrolled over the slopes. Additionally, slopes on this site are recommended to be reinforced with a geotextile along the surface to increase the surficial stability. This reinforcement should be Miramesh® Biaxial Geosynthetics or equivalent. See sections 5.5.1 and 5.5.2 of this report for additional recommendations.

Where fill is to be placed against sloping terrain with gradients 5:1 (h:v) or steeper, the sloping ground surface should be benched to remove loose and disturbed surface soil to assure that the new fill is placed in direct contact with competent native soils and to provide horizontal surfaces for fill placement. Keyways and benches should be constructed per instructions of GeoTek's representative.

The base of the keyways and benches should be sloped back into the hillside at a gradient of at least 2 percent. The base of the benches should be evaluated by a representative of GeoTek prior to processing. Upon approval, the exposed soils should be moistened to at least the optimum moisture content, and densified to a relative compaction of at least 90 percent (ASTM D 1557). Details showing slope construction are presented in Appendix E.

An engineering geologist should observe all cut slopes. Cut slopes should expose competent native soils. If adverse structure or incompetent materials are exposed and identified in the cut slopes, stabilization fills may be recommended.

5.2.6 Excavation Characteristics

Excavation in the on-site soils is expected to be feasible using heavy-duty grading equipment in good operating condition. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines.



Temporary excavations within the on-site materials should be stable at 1:1 (h:v) inclinations for cuts less than 5 feet in height.

5.2.7 Trench Excavations and Backfill

Temporary excavations within the onsite materials should be stable at 1:1 inclinations for short durations during construction, and where cuts do not exceed 5 feet in height. Temporary cuts to a maximum height of 4 feet can be excavated vertically, but local sloughing and/or failure could occur due to the granular nature of some of the soils at this site. If excavations deeper than 5 feet are required, these should be sloped to at least 1.5:1 (h:v). Increased caution should be applied when working near or within any excavations at this site.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90 percent relative compaction (as determined per ASTM D 1557). Under-slab trenches should also be compacted to project specifications. Where applicable, based on jurisdictional requirements, the top 12 inches of backfill below subgrade for road pavements should be compacted to at least 95 percent relative compaction. Onsite materials should be suitable as backfill provided particles larger than 6± inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.2.8 Shrinkage and Subsidence

Several factors will impact earthwork balancing on the site, including shrinkage, bulking, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage, bulking and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 5 to 15 percent may be considered for the materials requiring removal and/or recompaction. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of site earthwork construction. Bulking is not considered to be a significant factor with the underlying materials within the vicinity of the anticipated construction. Subsidence on the order of up to 0.1 foot could occur.



5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

The soils encountered in our exploratory trenches and in the exploratory borings by L&A (2006) are mostly granular soils and possess "very low" (0 \(\sigma \sigma \sigma \sigma \) expansion potential in accordance with ASTM D 4829. Foundation design criteria, in general conformance with the 2016 CBC, are presented below. These are minimal recommendations and are not intended to supersede the design by the project structural engineer.

The foundation elements for the proposed structures should bear entirely in engineered fill soils. Foundations should be designed in accordance with the 2016 California Building Code (CBC).

A summary of our foundation design recommendations is presented in the following table:

GEOTECHNICAL RECOMMENDATIONS FOR FOUNDATION DESIGN								
Design Parameter	"Very Low" Expansion Potential 0≤El≤20							
Foundation Depth or Minimum Perimeter Beam Depth (inches below the lowest adjacent grade)	One-Story – 12 Two-Stories – 12							
Minimum Foundation Width (inches)*	One- to Two-Stories – 12							
Minimum Slab Thickness (inches)	4 - Actual							
Sand Blanket and Moisture Retardant membrane below On-Grade Building Slabs	2 inches of sand** overlying moisture vapor retardant membrane overlying 2 inches of sand**							
Minimum Slab Reinforcing	6" x 6" – W1.4/W1.4 welded wire fabric placed in the middle of slab							
Minimum Footing Reinforcement for Continuous Footings, Grade Beams and Retaining Wall Footings	Two No. 4 reinforcing bars, one placed near the top and one near the bottom							
Effective Plasticity Index***	NA							
Presaturation of Subgrade Soil (Percent of Optimum/Depth in Inches)	Minimum of 100% of the optimum moisture contento a depth of at least 12 inches prior to placing concrete							

^{*} Code minimums per Table 1809.7 of the 2016 CBC

An allowable bearing capacity of 1800 pounds per square foot (psf) may be used for design of building and retaining wall footings. This value may be increased by 400 psf for each additional 12 inches of embedment depth and by 200 psf for each additional 12 inches in width to a maximum of 3000 psf. The allowable bearing capacity may be increased by one-third when considering short-term wind and/or seismic loads.



^{**} Sand should have a sand equivalent of at least 30

For footings designed in accordance with the recommendations presented in this report, we would anticipate a maximum static settlement of less than one inch and a maximum differential static settlement of less than 1/2-inch in a 40-foot span. Differential seismic settlement is anticipated to be less than 1-inch in a 40-foot span (L&A, 2006).

The passive earth pressure may be computed as an equivalent fluid having a density of 300 psf per foot of depth, to a maximum earth pressure of 3000 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. When combining passive and frictional resistance, the passive pressure component should be reduced by one-third.

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2016 California Green Building Standards Code (CALGreen) Section 4.505.2 and the 2016 CBC Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a six-mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeability) to achieve the desired performance level. Consideration should be given to consulting with an individual possessing specific expertise in this area for additional evaluation.



Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarders should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, and/or architect be consulted to evaluate the general and specific moisture vapor transmission paths and associated potential impact.

In addition, the recommendations in this report and our services in general are not intended to address mold prevention, since we along with geotechnical consultants in general, do not practice in areas of mold prevention. If specific recommendations are desired, a professional mold prevention consultant should be contacted.

5.3.2 Miscellaneous Foundation Recommendations

- To reduce moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.
- Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.
- Under-slab utility trenches should be compacted to project specifications. Compaction should be achieved with a mechanical compaction device. If soils to be used as backfill have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3.3 Foundation Set Backs

Minimum setbacks to all foundations should comply with the 2016 CBC or City of Redlands requirements, whichever is greater. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movements and/or differential settlements. If large enough, these movements can compromise the integrity of the improvements. The bottom of any proposed foundations should be deepened so as to extend below a 1:1 (h:v) upward projection from the bottom edge of the closest footing.



5.3.4 Retaining Wall Design and Construction

5.3.4.1 General Design Criteria

Recommendations presented in this report apply to typical masonry or concrete retaining walls to a maximum height of up to about 6 feet. Additional review and recommendations should be requested for higher walls. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Retaining wall foundations should be embedded a minimum of 12 inches into engineered fill and/or competent native materials and should be designed in accordance with Section 5.3.1 of this report. Structural needs may govern and should be evaluated by the project structural engineer.

Earthwork considerations, site clearing and remedial earthwork for all earth retention structures should meet the requirements of this report, unless specifically provided otherwise, or more stringent requirements or recommendations are made by the designer. The backfill material placement for all earth retention structures should meet the requirement of Section 5.3.4.3 in this report.

In general, cantilever earth retention structures, which are designed to yield at least 0.001H, where H is equal to the height of the earth retention structure to the base of its footing, may be designed using the active condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at top, such as typical basement walls) should be designed using the at-rest condition.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent building or traffic loading, should be considered in the design of the earth retention structures. Loads applied within a 1:1 (h:v) projection from the surcharge on the stem and footing of the earth retention structure should be considered in the design.

Final selection of the appropriate design parameters should be made by the designer of the earth retention structures.

5.3.4.2 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 6 feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given



below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, or adverse geologic conditions.

ACTIVE EAF	RTH PRESSURES
Surface Slope of Retained Materials (h:v)	Equivalent Fluid Pressure (pcf) (Native Backfill)*
Level	37
2:1	58

^{*} The design pressures assume the backfill material has an expansion index less than or equal to 20. Backfill zone includes area between back of the wall to a plane (1:1 h:v) up from bottom of the wall foundation (on the backside of the wall) to the (sloped) ground surface.

5.3.4.3 Restrained Retaining Walls

Retaining walls that will be restrained at the top that support level backfill or that have reentrant or male corners, should be designed for an equivalent at-rest fluid pressure of 58 pcf, plus any applicable surcharge loading for level backfill conditions. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

5.3.4.4 Retaining Wall Backfill and Drainage

Retaining walls should be provided with an adequate pipe and gravel back drain system to help prevent buildup of hydrostatic pressures. Backdrains should consist of a 4-inch diameter perforated collector pipe (Schedule 40, SDR 35, or approved equivalent) embedded in a minimum of one-cubic foot per linear foot of ³/₄- to 1-inch clean crushed rock or an approved equivalent, wrapped in filter fabric (Mirafi 140N or an approved equivalent). The drain system should be connected to a suitable outlet. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Retaining wall backfill should be placed in lifts no greater than 8 inches in thickness and compacted to a minimum of 90 percent relative compaction in accordance with ASTM Test Method D 1557. The wall backfill should also include a minimum one-foot wide section of ¾-to 1-inch clean crushed rock (or an approved equivalent). The rock should be placed immediately adjacent to the back of the wall and extend up from a back drain to within approximately 24 inches of the finish grade. The rock should be separated from the earth with filter fabric. The upper 24 inches should consist of compacted on-site soil.



As an alternative to the drain rock and fabric, Miradrain 2000, or approved equivalent, may be used behind the retaining wall. The Miradrain 2000 should extend from the base of the wall to within 2 feet of the ground surface. The subdrain should be placed at the base of the wall in direct contact with the Miradrain 2000.

The presence of other materials might necessitate revision to the parameters provided and modification of the wall designs. Proper surface drainage needs to be provided and maintained.

5.3.4.5 Other Design Considerations

- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.
- No backfill should be placed against concrete until minimum design strengths are evident by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should be approved the project geotechnical engineer or their authorized representative.

5.3.5 Pavement Design Considerations

Pavement design for proposed street improvements was conducted per Caltrans *Highway Design Manual* guidelines for flexible pavements. Based on an assumed R-value of 35 typically associated with silty sandy soils and for Traffic Indices (TIs) ranging from 4.5 to 5.5 generally linked to roads with light vehicular traffic with occasional heavy truck traffic, the following sections were calculated:

PRELIMINA	RY STRUCTURAL SECTIONS F	OR SITE PAVEMENTS
Traffic Index	Thickness of AC (feet)	Thickness of AB (feet)
4.5	0.25*	0.33*
5.0	0.25	0.40
5.5	0.25	0.50

^{*}Minimum thickness required by the City of Redlands

Traffic Indices (TIs) used in our pavement design are considered reasonable values for the proposed residential street areas, and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from the paving will result in premature pavement failure. Traffic parameters used for design were selected based upon engineering judgment and not upon information furnished to us such as an equivalent wheel load analysis or a traffic study.



The recommended pavement sections provided are intended as a minimum guideline and final selection of pavement cross section parameters should be made by the project civil engineer, based upon the local laws and ordinates, expected subgrade and pavement response, and desired level of conservatism. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. Final pavement design should be checked by testing of soils exposed at subgrade (the upper 5 feet) after final grading has been completed.

Asphalt concrete and aggregate base should conform to current Caltrans Standard Specifications Section 39 and 26-1.02, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the current Standard Specifications for Public Work (Green Book). Crushed aggregate base or crushed miscellaneous base can conform to Section 200-2.2 and 200-2.4 of the Green Book, respectively. Pavement base should be compacted to at least 95 percent of the ASTM D1557 laboratory maximum dry density.

All pavement installation, including preparation and compaction of subgrade, compaction of base material, placement and rolling of asphaltic concrete, should be done in accordance with the City of Redlands specifications, and under the observation and testing of GeoTek and a City Inspector where required. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern.

Deleterious material, excessive wet or dry pockets, oversized rock fragments, and other unsuitable yielding materials encountered during grading should be removed. Once existing compacted fill are brought to the proposed pavement subgrade elevations, the subgrade should be proof-rolled in order to check for a uniform and unyielding surface. The upper 12 inches of pavement subgrade soils should be scarified, moisture conditioned at or near optimum moisture content, and recompacted to at least 95 percent of the laboratory maximum dry density (ASTM D1557). Rock fragment over 6 inches in one dimensions should not be placed within the upper 12 inches of the subgrade. If loose or yielding materials are encountered during construction, additional evaluation of these areas should be carried out by GeoTek. All pavement section changes should be properly transitioned.

5.3.6 Soil Corrosivity

The soil resistivity at this site was tested in the laboratory on two samples collected during the field exploration. The results of the testing indicate that the soil samples are "mildly corrosive" to buried ferrous metals in accordance with current standards commonly used by corrosion engineers. These characteristics are considered typical of soils commonly found in Southern California. Consideration should be given to consulting with a corrosion engineer.



5.3.7 Soil Sulfate Content

The sulfate content was determined in the laboratory on two samples of the on-site soils. The results indicate that the water-soluble sulfate range is less than 0.1 percent by weight, which is considered "not applicable" (i.e. negligible) as per Table 4.2.1 of ACI 318. Based upon the test results, no special concrete mix design is required for sulfate attack resistance.

5.3.8 Import Soils

Import soils should have expansion characteristics similar to the on-site soils. GeoTek also recommends that, as a minimum, proposed import soils be tested for corrosivity and soluble sulfate content. GeoTek should be notified a minimum of 72 hours prior to importing so that appropriate sampling and laboratory testing can be performed.

5.4 CONCRETE CONSTRUCTION

5.4.1 General

Concrete construction should follow the 2016 CBC and ACI guidelines regarding design, mix placement and curing of the concrete. If desired, we could provide quality control testing of the concrete during construction.

5.4.2 Concrete Mix Design

As indicated in Section 5.3.7, no special concrete mix design is required by Code to resist sulfate attack based on the existing test results. However, additional testing should be performed during grading so that specific recommendations can be formulated based on the asgraded conditions.

5.4.3 Concrete Flatwork

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. No specific reinforcement is required from a geotechnical perspective. However, some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices commonly utilized in residential construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented in this report.

Subgrade soils (typically "very low" expansion potential) should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. at the



subject site should be pre-saturated to a minimum of 100 percent of optimum moisture content to a depth of at least 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with City of Redlands specifications, and under the observation and testing of GeoTek and a City/County inspector, if necessary.

5.4.4 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than I/8 inch in width. Most cracks in concrete while unsightly do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

5.5 POST CONSTRUCTION CONSIDERATIONS

5.5.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not



recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided.

5.5.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings. Soil areas within 10 feet of the proposed structure should slope at a minimum of 5 percent away from the building, if possible unless the area is paved. Paved areas are to be sloped at 2 percent away from the structure. Roof gutters and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street gutter pan or directly to the storm drain system. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.6 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that grading and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. We also recommend that GeoTek, Inc. representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should have the representative from GeoTek, Inc. perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of all unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement, and collect soil samples for laboratory testing where necessary.



- Observe the fill for uniformity during placement, including utility trenches.
- Perform field density testing of the fill materials.
- Observe and probe foundation soils to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, Inc. which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6. INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of our evaluation is limited to the boundaries of the subject property. This review does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and the client's needs, our fee estimate (Proposal No. P-0906217r) dated September 22, 2017 and geotechnical engineering standards normally used on similar projects in this locality at the present.



7. LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil materials vary in character between excavations formed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

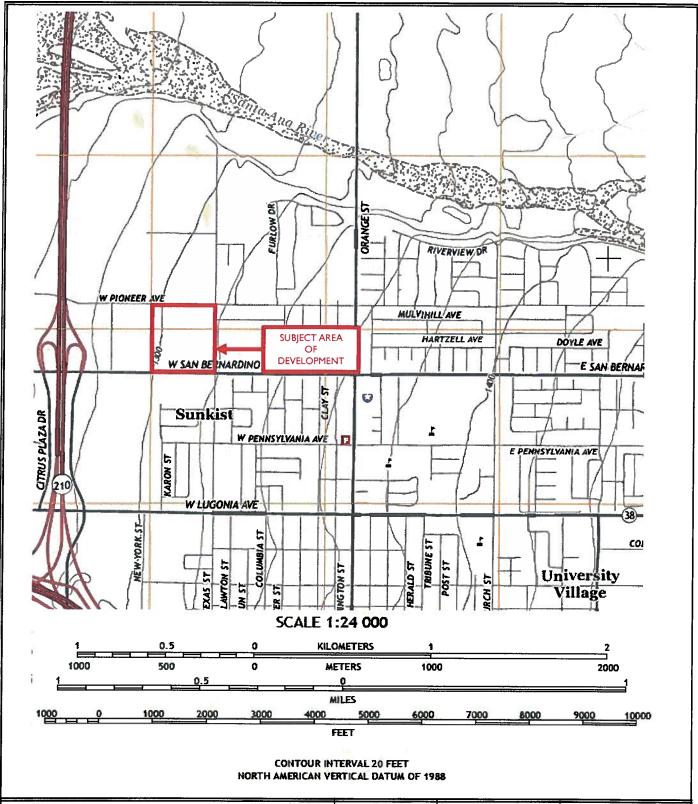
Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.



8. SELECTED REFERENCES

- American Concrete Institute (ACI), 2006, Publication 302.2R-06, Guide for Concrete Slabs That Receive Moisture Sensitive Flooring Materials.
- ASTM, 2011, "Soil and Rock: American Society for Testing and Materials," vol. 4.08 and 4.09.
- Morton, D.M. and Miller, F.K., 2006, "Preliminary Geologic Map of the San Bernardino and Santa Ana 30'X60' Quadrangle," U.S. Geological Survey open-file Report 2006-1217.
- Bryant, W.A., and Hart, E.W., 2007, "Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps," California Geological Survey: Special Publication 42.
- California Code of Regulations, Title 24, 2016 "California Building Code," 3 volumes.
- California Department of Water Resources groundwater well data (http://www.water.ca.gov/).
- Leighton and Associates, Inc, 2006, "Geotechnical Study to Support the Environmental Impact Report, Redlands Commons and Trojan Grover Project, West pf Texas Street, North of San Bernardino Avenue, City of Redlands, California", June 21.
- National Association of Corrosion Engineers, 1984, "Corrosion Basics An Introduction."
- Seismic Design Values for Buildings (http://geohazards.usgs.gov/designmaps/us/application.php).
- State of California, 1997, "Seismic Hazard Zone Report, Redlands Quadrangle."
- Terzaghi, K. and Peck, R. B., 1967, "Soil Mechanics in Engineering Practice", Second Edition.





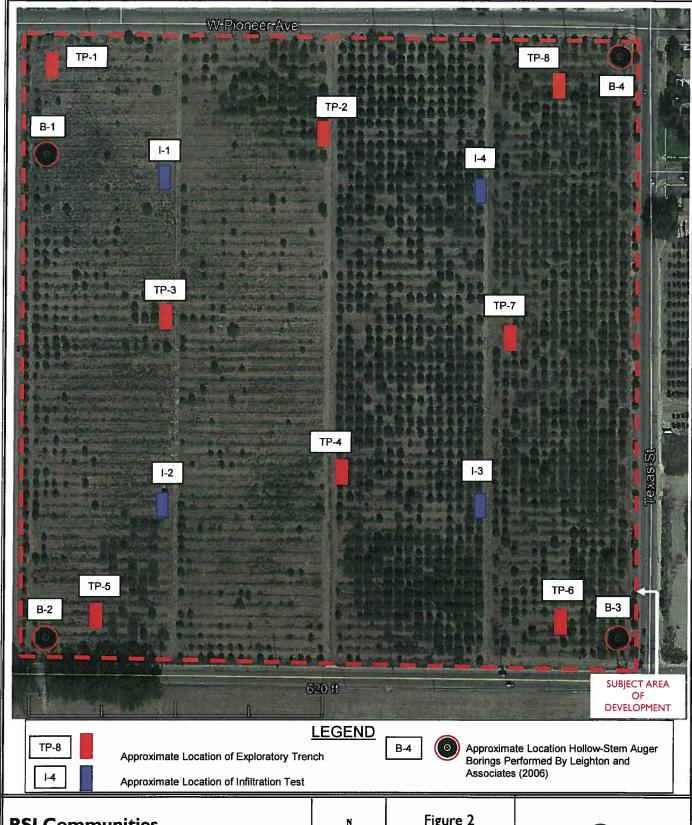
RSI Communities

Citrus Valley Project Redlands, San Bernardino County, California GeoTek Project No. 1776-CR



Modified from USGS 7.5-minute Redlands Topographic Map Figure 1 Site Location Map





RSI Communities

Citrus Valley Project Redlands, San Bernardino County, California GeoTek Project No. 1776-CR



Figure 2 **Exploration** Location Мар



APPENDIX A

BORING LOGS AND LABORATORY TEST RESULTS BY L&A (2006)

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



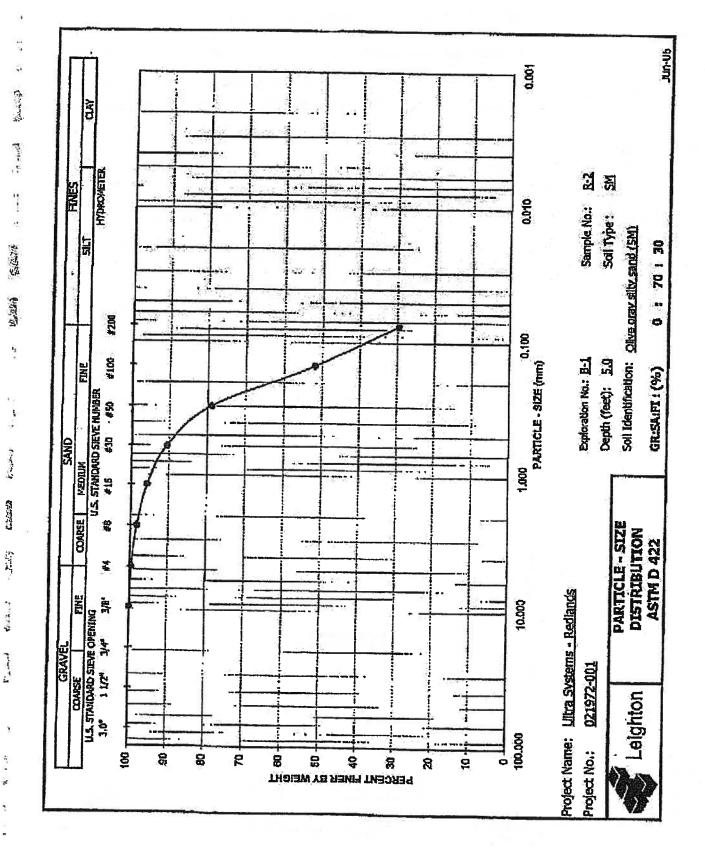
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			R-2	668			SM	(a) 4' Drill manuschered 10" Integries Line (a) 5' ALL-UVIUM (Onl) Silvy SAND, fine- to medium-grained, some charm grains, grayish heaven, losse, wet due to damaged integation line; sand with silt interbuilded (30% 200)	S
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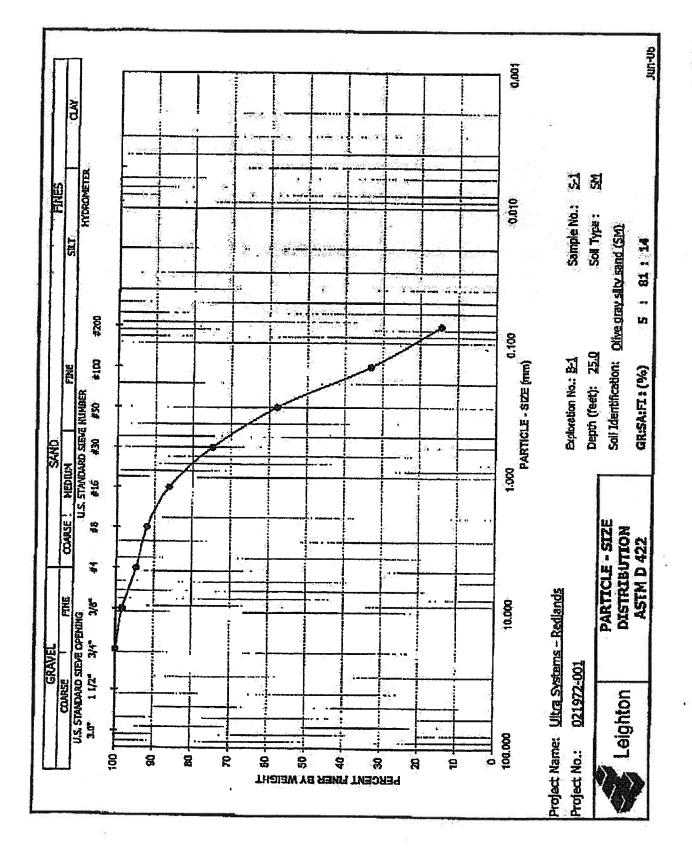
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		on Top o				ocatio			140 lb: Automatic Hammer Di See Geolechnical Map	rop <u>30*</u>
Eleyation Feat	Depth	Graphic	Atifindes	Sample No.	Blows Per-Six Inches	Dry Densily por	Mojeture Content, %	Soil Class.	DESCRIPTION Logged By CBC	Type of Tests
	30-			8-6	14 15 18	105.0	4.0	SP	(2 30' Poorly graded SAND, moist, medium dense, trace subangular gravel to 1 inch; thin alternating horsen/gray layers, decreasing course and	
	35-			S-2	74 16 18		***	SP	@35' Poorly graded SAND as above, gray, moist, trace sub-angular gravet to 1 inch	
	40-			R-7	29 34 50/6			SP	@ 40° Poorly graded SAND as above, very dense	
	45			S-3	8 11 9			SP-SM	(245' Poorly graded SAND with silt lenses, gray brown, medium dense, moist	
	50-			R-8	14 16 26			SP-SM	@ 50" Propriy gracied SAND with silt lenses as above	
3	55								Total depth 51.5 feet No ground water consuntered Backfilled with soil cuttings	
R RING B BULL	TYPES T SPOC SAMP (SAMP SAMP SAMP	N LE LE		!				DS DIR MD MA CN CO	FTESTS: CR CORROSICM EGIT SHEAR SA SIEVE ANALYSIS UNBUM DENSITY AL ATTERBERG LIMITS NISOLIDATION EI EXPANSION RIDEX LLAPSE RV RAVALUS	*

	oject Illing	Co.	3-20-0t		trasyste		edland: 2R Dr		mions Site Sheet 1 of 1 Project No. 02197: Type of Rig CMI	
		meter n Top o		inch			Veight			p 30°
Elevation	Depth	Graphic Log	Attitudes	Sample No.	Biows Par Six Inches	Dry Density pcf	Molsture Content, %	Soll Class. (U,S.C.S.)	DESCRIPTION Logged ByCBC Sampled ByCBC	Type of Tests
4	,			15-15-1	4 67	110,0	5.0	SP	O ALLUVIUM (On) Pourly graded SAND with Silt, fine-to medium-prained, some course grains, brown, slightly regist to mood, this forces. (A 2' Poorly graded SAND with Silt as above	MD
	10			R-2	51869	1100	20	SP	Proofly gradual SANID, fine-to coarse-grained, gray, media, medium dense, trace sub-argular grayel to 1 inch	CM
	15			K-3	457 57K	92.0	13.0	sr sr	(a) 15 Pourty graded SAND, gray-brown, fine to medium grained.	, ÇA
	20-			K-4	10 14 20	102.0	3.0	SP	(20° Poorly graded SAND, fine-to medium-grained, some course grains, gray, moist, dense.	£
	25			-					Total depth 21.3 feet No ground water encountered Backilled with soil cuttings	
AMPLE EPUI RING BULL	TYPES TEPOO BAMPI KEALEP ESAMPI	N E						DE DIR	FTESTE: CR CORNOSION ECT ENFAR SA SIEVE AKALYSIS UGRUM DENSITY AL ATTERBERG LIMITS NEOLIDATION EI EXPANSION INDEX LLAPSE RV R-VALUE	

Project Drilling Co	I FEE		trasyste	ms Re	edland: 2R Dr		Sheet 1 of 1 more Site Project No. 021972 Type of Rig CME	
Hole Diameter Elevation Top o		inch		Drive V		n di Satur		30
Caphic Log	Attliudes	Sample No.	Blows Per Six (nohes	Dry Denatty por	Moisture Content, %	Soll Class	DESCRIPTION Logged By CBC Sampled By CBC	Type of Teats
3-	•	R-1	6 5 7 10	114.0	3.0	SI'	(*ALLUYIUM (Onlineerly graded SAND with Silt, fine-to medium-granted, some exarse grains, brown, trace sub-angular gravel to I inch (d) I Poorly graded SAND with Silt, larown, maist, lorse, fine to medium grained (d) S' Poorly graded SAND, fine-to medium-grained, some course grains, grayish hown, moist, medium dense, some sub-angular gravel to 1½ inches	Cal
10		R.J	9 11 13	104,0	3,0	SP	@ 10' Poorty graded SAND as above	
15—	٠	R-4	7 8 9	98.0	G.D	SP	@ 15 Pourly graded SAND as above, dark grayish brown, moist, loose to maximum derive, decreasing course sand, trace gravel to 1 inch	
20-		S-1 5	13 16 12			SI'	@ 20 Poorly graded SAND as alrays, medium dense, increasing gravel, poor recovery due to 1½ inch gravel in tip of sampler	
25-							Total depth 21.5 feet No ground water encountered Backfilled with soil curriage	
38								
PLE TYPES: PLIT SPOON ENG SAMPLE BULK BAMPLE WEE SAMPLE					A	B DIR	CTESTS CR CORROSION SA SIEVE ANALYSIS ANGUN DEBISITY AL ATTERBERG LIMITS HEADLIDATION LAPBE RY R-VALUE SSOCIATES, INC.	}

Dr He		Co. Imeler n Top of	-	inch			2R Dr Velght	illing	mons Sile Project No. 021972 Type of Rig CME 140 lb. Automatic Hammer Dro See Geotechnical Map	
Elevation Feet	P. P	Graphic Log	Attitudes	Sample No.	Blows Per Six inches	Dry Density pcf	Moisture Content, %	Soll Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
	5 1			R-1 R-2 ting-1	556 787	117,0	3.0	SM	ALLUVIUM (Onl Silty SAND, fine-to medium-grahed, grayes brown, slightly moist, some sub-rounded gravel to 1 inch Silty SAND, fine-to medium-grained, some coarse grains, hower, hosse, moist, non-plastic (3194-200) Silty SAND with Oravel, fine-to-medium grained, some coarse grains, grayes brown, loose, moist, sub-angular gravel in 1 inch, non-plastic	SA CE
	10-			R-3	11 21 81	107.0	3.0	SP	(a) 10° Poorty graded SAND with geaved, fine-in course-grained, gray, moin, medium dense, sub-angular gravel to 1 inch	
	15-			ક્ત	5 6 7			Zr	@ 15 Poorly graded SAND with pravel as abuve, some brown silty leases	
	20-			R.4	19 24 28	1160	5.0	SP	@ 20' Poorly graded SAND with gravel as above, dense, 2 (soft gravel in tip of sampler.	
	25-			-					Total depth shilled 21.5 fleet No ground water encountered Back filled with wal contage	
AMPLI SPLI RINK BUL	SO LE TYPES IT SPOC G SAMPI K SAMP E SAMP	ᄩ					G	DS CAR MID MA	ETEBERS CR CORROSION ECT BRIEAR SA SIEVE AVALYSIS AXTHERERS LIMITS RISOLIDATION EL EXPANSION INDEX LLARSE RV R-VALUE	



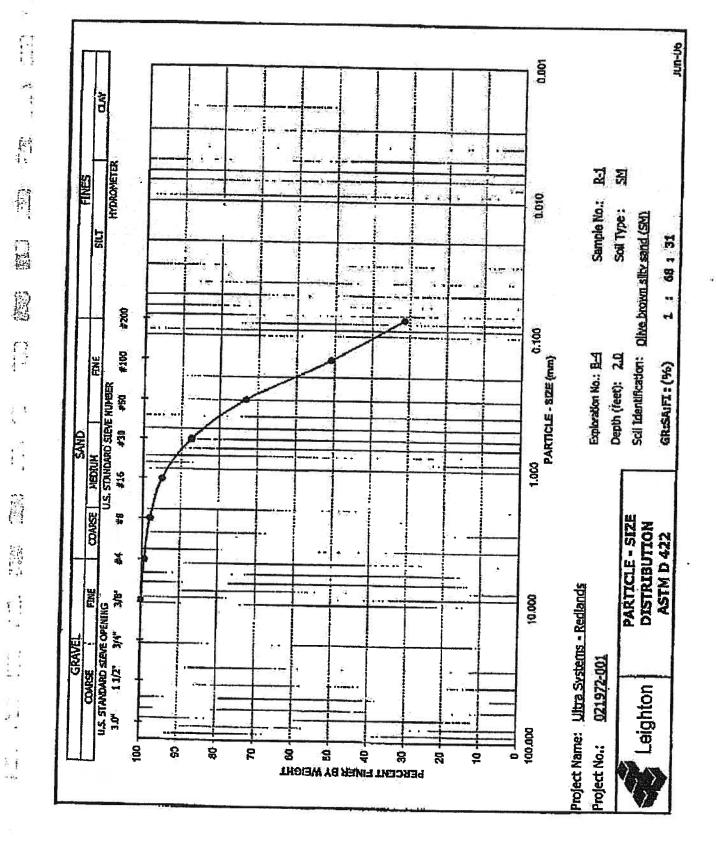


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MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Ultra Systems -	Redlands		Tested By:	GEB/RSM	Date:	06/05/06
Project No.:	021972-001	_	i E	Input By:		Date:	06/12/06
Boring No.:	B-2			Depth (ft.)		V. O. C. C. C.	
Sample No.:	Bag-1			9 180 1.0 NA	44 T. 12	11.8	
Soil Identification;	Olive poorly gra	ded sand w	ith silt (SP-SI	4)			
Preparation Method		Moist Dry			X	Mechanica Manual Ra	
	Mold Volt		0.03307]. Ram V	Velght = 10 1	and the second second second	4.5
ाडाः	The state of the s	. 1	2	3 -	4	,5	6
Wt. Compacted 5	01 + Mold (g)	3738.0	3817.0	3857.0	3804.0		! • • • •
Weight of Mold	(9)	1810,0	1810.0	1810.0	1810.0	1.	×11.4
Net Weight of Soil	(g)	1928.0	2007.0	2047.0	1994.0	ATT 177	
Wet Weight of So	I + Cont. (g)	449.80	497,10	468.10	540.10		Child Make Make
Dry Weight of Soil		432.00	466.50	431,40	486.70		
Weight of Contain		54.40	52.30	54:20	51.60		751 12
Moishure Content	(%)	4.71	7.39	9.73	12.27	nikotowani mana	Contractor Contractor
Wet Density	(pd)	128.5	133.8	136.5	132.9		
Bert Brand							· · · · · ·
PROCEDURE US Procedure A of Passing No. 4 (4.75 m	nm) Siève	122.7 sity (pcf)	124.6	Optimum)	118.4 Moisture Co	SP. GR.	= 2.63 ■ 2.70
PROCEDURE US Procedure A all Passing No. 4 (4.75 m old: 4 in. (101.6 mm) nyers: 5 (Five) owa per layer: 25 (two ay be used if +#4 is 20% Procedure B all Passing 3/8 in. (9.5 m old: 4 in. (101.6 mm) nyers: 5 (Five) ows per layer: 25 (two old: 4 in. 4 in. 20% off -#4 is > 20% and 4 old or less	imum Dry Dens ED 131 Im) Steve diameter 22 Im) Steve diameter 23 Im) Steve diameter 24 Im) Steve diameter 25	5.0	2 12 13	Optimum		SP. CR.	= 2.63 = 2.7¢
PROCEDURE US Procedure A oil Passing No. 4 (4.75 m old: 4 in. (101.6 mm) syers: 5 (five) lows per layer: 25 (two ay be used if +#4 is 20% Procedure B oil Passing 3/8 in. (9.5 m old: 4 in. (101.6 mm) syers: 5 (Five) Procedure B oil Fassing 3/8 in. (9.5 m old: 4 in. (101.6 mm) overs: 5 (Five) ows per layer: 25 (two of it +#4 is >20% and 4 of correct if Procedure C	imum Dry Dens imum Dry Dens imum Dry Dens 131 131 131 131 131 131 131 131 131 13	sity (pcf)	125.0	Optimum		SP. GR.	= 2.63 = 2.7¢
PROCEDURE US Procedure A oil Passing No. 4 (4.75 m oil 1 in. (101.6 mm) syers: 5 (Five) lows per layer: 25 (two ay be used if +#4 is 20% Procedure B oil Passing 3/8 in. (9.5 m oil 4 in. (101.6 mm) overs: 5 (Five) ows per layer: 25 (two oil 1 in 44 is >20% and 4 off or less Procedure C oil Possing 3/4 in. (19.0 m oil 2 in (152.4 mm) overs: 5 (Five) ows per layer: 56 (five)	imum Dry Dens ED 131 Im) Sleve diameter Try five) Sleve diameter Try five) 3/8 in, is Try five) 3/8 in, is Try five) 4 Try five)	sity (pcf)	125.0	Optimum!		SP. GR.	= 2.63 = 2.70



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EXPANSION INDEX of SOILS ASTM D 4829

Project Name: Project No. :	Ultra Systems - Redlands 021972-001		06/08/06 06/12/06
Baring No.:	B-4	Depth (ft.) 5-10	MITTING
Sample No. :	Bag-1		
Soll Identification:	Olive silty sand (SM)		
	Sire sire, said (575)		
	Dry Wt. of Soil + Cont. (g)	1000.00	
	Dry Wt. of Soil + Cont. (g) Wt. of Container No. (g)	1000.00	
	Dry Wt. of Soil + Cont. (g) Wt. of Container No. (g) Dry Wt. of Soil (g)	1000.00 0,00 	
	Dry Wt. of Soil + Cont. (g) Wt. of Container No. (g)	0.00	

D

MOLDED SPECI	MEN	Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	0.9990
Wt. Comp. Soil + Mold	(g)	593.40	430.20
Wt. of Mold	(9)	190.50	0.00
Specific Gravity (Assume	d)	2.70	2.70
Container No.	500 S	O	0
Wet Wt. of Soil + Cont.	(g)	841.90	620.70
Dry Wt. of Soil + Cont.	(g)	779.30	563.60
Wt. of Container	(g)	0.00	190.50
Moisture Content	(%)	8.03	15.30
Wet Density	(pcf)	121,5	129.9
Dry Density	(pcf)	112.5	112.7
Void Ratio		0.499	D.496
Total Porosity		0.333	0.332
Pere Volume	(cc)	68.9	68.6
Degree of Saturation (%)	[S mess]	43.5	83.2

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Expansion Index (EI) = EI meas - (50 -\$ meas)x((65+EI meas) / (220-\$ meas))

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
06/08/06	10:31	1,0	0	0.4810
06/08/06	10:41	1.0	10	0,4810
	= A	dd Distilled Water to the	Specimen	3011000
06/08/06	16:54	1.0	373	0,4800
06/09/06	8:51	1.0		0.4800
06/09/06	9:55	1.0		0.4800
nsion Index (EI a	eas) = ((Final R	dg - Initial Rdg) / Initial	Thick.) x 1000	-1.0



One-Dimensional Swell or Settlement Potential of Cohesive Soils (ASTM D 4546)

Project Name: Ultra Systems - Redlands

021972-001

Tested By:

FT, ESS Date:

06/08/06

Project No.: Boring No.:

B-2

Checked By:

Date:

06/12/06

Sample No.:

Sample Type:

R-3

Depth (ft.)

10.0

Drive

Sample Description: Grayish brown silty sand (SM)

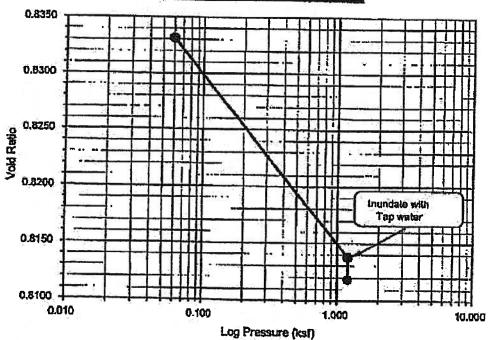
initial Dry Density (pcf):	91.9
Initial Moisture (%):	13.42
Initial Length (in.):	1,0000
Initial Dial Reading:	0.1080
Diameter(In):	2.416

Final Dry Density (pcf):	88.9
Final Moisture (%):	32.7
Initial Void ratio:	0.8335
Specific Gravity(assumed):	2.70
Initial Saturation (%)	43.5

Pressure (p) (kar)	Final Reading (In)	Apparent Thickness (In)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Vold Ratio	Corrected Deformation (%)
0,060	0.1082	0.9998	0.00	-0.02	0.8331	-0.02
1.200	0.1188	0.9893	0.00	-1,0B	0.8138	-1.08
, H2O	0.1198	0.9882	0.00-	-1.18	0.8118	-1.18

Percent Swall (+) / Settlement (-) After inundation = -0.11







One-Dimensional Swell or Settlement Potential of Cobesive Soils (ASTMTD 4546)

Project Name: Ultra Bystema - Redlands

Project Na.: 021972-001

Boring No .: Sample No.:

Sample Description:

B-3 R-2

Brown silty sand (SM)

Tested By:

FT, ESS Date;

06/00/06 Date: 06/12/06

Checked By: LF. Sample Type: Drive

Depth (ft.)

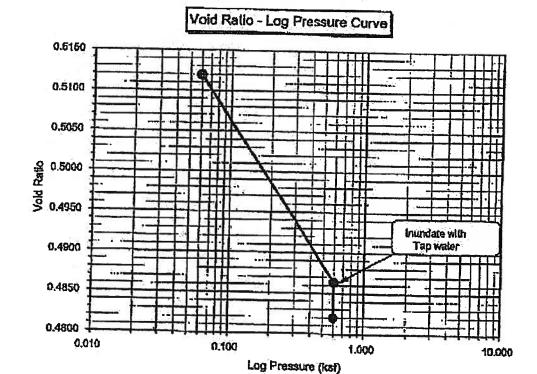
5.0

Initial Dry Density (pcf):	111.5
Initial Moisture (%):	1.35
Initial Length (in.):	1.0000
Initial Dial Reading:	0.1346
Diameter(in);	2418

Final Dry Density (pcl):	111.5
Final Moisture (%):	17.2
Initial Vold ratio:	0.5120
Specific Gravity(assumed):	2.70
trillial Saturation (%)	The second secon

Pressure (p) (Ksl)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1347	0.9999	0.00	-0.01	0.5119	-0.01
0.600	0.1516	0.9830	0.00	-1.70	0.4863	
H2O	0.1545	0.9801	0.00	-1.99	0,4820	-1.70 -1.99

Percent Swell (+) / Settlement (-) After inundation = -0.30





One-Dimensional Swell or Settlement Potential of Collesive Soils (ASTM D 4546)

Project Name.

Ultra Systems - Redlands

Tested By:

FT, ESS Date:

06/08/06

Project No.:

021972-001

Checked By:

Date:

Boring No.:

B-4

Sample Type:

06/12/06

Sample No.:

Depth (IL)

Drive

Sample Description:

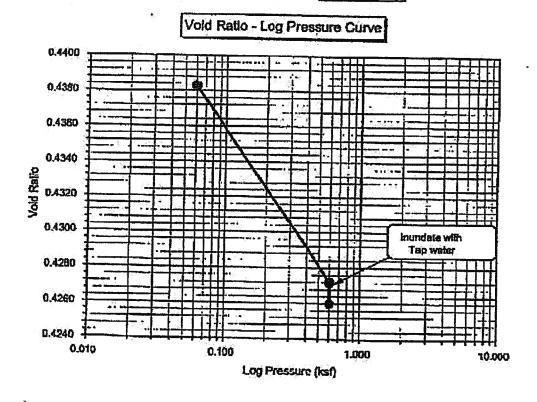
Olive brown silly sand with gravel (SM)g

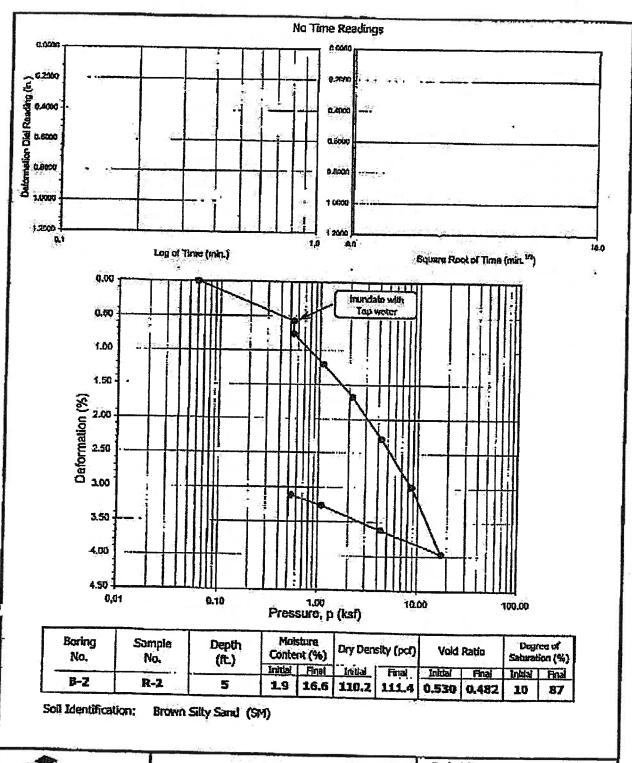
Initial Dry Density (pcf);	117.1
initial Moisture (%):	12.54
Initial Length (in.):	1.0000
Initial Dist Reading:	0.1523
Diameter(in):	2418

Final Dry Dansity (pcf):	117.0
Final Moisture (%):	14.2
Initial Void ratio:	0.4389
Specific Gravity(assumed):	2.70
Initial Saturation (%)	77.2

Pressuré (p) (kef)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Vald Relig	Corrected Deformation (%)
0.060	0.1527	0,9996	0.00	-0.04	0.4383	-0.04
0.600	0.1604	0.9919	0.00	-0.81	0.4272	-0.81
1120	0.1613	0.9911	0.00	-0.90	0.4260	-0.90

Percent Swell (+) / Settlement (-) After Inundation = -0.09





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ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS (ASTM D 2436) Project Na.:

021972-001

Ultra Systems - Redlands

05-04

APPENDIX B

TRENCH LOGS BY GEOTEK

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



Project No. 1776-CR October 24, 2017 Page B-1

B-FIELD TESTING AND SAMPLING PROCEDURES

Bulk Samples (Large)

These samples are normally large bags of representative earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)

These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of representative earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B-TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of trenches:

SOILS USCS Unified Soil Classification System f-c

Fine to coarse

f-m Fine to medium

GEOLOGIC

C:

B: Attitudes Bedding: strike/dip J: Attitudes Joint: strike/dip

> Contact line Dashed line denotes USCS material change Solid Line denotes unit / formational change Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the logs of trenches)



CLIE	NT:			RSI Communities	LOGG	ED BY:	DRW
PRO	JECT	NAME:		Citrus Valley	EQUI	PMENT	Backhoe
PRO	JECT	NO.:		1776-CR		DATE:	10/9/2017
LOC	ATIC	N:		See Exploration Location Map			
	SA	AMPLES				Labora	atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-I	Water Content (%)	Dry Density (pcf)	Others
⊨	ļ",		-	MATERIAL DESCRIPTION AND COMMENTS	}		
			SM	YOUNGER ALLUYIUM Silty f-m SAND, brown, dry, loose to medium dense Becomes slightly moist			
		ł	SP	Silty f-c SAND, brown, slightly moist, medium dense	2.3	108.2	
5-		7	SP	F-c SAND, gray, slightly moist, trace gravel	2.5		
- - - 10 -				Same as above. Starts caving	3		SA
			I .	TRENCH TERMINATED AT 10 FEET No groundwater encountered Trench backfilled with soil cuttings			
LEGEND		ple typ		Ring		Water	
LEG	Lab	testing		AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resistivity Test SH = Shear Test HC= Consolid-	•		R-Value Test

CLII	ENT:			RSI Communities	LOGG	ED BY:	DRW
PRC	JECT	NAME:	E: Citrus Valley 1776-CR		EQUI	PMENT	Backhoe
PRO	JECT	NO.:			DATE:		10/9/2017
LOCATION:				See Exploration Location Map			311
	SA	AMPLES			T	Labora	atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-2	Water Content (%)	Dry Density (pcf)	Others
	J.S.	👸	'	MATERIAL DESCRIPTION AND COMMENTS	# ∯	٦ م	0
			 	YOUNGER ALLUYIUM		† 	
-		6	SM	Silty f-m SAND, brown, dry, loose	1.4	96.2	НС
5-		10		Same as above, becomes medium dense	3.9	104.8	SH, EI, MD HC
- 10 - -			ML	F sandy SILT, Dark gray, moist, stiff			
-			SP	F-c SAND, light gray, slightly moist, medium dense			
- - - - - - - -				TRENCH TERMINATED AT 12 FEET No groundwater encountered Trench backfilled with soil cuttings			
EGEND		ple typ		RingSmall Bulk	<u> </u>	/ater Table	e .
ပ္သ	Lab	testing:	2.00	AL = Atterberg Limits EI = Expansion Index SA = Sieve Ana	lysis	RV =	R-Value Test

SH = Shear Test

HC= Consolidation

MD = Maximum Density

EGG OF EXPLORATORY INCHOR											
CLIENT:			RSI Communities	LOGG	ED BY:	DRW					
PRO	JECT	NAME:		Citrus Valley	EQUII	PMENT	Backhoe				
PRO	JECT	NO.:		1776-CR		DATE:	10/9/2017				
LOCATION:			See Exploration Location Map								
	SA	AMPLES				Labora	tory Testing				
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-3	Water Content (%)	Dry Density (pcf)	Others				
	\$	蓋		MATERIAL DESCRIPTION AND COMMENTS	≱ax	۵					
				YOUNGER ALLUYIUM							
•		8	SM	Silty f-m SAND, light brown, dry, loose		:					
•			SM	Silty f-c SAND, brown, slightly moist, loose, trace well-rounded gravel							
5•			SP	F-c SAND, gray, slightly moist, medium dense, trace gravel and cobble, rare boulders							
-				Same as above, no boulders							
				TRENCH TERMINATED AT 10 FEET No groundwater encountered Trench backfilled with soil cuttings							
9	Sam	ple typ	e:	RingBrall Bulk	<u></u> w	/ater Tabl	e				

El = Expansion Index

SH = Shear Test

SA = Sieve Analysis

HC= Consolidation

RV = R-Value Test

MD = Maximum Density

AL = Atterberg Limits

SR = Sulfate/Resisitivity Test

Lab testing:

CLIE	ENT:			RSI Communities	LOGGED BY: DRW		
PRO	JECT	T NAME:	,	Citrus Valley	EQUIPME	ENT	Backhoe
PRO	JECT	T NO.:		1776-CR	D/	ATE:	10/9/2017
LOC	CATIC	ON:		See Exploration Location Map		-	
	5	SAMPLES			Li	abora	tory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-4 MATERIAL DESCRIPTION AND COMMENTS	Water Content (%) Dry Density		Others
	十	+-	 	YOUNGER ALLUYIUM	 	-	
- - -			SM	Silty f-m SAND, light brown, dry, loose			
5-		-	1 .	F-c SAND, brown, dry to slightly moist, loose to medium dense, trace gravel	;		
- - - - 10 -		7		Silty f-c SAND, gray, slightly moist, medium dense			
-			SP	F-c SAND, gray, slightly moist, medium dense, trace fine gravel			
5 -				TRENCH TERMINATED AT 12 FEET No groundwater encountered Trench backfilled with soil cuttings			
3	San	nple type	e :	RingLarge BulkSmall Bulk \(\frac{\z}{2}\)		r Table	1
□ <u> </u>		testing:		AL = Atterberg Limits EI = Expansion Index SA = Sieve Analysi			R-Value Test
٢_				SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidation			Maximum Density

CLIE				RSI Communities	LOGG	ED BY:	DRW			
		NAME:		Citrus Valley	EQUII	PMENT	Backhoe			
		NO.:		1776-CR		DATE:	10/9/2017			
LOC	ATIC	N:		See Exploration Location Map						
	SA	AMPLES	_			Labora	tory Testing			
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-5	Water Content (%)	Dry Density (pcf)	Others			
	\ <u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	ă	٠	MATERIAL DESCRIPTION AND COMMENTS	×at	۵	Ü			
	1			YOUNGER ALLUYIUM						
- -	 		SM	Silty f-c SAND, light brown, dry, loose						
			SP	F-c SAND, brown, slightly moist, loose to medium dense F-c SAND, gray, slightly moist, medium dense, some fine gravel Starts caving TRENCH TERMINATED AT 10 FEET No groundwater encountered Trench backfilled with soil cuttings			SA			
15	Sam	ple typ	<u>e</u> :	RingSmall Bulk	₹	√ater Tabl	e .			

El = Expansion Index

SH = Shear Test

SA = Sieve Analysis

HC= Consolidation

RV = R-Value Test

MD = Maximum Density

AL = Atterberg Limits

SR = Sulfate/Resisitivity Test

Lab testing:

PRO	JECT	NAME: NO.: ON:		RSI Communities Citrus Valley 1776-CR See Exploration Location Map		ED BY: PMENT DATE:	Backhoe
æ	\vdash	AMPLES	mboi	TRENCH NO.: TP-6			atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	12	Water Content (%)	Dry Density (pcf)	Others
	⊭	+		MATERIAL DESCRIPTION AND COMMENTS	}		
-	┨			YOUNGER ALLUYIUM			
- -	1		SM	Silty f-m SAND, light brown, dry, loose			
- -			SP	F-c SAND, brown, slightly moist, loose to medium dense			
5 -	<u> </u>	7	SP	F-c SAND, gray, slightly moist, trace gravel			
- -	X	<u> </u>		Same as above, some fine gravel, becomes medium dense			El
- - - 10 -				Starts caving			
_			ļ	TRENCH TERMINATED AT 10 FEET			
				No groundwater encountered Trench backfilled with soil cuttings			
- - 5 -							
`							
⊒ ב		ple type		RingLarge BulkSmall Bulk AL = Atterberg Limits FI = Expansion Index SA = Sieve Analy	<u> </u>		e R. Value Test

SH = Shear Test

HC= Consolidation

MD = Maximum Density

CLIENT: PROJECT NAME:		RSI Communities Citrus Valley				DRW Backhoe		
PRC	JECT	NO.:		1776-CR	DATE:		10/9/2017	
LOC	LOCATION:			See Exploration Location Map				
SAMPLES						Laboratory Testing		
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-7	Water Content (%)	Dry Density (pcf)	Others	
	\sigma			MATERIAL DESCRIPTION AND COMMENTS	⋛			
,	4			YOUNGER ALLUYIUM				
			SM	Silty f-m SAND, brown, dry, loose				
5.			SP	F-c SAND, brownish gray, slightly moist, few fine gravel, loose to medium dense				
			SP	F-c SAND, gray, slightly moist, medium dense, trace gravel Starts caving				
				TRENCH TERMINATED AT 10 FEET No groundwater encountered Trench backfilled with soil cuttings				
		nple typ				/ater Tabl		
<u>۳</u> ۱	Lab	testing	i	AL = Atterberg Limits EI = Expansion Index SA = Sieve Analy	'SIS	KV =	R-Value Test	

SH = Shear Test

HC= Consolidation

MD = Maximum Density

CLIENT:				RSI Communities		ED BY:			
		NAME:		Citrus Valley	EQUI	PMENT	Backhoe		
		NO.:		1776-CR		DATE:	10/9/2017		
LOC	CATIC)N:		See Exploration Location Map					
	S/	AMPLES			1	Labora	atory Testing		
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-8	Water Content (%)	Dry Density (pcf)	Others		
	ß	蓋		MATERIAL DESCRIPTION AND COMMENTS	ă Ķ	و			
	_			YOUNGER ALLUYIUM					
	1		1	TACHARITATION					
	- - -		SM	Silty f-m SAND, brownish gray, dry, loose					
5•		7	SP	F-c SAND, brownish gray, slightly moist, medium dense, few fine gravel					
-	1		SP	F-c SAND, gray, slightly moist, trace gravel					
- - - 0 -				Starts caving					
_	-			TRENCH TERMINATED AT 10 FEET					
5 -				No groundwater encountered Trench backfilled with soil cuttings					
	Sam	iple type	<u>2</u> :	RingLarge BulkSmall Bulk	¥w	/ater Table	e		
5	Lab	testing:		AL = Atterberg Limits EI = Expansion Index SA = Sieve Analy	/sis	RV =	R-Value Test		

SH = Shear Test

HC= Consolidation

MD = Maximum Density

CLIE	CLIENT:			RSI Communities		: DRW
PRO	ECT	NAME:		Citrus Valley	EQUIPMENT	Backhoe
PROJ	ECT	NO.:		1776-CR	DATE	10/9/2017
LOC	ATIC	N:		See Exploration Location Map		
	S/	MPLES				atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: I-I MATERIAL DESCRIPTION AND COMMENTS	Water Content (%) Dry Density (pcf)	Others
				YOUNGER ALLUYIUM		
- - -			SM	Silty f-c SAND, brownish gray, dry, loose		
				TRENCH TERMINATED AT 3 FEET		
5	Sam	ple typ	<u>e</u> :	No groundwater encountered Trench backfilled with soil cuttings	₩Water Tab	ole
□ ⊨						
<u> </u>	Lab	testing:		AL = Atterberg Limits EI = Expansion Index SA = Sieve Ana SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolid		R-Value Test Maximum Density

PRO PRO	ENT: DJECT DJECT CATIO			RSI Communities Citrus Valley 1776-CR See Exploration Location Map	LOGGED BY: EQUIPMENT DATE:		Backhoe
		AMPLES			1	Lahora	tory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: 1-2	Water Content (%)	Dry Density (pcf)	stando Others
	\sigma_2	8		MATERIAL DESCRIPTION AND COMMENTS	≱	۵	
				YOUNGER ALLUYIUM			
			SM	Silty f-c SAND, brownish gray, dry, loose			
				TRENCH TERMINATED AT 3 FEET	 		
5.				No groundwater encountered Trench backfilled with soil cuttings			
GEND		ple type			<u></u> w		: R-Value Test

SH = Shear Test

SR = Sulfate/Resisitivity Test

HC= Consolidation

MD = Maximum Density

CLIE	LIENT:			RSI Communities		LOGGED BY: DRW	
PROJ	ROJECT NAME ROJECT NO.:			Citrus Valley	EQUIP	MENT	Backhoe
				1776-CR		DATE:	10/9/2017
LOCA	ATIO	N:		See Exploration Location Map			
	SA	MPLES				Labora	tory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: 1-3 MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
	Ħ	=		YOUNGER ALLUYIUM			
			SM	Silty f-c SAND, brownish gray, dry, loose			
_				TRENCH TERMINATED AT 3 FEET			
_		 					
_				No groundwater encountered Trench backfilled with soil cuttings			
5-				Trench backfilled with soil cuttings			
						ļ	
4							
\vdash							
⊢						İ	
ヿ							
10							
						ŀ	
4							
\dashv						i	
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15							
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4							
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血厂		ple typ			<u></u> w		
Ĕ	Lab '	testing		AL = Atterberg Limits EI = Expansion Index SA = Sieve Analy SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolida			R-Value Test

CLIE				RSI Communities		_	LOGG	ED BY:	DRW
PROJ	ECT	NAME:		Citrus Valley				PMENT	Backhoe
		NO.:		1776-CR		_		DATE:	10/9/2017
LOC	ATIC	N:		See Exploration Location	п Мар				
	SA	AMPLES	7				1	Laborato	ry Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TR	RENCH NO.: I	.4	Water Content (%)	Dry Density (pcf)	Others
	Ŋ	<u> </u>		MATERIAL DES	SCRIPTION AND	COMMENTS	Mat	۵	"
				YOUNGER ALLUYIUM					
- -			SM	Silty f-c SAND, brownish gra					
-				TRENCH 1	TERMINATED AT) FEET	 		
5				No groundwater encountered Trench backfilled with soil cu	ed				
	Sa	nle tors	a.	Dine V	1		∇		
		ple typ		Ring	Large Bulk	Small Bulk	<u></u> w	ater Table	
TEGEND	Lab	testing:		AL = Atterberg Limits SR = Sulfate/Resisitivity Test	EI = Expansion Index SH = Shear Test	SA = Sieve Anal) HC≃ Consolida			/alue Test ximum Density

APPENDIX C

LABORATORY TEST RESULTS

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



SUMMARY OF LABORATORY TESTING

In Situ Moisture Content and Unit Weight

The field moisture content was measured in the laboratory on selected samples collected during the field investigation. The field moisture content is determined as a percentage of the dry unit weight. The dry density was measured in the laboratory on selected ring samples. The results are shown on the logs of exploratory trenches in Appendix B.

Moisture-Density Relations

Laboratory testing was performed on a site sample collected during the recent subsurface exploration. The laboratory maximum dry density and optimum moisture content for the sample tested was determined in general accordance with test method ASTM Test Procedure D 1557. The results are shown on Enclosure C-1.

Direct Shear

Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080. The rate of deformation was approximately 0.035 inch per minute. The sample was sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The test was performed on a sample remolded to 90% of the maximum dry density per ASTM D 1557. The shear test results are presented on Enclosure C-2.

Expansion Index

Expansion Index (EI) testing was performed on two soil samples collected from the trenches. Testing was performed in general accordance with ASTM Test Method D 4829. The results are shown on Enclosures C-3 and C-4.

Materials Finer Than the No. 200 Sieve

A #200 sieve wash was performed on selected samples of the soils according to ASTM Test Method D 1140. The results of this testing are presented on the trench logs in Appendix B.

Consolidation

Consolidation/collapse testing was performed on two selected samples of the site soils according to ASTM Test Method D 2435. The results of these tests are presented graphically on Enclosures C-5 and C-6.



Corrosion

Corrosion testing (resistivity per ASTM G187, sulfates per ASTM D516, chlorides per ASTM D512B, pH per ASTM G51) was conducted on representative samples obtained during the field investigation. The test results are included on Enclosure C-7.





MOISTURE/DENSITY RELATIONSHIP

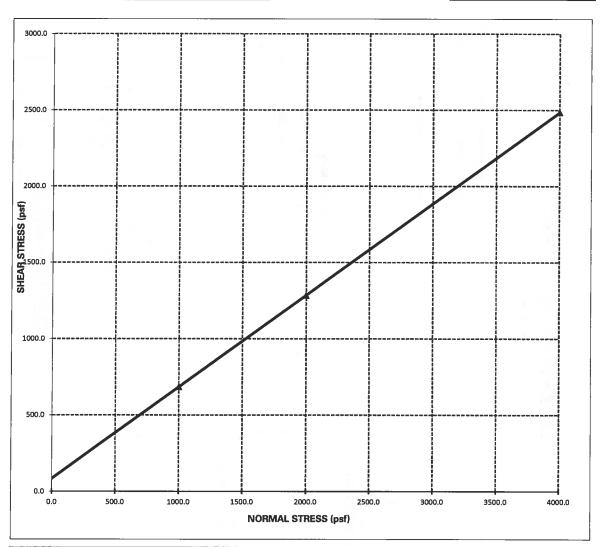
		: RSI Communities	Job No.: <u>1776-CR</u>
		: Citrus Valley	Lab No.: Corona
	Location	: 0	
	Material Type:	Gray Brown Fine Sand w/ Silt	-
	Material Supplier:		
	Material Source:		-
	Sample Location:		_
	oumpro dooddom	11 2 6 0	-
	Sampled By:	DRW	Date Sampled: 13-Oct-17
	Received By:		···
			Date Received: 16-Oct-17
	Tested By:		Date Tested: 16-Oct-17
	Reviewed By:		Date Reviewed:
_	Test Procedure:		
Ove	rsized Material (%):	0.0 Correction	n Required:/es x no
			A DRY DENCITY (140)
	MOISTURE/D	ENSITY RELATIONSHIP CURVE	◆ DRY DENSITY (pcf):
1			■ CORRECTED DRY DENSITY (pcf):
	440	A	SOURCE DE BRY DENGITY (pc).
	140	NATITITI	ZERO AIR VOIDS DRY DENSITY
	135	$\perp N \setminus X \mid \perp \mid \perp \mid \perp \mid \perp \mid \perp$	(pcf)
	155 1 1 1 1 1		× S.G. 2.7
	130		
	100		* S.G. 2.8
Ž	125		
DRY DENSITY, PCF	1		• S.G. 2.6
늗	120		
			Poly. (DRY DENSITY (pcf):)
=	115		
€			OVERSIZE CORRECTED
-	110	++++++++++	7500 AIR VOIDS
			- ZERO AIR VOIDS
	105		Poly. (S.G. 2.7)
1	400		7 diy. (d.d. 2.7)
	0 1 2 3 4 5	6 7 8 9 10 11 12 13 14 15 16 17 18	19 20 Poly. (S.G. 2.8)
	012040	0 7 0 3 10 11 12 13 14 13 10 17 18	19 20
		MOISTURE CONTENT, %	Poly. (S.G. 2.6)
		MOISTURE DENSITY DELAT	TONOUR VALUES
		MOISTURE DENSITY RELAT	White the second of the second
	Maxir	mum Dry Density, pcf 117.0	
	Corrected Maxin	mum Dry Density, pcf	@ Optimum Moisture, %
		MATERIAL DESCR	RIPTION
Grain	Size Distribution:		Atterberg Limits:
	% Gravel (r	retained on No. 4)	Liquid Limit, %
1		assing No. 4, Retained on No. 200)	
		Clay (Passing No. 200)	Plasticity Index, %
	Classificat		
		Unified Soils Classification:	
		AASHTO Soils Classification:	
		7 VOLTE OUTS Classification.	



DIRECT SHEAR TEST

 Project Name:
 Citrus Valley
 Sample Location:
 TP-2 @ 3 - 5 ft

 Project Number:
 1776-CR
 Date Tested:
 10/18/2017



Shear Strength: $\Phi = 31.0^{\circ}$ C = 84.00 psf

Notes:

- I The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.
- 2 The above reflect direct shear strength at saturated conditions.
- 3 The tests were run at a shear rate of 0.035 in/min.



EXPANSION INDEX TEST

(ASTM D4829)

Cllent:	RSI Communities
Project Number:	1776-CR
Project Location:	Citrus Valley

Ring Dia. : 4.01" Ring Ht.:1" Ring #:

Tested' Checked By: Sample Source: Date Tested:

Corona Lab No TP-2@3-5ft 10/16/2017 Ճ

Sample Description:

10 min/Dry Initial TIME READING 0.2320 0.2320 READINGS 5:10 5:20 10/16/2017 DATE

766.5 363.1 403.4 121.7 111.1

A Weight of compacted sample & ring (gm)

DENSITY DETERMINATION

Final

0.2320

5:30

10/17/2017

2.70 62.4

H Unit Wt. of Water @ 20 °C, (pcf)

8 Saturation

G Specific Gravity, assumed F Moisture Content, %

49.7

9.5

SATURATION DETERMINATION

D | Wet Density, lb / ft3 (C*0.3016) **E** Dry Density, lb / ft3 (D/1.F)

C Net weight of sample (gm)

B Weight of ring (gm)

MOISTURE		% Moisture	16.1
FINAL M	Final Weight of wet	sample & tare	793.1

EXPANSION INDEX =



EXPANSION INDEX TEST

(ASTM D4829)

Corona

Lab No

Tested Checked By:

TP-6 @ 6-8 ft 10/16/2017 Ճ

Sample Description:

Sample Source: Date Tested:

1		
RSI Communities	1776-CR	Citrus Valley
Cllent:	Project Number:	Project Location:

Ring Ht.:1"
4.01"
Ring Dia.
Ring #:

		Initial	10 min/Dry	
3	READING	0.3850	0.3850	
READINGS	TIME	4:42	4:52	
~	DATE	10/16/2017		

121.5

D Wet Density, lb / ft3 (C*0.3016) E Dry Density, lb / ft3 (D/1.F)

C Net weight of sample (gm)

B Weight of ring (gm)

110.5

SATURATION DETERMINATION

10.0 2.70

51.4 62.4

H Unit Wt. of Water @ 20 °C, (pcf)

1 % Saturation

G Specific Gravity, assumed F Moisture Content, %

366.2 402.9

769.1

A Weight of compacted sample & ring (gm)

DENSITY DETERMINATION

FINAL MOISTURE		% Moisture	17.2
FINAL M	Final Weight of wet	sample & tare	798.2

Final

0.3850

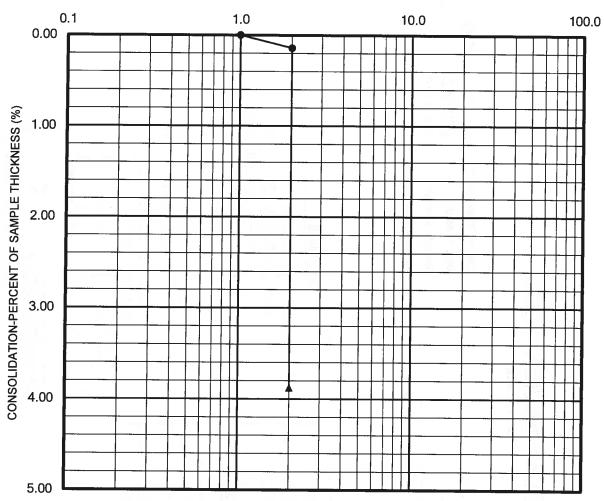
5:30

10/17/2017

FINAL MOISTURE		% Moisture	17.2
FINAL M	Final Weight of wet	sample & tare	798.2

EXPANSION INDEX =





--- Seating Cycle

Loading Prior to Inundation
Loading After Inundation

--★--- Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435



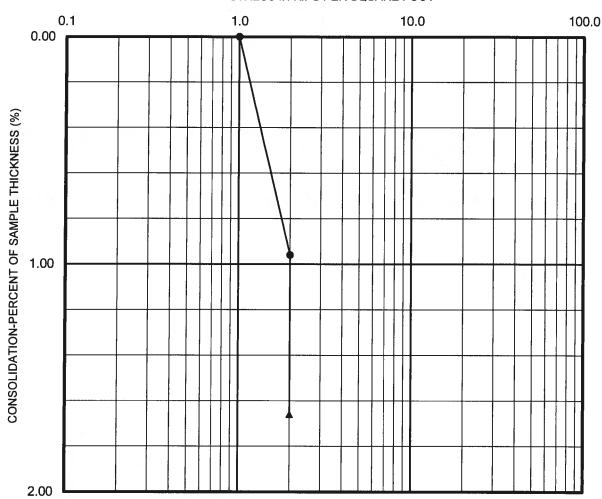
CHECKED BY:	Lab: DI
PROJECT NO.: 1776-CR	Date: 10/16/17

CONSOLIDATION REPORT

Sample: TP-2 @ 2 ft

Plate C-5





--Seating Cycle

Loading Prior to Inundation
Loading After Inundation

--★--- Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435



CLICCKED DV:	Lab. DI
CHECKED BY:	Lab: DI
PROJECT NO.: 1776-CR	Date: 10/16/17

CONSOLIDATION REPORT

Sample: TP-2 @ 6 ft

Plate C-6



Soil Analysis Lab Results

Client: Geotek Inc Job Name: Citrus Valley Client Job Number: 1776-CR Project X Job Number: S171017B October 18, 2017

	Method	ASTM	1 G187	ASTN	4 D516	ASTM	D512B	SM 4500-E	SM 4500-C	SM 4500-D	ASTM G200	ASTM G51
Bore# / Description	Depth		tivity Minimum	Sulf	fates	Chlo	rides	Nitrate	Ammonia	Sulfide	Redox	pН
	(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(mg/kg)	(mg/kg)	(mg/kg)	(mV)	
TP-2	3.0-5.0	134,000	15,410	6	0.0006	18	0.0018	ND	5.8	0.36	201	8.36
TP-6	6.0-8.0	321,600	18,760	3	0.0003	15	0.0015	ND	3.5	0.27	205	7.91

Unk = Unknown

ND = 0 = Not Detected

NT = Not Tested

mg/kg = milligrams per kilogram (parts per million) of dry soil weight

Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Ernesto Padilla, BSME

Field Engineer

Respectfully Submitted,

Ed Hernandez, M.Sc., P.E.

Sr. Corrosion Consultant

NACE Corrosion Technologist #16592

Professional Engineer

California No. M37102

ehernandez@projectxcorrosion.com



Enclosure C-7

APPENDIX D

INFILTRATION RATE RESULTS

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



Client:

RSI Communities

Project:

Citrus Valley Project

Project No:

1776-CR

Date:

10/11/2017

Test No.

I-I @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	10	min
Final Depth to Water, $D_F =$	11.750	in
Test Hole Radius, r =	4	in
Initial Depth to Water, $D_0 =$	0	in
Total Test Hole Depth, $D_T =$	12	in

Equation -	_t =	ΔH (60r)	
		Δt (r+2H _{avg})	
$H_O = D_T - D_O =$		12	in
$H_F = D_T - D_F =$		0.25	in
$\Delta H = \Delta D = H_{O} - H_{F} =$		11.75	in
$Havg = (H_O + H_F)/2 =$		6.125	in

I_t = 17.354 Inches per Hour



Client:

RSI Communities

Project:

Citrus Valley Project

Project No:

1776-CR

Date:

10/11/2017

Test No.

I-2 @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	8.75	min
Final Depth to Water, $D_F =$	12.000	in
Test Hole Radius, r =	4	in
Initial Depth to Water, D_0 =	0	in
Total Test Hole Depth, $D_T =$	12	in

Equation -
$$I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$$

$$H_O = D_T - D_O = \frac{12}{4} \quad \text{in}$$

$$H_F = D_T - D_F = 0$$
 in $\Delta H = \Delta D = H_O - H_F = 12$ in $Havg = (H_O + H_F)/2 = 6$ in



Client:

RSI Communities

Project:

Citrus Valley Project

Project No:

1776-CR

Date:

10/11/2017

Test No.

I-3 @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, Δt =	10	min
Final Depth to Water, $D_F =$	11.500	in
Test Hole Radius, r =	4	in
Initial Depth to Water, $D_O =$	0	in
Total Test Hole Depth, $D_T =$	12	

Equation -	$l_t =$	ΔH (60r)		
		$\Delta t (r+2H_{avg})$		
$H_O = D_T - D_O =$		12	in	
$H_F = D_T - D_F =$		0.5	in	
$\Delta H = \Delta D = H_{O}$	H _F =	11.5	in	
$Havg = (H_O + H_F)$)/2 =	6.25	in	

I_t = 16.727 Inches per Hour



Client:

RSI Communities

Project:

Citrus Valley Project

Project No:

1776-CR

Date:

10/11/2017

Test No.

I-4 @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	10	min
Final Depth to Water, $D_F =$	8.250	in
Test Hole Radius, r =	4	in
Initial Depth to Water, $D_0 =$	0	in
Total Test Hole Depth, $D_T =$	12	in

Equation -
$$I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$$
 $H_O = D_T - D_O = 12$ in $H_F = D_T - D_F = 3.75$ in $\Delta H = \Delta D = H_O - H_F = 8.25$ in $H_{avg} = (H_O + H_F)/2 = 7.875$ in



APPENDIX E

GENERAL GRADING GUIDELINES

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the California Building Code, CBC (2016) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

- 1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
- 2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
- 3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
- 4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.



- In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
- 6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a minimum of 48 to 72 hours to complete test procedures. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
- 7. Procedures for testing of fill slopes are as follows:
 - a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
 - b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
- 8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

- I. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
- 2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
- 3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

Treatment of Existing Ground

 Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed unless otherwise specifically indicated in the text of this report.



- 2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
- 3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
- 4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
- 5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Fill Placement

- I. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
- 2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
- 3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
 - a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
 - b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
- 4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
 - a) They are not placed in concentrated pockets;
 - b) There is a sufficient percentage of fine-grained material to surround the rocks;
 - The distribution of the rocks is observed by, and acceptable to, our representative.
- 5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
- 6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable



methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

- 1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
- Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
- 3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
- 4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
- 5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.



- 2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
 - a) shallow (12 + inches) under slab interior trenches and,
 - b) as bedding in pipe zone.

The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.

- 3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
- 4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
- 5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

- I. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
- 2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
- 3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.



In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

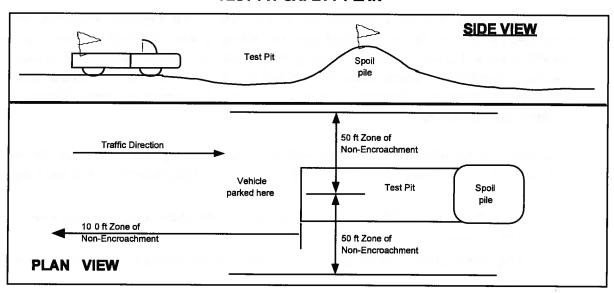
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN





Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

- 1. is 5 feet or deeper unless shored or laid back,
- 2. exit points or ladders are not provided,
- 3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
- 4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractors representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project

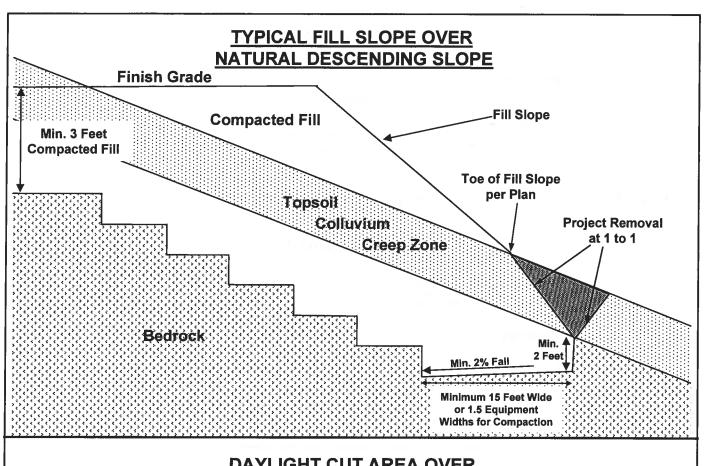


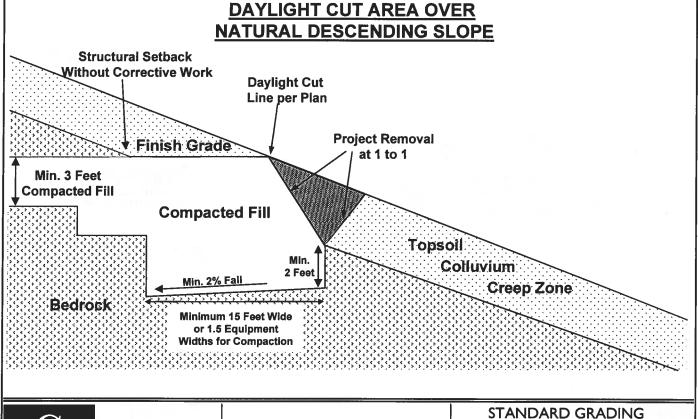
manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.







TREATMENT ABOVE

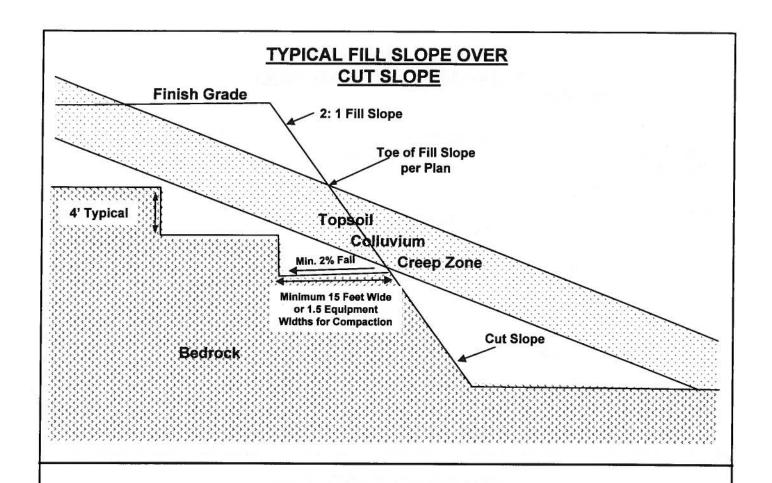
NATURAL SLOPES

1548 North Maple Street

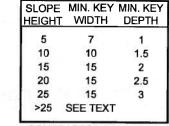
Corona, California 92880

GEOTEK

GUIDELINES







CONTRACTOR TO VERIFY WITH SOIL ENGINEER PRIOR TO CONSTRUCTION

Bedrock or Sultable Dense Material Minimum compacted fill required to provide lateral support.

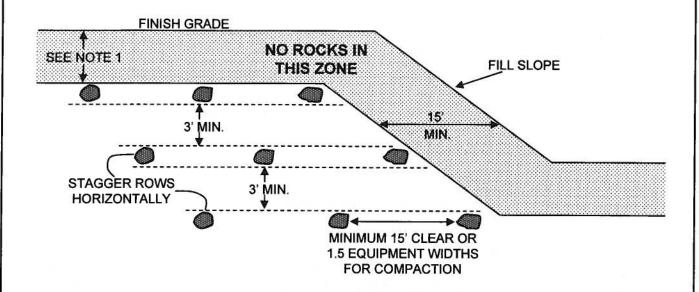
Excavate key if width or depth:



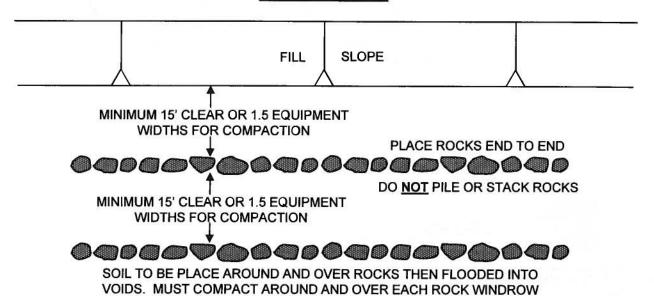
1548 North Maple Street Corona, California 92880 COMMON FILL SLOPE KEYS

STANDARD GRADING GUIDELINES

CROSS SECTIONAL VIEW



PLAN VIEW



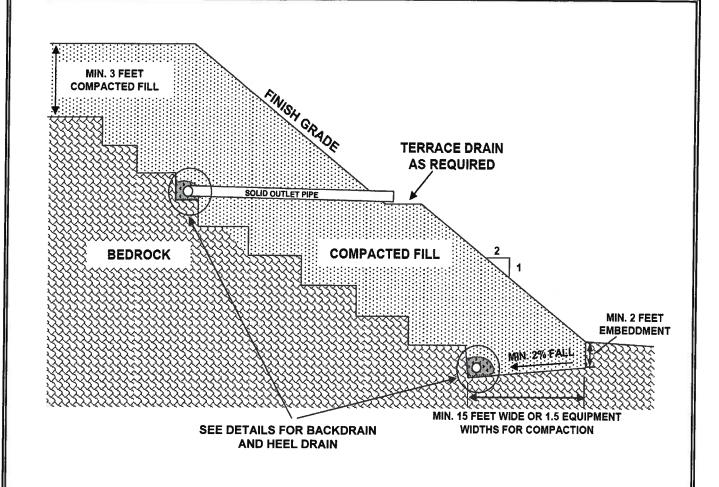
NOTES:

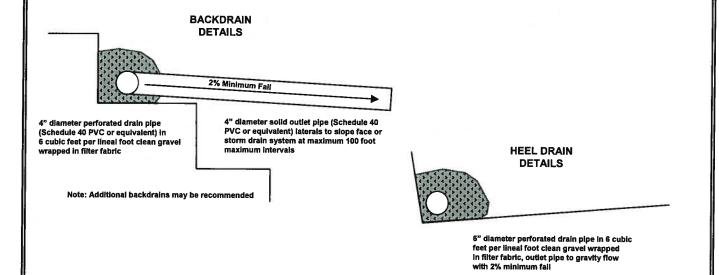
- 1) SOIL FILL OVER WINDROW SHOULE BE 7 FEET OR PER JURISDUICTIONAL STANDARDS AND SUFFICIENT FOR FUTURE EXCAVATIONS TO AVOID ROCKS
- 2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER
- 3) SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO SOIL ENGINEER ACCEPTANCE
- 4) SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION
- INDIVDUAL LARGE ROCKS MAY BE BURIED IN PITS.



1548 North Maple Street Corona, California 92880 **ROCK BURIAL DETAILS**

STANDARD GRADING GUIDELINES







1548 North Maple Street Corona, California 92880 TYPICAL BUTTRESS AND STABILIZATION FILL

STANDARD GRADING GUIDELINES

Appendix D2 Geotechnical Evaluation Peer Review Letter

HERITAGE SPECIFIC PLAN
INITIAL STUDY



To: Loralee Farris, City of Redlands

From: Emily Elliott, AICP, Michael Baker International

Date: July 18, 2019

Project: Griffin Homes Heritage Specific Plan IS/MND

Subject: Review of the Updated Geotechnical and Infiltration Evaluation for

Proposed Residential Development Citrus Valley Project North of San Bernardino Avenue and West of Texas Street, City or Redlands, San Bernardino County, California, Prepared by GeoTek, Inc. (October 2017)

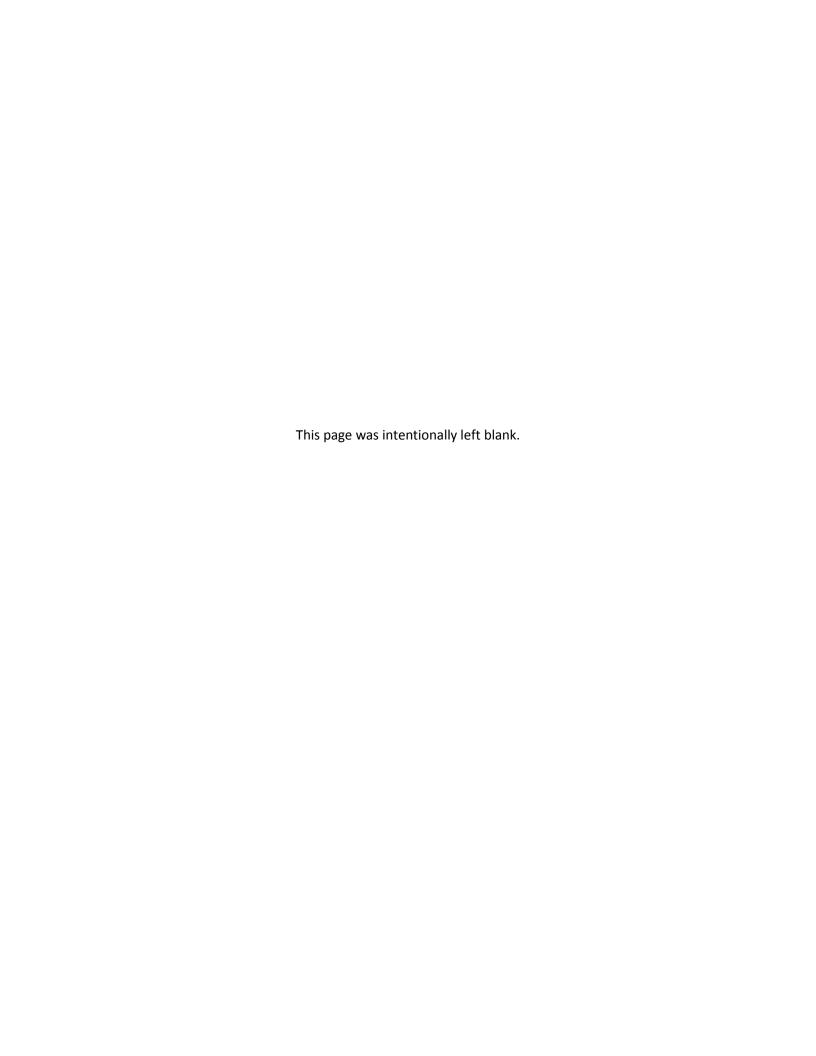
Introduction

As requested, Michael Baker International (Michael Baker) reviewed the Updated Geotechnical and Infiltration Evaluation for Proposed Residential Development Citrus Valley Project North of San Bernardino Avenue and West of Texas Street, City or Redlands, San Bernardino County, California, Prepared by GeoTek, Inc. (October 2017) (Geotechnical Evaluation) for the proposed project. Specifically, the area discussed in this memorandum consists of an approximately 37.3-acre study area. The project site is situated within Assessor's Parcel Numbers 0167-091-02-0000, 0167-091-04-0000, 0167-091-05-0000, and 0167-091-08-0000, located west of Texas Street, north of San Bernardino Avenue and south of Pioneer Avenue, in the City of Redlands, San Bernardino County, California.

Findings and Opinions

Based upon a review of the Geotechincal Evaluation, it is our professional opinion that the research, methods, and analysis applied are consistent with current industry standards and covers the geotechnical subject matter applicable to environmental review. Therefore, the information and results provided in these reports appears to be adequate for incorporating into the California Environmental Quality Act document.

Please do not hesitate to contact me at (949) 974-4961 or Emily. Elliott@mbakerintl.com if you have any further questions or if above statement needs further clarification.



Appendix E1 Phase I Environmental Site Assessment

HERITAGE SPECIFIC PLAN
INITIAL STUDY

Phase 1

Executive Summary

The following is an Executive Summary of the Phase I Environmental Site Assessment (Phase I ESA) that was conducted by Converse Consultants (Converse). Please refer to the appropriate sections of the report for a complete discussion of these issues. In the event of a conflict between this Executive Summary and the report, or an omission in the Executive Summary, the report shall prevail.

This report presents the results of the Converse Phase I ESA performed for 37.9 acres of land identified with the Assessor Parcel Numbers (APN) 0167-091-02, 0167-091-04, 0167-091-05, 0167-091-08 in the City of Redlands, San Bernardino , California, referred to as the Property in this report. Converse was retained by RSI Communities to conduct this Phase I ESA. Our study has been conducted in order to identify, to the extent practical within the scope of an ESA, Recognized Environmental Conditions (RECs) in connection with the Property.

Converse has compiled and reviewed information that was obtained from interviews, document research, and on-site and area reconnaissance to identify potential environmental conditions at the Property, in conformance with the ASTM Standard E: 1527-13 Environmental Site Assessment Standard Practice (ASTM Standard: E1527-13). This Phase I ESA was conducted during the period of September 22, 2017 to October 20, 2017.

Repoi	rt Section	No Further Action	REC	CREC	HREC	Other Environmental Considerations	Recommended Action
3.0	USER PROVIDED INFORMATION & RESPONSIBILITIES	~					
5.2.5	Summary of Historical Property Use		>				Prior agricultural use; limited soil sampling is being conducted concurrently.
5.2.6	Summary of Past Uses of Adjoining Properties	*					
5.2.7	Summary of Past Uses of the Surrounding Area	*					
5.3.1	Property Listings	~				П	

Report Section		No Further Action	REC	CREC	HREC	Other Environmental Considerations	Recommended Action
5.3.2	Adjoining Properties	~					
5.3.3	Other Off-site Locations of Concern	*					
5.4	Additional Environmental Record Sources	>					
6.3	Exterior Observations of Property	*					
6.4	Current Uses of Adjoining Properties	~					
6.5	Current Uses of Surrounding Area	~					
7.0	INTERVIEWS	~					

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1.0 INTRODUCTION

1.1 Purpose and Scope of Services

This report presents the results of the Converse Consultants (Converse) Phase I Environmental Site Assessment (ESA) performed for 37.9 acres of land identified with Assessor Parcel Numbers (APN) 0167-091-02, 0167-091-04, 0167-091-05, 0167-091-08 in the City of Redlands, San Bernardino County, California, referred to as the Property in this report. Converse was retained by RSI Communities to conduct this Phase I ESA. Our study has been conducted in order to identify, to the extent practical, Recognized Environmental Conditions (RECs) in connection with the Property. The term Recognized Environmental Conditions is defined in Section 1.1.1 of the American Society of Testing and Materials (ASTM) Standard Practice as the presence or likely presence of any hazardous substances or petroleum products in, at or on a property due to any release to the environment; under conditions indicative of a release to the environment; under conditions that pose a material threat of a future release to the environment.

This Phase I ESA was completed in accordance with our proposal dated September 22, 2017. Our work consisted of the following and was completed in general conformance with the scope and limitations of the ASTM Practice E1527-13 and complies with standards and practices set forth in 40 Code of Federal Regulations (CFR) Part 312 for AAI.

- Interviews with the Property owner representatives
- Property and vicinity reconnaissance
- Review of regulatory agency records
- Description of physical setting
- Historical review
- Interviews with public agency personnel
- Preparation of this report

1.2 Non-Scope Considerations

There are a number of non-scope issues which are sometimes assessed concurrently with a Phase I ESA. Unless specifically agreed in the contract proposal documents,

these non-scope considerations are not included as part of the Phase I ESA. Examples of non-scope issues include:

- Asbestos-containing building material
- Lead-based Paint
- Lead in Drinking Water
- Wetlands
- · Cultural & Historic Resources
- Radon
- Regulatory Compliance
- Ecological Resources
- Industrial Hygiene
- · Health & Safety
- Mold
- Diffuse Anthropogenic Pollution
- Endangered Species
- Indoor Air Quality
- Biological Agents
- Non-liquid Polychlorinated Biphenyls

1.3 Significant Assumptions

No assumptions were made for this assessment that need to be noted as significant.

1.4 Limitations and Exceptions

The following limitations and exceptions were encountered during the course of this assessment:

• Ground surface of the eastern portion of the Property was covered with extensive vegetation and could not be observed.

1.5 Special Terms and Conditions

No other users were identified.

1.6 Reliance

This report is for the sole benefit and exclusive use of RSI Communities. Its preparation has been in accordance with generally accepted environmental practices. No other warranty, either express or implied, is made. The Scope of Services associated with the report was designed solely in accordance with the objectives, schedule, budget, and risk-management preferences of RSI Communities.

This report should not be regarded as a guarantee that no further contamination, beyond that which could be detected within the scope of this assessment, is present at the Property. Converse makes no warranties or guarantees as to the accuracy or completeness of information provided or compiled by others. It is possible that information exists beyond the scope of this assessment. It is not possible to absolutely confirm that no hazardous materials and/or substances exist at the Property. If none are identified as part of a limited scope of work, such a conclusion should not be construed as a guaranteed absence of such materials, but merely the results of the evaluation of the property at the time of the assessment. Also, events may occur after the Property visit, which may result in contamination of the Property. Additional information, which was not found or available to Converse at the time of report preparation, may result in a modification of the conclusions and recommendations presented.

Any reliance on this report by Third Parties shall be at the Third Party's sole risk. Should RSI Communities wish to identify any additional relying parties not previously identified, a completed Application of Authorization to Use (see Appendix A of this report) must be submitted to Converse Consultants.

2.0 PROPERTY DESCRIPTION

ltem	Comment
Current Use(s) of the Property	The Property is owned by Redlands Re Holdings, LLC, a California Limited Liability Company and is identified as Citrus Valley Redlands. The Property includes 37.9 acres of land, formerly developed with citrus groves. A Property location map and a field generated Property plan are provided in Appendix B. Pertinent Property photographs are provided in Appendix C.
Location and Legal Description	The Property is located on the southwest corner of Texas Street and West Pioneer Avenue, approximately 0.5 miles east of the 210 Freeway and 1-mile north of the 10 Freeway. The San Bernardino County Assessor's Parcel Number for the Property is 167-091-02, 0167-091-04, 0167-091-05 and 0167-091-08. The legal description of the Property are described as the following: APN 0167-091-02 SUB S 1/2 SE 1/4 SEC 16 TP 1S R 3W LOT 4 9.55 AC APN 0167-091-04 SUB S 1/2 SE 1/4 SEC 16 TP 1S R 3W LOT 2 9.55 AC APN 0167-091-05 SUB S 1/2 SE 1/4 SEC 16 TP 1S R 3W LOT 1 9.25 AC APN 0167-091-08 SUB S 1/2 SE 1/4 SEC 16 TP 1S R 3W LOT 3 9.55 AC
Zoning Information	According to the City of Redlands, Planning Department, the zoning for the Property is CP-7, which is defined as Planned Commercial.
Property Characteristics	The Property is currently includes remnants of former agricultural use.

Item	Comment				
Description of Property Structure(s)	No structures are located at the Property.				
	The following services were present in the vicinity of the Property at the time of the assessment.				
Electricity	Southern California Edison				
Gas	Southern California Gas Company				
Potable Water	City of Redlands				
Sanitary Sewer	City of Redlands				

3.0 USER PROVIDED INFORMATION & RESPONSIBILITIES

3.1 Requested Documents and Information

The ASTM E1527-13 specifies that the User, RSI Communities provide any helpful documents that may be available, as listed below.

- · Environmental site assessment or environmental compliance audit reports
- · Environmental permits or hazardous waste generator notices/reports
- Registrations for aboveground and underground storage tanks
- Septic systems, oil wells, or water wells
- · Registrations for underground injection systems
- Material Safety Data Sheets; Community Right to Know Plans; or Safety, Preparedness and Prevention Plans; Spill Protection Countermeasures and Control Plans
- · Reports regarding hydrologic conditions on the Property or surrounding area
- Notices or other correspondence from any government agency relating to past or current violations of environmental laws with respect to the Property or relating to environmental liens encumbering the Property.
- · Hazardous waste generator notices or reports
- · Geotechnical studies
- · Risk assessments
- Recorded Activity Use Limitations (AULs)
- Proceedings regarding hazardous substances and petroleum products including any pending, threatened or past: litigation; administrative proceedings; or notices from any governmental entity regarding possible violations of environmental laws or other possible liability related to hazardous substances or petroleum products.

The following documents were provided for review:

A <u>DRAFT Phase I ESA</u> prepared by Ninyo & Moore dated June 20, 2005 was appended to the Environmental Impact Report (EIR) that was provided for review. Ninyo & Moore did not identify any RECs during their assessment.

A <u>Biological Technical Report</u> prepared by Ultra Systems Environmental dated June 11, 2006 was appended to the EIR that was provided for review. No environmental concerns were noted.

A <u>Geotechnical Study</u> prepared by Ultra Systems Environmental dated June 21, 2006 to was appended to the EIR that was provided for review. No environmental concerns were noted.

A <u>Cultural Resources Technical Report</u> prepared by Ultra Systems Environmental dated July 5, 2006 was appended to the EIR that was provided for review. No environmental concerns were noted.

A <u>Special Status Wildlife and Plant Species Potentially Occurring with the Study Area Report</u> was appended to the EIR that was provided for review. No environmental concerns were noted.

A <u>Preliminary Hydrology Study and Drainage Analysis prepared</u> by Joseph E. Bonadiman & Associates, Inc. dated January 23, 2007 was appended to the EIR that was provided for review. No environmental concerns were noted.

A <u>Preliminary Title Report</u> prepared by First American Title Insurance dated September 15, 2017 was provided for review. No environmental concerns were noted.

A <u>Natural Hazard Disclosure Statement and Acknowledgement of Receipt</u> prepared by the First American Natural Hazard Disclosure dated September 19, 2017 was provided for review. No environmental concerns were noted.

3.2 User Provided Information

Section 6 of ASTM E1527-13 outlines specific User's responsibilities. This information will help identify the possibility of RECs in connection with the Property. The ASTM Standard provides a questionnaire to help the User to comply with the statutory requirements to perform tasks which would help identify RECs. Converse included the questionnaire as Attachment A to our proposal. In general, any Users should make Converse aware of information they have regarding the following:

- Environmental Cleanup Liens filed or recorded against the Property
- Activity and land use limitations that are in place on the Property or have been filed or recorded in a registry.

- Specialized knowledge or experience of the person seeking to qualify for the Legal Liability Protections (LLP)
- Relationship of the purchase price to fair market value of the Property if it were not contaminated
- · Commonly known or reasonably ascertainable information about the Property
- The degree or obviousness of the presence or likely presence of contamination at the Property, and the ability to detect this contamination by appropriate investigation.

3.2.1 Environmental Cleanup Liens

The title records were provided and are included in Appendix D, Supplemental Information. No environmental concerns were noted.

3.2.2 Activity and Use Limitations

The User did not have any information indicating they were aware of any AULs.

3.2.3 Specialized Knowledge or Experience

The User did not have any information indicating they had specialized knowledge or experience related to the Property or nearby property.

3.2.4 Reason for Significantly Lower Purchase Price

Converse has no information regarding the purchase price of the Property or comparable properties. The User has not indicated to Converse that there is any conclusion that there was a lower purchase price because of known or suspected contamination at the Property.

3.2.5 Commonly Known or Reasonably Ascertainable Information

The User did not have any information about past uses, specific chemicals at the Property, past spills, environmental cleanup or other reasonably ascertainable information regarding the Property.

3.2.6 Obviousness of Contamination

The User did not provide any information based on their knowledge or experience that would be obvious indicators of contamination on the Property.

Unless specifically stated otherwise in the Scope of Services, the purpose of this Phase I ESA was to qualify for the landowner liability protections to CERCLA Liability as described in ASTM E1527-13.

Business risk unrelated to the CERCLA innocent landowners defense are only assessed as specifically agreed in the Scope of Services and discussed in Section 11.0, Additional Non-Scope Services, of this report.

3.3 Continuing Obligations

In order to assert a LLP, the User must satisfy a number of statutory requirements that are generally referred to as Continuing Obligations, which are outside the Scope of Services of the Phase I ESA. Examples of Continuing Obligations include providing legally required notices, stopping continuing releases and complying with land use restrictions. Failure to comply with these and other statutory post-acquisition requirements will jeopardize liability protection.

It is the responsibility of the User to comply with the Continuing Obligations requirements of ASTM E1527-13 and AAI. Anyone seeking LLP protections should take independent action beyond this Phase I ESA to perfect their position.

4.0 OWNER PROVIDED INFORMATION

The ASTM E1527-13 specifies that the Property owner and the Key Site Manager provide any helpful documents that may be available as listed below.

- Environmental site assessment or environmental compliance audit reports
- Environmental permits or hazardous waste generator notices/reports
- · Registrations for aboveground and underground storage tanks
- · Septic systems, oil wells, or water wells
- · Registrations for underground injection systems
- Material Safety Data Sheets; Community Right to Know Plans; or Safety, Preparedness and Prevention Plans; Spill Protection Countermeasures and Control Plans
- Reports regarding hydrologic conditions on the Property or surrounding area
- Notices or other correspondence form any government agency relating to past or current violations of environmental laws with respect to the Property or relating to environmental liens encumbering the Property.
- · Hazardous waste generator notices or reports
- Geotechnical studies
- Risk assessments
- Recorded AULs
- Proceedings regarding hazardous substances and petroleum products including any pending, threatened or past: litigation; administrative proceedings; or notices from any governmental entity regarding possible violations of environmental laws or other possible liability related to hazardous substances or petroleum products.

Information provided by the Owner was provided by the User of the report. Please refer to Section 3.0.

5.0 RECORDS REVIEW

5.1 Physical Setting

ltem	Comments
Physical Setting	The Property is located approximately 1,305 feet above mean sea level with surface topography sloping towards the southwest (United States Geological Survey [USGS] Topographic Map, Redlands, California 2015).
Geology	The Property is underlain by marine and non-marine (continental) sedimentary rocks of the Pleistocene-Holocene Age (Division of Mines and Geology, Geologic Map of California, 2010).
Groundwater	According to information obtained from the Regional Water Quality Control Board for a site located approximately 0.5 mile south of the Property (1401 Texas Street), groundwater in the vicinity of the Property is expected to be encountered at a depth of 95 feet below grade and generally flows in a westerly direction.
Potable Water Supply	Potable water is supplied by the City of Redlands.

5.2 Historical Review

5.2.1 Aerial Photograph and Map Review

Available historical aerial photographs and maps, which were provided by Environmental Risk Information Services (ERIS), were reviewed.

A summary of the review is provided in the following table. Copies of the aerial photographs and topographic maps are provided in Appendix D, Historical Information.

Table 1 - Historical Resource Review

Property	Adjoining Properties	General Vicinity						
1899, 1901 Topographic Map								
Undeveloped	Undeveloped	Undeveloped						
1930, 1938 Aerial Photog	1930, 1938 Aerial Photographs							
Agricultural	Agricultural; Industrial	Agricultural; Scattered Residential						
1948 Aerial Photograph								
Agricultural	Agricultural; Industrial	Agricultural; Scattered Residential						
1952 Aerial Photographs,	1954 Topographic Map &	1959 Aerial Photograph						
Agricultural	Agricultural; Industrial	Agricultural; Scattered Residential						
1966 Aerial Photograph 8	1967 Topographic Map							
Agricultural	Agricultural; Industrial; Residential	Agricultural; Scattered Residential						
1973 Topographic Map &	1974 Aerial Photograph							
Agricultural	Agricultural; Industrial; Residential							
1980 Topographic Map, 1985 Aerial Photograph & 1988 Topographic Map								
Agricultural	Agricultural; Industrial; Residential	Agricultural; Scattered Residential						
1994 Aerial Photograph & 1996 Topographic Map								

Property	Adjoining Properties	General Vicinity		
Agricultural	Agricultural; industrial; Residential	Agricultural; Residential		
2002, 2004 & 2006 Aerial Photographs				
Agricultural	Agricultural; Residential	Agricultural; Residential		
2010, 2012 Aerial Photographs, 2015 Topographic Map & 2016 Aerial Photograph				
Agricultural	Residential; Undeveloped; A school is located to the north of the Property.	Undeveloped; Residential; Agricultural		

5.2.2 Building Permit Review

Based on the lack of development at the Property, no building records were available for review.

5.2.3 City Directories

City directories were requested from ERIS. However, no information regarding the Property was provided.

5.2.4 Data Failure

Historical information regarding the Property indicated the Property was undeveloped land as early as 1899. Therefore, no historical data failure occurred during this assessment.

5.2.5 Summary of Historical Property Use

According to historical sources, the Property was undeveloped from as early as 1899. By 1930, the Property was developed for agricultural use with remnants of agricultural use still observed during the October 2017 Property Reconnaissance.

5.2.6 Summary of Past Uses of Adjoining Properties

According to historical sources, the adjoining properties were undeveloped from as early as 1899. By 1930, the adjoining properties were developed with agricultural and industrial uses. By the mid 1960s, the adjoining properties were also developed for residential purposes. By 2010, the adjoining property to the north was developed with the current school.

5.2.7 Summary of Past Uses of the Surrounding Area

According to historical sources, the general vicinity of the Property appeared to be undeveloped from as early as 1899. By 1930, the general vicinity was developed for agricultural, residential and industrial uses.

5.3 Results of Environmental Records Sources Review

An ERIS report of Standard Environmental Record Sources (Records) was prepared specifically for the Property. The search included queries to the following databases for cases within specified ASTM search distances. A copy of the database report is provided in Appendix F, Regulatory Database Report.

5.3.1 Property Listings

The Property was not identified on the databases in the regulatory database report.

5.3.2 Adjoining Properties

The following adjoining properties were identified on the databases in the ERIS report.

- Citrus Valley High School Redlands Unified School District /New High School
 No. 3 (Map Key ID 1 and 4) at 800 West Pioneer Avenue located to the north
 was identified on the San Bernardino County Certified Unified Program Agency
 (CUPA) site, Envirostor site and School (SCH) site on the regulatory database
 report. This site was evaluated as a school site with the DTSC and no further
 action was warranted. This site was also identified as a conditionally exempt
 small quantity generator. No violations were noted.
- Redlands Farming Company at 780 West San Bernardino Avenue (Map Key ID 2) was identified for a historical Envirotor site with no further action recommended. This site was identified with a release of pesticides to the soil from rinse water and waste production, in addition to unspecified oil containing wastes and wastes oil/mixed oil from previous oil tanks located at this site. This site was granted no further action by the DTSC after a completion of an on-site screening on October 27, 1994. No further information was provided on the regulatory database report or Envirostor database.

Based on the current status and non-contiguous location, these sites are not expected to represent a significant concern to the Property.

Surrounding Properties Summary

Database	Site Name	Address	Dist. (mi) / Dir.	Elev. diff. (ft)	Comments
SANBERN CUPA	CITRUS VALLEY HS - REDLANDS USD	800 W PIONEER AVE800 W PIONEER AVE, REDLANDS, CA, 92374	0.16/ NE	11.0	North/ Conditionally Exempt Small Quantity Generator permitted with the San Bernardino County CUPA; Facility ID FA0013410. No violations were noted.
ENVIROSTO	RREDLANDS FARMING COMPANY	780 WEST SAN BERNARDING AVENUE, REDLANDS, CA, 92373	0.21/ ESE	18.0	East/ Historical Envirostor site that had known contaminated soil. The DTSC issued NFA based on site screening on October 27, 1994.

Database	Site Name	Address	Dist. (mi) / Dir.	Elev. diff. (ft)	Comments
SANBERN CUPA	PARAMOUNT CITRUS-RED HEIGHTS	780 W SAN L ANDS ARDING AVE, REDLANDS, CA, 92373	0.24/ D SE	18.0	East/ Inactive handler of hazardous wastes (Permit ID PT0002675).
ENVIROSTO	RNEW HIGH SCHOOL NO.3	TEXAS STREET/W. PIONEER AVENUE, REDLANDS, CA, 92374	0.25/N	-6.0	North/ School evaluation, no further action.
SCH	NEW HIGH SCHOOL NO.3	TEXAS STREET/W. PIONEER AVENUE, REDLANDS, CA, 92374	0.25/N	-6.0	North/ School evaluation, no further action.

5.3.3 Other Off-site Locations of Concern

Other off-site locations of concern identified by ERIS within a maximum one-mile radius from the Property included waste generators, leaking tank sites, Superfund sites and permitted underground storage tanks sites.

The potential for environmental concern to the Property from these off-site locations appears to be low due to one or more of the following: location with respect to direction of regional groundwater, type of regulatory listing, current status of listing, no indication of leak/spill, and/or responsible parties identified.

5.3.4 Orphan Listings

The ERIS database report identified 17 orphan listings. The locations of sites that were identified by address were found to be in the general vicinity of the Property; however, due to distance, location with respect to the direction of regional groundwater, and/or type of listing were determined to have a low potential for environmental concern to the Property.

Other orphan sites were identified only by street name. These street names were found in the general vicinity of the Property; however, the specific site locations could not be determined. These orphan sites appeared to have a low potential for environmental impact to the Property due to one or more of the following: type of regulatory listing; type of resource (soil) affected, location with respect to the direction of regional groundwater, distance from the Property; status of the case; remedial efforts being directed by a regulatory agency; and/or potential responsible parties have been identified.

5.4 Additional Environmental Record Sources

Federal Agencies

Federal Agencies		
Source	Comments	
U.S. Department of Transportation, Pipeline and Hazardous Material Safety Administration (PHMSA)	PHMSA online mapping system for gas transmission pipelines or hazardous liquid pipelines in San Bernardino County was reviewed (https://www.npms.phmsa.dot.gov/default.htm). No pipelines are located on the Property or adjacent properties.	

State Agencies

State Agencies			
Source	Comments		
California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC)	There is no information regarding the Property on file. The Envirostor website (http://www.envirostor.dtsc.ca.gov/public/) was reviewed for information, and the Property was not listed in the database.		
Cal/EPA, Santa Ana Regional Water Quality Control Board (RWQCB)	No information regarding the Property was on file with the RWQCB. The Geotracker website (http://geotracker.waterboards.ca.gov/) was reviewed for information, and the Property was not listed in the database.		
California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR)	According the DOGGR Well Finder database (http://maps.conservation. ca.gov/doms/doms-app.html), there are no oil or gas wells located on the Property or adjacent properties.		

Local Agencies

Source	Comments
South Coast Air Quality Management District (SCAQMD)	No information regarding the Property was on file with SCAQMD.

Source	Comments
San Bernardino County Fire Department (SBCFD)	No information regarding the Property was on file with SBCFD.

6.0 PROPERTY RECONNAISSANCE

6.1 Methodology

On October 5, 2017, Converse visited the Property to evaluate present use and to identify observable environmental conditions at the Property. Our methodology involved walking the perimeters, center lines, and accessible areas while observing evidence of present and potential environmental concerns

A field-generated map is provided in Appendix B. Pertinent Property photographs are provided in Appendix C.

6.2 Limiting Conditions

Converse's findings are based on the Property conditions observed on Thursday, October 5, 2017.

Ground surface of the eastern portion of the Property was covered with extensive vegetation and could not be observed.

6.3 Exterior Observations of Property

During our Property visit, Converse made the following observations of the exterior of the Property:

Table 4 – Exterior Observations of Property

Item or Condition	Observed Evidence	No Evidence Observed	Comments
Hazardous Substances & Petroleum Products:		*	

Item or Condition	Observed Evidence	No Evidence Observed	Comments
Storage Tanks and Related Equipment:	-	*	
Odors:		>	
Standing Surface Water or Other Pools of Liquid:		*	
Drums & Other Containers of Hazardous Substances, Petroleum Products, or Other Unidentified Contents:		*	
Transformers or Equipment containing Polychlorinated Biphenyls (PCBs):	2 15	~	
Pits, Ponds, or Lagoons:		~	
Stained Soil or Pavement:	*	~	
Stressed Vegetation (other than from insufficient water):		40	

Item or Condition	Observed Evidence	No Evidence Observed	Comments
Evidence of Mounds, Depressions or Filled or Graded Areas Suggesting Trash or Other Solid Waste Disposal:		~	
Waste Water or any discharge (including storm water) into a Drain, Ditch, or Stream on or Adjacent to the Property:		~	
Wells (active, inactive, or abandoned):		*	
Septic Systems or Cesspools:		<	
Prior Structures:		~	
Roads, Tracks, Railroad Tracks or Spurs:	~		West Pioneer Avenue is located to the north, Texas Street is located to the east and San Bernardino Avenue is located east and San Bernardino Avenue located to the south.

6.4 Current Uses of Adjoining Properties

Based on our research and observations during our Property visit, the Property is bordered by the following:

Table 5 - Adjoining Property Use

Direction	Current Development
North	West Pioneer Avenue followed by Citrus Valley High School (800 -880 West Pioneer Avenue).
Northeast	Intersection of West Pioneer Avenue and Texas Street followed by undeveloped land.
Northwest	West Pioneer Avenue followed by Citrus Valley High School (800 -880 West Pioneer Avenue).
South	San Bernardino Avenue followed by undeveloped land.
Southeast	Intersection of San Bernardino Avenue and Texas Street followed by undeveloped.
Southwest	San Bernardino Avenue followed by undeveloped land.
East	Texas Street followed by residential dwellings, Baldwin Avenue, agriculturally developed land and undeveloped land.
West	Undeveloped land.

6.5 Current Uses of Surrounding Area

Based on our research and observations during our Property visit, the surrounding area of the Property consists of undeveloped land, a school and residential tenants.

7.0 INTERVIEWS

Interview:	Comments:
Property Owner	An Owner interview was not conducted. Information provided by the Owner was provided by the User of the report. Please refer to Section 3.0.
Tenant/ Occupant	No tenants or occupants were available for interview.
State or Local Government Officials	A State or local government official was not interviewed.
Owners and Occupants of Neighboring Sites	No interviews of owners or occupants of neighboring sites were conducted.

8.0 FINDINGS

A cursory summary of findings is provided below. However, details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein.

The Property is owned by Redlands Re Holdings, LLC, a California Limited Liability Company and is identified as Citrus Valley Redlands. The Property includes 37.9 acres of land, formerly developed with citrus groves.

The Property is located on the southwest corner of Texas Street and West Pioneer Avenue, approximately 0.5 miles east of the 210 Freeway and 1-mile north of the 10 Freeway.

According to historical sources, the Property was undeveloped from as early as 1899. By 1930, the Property was developed for agricultural use with remnants of agricultural use still observed during the October 2017 Property Reconnaissance.

The Property was not identified on the regulatory database report.

The following adjoining properties were identified on the databases in the ERIS report.

- Citrus Valley High School Redlands Unified School District /New High School No. 3 at 800 West Pioneer Avenue) located to the north was identified on the San Bernardino County Certified Unified Program Agency (CUPA) site, Envirostor site and School (SCH) site on the regulatory database report. This site was evaluated as a school site with the DTSC and no further action was warranted. This site was also identified as a conditionally exempt small quantity generator. No violations were noted.
- Redlands Farming Company at 780 West San Bernardino Avenue, located to east, beyond Texas Street, was identified as a historical Envirstor site. This site was identified with a release of pesticides to the soil from rinse water and waste production, in addition to unspecified oil containing wastes and wastes oil/mixed oil. Previous oil tanks were located at this site from as early as 1930 until at least 1996. This site was granted No Further Action by the DTSC after a completion of an on-site screening and remedial activities on October 27, 1994. No further information was provided on the regulatory database report or Envirostor database.

9.0 OPINION

The historical use of the Property is a REC. Potential exists for residual agricultural chemicals in the soil from historic agricultural operations.

The current of the adjoining sites are not a REC.

The historical industrial use of the adjoining site is not a REC based on the current regulatory status. The historical use of the remaining adjoining sites are not a REC.

The identification of the adjoining properties on the adjoining properties are not a REC based on the current status and non-contiguous location of these sites.

No RECs, Historical Recognized Environmental Conditions (HREC), Controlled Recognized Environmental Conditions (CRECs), or de minimis conditions were identified at the Property.

No significant data gaps were identified that affect the ability of the Environmental Professional (EP) to identify any RECs.

There are no unusual circumstances where greater certainty is required regarding RECs.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Converse has performed a Phase I Environmental Site Assessment in general conformance with the scope and limitations of ASTM Practice E1527-13 for 37.9 acres of land identified with the Assessor Parcel Numbers (APN) 0167-091-02, 0167-091-04, 0167-091-05, 0167-091-08, City of Redlands, San Bernardino County, California. Any exceptions to or deletions from this practice are described in the Limitations and Exceptions of Assessment section of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the Property except for the following:

The Property was historically used for agricultural purposes from at least 1930. There
remains a potential for the presence of agricultural chemical residues in soils at the
Property. The historical agricultural use is a REC.

Based on this assessment, Converse has the following conclusions and recommendations:

- Further assessment (soil sampling) was recommended and is being conducted concurrently. Results are to be provided under a separate cover.
- The non-scope issue of possible asbestos transite irrigation pipes is a concern and could be addressed through exploratory trenching.

11.0 DEVIATIONS AND LIMITATIONS

The following deviations and/or limitations from the ASTM Standard were encountered during this assessment:

• Ground surface of the eastern portion of the Property was covered with extensive vegetation and could not be observed.

12.0 ADDITIONAL NON-SCOPE SERVICES

There are environmental issues outside the scope of the ASTM E1527-13 that can be assessed in connection with a commercial real estate transaction. These are dealt with as non-scope considerations since they do not typically present a Superfund Liability. The specific level of inquiry (if any) is defined in the Proposal which contains a Scope of Work. These non-scope services are very client specific and not covered by the ASTM standard. They are frequently related to the business environmental risk which is defined in the standard as "risk which can have a material environmental or environmentally-driven impact on the business associated with the current or planned use of a parcel of commercial real estate..."

No non-scope issues were addressed in this report. Asbestos transite pipe possibly associated with irrigation for agricultural activities is a concern.

13.0 SIGNATURE OF ENVIRONMENTAL PROFESSIONAL

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in §312.10 of 40 CFR 312.

I have the specific qualifications based on education, training and experience to assess a property of the nature, history, and setting of the subject property. I have developed and performed the all appropriate inquiries in conformance with the standard and practices set forth in 40 CFR Part 312.

Sue Krobthong

Project Environmental Scientist

This Phase I ESA was completed [by or under the supervision] of the above Environmental Professional. A complete list of preparers, and their responsibilities for this assessment, is provided in the following section (Section 14.0, List of Preparers).

14.0 LIST OF PREPARERS

Norman S. Eke

Senior Vice President/Managing Officer

B.A., Liberal Studies, Environmental Studies Emphasis, University of California, Santa Barbara, 1988.

Cal/OSHA Certified Asbestos Consultant, #96-2093 NIOSH 582 Equivalent Training

Senior Vice President and Managing Officer of Converse's California Environmental offices. Mr. Eke has served as the Principal-in-Charge and Contract Administrator to deliver services to our public agency and private clients. Mr. Eke has 27 years of experience in the fields of Environmental Due Diligence including Phase I and Phase II Environmental Site Assessments, Asbestos surveys/specifications/abatement monitoring, Preliminary Endangerment Assessments and associated Supplemental Site Investigations and Removal Action Work Plans/Implementation, various forms of Remediation, Human Health Risk Assessment and Indoor Air Quality. Mr. Eke is the former Subcommittee Chairman for E.50-02 Real Assessment and Management of the ASTM E.50 Committee on Environmental Assessment, Risk Management, Corrective Action, which includes Phase I ESA standards (2008 to 2016).

Principal area of responsibility for this ESA report: Project Management, Client Point of Contact, and Quality Assurance/Quality Control and Technical Review.

Sue Krobthong

Project Environmental Scientist

B.S., Environmental Science, Social Science Emphasis, University of California, Riverside, 2005

Certificate of Environmental Management, University of California, Irvine, 2011

Ms. Krobthong has over 10 years' experience conducting Phase I and II Environmental Site Assessments throughout California. Ms. Krobthong has completed Phase I ESAs on undeveloped land, residential properties, commercial/retail facilities, industrial facilities,

and school sites. Current duties at Converse include project management, business development and client maintenance, conducting/managing ESAs, and completing third party documents reviews.

Principal area of responsibility for this ESA report: Project Management, Historical Research, Regulatory Agency Interaction, Property Reconnaissance, Interviews, and Report Generation.

15.0 REFERENCES

Biological Technical Report prepared by Ultra Systems Environmental dated June 11, 2006

California Department of Conservation, Division of Mines and Geology, Geologic Map of California, 2010.

California Department of Conservation, Division of Oil and Gas and Geothermal Resources, August 2017.

California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control, Cypress/Chatsworth Office, Request for Information, August 2017.

Cal/EPA, Envirostor Website (http://www.envirostor.dtsc.ca.gov/public/, August 2017.

Cal/EPA, Santa Ana Regional Water Quality Control Board, Request for Information, August 2017.

Cal/EPA, Geotracker Website (http://geotracker.waterboards.ca.gov/), August 2017.

Cultural Resources Technical Report prepared by Ultra Systems Environmental dated July 5, 2006.

Geotechnical Study prepared by Ultra Systems Environmental dated June 21, 2006

Redlands, City, of Building Department, Records Review, September 2017.

Environmental Risk Information Services (ERIS), Aerial Photographs, August 2017.

ERIS, City Directory Abstract, August 2017.

ERIS, Database Report, August 2017.

ERIS, Request for Fire Insurance Maps, August 2017.

ERIS. Topographic Map, August 2017.

Natural Hazard Disclosure Statement and Acknowledgement of Receipt prepared by the First American Natural Hazard Disclosure dated September 19, 2017

Preliminary Hydrology Study and Drainage Analysis prepared by Joseph E. Bonadiman & Associates, Inc. dated January 23, 2007

Preliminary Title Report prepared by First American Title Insurance dated September 15, 2017.

Phase I ESA prepared by Ninyo & Moore dated June 20, 2005.

San Bernardino County Fire Department, Request for Information, August 2017.

Special Status Wildlife and Plant Species Potentially Occurring with the Study Area Report

South Coast Air Quality Management District, Request for Information, August 2017.

United States Geological Survey, 7.5-Minute Topographic Quadrangle, Redlands 2015.

United States Department of Transportation, Pipeline and Hazardous Material Safety Administration (PHMSA), Pipeline Location Website (https://www.npms.phmsa.dot.gov/default.htm), August 2017.

Appendix A - Application for Authorization to Use

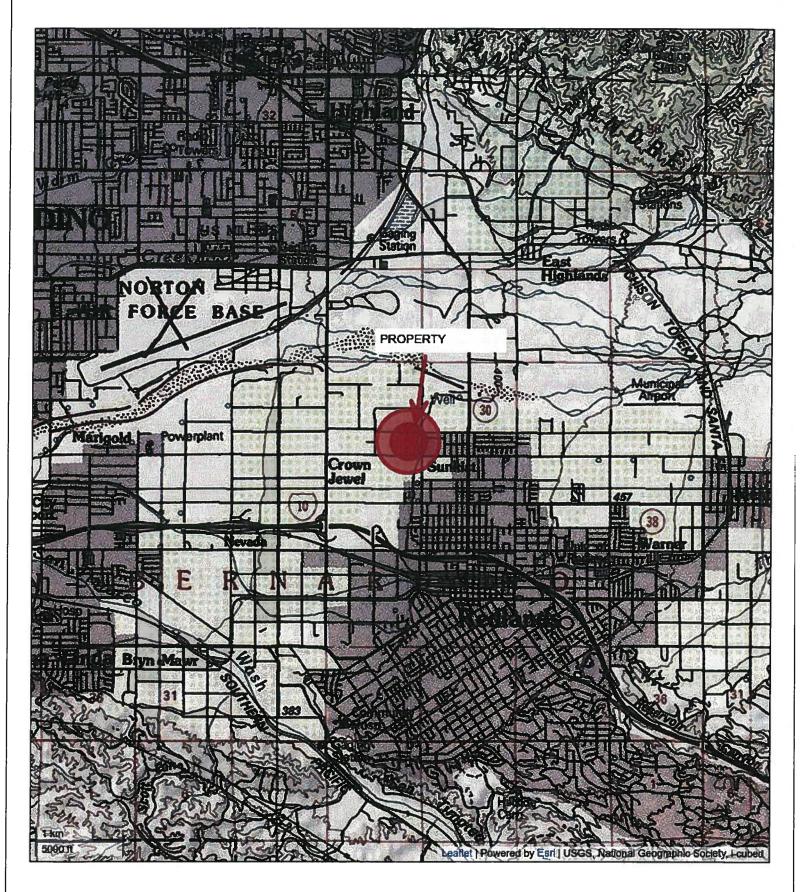


Application for Authorization to Use

TO: **Converse Consultants** 717 South Myrtle Avenue Monrovia, California 91016 Project Title & Date: Project Address: FROM: (Please identify name & address of person/entity applying for permission to use the referenced report.) hereby applies for permission to use Applicant the referenced report in order to: Applicant wishes or needs to use the referenced report because: Applicant also understands and agrees that the referenced document is a copyrighted document and shall remain the sole property of Converse Consultants. Unauthorized use or copying of the report is strictly prohibited without the express written permission of Converse Consultants. Applicant understands and agrees that Converse Consultants may withhold such permission at its sole discretion, or grant such permission upon agreement to Terms and Conditions, such as the payment of a re-use fee, amongst others. Applicant Signature: Applicant Name (print): Title:

Date:

Appendix B - Property Plans







Property Location Map
Citrus Valley Redlands - 37.9 Acres
APNs 0167-091-02, 0167-091-04, 0167-091-05 and 0167-091-08
Redlands, San Bernardino County, California







Figure 2

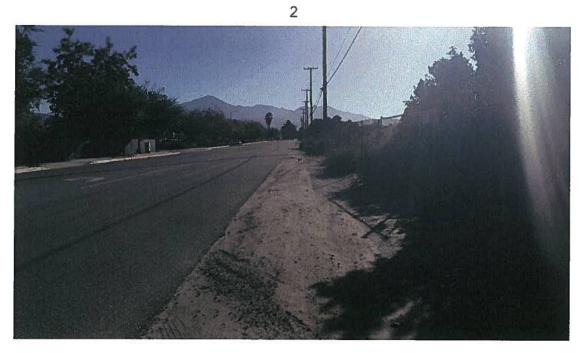
Property Map
Citrus Valley Redlands - 37.9 Acres
APNs 0167-091-02, 0167-091-04, 0167-091-05 and 0167-091-08
Redlands, San Bernardino County, California



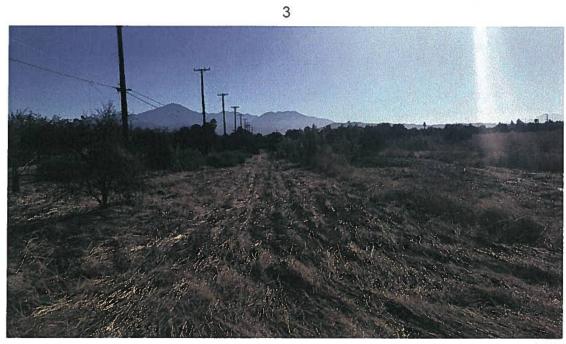
Appendix C - Pertinent Property Photographs



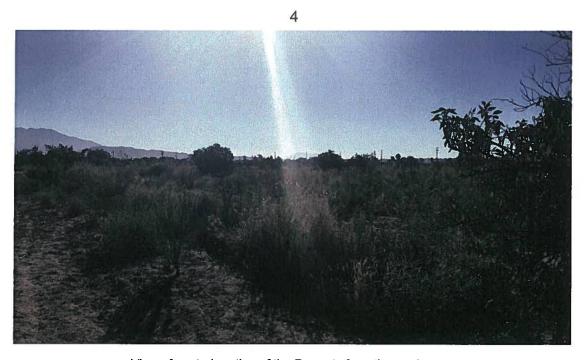
View of western property boundary and adjoining property to the west.



View of northern Property boundary and West Pioneer Avenue.



View of northeast portion of the Property.



View of central portion of the Property from the northwest.



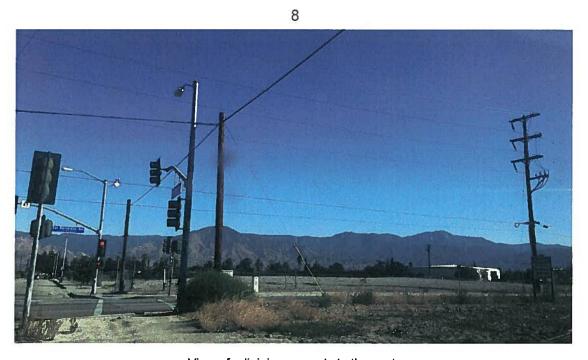
View of central portion of the Property from the west.



View of apparent on-site irrigation stand pipe.



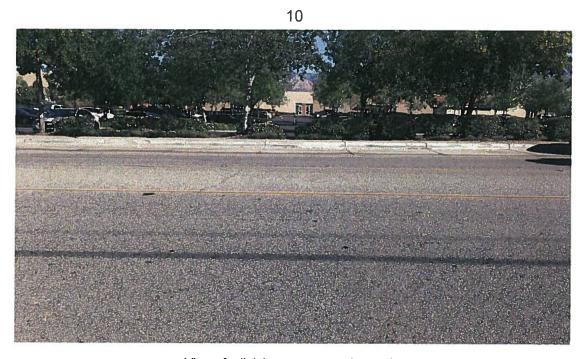
View of southeast portion of the Property.



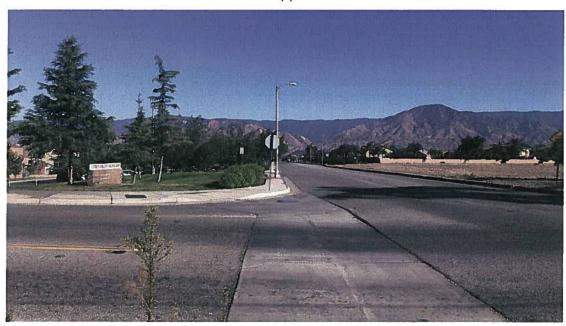
View of adjoining property to the east.



View of central portion of the Property from the south.



View of adjoining property to the north.



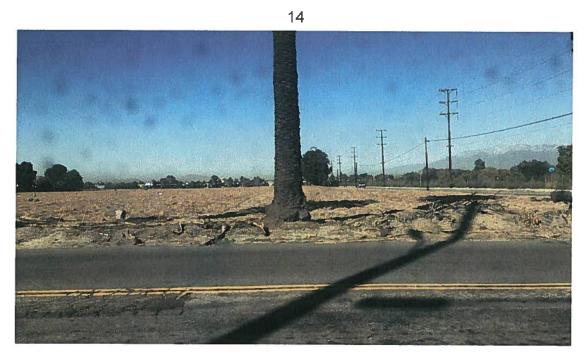
View of adjoining property to the northeast.



View of eastern portion of the Property.



View of southeast portion of the Property from the adjoining property to the southeast.



View of adjoining property to the south.

Appendix D - Supplemental Information

Commitment No.: NCS-869563-LA2

Page Number: 1



First American Title Insurance Company

National Commercial Services

777 South Figueroa Street, Suite 400 Los Angeles, CA 90017

September 15, 2017

Gary Dou Metro LA Land Realty, Inc. 14240 Sapphire Hill Lane Chino Hills, CA 91709 Phone: (909)951-6389

Customer Reference:

Citrus Valley, Redlands

Title Officer:

Liz Thymius

Title Assistant:

Nvart Hovsepian

Phone:

(213)271-1744

Phone:

(213)271-1733

Email:

Ithymius@firstam.com

Email:sss

nhovsepian@firstam.com

Order Number:

NCS-869563-LA2

Escrow Officer:

Brian Serikaku

Phone:

(213)271-1774

Email:

bmserikaku@firstam.com

Property:

Vacant Land/APN: 0167-091-02, 0167-091-04,0167-091-05,,

0167-091-08, Redlands, CA

Attached please find the following item(s):

Commitment

Thank You for your confidence and support. We at First American Title Insurance Company maintain the fundamental principle:

Customer First!



Disclosure Report Signature Page For SAN BERNARDINO County

Property Address: VACANT LAND

REDLANDS, SAN BERNARDINO COUNTY, CA 92374

("Property")

APN: SEE ADDENDUM Report Date: 09/19/2017 Report Number: 2170751

Natural Hazard Disclosure ("NHD") Statement and Acknowledgment of Receipt

DISCLAIMER: This NHD Summary (a) is not valid unless delivered with the complete FANHD Disclosure Report which transferee must read and acknowledge before close of escrow, and (b) is subject to the Terms and Conditions contained in that complete Disclosure Report.

The transferor and his or her agent(s) or a third-party consultant disclose the following information with the knowledge that even though this is not a warranty, prospective transferees may rely on this information in deciding whether and on what terms to purchase the Property. Transferor hereby authorizes any agent(s) representing any principal(s) in this action to provide a copy of this statement to any person or entity in connection with any actual or anticipated sale of the Property.

The following are representations made by the transferor and his or her agent(s) or a third-party consultant based on their knowledge and maps drawn by the State, This information is a disclosure and is not intended to be part of any contract between the transferee and the transferor. THIS REAL PROPERTY LIES WITHIN THE FOLLOWING HAZARDOUS AREA(S):

A SPECIAL FL	OOD HAZARI No X	D AREA (Any type Zone "A" or Do not know and information r		ne Federal Emergency Management Agency al jurisdiction	
AN AREA OF F	OTENTIAL F	LOODING shown on a dam fail	lure inundation map ;	oursuant to Section 8589.5 of the Government Code.	
Yes	No_ X _	Do not know and information r	ot available from loc	al jurisdiction	
		RD SEVERITY ZONE pursual Section 51182 of the Government		or 51179 of the Government Code. The owner of this Pro	operty is subject to the
owner of this P provide fire pro	roperty is sub tection service	ject to the maintenance requires to any building or structure	ements of Section 4 located within the v	ISK AND HAZARDS pursuant to Section 4125 of the Public 291 of the Public Resources Code. Additionally, it is not the vildlands unless the Department of Forestry and Fire Protect 4142 of the Public Resources Code.	state's responsibility to
AN EARTHQUA	KE FAULT Z No <u>X</u>	ONE pursuant to Section 2622	of the Public Resour	ces Code.	
A SEISMIC HA	ZARD ZONE	oursuant to Section 2696 of the	Public Resources Co	ode.	
Yes (Landslide 2		Yes (Liquefaction Zone)			
No	Man not vet re	eleased by state X	-		
INDICATORS O OBTAIN PROFE	F WHETHER ESSIONAL AD	OR NOT A PROPERTY WILL	BE AFFECTED BY AZARDS AND OTHE	ESTIMATE WHERE NATURAL HAZARDS EXIST. THEY A NATURAL DISASTER. TRANSFERE(S) AND TRANSFER HAZARDS THAT MAY AFFECT THE PROPERTY.	ROR(S) MAY WISH TO
Signature of Tra	nsteror(s)		Date	Signature of Transferor(s)	Date
Signature of Age	ent		Date	Signature of Agent	Date
Transferor(s) and agent(s)		ent(s) represent that the inform	ation herein is true a	and correct to the best of their knowledge as of the date signe	ed by the transferor(s)
1103.7, and disclosure prinformation of	that the repre- covider as a s contained in the	esentations made in this Natur ubstituted disclosure pursuant	al Hazard Disclosure to Civil Code Section	aith in the selection of a third-party report provider as required e Statement are based upon information provided by the in- n 1103.4. Neither transferor(s) nor their agent(s) (1) has inde e of any errors or inaccuracies in the information contained o	dependent third-party pendently verified the
Third-Party Disc Date <u>19 Septen</u>		er(s) <u>FIRST AMERICAN PROF</u>	ESSIONAL REAL ES	TATE SERVICES, INC. OPERATING THROUGH ITS FANHD	DIVISION.
		or she has read and underst onstitute all of the transferor's c		Pursuant to Civil Code Section 1103.8, the representations obligations in this transaction.	s in this Natural Hazard
Signature of Tra	nsferee(s)		Date	Signature of Transferee(s)	Date

TRANSFEREE(S) REPRESENTS ABOVE HE/SHE HAS RECEIVED, READ AND UNDERSTANDS THE COMPLETE FANHD DISCLOSURE REPORT DELIVERED WITH THIS SUMMARY:

- A. Commercial Natural Hazard Disclosure Report.
- B. Additional Property-specific Statutory Disclosures: Former Military Ordnance Site, Airport Influence Area, Airport Noise, San Francisco Bay Conservation and Development District Jurisdiction (in S.F. Bay counties only).
- C. Additional County and City Regulatory Determinations as applicable: Airports, Avalanche, Blow Sand, Coastal Zone, Dam/Levee Failure Inundation, Debris Flow, Erosion, Flood, Fault Zone, Fire, Groundwater, Landslide, Liquefaction, Methane Gas, Mines, Naturally Occurring Asbestos, Redevelopment Area, Right to Farm, Runoff Area, Seiche, Seismic Shaking, Seismic Ground Failure, Slope Stability, Soil Stability, Subsidence, TRPA, Tsunami.

 D. General advisories: Methamphetamine Contamination, Mold, Radon, Endangered Species Act, Abandoned Mines, Oil & Gas Wells, Tsunami Maps (coastal only),
- Non-residential Building Energy Use.
- E. Government Guides in Combined Booklet with Report. Refer to Booklet: Commercial Property Owner's Guide to Earthquake Safety. Government Guides are also available on the Company's "Electronic Bookshelf" at http://www.disclosures.com/.



The Natural Hazard Disclosure Report FOR San Bernardino COUNTY

Property Address: VACANT LAND, REDLANDS, San Bernardino COUNTY, CA ("Property")

APN: SEE ADDENDUM Report Date: 9/19/2017 Report Number: 2170751

ADDENDUM FOR ASSESSOR PARCEL NUMBERS

This Addendum pertains solely to Report No. 2170751 dated Tuesday, September 19, 2017 ("Report Date") for disclosure information with respect to the Property, situated in the County of San Bernardino, State of California, as collectively constituted by only those 2 assessor parcel numbers ("APN") and geographic boundaries thereof listed below as provided to the Company on said Report Date:

0167-091-04-0000 0167-091-05-0000

Responses contained in this Report pertain only to Property as identified above and to no others pursuant to a Transaction. This Report should not to be used for, and liability shall not be applicable to, any transaction involving any fewer or any other parcels than those identified above. For liability purposes a Report should be ordered for an individual parcel should it be sold separately from other parcels in a separate transaction.

This Addendum is attached hereto and made a part of Report No. 2170751 as of this reference and is subject to the Methods and Limitations contained herein.



Disclosure Report Summary Pages For SAN BERNARDINO County

Property Address: VACANT LAND

REDLANDS, SAN BERNARDINO COUNTY, CA 92374

("Property")

APN: SEE ADDENDUM Report Date: 09/19/2017 Report Number: 2170751

Natural Hazard Disclosure ("NHD") Statement and Acknowledgment of Receipt

DISCLAIMER: This NHD Summary (a) is not valid unless delivered with the complete FANHD Disclosure Report which transferee must read and acknowledge before close of escrow, and (b) is subject to the Terms and Conditions contained in that complete Disclosure Report.

The transferor and his or her agent(s) or a third-party consultant disclose the following information with the knowledge that even though this is not a warranty, prospective transferees may rely on this information in deciding whether and on what terms to purchase the Property. Transferor hereby authorizes any agent(s) representing any principal(s) in this action to provide a copy of this statement to any person or entity in connection with any actual or anticipated sale of the Property.

The following are representations made by the transferor and his or her agent(s) or a third-party consultant based on their knowledge and maps drawn by the State. This information is a disclosure and is not intended to be part of any contract between the transferee and the transferor. THIS REAL PROPERTY LIES WITHIN THE FOLLOWING HAZARDOUS AREA(S):

A WILDLAND AREA THAT MAY CONTAIN SUBSTANTIAL FOREST FIRE RISK AND HAZARDS pursuant to Section 4125 of the Public Resources Code. AWILDLAND AREA THAT MAY CONTAIN SUBSTANTIAL FOREST FIRE RISK AND HAZARDS pursuant to Section 4125 of the Public Resources Code. Additionally, it is not the state's respon provide fire protection services to any building or structure located within the wildlands unless the Department of Forestry and Fire Protection has enter cooperative agreement with a local agency for those purposes pursuant to Section 4142 of the Public Resources Code. Yes	Signature of Transfer Signature of Agent Transferor(s) and and agent(s). Transferor(s) and 1103.7, and that disclosure provide information contains statement was presented to the statement of the statement o	their agent(s) represent that the information their agent(s) acknowledge that they have representations made in this Nature as a substituted disclosure pursuant inted in this statement and Report or (2 pared by the provider below: The Provider(s) FIRST AMERICAN PROFES 2017 The state has read and understated in the constitute all of the transferor's	Date nation herein is true a nation herein is true a nave exercised good f ural Hazard Disclosur to Civil Code Sectio 2) is personally award ESSIONAL REAL Es stands this document or agent's disclosure	Signature of Agent and correct to the best of their knowledge as of the date sign aith in the selection of a third-party report provider as require estatement are based upon information provided by the in 1103.4. Neither transferor(s) nor their agent(s) (1) has indicate of any errors or inaccuracies in the information contained estate SERVICES, INC. OPERATING THROUGH ITS FANHIOL. Pursuant to Civil Code Section 1103.8, the representation obligations in this transaction.	Date ned by the transferor(s) of in Civil Code Section ndependent third-party ependently verified the on the statement. This
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·	Yes No_X	X A THAT MAY CONTAIN SUBSTANTI	AL FOREST FIRE R	NISK AND HAZARDS pursuant to Section 4125 of the Pub	lic Resources Code. The
A VERY HIGH FIRE HAZARD SEVERITY ZONE pursuant to Section 51178 or 51179 of the Government Code. The owner of this Property is subjet maintenance requirements of Section 51182 of the Government Code.				or 51179 of the Government Code. The owner of this P	Property is subject to the
AN AREA OF POTENTIAL FLOODING shown on a dam failure inundation map pursuant to Section 8589.5 of the Government Code. Yes No X Do not know and information not available from local jurisdiction				•	
Yes No_X Do not know and information not available from local jurisdiction	AN AREA OF POTE			•	

- A. Commercial Natural Hazard Disclosure Report.
- B. Additional Property-specific Statutory Disclosures: Former Military Ordnance Site, Airport Influence Area, Airport Noise, San Francisco Bay Conservation and Development District Jurisdiction (in S.F. Bay counties only).
- C. Additional County and City Regulatory Determinations as applicable: Airports, Avalanche, Blow Sand, Coastal Zone, Dam/Levee Failure Inundation, Debris Flow, Erosion, Flood, Fault Zone, Fire, Groundwater, Landslide, Liquefaction, Methane Gas, Mines, Naturally Occurring Asbestos, Redevelopment Area, Right to Farm, Runoff Area, Seiche, Seismic Shaking, Seismic Ground Failure, Slope Stability, Soil Stability, Subsidence, TRPA, Tsunami.
- D. General advisories: Methamphetamine Contamination, Mold, Radon, Endangered Species Act, Abandoned Mines, Oil & Gas Wells, Tsunami Maps (coastal only), Non-residential Building Energy Use.
- E. Government Guides in Combined Booklet with Report. Refer to Booklet: Commercial Property Owner's Guide to Earthquake Safety. Government Guides are also available on the Company's "Electronic Bookshelf" at http://www.disclosures.com/.



The Natural Hazard Disclosure Report FOR San Bernardino COUNTY

Property Address: VACANT LAND, REDLANDS, San Bernardino COUNTY, CA ("Property") APN: SEE ADDENDUM Report Date: 9/19/2017 Report Number: 2170751

ADDENDUM FOR ASSESSOR PARCEL NUMBERS

This Addendum pertains solely to Report No. 2170751 dated Tuesday, September 19, 2017 ("Report Date") for disclosure information with respect to the Property, situated in the County of San Bernardino, State of California, as collectively constituted by only those 2 assessor parcel numbers ("APN") and geographic boundaries thereof listed below as provided to the Company on said Report Date:

0167-091-04-0000 0167-091-05-0000

Responses contained in this Report pertain only to Property as identified above and to no others pursuant to a Transaction. This Report should not to be used for, and liability shall not be applicable to, any transaction involving any fewer or any other parcels than those identified above. For liability purposes a Report should be ordered for an individual parcel should it be sold separately from other parcels in a separate transaction.

This Addendum is attached hereto and made a part of Report No. 2170751 as of this reference and is subject to the Methods and Limitations contained herein.



Disclosure Report Summary Pages For SAN BERNARDINO County

Property Address: VACANT LAND

REDLANDS, SAN BERNARDINO COUNTY, CA 92374

("Property")

APN: SEE ADDENDUM Report Date: 09/19/2017 Report Number: 2170751

PROPERTY DISCLOSURE SUMMARY - READ FULL REPORT

Statutory NHD Determinations	1N	NOT IN	Map N/A*	Property Is:	NHD Report page:
Flood		x		NOT IN a Special Flood Hazard Area. The Property is IN a FEMA-designated Flood Zone(s) X.	5
Dam		X		NOT IN an area of potential dam inundation.	5
Very High Fire Hazard Severity		X	4	NOT IN a very high fire hazard severity zone.	6
Wildland Fire Area		X	h/illi	NOT IN a state responsibility area.	6
Fault		x		NOT IN an earthquake fault zone designated pursuant to the Alquist-Priolo Act.	7
Landslide			X	Map Not Available	7
Liquefaction			X	Map Not Available	7

County-level NHD Determinations	IN	NOT IN	Map N/A*	Property is:	NHD Report page:
Liquefaction		X		NOT IN an area of liquefaction susceptibility	9
Fault		X		NOT WITHIN a designated or adopted fault zone.	9
Landslide		X	Stave EU	NOT IN a mapped Landslide	9
Fire		X		NOT IN a designated Fire Safety Area.	9
Landslide Susceptibility	×			IN a mapped area of low landslide susceptibility.	9
Flood			X	Map Not Available	10

Additional Statutory Disclosures	IN	NOT IN	Map N/A*	Property Is:	NHD Report page:
Former Military Ordnance	Y WEST	X		NOT WITHIN one mile of a formerly used ordnance site.	12
Airport Influence Area	X			IN an airport influence area: San Bernardino Int'l & Redland Muni	13
Airport Noise Area for 65 Decibel		X		NOT IN a delineated 65 dB CNEL or greater aviation noise zone.	14

General Advisories	Description	NHD Report page:
Methamphetamine Contamination	Provides an advisory that a disclosure may be required pursuant to the "Methamphetamine Contaminated Property Cleanup Act of 2005".	15
Mold	Provides an advisory that all prospective purchasers of residential and commercial property should thoroughly inspect the subject property for mold and sources for additional information on the origins of and the damage caused by mold.	16
Radon	Provides an advisory on the risk associated with Radon gas concentrations.	17
Endangered Species	Provides an advisory on resources to educate the public on locales of endangered or threatened species.	17
Abandoned Mines	Provides an advisory on resources to educate the public on the hazards posed by, and some of the general locales of, abandoned mines.	18
Oil and Gas Wells	Provides an advisory on the potential existence of oil and gas wells and sources for additional general and/or specific information.	18
10年13年2月1日日本大学工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺工艺	general and/or specific information.	Ñ

Determined by First American Professional Real Estate Services, Inc.

For more detailed information as to the foregoing determinations, please read this entire Report.

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Appendix G

Phase 1 Environmental Site Assessment

		26	

Winyo & Moore

REDLANDS, CALIFORNIA **ENVIRONMENTAL SITE ASSESSMENT** 37.9-ACRE PROPERTY PHASE I

PREPARED FOR:

515 South Figueroa Street, Suite 1600 Los Angeles, California 90071 **IDS Equities**

PREPARED BY: Ninyo & Moore

Geotechnical and Environmental Sciences Consultants 475 Goddard, Suite 200 Irvine, California 92618 June 20, 2005 Project No. 206343001

475 Godana • Suco 260 • mmc, Calibrina 9261H • Imme (HH) 753-1070 • • £4 (HH) 753-1071 Marrie - hone - Son Dego - Los Anders - Contaris - Les Vegas - Sas Line Coy - Ontario

Winyo & Moore

June 20, 2005 Project No. 206343001

Ms. Gretchen Sauer IDS Equities 515 South Figueroa Street, Suite 1600

Los Angeles, California 90071

Phase I Environmental Site Assessment Subject:

37.9-Acre Property Redlands, California

Dear Ms. Sauer:

In accordance with our proposal dated May 27, 2005, Ninyo & Moore has performed a Phase I Environmental Site Assessment of the above-referenced property ("site"). The attached report presents our methodology, findings, opinions, and conclusions regarding the environmental conditions at the site. We appreciate the opportunity to be of service to you on this project. Should you have any questions, please contact the undersigned at your convenience.

NINYO & MOORE

Staff Environmental Geologist

Paul A. Roberts, P.G, R.E.A. I/II Senior Environmental Geologist

BAP/PAR/emp

Distribution: (3) Addressee (1) Mark S. Cousineau, Hazard Management Consulting, Inc.

415 Goddurd + Jude 200 - #ume Combina 9261H + Frame (949) 753 707U + Enc (949) 753 7071 Process - brane - San Drojo - Los Angeles - Delseus - Las Verpa - Salt Lair City - Ordano June 20, 2005 Project No. 206343001

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9	9.	RECOMMENDATIONS	\approx

Figures Figure 1 – Site Location Map Figure 2 – Site Vicinity Map

Appendices
Appendix A - Photographic Documentation
Appendix B - Relevant Site Information
Appendix C - Environmental Database Search

206343001 R Phase I - PDF.doc

Winyo. Moore

206343001 R Phase 1 - PDF.doc

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June 20, 2005 Project No. 206343001

EXECUTIVE SUMMARY

Ninyo & Moore was retained by IDS Equities to perform a Phase I Environmental Site Assessment (ESA) of the 37.9-acre property located in the city of Redlands, California (site). The site consists of four parcels used for agricultural purposes. IDS Equities is considering purchasing the site for redevelopment as commercial property. Historical research, document review, and site assessment activities were conducted between May 27 and June 17, 2005.

In summary, the following items were noted:

- The property has been used for agricultural purposes (orange groves) since at least 1930.
 The site currently consists of orange groves. Many utilities lines and features, such as natural gas pipelines, water drip systems, and irrigation systems, were noted on-site. No groundwater wells were observed. Historically, the surrounding properties have also generally been used for agricultural purposes (orange groves) and currently are vacant land, or used for commercial or residential purposes.
- Groundwater beneath the site occurs at depths of approximately 200 feet below the ground surface (bgs) and flows in a westerly direction.
- Hundreds of smudge-pots are located throughout the site. There was no historical or current
 information or indication that smudge-pot oils were stored on-site in large quantities (e.g., in
 aboveground storage tanks [ASIB]). Each smudge-pot contains a small underground holding
 container for oil. Due to the depth to groundwater and type of chemicals used in the smudgepots (i.e., heavy oils), these features would not be considered an environmental concern to
 the site.
- It is our assumption that pesticides and herbicides have been used at the site. There has been no indication, based on our review of historical information, regulatory agency file and database review, and site visit, that pesticides or herbicides have been stored in large quantities or mixed on the site. Due to the depth to groundwater, limited quantities of chemicals, lack of observed staining, and proposed commercial when there is a low likelihood that residual chemicals associated with these activities would pose an environmental concern or following grading and redevelopment activities, pose a health threat to future occupants.
- A Sunkist Growers Redlands Heights Citrus fruit packing facility (Sunkist) has been located immediately east of and upgradient from the site and beyond Texas Street since at least 1928. Historical topographical maps indicated that the facility stored "oil" in ASTs (probably smudge-pot oil for the surrounding orange groves). This facility was listed on the Hazardous Materials Manifests Notwork (HAZPET) database (non-American Society for Testing and Materials Practice [ASTM] database) for the disposa of aqueous solutions, possibly associated with waste products at the facility. The facility was also listed on the REF database (non-ASTM database). According to the database, a drive-by investigation noted some oil

staining, pesticide equipment, and an unlined pond. A preliminary investigation completed under the direction of the County of San Bernardino Department of Environmental Health (DEH) concluded that "contamination in low quantities" were present. The site was issued a no further action (NFA) status. Based on the depth to groundwater, type of facility, chemicals used/stored on the property, and regulatory status, there is a low likelihood that this offsite facility has environmentally impacted the site. No other off-site sources of environmental concern were noted in the site vicinity.

Ninyo & Moore has performed a Phase I ESA in conformance with the scope and limitations of the ASTM E 1527-00 for the 37.9-acre property located in the city of Redlands, California. No evidence or indication of recognized environmental conditions (RECs) in connection with the property have been revealed. Ninyo & Moore does not recommend additional investigations at this time. Due to the size of the property, numerous orange trees, and time constraints, some areas of the site were not physically inspected. Groundwater wells may be located on-site and were not discovered. Although not considered an environmental concern, if groundwater wells are discovered during grading activities, these wells should be abandoned in accordance with current regulatory guidelines.

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Redlands, California 37.9-Acre Property

1. INTRODUCTION

Work was conducted in general accordance with the contract dated May 27, 2005, between IDS Equities and Ninyo & Moore, and in accordance with IDS Equities' Purchase Order No. DT-7670. IDS Equities is considering purchasing the site for redevelopment as commercial property. The following sections identify the purpose, the involved parties, the scope of work, ment (ESA) of the 37.9-acre property located in the city of Redlands, California (Figure 1; site). Ninyo & Moore was retained by IDS Equities to perform a Phase I Environmental Site Assessand the limitations and exceptions associated with the Phase I ESA.

1.1. Purpose

ESA was to identify Recognized Environmental Conditions (RECs), which are defined by ASTM as "the presence or likely presence of any hazardous substance or petroleum products threat of a release of any hazardous substances or petroleum products into structures on the In accordance with the American Society for Testing and Materials (ASTM) Standards on Environmental Site Assessments for Commercial Real Estate E 1527-00, the objective of the on a property under conditions that indicate an existing release, a past release, or a material property or into the ground, groundwater, or surface water of the property."

1.2. Involved Parties

Ms. Beth Padgett of Ninyo & Moore conducted the site reconnaissance and performed regulatory inquiries. Mr. Paul Roberts of Ninyo & Moore performed project oversight and quality review

1.3. Scope of Work

Ninyo & Moore's scope of work for this Phase I ESA included the following:

- Review of readily available maps and reports pertaining to the site, as provided by the
- cial soil or surface water, improperly stored hazardous materials, possible sources of polychlorinated biphenyls (PCBs), and possible risks of contamination from activities at Perform a site reconnaissance to visually identify areas of possibly contaminated surfi-

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the site and adjacent properties. Color photographs of the site and surrounding proper-ties were taken and are included in this report.

- Review of readily available local regulatory agency files for the site.
- sible environmental impact to the site. These databases list locations of known hazardous waste sites, landfills, and leaking underground storage tanks (LUSTS), permitted facilities that utilize underground storage tanks (USTs), and facilities that use, Review of available regulatory agency databases for the site and for properties located within a specified radius of the site. The purpose of this review was to evaluate the posstore, or dispose of hazardous materials.
- Review of readily available historical documents, including aerial photographs (site and vicinity), historical fire insurance rate maps (site and available adjacent properties), building and planning department records (site only), and city directories (site and available adjacent properties), as necessary. •
- Review previous environmental reports provided by the client.
- Prepare this Phase I ESA report documenting findings and providing opinions and conclusions regarding possible environmental impacts at the site.

1.4. Limitations and Exceptions

analysis of the following: asbestos-containing materials, methane gas, radon, lead-based The environmental services described in this report have been conducted in general accorenvironmental consultants performing similar work in the project area. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Please note that this study did not include an evaluation of geotechnical conditions or potential geologic hazards. In addition, it should be noted that this Phase I ESA does not include paint, lead in drinking water, wetlands, regulatory compliance, cultural and historic redance with current regulatory guidelines and the standard of care exercised by sources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality, and high voltage power lines. This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Winyo . Moore

Ninyo & Moore should be contacted if the reader requires any additional information or has questions regarding the content, interpretations presented, or completeness of this document.

Our findings, opinions, and conclusions are based on an analysis of the observed site conditions and the referenced literature. It should be understood that the conditions of a site can change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control. Ninyo & Moore cannot warrant or guarantee that not finding indicators of any particular hazardous material means that this particular hazardous material or any other hazardous materials do not exist on the site. Additional research, including invasive testing, can reduce the uncertainty, but no techniques now commonly employed can eliminate the uncertainty altogether.

1.5. User Reliance

This report may be relied upon and is intended exclusively for use by the IDS Equities, its partners, lenders, and counsel. Any use or reuse of the findings, opinions, and/or conclusions of this report by parties other than those listed above is undertaken at said parties' sole risk.

GENERAL SITE CHARACTERISTICS

The following sections describe the location and the current uses of the site. The uses of adjacent properties are also described.

2.1. Location and Site Description

The site is located on the northwest corner of the intersection of San Bernardino Avenue and Texas Street in the city of Redlands, California (Figure 1). The site includes four parcels comprising 37.9 acres of agricultural land (Figure 2). According to the San Bernardino County Tax Assessors Office, the site parcel numbers are 0167-091-02, 0167-091-04,

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0167-091-05, and 0167-091-08. The site is bounded to the north by Pioneer Street, to the east by Texas Street, to the south by San Bernardino Avenue, and to the west by vacant land (Figure 2). The site boundary information was provided by IDS Equities and during a site reconnaissance by Ninyo & Moore.

2.2. Current Title Information

A preliminary title report was not provided to Ninyo & Moore for review.

. Adjacent Properties

In general, the site vicinity is occupied by vacant and agricultural land, and residential and commercial properties (Figure 2). Vacant land was noted to the north and south beyond Pioneer Street and San Bernardino Avenue, respectively. Vacant land was observed west of the site and also beyond Tennessee Street. Residential properties, agricultural land, and Sunkist Growers Redlands Heights Citrus fruit packing facility (Sunkist) were observed beyond Texas Street to the east.

2.4. Site Description and Current Site Uses/Operations

The following paragraphs present a description of the structures present at the site, the tenants currently occupying the site, if any, the activities being conducted on-site, the heating and cooling systems utilized in the site building, if any, the sewage disposal system, and the potable water provider for the site.

2.4.1. Site Description

At the time of our site reconnaissance, the site was agricultural land with no occupants.

2.4.2. Heating and Cooling Systems

As no structures are located at the site, there are no heating or cooling systems present.

2.4.3. Sewage Disposal/Septic Systems

No sewage disposal or septic systems are present at the site. Sewage disposal would be supplied by City of Redlands Municipal Utilities Department.

2.4.4. Potable Water

Potable water is provided to the site by the City of Redlands Municipal Utilities Department.

SITE RECONNAISSANCE ૡ૽

On June 8, 2005, Ms. Beth Padgett of Ninyo & Moore conducted a site reconnaissance. The reconnaissance involved a walking tour of the site and visual observations of adjacent properties. At the time of the site reconnaissance, the weather was clear and sunny. Selected photographs taken during the site reconnaissance are included in Appendix A.

3.1. Property Uses

The site was being used as an orange grove.

3.2. Physical Limitations

Due to the size of the property, numerous orange trees, and time constraints, some areas of the site were not physically inspected.

3.3. Use and Storage of Hazardous Substances and Petroleum Products

carbons). There was no indication that smudge pot oils were stored on-site. A small fill cap Hundreds of smudge pots were located throughout the site. Each smudge pot contained a small underground holding container for oils (typically comprising heavy petroleum hydrowas noted at the bottom of each smudge pot. It appeared that the smudge pot oils were delivered to each smudge pot via truck. No staining was noted around the smudge pts. Winyo .. Moore

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however, it appeared that these blocks may have been associated with older type smudge Concrete blocks were also noted throughout the site. The use of these features is unknown, pots. No staining was noted in the vicinity of these features. Pesticides and herbicides were most likely used on-site. There was no indication that these chemicals were stored in large quantities or mixed on site.

3.4. Storage and Disposal of Hazardous Wastes

The storage of hazardous wastes was not observed.

3.5. Unidentified Substance Containers

No unidentified substance containers were noted at the site.

3.6. Aboveground and Underground Storage Tanks

No evidence of underground storage tanks (USTs) or aboveground storage tanks (ASTs) was observed at the site.

3.7. Evidence of Releases

Evidence of releases at the site, such as odors, stressed vegetation, stains, leaks, pools of liquids, and spills, was not observed during the site reconnaissance.

3.8. Polychlorinated Biphenyls (PCBs)

Electrical transformers can be a source of PCBs. No transformers were noted on-site.

3.9. Building Materials and Mold

containing building materials (ACMs), lead-based paint (LBP), or mold would be present at No buildings or structures are located on the site, and therefore, it is unlikely that asbestos-

3.10. Wastewater Systems

Wastewater systems, such as clarifiers, sumps, pits, grease traps, and floor drains, were not observed on the site at the time of the site reconnaissance.

3.11. Storm Water Systems

Storm drains were not observed on-site. Storm water from the site appeared to flow to the surrounding streets.

3.12. Wells

Although no groundwater wells were noted on-site, groundwater wells may have been used mental concern, however, these features should be abandoned prior to the redevelopment of the site. Historical irrigation valves and water troughs were noted throughout the site. Other to irrigate the orange groves. These wells, if present, would not be considered an environutilities, such as natural gas lines and drip systems, were noted throughout the site.

3.13. Other Issues

No other issues of environmental concern were noted at the site or in the site vicinity.

HISTORICAL LAND USE

torical fire insurance maps, historical city directories, building permits and plans, topographic Ninyo & Moore conducted a historical record search for both the site and surrounding areas. This ascertainable and useful for the purposes of this Phase I ESA: historical aerial photographs, hissessment reports regarding the site. In summary, the site has been used for agricultural purposes included a review of one or more of the following sources that were found to be both reasonably maps, property tax records, zoning/land use records, and a review of prior environmental as-(orange groves) since at least 1930.

37.9-Acre Property Redlands, California

4.1. Historical Aerial Photographs

Historical aerial photographs for selected years between 1930 and 2002 were provided by Environmental Data Resources, Inc. (EDR), of Milford, Connecticut, and Terraserver.com. Copies of the historical aerial photographs are provided in Appendix B. The following presents a summary of our review. 1930, 1938, and 1953 - The site and site vicinity appeared as agricultural land. No structures were noted on-site. Pioneer Street, San Bernardino Avenue, and Texas Street were noted on these photographs. The Sunkist facility was observed immediately east of the site and beyond Texas Street. Many ASTs were noted in the eastern portion of this facility. Farm houses were noted scattered throughout the surrounding areas. 1968, 1977, 1989, 1994, 1997, and 2002 - The site and most of the surrounding properties continued to be used for agricultural purposes. The residences located east of the site were first noted in the 1989 photograph. The Sunkist facility continued to be located east of the site, however, the ASTs were no longer noted starting in 1989.

4.2. Building Permits

Ninyo & Moore contacted the City of Redlands Building Department to assess whether building permits were issued to the site. According to the building department, no addresses have been issued to the site and no structures have been constructed.

4.3. Fire Insurance Rate Maps

Coverage was not available for the subject site, although, coverage was available of the Fire insurance rate maps for the subject and surrounding area were requested from EDR. property located on the northeast corner of San Bernardino Avenue and Texas Street, immediately east of the site (off site) and beyond Texas Street. Sanborn maps were available dated 1928, 1948, and 1955.

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Based on our review of these maps, the off-site property was used by the "Redlands Heights Groves, Inc." as an orange packing and warehouse facility. The eastern portion of the property was used as a fertilizer warehouse.

4.4. City Directories

Ninyo & Moore personnel conducted a city directory review for the site and site vicinity at the Haines Criss-Cross Directory in Fullerton, California, for selected years ranging from dino Avenue, Pioneer Street, and Texas Street that would include the site. EDR also provided city directories along San Bernardino Avenue for selected years from 1970 through 2004. Based on our review, no facilities that would pose an environmental concern were 1971 through 2004. This search was completed for a range of addresses along San Bernarnoted at the site or in the site vicinity.

4.5. Land Title Records

Ninyo and Moore was not provided with a 50-year chain of title report.

Historical Topographic Maps 4.6.

1954 map labels ASTs in the eastern portion of this property as "Oil Tanks." These ASTs are Historical topographic maps dated 1939, 1954, 1967, 1980, 1988, and 1996 were provided Based on our review, the site and most of the surrounding properties have been used for orange groves. The Sunkist facility is marked on the topographical maps from 1954 through 1996 (the 1939 map is at too large of scale to assess whether this facility is present). The by EDR. Copies of the topographical maps obtained from EDR are provided in Appendix B. noted on the 1954, 1967, 1980, 1988, and 1996 maps.

4.7. Property Tax Records

Historical property tax records were not provided for review.

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37.9-Acre Property Redlands, California

4.8. Zoning/Land Use Records

According to the City of Redlands Planning Department, the site is zoned "EV/SD" for East Valley/Special Development District.

4.9. Interviews

No site representative was available to be interviewed regarding the site. Representatives of the City of Redlands Building and Planning Departments were not aware of historical land usage at the site.

4.10. Previous Reports and Documents

Previous reports and documents regarding the site were not provided by the client for review.

PHYSICAL SETTING

tions in the vicinity of the site, based upon our document review and our visual reconnaissance The following sections include discussions of topographic, geologic, and hydrogeologic condiof the site and adjacent areas.

5.1. Site Topography

The site is generally flat with a slight slope to the west. Based on the review of the United States Geological Survey (USGS) 7.5-Minute Series, Redlands, California, Topographic Quadrangle Map, dated 1967 and photorevised in 1988, the site has an approximate elevation of 1,300 feet above mean sea level (MSL).

5.2. Geology

The site is located in the southwestern portion of the Transverse Ranges Geomorphic Province. The geomorphic province encompasses an area that extends 320 miles from Point Arguello and San Miguel Island on the west to the mountains of Joshua Tree National

ized by east-west trending mountain ranges that are underlain by a range of Jurassic to older age metamorphic and igneous rocks. The site is located approximately 0.75 miles south of the foothills of the San Bernardino Mountains. The site vicinity is characterized by recent non-marine alluvial deposits forming a veneer of unconsolidated deposits derived from the Monument on the east, where the province merges with the Mojave and Colorado deserts. The geomorphic province varies in width from 40 to 60 miles, most of which is character-

nearby mountains over approximately 17,000 feet of interbedded conglomerate, sandstone,

5.3. Site Hydrology

The following sections discuss the site hydrology in terms of both surface waters and groundwater.

5.3.1. Surface Waters

No natural surface water bodies, including ponds, streams, or other bodies of water, are present on the site or in the immediate site vicinity. Based on review of topographic maps, the Santa Ana Wash is located approximately 1 mile north of the site. The Santa Ana River runs west from the wash.

Groundwater

No groundwater data was available for the site. No beneficial or potential beneficial use of groundwater is reported. According to well data from the Western Municipal Water injection, and other factors. The regional groundwater flow direction is estimated to be District (WMWD), monitoring wells are located within close proximity to the site. Based on groundwater data collected from these well in late 2004, depth to groundwater was reported at approximately 200 to 210 feet below the ground surface (bgs). Groundwater levels can fluctuate due to seasonal variations, groundwater withdrawal or toward the west following surface topography.

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ENVIRONMENTAL DATABASE SEARCH

mental databases searched, their corresponding search radii, and a number of noted sites of A computerized environmental information database search was performed by EDR on May 27, 2005. The EDR search included federal, state, and local databases. A summary of the environenvironmental concern are presented in Appendix C. In addition, a description of the assumptions and approach to the database search is provided in Appendix C. The review was conducted to evaluate whether the site or properties within the vicinity of the site have been reported as having experienced significant unauthorized releases of hazardous substances or other events with potentially adverse environmental effects. The database search identified surrounding properties of potential environmental concern on various databases. In addition, three unmapped properties were identified in the vicinity of the subject site. Based on the address information provided for the three properties, and/or the types of databases on which these properties are listed, there is a low likelihood that the environmental integrity of the site has been adversely affected by these three off-site sources. The following paragraphs describe the databases that contain noted properties of environmental concern, and include a discussion of the regulatory status of the facilities and potential environmental impact to the subject site.

6.1. National Priorities List (NPL): Distance Searched - 1 mile

The NPL is the EPA's database of uncontrolled or abandoned hazardous waste properties identified for priority remedial actions under the Superfund program. Neither the site nor properties located within a 1-mile radius from the site were listed on this database.

6.2. Corrective Action Report (CORRACTS); Distance Searched - 1 mile

The EPA maintains this database of Resource Conservation and Recovery Act (RCRA) facilities that are undergoing corrective action. A corrective action order is issued when there

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has been a release of hazardous waste or constituents into the environment from a RCRA fa-

Brockton Avenue, approximately 0.75 mile south of and crossgradient from the site. Based The site was not listed on this database. One property within the 1-mile radius search was listed on this database. The facility, Teledyne Continental Motors, is located at 840 West on distance and direction from the site, there is a low likelihood that this facility has had an environmental impact on the site.

State Equivalent Priority List, Annual Workplan Sites (AWP): Distance Searched - 1 mile 6.3.

Department of Toxic Substance Control (DTSC) to develop a site-specific expenditure plan Clean-Up Bond Act of 1984 funds. The DTSC is also required to update the report annually (Annual Workplan sites) as the basis for an appropriation of California Hazardous Substance and report any significant adjustments to the Legislature on an ongoing basis. The AWP identifies California hazardous waste sites targeted for cleanup by responsible parties, the The Health and Safety Code, as amended by AB129, requires the California-EPA (Cal-EPA), DTSC and the Cal-EPA over a five-year period. Neither the site nor properties located within a 1-mile radius from the site were listed on this database.

6.4. Calsites Database (Calsites): Distance Searched - 0.5 mile

tion on AWP, and both known and potentially contaminated properties. Two-thirds of these properties have been classified, based on available information, as needing no further action (NFA) by the DTSC. The remaining properties are in various stages of review and remediation The Calsites database is maintained by the Cal-EPA, DTSC. This database contains informato determine if a problem exists. *Ninyo.* Moore

Neither the site nor properties located within a 0.5-mile radius from the site were listed on this database.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) List: Distance Searched - 0.5 mile 6.5.

properties which are in the screening and assessment phase for possible inclusion on the The CERCLIS database contains properties which are either proposed or on the NPL and

Neither the site nor properties located within a 0.5-mile radius from the site were listed on this database.

RCRA Treatment, Storage and Disposal (TSD) Facilities List: Distance Searched - 0.5 mile 9.9

The RCRA TSD database is a compilation by the EPA of facilities that report generation, storage, transportation, treatment, or disposal of hazardous waste. Neither the site nor properties located within a 0.5-mile radius from the site were listed on this database.

Leaking Underground Storage Tank (LUST) Lists: Distance Searched 0.5 mile 6.7.

Databases of the LUST information system are maintained by the State Water Resources Control Board (SWRCB) and RWQCB. The site was not listed on this database. One property was listed within a 0.5-mile radius from the site. Texas Street Pumping Plant, located at 1401 Texas Street, approximately 0.35 mile south of and crossgradient from the site was listed. The case type is "soil only" and the regulatory status is "case closed." Based on the distance and direction from the site,

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the case type, and regulatory status of the facility, this facility would not be considered an environmental concern to the site.

6.8. Solid Waste Landfill Sites (SWLF): Distance Searched - 0.5 mile

The SWLF database consists of open and closed solid waste disposal facilities and transfer stations. The data comes from the Integrated Waste Management Board's Solid Waste Information System (SWIS) database and the State Water Resources Control Board's Waste Management Unit database. Neither the site nor properties located within a 0.5-mile radius from the site were listed on this database.

Toxic Release Inventory Database (TRIS): Distance Searched - Site 6.9

The Community Right to Know Act (SARA Title III) required the EPA to establish this inventory of toxic chemical emissions from certain facilities.

The site was not listed on this database.

6.10. Underground Storage Tank (UST) and Aboveground Storage Tank (AST) Reg-

UST and AST databases are provided by the SWRCB. Inclusion on these lists is for permitistration List: Distance Searched - Site and Adjacent Properties ting purposes and is not indicative of a release. The site was not listed. One adjacent property was listed. Blue Goose Growers at ing our site vicinity reconnaissance, however, EDR indicated that the facility was associated with a "citrus packing house." Based on this information, it is our assumption that this facility is associated with the Sunkist facility. The tank was reported to contain "waste." This 1600 Texas Street was listed as having had a historical UST. This facility was not noted durproperty was not listed on the LUST database. Winyo .. Moore

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6.11. RCRA Generators List: Distance Searched - Site and Adjacent Properties

grams/month) and small quantity (between 100 and 1,000 kilograms/month) generators of This list identifies sites that are considered large quantity (greater than 1,000 kilohazardous waste as defined by RCRA. Inclusion on these lists is for permitting purposes and is not indicative of a release.

Neither the site nor properties adjacent to the site were listed on this database.

6.12. Other Non-ASTM Database

standards. The site was not listed on these databases, although the Sunkist facility, which is Some listings on regulatory databases are readily available but are not required by ASTM located directly upgradient from the site was listed. The Sunkist facility was listed on the REF database as Redlands Farming Company and on the HAZNET database as Redlands Heights. Both facilities were listed at 780 West San Bernardino Avenue. The HAZNET database is maintained by Cal-EPA and lists facilities which have used hazardous waste manifests. According to EDR, this facility disposed of aqueous solutions, possibly associated with the waste products at the facility. The REF database is maintained by the DTSC of facilities which were determined as not requiring direct DTSC oversight. These facilities were referred to local agencies, in this case, the County of San "contamination in low quantities" was present. The property was issued a no further action (NFA) letter. Based on the depth to groundwater, type of facility, chemicals used/stored on Bernardino Department of Environmental Health (DEH). According to the database, a driveby investigation noted some oil staining, pesticide equipment, and an unlined pond. A preliminary investigation completed under the direction of the DEH concluded that the property, and regulatory status, there is a low likelihood that this off-site facility has environmentally impacted the site.

Redlands, California 37.9-Acre Property

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ENVIRONMENTAL RECORDS REVIEW

mation regarding the site, the site has been used for agricultural purposes since at least 1930. No addresses have been assigned to the site. Regulatory agencies typically file information based on site address. Based on this information, no regulatory file information was requested from certain County Fire Department, Hazardous Materials Division using Assessor's Parcel Numbers (APNs). To-date, no information has been obtained. Based on the historical land use, there is a low likelihood that regulatory files, if any, would change the conclusions and recommendations regulatory agencies. Ninyo & Moore has requested file information from the San Bernardino Based on the site reconnaissance, historical research, environmental database review, and inforof this report.

FINDINGS, OPINIONS, AND CONCLUSIONS œ.

Based upon the results of this Phase I ESA, the following findings, opinions, and conclusions are provided.

8.1. Findings and Opinions

The following presents a summary of findings and opinions associated with the Phase I ESA performed for the subject site, including known or suspect RECs, historical RECs, and de minimus environmental conditions (i.e., conditions that generally do not present a material risk of harm to public health or the environment).

- The property has been used for agricultural purposes (orange groves) since at least 1930. The site currently consists of orange groves. Many utilities lines and features, such as natural gas pipelines, water drip systems, and irrigation systems, were noted onsite. No groundwater wells were observed. Historically, the surrounding properties have also generally been used for agricultural purposes (orange groves) and currently are vacant land, or used for commercial or residential purposes.
- Groundwater beneath the site occurs at depths of approximately 200 feet bgs and flows in a westerly direction.
- Hundreds of smudge-pots are located throughout the site. There was no historical or current information or indication that smudge-pot oils were stored on-site in large quantities (e.g., in ASTs). Each smudge-pot contains a small underground holding container

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served staining, and type of chemicals used in the smudge-pots (i.e., heavy oils), these for oil. Due to the depth to groundwater, limited quantities of chemicals, lack of obfeatures would not be considered an environmental concern to the site.

- been no indication, based on our review of historical information, regulatory agency file large quantities or mixed on the site. Due to the depth to groundwater and proposed commercial land use, there is a low likelihood that residual chemicals associated with It is our assumption that pesticides and herbicides have been used at the site. There has and database review, and site visit, that pesticides or herbicides have been stored in these activities would pose an environmental concern or, following grading and redevelopment activities, pose a health threat to future occupants.
- A fruit packing facility, Sunkist, has been located immediately east of and upgradient from the site and beyond Texas Street since at least 1928. Historical topographical maps indicated that the facility stored "oil" in ASTs (probably smudge-pot oil for the surrounding orange groves). This facility was listed on the HAZNET database (non-ASTM database) for the disposal of aqueous solutions, possibly associated with waste products at the facility. The facility was also listed on the REF database (non-ASTM database). According to the database, a drive-by investigation noted some oil staining, pesticide equipment, and an unlined pond. A preliminary investigation completed under the direction of the DEH concluded that "contamination in low quantities" were present. The site was issued an NFA status. Based on the depth to groundwater, type of facility, chemicals used/stored on the property, and regulatory status, there is a low likelihood that this offsite facility has environmentally impacted the site. No other off-site sources of environmental concern were noted in the site vicinity.

Conclusions

tions of the ASTM E 1527-00 standards for the 37.9-acre property located in the city of Redlands, California. No evidence or indication of RECs in connection with the property has Ninyo & Moore has performed a Phase I ESA, in conformance with the scope and limitabeen revealed

RECOMMENDATIONS

Ninyo & Moore does not recommend additional investigations at this time. Due to the size of the property, numerous orange trees, and time constraints, some areas of the site were not physically inspected. Groundwater wells may be located on-site and were not discovered. Although not

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considered an environmental concern, if groundwater wells are discovered during grading activities, these wells should be abandoned in accordance with current regulatory guidelines.

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10. SELECTED REFERENCES

Environmental Data Resource, Inc., 2005, The EDR Radius Map Report, dated May 27.

United States Geological Survey, 1967 (Photorevised 1988), Redlands, California, Topographic Quadrangle Map, 7.5 Minute Series: Scale 1:24,000.

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June 20, 2005 Project No. 206343001

QUALIFICATIONS STATEMENT AND SIGNATURE OF ENVIRONMENTAL PROFESSIONAL

Mr. Paul Roberts states that the Phase I ESA was performed under his direct supervision, and that he has reviewed and approved the report, and the methods and procedures employed in the development of the report conform to the minimum industry standards. Mr. Roberts certifies that Ninyo & Moore project personnel and subcontractors are properly licensed and/or certified to do the work described herein.

Paul A. Roberts, P.G., R.E.A. I/II Senior Environmental Geologist

REI HIGHL SITE PRVKA MAL 2 **100** RIVER

REFERENCE: 2004 THOMAS GUIDE FOR SAN BERNARDING AND RIVERSIDE COUNTIES, STREET GUIDE AND DIRECTORY



APPROXIMATE SCALE IN FEET

SITE LOCATION MAP

37.9 ACRE PROPERTY REDLANDS, CALIFORNIA

FIGURE DATE 6/2005 PROJECT NO. 206343001 *linyo ∞* Moore__

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Winyo. Moore

Winyo. Asor a

37.9-Acre Property Redlands, California

RESIDENTIAL

VACANT LAND

RESIDENTIAL

TEXAS STREET

VACANT LAND

TENNESSEE STREET

June 20, 2005 Project No. 206343001

APPENDIXA

SUNIGST GROWERS REDLANDS HEIGHTS CITRUS

- SITE BOUNDARY

VACANT LAND

PHOTOGRAPHIC DOCUMENTATION

37.9 ACRE PROPERTY REDLANDS, CALIFORNIA

SITE PLAN

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

0 400 APPROXIMATE SCALE IN FEET

DATE 6/2005 PROJECT NO. 206343001

Appendix A Project No. 206343001

37.9 Acre Property Redlands, California

Appendix A Project No. 206343001



Looking south at the site. Photograph No. 1:



Smudge pots observed throughout site. Photograph No. 2:

206343001 A.doc



Concrete blocks believed to be associated with historical smudge pots. Photograph No. 3:



Looking north, away from site, at vacant land beyond Pioneer Avenue. Photograph No. 4:

206343001 A.doc

206343001 R Phase I - PDF doc



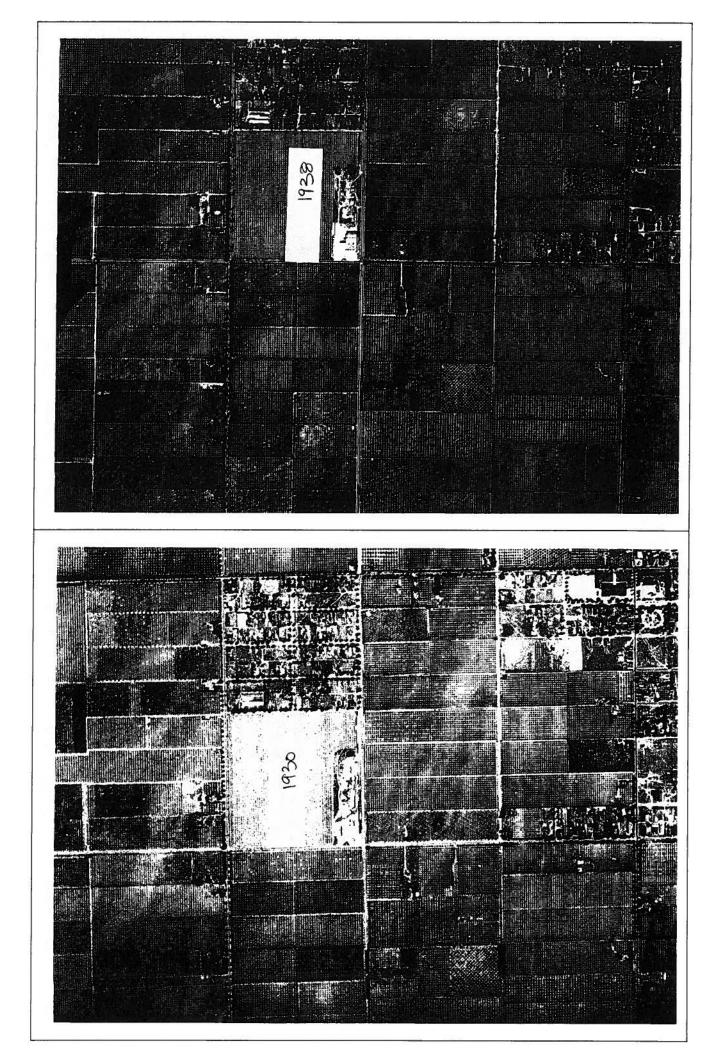
Looking south at vacant land west of the site. Photograph No. 5:



Sunkist Gravers Redlands Heights citrus fruit packing facility located east of the site and beyond Texas Street.

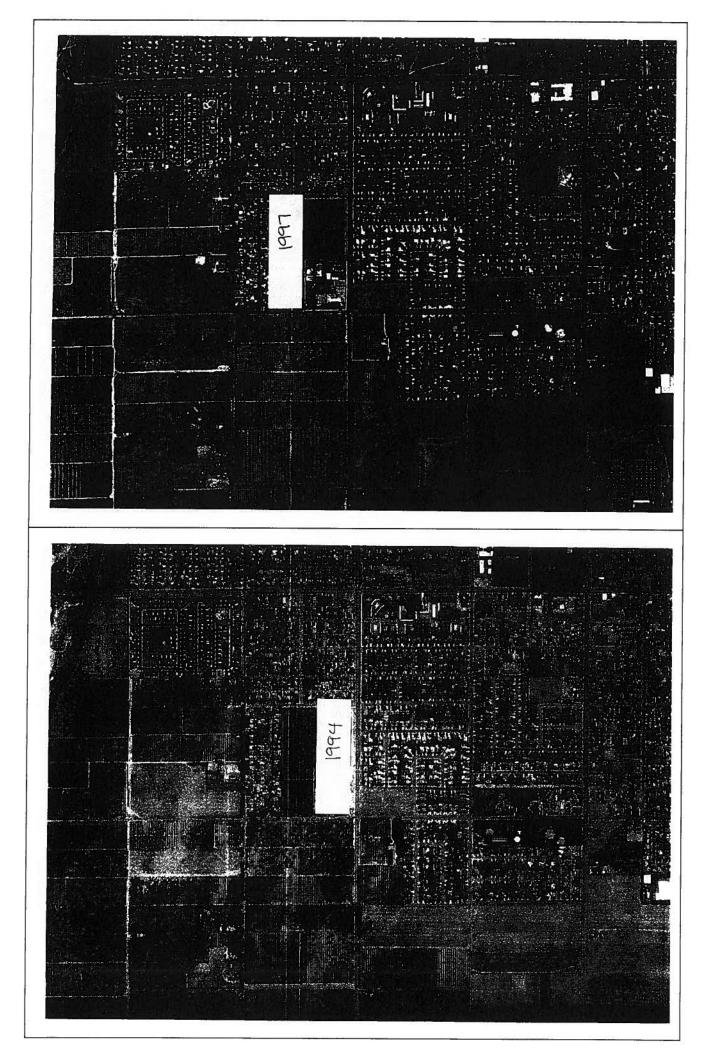
RELEVANT SITE INFORMATION APPENDIX B

206343001 A.doc









TerraServer Image Courtesy of the USGS

Page 1 of 1

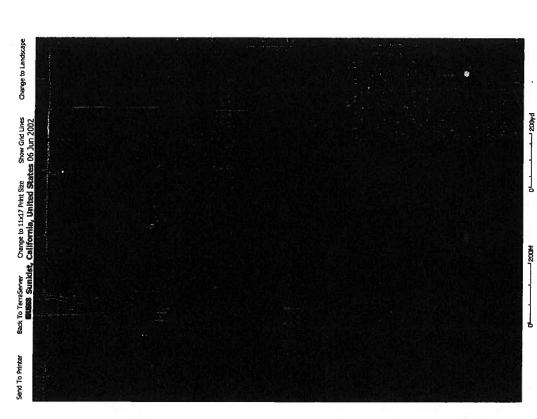


Image courtesy of the U.S. Geological Survey © 2004 Microsoft Corporation. Terms of Use Privacy Statement

http://www.terraserver.microsoft.com/PrintImage.aspx?T=1&S=11&Z=11&X=1204&Y=94... 6/1/2005



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Sanborn® Map Report

Order Date: 5/27/2005 Completion Date: 5/31/2005

Inquiry #: 1432255.3s

206343001

P.O. #:

Ship To: Beth Padgett

Ninyo & Moore

475 Goddard

Irvine, CA 92618

949-753-7070

1023871TDM

Customer Project: 206343001

Address: San Bernardino Ave/Texas St Site Name: Orange Groves

City/State: Redlands, CA 92373 Cross Streets: Based on client-supplied information, fire insurance maps for the following years were identified

1948 - 1 Map 1928 - 1 Map 1955 - 1 Map

Total Maps: 3 Limited Permission to Photocopy

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This User's Guide provides guidelines for accessing Sanborn Map® images and for transferring them to your Word Processor.

Reading Sanborn Maps

Sanborn Maps document historical property use by displaying property information through words, abbreviations, and map symbols. The Sanborn Map Key provides information to help interpret the symbols and abbreviations used on Sanborn Maps. The Key is available from EDR's Web Site at: http://www.edmet.com/reports/samples/key.pdf

Organization of Electronic Sanborn image File

- Sanborn Map Report, listing years of coverage
 - Oldest Sanborn Map Image User's Guide

Navigating the Electronic Sanborn Image File

Most recent Sanborn Map Image

Open file on screen.

- 2. Identify TP (Target Property) on the most recent map.
 3. Find TP on older printed images.
 4. Using Acrobatic Readen®, zoom to 250% in order to view more dearly. (200-250% is the approximate equivalent scale of hardcopy Samborn Maps.)
 A. On the menu ber, click "View" and then "Zoom to..."
 B. Or, use the magnifying tool and drag a box around the TP

Printing a Sanborn Map From the Electonic File

- EDR recommends printing images at 300 dpi (300 dpi prints faster than 600 dpi)
 To print only the TP area, cut and paste from Acrobat to your word processor application.

Acrobat Versions 6 and 7

- 2. Click the "Select Tool"

- 3. Draw a box around the area selected 4. "Right click" on your mouse 5. Select "Copy Image to Clipboard"
- Go to Word Processor such as Microsoft Word, paste and print.

Acrobat Version 5

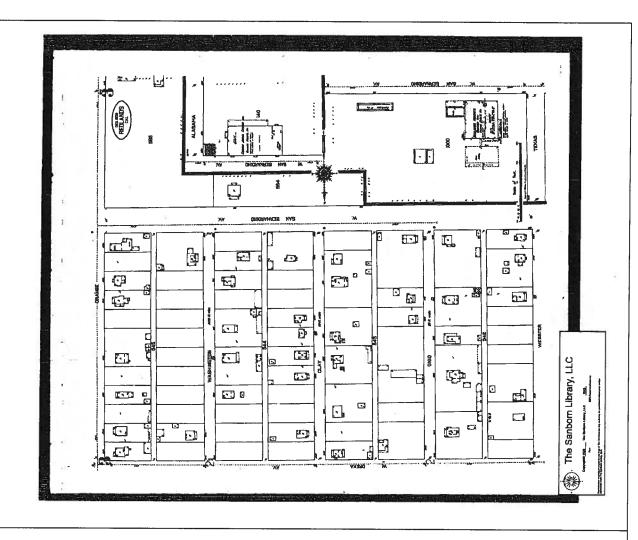
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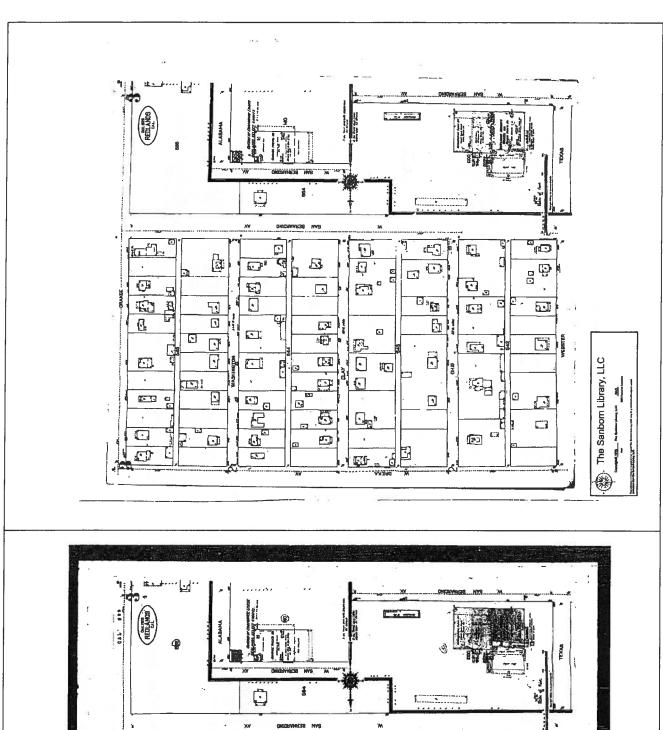
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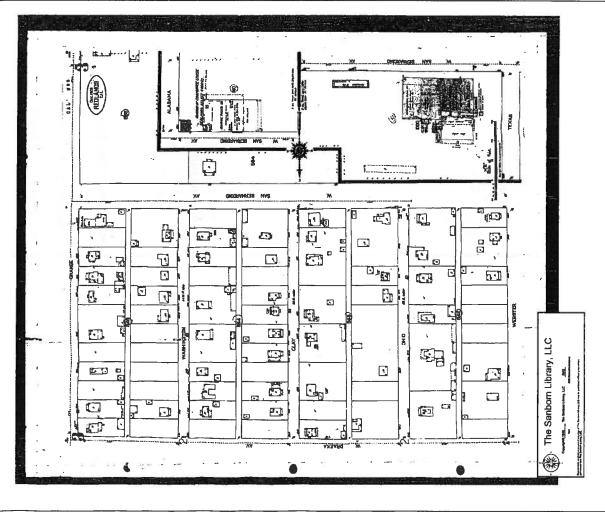
- Go to the menu bar
 Click the "Graphics Select Tooi"
 Draw a box around the area selected
- 4. Go to "Menu"
 5. Highlight "Edit"
 6. Highlight "Copy"
 7. Go to Word Processor such as Microsoft Word, paste and print.

Important Information about Email Delivery of Electronic Sanborn Map images

- Images are grouped intro one file, up to 2MB.
- In cases where in excess of 6-7 may years are available, the file size typically exceeds 2MB. In these cases, you will receive multiple files, lethed as "1 of 3" 2 of 3" etc. including all available map years.
 Due to file size limitations, cartain ISPs, including AOL, may occasionally delay or decline to deliver files. Please contact your ISP to Identify their specific file size limitations.









The EDR-City Directory

800 San Bernadino Ave Redlands, CA 92373 Orange Groves

Inquiry Number: 1432255-7

Risk Management In Environmental The Standard Information

440 Wheelers Farms Road Milford, Connecticut 06460 Nationwide Customer Service

Telephone: 1-800-352-0050 Fax: 1-800-231-6802

Environmental Data Resources, Inc. City Directory Abstract

Environmental Data Resources, Inc.'s (EDR) City Directory Abstract is a screening tool designed to assist professionals in evaluating potential labelity on a larget property enabling from the 1527-00, Section 73 on Historical Use information identifies the prior use requirements for a Place I conformation labelity to a large and a standard requires a review of reasonably accordanced to the conformation of the section of reasonably accordanced to the section of the section of the section of present Reposition and the section of the section of present Reposition of the section of the section of present and the section of the secti

To meet the prior use requirements of ASTM E 1527-00, Section 7.3.4; the following standard historical sources range be used: serial photographs, five insurance maps, property instilled, and this records (although these cannot be the sub-listorical counce consulted), propagablic maps, city directories, building department records, or zoning/land use records. ASTM & E 1577-00 required, propagablic maps, city directories, building department research or zoning/land use records. ASTM & E 1577-00 requires **/411 lowinguise uses of the repoperty shall be identified from the present, back to the property solving for developed uses, or back to 1940, whichever it earlier. This task requires reviewing only as many of the standard instances sources as are reasonably accordantable and likely to be useful. (ASTM & 1577-00, Section 73.2 page 12.)

BDR's City Directory Abstract includes a search and abstract of available city directory data.

City Directories

City directories have been published for cities and towns across the U.S. since the 1700s. Originally a first of residents, the city directories have been published for cities and towns directories are particular union or subturent or the control of the city directory developed into a sophishicisted tool for locating incitivables and businesss in a particular union or subturent solutions are centrally directories are generally directory times excitons: a business index, a list of resident memors and seldresses, and a street index. With each stadies, the times and states, the name and type of business (if tunclest from the name). While city directory coverage is comprehensive for major cities, it may be spory for rural areas and small towns. ASTM E 1527-40 specifies that a his practice. * (ASTM E 1527-40, Section 7.3.1.), page 12.)

NAICS (North American Industry Classification System) Codes
NAICS is undue, all-lawe system for Classifying Universe stabilishments. Adopted in 1997 to replace the
prior Standard Industry Classification (SIC) system, it is the system used by the statistical
prior Standard Industry Classification (SIC) system, it is the system used by the statistical
spancies of the United States, If it the first economic classification system to be constructed based on a
single economic concept. To learn more about the background, the development and difference between
NAICS and SIC, visit the following Census website: http://www.census.gov/cpcd/www.haissedv.htm.

Please call EDR Nationwide Customer Service at with questions or comments about your report. 1-800-352-0050 (8am-8pm EST) Thank you for your business!

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SUMMARY

City Directories:

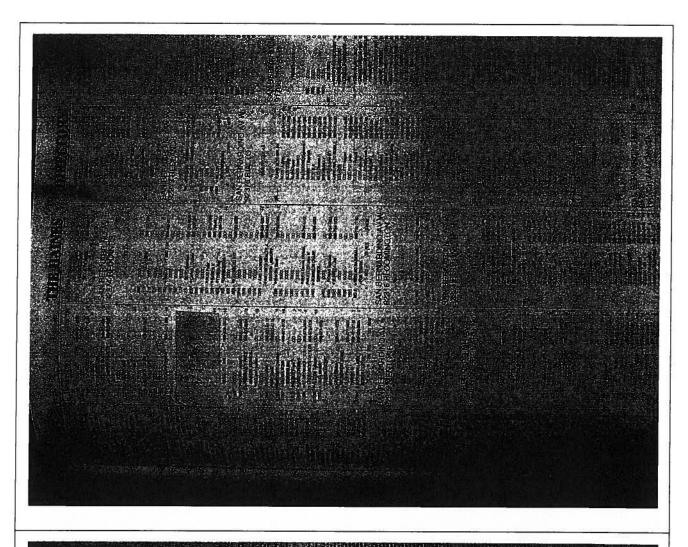
Business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five year intervals for the years spanning 1970 through 2004. (These years are not necessarily inclusive.) A summary of the information obtained is provided in the text of this report.

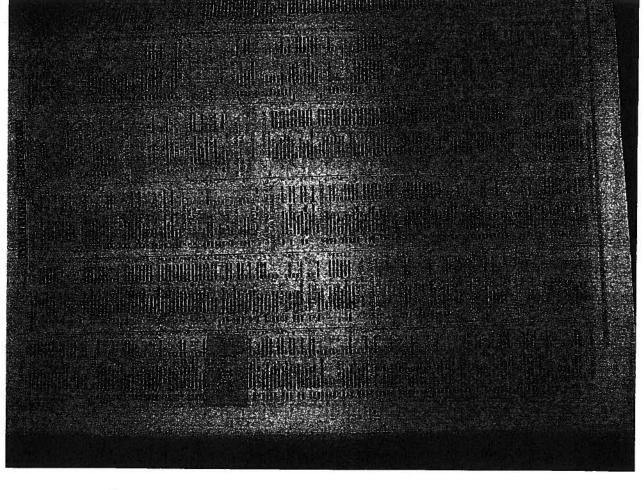
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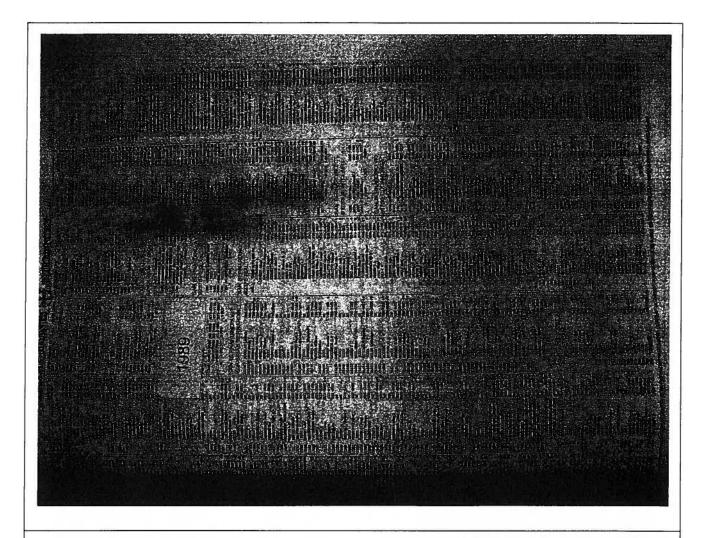
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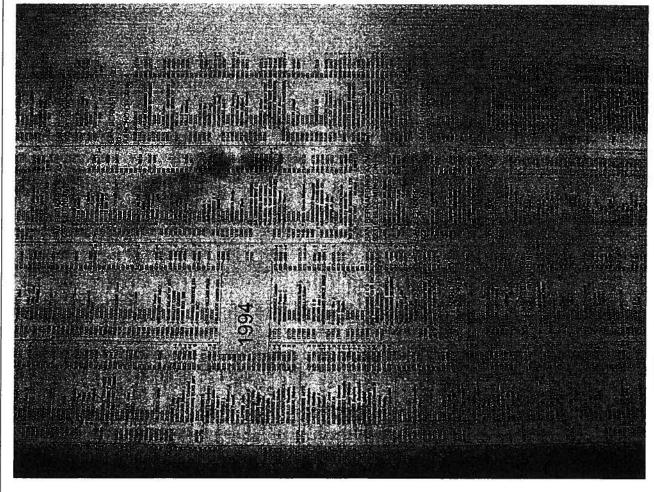
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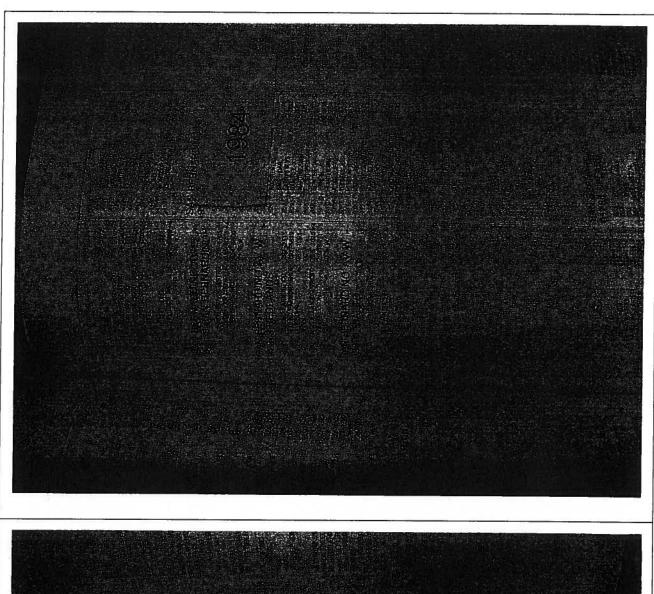
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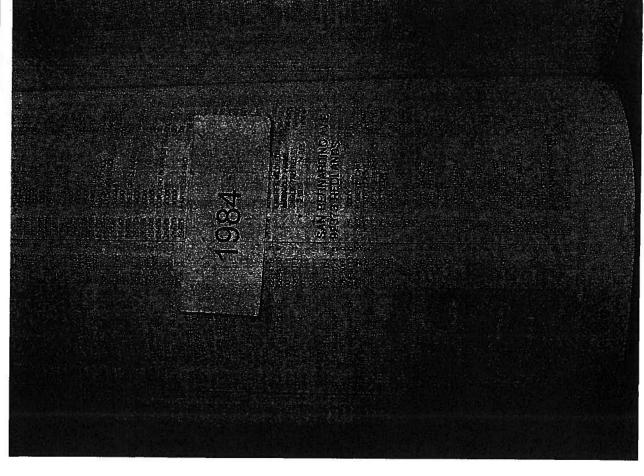


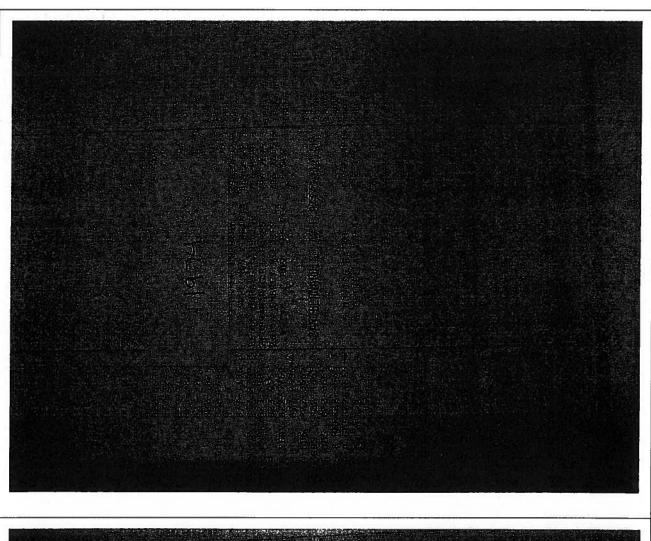


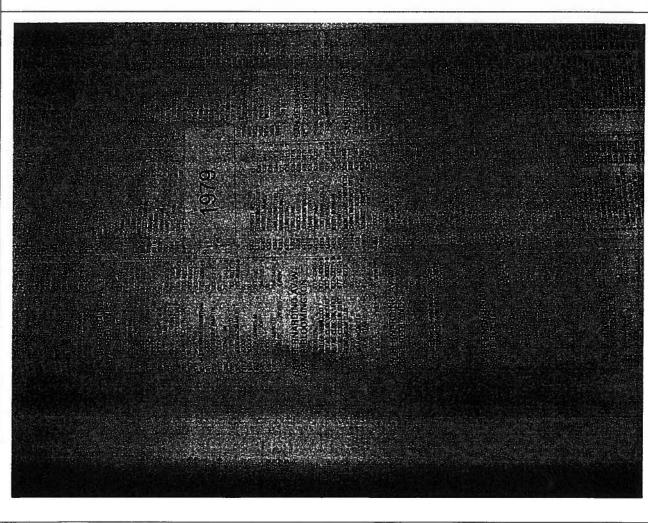


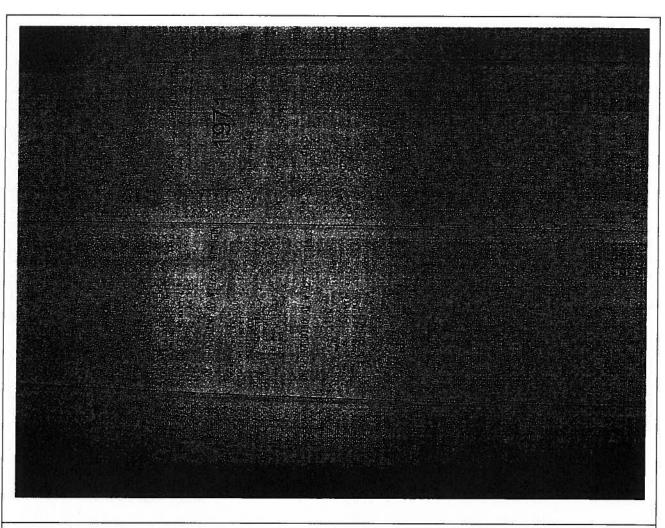


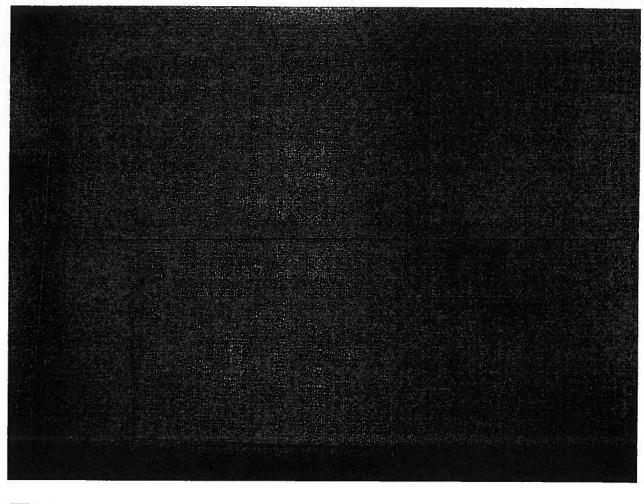


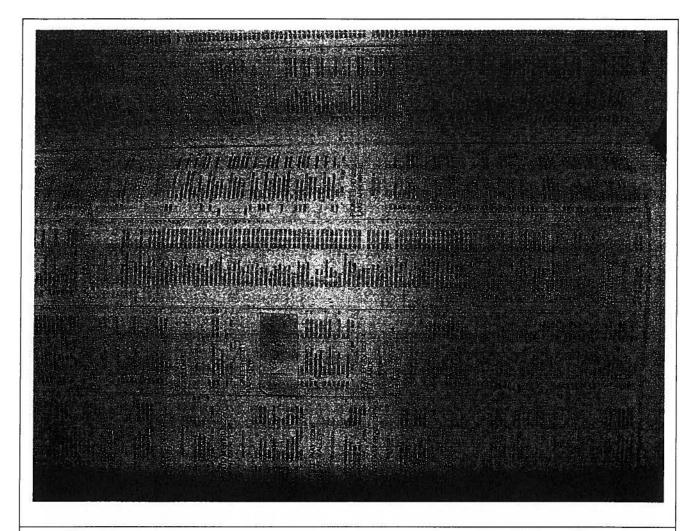


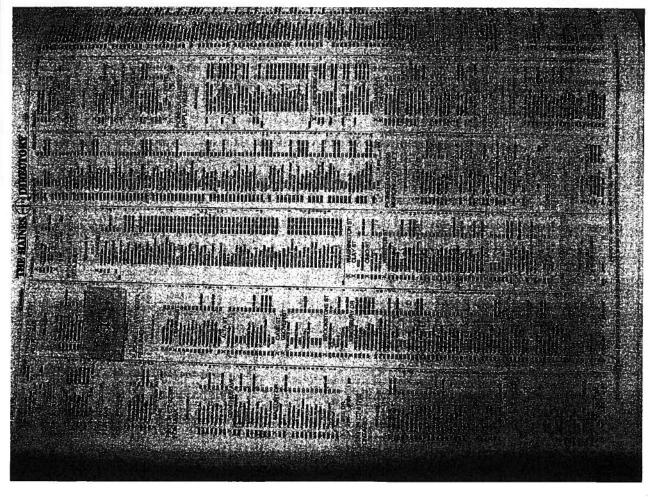


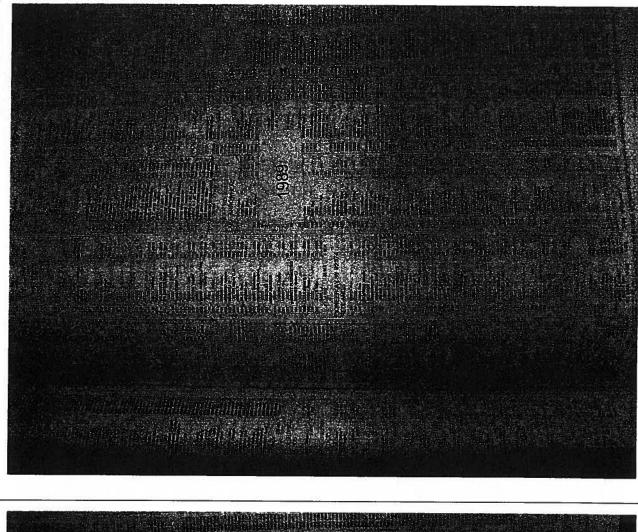


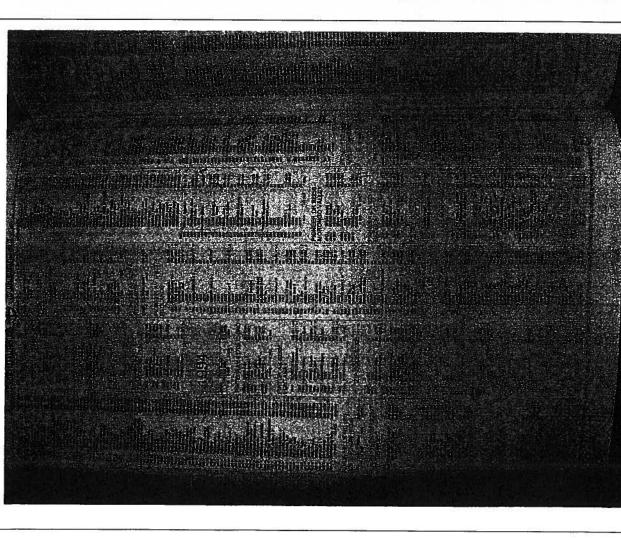


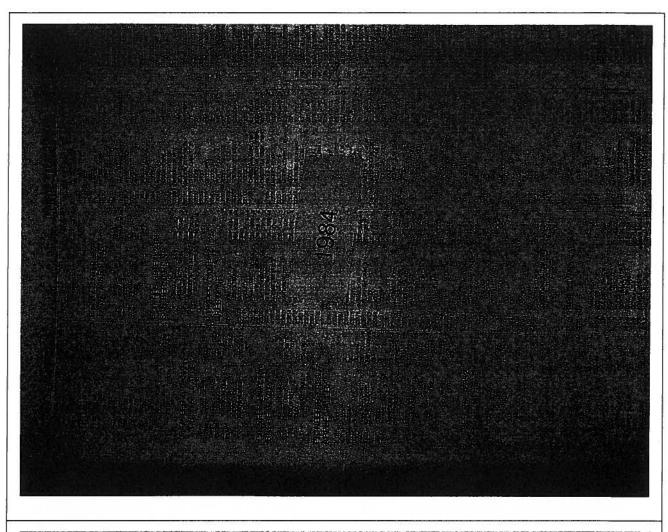


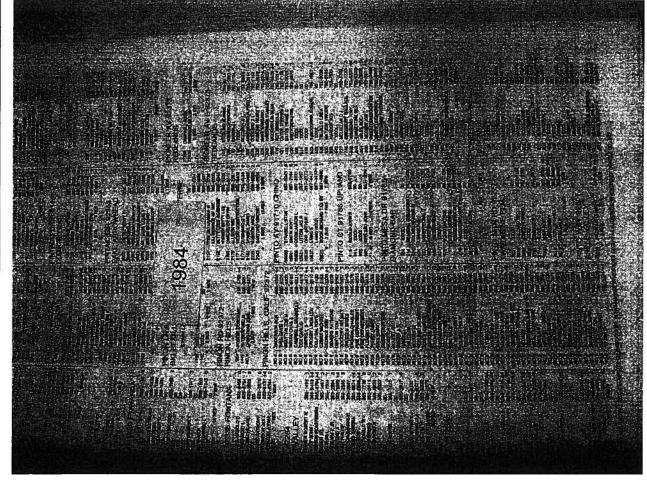


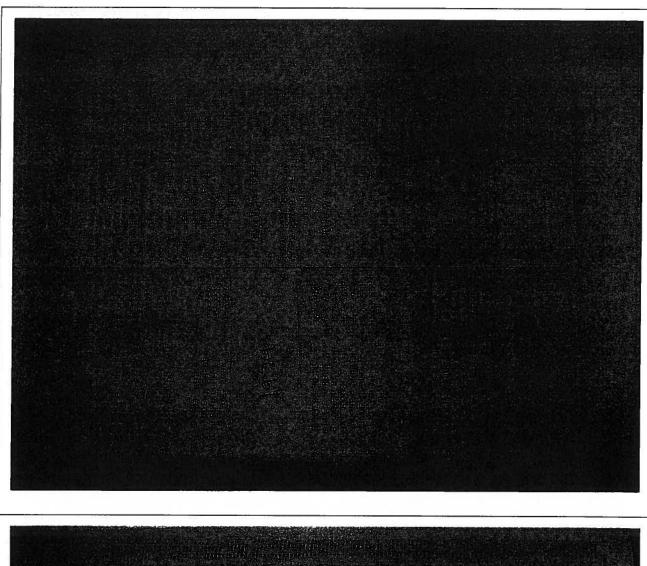


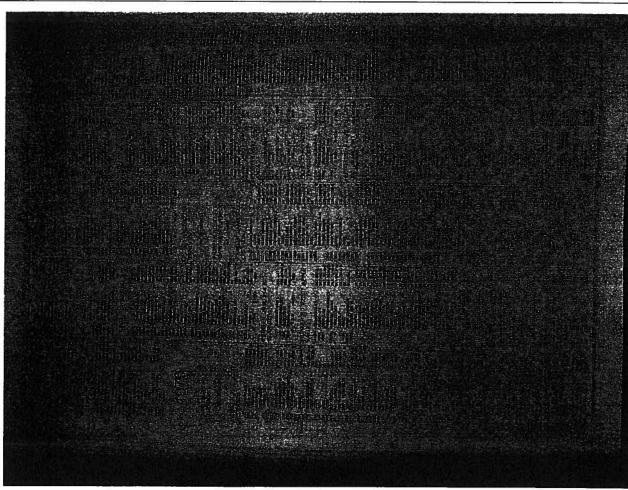


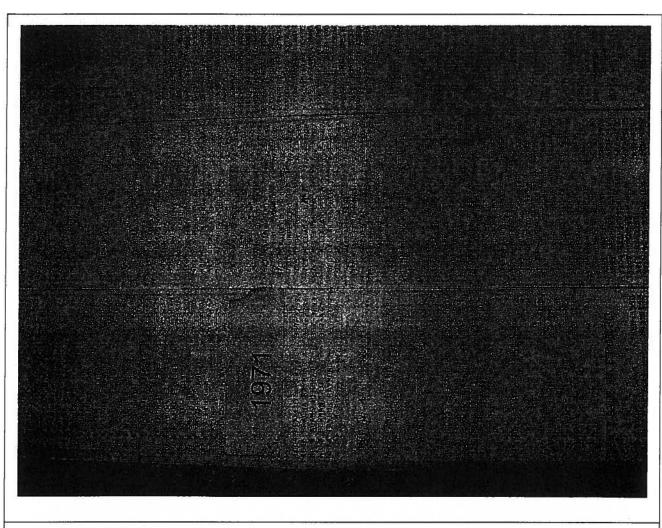


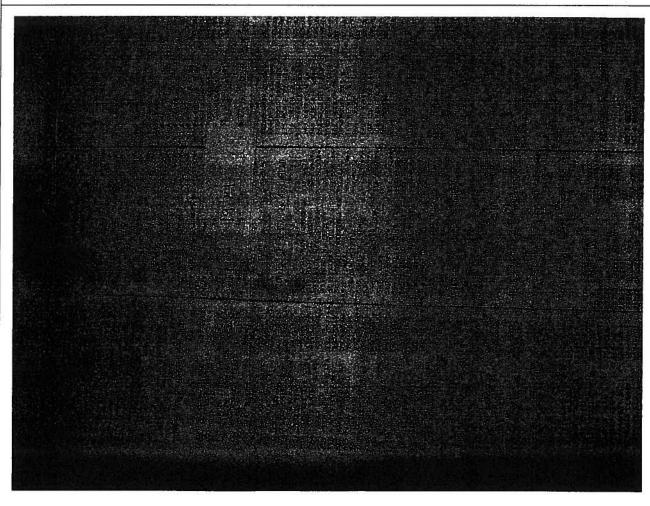


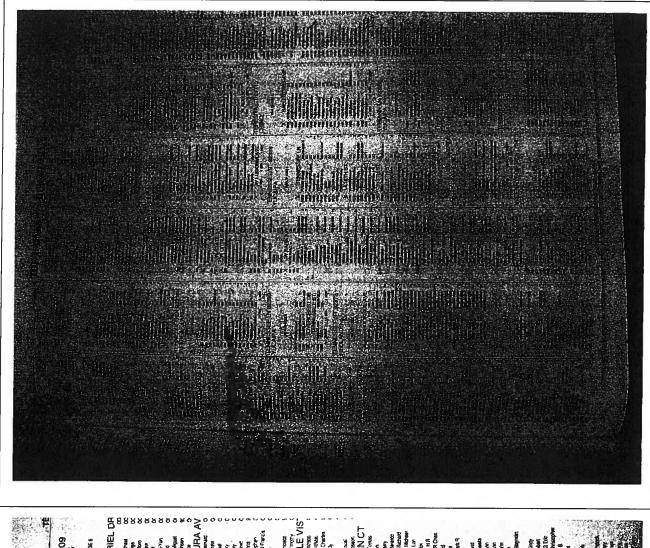




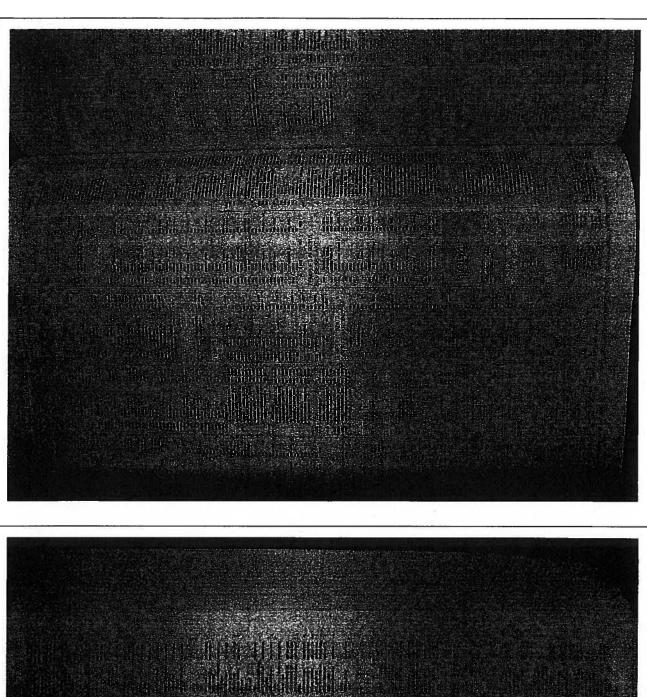


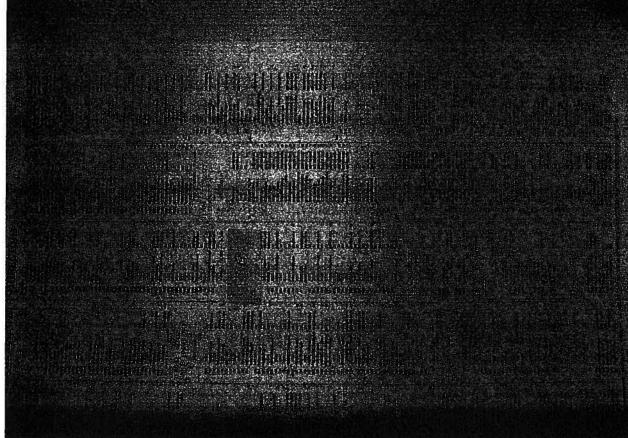


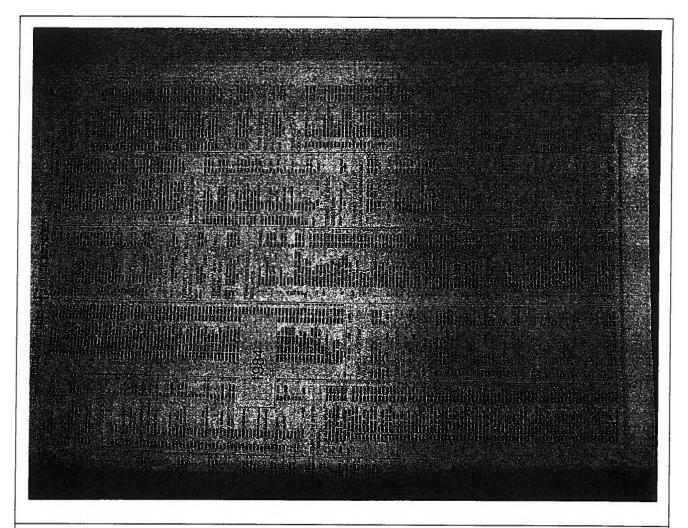


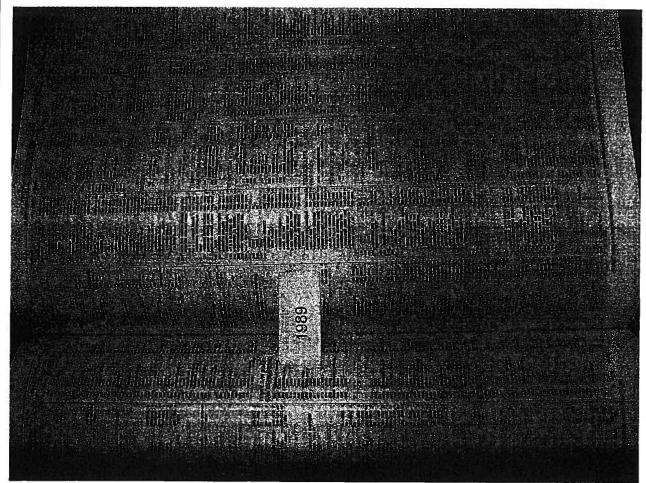


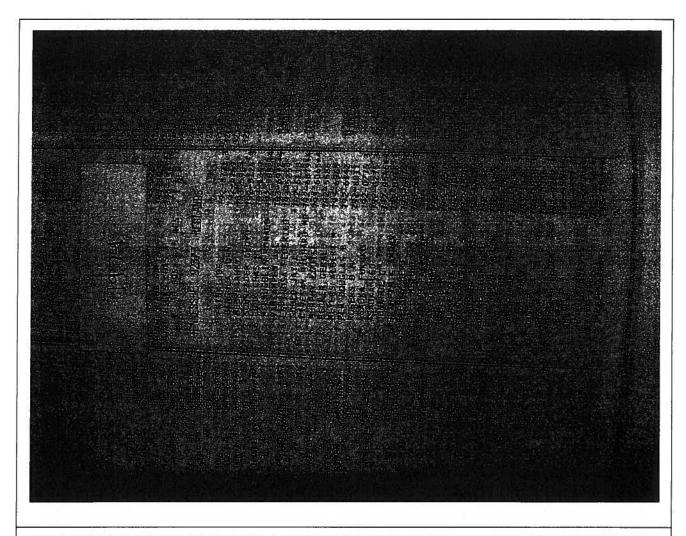
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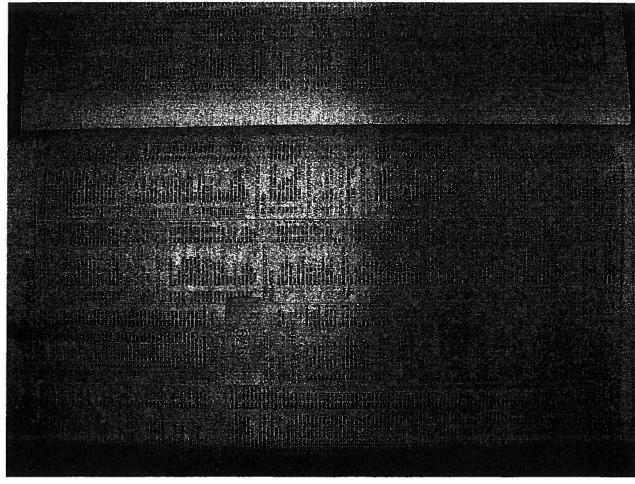


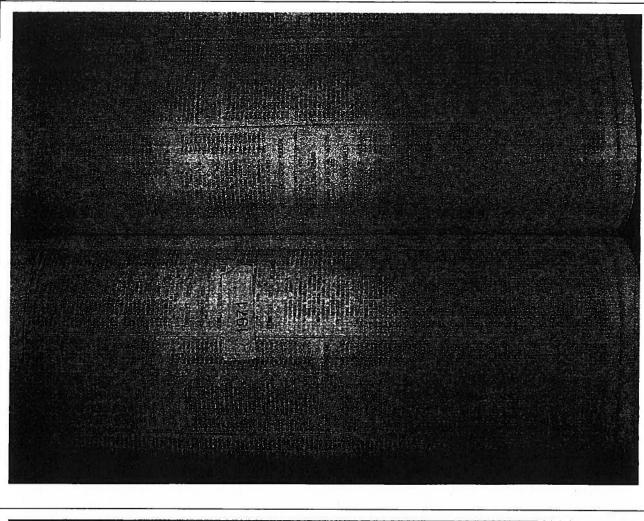


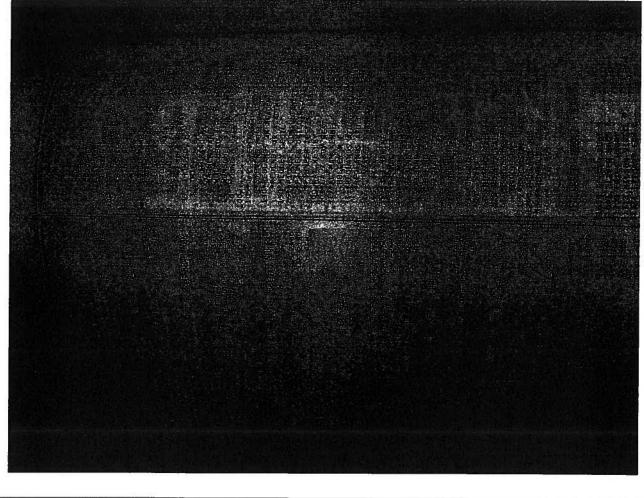


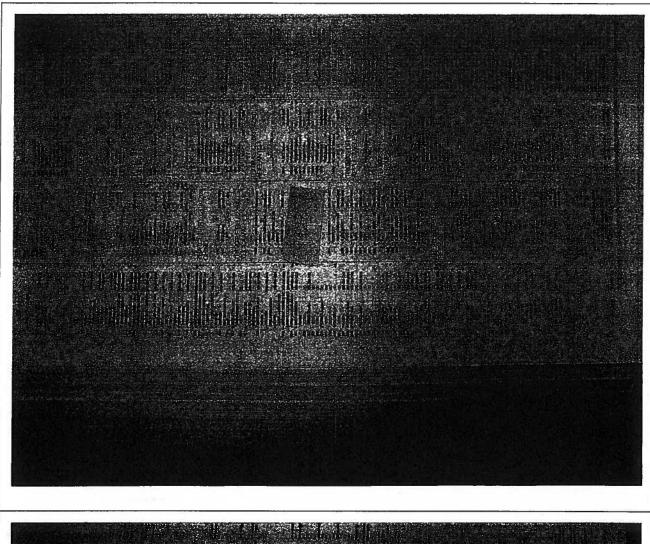


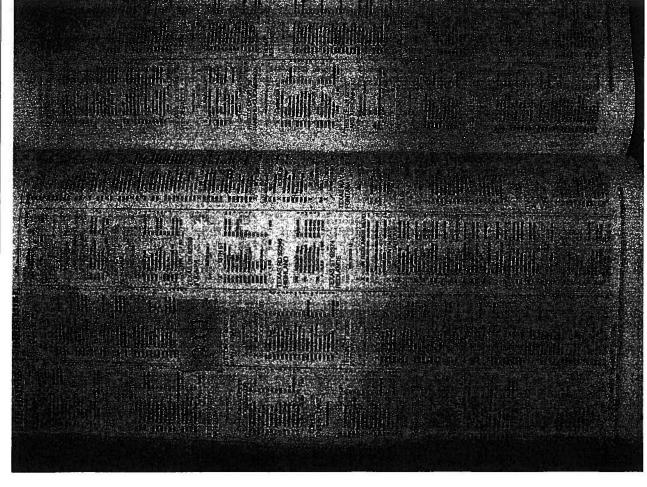


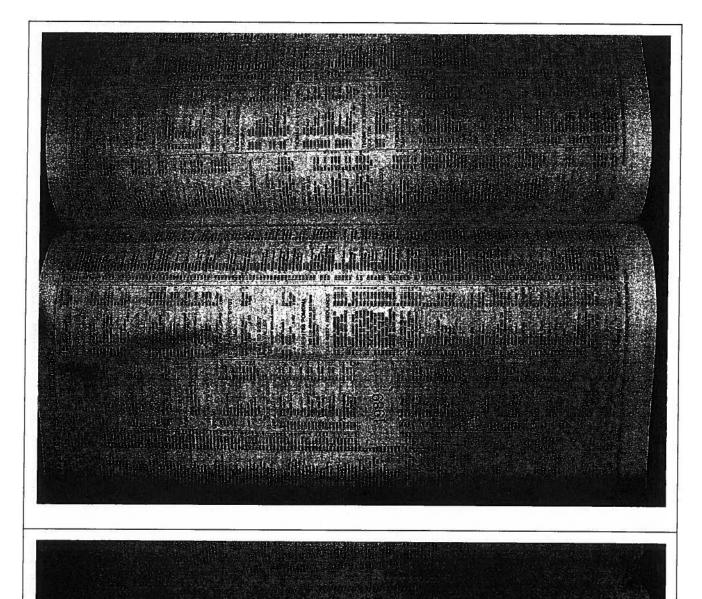


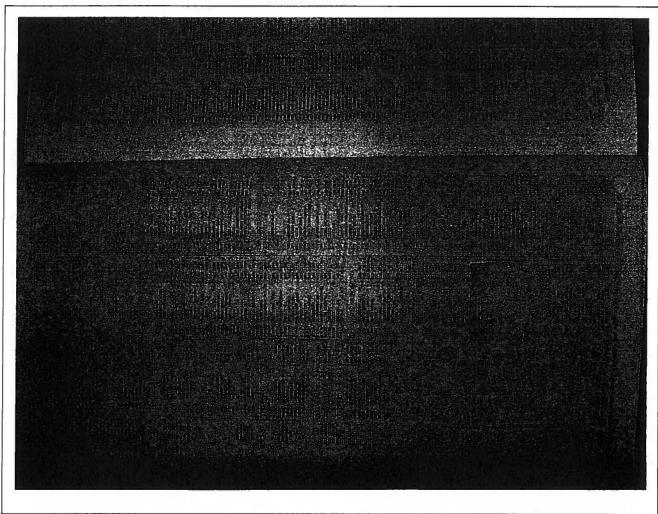


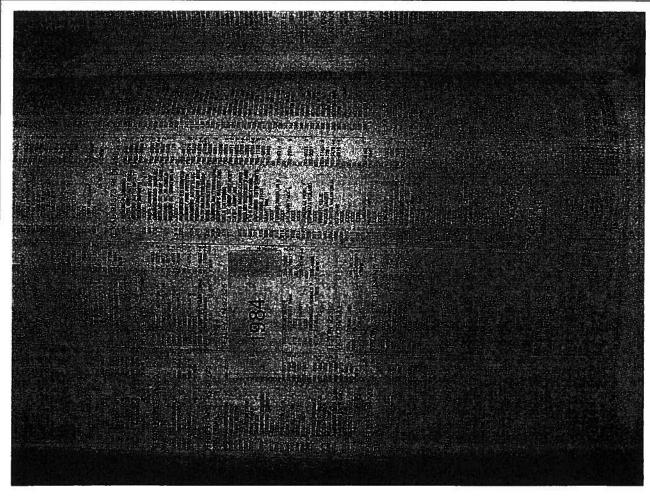


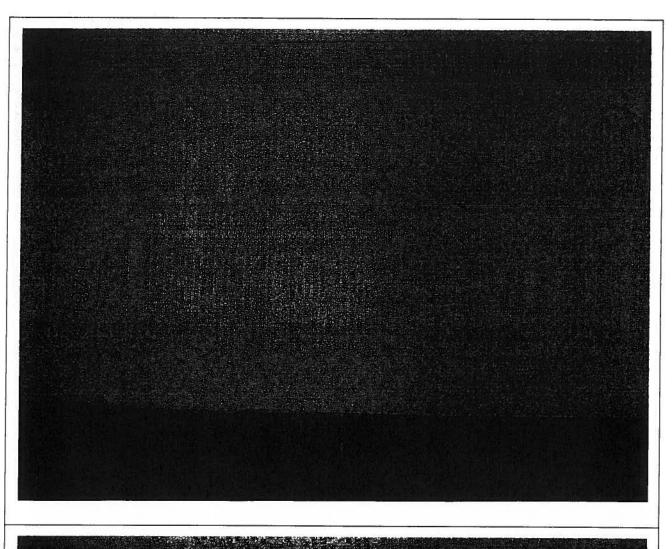


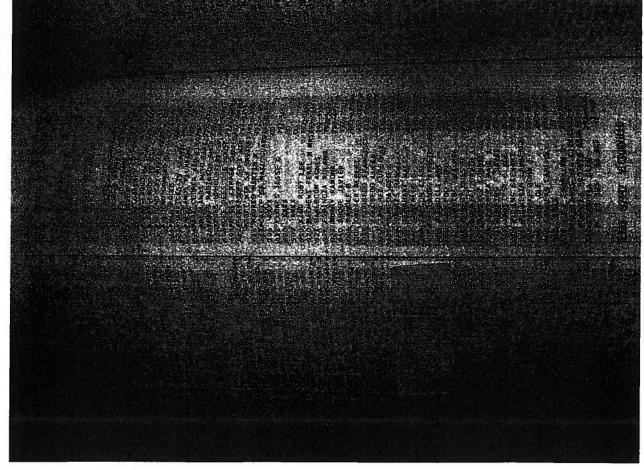














EDR Historical Topographic Map Report

Orange Groves
San Bernardino Ave/Texas St
Redlands, CA 92373

Inquiry Number: 1432255.4

May 31, 2005

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road Milford, Connectlcut 06460 Nationwide Customer Service

Telephone: 1-800-352-0050 Fax: 1-800-231-6802 Internet: www.edmet.com

EDR Historical Topographic Map Report

Environmental Data Resources, Inc.'s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property, and its surrounding area, resulting from past activities. ASTM E 1527-03, Section 7.3 on Historical Use Information, thentifies the prior use requirements for a Phase I environmental site assessment. The ASTM standard requires a review of reasonably ascertainable is defined as information that is publicly available, obtainable from a source with reasonable time and cost constraints, and practically reviewable. To meet the prior use requirements of ASTM E 1527-00, Section 7.3.4, the following standard instructes sources on the professional source consulted), building openity tax files, land title records (although these cannot be the sole historical source consulted), building department records, or zoningatural use records. ASTM E 1527-00 getter 9.44 dovicus uses of the property shalf be identified from the present, back to the property's obvicus first developed use, or back to 1940, whichever is earlier. This task requires reviewing only as many of the standard historical sources as are necessary, and that are reasonably ascentainable and likely to be useful." (ASTM E 1527-00, Section 7.3.2.

EDR's Historical Topographic Map Report includes a search of available public and private color historical topographic map collections.

Topographic Maps

A topographic map (topo) is a color coded line-and-symbol representation of natural and selected artificial features plotted to accele. Topos show the strape, elevation, and development of the terrain in precise detail features plotted to a scale. Topos show the strape, elevation, and development of the terrain in precise detail for using contour lines and color coded symbols. Many features are shown by lines that may be straight, curved, soild, dashed, other, of in any combination. The colors of the lines usually indicate similar classes of information. For example, prographic contours (brown); lakes, streams, irrigation ditches, etc. (blue); land grids and important roads (red); secondary roads and trails, railroads, boundaries, etc. (blue); land features that have been updated using atenial photography, but not field verified, such as disturbed land areas (e.g., gravel pits) and newly developed water bodies (purple).

For more than a century, the USGS has been creating and revising topographic maps for the entire country at a variety of scales. There are about 60,000 U.S. Geological Survey (USGS) produced topo maps covering the United States. Each map covers a specific quadrangle (quad) defined as a four-stoked area bounded by letitude and origitude. Historical topographic maps are a valuable historical resource for documenting the prior use of a property and its surrounding area, and due to their frequent availability can be particularly integrity when other standard historical sources (such as city directories, fire insurance maps, or serial photographs) are not reasonably ascertainable.

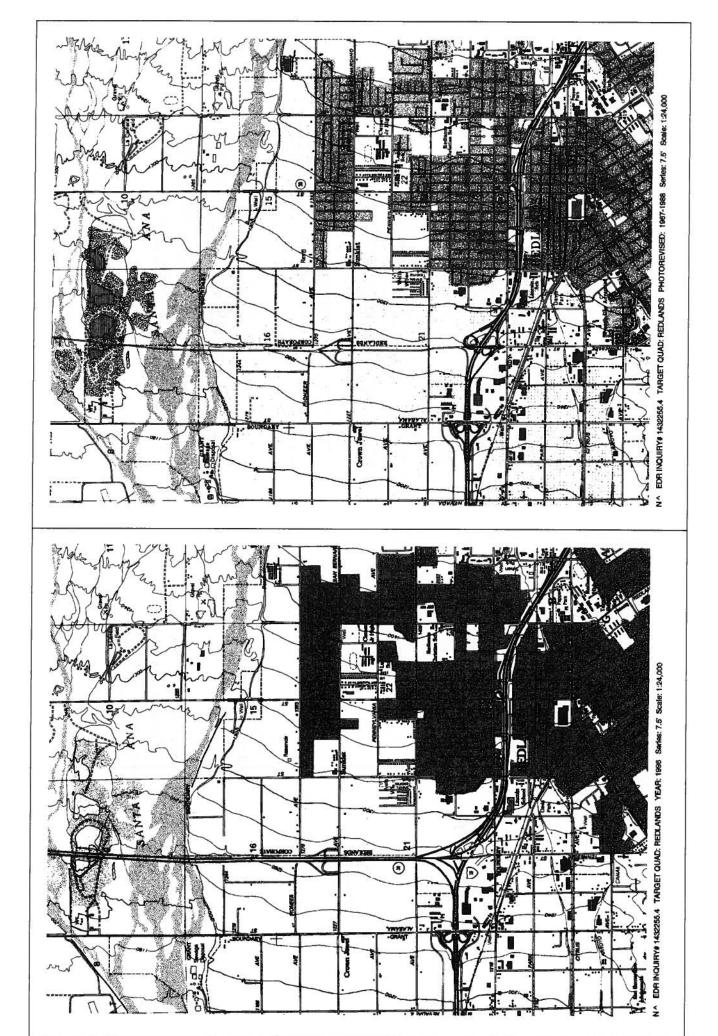
Disclaimer - Copyright and Trademark Notice

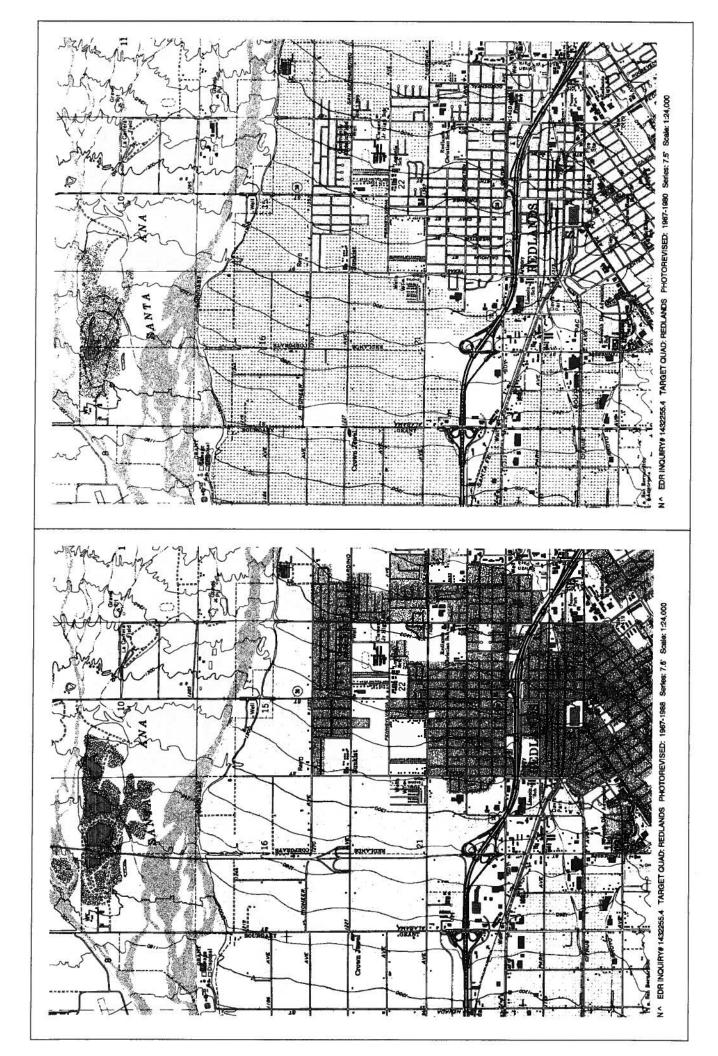
The Report contains centain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, for Il created by Control and Control an

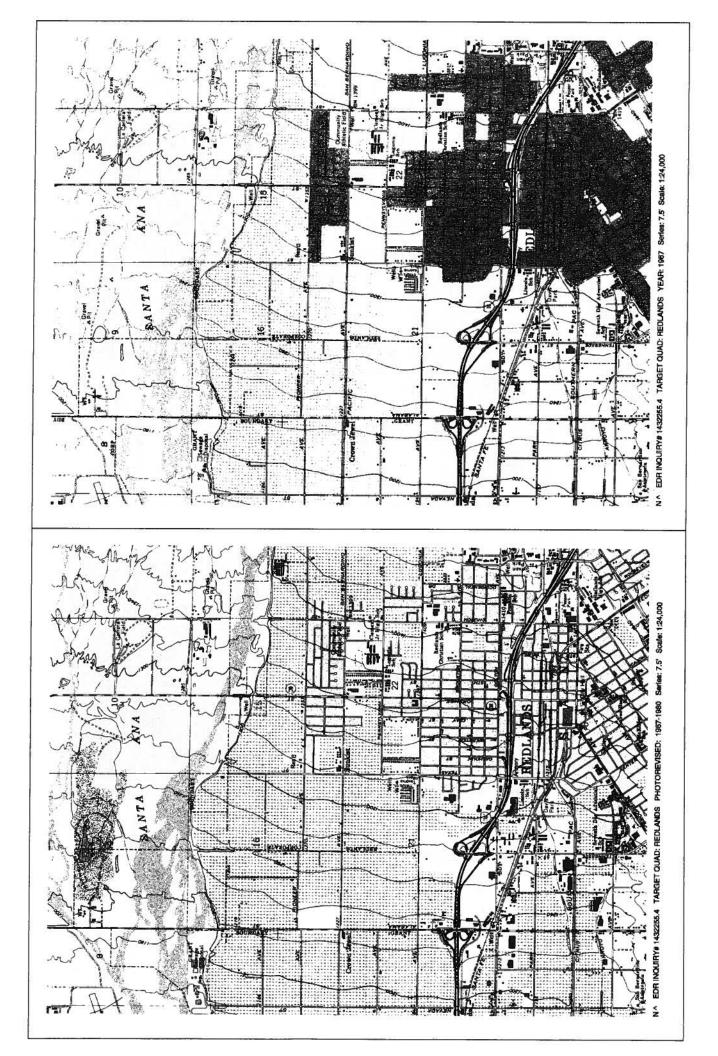
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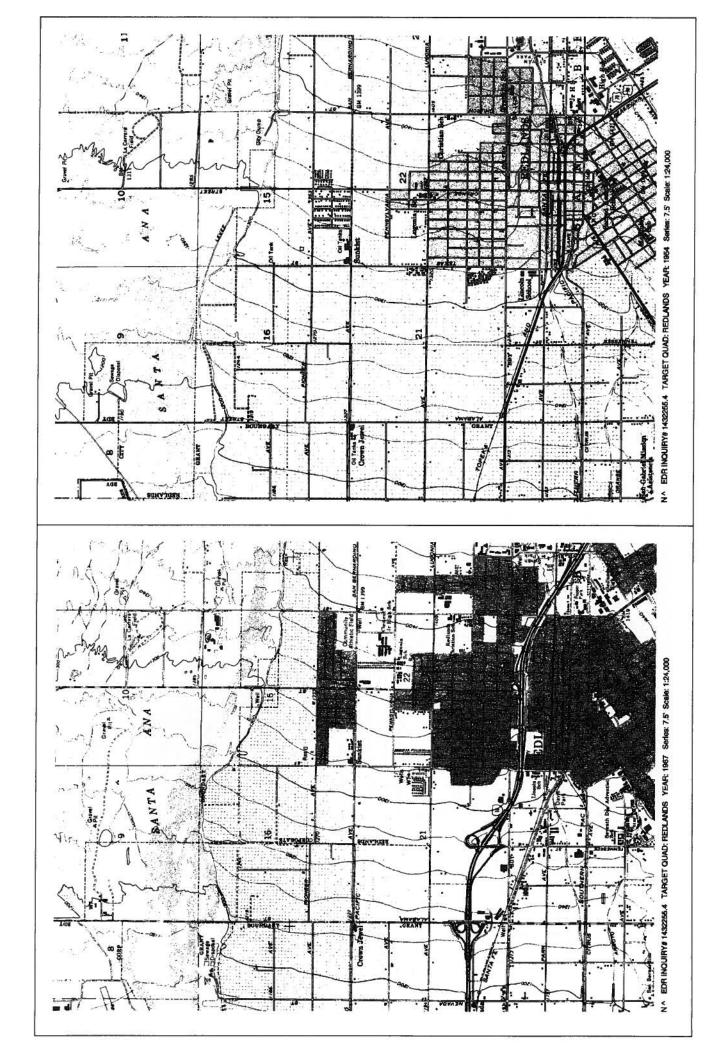
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Form-Tild









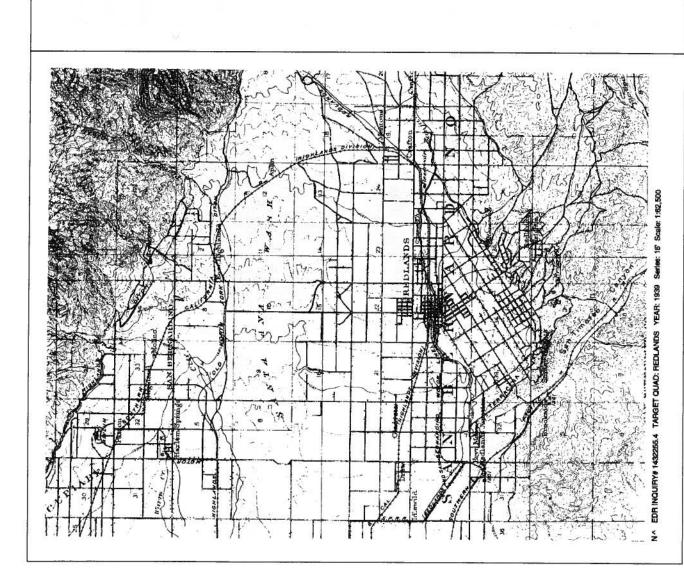
206343001 R Plans 1 - PDF. doc

37.9-Acre Property Redlands, California

June 20, 2005 Project No. 206343001

APPENDIX C

ENVIRONMENTAL DATABASE SEARCH





SECTION

The EDR Radius Map with GeoCheck®

Orange Groves San Bernardino Ave/Texas St Redlands, CA 92374

Inquiry Number: 1432255.2s

May 27, 2005

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road Milford, Connecticut 06460

Nationwide Customer Service

Telephone: 1-800-352-0050 Fax: 1-800-231-6802 Internet: www.edmet.com

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SECTION	Executive Summary.	-	Detail Map.	Map Findings.	Orphan Summary	EPA Waste Codes.	Government Records Searched/Data Currency Tracking	GEOCHECK ADDENDUM		Physical Setting Source Summary	Physical Setting Source Map.	Physical Setting Source Map Findings.	

Thank you for your business. Please contact EDR at 1-800-352-0050 with any questions or comments.

This Report contains certain information obtained from a variety of public and other acutose researceably available to Environmental Data Resources for Controlled in this Report of the Convergent information for the authority of public does not acut from DAYs acutose for controlled in the Report that coverage information for the authority and section of costs and controlled in the Resource of th Disclaimer - Copyright and Trademark Notice

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, inc. (EDR). The heart needs the government records search requirements of ASTM Standard Practice for Environmental Sita Assessments, E 1527-00. Search distances are per ASTM standard or custom distances requested by the laser.

TARGET PROPERTY INFORMATION

SAN BERNARDINO AVE/TEXAS ST REDLANDS, CA 92374

COORDINATES

34.077300 - 34" 4" 38.3" 117.191100 - 117" 11" 28.0" 3770548.8 1320 ft. above sea lavel Lathuce (North): 34.077300 - 3 - Conglude (West): 117.191100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 107100 - 1071

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

34117-A2 REDLANDS, CA USGS 7.5 min quad index Target Property: Source:

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

<u>DATABASES WITH NO MAPPED SITES</u>
No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the ASTM E 1527-00 search radius around the target property for the following databases:

FEDERAL ASTM STANDARD

STATE ASTM STANDARD

AWP.....Annual Workplan Sites

TC1432265.2s EXECUTIVE SUMMARY 1

EXECUTIVE SUMMARY

Call-Siftes	Toxic Pits Creanup Act Stees Solid Wester Information System Waste Management Unit Darthase	CA BOND EXP. PLAN. Bord Expenditure Plan UST CHORD OF OUR CHORD Storage Tank Facilities Voluntary Channu Promens Demonstrates	INDIAN LUST. Leaking Underground Storago Tanks on Inclan Land INDIAN UST. Underground Storage Tanks on Inclan Land CA FID UST. Facility Inventory Database
Cal-Sites	Toxic Pits. SWF/LF. WMUDS/SWAT.	CA BOND EXP. PLAN Band Expenditure Plan UST. List of Underground Sto Voluntary Cleanin Proce	INDIAN LUST Leaking Underground Stores CA FID UST Facility Inventory Database

FEDERAL ASTM SUPPLEMENTAL

CONSENT Superfund (CERCLA ROD. Records Of Decision Delisted NPL. National Priority List I	CONSENT Superfund (CERCLA) Consent Decrees RDD Records of Decision Delibrad NPL
FINDS	Facility Index System/Facility Identification Initiative Program Summary Report
MLTS	Material Licensing Tracking System
WINES NPL Liens	Mines Master Index File Federal Superfund Liens
PADS. US ENG CONTROLS	PADS
ODL. Open Dump Inventory	Chen Dump Inventory
INDIAN RESERV. Indian Reservations	Department of Denensa Sites Indian Reservations
UMTRAFormerly Used Defense Sites FUDS.	Uranium Mill Taltings Sites Formerty Used Defense Sites
RAATS	RAATSRCRA Administrative Action Tracking System
TSCA	INS
SSTS. FTTS INSP.	Section 7 Tracking Systems FIFRA TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, &
	Rodenticide Act)/TSCA (Toxic Substances Control Act)

The state of the s

TC1432256.28 EXECUTIVE SUMMARY 2

EXECUTIVE SUMMARY

2	
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BURROUNDING SITES: BEARCH RESULTS

Surrounding sites were identified.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) bases. Relative elevation information between sites of close proximity as relative for worffeet. Sites with an elevation requal to or higher than the target property have been differentiated below from sites with an elevation tower than the target property. Page numbers and map identification numbers refer to the EDR Radius Map report where detailed date on individual sites can be reviewed.

Sites listed in bold italics are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

FEDERAL ASTM STANDARD

CORRACTS: CORRACTS is a list of handlers with RCRA Corrective Action Activity. This report shows which nationally-defined corrective action core events have occurred for every handler that has had corrective action activity.

A review of the CORRACTS list, as provided by EDR, and dated 03/29/2005 has revealed that there is 1 CORRACTS site within approximately 1 mile of the target property.

Page	¥
Map 10	9
Dist / Dir	1/2-1 8
Address	840 W BROCKTON AVE
Equal/Higher Elevation	TELEDYNE CONTINENTAL MOTORS

STATE AST'M STANDARD

CORTESE: This detabase identifies public drinking water wells with detectable levels of contamination, betacrdous substance sites eelected for remedial action, sites with known toxic material identified through the abstandoned site assessament program, sites with USTs having a reportable release and all solid waste disposal facilities from which there is known inigration. The source is the Celifornia Environmental Protection Agency/Office of Emergency Information.

A review of the Cortese list, as provided by EDR, has revealed that there is 1 Cortese site within approximately 0.5 miles of the target property.

Раде	
Map ID	7
Dist / Dir	1/4 - 1/25
Address	1401
Equal/Higher Elevation	R.F. WHITE CO.

TC1432255.28 EXECUTIVE SUMMARY 3

EXECUTIVE SUMMARY

LUST: The Leaking Underground Storage Tank Incident Reports contain an Inventory of reported leaking underground storage tank Incidents. The data come from the State Water Resources Control Board Leaking Underground Storage Tank Information System.

A review of the LUST list, as provided by EDR, and dated 01/10/2005 has revealed that there is 1 LUST site within approximately 0.5 miles of the target property.

Page	6
Map ID	82
Dist / Dir	1/4 - 1/25
Address	1401 TEXAS STREET
Equal/Higher Elevation	TEXAS STREET PUMPING PLANT

HIST UST: Historical UST Registered Database.

A review of the HIST UST list, as provided by EDR, and dated 10/15/1990 has revealed that there is 1 HIST UST atte within approximately 0.25 miles of the target property.

Page	9
Map ID	¥4
Dist / Dir Map ID	0 - 1/8 NW
Address	1600 TEXAS ST
Equal/Higher Elevation	BLUE GOOSE GROWERS

STATE OR LOCAL ASTM SUPPLEMENTAL

REF: This category contains properties where containination has not been confirmed and withby were determined as not requiring failerst DTSC Site Mitigation Program action or oversight. Accordingly, these sites have been referred to another tate or local regulatory agency.

A review of the REF list, as provided by EDR, and delad 02/07/2005 has revealed that there is 1 REF site within approximately 0.25 miles of the target property.

Page	9
Map ID	8
Dist / Dir	0-1/8 E
Address	780 WEST SAN BERNARDING
Equal/Higher Elevation	REDLANDS FARMING COMPANY

DEHS Permit System: San Bernardino County Fire Department Hazardous Materials Division.

A review of the San Bern. Co. Permit list, as provided by EDR, has revealed that there is 1 San Bern. Co. Permit sile within approximately 0.25 miles of the larget property.

Page	100
Map 10	A 3
Dist / Dir	0-1/8 E
Address	780 W SAN BERNARDINO AV
Equal/Higher Elevation	REDLANDS HEIGHTS

TC1432265.26 EXECUTIVE SURMARY 4

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

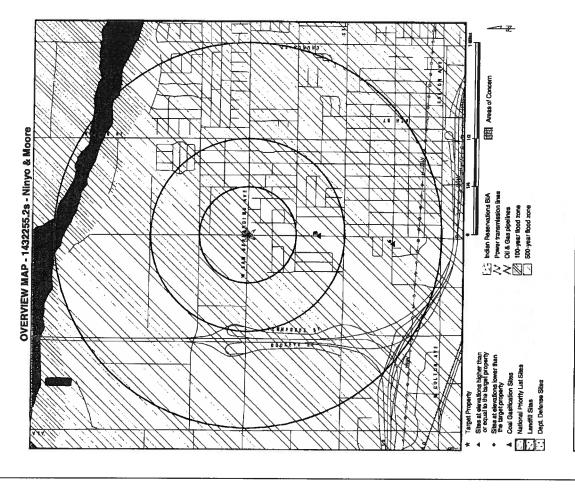
Site Name

SAN TIMOTEO CANYON ROAD ILLEGAL DUMP BECTON DICKINSON/C/O GENCO

NORTH ORANGE WELLFIELD

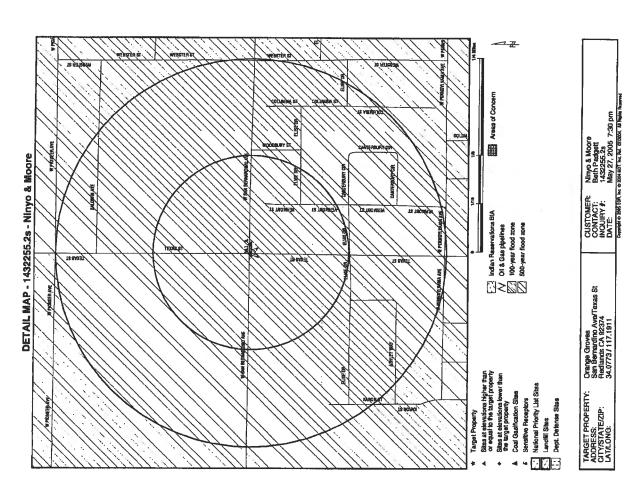
Database(s)

SWF/LF HAZNET, San Bern. Co. Permit San Bern. Co. Permit



TC1432256.24 EXECUTIVE SUMMARY 6

Orange Groves San Bernardino Ave/Texas St Rediands CA 92374 34.0773/117.1911 TARGET PROPERTY:
ADDRESS:
CITY/STATE/ZIP:
LAT/LONG:



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1/8 - 1/4	00000000 <u>x</u>	00 <u>K</u> 000000000000	000 <u>K</u> K K 0 K K 000000 K
× 1/8	0000000 <u>K</u>	00 <u>K</u> 000000000000	000KKK0KK000000K
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Target Property		HA.	
Detabese FEDERAL ASTN STANDARD	NPL Proposed NPL CERCLIS CERCLISA CORRACTS CORRACTS RCRA TSD RCRA TSD RCRA SS	AWP Cacalities CHMIRS CHMIRS Corless North 65 Toxic Pils State Landfill WALUS/SWAT U.U.ST CA Bond Exp. Plant V.CP NDIAN LUST NDIAN LUST ROLAN LUST REDERAL ASTIN SUPPLEMENTA	CONSENT ROD Delisted NPL FINDS HAMRS MILTS MILTS MILTS MILTS MILTS OD OD OD MIDDA MILTS MI

TC1432255.2s Page 5

TC1432255.2s Page 6

MAP FINDINGS SUMMARY

									1
Dafabase	Target Property	Search Distance (Miles)	× 1/8	1/8 - 1/4	14 - 1/2	1/2-1	7	Total Plotted	
TRIS TSCA		d of	K a	Z Z	¥9	Æ.	¥.		
SSTS		<u>.</u> e	ξ£	ξX	r œ	ž	Z Z	00	
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STATE OR LOCAL ASTM SUPPLEMENTAL	JPPLEMENTAL								
AST		F	Z	X.	Z	ž	2	c	
CLEANERS		0.250	0	0	ž	¥	¥	. 0	
DEED		0.500	Ľ c	£ <	Œ °	¥ 9	ž š	0	
NFA		0.250		0	¥	ž Z	žž		
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San Bern. Co. Permit		0.250	-	0	ĸ	Ř	¥	·	
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Coel Gas		1.000	0	0	0	0	Ä	0	
BROWNFIELDS DATABASES	ωı								
US BROWNFIELDS US INST CONTROL VCP		0.500	000	000	000	X X X	£ £ 5	000	
				•	•	É	É	•	

NOTES: AQUIFLOW - see EDR Physical Setting Source Addendum

TP = Target Property

NR = Not Requested at this Search Distance

Shas may be listed in more than one database

EDR ID Number EPA ID Number MIST UST 110041575386 N/A (714) 793-2188 CITRUS PACKING HOUSE Detabase(s) FMC CORPORATION STATE Coal Gas Site Search: No site was found in a search of Real Property Scan's ENVIROHAZ database. Container Num: 1 Year Installed: Not reported Tank Construction: 10 gauge Lead Agency Code: Not reported
Sta Type: Code: Not reported
Sur Type: Number Code: Not reported
Test: Not reported
Source Of Funding Code: Not reported
Supervisor: Supervisor: Not reported
Supervisor: Supervisor: Not reported
Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: Supervisor: S REFOA
PROPERTY/SITE REFERRED TO ANOTHER AGENCY
Mot reported Owner Name: Region: Telephone: Other Type: 0 ° 0 ° 0 ′ / 0 ° 0 ° 0 ° Not reported Not reported MAP FINDINGS UST HIST: 7389
Total Tranks: 1540 LINDEN ST.
Owner Address: 1540 LINDEN ST.
Tank Used for: WASTE 1814 Capacity
Total Capacity: 00001000
Type of Fuel: Not reported
Contact Name: Not reported
Facility Type: Other Vot reported 18221995 CYPRESS REDLANDS FARMING COMPANY 780 WEST SAN BERNARDING AVENUE REDLANDS, CA 92373 REF.
Flatibly ID
Des Region Code:
Region Code Definition:
County Code:
Site Name Under:
County Status Date:
County Status Date:
County Status Code:
County Status Code:
Lead Agency:
Lead Agency:
Site Type:
Site Type:
Code:
Code:
Code:
Site Type:
Code:
Code BLUE GOOSE GROWERS 1600 TEXAS ST REDLANDS, CA 92373 Site 1 of 3 in cluster A Sits 2 of 3 in cluster A Map ID
Direction
Distance
Distance
Distance (ft.)
Elevation Site Relative: Equal Actual: 1320 ft. Relative: Higher Actual: 1321 ft. A1 A1/8 A1/8 12/8 A2 6 1/8 55 ft.

DISC DISCOVERY Not reported Not reported Not reported 02031983 0.00000 Not reported Not reported PROPERTY/SITE REFERRED TO ANOTHER AGENCY Database(s) CAD862360307
EAL DESTRICTECATION NUMBER
REDLAND HEIGHTS DOLE
REDLANDS FARMING COMPANY
TOW WEST SAN BERNARONO AVENUE
REDLANDS, CA 82373
SAN BERNARDING AVE EAST OF TEXAS STREET
REDLANDS, CA 82373
Not reported Beadground Into:
Featily 1 and Not reported Not reported Not reported Not reported REDIANDS FARMING COMPANY (Continued) Lethong Method:
Entity Lethong Coordinates Refer To:
State Assembly Diest Code:
State Senate Diest Code:
Genetal Senate Diest Code: Other ID Desc: Alternate Name(s): Address(es): Address(es):

EDR ID Number EPA ID Number

MAP FINDINGS

Mep ID Direction Distance Distance (ft.) Elevation Site

1000277298

CERCLA II
O101788E LIST
O10178E LIST
O10178E LIST
DELETED FROM CONFITSE
STE SCREENING DONE NO FURTHER ACTION UNDER CERCLA 10728/88
INTE MINIOR STE MITIGATION
STE SCREENING DONE FURTHER RECORD SEARCH NEEDED TO DETERMINE EMCALT TYPE OF OPERATION.
FACILITY ORNALE-9'S OME OLI STANIBLE GOLUPATION
STELLS AN ORANGE GROVE AND SHIPPING
ALTERS AN ORANGE GROVE AND SHIPPING

FACULTY DENTIFIED ID VIA DRIVE BY FACULTY DENTIFIED IN VIA DRIVED POND WITH OILY WASTE ON SITE. PRESTICIDE SPRAY TANKS ON SITE. REVICES NO FILES STRATEGY SITE REPERSED: TO HYMBENE SAN BERNARDING CO HEALTH. GENERATOR SAN BERNARDING CO HEALTH. GENERATOR SAN BERNA CO AG COMMISSIONER. RECORDS ON PERSTICIDE USE AT SITE. Active generator, refer to County.
REPORTED FOR PROPEGE
PRELIM ASSESS DOWE RECLANDS FARMING: HISTORY OF SITE
WASTES DISPOSED OFF SITE, ANY OTHER

EDR ID Number EPA ID Number 1000277298 HAZNET 8102284809 San Barn. Co. Permit NIA Cortese S101619383 CA FID UST N/A Database(s) CONTAMINATION IN LOW QUANTITIES
Dislabses verification program confirmed the NFA status for DTSC.
SUBMIT TO EPA RECOMMENDATION MSSI Gepeld: Court.
TSD EPA ID: Not reported
General Courty: Sam Bernardino
Ted Courty: Sam Bernardino
Ted Courty: Sam Bernardino
Ted Courty: Sam Bernardino
Ted Courty: Sam Bernardino
Wests Calegory: Aqueous acution with less than 10% total organic residues
Disposal Method: Transfer Station
Contact: SANA DISPATHANA RESOURCES
Telephone: (909) 792-7188
Mailing Address: (909) 792-7189
Ma Tons:

Waste Capegor, Aquencus solution with less than 10% total organic residues
Waste Capegor, Aquencus Station
Disposal Method; Transfer Station
Contact
Contact
Telephone: (909) 1792-178
Mailing Address: 780 W SAN BERNARDINO AVE
REDLANDS, CA 92373
County
Not reported DEHS Permit: FA0000618
Fedibly D.: FA0000618
Fedibly Status: ACTIVE
Femil Category: HAZMAT HANDLER 0-10 EMPLOYEES
Femil Mumber: P10002674
Experient Date: 2005-10.31
Region: SAN BERNARDINO MAP FINDINGS REDLANDS FARMING COMPANY (Continued) CORTESE Not reported CORTESE Not reported CALD00192021 Not reported San Bernardino San Bernardino REDLANDS HEIGHTS 780 W SAN BERNARDINO AVE REDLANDS, CA 92373 Site 3 of 3 in cluster A REDLANDS, CA 92374 HAZNET:
Gepald:
TSD EPA ID:
Gen County:
Ted County: Site 1 of 2 in cluster B Region: Fac Address 2: Region: Fec Address 2: R.F. WHITE CO. CORTESE: Map ID Direction Distance Distance (ft.) Elevation Site Relative: Higher Actual: 1321 ft. B4 South 14-1/2 1923 ft. Relative: Higher Actual: S A Est S A Est

TC1432255.2s Page 7

TC1432255.2s Page 8

TC1432255.2s Page 10

TC1432265.2s Page 9

	EPA ID Number Database(s) EPA ID Number	S101619383																				LUST 8105035775	Y 2																		
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MAP FINDINGS			Regulate ID:	Tank Location	SIC Code:			Contact Tel:	NPDES No:	Modilied:		Recutate ID-	Fank Location	SIC Code:	radaty iot.			NPDES No.	Modified:														Confirm Leak:	Prelim Assess:	Kemed Fan:						
МАР		(penuji	36000428	Active Underground Storage Tank Location	Active	Not reported	30 CAJON ST REDLANDS, CA 92373	Not reported	Not reported	Not reported	Not reported	36000428	Active Underground Storage Tank Location	Not reported	Not reported	30 CAJON ST	REDLANDS, CA 92373	Not reported	10/22/83	Not reported	Nox reported	ING PLANT				Not reported	Not reported	783502258T	3 60	Local Agency	38000L	Case Closed	Not reported	Not reported	2002-12-16 00:00:00	Not reported	2004-07-16 00:00:00	Not reported Not renorted	Not reported	Not reported	907
	Site	R.F. WHITE CO. (Continued)	FID: Facility ID:	Reg By:		Mail To:		Confact:	DUNs No:		Comments:	Facility ID:	-	Cortese Code:			Conferi	ö	Creation:	Comments:	Comments	TEXAS STREET PUMPING PLANT	REDLANDS, CA 92374	Site 2 of 2 in chester B	State 118T	1		Ren Brand	Chamical: 6	_ Š			Date:	Workplan:		_		Cleanup Fund Id : Not reported	Discover Date:	Enforcement Dt : N	
Map ID Direction Distance	Distance (ft.) Elevetion																					882 624	1/4-1/2	1823 11.	Relative:	a Bulling	Actual:	1													

Map ID Direction Distance (ft.) Elevetion Site		MAP FINDINGS	8		Database(s)	EDR ID Number	
TEXAS	BTREET PUM	TEXAS STREET PUMPING PLANT (Continued)				8105035775	
2 3	now supped: Interfm :	Not reported Not reported					
¥ .	Leak Cause:	LINK					
55	MTBE Date:	Not renorted					
Ma	>	: Not reported					
\$ 2	MTBE Tested:	MTBE Detected. Site tested for MTBE & MTBE detected	MTBE detected				
Ē 3	Priority:	Not reported					
.	Beneficial:	MUN					
B	Staff:	TIME					
8	GW Quelifier:						
8 3	Max MTBE Soft:						
83	Soil Chairler:	in the state of th					
řě	Hydr Basin #: Onersion	UPPER SANTA ANA VALL					
ð	Oversight Prom:						
E.	Review Date:						
SS	Stop Date:	Not reported					
Wa	Work Suspended Not reported	1 Not reported					
£ 6	sponsible Part	Responsible PartyCiTY OF REDLANDS					
<u></u> ₹ 8	Global Id-	TACT LEXAS ST.					
88	Ora Name:	Not reported					
්රී	Contact Person:	Not reported					
E :	MTBE Conc	0					
9 N	Mittee Fluel: 0						
Wei	Well Name:	Not reported					
100	tence To Lust:						
We	Waste Discharge Global ID:	Global ID: Not reported					
Wa	ste Disch Assi						
Š	Summary:	NEW OIL 30W					
LUST	LUST Region 8:						
ž	Region:	so 8	Cross Street:	Not reported			
<u> </u>	ocal Case Num:	93018					
- F	Facility Status:	Case Closed					
Staff	£	TME					
E.	acility Contact:	Not reported					
	Lead Agency:	Local Agency					
ŧ	Oty Lealerd:	Not recorted					
. g	County	San Bemardino					
ਲੈੱ	Cleanup Fund id : Not reported	: Not reported					
P. Se	Review Date:	Not reported	Confirm Leak:	Not reported			
e ford	Wondam: Dolli dion Char	Not reported	Prelim Assess:	Not reported			
	Remed Action:	Not reported	Monttoning:	Not reported			
Ö	Close Date:	7/18/2004	-0-	Man reputied			
S i	Discover Date:	8/1/1981					
	Enforcement Dt :	Not reported					
ā 5	Enter Date:	CLUS 6/22/1983					
Fea	Funding:	Not reported					
900	Stoff Indials	2,00					

EDR ID Number EPA ID Number 1000921584 B TRIRE FACILITY
12/19/1891
CAUTH—CA Prioritization, Facility or area was essigned a high corrective action priority
Stonage Battery Manufiscluring Database(s) ENTIRE FACILITY 08/28/2004 CA350 - CMS Approved Storege Bettery Manufacturing ENTRE FACILITY 12/17/1993 CA200 - RFI Approved Storage Battery Manufacturing 01/19/2000 CA200 - RFI Approved Storage Bettery Manufacturing MAP FINDINGS CAD008386641 CAD008386641 CAD008386641 FELEDYNE CONTINENTAL MOTORS (Continued) EPA kt-Region: Area Name: Actuel Date: Corrective Action: 2002 NAICS Title: Actual Date: Corrective Action: 2002 NAICS Title: EPA ldt Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title: EPA Ict Region: Area Name: Actual Defe: Corrective Action: 2002 NAICS Title: Map ID Direction Distance Distance (ft.) Elevation Site

Citor, this traped as while viewing on your computer to access 9 additional CORRACTS record(s) in the EDR Sile Report.

RCRAInto Contactive Action Summary:

Event CASA Approved

Event CASA Approved

Event Data: GRZB42004

Event Data: GMI Workflean Approved

Edetermination, current Human Exposures Under

Control has been verified. Besed on a review of information contained in the

El determination, current human exposures are expected to be under control

determination will be re-evaluated when the Agenty/State becomes aware of

Event Data: GYIS2000

Event Data: GYIS2000

CASA Affaction of Contaminated Gnoundwater under Control, Yes, Mitmation of

ignifion of Contuminated Groundwater under Control, Yes, Migration of Contaminated Consulvated to Morel Control has been verified. Besact on a rovie of information contained in the El determination. It has been determined that migration of contaminated the El determination. It has been determined that migration of contaminated groundwater is under control at the Steality. Specifically, that determination infeates the fine anglation of contaminated groundwater is under control and that monitoring will be contained to contaminate groundwater randoms within the exciting area of contaminated groundwater. This determination will be re-evaluated when the Agency becomes aware of significant denings at the

facility. Event Date: 05/15/2 TC1432255.2s Page 12

TC1432255.2s Page 11

CAD008386841

EPA Id: Region: Area Name:

ENTIRE SITE

MAP FINDINGS Map ID Direction Distance Distance (ft.) Elevation Site

Defabase(s) TELEDYNE CONTINENTAL MOTORS (Continued)

EDR ID Number EPA ID Number

1000921584

Current Human Exposures under Control, Yea, Current Human Exposures Under Control has been verified. Based on a review of information contained in the El determination. Lurenth Human exposures are expected to be under control at the facility under current and reasonably expected conditions. This extermination will be me-vealusted when the Agency/State becomes aware of 64/19/1999. Event Event Dale: Event

Event Date:

Ignation of Contaminated Groundwaster under Control, Yes, Migration of Contaminated Groundwaster Under Control has been verified. Lased on a review of information contained that the El determinated control and the tripication of contaminated that the tripication of contaminated proundwaster is under control at the feditive Specifically, this determinated requirement in the contaminated groundwaster remains which the control and control that confident of control and that moderating will be confidented to confirm that condiminated groundwaster remains which the existing area of containful agreements of groundwaster remains which the revaluated or control and groundwaster remains which the results of control and groundwaster. This disturmination wall be re-walkabled when the Agency becomes aware of significant changes at the 05/12/1999

RFI Worliplan Approved 10/25/1985 RFI Approved 12/17/1993 Event Date:
Event Date:
Event Event Date:
Event Event Date:
Event Date:
Event Date:
Event Date:
Event Date:
Event Date:

RFI Workplan Approved 11/10/1892 RFI Approved 08/20/1993

CA Prioritization, Facility or area was essigned a high corrective action

Event Date:

RFI Wodqlan Approved 10/25/1985 RFI Imposition 02/24/1989 Event Event Date: Event Event Date:

RCRAInfo: Owner:

TELEDYNE INDUSTRIES INC (213) 277-3311 CAD008386841 EPA ID:

Classification: Large Quantity Generator, TSDF TSDF Activities: Not reported Contact

SIENNIAL REPORTS: Last Biennial Reporting Year: 2001

EDR ID Number EPA ID Number 1000921584 Database(s) 284.140-150.H TSD-FRANCIAL RESPONSIBILITY REQUIREMENTS 08/04/1984 09/28/1984 284.50-94.F TSD-GOUNDWATER MONITORING REQUIREMENTS 1/207/1882 1/207/1883 284.140-150.H TSO-FINANCIAL RESPONSIBILITY REQUIREMENTS 17/08/1982 12/07/1983 284.140.150.H TSO-FINANCAL RESPONSIBILITY REQUIREMENTS 02/10/182 03/1/1883 284.140-160.H TSD-FINANCIAL RESPONSIBILITY REQUIREMENTS 0878/1982 0371/1983 264.170-177.1 TSD-07THER RECAUREMENTS (OVERSIGHT) 11/21/1961 INITIAL 3008(A) COMPLIANCE ORDER 07/14/1983 Final Monetary Penatty INITIAL 3008(A) COMPLIANCE ORDER 02/20/1982 Final Monstary Pensity 288 ALL. TSD-LAND BAN REQUIREMENTS 04/15/1983 06/07/1983 CMIL ACTION FOR COMPLIANCE WRITTEN INFORMAL 04/15/1983 Fins! Monetary Penalty WRITTEN INFORMAL 08/04/1994 Not reported WRUTTEN INFORMAL 10/01/1987 Not reported WRITTEN INFORMAL Final Monetary Penalty Final Monetary Penalty MAP FINDINGS TELEDYNE CONTINENTAL MOTORS (Continued) Regulation Violated:
Area of Violation:
Date Violation Determined:
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Area of Vicienion:
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Actual Date Achieved Compilanos: Regulation Violated:
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Area of Violation:
Date Violation Determined:
Actual Date Achieved Compliance: Regulation Violated:
The of Violation:
Date Violation Determined:
Actual Date Achieved Compliance:
Enforcement Action:
Enforcement Action:
Penalty Type: Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Achieved Compliance: Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Achieved Compliance: Violation Status: Violations exist Enforcement Action: Enforcement Action Date: Penalty Type: Enforcement Action; Enforcement Action Date; Penalty Type: Map ID
Direction
Distance
Distance (ft.)
Elevation Site

TC1432255.2s Page 13

TC1432255.2s Page 14

Map ID
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Disection
Distance (I.)
Elevation Sile

Sile

EDR ID Number

TELEDYNE CONTINENTAL MOTORS (Continued)

Regulation Violated: 252.40.43.D

Ave of Violation: CENERAL REQUIREMENTS (OVERSIGHT)

CHARA Violation Described: 110.44.04.D

282.40.43.D GENERATOR-ALL REQUIREMENTS (OVERSIGHT) 11/2/11991 09/13/1993 284.50-56.D TSD-OTHER REQUIREMENTS (OVERSIGHT) 11/21/1981 08/13/1983 284.10-18.B TSD-OTHER REQUIREMENTS (OVERSIGHT) 11/2/1/1991 08/13/1993 TSD-OTHER REQUIREMENTS (OVERSIGHT) TSD-OTHER REQUIREMENTS (OVERSIGHT) INITIAL 3008(A) COMPLIANCE ORDER 02/20/1892 Final Monetary Pensity INITIAL 3008(A) COMPLIANCE ORDER 02/20/1992 Final Monetary Penafty INITIAL 3008(A) COMPLIANCE ORDER 02/20/1892 CIVIL ACTION FOR COMPLIANCE 02/20/1992 Finst Monetary Penatry CIVIL ACTION FOR COMPLIANCE 02/20/1982 Final Monetary Penalty 11/21/1991 Final Monetary Penalty 11/21/1991 Final Monetery Penetry WRITTEN INFORMAL WRITTEN INFORMAL 12/23/1990 WRITTEN INFORMAL Not reported 11/08/1990 01/31/1991 Regulation Violated:
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MAP FINDINGS

EDR ID Number EPA ID Number

Database(s)

000921584 284.80-84.F TSD-0-OUNDWATER MONITORING REQUIREMENTS 01/12/1889 02/27/1980 294.140-150.H TSD-FINANCIAL RESPONSIBILITY REQUIREMENTS 11/102/1988 SD-OTHER REQUIREMENTS (OVERSIGHT) GENERATOR-LAND BAN REQUIREMENTS INITIAL 3008(A) COMPLIANCE ORDER 0414/1988 INITIAL 3008(A) COMPLIANCE ORDER 05/25/1989 Final Monelary Penalty NITIAL 3008(A) COMPLIANCE ORDER 288 ALL TSD-LAND BAN REQUIREMENTS 12/08/1988 02/09/1989 06/25/1989 Final Monetary Penalty WRITTEN INFORMAL 01/20/1989 WRITTEN INFORMAL 01/20/1989 MRITTEN INFORMAL WRITTEN INFORMAL 12/30/1987 Not reported Not reported Not reported 12/08/1988 02/08/1989 TELEDYNE CONTINENTAL MOTORS (Continued) Regulation Violeted:
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TC1432255.2s Page 15

rsp-other requirements (overskaht)

WRITTEN INFORMAL

01/12/1990 Not reported

Enforcement Action: Enforcement Action Date: Penalty Type:

Regulation Violated: Area of Violation; Data Violation Determined: TC1432255 2a Page 16

TSD-OTHER REQUIREMENTS (OVERSIGHT) 10/01/1987 10/19/1987

Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Achieved Compilance:

WRITTEN INFORMAL

Enforcement Action:

FINAL 3008(A) COMPLIANCE ORDER 07/01/1988

Not reported

Enforcement Action: Enforcement Action Date: Penalty Type:

EDR ID Number EPA ID Number Database(s) MAP FINDINGS Map ID Direction Distance Distance (ft.) Elevation Site

1080921584 Lead Agency STATE STATE STATE STATE STATE STATE Penalty Amount 1000 37725 3000 11320 15000 10/01/1987 Not reported Penalty Date There are 19 violation record(s) reported at this site: 7/14/1993 7/14/1993 1/29/1993 1/29/1993 2/20/1992 TELEDYNE CONTINENTAL MOTORS (Continued) Final Monetary Penalty Proposed Monetary Penalty Final Monetary Penalty Proposed Monetary Penalty Final Monetary Penalty Enforcement Action Date: Penalty Type: Penalty Summary: Penalty Description

Evaluation
Compliance Evaluation Inspection
Compliance Evaluation Inspection
Financial Record Review
Operation and Maintenance Inspection

19831207 19831311 19831311 19831311 198310913 19910131 19900227 19900227 19900227 19900227 Ame of Woolden

TSD-LAND BAN REQUIREMENTS
TSD-LAND BAN REQUIREMENTS
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TSD-CHER REQUIREMENTS (OVERSIGHT)
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TSD-CHERNICAL RESPONSIBILITY REQUIREMENTS
TSD-CHERNICAL RESPONSIBILITY REQUIREMENTS Compliance Evatuation Inspection Compliance Evatuation Inspection Compliance GW Monitoring Evatuation Financial Record Review Compliance Evaluation inspection

Financial Record Review Compliance Evaluation Inspection Compliance Evaluation Inspection

Other Pertinent Environmental Activity Mentified at Sile:
COMPRETENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND INFORMATION SYSTEM
COMPRETENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND INFORMATI
MATINAL, ENISSIONS INVENTORY
RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM
TOXIC CHEMICAL RELEASE INVENTORY SYSTEM

DEHS Permit:
Feality, 1D: FA0006608
Feality, Status. ACTIVE
Permit Category: EPCRA FACILITY
Fermit Number: PT001335
Expiration Dates: 2005-07-31
Region:

ACTIVE GENERATOR - 28-50 EMPLOYEES PT0001495 Facility (D: Facility Status: A Permit Category: G Permit Number: P Expiration Date: 2 Region: 9

MAP FINDINGS Map ID
Direction
Distance
Distance (ft.)
Elevation Site

EDR ID Number EPA ID Number

Database(s)

1000921584

TELEDYNE CONTINENTAL MOTORS (Continued)

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Facility Sharin. Page 3AN BERNARDINO

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TC1432255.2s Page 18

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TC1432255.25 Page 19

REDLANDS REDLANDS REDLANDS

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2408 N ORANGE ST 2200 W SAN BERNARDING AVE SAN TIMOTEO CANYON RD.

2104483110 8VM JIMOJEC CYNJON BOVD IFTEGYF DNWL 2108084141 BECLON DICKINSONICO GENCO 2108498148 NOKJH OKYNGE METITLIETD

VAMMIUS MAHRINO

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly bests, as required.

Elapsed ASTM days: Provides confirmation that this EDR report meets or exceeds the 90-day updating requirement of the ASTM standard.

FEDERAL ASTM STANDARD RECORDS

NPL: National Priority List Source: EPA

Telephone: N/A Membrand, The NPL is a subset of CERCLIS and identifies over 1,200 sizes for priority destruct the Membrand Propies. As such EDR provides polygon destruct the Superfund Program. NPL sities may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL sits boundaries produced by EPA's Environmental Protographic interpretation Center (EPIC) and regional EPA offices.

Date of Data Arrival at EDR: 05/04/05 Elapsed ASTM days: 12 Date of Leat EDR Contact: 05/04/05

Data of Government Version: 04/28/05 Data Made Activa at EDR: 05/16/05 Databasa Ralease Frequency: Quarterly

MPL Site Boundaries

EPA's Environmental Photographic Interpretation Center (EPIC) Telephone: 202-564-7333

EPA Region 1 Telephone 617-918-1143

EPA Region 8 Telephone: 214-655-6659 EPA Region 8 Telephone: 303-312-8774 EPA Region 3 Telephone 215-814-5418

EPA Region 4 Telephone 404-562-8033

Proposed MPL: Proposed National Priority List Sites Source: EPA

elephone: N/A

Date of Data Arrival at EDR: 05/04/05 Elapsed ASTM days: 12 Date of Lest EDR Contact: 05/04/05 Date of Government Version: 04/27/05 Date Made Active at EDR: 05/16/05 Database Release Frequency: Quarterly

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System Source: EPA

Telephone. 709-419-0223
Telephone. 709-419-0223
Telephone and predicting the state of the state Date of Data Arrival at EDR: 03/22/05 Elapsed ASTM days: 15 Date of Last EDR Contact: 03/22/05

Data of Government Version: 02/15/05 Data Made Active at EDR: 04/05/05 Database Release Frequency: Quarterly

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned Source: EPA

Telephone: 703-413-0223

As of Fethuary 1698, CERCLIS sites designated No Furber Remedial Action Planned' (NFRAP) have been removed from CERCLIS with Passe map a sites where 1, belowing an infall investigation, no confirmation was found; confamiliation was found; confamiliation was removed quickly without it as eased for the site to be placed on the NPL, or the contamination was sought to require federal superfluid earlor of NLC consideration. EAA has removed approximation was not endought of each of the definition of the confamiliation was not endought in enquire federal subscription action of the Consideration EAA has uncompared approximately as 5,000 NPRAP dies to till the unimended barriers to the rectivescorned or these properties and has enchanded men as historical results and the subscriptioned Program to help often; sides, private investors and effected officers to promise occurrant reveals and sife-cities of supervisions.

TC1432255.2s Page GR-1

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 03/22/05
Date Made Active at EDR: 04/06/05
Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 04/01/05 Elapsed ASTM days; 5 Date of Last EDR Contact: 04/01/05

CORRACTS: Corrective Action Report Source: EPA

Telephone: 800-424-9346 CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Data Arrival at EDR: 04/11/05 Fispwed ASTM days: 35 Date of Last EDR Contact: 03/07/05

RCRA: Resource Conservation and Recovery Act information Source: EPA

Date of Government Version: 03/29/05 Date Made Active at EDR: 05/16/05 Database Release Frequency: Quarterly

Telephone: BOA-24-836.

RORAIND is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery A-RG(RCA) of 1876 and the Hazardous and Sold Weste Amendments (HSWA) of 1864. RCRAINT replaces the data recording and reporting shall reporting shall reporting shall report the system (RCRIS). The database information of sites which generate, transport, sare, treat endor dispose of hazardous weste as editined by the Resource Conservation and Recovery A (RCRA). Conditionally were made quantity generated by the Resource Conservation and Recovery A (RCRA). Conditionally because made quantity generated risks than 100 kg of hazardous weste, or less than 14 of scately hazardous weste, or described the standardous wester or cover 15 of or courtly the generator (LCRS) generate over 100 lidigarens (b) of hazardous weste, or over 15 of or cately hazardous weste por month. Terasporters are infrinciate or entities that move hazardous wester or over 15 or dispose of the waste. 1SUH-5 treat, store, or dispose of the waste.

Dete of Government Version: 03/13/05 Date Made Active at EDR: 04/25/05 Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 03/23/05 Elapsed ASTM days: 33 Date of Last EDR Contact: 03/23/05

ERNRS: Energrancy Response Notification System
Source: National Response Center, United States Coast Guard
Telephone: A22-202-202.
Energiancy Response Notification System. ERNS records and stones information on reported releases of oil and hazardous subditances.

Date of Government Version; 1231/04 Date Made Active at EDR; 03/24/05 Database Release Frequency; Annually

Date of Data Arrival at EDR: 01/27/05 Elapsed ASTM days: 56 Date of Last EDR Contact: 04/25/05

FEDERAL ASTM SUPPLEMENTAL RECORDS

RS: Biennial Reporting System

Source: EPANTIS

Telephone: 800-424-8346
The Bennial Reporting System is a national system administered by the EPA flast collects data on the generation and management of hozardnous water. BRS captures dealed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/01/01 Database Release Frequency: Blennially

Date of Last EDR Contact: 04/15/05 Date of Next Scheduled EDR Contact: 06/13/05

CONSENT: Supertural (CERCLA) Consent Decrees
Source: Destinated of Justice, Consent Decree Library
Telephone: Vertee
Telephone: Vertee
Main to gals settlements that establish responsibility and standands for clearup at NPL (Superfund) sites. Released
perfocically by United States District Courts after settlement by parties to fligation matters.

Date of Government Version: 12/14/04 Database Rolease Frequency: Varies

Date of Last EDR Contact: 04/28/05 Date of Next Scheduled EDR Contact: 07/25/05

NOD: Records Of Decision Source: EPA

Date of Last EDR Contact: 04/04/05 Date of Next Scheduled EDR Contact: 07/04/05 Telephone: 703-416-0223
Record of Decision, ROD documents mandate a permanent remedy at an NPL (Superfund) atte containing technical and health information to aid in the cleanup. Date of Government Version: 01/10/05 Database Release Frequency: Annually

PELISTED NPL: National Priority List Deletions Source: EPA

Telephone: IMT
The Methone of and Hazardous Substances Pollution Contingency Plan (MCP) establishes the criteria that the
EPA uses to deste after from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the
NPL where no further response is appropriate.

Date of Government Version: 04/28/05 Database Release Frequency: Querterly

Date of Leaf EDR Contact: 05/04/05 Date of Next Scheduled EDR Contact: 08/01/05

FINDS: Facility Index System/Facility Identification Initiative Program Summary Report Source: EPA

Telephone: NA/ Facily (nekx System, FNUS contains both facility information and 'polities' to other sources that contain more deets. EDR biologic the debowing FNUS detableses in this report. PCS (Permit Compliance System), AIRS (Ancomette information Retrieval System), DOC/RCT (Enforcement Docket used to manage and track information on civil judicial information Retrieval System), DOC/RCT (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental astables), PCRS (Federal Information Contral System), DOCKET (Circles) Docket System), STATE (State Environmental Lews and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 04/11/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/04/05 Date of Next Scheduled EDR Contact: 07/04/05

Hillints: Hazardoua Materials Information Reporting System

Ource U.S. Logariment of Transportation
Telephone: 202-386-4859
Hazardous Materials Incidents report System: HMIRS contains hazardous material spill incidents reported to DOT.

Date of Last EDR Contact: 04/19/05
Date of Next Scheduled EDR Contact: 07/18/05

Date of Government Version: 12/31/04 Database Release Frequency; Annually

INLT 78: Material Liberaring Tracking System

Source: Nuclear Regulatory Commission

Source: Nuclear Regulatory Commission

Tolesphone: 301-415-7188

The Standard by the Nuclear Regulatory Commission and contains a list of approximately 8,100 after which possess or use redicocitive materials and which are subject to NRC Renaing requirements. To maintain purrency,

EDR contacts the Agency on a quarterly bests.

Date of Lest EDR Contact: 04/04/05 Date of Next Scheckled EDR Contact: 07/04/05

Date of Government Version: 01/12/05 Database Release Frequency: Quarten)

MRS: Mines Master Index File

The Labor, Mine Safety and Health Administration

Teleptrone: 509-51-51899

Contains all mine locatification numbers issued for mines active or repared since 1971. The data also includes volation information.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 02/11/05 Detabase Release Frequency: Semi-Annually

Date of Last EDR Contact: 03/30/05 Date of Next Scheduled EDR Contact: 08/27/05

NPL LIENS: Federal Superfund Liens

Source: EPA

Telephone: 202-584-4267
Federal Superfund Lens, Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Lability Act (CECLA) of 1990, the USEPA has the authority to tile fens against real property in order to recover emedial author expenditions or when the property owner receives notification of potential lability. USEPA compiles a listing of illed notices of Superfund Liens.

Date of Lest EDR Contact: 02/22/05 Date of Next Scheduled EDR Contact: 05/23/05

Date of Government Version: 10/15/91 Database Release Frequency: No Update Planned PADS: PCB Activity Database System

Source: EPA
Telephone: 202-664-3897
PCB Adhirty Detablese, PADS Identifies generations, transporters, commercial solvers and/or brokers and disposers of PCB's who are required to notify the EPA of such pativities.

Date of Last EDR Contact: 05/10/05 Date of Next Scheduled EDR Contact: 08/08/05

DOD: Department of Defense Sites Source: USGS

Date of Government Version: 03/30/05 Database Release Frequency: Annual)

Telephone: 703-882-8801
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have sary eree equel to or greater than 640 ecres of the United States, Puerto Roo, and the U.S. Virgin Islands.

Date of Government Version: 10/01/03 Database Release Frequency: Semi-Annually

Date of Lest EDR Contact: 02/08/05 Date of Next Scheduled EDR Contact: 05/09/05

DMTRA: Unantum Mall Talings Sites
Source: Department of Energy
Telephone: 505-645-0011
Uranitum one was mined by private companies for federal government use in national defemas programs. When the malis
eitht down, large pile of the sand-fellor material time is failing; normal information failure boten contractor from
the one. Levels of human sopours to radioachive malerials from the piles are low; hovever, in some cases talings
were used as construction meetries before the population heath states of the talings were recognized. In 1979,
24 hackive uranium mill satings alters in Chegon, idento, Woming, Useh, Coforado Mew Melodo, Texas, North Datods.
South Dakote, Pentrayhemia, and on Narvejo and Hopi titled lands, were targeted for cleaning by the Department of

Date of Government Version: 12/29/04 Database Release Frequency: Varies

Date of Last EDR Contact: 03/22/05 Date of Next Scheduled EDR Contact: 06/20/05

Date of Government Version: 06/30/85 Detabase Release Frequency: No Update Planned

Date of Last EDR Contact: 05/23/85 Date of Next Scheduled EDR Contact: N/A

FUDS: Formarly Used Defense Sites
Source: U.S. Army Corps of Engineers
Telephone: 2.02.628-4286
Telephone: 2.02.628-4286
The listing includes broadens of Pormerly Used Defense Sites properties where the US Army Corps of Engineers is extively working or will take necesseny cleanup actions.

TC1432255.2s Page GR-3

Date of Government Version; 12/31/03 Database Release Frequency: Varies

Date of Last EDR Contact: 04/04/05 Date of Next Scheduled EDR Contact: 07/04/05

NDIAN RESERV: Indian Reservations

Teleptrons: 202-208-3/10
This may liver portrays inclina administered lands of the United States that have any sens equal to or greeter than 640 ecres.

Date of Government Version: 10/01/03 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 02/08/06 Nate of Next Scheduled EDR Contact: 05/09/05

US ENG CONTROLS: Engineering Controls Sines Lies
Source: Environmental Protection Agency
Source: Environmental Protection Agency
Telephone: 703-602-807
A listing of sites with engineering controls in piece. Engineering controls include verious forms of cape, building
foundations, livers, and treatment methods to creete pathway elimination for regulated substances to enter environmental
media or effect human health.

Date of Government Version: 01/10/05 Database Release Frequency: Varies

Date of Lest EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

2AATS: RCRA Administrative Action Tracking System

Pounce: 272-5544-1104
RCSA Administration Action Tracking System. RAATS conteins records based on enforcement actions lesued under RCRA peterling to major volucions and includes ediministration and of olders and includes ediministration brought by the EPA. For administration peterlining to major volucions and includes ediministration and editors after September 30, 1986, dutal entry in the RAATS detabase was discontinued. EPA will retain a copy of the detabase for instortical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the infarmation contained in the distitutes.

Date of Last EDR Contact: 03/07/05 Date of Next Scheduled EDR Contact: 06/06/05

Data of Government Version: 04/17/95 Database Release Frequency: No Update Planned

TRIS: Toxic Chemical Release Inventory System

Trajentome: 202 -688 -0250. Took Rebeste Inventory System. TRIS Identifies Bacilities which release looks othernicals to the air, water and land in reportable quantifies under SNPA Title III Section 313.

Date of Lest EDR Contect: 03/22/05 Date of Next Scheduled EDR Contect: 06/20/05

T8CA: Toxic Subelances Control Act

Date of Government Version: 12/31/02 Database Release Frequency, Annually

Telephone: 202-280-5821 Toxic Substances Control Act TSCA identifies menufacturers and importers of chemical substances included on the TSCA Chemical Substance inventory list. It includes data on the production volume of these substances by plant

Date of Government Version: 12/31/02 Database Release Frequency: Every 4 Years

Source: EPA Telephone: 202-566-1687

FTTS INSP: FIFRA/TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

Date of Last EDR Contact: 04/05/05 Date of Next Scheduled EDR Contact: 06/06/05

Date of Last EDR Contact: 03/21/05 Date of Next Scheduled EDR Contact: 05/20/05

Date of Government Version: 04/13/05 Database Release Frequency: Quarterly

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GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

8T8: Section 7 Tracking Systems

Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Source: EPA, Sourc

Data of Government Version: 12/31/03 Database Release Frequency: Annually

Date of Last EDR Contact: 04/19/05 Date of Next Scheduled EDR Contact: 07/19/05

FITS: FIFPA TSCA Tracking System - FIFRA (Federal Insectiode, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: FPACATive of Prevention, Pesticides and Toxic Substances
Totelphone: 202-569-1697
TISS tracks activities to cases and pesticide enforcement actions and compliance activities related to FIFRA,
TSCA and EFCRA (Enregsancy Planning and Community Right-br-frow Act). To maintain currency, EDR contacts the
Agency on a quantity besis.

Date of Government Version: 04/13/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/21/05 Date of Next Scheduled EDR Contact: 06/20/05

STATE OF CALIFORNIA ASTM STANDARD RECORDS

AWP: Annual Workplan Sites
Source: Callorina Environmental Protection Agency
Source: Callorina Environmental Protection Agency
Source: Callorina Environmental Environmental Protection: 916-32-3400
Known Hazardous Weste Sites California DTSC's Annual Workplan (AWP), formarly BEP, identifies known hazardous substance sites targeted for desurap.

Data of Government Version: 02/07/05
Data Made Active at EDR: 04/05/05
Database Rolesse Frequency: Annually

Dete of Data Arrival at EDR: 03/01/05 Elapsed ASTM days: 35 Date of Last EDR Contact: 03/01/05

CAL-SITES: Catchine Database
Source: Department of Tools Substance Control
Telephone: 916-223-3406
The Catchine: 916-223-3406
The Catchine: 916-223-3406
The Catchines contrating potentials or confirmed hazardous substance misese properties. In 1998, Calibratia
EPA resorbusted and significantly reduced the number of sites in the Catchine detailed.

Date of Government Version: 02/07/05 Date Made Active at EDR: 04/05/05 Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 03/01/05 Elapsed ASTM days: 35 Date of Last EDR Corrisot: 03/01/05

CHMIRS: California Hazardous Material Incident Raport System
Source: Office of Emergency Services
Telephone: 918-845-8400
Galfornia Hazardous Material incident Reporting System. CHMIRS contains information on reported hazardous material incidents (excidents resolves or epile).

Date of Government Version: 12/31/03 Date Made Active at EDR: 06/25/04 Database Release Frequency, Varies

Date of Deta Arrival et EDR: 05/18/04 Elapsed ASTM days: 38 Date of Lest EDR Contact: 02/23/05

CORTESE: "Cortese" Hezandous Waste & Substances Sites List
Source: CAL EPAUGINes of Emergency Information
Telephone: 1916-3224-010
The Sites for the list are designated by the State Watter Resource Control Board (LUST), the Integrated Weste
Board (SWFLS), and the Department of Toxic Substances Control (Cat-Sites). This fishing is no broger updated
by the state agency.

Date of Government Version: 04/01/01 Date Made Active at EDR: 07/26/01 Databese Release Frequency: No Update Planned

Date of Data Arrival at EDR: 05/29/01 Elapsed ASTM days: 58 Date of Last EDR Contact: 04/25/05

VOTIFY 65: Proposition 65 Records

Boyncus: State Water Resources Control Board
Telephone: 916-445-9846
Telephone: 916-445-9846
Proposition 66 Notification Records. NOTIFY 65 contains facility notifications about any release which could impact districting wester and thereby expose the public to a potential health risk.

Date of Government Verston: 10/21/83 Date Made Active at EDR: 11/19/83 Database Release Frequency: No Update Planned

Date of Data Arrival at EDR: 11/01/83 Elapsed ASTM days: 18 Date of Last EDR Contact: 04/18/05 TOXIC PTS: Toxic Pits Cleanup Act Sites
Source: State White Resources Control Board
Telephone: e16-227-4394
Toxic PTS Cleanup Act Sites TOXIC PTS Identifies sites suspected of containing hazardous substances where cleanup

Deta of Government Veraion: 07/01/85 Data Made Active at EDR: 09/28/95 Database Refeses Frequency: No Updata Planned

Date of Data Arrival at EDR: 08/30/95 Elapsed ASTM days: 27 Date of Lest EDR Contact: 02/01/05

Source: Integrated Weste Information System
Source: Integrated Weste Management Board
Source: Integrated Weste Management Board
Source: Integrated Weste Management Board
Active, Clease and Interior Leadilis. SWFILF records typically contain an inventury of solid weste disposal
facilities or landfille. These may be active or I nactive facilities or open dumps that falled to meet RCRA Section
4004 criteria for solid weste landfills or disposal sites.

Date of Data Arrival at EDR: 03/15/05 Elapsed ASTM days: 21 Date of Lest EDR Contact: 03/15/05

Date of Government Version: 03/14/05 Date Made Active at EDR: 04/05/05 Database Release Frequency: Quarterly

Wild LIDS/BWIAT: Waste Management Unit Distablese
Sources: State Marker Resources Control Board
Telephones: 1616-2271-4448
Waste Management Unit Databases System, WM-LIDS is used by the State Water Resources Control Board staff and the
Responsibility of Chair Management Unit Databases System, WM-LIDS is used by the State Water Resources Control Board staff and the
Responsibility Chair Management Unit Industry State Chair Management Unit Industry State Chair
of the solutioning desbases: Fedilly Information, Short Report Summary Industry Data, Chair Chair
(19) Information, Chair Chair Management Light Information, SWAT Report Summary Data, Chair
(19) Information, Chair Management Light Resources Chair
Information, and Interested Partice Information.

Date of Government Version: 04/01/00 Date Made Active at EDR: 05/10/00 Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 04/10/00 Elapsed ASTM days: 30 Date of Last EDR Contact: 03/07/06

LUST: Geotracker's Leaking Underground Fuel Tank Report
Source: State Water Resources Control Board
Context: State Water Resources Control Board
Context: San Bernardhor County Fre Hezmel Division, (909) 388-9418
Leaking Underground Stonger Fach incident Reporter, LUST records contain an inventory of reported leaking underground stonger tank incidents. Not all states maintain these records, and the information stoned varies by state.

Date of Data Arrival at EDR: 01/10/05 Elapsed ASTM days: 42 Date of Last EDR Contact: 04/13/05 Date of Government Version: 01/10/05 Date Mede Active at EDR: 02/21/05 Database Release Frequency: Quarterly

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GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CA BOND EXP. PLAN: Bond Expenditure Plan
Source: Department of Healb Services
Telephone: 916-252-4148
Department of Healb Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Ant hands. It is not updated.

Date of Government Version: 01/01/89 Date Made Active at EDR: 08/02/94 Database Release Frequency: No Update Planned

Date of Data Arrival at EDR: 07/27/84 Elapsed ASTM days: 6 Date of Last EDR Contact: 05/31/84

CA UST:

UST: Active UST Facilities

Contact: Sen Bernardino County Fire Hazmat Division, (909) 386-8418 Active UST facilities gethered from the local regulatory agencies

Date of Government Version: 04/12/05
Date Made Active at EDR: 05/06/05
Database Release Frequency: Semi-Annually

Date of Data Arrival at EDR: 04/13/05 Elapsed ASTM days: 23 Date of Last EDR Contact: 04/13/05

VCP: Voluntary Cleanup Program Properfees
Source: Department of Took Substances Control
Telephone: 915-223-430
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents
have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for

DTSC's costs.

Date of Government Version: 02/07/05 Date Made Active at EDR: 03/31/05 Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 03/01/05 Elapsed ASTM days: 30 Date of Last EDR Contact: 03/01/05

INDIAN LUST: Leateng Underground Storage Tanks on Indian Land Source: Enforcemental Protection Agency Telephone: 416-972-3372 LUSTs on Indian land in Artoona, California, New Maxico and Newada

Date of Government Version: 03/18/05 Date Made Active at EDR: 04/13/05 Database Release Frequency: Varies

Deto of Data Arrival at EDR: 03/21/05 Elapsed ASTM days: 23 Date of Last EDR Contact: 02/22/05

INDIAN LUST: Leating Underground Storage Texts on Indian Land Squore: EPA Region 10 Teleptrone: 206-555-2657 LUSTs on Indian Innt in Alsaka, Idaho, Oregon and Weshington.

Date of Government Version: 02/02/05 Date Made Active at EDR: 03/28/05 Database Release Frequency: Varies

Date of Date Arrival et EDR: 02/02/05 Elapsed ASTM days: 54 Dale of Lest EDR Contact: 01/31/05

INDIAN UST: Undarground Storage Tanks on Indian Land Source: EPA Region 9 Telephone: 415-972-3368

Date of Government Version: 11/02/04 Date Made Active at EDR: 12/13/04 Database Release Frequency: Varies

Date of Date Arrival at EDR: 11/03/04 Elapsed ASTM days: 40 Date of Lest EDR Contact: 02/22/05

CA FID UST: Facility inventory Database
Source: Caldionia Environmental Protection Agency
Telephone: 916-341-5851
Telephone: 9

Date of Government Version: 10/21/94
Date Made Active at EDR: 09/28/96
Database Release Frequency: No Update Planned

Date of Data Arrival at EDR: 09/05/95 Elapsed ASTM days: 24 Date of Last EDR Contact: 12/29/98

4187 UST: Yazardous Substance Storage Container Database Source: State Water Resources Control Board Telephone: 916-341-5851

The Hazardous Substence Storage Conteiner Database is a historical listing of UST sites. Refer to local/county

source for current data.

Date of Government Version: 10/15/80
Date Made Active at EDR: 02/12/91
Datebase Refease Frequency: No Update Planned

Date of Data Arrival at EDR: 01/25/91 Elapsed ASTM days: 18 Date of Last EDR Contact: 07/26/01

STATE OF CALIFORNIA ASTNI BUPPLEMENTAL RECORDS

A8T: Aboveground Petroleum Starage Tank Faullites Source: Salet Wetter Resources Control Board Teleptrone: 916-241-5712 Registared Aboveground Storage Tants.

Date of Government Version: 02/01/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 02/24/05 Date of Next Scheduled EDR Contact: 05/02/05

CLEANERS: Cleaner Facilities
Source: Department of Toack Substance Control
Source: Department of Toack Substance Control
Source: Department of Toack Substance Control
Source: Department of Substance Substan

Date of Lest EDR Contact: 04/15/05 Date of Next Scheduled EDR Contact: 07/04/05

Date of Government Version: 04/18/06 Detabase Release Frequency: Annually

CA WDS: Weste Discharge System Source: State Water Resources Control Board

Telephone: 916-341-5227 Sites which have been issued waste discharge requirements.

Date of Government Version: 03/21/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/22/05 Date of Next Scheduled EDR Contact: 08/20/05

DEED: Deed Restriction Leting
Source: Department of Toxic Stabsances Control
Source: Department of Toxic Stabsances Control
Source: Department of Toxic Stabsances Control
Solve Militarion and Boxwindeah Reuses Program Facility Sites with Deed Restrictions & Hezardous Wate Management
Program Facility Sites with Deed I Lend Use Restriction. The DTSC Site Militarion and Brownflesk Reuse Program
(SMBRP) list Includes sites cleaned up under the program's correspond on the Control Control Control Management and the American Stabsance of Box Militarion and Brownflesk Reuse Program
(PMBRP) list Includes sites cleaned up under the program's coveragin and generally then not thinke current
restriction and an active. Some sites from milities deed restrictions. The DTSC Hessection Weste Management
Use restriction in Site be boat county recorder's affice. The land use restriction on this list were required by
the DTSC HWMP has a result of the presence of hessections after the feetility (or
part of the Reislity) has been closed or cleaned up. The Myses of land use restriction include deed notice, deed
restriction, or a land use restriction that blinds current and faunte owners.

Data of Government Version: 04/05/05 Dubdesse Release Frequency: Semi-Armusity

Date of Lest EDR Contect: 04/04/05
Date of Next Scheduled EDR Contect: 07/04/05

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GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

4FA: No Further Action Determination Source: Department of Toxio Substances Control Telephone: 916-323-3400

This category contains properties at which DTSC has made a clear determination that the property does not pase a problem to the environment or to public health.

Date of Government Version: 02/07/05 Database Release Frequency: Quarterly

Date of Lest EDR Contect: 03/01/05 Date of Next Scheduled EDR Contect: 05/30/05

EMI: Emissions Inventory Date

Source: California Air Resources Board

Date of Last EDR Contact: 04/22/05 Date of Next Scheduled EDR Contact: 07/18/05 Telephone: 916-322-2990 Toxics and criteria pollulant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/02 Database Release Frequency: Varies

WRP: Well Investigation Program Cese List
Source: Los Angelee Water Quality Control Board
Telephone: 13-578-67728
Well Investigation Program case in the Sen Gebriel and Sen Fernando Valley area.

Date of Government Version: 04/28/05 Database Ralease Frequency: Varies

Date of Last EDR Contact: 04/25/05 Date of Next Scheduled EDR Contact: 07/25/05

REF: Unconfirmed Properties Referred to Another Agency
Securo: Department of Toxic Substances Control
Telephone: 916-323-3400
This calegory contains properties where contamination has not been confirmed and which were determined as not requiring direct DTSC Site Mitigation Program action or oversight. Accordingly, these sites have been referred to another state or local regulatory agency.

Date of Lest EDR Contact: 03/01/05 Date of Next Scheduled EDR Contact: 05/30/05 Date of Government Version: 02/07/05 Database Release Frequency: Quarterly

9CH: School Property Evaluation Program
Source: Department of Tack Substances Combol
Telephone: 914-232-3400
This chappon vortisine proposed and existing actival sites there in being evaluated by DTSC for possible hazardous
natisficials contamination. In some cases, these properties may be fisted in the CarSies category depending on the
level of threat to public health and safely or the environment they pose.

Date of Government Version: 02/07/06 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/05 Date of Next Scheduled EDR Contact: 05/30/05

NFE: Properties Needing Further Evaluation Source: Department of Toxic Substances Control Telephone: 916-323-3400

This outlegary contains properties that are suspected of being contaminated. These are unconfirmed contaminated properties that insed to be assessed using the PEA process. PEA in Progness indicates properties where DTSC is currently conducting a PEA. PEA Required indicates properties where DTSC has determined a PEA is required, but not currently underway.

Date of Government Version: 02/07/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/05 Date of Next Scheduled EDR Contact: 05/30/05

BLIC: Statewide SLIC Cases
Source: Site Water Resources Control Board
Contact: State Manual Resources Control Board
Contact: San Bernardino Courtry Fire Hazmat Division, (809) 386-6418
The Splits, Leadh, "meedigations, and Cerentus Scilic") liadings includes unauthorized discharges from splits and leals, other than from underground storage tanks or other regulated sites.

Date of Government Version: 04/12/05 Datebase Release Frequency: Varies

Date of Lest EDR Contact: 04/13/05 Date of Next Scheduled EDR Contact: 07/11/05

NAZNET: Facility and Manilest Data
Source: California Environmental Protection Agency
Source: California Environmental Protection Agency
Telephone: 816-256-1138
Facility and Manilest Data. The data is extracted from the copies of hazardous weste manifests received each year
Edily and Manilest Data. The data is extracted from the copies of hazardous weste manifests unequived source by the DTSC. The armain source manifests such the manifests such the manifests such the manifests such as generation for the process for the process for data elements such as generation [D, TSD ID, waste categogy, and disposal method

Date of Government Version; 12/31/02 Database Release Frequency; Annually

Date of Last EDR Contact: 02/17/05 Date of Next Scheduled EDR Contact: 05/09/05

LOCAL RECORDS

ALAMEDA COUNTY:

Local Oversigh Program Listing of UCT Cleanup 8thes Source: Alameda County Environmental Health Services Telephona: 510-567-8700

Date of Government Version: 02/14/05 Detabase Relesse Frequency: Semi-Annually

Date of Last EDR Contact: 04/25/05 Date of Next Scheduled EDR Contact: 07/25/05

Underground Tenks Source: Alemeds County Ervironmental Health Services Telephone: 510-567-8700

Date of Government Version: 02/15/05 Database Release Froquency: Semi-Annually

Date of Lest EDR Contact: 04/25/05 Date of Next Scheduled EDR Contact: 07/25/05

CONTRA COSTA COUNTY:

Source: Contra Costa Health Services Department

Teleptrane: 825-646-2286 List includes altes from the underground tank, hazardous waste generator and business plan/2186 programs.

Date of Government Version; 03/04/05 Database Release Frequency; Semi-Annually

Date of Last EDR Contact: 02/28/05 Date of Next Scheduled EDR Contact: 05/30/05

FRESHO COUNTY:

CUPA Resources List
Source: Dept of Community Health
Telephone: 554-45-3271
Telephone: 554-45-3271
Certibled Unithed Program Agency, CUPA's are responsible for implementing a unified hazardous meterlets and hazardous
weste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials,
operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 03/31/05 Database Release Frequency: Semi-Armually

Date of Lest EDR Contect: 01/19/05 Date of Next Scheduled EDR Contact: 05/09/05

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TC1432255.2s Page GR-12

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

GERN COUNTY:

Underground Storage Tank Shas & Tank Listing Source: Kern County Environment Health Services Department

Telephone: 661-862-8700 Kern County Siles and Tanks Listing.

Date of Government Version: 12/13/04 Database Release Frequency: Quarterly

Date of Last EDR Contact. 03/07/05 Date of Next Scheduled EDR Contact: 05/06/05

LOS ANGELES COUNTY:

List of Solid Waste Facilities

Source: La County Department of Public Works Telephone: 818-458-5185

Date of Government Version: 02/01/05 Database Release Frequency: Varies

Date of Last EDR Contact: 02/18/05 Date of Next Scheduled EDR Contact: 05/16/05

City of El Begundo Underground Storage Tank Source: City of El Segundo Fire Department Telephone: 310-524-2236

Date of Government Version: 02/14/05 Database Release Frequency: Semi-Annually

City of Long Beach Underground Storage Tank Source: City of Long Beach Fire Department Telephone: 682-570-2543

Date of Government Varsion: 03/28/03 Database Release Frequency: Annually

Date of Last EDR Contact: 02/23/05 Date of Next Scheduled EDR Contact: 05/23/05

Date of Last EDR Contact: 02/14/06 Date of Next Scheduled EDR Contact: 05/16/05

City of Terrance Underground Storage Tank Source: City of Torance Fire Department Telephone: 310-818-2973

Date of Government Version: 03/24/05 Datebase Release Frequency: Semi-Annually

Date of Last EDR Contact: 02/28/05 Date of Next Scheduled EDR Contact: 05/16/05

City of Los Angeles Landfills Source: Engineering & Construction Division Telephone: 213-473-7869

Date of Government Version: 03/01/05 Database Release Frequency: Varies

Date of Last EDR Contact: 03/18/05 Date of Next Scheduled EDR Contact: 06/13/05

HIRD: Steed Number List Source: Department of Public Works Telephone: 626-458-3517 Industrial Waste and Underground Storage Tank Siles.

Date of Government Version: 02/28/05 Database Release Frequency: Semi-Annually

Date of Lest EDR Contact: 02/14/05 Date of Next Scheduled EDR Contact: 05/16/05

Site Mitigation List Source: Commanty Health Services Telephone: 323-890-7806 Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 03/09/05 Database Release Frequency: Annually

Am Gabriel Valley Areas of Concern Source: EPA Region 9

Telephone: 416-672-3178 San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office.

Date of Government Version: 12/31/98 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 02/14/05 Date of Next Scheduled EDR Contact: 05/16/05

Date of Lest EDR Contact: 07/06/99
Date of Next Scheduled EDR Contact: N/A

MAJRIN COUNTY:

Underground Storage Tank Sibse Source: Jubilic Works Department Waste Management Telephone: 415-490-8647 Currently permitted USTs in Manin County.

Date of Government Version: 02/08/05 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 01/31/05 Date of Next Scheduled EDR Contact: 05/02/05

NAPA COUNTY:

Sites With Reported Contamination Source: Napa County Department of Environmental Management Telephone: 707-253-4289

Date of Government Version: 03/29/05 Database Release Frequency: Semi-Armusily

Date of Lest EDR Contact: 03/28/05 Date of Next Scheduled EDR Contact: 08/27/05

Closed and Operating Underground Storage Tank Sites Source: Napa County Department of Environmental Management Telephone: 707-253-4289

Date of Government Version: 03/29/05 Database Release Frequency: Annually

Date of Last EDR Contact: 03/28/05 Date of Next Scheduled EDR Contact: 06/27/05

ORANGE COUNTY:

List of Underground Storage Tank Cleanups Source: Health Care Agenry Telephone: 714-834-3446 Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 02/01/05 Database Release Frequency: Quarterly

Date of Lest EDR Contact: 03/11/05 Date of Next Scheduled EDR Contact: 08/06/05

Llet of Underground Sterage Tank Facilities Source: Health Care Agency Teleptrone: 714-834-3446 Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 03/01/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/11/05 Date of Next Scheduled EDR Contact: 06/06/05

List of Industrial Site Cleanupe Source: Health Care Agency Telephone: 714-834-3446 Petroleum and non-petroleum spills.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Data of Government Version: 03/01/05 Database Release Fraquency: Annually

Date of Lest EOR Contact: 03/11/05 Date of Next Scheduled EDR Contact: 08/08/05

PLACER COUNTY:

Master List of Facilities
Source: Pecar County Health and Human Services
Source: 530-589-7312
List includes aboveground lanks, underground lanks and cleanup siles.

Date of Government Version: 04/05/05 Database Release Frequency: Semi-Amually

Date of Last EDR Contact: 03/21/05 Date of Next Scheduled EDR Contact: 06/20/05

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Source: Department of Public Health
Telephone: 861-388-5056
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 02/14/05 Database Release Frequency: Quarterly

Underground Storage Tank Tank List Source: Health Services Agency Telephone: 951-358-5055

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 07/18/05

Date of Government Version: 02/14/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 07/18/05

SACRAMENTO COUNTY:

CS - Contaminated Sites Source: Secramento County Environmental Management Telephone: 916-875-8406

Data of Government Version: 12/30/04 Database Release Frequency: Quarterly

Date of Last EDR Contact: 02/04/05 Date of Next Scheduled EDR Contact: 05/02/05

ML - Regulatory Compitance Masster List
Source. Sexremental County Environmental Management
Telephone: 916-975-8406
Telephone: 916-975-8406
Waste generation: a pre-process materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Varsion: 12/30/04 Database Relesse Frequency: Quarterly

Date of Last EDR Contact; 02/04/05 Date of Next Scheduled EDR Contact; 05/02/05

BAN BERNARDINO COUNTY:

Hazandous Material Parmits
Source: San Bernatino County Fre Department Hazandous Maleriels Division
Telephones: B Researatino County Fre Department Hazandous Maleriels Division
Telephones: B Researatino County Fre Department Hazandous Maleriels President Maleriels President Fred India

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Date of Government Version; 03/25/05 Database Release Frequency; Quarterly

Date of Last EDR Contact: 03/07/05 Date of Next Scheduled EDR Contact: 09/09/05

BAN DIEGO COUNTY:

Solid Waste Facilities

Source: Department of Health Services Telephone: 619-338-2208 San Diego County Solid Waste Facilities.

Date of Government Version: 06/01/00 Database Release Frequency: Varies

Date of Lest EDR Contact: 02/22/05 Date of Next Scheduled EDR Contact: 05/23/05

Mazurdous Materiatis Management Division Databases
Source: Hazardous Metarias Management Division
Telephone: 619-338-2288
Telephone: 619-338-2288
Telephone: 619-338-2288
The database includes: HESB - This report contains the business name, alto address, business phone number, selatishment Hi formit number, type of permit, and the business status. HETP - In addition to providing the sense information provided in the HESB intig., HETP provides imposition classes, whicklors received by the establishment, hazardous wests against the quantity method of starces, treatmenticiposes of wasts and fine hazard, and formation on underground strange telests. Undistricted Release List - includes a summary of environmentical contamination cases in Sen Diejo County (underground strange teles). Undistricted Release List - includes a summary of environmentical contamination are included.)

Date of Government Version; 05/29/04 Database Release Frequency; Quarterly

Date of Last EDR Comtact: 04/22/05
Date of Next Scheduled EDR Contact: 07/04/05

BAN FRANCISCO COUNTY:

Local Oversite Facilities Source: Department Of Public Health Sen Francisco County Telephone: 415-252-3920

Date of Lest EDR Contact: 03/07/05 Date of Next Scheduled EDR Contact: 08/06/05

Date of Government Version: 03/09/05 Database Release Frequency: Quarterly

Undergraund Storage Tank Information Source: Department of Public Health Telephone: 415-252-3920

Date of Government Version: 03/09/05 Database Release Frequency: Quarterly

Date of Lest EDR Contact: 03/07/05 Date of Next Scheduled EDR Contact: 06/06/05

SAN MATEO COUNTY:

Five Leak List Source: San Mateo County Environmental Health Services Division Telephone: 650-353-1921

Date of Government Version: 02/14/05 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/11/05 Date of Next Scheduled EDR Contact: 07/11/05

Business Inventory
Source Source County Environmental Health Services Division
1 Reports Service County Environmental Health Services Division
1 Reports Service Servi

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GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 02/28/05 Database Release Frequency: Annually

Date of Lest EDR Contact: 04/11/05 Date of Next Scheduled EDR Contact: 07/11/05

BANTA CLARA COUNTY:

Fuel Leak Site Activity Report Source: Santa Clara Valley Water District Telephone: 408-265-2600

Date of Last EDR Contact: 03/29/05 Date of Next Scheduled EDR Contact: 06/27/05

Date of Government Version: 03/29/05 Database Release Frequency: Semi-Annually

Nazardeus Meterial Fecilities Source: City of Sen Jose Fire Department Telephone: 408-277-4859 Date of Government Version: 01/14/05 Database Release Frequency: Annually

Date of Lest EDR Contact: 03/07/05 Date of Next Scheduled EDR Contact: 08/09/05

Lasting Underground Storage Tanks Source: Solano County Department of Environmental Management Telephone: 707-784-6770

SOLAND COUNTY:

Date of Government Version: 04/18/05 Detebase Release Frequency: Quarterly

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 05/13/05

Undergrownd Storage Tanks
Source: Sotano County Department of Environmental Management
Telephone: 707-784-6770

Date of Government Version: 04/18/05 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 06/13/05

SONOMA COUNTY:

Leaking Underground Storage Tank Sites Source: Department of Health Services Telephone: 707-585-8565

Date of Government Version: 04/25/05 Database Release Frequency: Quarterly

SUTTER COUNTY:

Underground Storage Tanks
Source: Sutter County Department of Agricutture
Telephone: 630-822-7500

Date of Government Version: 01/29/04 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/25/05 Date of Next Scheduled EDR Contact: 07/25/06

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 07/04/05

JENTURA COUNTY:

vantory of litegal Abandoned and Inactive Sites
Source: Environmental shall: Division
Telephone: 666-281 shall: Division
Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Data of Government Version: 08/01/04 Database Release Frequency: Annually

Date of Last EDR Contact: 02/23/05 Date of Next Scheduled EDR Contact; 05/23/05

Listing of Underground Tank Clearup Sites
Source: Environmental Health Division
Telephone: 805-654-2613
Venture County Underground Storage Tenk Cleanup Sites (LUST).

Data of Government Version: 03/01/05 Database Release Frequency: Quarterly

Dete of Last EDR Contact: 03/18/05 Date of Next Scheduled EDR Contact: 08/13/05

Underground Tank Closed Sikes List
Source: Enformmental Health Division
Telephores: BGS-62-281s
Ventura County Operating Underground Storage Tank Shes (UST) VUnderground Tank Closed Sites List.

Date of Last EDR Contact: 04/15/05 Date of Next Scheduled EDR Contact: 07/11/05 Date of Government Version: 03/30/05 Database Release Frequency: Quarterly

Sustiness Plan, Hazardous Waste Producers, and Operating Underground Tanks
Source: Variat County Environmental Health Division
Telephone: 685-684-2813
The BWT list Indicates by alto address whether the Environmental Health Division has Business Plan (B), Waste
Producer (W), andor Underground Tank (T) Information.

Date of Government Version: 03/01/05 Database Release Frequency: Quarterly

Date of Lest EDR Contact: 03/18/05 Date of Next Scheduled EDR Contact: 08/13/05

YOLD COUNTY:

Underground Storage Tank Comprehensive Facility Report Source: Yolo County Department of Health Telephone: 530-666-8846

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 07/18/05 Date of Government Version; 04/19/05 Database Release Frequency; Annually

California Regional Water Quality Control Board (RWQCB) LUST Records

LUST REG 1: Active Todo Site Investigation
Source: Catifornia Regional Water Clustity Control Board North Coast (1)
Telephoren: 702-76-2220
Del North, Hurbodt, Likel, Mendocrino, Modoc, Stathyou, Sonoma, Titrity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/01 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 02/23/06 Date of Next Scheduled EDR Contact: 05/23/05

LUST REG 2: Fuel Leak List
Source: Cafforia Regard Water Quality Control Board Sen Francisco Bay Region (2)
Source: 510-286-0467

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 09/30/04 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/11/05 Date of Next Scheduled EDR Contact: 07/11/05

LUST REG 3: Leaking Underground Storege Tank Database Source, California Replanti Water Quality Control Board Central Coast Region (3) Telephone: 805-68-5147

Date of Government Version: 05/19/03 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 02/14/05 Date of Next Scheduled EDR Contact: 05/16/05

LUST REG. 4: Underground Storage Tank, Lesk List
Source: Calterinal Regional Water Cuellity Control Board Los Angeles Region (4)
Telephone: 213-576-5800
Los Angeless, Vehinz acounties. For more ourrent knormation, please refer to the State Water Resources Control
Board's LUST database.

Date of Lest EDR Contact: 03/29/05 Date of Next Scheduled EDR Contact: 06/27/05 Date of Government Version; 09/07/04 Database Release Frequency; No Update Planned

LUST REG St. Leating Underground Storage Teak Database Source: California Regional Water Quality Control Board Central Valley Ragion (5) Telephone: 918-484-3291

Date of Last EDR Contact: 04/19/05 Date of Next Scheduled EDR Contact: 07/04/05 Data of Government Version: 04/01/05 Database Release Frequency: Quarterly

LUST REG 6L: Leating Underground Starage Tank Case Listing
Source: Cultimete Regions (Water Closity Control Board Lehronten Region (6)
Source: Cultimete Regions (1952-5424)
For more current information, please refer to the State Werter Resources Control Board's LUST database.

Date of Government Version: 09/09/03 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 04/12/05 Date of Next Scheduled EDR Contact: 06/06/06

LUST REG 6V: Leaking Underground Storage Tank Case Leting Source: Catifornie Regional Water Quality Control Board Victorville Branch Office (6) Telephone: 760:346-7491

Date of Last EDR Contact: 04/15/05 Date of Next Scheduled EDR Contact: 07/04/05 Date of Government Version: 08/09/04 Database Rolease Frequency: No Update Plannad

LUST REG 7: Leaking Underground Storage Tank Case Lisking Source: California Regional Water Quality Control Board Colorado River Basin Region (7) Telephone: 780-346-7481

Date of Lest EDR Contact: 03/29/05 Date of Next Scheduled EDR Contact: 08/27/05

Date of Government Version: 02/26/04 Database Release Frequency: No Update Planned

LUST REG 8: Leaking Underground Storage Tenka Source: California Regional Water Quality Centrol Board Sortia Ana Region (6) Telephone: 85-1728-41 20 California Regional Water Quality Centrol Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Last EDR Contact: 02/08/05 Date of Next Scheduled EDR Contact: 05/09/05 Date of Government Version: 02/14/05 Database Release Frequency: Varies

LUST REG 8: Leaking Underground Storage Tents Report
Source: California Regional Weter Quelity Control Board San Diego Region (8)
Telephone: 564-617-2860
Telephone: 564-617-2860
Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources
Control Board's LUST database.

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Date of Government Version: 03/01/01 Database Release Frequency: No Update Plannod

Date of Last EDR Contact: 04/19/05
Date of Next Scheduled EDR Contact: 07/18/05

California Regional Water Quality Control Board (RWQCB) SLIC Records

SLIC REG 1: Active Toxic Site Investigations
Source. California Reponsi Water Charliny Control Board, North Coast Ragion (1)
Solinia: 7007-516-2220

Data of Government Version: 04/03/03 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 02/23/05 Date of Next Scheduled EDR Contact: 05/23/05

BLC REG 2: Spils, Leate, investigation & Chemup Cost Recovery Listing Source; Reports Water Custly Control Board Sea Francisco Bay Region (2) Source; Repórel Water Custly Control Board Sea Francisco Bay Region (2) Periperon: 510-286-0457
Any contambrated alte that Impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 09/30/04 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/11/05 Date of Next Schedufed EDR Contact: 07/11/06

SLIC REG 3: Spils, Leaks, Investigation & Cleanup Cost Rocovery Listing
Source: Cacifornia Regional Water Cuality Control Board Central Cosst Region (3)
Sources: Cacifornia Regional Water Cuality Control Board Central Cosst Region (3)
Forty contaminated atte that Impacts groundwater, any

Date of Government Version: 03/21/05 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 02/14/05 Date of Next Scheduled EDR Contact: 05/23/05

SLIC REG 4: Spills, Leake, Investigation & Cleanup Coat Recovery Listing Source: Region Water Quality Control Board Los Angeles Region (4) Prephone: 213-576-6600 Any contaminated alle that Impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 11/17/04 Database Release Frequency: Varies

Date of Last EDR Contact: 04/25/05 Date of Next Scheduled EDR Contact: 07/25/05

SLIC REG 5: Spife, Leaks, Investigation & Cleanup Cost Racovery Listing Source: Reporte Water Quality Control Board Central Visitey Region (5) Teleptone: 916-444-4231 Univegulated reported to have the potential to impact groundwater or have the potential to impact groundwater.

Date of Government Version; 04/01/05 Database Release Frequency: Semi-Armusily

Date of Last EDR Contact: 04/05/05 Date of Next Scheduled EDR Contact: 07/04/05

8LIC REG 8L: SLIC Sites Source: California Regional Water Quality Control Board, Lehonian Region Telephone: 530-542-5574

Dete of Government Version: 09/07/04 Database Release Frequency: Varies

Date of Last EDR Contact: 03/07/05 Date of Next Scheduled EDR Contact: 06/06/05

SLIC REG 6V: Spills, Lesks, Investigation & Cheanup Cost Recovery Listing Source: Regional Water Quality Control Board, Victorville Branch Telephone: 619-241-8583

Date of Government Version: 01/25/05 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/18/05 Date of Next Scheduled EDR Contact: 07/04/05

8LIC REG 7: SLIC Ltst
Source: California Regional Quality Control Board, Colorado River Basin Region
Source: 760-461-7481

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GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 11/24/04 Database Release Frequency: Varies

Date of Lest EDR Contact: 02/22/05 Date of Next Scheduled EDR Contact: 05/23/05

SLUC REG 8: Solfis, Leeks, investigation & Clearup Cost Recovery Listing Source: California Region Water Quality Control Board Santa Ana Region (8) Telephone: 951-782-3298

Date of Last EDR Contact: 04/06/05 Date of Next Scheduled EDR Contact: 07/04/05

Date of Government Version: 07/01/04 Database Release Frequency: SemI-Annually

SLLC REG B: Spills, Lestis, Investigation & Clearup Cost Recovery Listing Source: California Regional Water Quality Control Board San Diego Region (9) Telephone: 858-467-2880

Date of Government Version: 09/10/04 Database Refesse Frequency: Annually

Date of Last EDR Contact: 03/01/05 Date of Next Scheduled EDR Contact: 05/30/05

EDR PROPRIETARY HISTORICAL DATABASES

Former Manufactured Gas (Coel Gas) Sittes: The existence and boarlan of Coal Gas also is provided exclusively to EDR by Real Property Scan, Inc. For a lecturical description of the types of hozards which may be found at such also, confact your EDR customer service representative.

Discialmer Provided by Real Property Scan, Inc.

The information contained in this report has predominantly been obtained from publicly available sources produced by entities other than the Responsible as the predominant of the property of this report, first property Scar local market the accuracy of this report, first people, Scar local market people, specifically on the part of Real Property Scar is strictly limited to a relund of the amount peld. No dainn is made for the actual existence of toxins at any site. This report does not considere a legal

BROWNFIELDS DATABASES

VCP: Voluntary Cleanup Program Properties Source: Department of Toxic Substances Control

Teleptrone: 918-323-3400
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents.
Rove request that DTSC oversee investigation and/or cleanup achieties and have agreed to provide coverage for

Date of Government Version: 02/07/06 Detabese Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/05 Date of Next Scheduled EDR Contact: 05/30/05

US BROWNETEL DB: A Listing of Brownfields Sites
Source: Environmental Probadion Agency
Telephones: 202-566-3777
Telephones: 202-566-3777
Telephones: Co22-566-3777
Telephones:

Date of Government Version; 01/10/05 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 03/14/05 Date of Next Scheduled EDR Contact; 08/13/05

US INST CONTROL: Sites with Institutional Controls
Source: Environmental Presention Agency
Telephone: 702-660-6887
Telephone: 702-660-6887
A fisting of alter with institutional controls in place. Institutional controls include administrative measures,
action as governative/enter use senticions, construction restrictions, property use restrictions, and post remediation
care requirements intended to prevent accounts to contaminants remarking on site. Deed restrictions are generally
required as part of the firstlustional controls.

Date of Government Version: 01/10/05 Database Release Frequency: Varies

Date of Last EDR Contact: 04/04/05 Date of Next Scheduled EDR Contact: 07/04/05

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specially dislabses may or may not be contriber. For example, the existence of whether thinneation data in a specific report does not mean that all wetlands in the state covered by the report are included. Inference, the absence of any reported wellands indomation does not necessarily mean that wetlands do not exist in the area covered by the report.

OlikGas Pipelinea: This data was obtained by EDR from the USGS in 1994, it is minmed to by USGS as GeoData Digital Line Graphs in 1100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data
Source: Penithiel Corporation
Telephone: (80)0 252-527.
The map includes information copyrighted by Penithel Corporation. This information is provided
on a basis effort Lessi and Penithiel Corporation does not guarantee its accuracy nor warrant its
fiftness for any particular purpose. Such information has been reginted with the permission of Penithiel.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity when when when the declaranges. These sensitive receptors typically include the effect, the sick, and chidron. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and sollities - echools, devoeres, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

Source, American Hospital Association, Inc.

Source, Chemer and Everyone Market of the Commission of Services Clement of Services Listing

Source: Center for Medican Commission of Services

Source: Center for Medican Commission of Services

Source: Center for Medican Commission of Services

Aliating of Nocytida's with Medicans provider number, produced by Centern of Medicans & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

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Telephrone: 301-594-520.
Telephrone: 301-595-520.
Telephrone: 301-595-5

The ballonal Center for Education Statistics
Source, National Center for Education Statistics
Telephone, 202-502-7300
The hallonal Center for Education Statistics' primary delatases on private school locations in the United States.

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TC1432255.2s Page GR-22

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Daycare Centers: Licensed Facilities Source: Depertment of Social Services Telephone: 918-657-4041

Flood Zone Deta: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Mannagement Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWE. National Wellands inventory. This data, available in select countles across the country, was obtained by EDR in 2002 from the U.S. Fish and Wildlife Sentre.

STREET AND ADDRESS INFORMATION

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GEOCHECK®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

SAN BERNARDINO AVE/TEXAS ST REDLANDS, CA 92374 ORANGE GROVES

TARGET PROPERTY COORDINATES

34.077301 - 34' 4' 38.3" 117.191101 - 117' 11' 28.0" Zone 11 482367.9 3770548.8 1320 ft. above sea level Latitude (North):

Longitude (West):

Universal Tranverse Mercator: 2

UTM X (Meters):

3

EDIT's GeoCheck Physical Setting Source Addendum has been developed to assist the environmental professional with the condition of ophicial setting source information in accordance with ASTM 457-40, Section 7.2.3. Section 7.2.3 requires that a current USIGS 7.5 Minuta Topographic Map (or equivalent, such as the USIGS Digital Elevation Model) be reviewed, it also requires that low or more additional physical setting sources be sought when (1) conditions there bear identified in which inazordus substances or perincipant products are likely in mightab to or from the property, and (2) more information than is provided in the current USIGS 7.5 Minute Topographic Map (or equivalent) is generally obtained, pursuant to local good commercial or assistmany practices in assesses the impact of ingritish or of recognised environmental conditions in connection with the property. Such additional physical setting sources generally include information about the topographic, hydrologic, hydrogeologic, and eveils in the area.

Assessment of the impact of contaminant migration generally has two principle investigative components:

Groundwater flow direction, and
 Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearly whell, Groundwater flow velocity is generately impected by the nature of the geacogic strate. EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

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GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

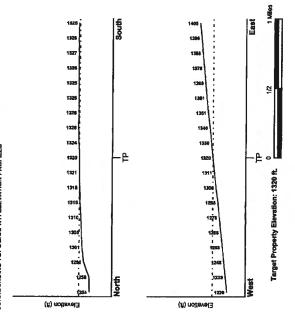
ORQUINDWATER FLOW DIRECTION INFORMATION
Commission direction for a peritular site is best determined by a qualified environmental professional using site-specific well data. If such data is not hearonably accordiable is, they be necessary to rety on other sources of information, such as suffice topographic information, hydrologic unformation, hydrologic object of sources of information, hydrologic object data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

TOPOGRAPHIC INFORMATION

Surface topography may be inclicative of the direction of auriticial groundwater flow. This information can be used to assist the environmental professional in forming an ophian about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY
USGS Topographic Map:
General Topographic Gradient: General WNW
Source:
USGS 7.5 min qued index

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Source: Topography has been determined from the USGS 7.5. Digital Elevation Model and should be evaluated on a relative (find an absolute) basis. Relative elevation information between sites of closs proximity should be fished to the field.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summery for hydrologic Information (major waterways and bodies of water).

FEMA FLOOD ZOME

FEMA Flood Electronic Data YES - refer to the Overview Map and Detail Map Target Property County SAN BERNARDING, CA

08071C8704F Flood Plain Panel at Target Property;

06071C8708F Additional Panels in search area:

NWI Quad at Target Property NOT AVAIL ABLE

NATIONAL WETLAND INVENTORY

NWI Electronic Data Coverage Not Available

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater few direction in the liminaditie area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearly contaminated properties or, should confamiliation exist on the larget property, what downgradient sites might be impacted.

1.25 miles
1 - 2 Maise ENE
CHURCH ST. LANDFILL
CAD863577990
TO 130 feet
The site is underlian by unconsolidated alluvial deposits of interbedded day, all sand, grawt, and boulders.
No information about a sole source aquiffer is available information is infered in the CERCLIS investigation report(s) Site-Specific Aydrogeological Data:
Search Reduic.
1.257
Location Relative to TP: 1.257
Site Name:
Site Name:
CADIO
Groundwater Flow Direction:
Inferred Depth to Water:
Hydraulic Camedion:
Hydraulic Camedion:
The site of the C Sole Source Aquifier: Data Quelity:

AQUIFLOW.

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory euclibrates at seelect sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

GENERAL DIRECTION FROM TP G1980 Stre-specific injusticamental interpretation of DRICE (I Albert, Inc., Berindering barret, MV. As higher removed. At of the Primaration and opiniors, presented are hope of the street CPA repress), which was a Character freedom of Responsibility (CSRCLX) freestigation.

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GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional unity site specific geologic and soil stated data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil cheracteristics data collected on nearly properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than sitty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY
Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

GEOLOGIC AGE IDENTIFICATION

Stratified Sequence Category: Cenozolo:
Quelemary
Quetemary
Q (decoded above as Era, System & Series) System: Series: Code:

Geologic Age and Rock Stratigraphic Unit Source: P.C. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 12,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Belkman Map, USGS Digital Data Series DDS - 11 (1994).

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SICS) leads the National Cooperative Soil Survey (NICSS) and is responsible for collecting, storting, maintaining and distributing soil survey information for priviality owned lands in the United States. A soil map in a soil survey is a representation of soil patienns in a lendezage. Soil maps for STATISGO are compiled by generating more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATISGO data.

GREENFIELD Soil Component Name:

sandy loam Soil Surface Texture: Hydrologic Group:

Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained solls with moderately coarse faxtures.

Weil drained. Solls have intermediate water holding capacity. Depth to water table is more than 8 feet. Soll Drainage Class:

Hydric Status: Soil does not meet the requirements for a hydric soil.

Corrosion Potential - Uncoated Steel: HIGH

> 60 Inches Depth to Bedrock Min: > 60 inches Depth to Bedrock Wax:

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

			Soil Layer	Soil Layer Information				ŀ
	Bour	Boundary		Classification	cation			
Layer	Upper	Lower	Soil Texture Class AASHTO Group	AASHTO Group	Unified Sail	Permeability Rate (in/hr)		Soil Reaction (pH)
-	0 inches	20 inches	sandy loam	Granular materials (35 pot. or less passaring No. 200), Silty, or Clayve Gravel	COARSE-GRAINED SOILS, Sends, Sends with fines, Silky Send.	Max: 6.00	Mirr	7.80 6.10
2	20 inches	40 inches	fine sandy loam	Granular materials (35 pcl. or less pessaling No. 200), Sitty, or Clayey Grevel and Sand.	COARSE-GRAINED SOILS, Sands, Sends with fines, Silty Sand.	Мак: 6.00 Min: 2.00	Max	6.10
r)	40 inches	60 inches	loam	Sit. Clay Materials (more than 35 pct. pessling No. 200), Sitty Soile,	FINE-GRAINED SOILS, Silts and Clays (Rould limit less than 50%),	Max; 2.00 Min: 0.60	M Mex	7.80 6.10
प	80 inches	72 inches	stratified	Granuter materials (3.5 pct. or less pesseng No. 200), Sifty, or (Jayey Grevel	COARSE-GRAINED SOILS, Sands, Sands with fines, Sifty Sand.	Mex: 6.00 Min: 2.00	Mex:	6.60

OTHER SOIL TYPES IN AREA

Based on Soit Conservation Service STATSGO data, the following edditional subordinant soil types may appear within the general area of target property.

Soil Surface Textures: coerse sandy loam gravelly - loany fine sand fine sand fine sand gravelly - loany sand barny sand cobbby - coerse sandy loam cobbby - coerse sandy loam

Surficial Soll Types:

coarse sandy loam gravelly - loamy fine sand fine sandy loam gravelly - loamy sand loamy sand cobbly - coarse sandy lourn

gravetly - loam loam cley loam Shallow Soil Types:

gravefly - sandy loam Deeper Soil Types: TC1432255.2s Page A-5

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

Abcording to ASTM E 1527-00, Section 7.2.2, "one or more additional state or local sources of environmental acrosts may be checked, in the discretion of the environmental professional, to enhance and supplement federal and state accurate. "Factor to consister in determining which local or additional state records, if any source in clearing the enscandant according to the checked include (1) whether they are reasonably ascordantable. (2) whether they are sufficiently associated, accurate, and complete in light of the objective of the records survey (see 7.1.1), and (3) whicher they are obtained, pursuant to local, good commercial or customary predicto." One of the record sources listed in Section 2.2 is water well information, whate well information can be used to assist the environmental professional in assessing sources that may impact groundwater flow direction, and in forming an opinion about the impact of contaminant migration on nearry districtly water wells.

WELL SEARCH DISTANCE INFORMATION

SEARCH DISTANCE (miles)	1.000 Nearest PWS within 1 mile	£ 500
DATABASE	Federal USGS Federal FRDS PWS	State Detahase

FEDERAL USGS WELL INFORMATION

		LOCATION
MAP ID	WELL ID	FROM TP
2	USGS3135389	1/8 - 1/4 Mile SW
A3	USG83136353	1/4 - 1/2 Mile SSW
¥	USGS3136354	2
A5	USGS3135355	1/4 - 1/2 Mile SSW
¥8	USGS3135358	2
7	USGS3135256	2
88	USGS3135347	1/4 - 1/2 Mile South
8	USGS3136278	1/4 - 1/2 Mile NNW
9	USGS3135272	1/4 - 1/2 Mile NE
=	USGS3135273	1/4 - 1/2 Mile NW
B12	USGS3135333	1/4 - 1/2 Mile SW
B13	USGS3135317	1/4 - 1/2 Mile SSW
14	USGS3135352	1/4 - 1/2 Mile SE
15	USGS3135277	1/4 - 1/2 Mile NW
C16	USGS313551B	1/4 - 1/2 Mile SSW
C17	USGS3135508	1/2 - 1 Mile SSW
Ç18	USGS3136507	1/2 - 1 Mile SSW
19	USGS3135219	1/2 - 1 Mile WNW
8	USG\$3135519	1/2 - 1 MIle SW
8	USGS3135180	1/2 - 1 Mile North
23	USGS3136282	1/2 - 1 Mile WNW
74	USGS3135414	
525	USGS3135134	1/2 - 1 Mile NE
32	USGS3135148	1/2 - 1 Mile NW
S	USGS3135211	1/2 - 1 Mile East

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

LOCATION	FROM TP	1/2 - 1 Mile WSW	1/2 - 1 Mile ENE	1/2 - 1 MIe ENE	1/2 - 1 Mile FNF	1/2 - 1 Mile ENE	1/2 - 1 Mile ENE	1/2 - 1 Mile SW	1/2 - 1 Mile WSW	1/2 - 1 Mile SW	1/2 - 1 Mile East	1/2 - 1 Mile East
	WELL ID	USGS3135481	USGS3135312	USG\$3135311	USGS3135102	USGS3135101	USGS3135100	USG83135457	USG\$3135324	USGS3135432	USGS3135245	USGS3135382
2	Ol -May	88	236	F37	538	28	F40	÷	42	43	\$	45

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

LOCATION FROM TP 0 - 1/8 Mile SSE	
WELL ID CA300759	location is not always the same as well location.
MAP ID	Note: PWS System

STATE DATABASE WELL INFORMATION

LOCATION	FROM TP	1/2 - 1 Mile NNE	1/2 - 1 MBs NE	1/2 - 1 Mile SSE	1/2 - 1 MHe SSE	1/2 - 1 Mile NW			
	WELL ID	815	816	819	820	18786	18785	818	18784
	MAP ID	2	028	E27	23	EZ3	E30	ā	ಸ



TARGET PROPERTY:
ADDRESS:
CITY/STATE/ZIP:
LAT/LONG:

CUSTOMER: Namyo & Moore
CONTACT: Back Pradget
INQUIRY #: 142256.28
DATE: May 27, 2005 7:30 pm
Cayedro 283 EM, fix e 264 EM, in No. 07204. 4 Pub Pum. Orange Groves San Benrardino Ave/Texas St Rediands CA 92374 34.0773 / 117.1911

EDR ID Number	CA3000759				
Database	FRDS PWS			17 11 24	0000000
		PWS Status: Active Date DeactivatedNot Reported SWAL PARK CYN RD 98		Facility Longitude 117 11 24	Population: 0
		CA3000759 PWS Status: 9404 CANYON RV PARK CEATHERLY REGIONAL PARK 24001 SANTA ANA CYN RD ANAHEIM, CA 92808	System Owner/Responsible Party FEATHERLY REGIONAL PARK 24001 SANTA ANA CYN ROAD ANAHEM, CA 92806		
		CA3000759 PV 8404 Da CANYON RV PARK FEATHERLY REGION 24001 SANTA ANA CY ANAHEIM, CA 92808	System Owner/Respor FEATHERLY REGION 24001 SANTA ANA CY ANAHEIM, CA 92806	34 04 37 Not Bennded	Untreated
Mep ID Direction Distance Elevation	0 - 1/8 Mile Higher	PWS ID: Date initated: PWS Name:	Addresses / Facility:	Facility Latitude: Oth Served:	Treatment Class:

Violations Information not reported.

PWS currently has or had major violation(s) or enforcement: Yes

ENFORCEMENT INFORMATION:

P	USGS31						
00000000.00 9608006 State Compliance Achieved	FED USGS	340431117113501	34.07529072 M	NAD27 08 071	Not Reported Not Reported	MGVD29	19480101 PST
Analylical Value: Enforcement ID: Enf. Action:	5	Site no:	Dec lat: Coor math:	Lationg defum: District: County:	Land nat: Map scale:	Attitude memod: Attitude datum: 30 sq.ml.	Date construction: Mean greenwich time offset:
CANYON RV PARK CAL, Monthy (TCR) COL,IFORM (TCR) 1985-07-11 - 1986-07-31 9508003		USGS 0015003WZ1A001S 340431	117.136	NAD83 06	US Not Reported	1450.000 Not Reported Sante Ana. Celifornia. Area = 1680 sq.ml. Not Benorted	Ground-water other than Spring Date construction: Not Reported Mean greenwich it
System Name: Violation Type: Contaminent: Compliance Period: Violation ID: Enforcement Date:	2 SW 1/8 - 1/4 Mile Lower	Agency cd: Site name: Lattude:	Longitude: Dec lon:	Coor acor: Dec lationg datum: State:	Country: Location map:	Attitude accuracy: Hydrotogic Topographic	Site type: Date inventoried:

USGS3136389

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Local standard time flag: Y Aquifler Type: Not Reported Aquifler Type: Sale Aquifler Well depth: 338 Reported Source of depth data: Not Reported Daily flow data end of data. Not Reported Peak flow data eoouht: Not Reported Peak flow data count: Not Reported	V Not Reported	4	Single well, other than collector or Ramey type 350 Mot Reported Not Reported Not Reported Not Reported Not Reported Not Reported Not Reported
weuer quality data ento date; not reported Ground water data begin date; Not Reported Ground water data count: Not Reported	:Not Reported Its: Not Reported Not Reported	Water quality data count: Ground water data end date:	Not Reported Not Reported

Ground-water levels, Number of Measurements; 0

FED USGS USGS3138363	340/25/11/12801 M WD27 M WD27 M WD27 M RD27 00 00 07 17 18 18 18 18 18 18 18 18 1	
FEDI	34.0725117112801 M M MAD27 00 00 07 07 07 07 07 07 07 08 Reported Net	
	Sila nor. 34.0738241 Coor meth: MACPT Desired: MACP	
	UBGGG Sila no. 1171128 Coor me 1171128 Coor me 1171128 Coor me 117128 Coor me 127128 Coor me 12	
A3 85W 114 - 1/2 Mile Higher	Agency od: 19595 Sile name: 10.1595 Lunghade: 340425 Dec for: 340425 Coor according to the first state of th	

USG83135354	
FED USGS	
85W 14 - 1/2 Mile	Higher

Agency cd:	nses	Sile no:	340425117112802
Site name:	HOLE-01 LYSIMETER AT 60		
Latitude:	340425		
Longitude:	1171128	Deciat	34 07382412
Dec lon:	-117.19198321	Coor meth:	
Coor soor:	-	Lationa datum:	NAD27
Dec lationg datum:	NAD83	District	
State:	. 88	County:	071
Country:	SN	Land net:	Not Reported
Location map:	Not Reported	Map scale:	Not Reported
Althode:	Not Reported	Altitude method:	Not Reported
Altitude accuracy:	10	Altitude detum:	Not Reported
Hydrologic.	Santa Ana, California, Area = 1880 sq.mi.	O sq.mi.	
Topographic	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Recorded
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	· ·	Type of ground water site:	Test hole not comoleted as a well
Aquifer Type:	Not Reported		West D Co possession can facing
Aquifer:	Not Reported		
Well depth:	Not Reported	Hole depth:	Not Reported
Source of depth data:	Not Reported	Project number:	Not Recorted
Real time data flag:	Not Reported	Dally flow data begin date:	Not Reported
Daily flow data and date:	Not Reported	Daily flow data count:	Not Recorted
Peak flow data begin date:		Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	
Water quality data end date: Not Reported	:Not Reported	Water quality data count:	Not Reported
Ground water data begin date: Not Reported	ite: Not Reported	Ground water data end date:	Not Reported
CHOOL IN WESTER CIBIGS COUNTY	Not response		

Ground-water levels, Number of Messurements: 0

A5 85W 14-12 Mile Higher			FED USGS USGS313535
Agency od:	uses	Site no:	340425117112803
Site name:	HOLE-01 LYSIMETER AT 110		
Latitude:	340425		
Longitude:	1171128	Declat	34.07362412
Dec lon:	-117.19198321	Coor meth:	
Coor accr.	5	Lationo datum:	NAD27
Dec lationg datum:	NAD83	District	
State:	90	County:	120
Country:	ns	Lend net:	Not Reported
Location map:	Not Reported	Mep scale:	Not Reported
Alitude:	Not Reported	Altitude method:	Not Reported
Altitude accuracy:	10	Alttude datum:	Not Reported
Hydrologic:	Santa Ana. California. Area = 1680 sq.mi.	80 sq.mf.	
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date Inventoried:	Not Reported		PST
Local standard time flag:	· >	Type of ground water site:	Test hole not completed as a use
Aquifer Type:	Not Reported		
Aquifer.	Not Reported		
Well depth:	Not Reported	Hole depth:	Not Reported
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:	Not Reported	Dally flow data begin date:	Not Reported
Dally flow data end date:	Not Reported	Dally flow data count:	Not Reported
Peak flow data begin date:	_	Peak flow data end date:	Not Reported

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Water quality data begin date: Not Reported Water quality data count: Not Reported Ground water data and date: Not Reported

Ground-water levels, Number of Measurements: 0

A6 88W 1/4 - 1/2 Mile Higher			FED USGS USGS3135336
Agency cd: Site name: Latitude:	USGS HOLE-01 LYSIMETER AT 187 340425	Sile no:	340425117112804
Longitude: Dec lon:	1171128	Dec lat Coor meth:	34.07362412 M
Coor accr: Dec lattong datum:	U NAD83	Lattong datum: District:	NAD27 06
State: Country:	98 SI	County:	07.1
Location map:	Not Reported	Map scale:	Not Reported
Althude:	Not Reported	Attitude method:	Not Reported
Hydrologic:	Santa Ana. California. Area = 1680 sq.mi.	Autude datum: 10 sq.mi.	Not Reported
l opographic: Site type:	Not Reported Ground-water other than Spring Date construction:	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Aquifer Type:	Not Reported	Type of ground water site:	Test hole, not completed as a well
Well depth:	Not Reported	Hole denth:	Not Benorted
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:		Daily flow dete begin date:	0000000
Daily flow data and date:	00-00-0000	Daily flow data count.	0
Peak flow data begin date: Peak flow data count:	00-00-0000	Peak flow data end date: 0000-00-00 Water custly data havin date: 1977-06-22	0000-00-00
Water quality data end date:1978-07-11	11978-07-11	Water quality data count:	37.007.65
Ground water data begin date: 0000-00-00 Ground water data count: 0	ate: 0000-00-00	Ground water data end date; 0000-00-00	00-00-0000

Ground-water levels, Number of Measurements: 0

•			FED USGS	USGS3135256
T 8	USGS 001S003W15N001S 340445	Site no:	340445117111001	
ë	1171110	Dec lat: Coor meth:	34.07917945 M	
Coor accr: Dec lattong datum: State:	S NAD83 06	Latlong datum: District: County;	NAD27 08 071	
map:	US Not Reported	Land net: Map scale:	Not Reported Not Reported	

	NGVD29			19270101	PST	Single well, other than collector or Ranney type	of forms		27.1	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported		
Attitude method:	Altitude datum:	Area = 1680 eq.ml.	. 8	Ground-water other than Spring Date construction:	Mean greenwich time offset:	Type of ground water site:			Hote depth:	Project number:	Daily flow data begin date:	Daily flow data count:	Peak flow data end date:	Water quality data begin date: Not Reported	Water quality data count:	Ground water data end date:	
1338.00	-	Santa Ana. California, Area = 1680 eq.ml.	Alluvial or marine terrace	Ground-water other th	Not Reported	>	Not Reported	Not Reported	548	Not Reported	Not Reported	Not Reported	: Not Reported	Not Reported	le:Not Reported	tale: Not Reported	Not Reported
Altitude:	Althrop accuracy:	Hydrologic:	Topographic:	Site type:	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquitier:	Well depth:	Source of depth data:	Real time data flag:	Daily flow data end date:	Peak flow data begin date:	Peak flow data count:	Water quality data end date: Not Reported	Ground water data begin date: Not Reported	Ground water data count: Not Reported

Ground-water levels, Number of Measurements: 0

USG83135347					Not Reported PST Single well, other than collector or Rarmay type	
FED USG8	340424117112801	34.07334835 M NAD27	06 071 Not Benefied	NGVD29	Not Reported PST Single well, other than	Not Reported 9478338800 0000-00-00 0 0000-00-00 1976-06-11 2
	Sile no:	Dec lat: Coor meth: Lattong datum:	District: County:	Map scale: Alltude method: Alltude datum: 0 eq.ml.	Date construction: Mean greenwich time offset: Type of ground water site:	Hole depth: Not Report Project number: 647935950 Project number: 667935950 Deliy flow date begin dels: 0000-000 Deliy flow date count: 0 Deliy flow date on date: 0000-000 Weter quality date begin dels: 1975-08-11 Weter quality date norm: 2 Ground weter date are dels: 0000-00-00
	USGS 0015003W21H007S 340424	1171128 -117.19198321 S	NAD83 06 LIS	PEDLANDS Map so 1319.00 Alltude Map So Alltude Alltude Alltude Santa Ans. California. Area = 1680 sq. ml. Noil Reported	other than Spring	773 No. Reported O 0000-00-00 0000-00-00 011886-18-28 0000-00-00 0
AB South 1/4 - 1/2 Mile Higher	Agency cd: Site name: Lettude:	Longitude: Dec ton: Coor accr:	Dec lationg datum: State: Country	Location map: Attlude: Attlude accuracy: Hydrologic: Topographic	Site type: Date trivemorfed: Local standard time fleg: Aquifer Type:	Well depth: 723 Source of depth data: Nex Reported Reat time data ling: 0 Debt Nex dette end dess: 0000-00-00 Peek flow date routile: 0000-00-00 Peek flow date rounit Walar quality date end date: 1989-198-29 Ground waler data begin date: 0000-00-00 Ground waler data begin date: 0000-00-00

sround-water levels, Number of Measurements; 0

GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

USGS Siba noc Si	Map ID Direction Distence Elevation			Database	EDR ID Number
USGS Siba no:	9 NNW 1/4 - 1/2 Mile Lower		_ =	FED USGS	USG83136278
1171133 Dec bit	Agency cd: Site name: Lattude:	USGS 0015003W16J001S 340453	Sille no:	340453117113301	
MAD MAD MAD	Longitude:	1171133	Declat	34.0814016	
deturn: NAD83 Destrict OS County US County 1303.00 Albace and rest Individe deturn: In MAD83 Destrict County Individe deturn: In Malace quality data begin date: In Malace qual	Core some	9	Coor meth:	2	
to the Reported Albande method: 13.30.0 Albande method: 130.30.0 Albande method: 130.30.0 Albande method: 14.30.10 Albande method: 15.30.10 Albande method: 15.30.10 Albande method: 10.30.10 Alban	Dec lations detum:	NAD83	Lationg detum: District	NAD27	
the control of the co	State:	90	County	3.6	
the interval of the interval o	Country.	ns	Land net:	Not Reported	
1303.00 The state of the state	Location map:	Not Reported	Map scale:	Not Reported	
unacy: Sentia Ana. California. Avea = 1890 aq.mir. Sentia Ana. California. Avea = 1890 aq.mir. Not Reported The Control-weater other than Spring Date construction: Not Reported Not Report	Altitude:	1303.00	Altitude method:		
Serita Ana. California. Area = 1890 eq. mi. Not Reported The Reported Cherr then Spring Date construction: Tories: The Reported Cherr then Spring Date construction: The Reported Not Repo	Altitude accuracy:	-	Altitude datum:	NGVD29	
Ground-weder other than Spring Date construction: The Reported Net Re	Hydrologic: Topographic:	Sente Ana. California. Anea = 168 Not Reported	iO sq.mi,		
rord time file: Not Reported Hole depth: Not Reported Hole depth: Not Reported Day frow data begin data: Not Reported Day frow data begin data: Dot-0-0-00 Peak frow data begin data: Day from data	Site type:	Ground-water other than Soring	Date construction:	19310101	
e: Type of ground water site: Not Reported Doubly flow data begin date: It en flow: DOD-00-00 Delly flow data begin date: Res flow data date: Res flow data and date: Res flow data date: Res flow date date: Res	Date inventorled:	Not Reported	Mean preenwich time offset:	PST	
Not Reported Not Reported Not Reported Not Reported Not Reported Hole depth: 388 Not Reported Not Reported Daily flow data begin data: 10 000-00-00 Daily flow data begin data: 10 00-00-00 Daily flow data count: 10 00-00-00 Peak flow data count:	Local standard time flag:	· >	Type of ground water site:	Single well, other the	n collector or Renney
And required to the control of the c	Aquifer Type:	Not Reported			
not find the second of the sec	Well depth:	388	Hole denth:	400	
Daily flow data begin data: Daily flow data begin data: Daily flow data count: Peak flow data and date: Vester quality data begin date: Where quality data begin date: Oncurd water data and data:	Source of depth date.	Not Reported	Project number:	Not Reported	
Daily flow defia count: Peak flow data and dete: Water quality data begin dete: Whater quality data beount: Ground water data and date:	Real time data flag:	0	Delly flow data begin date:	0000-0000	
Peak flow data end dete: Water quality data bogin dele: Water quality data count: Water quality data count: Ground water deta end dete:	Daily flow data end date:		Daily flow data count.		
Water quality data begin date: Water quality data count: On Ground water data and date:	Peak flow data begin date:		Peak flow data end date:	00-00-0000	
8	Peak flow data count.	0	Water quality data begin date:		
	Water quality data end date Ground water data bacin d	x:1975-06-12 ata: 0000-00-00	Water quality data count:	1	
	Ground water data count:	0	CIOCAN WAREI URIS SILLI URIS.	MM-40-40	

Ground-water levels, Number of Measurements: 0

U8G83135272								
FED USGS	340452117111001	34.08112362 M	NAD27	06 071	Not Reported	Not Reported	NGVD29	19300101 PST
	Sile no:	Declat Coor meth:	Lettong detum:	District: County:	Land net:	Map scale: Altitude method:	Aithude datum:	B Date construction: Mean greenwich time offset:
	U8GS 001S003W16M003S 340462	1171110	80	NADE3	s	Not Reported 1335,00	Sents Ans California Ame a	All visit or marine transport of the construction: 19300101 Not Reported the Spring Date construction: 19300101 Not Reported Mean greenwich time offset: PST
10 NE 1/4 - 1/2 Mile Higher	Agency cd: Site name: Latitude:							Topographic: Site type: Date inventoried:

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Local standard time flag: Aquifer Type:	Not Reported	Type of ground water site:	Single well, other than collector or Ranney typ
Well depth: Source of depth data:	Not Reported	Hole depth: Project number:	396 Not Reported
Feet und care ingo. Day's flow data end date: 0000-00-00 Peak flow data begin diate: 0000-00-00 Peak flow data count: 0 Weter quality data word tales: 19 Weter quality data word tales: 1974-10-16 Ground weter data begin dete: 0000-00-00 Ground weter data pount: 0	000-00-00 0000-00-00 0 1974-10-16 ls: 0000-00-00	Dally flow data begin date: 0000-00-00 Dally flow data begin date: 0000-00-00 Peak flow date and delne: 0000-00-00 Weter quality date begin date: 1974-10-16 Water quality date begin date: 1974-10-16 Ground water date and date: 0000-00-00	0000-00-00 0 0 1974-10-16 1 0000-00-00
Ground-water levels, Number of Measurements: 0	r of Measurements: 0		
±3			

States: States: Location map: Altitude: Altitude: Altitude: Altitude: Croomaphic: Sile type: Doale Inventioned:
Aquifer Type: Not Reported Aquifer Type: Not Reported Aquifer Source of Searce of Sear

Ground-water levels, Number of Messurements: 0

B12 BW 1/4 - 1/2 Mile Lower

FED USGS USGS3135333

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

340422117113801			34.07279082		NAD27		120	Not Reported	24000		NGVD29			19290101	PST	Single und other then collected as December 1	Cough men, bare might consciou or rearried type		438	8478335800	00000000	200000	OU O	1986.06-13		0000-0000	
Site no:			Declat	Coor meth:	Lationa datum:	District	County	Land net	Map scale:	Altitude method:	Atttude datum:	880 sq.mi.		Date construction:	Mean greenwich time offset:	Type of ground water site.			Hole depth:	Project number:	Daily flow data begin date:	Deliv flow data count:	Pasit flow data and date:	Water ouality data begin date: 1996-06-13	Water quelity data count:	Ground water data end date:	
usas	0015003W21H001S	340422	1171138	-117.1947611	ø	NAD83	80	ns	REDLANDS	1318.00	Ψ.	Senta Ana. California. Area = 1680 sq.mi.	Not Reported	Ground-water other than Sorting Date construction:	Not Reported		Not Reported	Not Reported	426	Not Reported	0	00-00-0000	00-00-0000	•	:1986-06-13	ite: 0000-00-00	0
Agency cd:	Site name;	Latitude:	Longitude:	Dec lon:	Coor secr	Dec lationg datum.	State:	Country:	Location map:	Althres:	Althude accuracy:	Hydrologic:	Topographic	Site type:	Date Inventoried:	Local standard time flag:	Aquiller Type:	Aquiter	Well depth:	Source of depth data:	Real time data flag:	Daily flow data end date:	Peak flow data begin date:	Peak flow data count:	Water quality data end date: 1988-06-13	Ground water data begin date: 0000-00-00	Ground water data count:

Ground-water levels, Number of Measurements: 0

Peak flow data count. Not Reported Water quality data end date: Not Reported Ground water data begin date: Not Reported Ground water data count: Not Reported

Water quality data begin date: Not Reported Water quality data count: Not Reported Ground water data end date: Not Reported

19510101 PST Single well, other than collector or Ranney type USG83135352 FED USGS 340425117110202 Hole depth: 440
Project numbers: Not Reported
Daily flow data begin date. Not Reported
Daily flow data count: Not Reported
Peak flow data count: Not Reported
Water quality data bodin date: Not Reported
Water quality data bodin date: Not Reported
Grounts water quality date order. Not Reported
Grounts water date end date. Not Reported Not Reported 34.0736241 NGVD29 USGS 0015003W22F002S 340425 1171102 Ground-water levels, Number of Massurements; 0 Agency cit: USGS
Lathcher: 1015GS
Langlinde: 340425
Dae for: 3417.18178CF
Coor accr: 35
Blaise: 00
14 SE 1/4 - 1/2 Mile Higher

Ground-water levels, Number of Messurements: 0

USG83135277 FED USGS 340453117114801 34.08140161 M NADZ7 06 071 Not Reported Not Reported Dec lat: Coor melb: Latlong datum District: County: Lend net: Map scale; USGS 001S003W16K001S 340453 11771148 NAD83 08 US Agency od:
Site name:
Lattude:
Longitude:
Dec kon:
Coor acor:
Dec lelong deturn:
State:
State:
Country:
Cooration map: 15 NW 1/4 - 1/2 Mile Lower

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Atthude method:	Altitude datum: NGVD29	na ≃ 1680 sq.ml.	Sround-water other than Spring Date construction: 18360101	The offset				Hole death: 351	Protect number	action clother		Peak flow data and data . Dron.on.on	-ale	Water quality data count:	Ground water date and date: 0000-00-00	The same of the sa
1292.00	£.	Santa Ana. Castomia. Area ≈ 1680 sq.ml. Not Reported	Ground-water other than S	Not Reported	>	Not Reported	Not Reported	351	Not Reported		00-00-0000	00-00-0000	0	s:1975-08-12	ats: 0000-00-00	
Alltude:	Allflude accuracy:	nyoroogic: Topographic:	Site type:	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquifer:	Well depth:	Source of depth data:	Real time date flag:	Delly flow data end date:	Peak flow data begin date: 0000-00-00	Peak flow data count:	Water quality data end date:1975-08-12	Ground water data begin date: 0000-00-00	

Ground-water levels, Number of Messurements: 0

C16 SSW			ĺ
1/4 - 1/2 Mile Lower			7ED USGS 138618
Agency cd:	uses	Site no:	340415117113801
Site neme:	001S003W21H003S		
Latitude:	340415		
Longitude:	1171138	Declat	34.07084845
Dec lon:	-117.19476108	Coor meth;	2
Coor scor:	co	Lettong datum:	NAD27
Dec lationg datum:	NAD83	District:	90
State:	90	County:	120
Country:	SI	Landinet:	Not Recorded
Location map:	Not Reported	Map scale:	Not Reported
Afflude:	1313.00	Affitude method:	
Attitude accuracy:	•	Althude datum:	NGVD29
Hydrologic	Santa Ana. California. Area = 1680 sq.ml.	3 80.mt.	
Topographic:	Not Reported		
Site type:	Ground-water other than Spring Date construction:	Date construction:	19130101
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	· .	Type of around water site:	Single wall, other than collector or Berneau ton
Aquifer Type:	Not Reported		th form in more one bear after
Aquifer:	Not Reported		
Well depth:	237	Hole depth:	237
Source of depth data:	Not Reported	Project number:	Not Reported
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Dally flow data end date:		Daily flow data count:	Not Reported
Peak flow data begin date:		Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	
Water quality data end date: Not Reported	:Not Reported	Water quality data count:	Not Reported
Ground water data begin date: Not Reported	ste: Not Reported	Ground water data end date:	Not Reported
Ground water data count.	Not Reported		

Map ID Direction Distance Elevation			Control	9
C17 86W 1/2 - 1 Mile Lover			FED USGS	USG\$3135506
Agency od: She name: Lattude:	USGS 001S003W21H006S 340414	Silve no:	340414117113701	
Longitude:	1171137	Dec lat:	34.07056868	
Coor accr.	-117.18448328 S	Coor meth:	M NAD27	
Dec lationg datum:	NAD83	District	8 8	
State:	90	County	07.1	
Country:	S	Land net:	Not Reported	
Location map:	Not Reported	Map scale:	Not Reported	
Althude:	1319.00	Altitude method:	2	
Altitude accuracy:	10	Altitude datum:	NGVD29	
Hydrologic:	Santa Ana. California. Area = 1680 sq.ml.	0 sq.ml.		
Topographic:	Not Reported			
Site type:	Ground-water other than Spring	Date construction:	Not Reported	
Date inventoried:	Not Reported	Mean greenwich time offset:	S	
Local standard time flag:		Type of ground water site:	Sindle well, other than	Single well, other than collector or Ranney Ivne
Aquifer Type:	Not Reported			adfi former in income
Aquifer:	Not Reported			
Well depth:	412	Hole depth:	480	
Source of depth data:	Not Reported	Project number:	Not Reported	
Real time data flag:	Not Reported	Dally flow data begin date:	Not Reported	
Daily flow data and date:	Not Reported	Dally flow data count:	Not Reported	
Peak flow data begin date:	Not Reported	Peak flow data and date:	Not Reported	
Peak flow deta count:	Not Reported	Water quality data begin date:		
Water quality date end date: Not Reported	:Not Reported	Water quality data count:		
Ground water data begin date: Not Reported	ate: Not Reported	Ground water data end date:	Not Reported	
Ground water data count: Not Reported	Not Reported			

Ground water data count: Not Reported Ground-water levels, Number of Messurements: 0

9				
SSW 1/2 - 1 Mile Lower			FED USGS	USG83135507
	USGS	Ste no:	340414117113702	
	0015003W21H006S			
	340414			
		Decist:	34,07056868	
		Coor meth:	2	
		Lattona datum:	NAD27	
Dec lationg datum:	NAD83	District	99	
		County	0.24	
		Land net:	Not Recorted	
Location map:		Man scale:	24000	
Altifude:	1320.00	Atthide method:	2	
Althude accuracy:		Attitude datum:	NGVD29	
Hydrologic:	ffornia, Area = 10	80 sq.ml.		
Topographic:	Not Reported			
Site type:	Ground-water other than Soring Date construction:	Date construction:	18580101	
Date inventoried:	Not Reported	Mean creamwith time offset	-	

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Type of ground water site: Single well, other than collector or Ranney type	600	ite: 0000-00-00): 0000-00-00 	t 2 date: 0000-00-00
Type of ground water si	Hole depth: Project number:	Daily flow data begin date: Daily flow data count:	Peak flow date and date: 0000-00-00 Without mailty data hands date: 1074-10.04	Water quality data count: Ground water data end date:
Y Not Reported Not Reported	500 Not Reported	0000-0000	00-00-0000	1:1886-06-13 ats: 0000-00-00
Local standard time flag: Aquifer Type: Aquifer:	Well depth: Source of depth data:	Real time data flag: Daily flow data end date:	Peak flow data begin date: 0000-00-00 Peak flow data count: 0	Water quality data end date:1989-06-13 Ground water data begin date: 0000-00-00 Ground water data count

Ground-water levels, Number of Measurements: 0

USGS3135219													ollector or Ranney type	26.6										
FED USGS U	340455117115701	34.08195715 M	NAD27	98	Not Recorded	Not Reported		NGVD29			19290101	PST	Single well, other than collector or Ranney type			430	Not Reported	Not Reported	Not Reported	Not Reported			Not Reported	
	Sitte no:	Declar Coor meth:	Lettong detum:	District:	Land net:	Map scale:	Althude method:	Altitude datum:	0 eq.mi.		Date construction:	Mean greenwich time offset:	Type of ground water site:			Hote depth:	Project number:	Daily flow data begin date:	Delly flow data count:	Peak flow data end date:	Water quality data begin date:	Weter quality data count:	Ground water date end date:	
	USGS 001S003W16L002S 340455	1171157	8	NAD83	sn	Not Reported	1268.00	•	alfornia. Area = 168	Not Reported	other than Spring	Not Reported	-	Not Reported	Not Reported	430	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	te: Not Reported	New Aspertage
19 WAW 1/2 - 1 Mile Lower	Agency cd: Site name: Latitude:	Longitude: Dec lon:	Coar secr.	State:	Country	Location map:	Altitude:	Altitude accuracy:	Hydrologic:	Topographic	Sile type:	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquiller:	Well depth:	Source of depth data:	Reaf time data flag:	Daily flow date and date:	Peak flow data begin date:	Peak flow data count:	Water quality data end date: Not Reported	Ground water data begin date: Not Reported	COULD WELL LOSS COUR.

Ground-water levels, Number of Measurements: 0

20 6W 1/2 - 1 Mile Lower

FED USGS USGS3135519

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340415117115301	34.07084646 M NAD77	006 071 Not Recorted	Not Reported M NGVD29	19270101 offset: PST single well, other than collector or Ranney type	274 Not Reported Not Reported Not Reported Not Reported Not Reported In date Not Reported In date Not Reported After Not Reported After Not Reported After Not Reported After Not Reported
Site no:	Dec lat. Coor meth: Lattopo datum:	District: County: Land net:	Map scale: Attitude method: Attitude datum: 1680 sq.ml.	g Dete construction: Mean greenwich time offsot; Type of ground water site;	Hote depth: Project number: Daily flow date begin date: Daily flow date count: Pask flow date ocunt: Water quality date begin date: Water quality date out date: Ground water date date and date:
USGS 0015003W21G0018	340415 1171153 -117.19892793 S	NAD83 06 US	Not Reported Map sos 1282.00 Attitude Not Reported Attitude Santa Ana. Celifornia. Area = 1680 eq.ml. Not Reported	Ground-weter other than Spring Dete construction: Not Reported Y Type of ground we Not Reported	Not Reported Not Reported Not Reported Not Reported Not Reported Not Reported Not Reported ste: Not Reported
Agency od: Sile name:	Longitude: Dec lon: Coor accr:	Dec tellong deturn: State: Country:	Location map. Altitude: Altitude accuracy: Hydrologic: Topographic:	Site type: Date inventoried: Local standard time flag: Aquifer Type: Aquifer:	Whet depth date: Not Reported Source of depth date: Not Reported These time date lang; Not Reported Day from date and date: Not Reported Peak frow date and date: Not Reported Peak frow date count: Not Reported Water qualify date and Cataly Vot Reported Orbund water date beam date: Not Reported

Ground-water levels, Number of Measurements: 0

20 10						
CAWELLS	TAN San Beemardino WELL/AMBNT Inactive Raw 1,000 Feet (10 Seconds)	18447	6.400 PCM.	1.000 PC/IL	8.500 PC/L	.300 PCIAL
	User ID: County: Stefan Type: Well Status: Precision: ACTIVE	Connections:	el Are Listed Findings:	Findings: OR	Findings:	Findings: OR
	n: 01869	REDLANDS, CA 92373 69300 REDLANDS	Sample Information: * Only Findings Above Detection Lavel Are Listed Sample Collected: 06/19/1986 Chemical: GROSS ALPHA	06/19/1986 GROSS ALPHA COUNTING ERROR	09/05/1986 GROSS ALPHA	09/05/1986 GROSS ALPHA COUNTING ERROR
21 NNE 1/2 - 1 Milo Lower	Water System Information: Prince Station Code: 015/03/W-15F FRDS Number: 3810037029 District Number: 1310037029 District Number: 1310037029 Source LeftLong: 9405110 117 Source Name: 9610037 System Number: 8610037 System Number: REDIANDS C	Pop Served: Area Served:	Sample Information: * O Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chomical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

7.180	87.289 MG/L	73.599 MG/L	153.800 MG/L	: .220	068' -	11.000	16.700 C	280.000 UMHO	8.040	8.040	93.300 MG/L	113.800 MG/L	105,600 MG/L	32.200 MGA.	6.100 MG/L	11.700 MG/L	2.200 MGA.	10.800 MG/L	.800 MG/L	5.800 PCM.	1.200 PCM.	183.900 MGAL	.290	480
Findings:	Findings: 3)	Findings: 3)	Findings:	Findings:	Findings: ETEMP.	Findings: IVITY)	Findings:	Findings:	Findings:	Findings:	Findings: 3)	Findings:	Findinge: 3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: EPENDENT)	Findings:	Findings: ROR	Findings:	Findings	Findings: ETEMP.
10/31/1888	10/31/1988	10/31/1986	10/31/1986	10/31/1986	10/31/1988	10/31/1986	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987	07/24/1987
PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	TOTAL HARDNESS (AS CACO3)	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 80 C	LANGELIER INDEX @ SOURCE TEMP.	AGGRSSIVE INDEX (COPROSIVITY)	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.
Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collacted:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

3.700 MGA.	11,500	17.200 C	7.460	.400 MG/L	.100 UG/L	6.200 PCM	1.400 PCIL	F 13.800 UGAL	340	- 1.090	2.300 MG/L	10,900	5.400 PCM.	1.000 PC/A	1.000 PC/L	4.400 PC/IL	.800 PCIA.	.200 PCM.	8.700 PC/A	.600 PC/L	18,300 C	280.000 UMHO	7.920	7.820
07/24/1987 Findings: NITRATE (AS NO3)	07/24/1987 AGGRSSIVE INDEX (CORROSIVITY)	08/17/1988 Findings: SOURCE TEMPERATURE C	06/17/1988 Findings:	08/17/1988 FLUORIDE (TEMPERATURE DEPENDENT)	08/17/1988 Findings: BORON	06/17/1988 Findings: GROSS ALPHA	06/17/1988 Findings: GROSS ALPHA COUNTING ERROR	06/77/1988 Findings: CHLOROFORM (THM)	06/17/1988 Findings: LANGELIER INDEX @ 60 C	06/17/1988 Findings: LANGELIER INDEX @ SOURCE TEMP.	06/17/1988 Findings: NITRATE (AS NO3)	06/17/1988 Findings: AGGRSSIVE INDEX (CORROSIVITY)	10/04/1988 Findings: GROSS ALPHA	10/04/1988 GROSS ALPHA COUNTING ERROR	11/01/1988 Findings: RADIUM 225 COUNTING ERROR	01/12/1989 GROSS ALPHA	01/12/1889 GROSS ALPHA COUNTING ERROR	01/13/1989 GROSS ALPHA COUNTING ERROR	04/11/1989 GROSS ALPHA	04/11/1989 GROSS ALPHA COUNTING ERROR	05/28/1989 SOURCE TEMPERATURE C	05/28/1989 Findings: SPECIFIC CONDUCTANCE	05/28/1989 Findings:	05/28/1989 Findings: PH (LABORATORY)
Sample Collected: Chemicat:	Sample Collected: Chemicat:	Sample Collected: Chemicat:	Semple Collected: Chemicat:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Sample Calected: Chemical:	05/26/1889 TOTAL ALKALINITY (AS CACO3)	Findings:	87.400 MG/L
Sample Collected: Chemical;	05/26/1989 BICARBONATE ALKALINITY	Findings:	106.600 MG/L
Sample Collected: Chemical:	05/26/1989 TOTAL HARDNESS (AS CACOS)	Findings:	108.000 MG/L
Sample Collected: Chemical:	05/26/1989 CALCRUM	Findings:	3.200 MG/L
Sample Collected: Chemical:	05/26/1989 MAGNESIUM	Findings:	6.100 MG/L
Sample Collected: Chemical:	05/26/1989 SODIUM	Findings:	12.900 MG/L
Sample Collected: Chemical:	05/26/1989 POTASSIUM	Findings:	2,000 MG/L
Sample Collected: Chemical:	05/26/1989 CHLORIDE	Findings:	16.600 MG/L
Sample Collected: Chemical:	06/28/1989 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: SENT)	400 MG/L
Sample Collected: Chemical:	05/26/1989 BORON	Findings:	.030 UGAL
Sample Collected: Chemical:	05/26/1989 GROSS ALPHA	Findings:	8.600 PCM.
Sample Collected: Chemical:	06/28/1989 GROSS ALPHA COUNTING ERROR	Findings:	.700 PCIAL
Sample Collected: Chemical:	05/26/1989 TOTAL DISSOLVED SOLIDS	Findings:	171.000 MG/L
Sample Collected: Chemical:	05/28/1989 LANGELIER INDEX @ 60 C	Findings:	.570
Sample Collected: Chemical:	05/26/1989 LANGELIER INDEX @ SOURCE TEMP.	Findings: P.	150
Sample Collected: Chemical:	05/28/1989 NITRATE (AS NO3)	Findings:	5.800 MG/L
Sample Collected: Chemical:	05/26/1989 AGGRSSIVE INDEX (CORROSIVITY)	Findings:	11.800
Sample Collected: Chemical:	06/09/1989 RADIUM 226 COUNTING ERROR	Findings:	1.000 PCM.
Sample Collected: Chemical:	08/11/1989 RADIUM 226 COUNTING ERROR	Findings:	1.000 PCM.
Sample Collected: Chemical:	1003/1989 GROSS ALPHA	Findings:	7.300 PCM.
Sample Collected: Chemicat	10/03/1989 GROSS ALPHA COUNTING ERROR	Findings:	2.100 PC/L
Sample Collected: Chemicat:	01/02/1990 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.080 UG/L
Semple Collected: Chemical:	01/02/1980 TRICHLOROETHYLENE	Findings;	.700 UG/L
Sample Callected: Chemical:	01/04/1990 GROSS ALPHA	Findings:	7.500 PCM.
Sample Collected: Chemical:	01/04/1990 GROSS ALPHA COUNTING ERROR	Findings:	1.800 PCM.

8.200 PC/L	1.700 PCIAL	1000.000 PC/IL	.DBO PCM.	.030 PCVL	1.000 PCIA.	6.000 PC/A	17.200 C	270.000 UMHO	8.190	8.190	93.800 MG/L	114.200 MG/L	100.000 MG/L	34.400 MG/L	3.400 MG/L	12.700 MG/L	1.900 MG/L	12.800 MG/L	.300 MG/L	.230 UG/L	3.500 PCM.	.800 PC/IL	.040 UGA	167.400 MS/L
Findings:	Findings:	Findings:	Findings:	Findings: OR	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Fladings:	Findings:	Findings: CP)	Findings:
01/04/1990	01/04/1990	01/04/1890	01/04/1880	01/04/1990	01/04/1990	01/04/1980	04/13/1990	04/13/1980	04/13/1990	D4/13/1980	D4/13/1990	04/13/1990	04/13/1990	04/13/1990	04/13/1890	04/13/1990	04/13/1990	04/13/1990	04/13/1990	04/13/1990	04/13/1980	04/13/1980	04/13/1990	04/13/1980
GROSS BETA	GROSS BETA COUNTING ERROR	TRITIUM COUNTING ERROR	RA 226 + RA 228	RA 228 + RA 228 COUNTING ERROR	STRONTIUM-80 COUNTING ERROR	URANIUM	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	BORON	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	TOTAL DISSOLVED SOLIDS
Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collacted:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat	Chemicat.	Chemical:	Chemical:	Chemical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Semple Collected: Chemical:	04/13/1890 LANGELIER INDEX @ 60 C	Findings:	.880
Sample Collected: Chemical:	04/13/1990 LANGELIER INDEX @ SOURCE TEMP.	Findings: IP.	.140
Sample Collected Chemical	04/13/1990 NITRATE (AS NO3)	Findings:	3.BO0 MG/L
Semple Collected: Chemical:	04/13/1980 AGGRSSIVE INDEX (CORROSIVITY)	Findings;	12.100
Sample Collected: Chemical:	07/05/1880 GROSS ALPHA	Findings:	5.700 PCIAL
Sample Collected: Chemical:	07/05/1890 GROSS ALPHA COUNTING ERROR	Findings:	1.300 PC/AL
Semple Collected: Chemicat:	10/26/1890 GROSS ALPHA	Findings:	3.000 PCIA
Sample Collected: Chemicat:	10/25/1990 GROSS ALPHA COUNTING ERROR	Findings:	1.000 PCIA.
Sample Collected: Chemicat:	01/08/1991 SOURCE TEMPERATURE C	Findings:	18.300 C
Semple Collected: Chemical:	01/08/1891 SPECIFIC CONDUCTANCE	Findings:	280.000 UMHO
Sample Collected: Chemical:	01/08/1991 FIELD PH	Findings:	7.800
Sample Collected: Chemical:	01/08/1991 PH (LABORATORY)	Findings:	7.800
Sample Collected: Chemical:	01/08/1891 TOTAL ALKALINITY (AS CACO3)	Findings:	82.000 MG/L
Sample Collected: Chemical:	01/08/1891 BICARBONATE ALKALINITY	Findings:	112.200 MG/L
Sample Coffected: Chemical;	01/08/1991 TOTAL HARDNESS (AS CACO3)	Findings:	112,000 MG/L
Sample Collected: Chemical:	01/08/1991 CALCIUM	Findings:	38.000 MG/L
Sample Collected: Chemical;	01/08/1991 MAGNESIUM	Findings:	5,400 MG/L
Sample Collected: Chemical:	91/08/1991 SODIUM	Findings:	11.800 MG/L
Sample Collected: Chemical:	01/08/1991 POTASSIUM	Findings:	2.200 MG/L
Sample Collected: Chemical:	01/08/1991 CHLORIDE	Findings:	19.600 MG/L
Sample Collected: Chemical:	01/08/1991 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: DENT)	.400 MG/L.
Semple Collected: Chemical:	01/08/1981 GROSS ALPHA	Findings:	6,200 PCIA
Sample Collected: Chemical:	01/08/1991 GROSS ALPHA COUNTING ERROR	Findings:	2.100 PCM.
Sample Collected: Chemical:	01/08/1981 GROSS BETA	Findings:	14.700 PCML
Semple Collected: Chemical:	01/08/1991 GROSS BETA COUNTING ERROR	Findings:	5.400 PCI/L

400.000 PCI/L	.100 PC/L	1.000 PC/L	14,000 PCI/I,	168.200 MG/L	2009	240	3.500 MG/L	11.700	8.500 PCM	1.700 PCIA.	6.400 PCM.	1.700 PCM	.030 UG/L	7.300 PC/A	2,000 PCM.	18.330 C	290.000 UMHO	7.700	7.700	BR.000 MG/L	107.400 MG/L	112,000 MG/L	34.400 MG/L	8:300 MG/L
01/08/1991	01/08/1991	01/08/1991	01/08/1991	01/08/1991	01/08/1991	01/08/1991	01/08/1991	01/08/1991	04/02/1991	04/02/1991	07/23/1991	07/23/1891	07/23/1991	10/08/1991	10/08/1991	01/28/1992	01/28/1992	01/28/1992 Findings:	01/28/1992	01/28/1982	01/28/1992	01/28/1992 Findings:	01/28/1992 Findings:	01/28/1992 Findings:
TRITIUM COUNTING ERROR	RA 226 + RA 228 COUNTING ERROR	STRONTIUM-90 COUNTING EPROR	URANIUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NTRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BXCARBONATE ALKALINITY	TOTAL MARDNESS (AS CACO3)	CALCIUM	MAGNESIUM
Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemicat	Chemicat	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

12.100 MG/L	1.400 MG/L	18.000 MG/L	.300 MG/L	10.900 PC//L	2.300 PCIA	10.700 PCI/L	1.400 PCI/L	8.000 PCI/L	135.400 MG/L	390	2.600 MG/L	200 NTU	11.580	7.000 PCM.	1,700 PCIA	9.300 PCM	2.000 PCIA.	12.600 PC/L	2800 PCM.	16.110 C	280.000 UMHO	7.800	7.800	92.000 MG/L
Findings:	Findings:	Findings:	Findings: DENT)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/28/1992	04/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1992	01/28/1882	01/28/1982	01/28/1992	04/07/1982	04/07/1992	07/07/1982	07/07/1992	10/29/1982	10/28/1982	01/12/1983	01/12/1993	01/12/1983	01/12/1993	01/12/1983
SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA	GROSS BETA COUNTING ERROR	URANIUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACOS)
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemioal:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

112.200 MG/L	112.000 MG/L	34.800 MG/L	6.100 MG/L	13.800 MG/L	1.800 MG/L	21.000 MG/L	A00 MG/L	5.300 PC/L	1.500 PCM.	1,000 PCM.	8.000 PC/L	148.700 MG/L	.510	280	6.200 MG/L	11.700	383.000 PCML	.100 PCIA.	1.000 PCIA.	10.400 PCM.	2.200 PCM.	4.600 PCM.	1200 PCM.	18.900 C
Findings:	Hindings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: (DENT)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	Findings:	Findings:	Findings:	Findings: R	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/12/1983	01/12/1983	01/12/1983	01/12/1903	01/12/1993	01/12/1993	01/12/1993	01/12/1993	01/12/1983	01/12/1983	01/12/1993	01/12/1993	01/1/2/1993	01/1/2/1993	01/12/1983	01/12/1993	01/12/1993	01/12/1993	01/12/1893	01/12/1993	04/27/1993	04/27/1983	10/15/1993	10/15/1983	01/19/1984
	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	TOTAL DISSOLVED SOUDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	TRITIUM COUNTING ERROR	RA 226 + RA 228 COUNTING ERROR	STRONTIUM-90 COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	SOURCE TEMPERATURE C
Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
	Chemical	Chemical:	Chemicat	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

280.000 UMHO	7.800	7.800	: 88.800 MG/L	108.300 MG/L	108.800 MG/L	35,200 MG/L	5.100 MG/L	14.300 MG/L	1.500 MG/L	23.400 MG/L	.400 MG/L	87.000 UGAL	4.100 PCM.	1.100 PCAL	BOO PCIAL	6.000 PCM.	152.000 MG/L	.490	240	5,200 MG/L	11,690	1174.000 UGAL	4.900 PCIAL	1.500 PCIAL
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Pandings:	Findings:	Findings:	Findings: XENT)	Findings:	Pindings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Prodings	Findings	Findings:
01/19/1994	01/19/1994	01/19/1994	01/19/1994	01/19/1984	01/19/1984	01/19/1964	01/19/1984	01/19/1994	01/19/1994	01/19/1894	01/19/1994	O1/19/1964	01/19/1994	01/19/1994	01/19/1994	01/18/1984	01/19/1994	01/19/1994	01/19/1994 FI	01/18/1884	01/19/1994	01/19/1894	04/08/1894	04/08/1894
SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACOS)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	ALUMINUM	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Coffected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected;	Sampla Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:
Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

4.000 MG/L	5.100 MG/L	5.400 PCM.	1.800 PCM.	6.000 MG/L	7.200 PCIAL	1.800 PCIAL	16.700 C	310.000 UMHO	7.600	7.800	102.000 MG/L	124.400 MG/L	148.000 MG/L	40.800 MG/L	6.800 MG/L	15.300 MG/L	2.000 MG/L	25.600 MG/L	.300 MG/L	74.000 UG/L	5.500 UGA.	8.800 PCM	2.000 PC/L	1200 PCIA.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: DENT)	Findings:	Findings:	Findings:	Findings.	Findings:
08/24/1994	07/05/1994	07/07/1/994	07/07/1/994	08/02/1994	10/18/1994	10/18/1994	01/26/1996	01/26/1995	01/26/1995	01/28/1985	01/26/1996	01/28/1995	01/26/1995	01/26/1995	01/26/1995	01/28/1996	01/26/1896	01/26/1996	01/26/1995	01/28/1995	01/28/1995	01/26/1995	01/28/1995	01/28/1885
NITRATE (AS NO3)	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUCRIDE (TEMPERATURE DEPENDENT)	COPPER	LEAD	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical;	Chemical;	Chemical:	Chemicat	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

11.000 PCM	175.000 MG/L	7.800	180	4.300 MG/L	UTN 001.	11.820	971.000 UG/L	462.000 PCI/L	127.000 PCI/L	.200 PCIA.	.100 PCIAL	200 PCIA	4.600 MG/L	5.200 MG/L	13.700 PCIA.	2.500 PCM.	5.300 MG/L	4.900 MG/L	15.900 PCM.	2.700 PCM	4.700 MGA.	1020.000 UG/L	6.500 PCM	1.800 PCM.
Findings:	Findings:	Findings:	Findings: EMP.	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: OR	Findings: R	Findings:	Findings:	Findings:	Findings: R	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/26/1995	01/26/1985	01/28/1995	01/26/1995	01/26/1896	01/28/1996	01/28/1985	01/28/1995	01/26/1895	01/28/1995	01/26/1995	01/26/1995	01/26/1986	02/17/1995	03/07/1895	08/01/1995	06/01/1995	06/01/1995	07/05/1995	07/17/1995	07/17/1885	07/17/1985	08/01/1995	1024/1996	1024/1985
URANIUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 80 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NOS)	TURBIOITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	TRITIUM	TRITIUM COUNTING ERROR	RA 226 + RA 228	RA 228 + RA 228 COUNTING ERROR	STRONTIUM-90 COUNTING ERROR	NITRATE (AS NO3)	NJTRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE (AS NO3)	NITRATE (AS NOS)	GROSS ALPHA	GROSS ALPHA COUNTING FRROR	NITRATE (AS NO3)	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected;	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffscled:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Coffected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

7.800 PCIAL	2.000 PCM.	8.800 PCM.	1.900 PCI/L	9.800 PCI/L	1.800 PCI/L	18.700 C	335.000 UMHO	7.300	7.710	87.600 MG/L	119.000 MG/L	132.000 MG/L	41.200 MGAL	6.700 MG/L	12.800 MG/L	2.400 MG/L	24.500 MG/L	.480 MGA.	8.400 PCM.	1.700 PCM.	1.000 PCM.	8.000 PCM.	174.000 MG/L	080
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: DENT)	Findings:	Findings:	Findings:	Findings.	Findings:	Findings:
05/28/1996	06/28/1996	08/12/1998	08/12/1996	10/09/1996	10/09/1996	01/2/1997	01/22/1997	01/22/1997	01/22/1897	01/22/1887	01/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1897	01/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1997
GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 80 C
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

4.100 MG/L	.200 NTU	5.000 PCI/L	1080,000 PCI/L	11.300	928.000 UG/L	343.000 PCI/L	80.000 PC//L	.290 PCJ/L	1.000 PC/A.	3.370 PCM.	1,440 PCIA	15.000 PCI/L	3.000 PCM.	11.800 PCM.	2.400 PC/IL	11.980 PCIA.	1.470 PCM.	8.600 PC//L	2.100 PCM.	8.200 PCM	1.400 PCM.	15,500 PC/L	2.800 PCM.	15.100 PCI/L
Findings:	Findings:	Findings: ROR	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/22/1997	01/22/1897	61/22/1997	01/22/1997	01/22/1997	01/22/1997	01/22/1987	01/22/1997	01/22/1997	01/22/1997	01/22/1987	01/22/1997	04/16/1997	04/16/1997	05/29/1997	05/28/1997	06/28/1997	05/29/1997	07/08/1997	07/08/1997	07/08/1997	07/08/1997	10/01/1987	10/01/1987	10/01/1987
NITRATE (AS NO3)	TURBIDITY (LAB)	TOTAL RADON 222 COUNTING ERROR	TOTAL RADON 222	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	TRITIUM	TRITHUM COUNTING ERROR	RADIUM 226 COUNTING ERROR	RADIUM 228 COUNTING ERROR	STRONTIUM-90	STRONTIUM 80 COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	URANIUM	URANIUM COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	URANIUM	URANIUM COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	URANIUM
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemioal:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

3.300 PCIA	: 17,200 C	SODLOON LIMHO	7.200	7.480	108.000 MG/L	132,000 MG/L	142.000 MG/L	40.800 MG/L	B.800 MG/L	8.800 MG/L	2.300 MG/L	17.200 MG/L	.348 MG/L	172.000 MG/L	030	-,740	6.480 MG/L	JTN 001.	11.240	1460.000 UGAL	
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: PENDENT)	Findings:	Findings:	Findings: TEMP.	Findings:	Findings	Findings:	Findings:	
10/01/1997	02/03/1998	02/03/1998	O2/03/1898	02/03/1998	02/03/1998	02/03/1998	02/03/1988	02/03/1998	OZYOZY1998	02/03/1988	02/03/1988	02/03/1988	0203/1998	02/03/1998	02/03/1998	02/03/1998	02/03/1998	02/03/1988	02/03/1998	02/03/1898	
URANIUM COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESKUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	
Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	
Chemical:	Chemicat	Chemicat.	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	

22 North 1/2 - 1 Mile Lower

FED USGS USGS3135160

USGS3135262					Not Reported PST Single well, other than collector or Ranney type	
FED USGS	340454117120902	34.08167939 M	NAD27 08 071	Not Reported Not Reported Not Reported Not Reported	Not Reported PST Single well, other tha	Not Reported Not Reported 0000-00-00 0 0000-00-00
	Sittle no:	Declat Coor meth:	Lettong datum: District: County:	Lenzu res. Map scele: Alfitude method: 30 sq.ml.	Date construction: Mean greenwich time offset: Type of ground water site:	Hote depth: Project number: Daily flow data begin date: Daily flow data count: Peak flow data end date:
	USGS 001S003W18L004S 340464	1171208	NAD83 06 US	Not Reported Map son Not Reported Allitude Allitude Serita Ana. California. Area = 1680 sq.ml. Not Reported	Ground-water other than Spring Date construction: Not Reported Y Type of ground wa Not Reported	Not Reported Not Reported 0 0000-00-00 0000-00-00
23 WAYW 1/2 -1 Mile Lower	Agency cd: Sile name: Lettude:	Longflude: Dec lon:	Coor scor: Dec lettong datum: State: Country	Location map: Atiliude Atiliude accuracy: Hydrotogic: Topographic:	Site type: Date inventoried: Local standard time flag: Aquifer Type:	Well depth: Source of depth data: Reat time data flag: Dally flow data end date: Peak flow data begin date:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

0	Jate: 1974-10-01	n date: 0000-00-00	4
Peak flow data count:	Water quality data end date:1974-10-01	Ground water data begin date: 0000-00-00	Ownered sentence date annual

Ground-water leveis, Number of Measurements: 0 4			FED USGS 0438117121301 07787959 (DZ7 1	UBG\$3136414
Mile nnoy cd: flude: gilude: for acor: or acor:		th: Safum: Sec.	117121301 17721301 77659 orled	16063136414
datum		th: Safum: Si: Be:	340438117121301 34.07887869 M NAD27 071 Not Reported	
n: cor: long datum:		fit: Setum: Sec	34.07887969 M NAD27 OG 071 Not Reported	
ocr. Ilong datum:		ini: iei: iei:	MAD27 NAD27 06 071 Nat Reported Nat Reported	
llong datum:			NALLZY 06 071 Not Reported Not Reported	
		County: Land net: Map scale:	071 Not Reported Not Reported	
State: 06		Land net: Map scale:	Not Reported Not Reported	
Country: US	•	Map scale:	Not Reported	
map:	•			
Altlude: 1249.00	•	Affiliade method:	2	
unecy:		Altitude datum:	NGVD29	
	mia. Area = 1680	Seq.mi.		
냋				
	-	Date construction:	Not Reported	
Date inventoried: Not Reported	-	Mean greenwich time offset:	PST	
time flag:	-	Type of ground water afte:	Single well, other then collector or Ranney type	collector or Ranney type
Aquifer Type: Not Reported Acuifer:				
:5	^	Hole depth:	167	
Source of depth date: Not Reported		Project number:	Not Reported	
Real time data flag: Not Reported		Dally flow data begin date:	Not Reported	
date:	_	Daily flow data count:	Not Reported	
Peak flow data begin date: Not Reported		Peak flow data end date:	Not Reported	
	_	Water quality data begin date:	Not Reported	
Water quality data and date; Not Reported	-	Water quality data count:	Not Reported	
Ground water data begin date: Not Reported	_	Ground water data end date:	Not Reported	
Ground water data count: Not Reported				

FED USGS USGS313513M	340509117105101	34.085845865 M M M MAD27 NAD27 06 071 340040	2000
	Site no:	Dec bit: Coor meth: Lating deturn: District: County: Land ret: Man cools:	man deaner
	USGS 0015003W15G001S 340509	117.18170517 S 1-17.18170517 S NAD83 06 US HFID ANDS	
D26 NE 1/2 - 1 Mile Lower	Agency cd: Site neme: Latitude:	Longitude: Dec lon: Coor accr: Dec lettong datum: State: Country:	-

GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Attitude: Attitude accuracy: Hydrologic: Topographic:	1300.00 Aktude I 10 Aktude 6 Senta Ana. California. Area = 1680 sq.mi. Stream channel	Aktude method: Aktude datum: Bo sq.mi.	M NGVD29	Sample Info Sample C Chemicat
Site type: Date inventoried: Lorst standard time flact	Ground-water other than Spring Date construction: Not Reported Mean greenwich tit	ne offset:	19660101 PST	Semple C Chemicat
Aquifer Type: Aquifer:	Not Reported Not Reported	The ci ground ward site.	Single well, brital than collector of Nathrey type	Sample C Chemical:
Weil depth: Source of depth deta: Real time data flac.	354 Not Reported	Hole depth: Project number:	354 Not Reported	Sample C Chemical:
Daily flow data end date: 0000-00-00 Peak flow data begin dete: 0000-00-00	00-00-0000	Daily flow data begin date: Daily flow data count: Peak flow data end date:	00-00-0000	Sample C Chemical:
Peak flow data count: 0 Water quality data end date:1988-05-06 Ground water data havin data: 0000-000	0 e:1988-05-08 ets: 0000-00-00	Water quality data begin date: 1976-08-24 Water quality data count: 3	1976-08-24	Sample C Chemical:
Ground water data count: 0	0	COCCINE WANTE ORIN OF LAKE.	00-00-000	Semple C Chemical:

Ground-water levels, Number of Measurements: 0

CA WELLS 816	38C San Beannardeo WELLAMENTAMUNITANC Active Raw 100 Feet (one Second)	+
	User ID: County: Station Type: Well Status: Prediston: ET RANGE	Connections:
	10.00	Not Reported
D26 NE 1/2 - 1 Mile Lower	Weter System Information: Prints Stafen Code: 105/334-16 FROS Number: 0500579070 Deletch Number: 88 Weter Type: Wedformort Source Lelft Ong: 940510.01 System Number: REILL AND System Number: REILLANDS Organization That Operate System:	Pup Served: Area Served:

TAN San Beenrachto WELLJAMBNTMLNINTAKE/SUPPLY Agriculturalintgation Well Undefined CA WELLS 819 User ID: County: Station Type: Well Status: Precision: Well-Groundwater W. Sackoo, 1117 1000. Pr. Well-Jao. Additional Mell-Jao. Additional Add Pop Served: Area Served:

TC1432255.2s Page A-39

18447

Connections:

600.000 UMHO	7.490	168.000 MG/L	228.000 MG/L	75.899 MG/L	11.000 MG/L	22.080 MG/L	2.800 MG/L	13.000 MG/L	.780 MG/L.	48.000 MG/L	.750 MG/L	45.000 MG/L	58.000 UG/L	1.080 UG/L	.780 UGAL	.480 UG/L	3.500 UGA.	8.900 UGAL	8.100 PCM	.800 PCM	540.000 UMHO	7.440	168.600 MG/L
on Level Are Listed Findings:	Findings:	Findings:	Findings: ACO3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: RE DEPENDENT)	Findings:	Findings: RE DEPENDENT)	Findings:	Findings:	Findings: ANE (DBCP)	Findings: ANE (DBCP)	Findings: ANE (DBCP)	Findings:	Findings:	Findings:	Findings: G ERROR	Findings:	Findings:	Findings: ACO3)
* Only Findings Above Detection Level Are Lintod 65/17/1964 SPECIFIC CONDUCTANCE	05/17/1984 PH (LABORATORY)	05/17/1984 TOTAL ALKALINITY (AS CACO3)	05/17/1984 TOTAL HARDNESS (AS CACO3)	05/17/1984 CALCIUM	05/17/1984 MAGNESIUM	05/17/1984 SODIUM	05/17/1984 POTASSIUM	05/17/1984 CHLORIDE	05/17/1884 FLUORIDE (TEMPERATURE DEPENDENT)	05/17/1984 NITRATE (AS NO3)	10/11/1984 Findin FLUORIDE (TEMPERATURE DEPENDENT)	10/11/1984 NITRATE (AS NO3)	03/07/1986 TRICHLOROETHYLENE	03/07/1886 DIBROMOCHLOROPROPANE (DBCP)	04/24/1986 DIBROMOCHLOROPROPANE (DBCP)	06/13/1986 DIBROMOCHLOROPROPANE (DBCP)	08/28/1988 1,1-DICHLOROETHYLENE	08/26/1886 TRICHLOROETHYLENE	09/23/1986 GROSS ALPHA	09/23/1986 GROSS ALPHA COUNTING ERROR	10/31/1886 SPECIFIC CONDUCTANCE	10/31/1986 PH (LABORATORY)	10/31/1986 TOTAL ALKALINITY (AS CACO3)
Sample Information: * Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Callected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

205.600 MG/L	237.600 MG/L	86.980 MG/L	4.960 MG/L	16.200 MG/L	2.100 MG/L	17.788 MG/L	.900 MG/L	319.790 MG/L	38.789 MG/L	.450 UG/L	12.700 UG/L	7.440	168.600 MG/L.	185.800 MG/L	319.790 MG/L	.300	390	11.900	9.400 PCM.	2.200 PCIA,	1.500 UG/L	.700 UG/L	28.000 UGAL	42.599 UGAL
10/31/1988 BICARBONATE ALKALINITY	10/31/1988 Findings: TOTAL HARDNESS (AS CACO3)	10/31/1988 Findings: CALCIUM	10/31/1986 Findings: MAGNESIUM	10/31/1988 Findings: SODIUM	10/31/1986 Findings: POTASSIUM	10/31/1986 Findings: CHLORIDE	10/31/1986 Findings: FLUORIDE (TEMPERATURE DEPENDENT)	10/31/1886 Findings: TOTAL DISSOLVED SOLIDS	10/31/1986 Findings: NTRATE (AS NO3)	10/31/1986 Findings: DIBROMOCHLOROPROPANE (DBCP)	10/31/1986 TRICHLOROETHYLENE	10/31/1966 Findings: PH (LABORATORY)	10/31/1988 Findings: TOTAL ALKALINITY (AS CACO3)	10/31/1986 TOTAL HARDNESS (AS CACO3)	10/31/1986 Findings: TOTAL DISSOLVED SOLIDS	10/31/1986 Findings: LANGELIER INDEX @ 60 C	10/31/1986 Findings: LANGELIER INDEX @ SOURCE TEMP.	10/31/1986 Findings: AGGRSSIVE INDEX (CORROSIVITY)	10/31/1988 Findings: GROSS ALPHA	10/31/1988 GROSS ALPHA COUNTING ERROR	01/23/1987 1,1-DICHLOROETHYLENE	01/23/1987 DIBROMOCHLOROPROPANE (DBCP)	01/23/1987 Findings: TRICHLOROETHYLENE	04/24/1987 Findings: TRICHLOROETHYLENE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Caffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicel:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected; Chemical;	Semple Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

270 UGAL	.400 UGA.	210 UGA	1.700 UG/L	39.700 UGAL	20.000 C	610.000 UMHO	8.100	8.100	166.400 MG/L	203.000 MG/L	218.800 MG/L	75.389 MG/L	7.400 MGAL	20.200 MG/L	1.800 MG/L	7.800 MG/L	.900 MG/L	6.500 PCM.	1.100 PCM.	337.590 MG/L	098.	.270	34.298 MG/L	UTN 001.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	Findings:	Findings:	Findings:	Findings	Findings: DENT)	Findingsc	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
04/24/1987	07/24/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/19/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987	10/13/1987 Findin	10/13/1987	10/13/1987		10/13/1987	10/13/1987 FI	10/13/1987	10/13/1987
DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACC3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLVORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR		LANGELIER INDEX @ 80 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	TURBIDITY (LAB)
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®. PHYSICAL SETTING SOURCE MAP FINDINGS

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Sample Collected: Chemical:	10/13/1987 AGGRSSIVE INDEX (COPROSIVITY)	Findings:	12.200
Sample Collected: Chemical:	01/12/1988 1,1-DICHLOROETHYLENE	Findings:	2.500 UG/L
Sample Collected: Chemical:	01/12/1988 TRICHLOROETHYLENE	Findings:	61.500 UGAL
Sample Collected: Chemical:	01/12/1988 DIBROMOCHLOROPROPANE (DBCP)	Findings: y	.730 UGAL
Sample Collected: Chemical:	05/06/1988 SOURCE TEMPERATURE C	Findings:	20.000 C
Sample Collected: Chemicel:	05/06/1988 SPECIFIC CONDUCTANCE	Findings:	530,000 UMHO
Sample Collected. Chemical:	OS/OB/1888 FIELD PH	Findings:	8.010
Sample Collected: Chemical:	05/06/1988 PH (LABORATORY)	Findings:	8.010
Sample Collected: Chemical:	05/06/1988 TOTAL ALKALINITY (AS CACO3)	Findings:	185,800 MG/L
Sample Collected: Chemical:	05/06/1988 BICARBONATE ALKALINITY	Findings:	226.700 MG/L
Semple Collected: Chemical:	05/06/1988 TOTAL HARDNESS (AS CACO3)	Findings:	219.800 MG/L
Sample Collected: Chemical:	05/06/1988 CALCIUM	Findings:	75.100 MG/L
Sample Collected: Chemical:	05/06/1988 MAGNESIUM	Findings:	7.800 MG/L
Sample Collected: Chemical:	05/06/1988 SODIUM	Findings:	19.800 MGA.
Sample Collected: Chemical:	05/06/1988 POTASSIUM	Findings:	1.400 MG/L
Sample Collected: Chemical:	05/06/1988 CHLORIDE	Findings:	7.700 MG/L
Sample Collected: Chemical:	05/08/1988 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: DENT)	.800 MG/L
Sample Collected: Chemical:	05/06/1988 BORON	Findings:	.200 UGAL
Sample Collected: Chemical:	05/06/1988 GROSS ALPHA	Findings:	7.800 PCM.
Sample Collected; Chemical:	06/06/1988 GROSS ALPHA COUNTING ERROR	Findings:	1.800 PCM.
Sample Collected: Chemical:	06/06/1988 1,1-DICHLOROETHYLENE	Findings:	1.600 UG/L
Sample Collected: Chemical:	05/06/1888 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.380 UG/L
Sample Collected: Chemical:	05/08/1988 TRICHLOROETHYLENE	Findings:	46.200 UG/L
Sample Collected: Chemical:	05/06/1988 TOTAL DISSOLVED SOLIDS	Findings:	308.400 MG/L
Sample Collected: Chemical:	06/08/1988 LANGELIER INDEX @ 60 C	Findings:	1.320

040	33,900 MG/L	12.600	2.000 UG/L	33.700 UGAL	.900 UGAL	6.800 UGA	3.100 UGA	6.000 UGA	B.100 PCM.	1.200 PCM.	1.800 UGAL	.150 UGA.	50.100 UGAL	2.800 UGA.	70.200 UGAL	5.800 PC/A	1.200 PCIA.	.170 UGA.	4.100 PCM.	.800 PCIAL	1.800 UGAL	50.500 UGAL	.220 UGA.	10.800 UGAL
05/08/1988 LANGELIER INDEX @ SOURCE TEMP.	05/08/1988 Findings: NITRATE (AS NO3)	05/06/1988 AGGRSSIVE INDEX (CORROSIVITY)	07/21/1988 1,1-DICHLOROETHYLENE	07/21/1888 Findings: TRICHLOROETHYLENE	07/21/1988 1,1-DICHLOROETHYLENE	07/21/1988 Findings: TRICHLOROETHYLENE	08/18/1988 1,1-DICHLOROETHYLENE	08/18/1988 Findings: TRICHLOROETHYLENE	10/14/1988 Findings: GROSS ALPHA	10/14/1988 GROSS ALPHA COUNTING ERROR	10/14/1988 1,1-DICHLOROETHYLENE	10/14/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	10/14/1988 Findings: TRICHLOROETHYLENE	01/12/1989 1,1-DICHLOROETHYLENE	01/12/1989 TRICHLOROETHYLENE	01/13/1969 Findings: GROSS ALPHA	01/13/1989 GROSS ALPHA COUNTING ERROR	01/13/1989 DIBROMOCHLOROPROPANE (DBCP)	04/20/1989 GROSS ALPHA	04/20/1989 GROSS ALPHA COUNTING ERROR	04/20/1989 Findings: 1,1-DICHLOROETHYLENE	04/20/1969 TRICHLOROETHYLENE	04/28/1889 Findings: DIBROMOCHLOROPROPANE (DBCP)	08/09/1989 Findings: TETRACHLOROETHYLENE
Sample Collected: Chemicat	Sample Collected: Chemicat:	Sample Collected: Chemical:	Semple Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemicat.	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chamical;	Sample Collected: Chemical;	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

20.000 C	520.000 UMHO	7.910	7.910	174.800 MG/L	213,300 MG/L	214.400 MG/L	72.000 MG/L	8.500 MG/L	19.700 MG/L	2.400 MG/L	8.400 MG/L	.800 MG/L	.200 UG/L	8.000 PCM.	2.200 PCM.	.300 UG/L	301.600 MG/L	1,170	.480	33.000 MG/L	12.400	1.000 PC/IL	6.500 PCIA.	2.400 PCM.
Findings: C	Findings:	Findings:	Findings:	Findings: ACO3)	Findings:	Findings: (CO3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: E DEPENDENT)	Findings:	Findings:	Findings: ERROR	Findings: NE (DBCP)	Findings:	Findings:	Findings: IRCE TEMP.	Findings:	Findings: (OSIVITY)	Findings: RROR	Findings:	Findings:
06/09/1989	06/09/1989	06/09/1989	06/09/1989	06/09/1989	06/08/1989	06/08/1989	08/09/1989	06/09/1989	06/09/1989	06/09/1989	06/09/1989	06/09/1989 FLUORIDE (TEMPERATURE DEPENDENT)	06/09/1989	06/09/1989	06/09/1989	06/09/1869	06/09/1869	06/09/1889	06/09/1989 FI	06/09/1989	06/09/1989	04/18/1989	10/13/1889	10/13/1999
SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE		BORON	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	RADIUM 228 COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collected	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemicst	Chemicat	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicel:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

IGN.	*	UGA	C/V		GNL	*	UGA	v	480.000 UMHO			MG/L	MG/L	MG/L	MG/L	MGA.	MGAL	KG/L	IGAL	*	*	늄	Cil.	5
1,100 UG/I	.140 UG/L	46.000 UGA	6.800 PC/A	1.600 PC/V.	1.500 UG/L	200 UGA	39.000 UGA	20.600 C	480.000	8.080	8.080	164.800 MG/L	201.100 MG/L	208.600 MG/L	65.500 MG/L	11.200 MGA.	12.500 MG/L	1.900 MG/L	8.300 MG/L	.800 MG/L	.310 UGA	4.500 PCM	1.400 PCM	1.600 UGA
Findings:	Findings: P)	Findings:	Findings:	Findings:	Findings:	Findings: P)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: IDENT)	Findings:	Findings:	Findings:	Findings:
10/13/1989 1,1-DICHLOROETHYLENE	10/13/1989 DIBROMOCHLOROPROPANE (DBCP)	10/13/1989 TRICHLOROETHYLENE	01/23/1990 GROSS ALPHA	01/23/1990 GROSS ALPHA COUNTING ERROR	01/23/1990 1,1-DKCHLOROETHYLENE	01/23/1980 DIBROMOCHLOROPROPANE (DBCP)	01/23/1990 TRICHLOROETHYLENE	04/26/1990 SOURCE TEMPERATURE C	04/26/1990 SPECIFIC CONDUCTANCE	04/26/1990 FIELD PH	04/26/1990 PH (LABORATORY)	04/26/1890 TOTAL ALKALINITY (AS CACO3)	04/26/1990 BICARBONATE ALKALINITY	04/26/1990 TOTAL HARDNESS (AS CACO3)	04/26/1990 CALCIUM	04/26/1990 MAGNESIUM	04/26/1990 SODIUM	04/26/1990 Potassium	04/26/1990 CHLORIDE	04/26/1990 Findin FLUORIDE (TEMPERATURE DEPENDENT)	04/26/1990 BORON	04/26/1990 GROSS ALPHA	04/28/1990 GROSS ALPHA COUNTING ERROR	04/28/1990 1,1-DICHLOROETHYLENE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Coffected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

JG/L	30.500 UGA.	283.200 MG/L			34.400 MG/L		PCIA.	PCIA	UGA	JGAL	40.200 UG/L	PCM	PC/L	UGAL	юл	12.100 UG/L	PCM	PCIAL	O	480.000 UMHO			168.200 MG/L	208.400 MG/L
.250 UG/L	30.500	283.20	1.280	910	34.400	12.500	9.300 PCIA	2.000 PCIA.	1.300 UG/L	.150 UG/L	40.200	5.100 PCM	1.500 PCM	1.600 UG/L	.200 UG/L	12.100	5.900 PCM	2.000 PCM	20.600 C	480.00	8.000	8.000	169.20	208.40
Findings: P)	Findings:	Findings:	Findings:	Findings: IP.	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: (°	Findings:	Findings:	Findings:	Findings:	Findings:	Findings.	Findings:	Findings:	Findings:
04/26/1990 DIBROMOCHLOROPROPANE (DBCP)	04/26/1990 TRICHLOROETHYLENE	04/26/1990 TOTAL DISSOLVED SOLIDS	04/26/1990 LANGELIER INDEX @ 60 C	04/26/1990 FI LANGELIER INDEX @ SOURCE TEMP.	04/26/1990 NITRATE (AS NO3)	D4/26/1990 AGCRSSIVE INDEX (CORROSIVITY)	07/26/1990 GROSS ALPHA	07/28/1990 GROSS ALPHA COUNTING ERROR	07/26/1990 1,1-DICHLOROETHYLENE	07/26/1990 DIBROMOCHLOROPROPANE (DBCP)	07/26/1990 TRICHLOROETHYLENE	10/16/1890 GROSS ALPHA	10/16/1990 GROSS ALPHA COUNTING ERROR	10/18/1890 1,1-DICHLOROETHYLENE	10/16/1990 DIBROMOCHLOROPROPANE (DBCP)	10/16/1990 TRICHLOROETHYLENE	01/15/1991 GROSS ALPHA	01/15/1991 GROSS ALPHA COUNTING ERROR	01/15/1991 SOURCE TEMPERATURE C	01/15/1981 SPECIFIC CONDICTANCE	01/15/1881 FIELD PH	01/15/1991 PH (LABORATORY)	01/15/1991 TOTAL ALKALINITY (AS CACOS)	01/15/1991 BICARBONATE ALKALINITY
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicel:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected. Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected. Chemical:	Semple Collected: Chemical:	Semple Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

209.200 MG/L	64.100 MG/L	12.000 MG/L	18.800 MG/L	2.800 MG/L	8.300 MG/L	.800 MG/L	1.400 UG/L	54.400 UG/L	288.000 MG/L	1.190	.500	30.300 MGAL	12.400	5.100 PCM	1.900 PCM	2.500 UGAL	.170 UG/L	48.800 UG/L	6.800 PC/A	2.100 PCIA	1.200 PCIA.	11.000 PCI/L	1.300 UGAL	.180 UG/L
Findings: 3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: EPENDENT)	Findings:	Findings:	Findings:	Findings:	Findings: E TEMP.	Findings:	Findings: WITY)	Findings:	Findings: ROR	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings: ROR	Findings: OR	Findings:	Findings:	Findings: DBCP)
01/15/1991	01/15/1981	01/15/1981	01/15/1981	01/15/1981	01/15/1991	01/15/1991	01/15/1981	01/15/1991	01/15/1891	01/15/1991	01/15/1991	01/15/1991	01/15/1981	04/23/1991	04/23/1991	04/23/1991	04/23/1991	04/23/1991	07/09/1991	07/09/1991	07/09/1991	07/09/1991	07/08/1891	07/09/1991
TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	1,1-DKCHLOROETHYLENE	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELJER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

66.900 UG/L	8.500 PCM	2,300 PCM.	1.400 UGAL	.150 UG/L	68.000 UG/L	20,560 C	480.000 UMHO	7.900	7.900	166 000 MG/L	202.500 MG/L	208.000 MG/L	64.100 MG/L	11.700 MG/L	17.500 MG/L	1.800 MG/L	8.800 MG/L	.800 MG/L	15.700 PC/L	2.800 PCM.	1.300 PC/L	10.000 PCM,	249.400 MG/L	1.090
Findings:	Findings:	Findings: IROR	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings;	Findings:	Findings:	Findings: 3)	Findings:	Findings: 3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: EPENDENT)	Findings:	Findings: ROR	Findings: IOR	Findings:	Findings:	Findings:
07/09/1991	10/16/1991	10/16/1991	10/16/1991	10/16/1991	10/16/1991	01/30/1992	01/30/1992	01/30/1992	01/30/1992	01/30/1992	01/30/1982	01/30/1992	01/30/1992	01/30/1992	01/30/1992	01/30/1982	01/30/1982	01/30/1982	01/30/1982	01/30/1982	01/30/1992	01/30/1992	01/30/1992	01/30/1992
TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C
Sample Collected:	Sample Collected:	Sample Collected:	Sample Cultected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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.400	28.000 MGAL	JTN 001.	12,320	3.800 UGAL	.130 UG/L	120.000 UGAL	267.000 PCM	.100 PCIAL	3.000 PCI/L	9.400 PCI/L	2.500 PCIA.	8.800 PCIAL	2.800 PCIAL	2,100 UGAL	.200 UG/L	77.200 UG/L	8.500 PCIA.	2.200 PCIA.	3.300 UGAL	.150 UG/L	68.000 UGAL	21.100 C	480.000 UMHO	7.800
01/30/1992 LANGELIER INDEX @ SOURCE TEMP.	01/30/1992 Findings: NITRATE (AS NO3)	01/30/1992 TURBIDITY (LAB)	01/30/1992 AGGRSSIVE INDEX (CORROSIVITY)	01/30/1992 1,1-DICHLOROETHYLENE	01/30/1992 DIBROMOCHLOROPROPANE (DBCP)	01/30/1992 Findings: TRICHLOROETHYLENE	01/30/1992 Findings: TRITIUM COUNTING ERROR	01/30/1992 RA 226 + RA 228 COUNTING ERROR	01/30/1992 STRONTIUM-90 COUNTING ERROR	GROSS ALPHA Findings:	64/16/1982 GROSS ALPHA COUNTING ERROR	07/16/1992 Findings: GROSS ALPHA	Findings: GROSS ALPHA COUNTING ERROR	07/16/1992 Findings: 1.1-DICHLOROETHYLENE	07/16/1992 Findings: DIBROMOCHLOROPROPANE (DBCP)	07/16/1992 Findings: TRICHLOROETHYLENE	1029/1902 Findings: GROSS ALPHA	Findings: GROSS ALPHA COUNTING ERROR	10/29/1992 1,1-DICHLOROETHYLENE	10/29/1992 Findings: OBROMOCHLOROPROPANE (DBCP)	10/28/1992 TRICHLOROETHYLENE	01/26/1993 Findings: SOURCE TEMPERATURE C	01/26/1993 Findings: SPECIFIC CONDUCTANCE	01/26/1993 Findings: FIELD PH
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:

7.900	168.800 MG/L	205.900 MG/L	204.800 MG/L	60.600 MG/L	13.000 MG/L	18.000 MG/L	1.900 MG/L	8.700 MG/L	.900 MG/L	250.900 MG/L	1,070	.390	29.200 MGAL	UTN 006.	12.310	7.700 PCM.	2.300 PCM.	1.200 PCM.	10.000 PCM.	2.900 UGAL	.110 UGA	95,200 UG/L	10.000 PC//L	2.500 PCIA.
01/26/1993 Findings:	01/26/1993 Findings:	01/26/1993 Findings: BICARBONATE ALKALINITY	01/26/1993 Findings:	01/26/1993 Fardings:	01/26/1993 Findings:	01/26/1993 Findings:	01/26/1993 Findings:	01/26/1993 Findings:	01/26/1993 Fludings:	01/26/1993 Findings:	01/26/1993 Findings:	01/26/1983 Findings:	01/26/1993 Findings:	01/26/1893 Findings:	01/26/1983 Findings:	01/29/1993 Findings:	01/29/1983 Findings:	01/29/1983 Findings:	01/29/1983 Findinga:	01/29/1983	01/28/1983 Findings:	01/29/1993 Findings:	04/20/1993 Findings:	04/20/1993
PH (LABORATORY)	TOTAL ALKALINITY (AS CACC)		TOTAL HARDNESS (AS CACC3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collacted:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemicat:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat	Chemicat	Chemicat	Chemical:

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e: 2.500 L/G/L		#: 70.400 UG/L	s: 7.000 PCIAL	s: 1.900 PCIAL	1.000 UG/L	3: .100 UCAL	8: 8.200 UG/L	s: 19.440 C	3: 480.000 UMHO	7.800	7.800	S: 169.800 MG/L	E 208.800 MG/L	E 200.000 MG/L	I: 86.500 MG/L	8.300 MG/L	:: 19.800 MG/L	1.900 MG/L	F 7.100 MG/L	: .800 MG/L	E 62.000 UGA	8.000 PCI/L	2.100 PCM	3.600 UG/L
Findings	Findings	Findings	Findings:	Findings	Findings	Findings	Findings	Findings:	Findings:	Findings	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	FIndings:	Findings:	Findings:
04/20/1993	04/20/1983	04/20/1993	10/19/1983	10/19/1993	10/19/1993	10/19/1983	10/19/1993	02/10/1994	02/10/1994	02/10/1994	02/10/1894	02/10/1994	02/10/1964	02/10/1994	02/10/1994	02/10/1984	02/10/1894	02/10/1964	02/10/1994	02/10/1894	02/10/1994	02/10/1994	02/10/1994	02/10/1994
1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIJM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	ALUMINUM	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1.1-DICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffacted:	Sample Collected:	Sample Collected:	Sample Cullected:	Sample Collected:	Sample Collected:				
Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

.070 UG/L	42.800 UGAL	263.800 MG/L	1.010	.300	25.200 IMG/L	.800 NTU	12.250	5688,000 UG/L	6.100 PCM	2.600 PC/IL	2.000 UGA.	.070 UGAL	85.800 UGAL	8.000 PCIA.	2.800 PC/A	1.700 UG/L	.090 UG/L	58.300 UG/L	8.200 PCM.	2.400 PCM.	.110 נומע.	66.200 UGAL	18,900 C	460.000 UMHO
02/10/1994 Findings: DIBROWOCHLOROPROPANE (DBCP)	02/10/1994 Findings: TRICHLOROETHYLENE	02/10/1994 Findings: TOTAL DISSOLVED SOLIDS	02/10/1994 Findings: LANGELIER INDEX @ 60 C	02/10/1994 Findings: LANGELIER INDEX @ SOURCE TEMP.	02/10/1984 Findings: NITRATE (AS NO3)	02/10/1994 TURBIDITY (LAB)	02/10/1894 Findings: AGGRSSIVE INDEX (CORROSIVITY)	02/10/1894 Findings: NITRATE + NITRITE (AS N)	06/10/1894 Findings: GROSS ALPHA	06/10/1894 Findings: GROSS ALPHA COUNTING ERROR	05/10/1894 Findings: 1,1-DICHLOROETHYLENE	05/10/1894 Findings: DIBROMOCHLOROPROPANE (DBCP)	05/10/1894 Findings: TRICHLOROETHYLENE	07/15/1994 Findings: GROSS ALPHA	07/15/1994 GROSS ALPHA COUNTING ERROR	07/16/1994 Findings: 1,1-DICHLOROETHYLENE	07/16/1994 Findings: DIBROMOCHLOROPROPANE (DBCP)	07/15/1994 Findings: TRCHLOROETHYLENE	10/07/1994 Findings: GROSS ALPHA	10/07/1994 GROSS ALPHA COUNTING ERROR ,	10/07/1994 DIBROMOCHLOROPROPANE (DBCP)	10/07/1994 Findings: TRICHLOROETHYLENE	01/05/1996 Findings: SOURCE TEMPERATURE C	01/05/1995 Findings: SPECIFIC CONDUCTANCE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sampte Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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7.900	7.900	172.000 MG/L	209.800 MG/L	204.000 MG/I.	58.500 MG/L	9:300 MG/L	18.600 MGA.	2.000 MG/L	6.600 MG/L	.800 MG/L	12.200 PC/A	1.000 PC/L	2.000 UGAL	.070 UGAL	82.800 UGA.	257.000 MG/L	1.060	.330	28.300 MGAL	J100 NTU	12.300	6388.000 UG/L	11.600 PCIA.	2.900 PCIAL
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: NDENT)	Findings:	Findings:	Findings:	Findings: (P)	Findings:	Findings:	Findings:	Findings: MP.	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/05/1995	01/05/1985	01/05/1985	01/05/1995	01/05/1985	01/06/1995	01/05/1985	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1895	01/05/1986	01/05/1995	01/05/1995	01/05/1995	01/05/1996	01/05/1995	01/05/1985	01/05/1995	06/08/1996	05/09/1995
FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUCRIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected	Sample Collected:	Sample Collected:	Sample Collected.	Sample Collected.	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

.110 UGA.	52.800 UGAL	28.800 MG/L	16.000 PCI/L	2.000 PCIAL	.280 UGA.	20.600 UGA.	10380.000 UGA.	9.400 PCIA.	2.500 PCIA,	.150 UG/L	39.100 UGA,	18.300 C	490.000 UMHO	7.700	8.000	170.000 MG/L	207.400 MG/L	220,000 MG/L	87.100 MG/L	11.000 MG/L	18.000 MG/L	2.200 MG/L	8.100 MG/L	.600 MG/L
05/08/1995 DIBROMOCHLOROPROPANE (DBCP)	05/09/1995 Findings: TRICHLOROETHYLENE	05/09/1995 NITRATE (AS NO3)	08/21/1996 GROSS ALPHA	08/21/1985 GROSS ALPHA COUNTING ERROR	09/21/1996 DIBROMOCHLOROPROPANE (DBCP)	09/21/1996 Findings: TRICHLOROETHYLENE	09/21/1995 NITRATE + NITRITE (AS N)	12/27/1995 Findings: GROSS ALPHA	12/27/1995 GROSS ALPHA COUNTING ERROR	12/27/1985 Findings: DIBROMOCHLOROPROPANE (DBCP)	12/27/1885 Findings: TRICHLOROETHYLENE	03/12/1996 Findings: SOURCE TEMPERATURE C	03/12/1996 Findings: SPECIFIC CONDUCTANCE	03/12/1896 Findings:	03/12/1896 Findings: PH (LABORATORY)	03/12/1896 TOTAL ALKALINITY (AS CACO3)	03/12/1896 BICARBONATE ALKALINITY	03/12/1896 Findings: TOTAL HARDNESS (AS CACO3)	03/12/1996 Findings: CALCIUM	03/12/1996 Findings:	03/12/1996 Findings: SODIUM	03/12/1996 Findings: POTASSIUM	03/12/1996 Findings: CHLORIDE	03/12/1998 Findings: FLUORIDE (TEMPERATURE DEPENDENT)
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Semple Collected: Chemical:	Sample Collected: Chemicet:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical:	Semple Collected: Chemical:

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420.000 UGAL	9.500 PCM.	2.200 PCIA.	1.400 PCI/L	8.000 PC/A	.120 UG/L	40.200 UGA.	273.000 MG/L	.910	.110	34.000 MG/L	UTN 001.	12.150	7680,000 UGAL	13.200 PCUL	2.200 PCM.	.300 UG/L	7.700 UGAL	10600.000 UGAL	10.700 PCM.	1,500 PCIA	.600 UGAL	.350 DGAL	10.600 UC/L	47.400 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
03/12/1996	03/12/1996	03/12/1996	03/12/1896	03/12/1998	03/12/1996	03/12/1998	03/12/1996	03/12/1896	03/12/1996	03/12/1996	03/12/1998	03/12/1996	03/12/1896	08/28/1998	06/26/1996	08/28/1998	08/26/1998	08/28/1998	09/23/1996	09/23/1996	09/23/1998	09/23/1996	08/23/1996	09/23/1996
BORON	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE (AS MOR)
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected;	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemiost:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

.280 UGA.	15.300 UGAL	21.100 C	548.000 UMHO	7.700	7.700	176.000 MG/L	215.000 MG/L	228.000 MG/L	75.000 MG/L	10.400 MG/L	18.000 MG/L	2.800 MG/L	9.800 MG/L	.740 MG/L	12.400 PC/IL	1.200 PC/L	4.200 PCM	.700 PCIA.	10.000 PCI/L	.220 UG/L	15.300 UG/L	305.000 MG/L	.970	280
12/17/1998 Findings: DIBROMOCHLOROPROPANE (DBCP)	12/17/1996 Findings: TRICHLOROETHYLENE	01/13/1997 Findings: SOURCE TEMPERATURE C	01/13/1997 Findings: SPECIFIC CONDUCTANCE	01/13/1997 Findings:	01/13/1897 Findings: PH (LABORATORY)	01/13/1987 Findings: TOTAL ALKALINITY (AS CACO3)	01/13/1997 Findings: BICARBONATE ALKALINITY	01/13/1997 Findings: TOTAL HARDNESS (AS CACO3)	01/13/1987 Findings: CALCIUM	01/13/1997 Findings: MAGNESIUM	01/13/1997 Findings:	01/13/1997 Findings: POTASSIUM	01/13/1997 Findings: CHLORIDE	01/13/1997 FluoRide (TEMPERATURE DEPENDENT)	01/13/1997 Findings: GROSS ALPHA	01/13/1997 Findings: GROSS ALPHA COUNTING ERROR	01/13/1997 Findings: GROSS BETA	01/13/1997 Findings: GROSS BETA COUNTING ERROR	01/13/1997 Findings: URANIUM	01/13/1997 Findings: DIBROMOCHLOROPROPANE (DBCP)	01/13/1997 Findings: TRICHLOROETHYLENE	01/13/1997 Findings: TOTAL DISSOLVED SOLIDS	01/13/1997 Findings: LANGELIER INDEX @ 80 C	01/13/1997 LANGELIER INDEX @ SOURCE TEMP.
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat	Sample Collected: Chemical:	Sample Collected: Chamical:	Sample Collected: Chemical:	Sampla Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical.	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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44.400 MG/L	JTN 001-	5.000 PCM.	700.000 PCI/L	12.220	10000.000 UGAL	207,000 PCI/L	80,000 PCI/L	.580 PCIAL	.480 PCM.	1.280 PC//L	.330 PCM.	2.160 PCM.	1.120 PCM.	1.900 UGA	.250 UG/L	19.100 UGAL	1.900 UG/L	11.000 PCI/L	3.000 PCM.	13.100 PCM.	3.200 PC/L	900 UG/L	.230 UC/IL	19.800 UGAL
Findings:	Findings:	Findings: ERROR	Findings:	Findings: VITY)	Findings:	Findings:	Findings:	Findings:	Findings: R	Findings:	Findings: R	Findings:	Findings: ROR	Findings:	Findings: DBCP)	Findings:	Findings:	Findings:	Findings: ROR	Findings:	Findings:	Lindings:	Findings: DBCP)	Findings
01/13/1997	01/13/1897	01/13/1887	01/13/1897	01/13/1987	01/13/1897	01/13/1997	01/13/1997	01/13/1897	01/13/1987	01/13/1997	01/13/1997	01/13/1997	01/13/1987	04/14/1987	04/14/1887	04/14/1987	04/14/1997	DA/H4/1997	04/14/1997	07/31/1997	07/31/1897	07/31/1987	97/31/1997	07/31/1987
NITRATE (AS NO3)	TURBIDITY (LAB)	TOTAL RADON 222 COUNTING ERROR	TOTAL RADON 222	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	TRITIUM	TRITIUM COUNTING ERROR	FADIUM 228	RADIUM 228 COUNTING ERROR	RADIUM 228	RADIUM 228 COUNTING ERROR	STRONTIUM-BO	STRONTIUM-90 COUNTING ERROR	CHLOROFORM (THM)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL TRIHALOMETHANES	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;

Example Exam	Map I) Direction Distance		
CA WELS	Elevation	Database	EDRI
	88E 1/2 - 1 Mile Hirbs	CA WELLS	828

EDR ID Number

TAN San Beannardino WELLAMIBNTANUNINTAKE/SUPPLY Acthe Raw 1,000 Feet (10 Seconds)	18447	405.000 UMHO	8.020	132,000 MG/L	183,000 MG/L	54.000 MG/L	9.000 MG/L	13.500 M/G/L	1.900 MG/L	10.000 MGA.	.700 MG/L	23.000 MG/L	.310 UG/L	7.800 UG/L	.800 UGA.	1.200 UG/L
User ID: County: Station Type: Well Status: Precision: R DIV	Connections:	4 Are Listed Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Fludings:	Findings:	Findings: ENDENT)	Findings:	Findings: iCP)	Findings:	Findings: :CP)	Findings: CP)
### ##################################	69300 REDLANDS	* Only Findings Above Detection Level Are Listed 08/14/1984 Findings SPECIFIC CONDUCTANCE	08/14/1984 PH (LABORATORY)	06/14/1984 TOTAL ALKALINITY (AS CACO3)	06/14/1984 TOTAL HARDNESS (AS CACO3)	06/14/1984 CALCIUM	06/14/1984 MAGNESIUM	06/14/1984 SODIUM	06/14/1984 POTASSIUM	06/14/1984 CHLORIDE	06/14/1984 FLUORIDE (TEMPERATURE DEPENDENT)	06/14/1984 NITRATE (AS NO3)	05/07/1985 DIBROMOCHLOROPROPANE (DBCP)	05/07/1885 TRICHLOROETHYLENE	07/11/1985 DIBROMOCHLOROPROPANE (DBCP)	08/20/1885 DIBROMOCHLOROPROPANE (DBCP)
Water System Information: Prins Station Code: FROS Number: District Number: Varier Type: Source Laff ong: System Number: System Number: System Number: System Number: Organization That Oper	Pop Served: Area Served:	Sample Information: * Or Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemicat:	Sample Collected: Chemicat	Sample Collected: Chemicat.	Sample Collected: Chemicat.	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected; Chemical;	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

18.000 UG/L	9.800 UG/L	.230 UGAL	230 UG/L	8.700 UG/L	.150 UGAL	4.800 PCM	.400 PCIAL	.130 UG/L	3.800 PCM.	A00 PCM.	6.500 UG/L	.170 UG/L	1.000 UGAL	.140 UG/L	6.900 UGAL	380.000 UMHO	7,360	131,200 MG/L	160.000 MG/L	164.800 MG/L	49.299 MG/L	7.510 MG/L	13.100 MGAL	2.330 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
08/20/1985	03/07/1986	03/07/1988	04/24/1886	05/30/1988	DEN3/1986	08/27/1888	06/27/1886	DIBROMOCHLOROPROPANE (DBCP)	09/26/1986	09/26/1986	09/26/1986	09/26/1986	10/24/1986	10/24/1986	10/24/1986	10/24/1988	10/24/1986	10/24/1986	10/24/1986	10/24/1988	10/24/1986	10/24/1986	10/24/1986	10/24/1998
TRICHLOROETHYLENE	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR		GROSS ALPHA	GROSS ALPHA COUNTING EPROR	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	SPECIFIC CONDUCTANCE	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACOS)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected;	Semple Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

5.100 MG/L	.890 MG/L	233.700 MG/L	.360	380	19.899 MG/L	11.600	.130 UG/L	9.500 UG/L	5.800 PCI/L	.900 PCM.	1,200 UGAL	8.100 US/L	.170 UG/L	.900 UGAL	.190 UGA.	7.700 UG/L	1.300 UGA	.110 UG/L	8.500 UG/L	1.300 UG/L	.130 UGAL	7.700 UGA.	1.000 UG/L	.100 UGAL
10/24/1986 Findings: CHLORIDE	10/24/1986 FLUORIDE (TEMPERATURE DEPENDENT)	10/24/1986 Findings: TOTAL DISSOLVED SOLIDS	10/24/1986 Findings: LANGELIER INDEX @ 60 C	10/24/1985 Findings: LANGELIER INDEX @ SOURCE TEMP.	10/24/1986 NITRATE (AS NO3)	10/24/1986 Findings: AGGRSSIVE INDEX (COPPROSIVITY)	11/18/1986 Findings: DIBROMOCHLOROPROPANE (DBCP)	11/18/1888 Findings: TRICHLOROETHYLENE	11/24/1986 Findings: GROSS ALPHA	11/24/1986 GROSS ALPHA COUNTING ERROR	12/16/1986 Findings: 1,1-DICHLOROETHYLENE	12/16/1986 Findings: TRICHLOROETHYLENE	12/16/1986 Findings: DIBROMOCHLOROPROPANE (DBCP)	01/23/1987 Findings: 1,1-DICHLOROETHYLENE	01/23/1887 DIBROMOCHLOROPROPANE (DBCP)	01/23/1887 TRICHLOROETHYLENE	02/13/1987 Findings: 1,1-DICHLOROETHYLENE	02/13/1987 DIBROMOCHLOROPROPANE (DBCP)	02/13/1987 TRICHLOROETHYLENE	03/24/1967 1,1-DACHLOROETHYLENE	03/24/1967 Findings: DBROMOCHLOROPROPANE (DBCP)	03/24/1987 Findings: TRICHLOROETHYLENE	04/24/1987 1,1-DICHLOROETHYLENE	04/24/1987 Findings: DIBROMOCHLOROPROPANE (DBCP)
Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Colfected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicel:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sumple Coffected: Ohernicat:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Findings: 7.800 UGAL	Findings: 1.000 UGAL	Findings: .130 UG/L.	Findings: .100 UGA.	Findings: 2.500 UG/L	Findings: 6.900 UGAL	Findings: .170 UGA.	Findings: .170 UGAL	Findings: 7.800 UG/L	Findings: 350 UQ/L	Findings: .800 UG/L	Findings: 6.100 UGA	Findings: 1.200 UGA	Findings: 8.500 UG/L	Findings: 17.799 C	Findings: 380.000 UMHO	Findings: 8,030	Findings: 8.030	Findings: 133,700 MG/L.	Findings: 163,200 MG/L	Findings: 156.800 MG/L	Findings: 54.500 MGA.	Findings: 5.000 MG/L	Findings: 14.300 MCA.	Shallare:
04/24/1987	05/22/1987	05/22/1987	08/19/1987	08/19/1987	08/19/1987	07/24/1987	08/14/1987	08/14/1987	09/25/1987	09/26/1987	09/25/1987	10/16/1987	10/16/1987	10/16/1967	10/16/1987	10/16/1987	10/16/1987	10/16/1987	10/16/1987	10/16/1987	10/16/1987	10/16/1987	10/16/1987	***************************************
TRICHLOROSTHYLENE	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	1,1-DICHLOROETHYLENE	TRICHLORDETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESILM	SODIUM	
Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Semple Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Creenty Collected
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	

5.300 MG/L	.700 MG/L	3.300 PCM.	.500 PC/L	248.100 MG/L	.670	0.070	19.089 MG/L	.400 NTU	11.900	.190 UG/L	6.200 UG/L	.060 UGAL	1.000 UGAL	6.500 UG/L	1.200 UG/L	8.200 UGAL	.240 UG/L	.800 UG/L	6.800 UGAL	.260 UG/L	.220 UG/L	2.900 UG/L	17.800 C	380,000 UMHO
10/16/1987 Findings: CHLORIDE	10/16/1987 Frudings: FLUORIDE (TEMPERATURE DEPENDENT)	10/16/1987 Findings: GROSS ALPHA	10/16/1987 Findings: GROSS ALPHA COUNTING ERROR	10/16/1987 Findings: TOTAL DISSOLVED SOLIDS	10/16/1987 Findings: LANGELIER INDEX @ 60 C	10/16/1987 Findings: LANGELIER INDEX @ SOURCE TEMP.	10/16/1987 Findings: NITRATE (AS NO3)	10/16/1987 Findings: TURBIDITY (LAB)	10/16/1987 Findings: AGGRSSIVE INDEX (CORROSIVITY)	11/10/1987 Findings: DIBROMOCHLOROPROPANE (DBCP)	11/10/1987 Findings: TRICHLOROETHYLENE	12/10/1987 Findings: DIBROMOCHLOROPROPANE (DBCP)	12/10/1987 Findings: 1,1-DICHLOROETHYLENE	12/10/1987 Findings: TRICHLOROETHYLENE	01/19/1988 Findings: 1,1-DICHLOROETHYLENE	01/19/1988 Findings: TRICHLOROETHYLENE	01/19/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	02/19/1988 1,1-DICHLOROETHYLENE	02/19/1988 Findings: TRICHLOROETHYLENE	02/19/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	03/22/1989 Findings: DIRCOMOCHLOROPROPANE (DBCP)	03/22/1968 TRICHLOROETHYLENE	04/19/1988 Findings: SOURCE TEMPERATURE C	04/19/1988 Findings: SPECIFIC CONDUCTANCE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Cafected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

7.670	7.670	135.700 MG/L	165.800 MG/L	153.800 MG/L	51.300 MG/L	6.200 MGAL	13.900 MG/L.	1.900 MG/L	4.800 MG/L	.500 MG/L	.080 UGAL	3.900 PCM.	1.300 PCIA.	1.000 UG/L	.280 UG/L	6.000 UGA	215.800 MG/L	.280	460	17.700 MG/L	11.500	1.000 UGAL	.350 UGA.	6.200 UGA
Findings:	Findings:	, Findings: ACO3)	Findings:	Findings: ACO3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: IE DEPENDENT)	Findings:	Findings:	Findings: SERROR	Findings:	Findings: NE (DBCP)	Findings:	Findings: S	Findings:	Findings: RCE TEMP.	Findings:	Findings: tOSIVITY)	Findings:	Findings: NE (DBCP)	Findings:
04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	D4/19/1988	04/19/1988	04/18/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	04/19/1988	O4/19/1988	06/13/1988	05/13/1988	05/13/1988
FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACOS)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	BORON	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicst.	Chemicat.	Chemicat.	Chemical:	Chemical:	Chemical:	Chernical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

1.200 UGA.	.250 UGAL	7.300 UG/L	.140 UGAL	.600 UG/L	6.200 UG/L	3.900 PCM	.300 PC/IL	1.200 UG/L	.210 UG/L	9.900 LYGAL	1.700 UG/L	.180 UGAL	5.100 UGAL	.280 UG/L	5.400 UGA.	3.600 PCI/L	.900 PCM.	.420 UG/L	6.300 UGAL	1.000 UG/L	8.300 UG/L	1.000 UGAL	.370 UGA.	6.800 UGA.
06/21/1988 Findings: 1,1-DICHLOROETHYLENE	06/21/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	06/21/1988 TRICHLOROETHYLENE	09/15/1998 Findings: DIBROMOCHLOROPROPANE (DBCP)	09/15/1988 1,1-DKCHLOROETHYLENE	09/15/1988 Findings: TRICHLOROETHYLENE	10/14/1988 Findings: GROSS ALPHA	10/14/1988 GROSS ALPHA COUNTING ERROR	10/14/1988 1,1-DICHLOROETHYLENE	10/14/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	10/14/1988 Findings: TRICHLOROETHYLENE	11/10/1988 Findings: 1,1-DICHLOROETHYLENE	11/10/1988 DIBROMOCHLOROPROPANE (DBCP)	11/10/1988 Findings: TRICHLOROETHYLENE	12/09/1988 DIBROMOCHLOROPROPANE (DBCP)	12/08/1988 Findings: TRICHLOROETHYLENE	01/19/1989 Findings: GROSS ALPHA	01/19/1088 GROSS ALPHA COUNTING ERROR	01/19/1989 DIBROMOCHLOROPROPANE (DBCP)	01/19/1989 Findings: TRICHLORDETHYLENE	01/19/1989 1,1-DICHLOROETHYLENE	01/19/1889 Findings: TRICHLOROETHYLENE	02/17/1989 Findings: 1,1-DICHILOROETHYLENE	02/17/1989 Findings: DIBROMOCHLOROPROPANE (DBCP)	02/17/1989 Findings: TRICHLOROETHYLENE
Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK®. PHYSICAL SETTING SOURCE MAP FINDINGS

.800 UG/L	.250 UGAL	8.900 UG/L	1.300 UGA	7.900 UGA.	4.100 PCM	.600 PCM.	.450 UGA	.630 UG/L	.800 UGAL	10.000 UGAL	23.300 C	580.000 UMHO	7.920	7.920	177.100 MG/L	216.100 MG/L	198.000 MG/L	57.800 MGA.	13.000 MG/L	39.700 MG/L	2400 MG/L	30.600 MGA.	1.000 MG/L	.100 UGA.
Findings:	Findings: VE (DBCP)	Findings:	Findings:	Findings:	Findings:	Findings: ERROR	Findings: VE (DBCP)	Findings: VE (DBCP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: 503)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: DEPENDENT)	Findings:
03/10/1989	03/10/1989	03/10/1989	04/20/1989	04/20/1989	04/20/1989	04/20/1988	04/28/1989	05/18/1989	05/18/1989	05/18/1989	05/26/1989	05/26/1989	05/26/1989	05/26/1989	05/26/1989	05/26/1989	05/26/1989	05/26/1989	O6/26/1989	06/26/1889	05/26/1889	05/26/1888	05/26/1989	05/26/1989
1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	GRCSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	BORON
Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

4.400 PCIA.	.500 PCIA.	354.000 MG/L	1.070	.440	24.000 MG/L	12.300	17.800 C	380.000 UMHO	7.870	7.870	130,200 MG/L	158.800 MG/L	154.000 MGAL	48.800 MG/L	7.200 MG/L	14.600 MG/L	1.800 MG/L	6.400 MG/L	.600 MG/L	.210 UG/L	3.400 PCM.	.600 PCM_	.700 UG/L	4.800 UG/L
Findings:	Findings:	Findings;	Findings:	Findings: EMP.	Findings:	Findings: 7)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	Findings	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: NDENT)	Findings:	Findings:	Findings:	Findings: (P)	Findings:
05/26/1989 GROSS ALPHA	05/26/1989 GROSS ALPHA COUNTING ERROR	05/26/1989 TOTAL DISSOLVED SOLIDS	05/26/1889 LANGELIER INDEX @ 80 C	05/26/1989 FANGELIER INDEX @ SOURCE TEMP.	05/26/1989 NITRATE (AS NO3)	05/26/1989 AGGRSSIVE INDEX (CORROSIVITY)	06/08/1989 SOURCE TEMPERATURE C	06/09/1989 SPECIFIC CONDUCTANCE	06/06/1989 FIELD PH	06/08/1989 PH (LABORATORY)	06/09/1989 TOTAL ALKALINITY (AS CACO3)	D6/09/1989 BICARBONATE ALKALINITY	06/09/1989 TOTAL HARDNESS (AS CACO3)	O6/09/1989 CALCIUM	08/09/1989 MAGNESIUM	08/08/1989 SODIUM	06/09/1989 POTASSIUM	06/09/1989 CHLORIDE	06/09/1989 FINDERATURE DEPENDENT)	06/09/1989 BORON	06/09/1989 GROSS ALPHA	06/08/1989 GROSS ALPHA COUNTING ERROR	08/09/1989 DIBROMOCHLOROPROPANE (DBCP)	06/09/1989 TRICHLOROETHYLENE
Sample Collected: Chemioal:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Semple Coffected: Chemical:	Sample Callected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Semple Coffected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:				

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

231.800 MGA.	.850	.110	21.700 MG/L	12,100	.460 UG/L	450 UGAL	2.400 UGAL	.540 UG/L	.800 UGAL	3.200 UGAL	5.300 PCIA.	1.800 PCIA.	.800 UG/L	.400 UG/L	2900 UG/L	3.500 UG/L	.770 UGAL	3.800 UG/L	4.300 PCIA.	1.200 PCIA.	1600 UG/L	.500 UG/L	5.000 UG/L	1.100 UGA
Findings:	Findings:	Findings: DE TEMP,	Findings:	Findings: SIVITY)	Findings: (OBCP)	Findings: (08CP)	Findings:	Findings: (DBCP)	Findings:	Findings:	Hndings:	Findings: RROR	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings:	Findings:	Findings: (DBCP)	Findings:	Findings:
06/09/1969	06/09/1889	08/09/1989	06/09/1989	06/09/1989	07/13/1989	08/18/1989	08/16/1989	09/22/1989	09/26/1989	09/26/1989	10/13/1889	10/13/1989	10/13/1989	10/13/1989	10/13/1989	11/10/1989	12/14/1989	12/14/1989	01/23/1990	01/23/1990	01/23/1990	01/23/1990	01/23/1990	02/15/1990
TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	DIBROMOCHLOROPROPANE (DBCP)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	GRUSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical.	Chemical:	Chemical:	Chernical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:

.600 UG/L	6.800 US/L	.700 UG/L	.560 UG/L	6.800 UGA	18.800 C	370,000 UMHD	8.240	8.240	131.600 MG/L	160.600 MG/L	158.000 MG/L	48.900 MG/L	8.300 MG/L	12,700 MG/L	1.800 MG/L	6.300 MG/L	.500 MG/L	.360 UGA.	3.100 PC/L	1.100 PCIA	.830 UGA.	5.000 UG/L	225.700 MG/L	1.220
02/15/1980 Findings: DIBROMOCHLOROPROPANE (DBCP)	02/15/1990 Findings: TRICHLOROETHYLENE	03/27/1990 1,1-DICHLOROETHYLENE	03/27/1990 DIBROMOCHLOROPROPANE (DBCP)	03/27/1990 TRICHLOROETHYLENE	04/26/1990 Findings: SOURCE TEMPERATURE C	04/26/1990 Findings: SPECIFIC CONDUCTANCE	04/26/1990 Findings:	04/26/1990 Findings: PH (LABORATORY)	04/28/1990 TOTAL ALKALINITY (AS CACO3)	04/26/1990 Findings: BICARBONATE ALKALINITY	04/26/1990 Findings: TOTAL HARDNESS (AS CACO3)	04/26/1990 Findings: CALCKUM	04/26/1990 Findings: MAGNESIUM	04/26/1980 Findings: SODIUM	04/28/1990 Findings: POTASSIUM	04/26/1990 Findings: CHLORIDE	04/26/1990 Findings: FLUORIDE (TEMPERATURE DEPENDENT)	04/26/1990 Findings: BORON	04/26/1990 Findings: GROSS ALPHA	04/26/1990 GROSS ALPHA COUNTING ERROR	04/26/1990 Findings: DIBROMOCHLOROPROPANE (DBCP)	04/26/1980 Findings: TRICHLOROETHYLENE	04/26/1990 Findings: TOTAL DISSOLVED SOLIDS	04/28/1990 Findings: LANGELIER INDEX @ 60 C
Sample Collected: Chemicat.	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemicat.	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemicat:	Sample Collected: Chemicaf:	Sample Collected: Chemicat	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemiost:	Sample Collected: Chemicat:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chomical:	Sample Collected: Chemicat.	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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.510	23.400 MGAL	12.400	.700 UG/L	.360 UG/L	6.400 UG/L	1.000 UGAL	.570 UG/L	6.500 UGAL	.380 UG/L	8.400 UG/L	.370 UG/L	7.500 UG/L	5.400 PCI/L	1.400 PCI/L	.800 UG/L	.580 UG/L	8.100 UG/L	.700 UG/L	.540 UGAL	7.300 UG/L	.470 UGAL	4.500 UGA.	2.800 PCI/L	1.200 PC/IL
D4/26/1990 Findings: LANGELIER INDEX @ SOURCE TEMP.	04/26/1990 Findings: NITRATE (AS NO3)	04/26/1990 Findings: AGGRSSIVE INDEX (CORROSIVITY)	05/22/1990 Findings: 1,1-DICHLOROETHYLENE	05/22/1990 DIBROMOCHLOROPROPANE (DBCP)	05/22/1990 Findings: TRICHLOROETHYLENE	06/14/1990 Findings: 1,1-DICHLOROETHYLENE	06/14/1990 DIBROMOCHLOROPROPANE (DBCP)	06/14/1990 Findings: TRICHLOROETHYLENE	06/27/1990 DIBROMOCHLOROPROPANE (DBCP)	06/27/1990 Findings: TRICHLOROETHYLENE	08/28/1990 DIBROMOCHLOROPROPANE (DBCP)	08/28/1990 Findings: TRICHLOROETHYLENE	07/28/1990 Findings: GROSS ALPHA	07/26/1990 GROSS ALPHA COUNTING ERROR	07/28/1990 Findings. 1,1-DICHLOROETHYLENE	07/26/1990 Findings: DIBROMOCHLOROPROPANE (DBCP)	07/28/1990 Findings: TRICHLOROETHYLENE	08/16/1990 Findings: 1,1-DICHLOROETHYLENE	08/16/1990 Findings: DIBROMOCHLOROPROPANE (DBCP)	08/16/1990 Findings: TRICHLOROETHYLENE	09/27/1990 DIBROMOCHLOROPROPANE (DBCP)	09/27/1990 Findings: TRICHLOROETHYLENE	10/16/1990 GROSS ALPHA	10/16/1990 Findings: GROSS ALPHA COUNTING ERROR
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemicat.	Sample Collected: Chemicat:	Sample Collected: Chemicat:	Semple Collected: Chemicat:	Semple Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Semple Collected: Chemicat.	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

.szo uga.	8.200 UGA	.310 UGA.	8.000 UG/L	.480 UG/L	6.000 UG/L	18.300 C	380.000 UMHO	7.700	7.700	139.200 MG/L	169.800 MG/L	161,200 MG/L	51.800 MG/L	7.900 MG/L	14.300 MG/L	1.700 MG/L	8.000 MG/L	.500 MG/L	3.800 PCM.	1.500 PCM.	4.600 PCM.	8.000 PCM.	.430 UG/L	7.000 UG/L
10/16/1990 Findings. DIBROMOCHLOROPROPANE (DBCP)	10/16/1980 Findings: TRICHLOROETHYLENE	11/08/1990 Findings: DIBROMOCHLOROPROPANE (DBCP)	11/08/1890 Findings: TRICHLOROETHYLENE	12/20/1990 Findings: DIBROMOCHLOROPROPANE (DBCP)	12/20/1990 Findings: TRICHLOROETHYLENE	01/10/1991 SOURCE TEMPERATURE C	01/10/1991 SPECIFIC CONDUCTANCE	01/10/1991 Findings:	01/10/1991 PH (LABORATORY)	01/10/1991 TOTAL ALKALINITY (AS CACO3)	01/10/1991 BICARBONATE ALKALINITY	01/10/1991 TOTAL HARDNESS (AS CACO3)	01/10/1991 Findings: CALCIUM	01/10/1991 Findings: MAGNESIUM	01/10/1991 Findings: SODIUM	01/10/1991 POTASSIUM	01/10/1991 Findings: CHLORIDE	01/10/1991 FLUORIDE (TEMPERATURE DEPENDENT)	01/10/1991 GROSS ALPHA	01/10/1991 GROSS ALPHA COUNTING ERROR	01/10/1991 GROSS BETA COUNTING ERROR	01/10/1991 URANIUM	01/10/1991 DIBROMOCHLOROPROPANE (DBCP)	01/10/1981 TRICHLOROETHYLENE
Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Callected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical;

GEO	GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS	TING SOUR	CE MAP FINDINGS
Sample Collected: Chemical:	01/10/1981 TOTAL DISSOLVED SOLIDS	Findings:	228.000 MG/L
Sample Collected: Chemical:	01/10/1881 LANGELIER INDEX @ 80 C	Findings:	.720
Sample Collected: Chemical:	01/10/1981 LANGELIER INDEX @ SOURCE TEMP.	Findings: P.	020
Sample Collected: Chemical:	01/10/1981 NITRATE (AS NO3)	Findings:	22.500 MGA.
Sample Collected: Chemical:	01/10/1981 AGGRSSIVÉ INDEX (CORROSIVITY)	Findings:	11.900
Sample Collected: Chemical:	01/10/1991 TRITIUM COUNTING ERROR	Findings:	400.000 PCI/L
Sample Collected: Chemical:	01/10/1991 RA 228 + RA 228 COUNTING ERROR	Findings:	.100 PCM.
Sample Collected: Chemical:	01/10/1991 STRONTIUM-90 COUNTING ERROR	Findings:	2.000 PCIAL
Sample Collected: Chemical:	02/14/1891 1,1-DICHLOROETHYLENE	Findings:	1.100 UG/L
Sample Collected: Chemical:	02/14/1991 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.390 UG/L
Sample Collected: Chemical:	02/14/1991 TRICHLOROETHYLENE	Findings:	7.800 UG/L
Sample Collected: Chemical;	03/05/1991 DIBROMOCHLOROPROPANE (DBCP)	Findings:	470 UGAL
Sample Collected: Chemical:	03/05/1991 TRICHLOROETHYLENE	Findings:	9.000 UG/L
Sample Collected: Chemical:	04/23/1991 GROSS ALPHA	Findings:	6.500 PCM.
Sample Collected: Chemical:	04/23/1991 GROSS ALPHA COUNTING ERROR	Findings:	1.800 PCI/L
Sample Collected: Chemical:	D4/23/1991 1,1-DICHLOROETHYLENE	Findings:	5.400 UG/L
Sample Collected: Chemical:	04/23/1991 DIBROMOCHLOROPROPANE (DBCP)	Findings:	520 UGAL
Sample Collected: Chemical;	04/23/1991 TRICHLOROETHYLENE	Findings:	48.600 UG/L
Sample Collected: Chemical:	05/16/1991 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.350 UGAL
Sample Collected. Chemical:	05/18/1991 TRICHLOROETHYLENE	Findings:	7.400 UG/L
Sample Collected: Chemical:	DBROWOCHLOROPROPANE (DBCP)	Findings:	ABO UGAL
Sample Collected: Chemical:	08/20/1991 TRICHLOROETHYLENE	Findings:	7.400 UG/L
Sample Callected: Chemical:	07/09/1991 GROSS ALPHA	Findings:	2.300 PCI/L
Sample Collected: Chemicat.	07/09/1991 GROSS ALPHA COUNTING ERROR	Findings:	1.300 PC/IL
Sample Collected: Chemical:	01/27/1993 SOURCE TEMPERATURE C	Findings:	18.890 C

390.000 UMHO	7.800	7.800	140,000 MG/L	170.800 MG/L	184,000 MG/L	47.300 MGA.	11.200 MG/L	17.000 MG/L	1,400 MG/L	7.600 MGA.	.700 MG/L	4.200 PCIA.	1.500 PCIA.	1.000 PCI/L	8.000 PCIA.	.800 UGA.	10.800 UGA.	204.000 MG/L	790	090	24.300 MG/L	12.020	24,300 MG/L	.700 UGA
Findings:	Findings:	Findings:	Findings: (03)	Findings:	Findings: (O3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: DEPENDENT)	Findings:	Findings: ERROR	Findings: RROR	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: ICE TEMP.	Findings:	Findings: SIVITY)	Findings:	Findings:
01/27/1993	01/27/1993	01/27/1993	01/27/1993	01/27/1993	01/27/1983	01/27/1993	01/27/1893	01/27/1893	01/27/1983	01/27/1983	01/27/1993	01/27/1983	01/27/1993	01/27/1983	01/27/1983	01/27/1983	01/27/1883	01/27/1983	01/27/1983	01/27/1993	01/27/1983	01/27/1893	01/28/1883	02/17/1993
SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACOS)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE (AS NO3)	1,1-DICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Semple Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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Semple Collected: Chemical:	02/17/1993 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.290 UGAL
Sample Collected: Chemical:	02/17/1993 TRICHLOROETHYLENE	Findings:	7.400 UGAL
Sample Collected: Chemical:	03/31/1993 1,1-DICHLOROETHYLENE	Findings:	.800 UG/L
Sample Collected: Chemical:	03/31/1993 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.190 UG/L
Sample Collected: Chemical:	03/31/1983 TRICHLOROETHYLENE	Findings:	8.500 UGAL
Sample Collected: Chemical:	03/31/1983 NITRATE (AS NO3)	Findings:	21.800 MG/L
Sample Collected: Chemical:	DAIDZ1983 1,1-DICHLOROETHYLENE	Findings:	.800 UG/L
Semple Collected: Chemical:	04/02/1983 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.370 UG/L
Sample Collected: Chemical:	04/02/1983 TRICHLOROETHYLENE	Findings:	11.000 UG/L
Sample Collected: Chemical:	04/02/1993 NITRATE (AS NO3)	Findings:	22.100 MGAL
Sample Collected: Chemical:	04/05/1993 1,1-DICHLOROETHYLENE	Findings:	.800 UG/L
Sample Collected: Chemical:	DIBROMOCHLOROPROPANE (DBCP)	Findings: a)	.370 UG/L
Sample Collected: Chemical:	04/05/1983 TRICHLOROETHYLENE	Findings:	12.000 UG/L
Semple Collected: Chemical:	04/05/1983 NITRATE (AS NO3)	Findings:	22.500 MG/L
Sample Collected: Chemical:	04/07/1993 NITRATE (AS NO3)	Findings:	22.400 MG/L
Sample Collected: Chemical:	04/09/1963 NITRATE (AS NO3)	Findings:	22.600 MG/L
Sample Collected: Chemical:	04/12/1993 GROSS ALPHA	Findings:	8.900 PCIA.
Sample Collected: Chemical:	04/12/1993 GROSS ALPHA COUNTING ERROR	Findings:	2.100 PCM.
Sample Collected: Chemical:	04/12/1983 1.1-DICHLOROETHYLENE	Findings:	.900 UG/L
Sample Collected: Chemical:	04/12/1983 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.310 UG/L
Sample Collected: Chemical:	04/12/1993 TRICHLOROETHYLENE	Findings:	21.400 UG/L
Semple Collected: Chemical:	04/12/1983 NITRATE (AS NO3)	Findings:	22.500 MG/L
Sample Collected: Chemical:	04/14/1883 NITRATE (AS NO3)	Findings:	22.700 MG/L
Sample Collected: Chemical:	04/16/1983 NITRATE (AS NO3)	Findings:	22.800 MGAL
Sample Collected: Chemical:	04/19/1983 NITRATE (AS NO3)	Findings:	22.700 MGAL

22.700 MG/L	22.800 MG/L	22.800 MG/L	22.800 MG/L	22.400 MG/L	21.900 MG/L	22.800 MG/L	22.000 MGAL	22.000 MG/L	22.200 MG/L	21.800 MG/L	22.000 MG/L	22.000 MG/L	21.300 MG/L	21.000 MG/L	21.400 MG/L	21.700 MG/L	21.200 MGA.	1.200 UGA.	.360 UG/L	35.200 UG/L	21.200 MG/L	20.800 MGA.	20.700 MG/L	21.000 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: IE (DBCP)	Findings:	Findings:	Findings:	Findings:	Firdings:
04/21/1983 NITRATE (AS NO3)	04/23/1983 NITRATE (AS NO3)	04/26/1883 NITRATE (AS NO3)	04/28/1983 NITRATE (AS NO3)	04/30/1893 NITRATE (AS NO3)	05/03/1993 NITRATE (AS NO3)	05/05/1893 NITRATE (AS NO3)	06/07/1993 NITRATE (AS NO3)	05/10/1993 NITRATE (AS NO3)	05/12/1983 NITRATE (AS NO3)	06/14/1993 NITRATE (AS NO3)	05/17/1883 NITRATE (AS NO3)	05/19/1893 NITRATE (AS NO3)	05/21/1983 NITRATE (AS NO3)	05/28/1883 NITRATE (AS NO3)	06/01/1993 NITRATE (AS NO3)	06/02/1983 NITRATE (AS NO3)	06/04/1983 NITRATE (AS NO3)	06/07/1983 1,1-DICHLOROETHYLENE	08/07/1993 DIBROMOCHLOROPROPANE (DBCP)	06/07/1983 TRICHLOROETHYLENE	06/07/1993 NITRATE (AS NOS)	D6/09/1993 NITRATE (AS NOS)	06/11/1983 NITRATE (AS NO3)	06/14/1893 NITRATE (AS NO3)
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chamical:	Sample Collected: Chemical:	Sample Collected; Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:					

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GEOCHECK®. PHYSICAL SETTING SOURCE MAP FINDINGS

20.500 MG/L	20.400 MG/L	20.900 MG/L	20.800 MGAL	20.500 MG/L	21.300 MG/L	21.400 MG/L	21.200 MGA.	21.300 MG/L	21.800 MG/L	21.300 MG/L	21.400 MGA.	21.300 MG/L	21.400 MG/L	21.400 MG/L	21.400 MGA.	21.500 MG/L	21.200 MG/L	22.400 MG/L	22.500 MG/L	22.400 MG/L	22.200 MG/L	22.200 MGAL	22.200 MG/L	22.200 MG/L
Findings:	Findings:	Findings:	Findings	Findings	Findings:																			
08/16/1993	06/16/1993	06/21/1983	08/23/1983	06/25/1993	06/28/1993	06/30/1983	07/02/1983	07/08/1983	07/07/1993	07/09/1993	07/12/1993	07/14/1983	07/16/1963	07/19/1983	07/21/1983	07/23/1883	07/26/1993	07/28/1993	07/30/1893	08/02/1993	08/04/1983	08/06/1993	08/08/1993	08/11/1993
NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NOS)	NITRATE (AS NO3)	NITRATE (AS NOS)	NTRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS MO3)	NITRATE (AS NO3)					
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicaf:	Chemical:	Chemical	Chemical:	Chemical,	Chemical:													

22.200 MG/L	22.300 MGA.	22.300 MGA.	22.300 MGA.	22.200 MG/L	22.000 MG/L	21.900 MG/L	22.100 MG/L	21.800 MG/L	21.800 MG/L	22.100 MGAL	21.900 MG/L	21.800 MG/L	1.000 UG/L	280 UGAL	33.100 UG/L	21.800 MG/L	22.100 MG/L	22.000 MG/L	22.000 MGAL	22.100 MGAL	20.800 MG/L	21.800 MG/L	22.100 MGAL	22.100 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
08/13/1993 NITRATE (AS NO3)	08/17/1993 NITRATE (AS NO3)	08/18/1993 NITRATE (AS NO3)	08/20/1983 NITRATE (AS NC3)	08/23/1993 NITRATE (AS NO3)	08/25/1993 NITRATE (AS NO3)	08/27/1983 NITRATE (AS NO3)	08/30/1983 NITRATE (AS NO3)	09/01/1993 NITRATE (AS NO3)	08/03/1893 NITRATE (AS NO3)	09/07/1993 NITRATE (AS NO3)	09/08/1893 NITRATE (AS NOS)	08/10/1983 NITRATE (AS NO3)	09/13/1993 1,1-DICHLOROETHYLENE	09/13/1993 DIBROMOCHLOROPROPANE (DBCP)	09/13/1993 TRICHLORUETHYLENE	09/13/1993 NITRATE (AS NO3)	09/15/1993 NITRATE (AS NO3)	09/17/1993 NITRATE (AS NO3)	09/20/1983 NITRATE (AS NO3)	09/22/1993 NITRATE (AS NO3)	09/24/1993 NITRATE (AS NO3)	09/27/1993 NITRATE (AS NO3)	09/29/1983 NITRATE (AS NO3)	10/01/1983 NITRATE (AS NO3)
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:					

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

21.600 MG/L	21.900 MG/L	: 22.000 IMG/L	: 22.400 MG/L	S 3.800 PCAL	1.600 PC/A	: 1.400 UG/L	: 240 UO/L	27.900 UG/L	22.600 MG/L	22.300 MG/L	21.800 MG/L	22.100 MG/L	24.400 MG/L	21.800 MG/L	21.700 MG/L	Z1.800 MGAL	21.800 MG/L	22.000 MG/L	21.700 MG/L	21.500 MG/L	21.500 MGAL	21.800 MG/L	: .700 UGAL	: .220 UG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	Findings:	Findings	Findings:	Findings	Findings	Findings:	Findings:	Findings:	Findings	Findings:	Findings:							
10/04/1983	10/06/1983	10/08/1993	10/12/1993	10/13/1983	10/13/1983	10/13/1983	10/13/1993	10/13/1983	10/13/1893	10/16/1893	10/18/1993	10/20/1993	10/22/1993	10/25/1983	10/27/1993	10/28/1983	11/01/1893	11/03/1883	11/05/1983	11/08/1993	11/10/1993	11/12/1993	11/15/1993	11/15/1983
NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE (AS NO3)	1.1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)													
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:															

45.200 UG/L	21.100 MG/L	.700 UG/L	260 UG/L	4.100 UG/L	18.900 C	380,000 UMHO	7.800	7.900	134.400 MG/L	164.000 MG/L	160.000 MG/L	62.900 MG/L	8.800 MG/L	16.100 MG/L	1.700 MG/L	8.600 MGA.	.700 MG/L	188.000 UG/L	7,300 PCIA.	1.900 PCM.	.160 UG/L	1.600 UG/L	213.800 MG/L	.920
Findings:	Findings:	Findings:	Findings: (BCP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: PENDENT)	Findings:	Findings:	Findings:	Findings: IBCP)	Findings:	Findhigs:	Findings:
11/15/1983	11/16/1983	12/14/1983	12/14/1993	12/14/1993	01/27/1994	01/27/1994	01/27/1994	01/27/1984	01/27/1994	01/27/1994	01/27/1994	01/27/1984	01/27/1984	01/27/1994	01/27/1984	01/27/1994	01/27/1984 FINDINGS DEPENDENT)	01/27/1884	01/27/1894	01/27/1994	01/27/1994	01/27/1994	01/27/1994	01/27/1994
TRICHLOROETHYLENE	NITRATE (AS NO3)	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE		ALUMINUM	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C
Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®. PHYSICAL SETTING SOURCE MAP FINDINGS

.180	21.300 MG/L	12.150	4808,000 UG/L	.120 UG/L	1.800 UG/L	UTN 001.	.100 UG/L	.800 UGA.	7.500 PCIA.	2.200 PCIA.	.090 UGAL	.800 UGAL	20.200 MG/L	22.200 MG/L	22.200 MG/L	21.800 MG/L	21.400 MG/L	22.000 MG/L	22.000 MG/L	21.200 MGA.	21.800 MG/L	.110 UGAL	11.200 UGAL	21.900 MG/L
Findings: JRCE TEMP.	Findings:	Findings: ROSIVITY)	Findings:	Findings: WE (DBCP)	Findings:	Findings:	Findings: NE (DBCP)	Fudings:	Findings:	Findings: 3 ERROR	Findings: WE (DBCP)	Findings:	Findings: INE (DBCP)	Findings:	Findings:									
6/27/1984	01/27/1994	01/27/1994	01/27/1994	02/10/1984	02/10/1894	02/10/1994	03/15/1994	03/15/1894	04/19/1994	04/18/1984	04/19/1984	04/19/1994	D4/19/1994	04/20/1994	04/22/1984	04/25/1884	04/27/1894	04/29/1994	05/02/1964	06/03/1994	05/04/1894	05/06/1894 DIBROMOCHLOROPROPANE (DBCP)	06/06/1884	06/06/1994
LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (COPROSIVITY)	NITRATE + NITRITE (AS N)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TURBIDITY (LAB)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE (AS NO3)	NTRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NOS)	NITRATE (AS NO3)		TRICHLOROETHYLENE	NITRATE (AS NO3)				
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical;	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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21.500 MG/L	21.000 MG/L	21.800 MG/L	21.200 MG/L	21.200 MG/L	21.500 MG/L	21.700 MG/L	21.800 MG/L	21.500 MG/L	21.700 MG/L	21.200 MG/L	20.500 MG/L	21.300 MG/L	1.000 UG/L	.170 UGAL	21.000 UG/L	21.000 MG/L	21.100 MG/L	21.200 MG/L	21.300 MG/L	21.300 MG/L	21.300 MG/L	21.200 MG/L	20.900 MG/L	21.000 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: BCP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
DS/08/1984 NITRATE (AS NO3)	05/11/1984 NITRATE (AS NO3)	05/13/1994 NITRATE (AS NO3)	05/16/1984 NITRATE (AS NO3)	05/16/1994 NITRATE (AS NO3)	06/20/1994 NITRATE (AS NO3)	06/23/1984 NITRATE (AS NO3)	05/25/1994 NITRATE (AS NO3)	05/27/1994 NITRATE (AS NO3)	06/31/1894 NITRATE (AS NO3)	08/01/1994 NITRATE (AS NO3)	08/03/1984 NITRATE (AS NO3)	08/03/1994 NITRATE (AS MO3)	08/08/1994 1,1-DICHLOROETHYLENE	06/06/1994 F DIBROMOCHLOROPROPANE (DBCP)	06/06/1894 TRICHLOROETHYLENE	06/06/1894 NITRATE (AS NO3)	DB/DB/1894 NITRATE (A8 NO3)	08/10/1994 NITRATE (AS NO3)	OGM3/1984 NITRATE (AS NO3)	OBM 5/1994 NITRATE (AS NO3)	DB/17/1994 NITRATE (AS NO3)	06/20/1884 NITRATE (AS NO3)	DUZZ/1884 NITRATE (AS NO3)	0624/1994 NITRATE (AS NO3)
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Semple Catlected: Chemical:	Sample Collected: Chemical:	Sample Callected: Chemical:	Semple Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemioal:	Sample Collected: Chemical:				

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21.100 MG/L	20.800 MG/L	20.800 MGA.	21.900 MG/L	21.000 MGAL	6.500 PC/A	2.200 PCM.	1.300 UGA	.160 UGA.	30.600 UGA.	20,900 MG/L	20.800 MGA.	20.900 MG/L	20.700 MGA.	20.900 MG/L	20.900 MGA.	21.000 MGA.	20.800 MGAL	20.800 MGAL	20.800 MGAL	20.900 MGAL	1.400 UGA	.180 UGAL	29.900 UG/L	20.700 MGAL
Pindings:	FIndings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	Findings:	Findings:	Findings:	Findings:										
06/27/1994	08/28/1994	07/01/1994	07/05/1994	07/05/1994	07/06/1994	07/08/1994	07/06/1994	07/08/1984	07/06/1994	07/06/1994	07/08/1994	07/11/1994	07/13/1984	07/15/1994	07/18/1984	07/20/1994	07/22/1994	07/26/1994	07/27/1994	07/29/1994	08/01/1994	08/01/1994	08/01/1994	08/01/1984
NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE (AS NO3)	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE (AS NO3)										
Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:													
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemicel:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:						

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20.900 MG/L	20.800 MG/L	20.900 MG/L	20.800 MGAL	21.000 MG/L	21.100 MG/L	21.100 MG/L	21.800 MC/L	21.000 MG/L	21.100 MGA	Z0.900 MG/L	20.900 MG/L	21.000 MG/L	21.200 MG/L	20.500 MG/L	19.400 MG/L	18.400 MG/L	18.400 MG/L	19.300 MG/L	19.800 MG/L	19.800 MGA.	19.400 MGA	.150 UGIL	30.000 UG/L	19.500 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: DPANE (DBCP)	Findings:	Findings:
08/02/1984	NITRATE (AS NO3) 08/03/1984 NITRATE (AS NO3)	08/05/1984 NITRATE (AS NO3)	08/08/1894 NITRATE (AS NO3)	08/10/1894 NTPATE (AS NO3)	08/12/1994 NITRATE (AS NO3)	08/15/1894 NITRATE (AS NO3)	08/17/1994 NITRATE (AS NO3)	08/18/1994 NITRATE (AS NO3)	08/22/1994 NITRATE (AS NO3)	08/24/1994 NITRATE (AS NO3)	08/28/1994 NITRATE (AS NO3)	08/29/1994 NITRATE (AS NO3)	08/31/1894 NITRATE (AS NO3)	09/02/1994 NITRATE (AS NO3)	09/02/1994 NITRATE (AS NO3)	09/06/1994 NITRATE (AS NO3)	09/07/1994 NITRATE (AS NO3)	09/09/1894 NITRATE (AS NO3)	09/12/1994 NITRATE (AS NO3)	09/14/1994 NITRATE (AS NO3)	09/16/1994 NITRATE (AS NO3)	09/19/1884 DIBROMOCHLOROPROPANE (DBCP)	09/19/1994 TRICHLOROETHYLENE	09/19/1994 NITRATE (AS NO3)
Sample Collected:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:												

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18,400 MG/L	19.300 MG/L	19.400 MG/L	19.300 MG/L	19.500 MG/L	8.500 PCIAL	2.000 PCI/L	1.500 UG/L	.140 UG/L	30.100 UGAL	21.200 MG/L	22.800 MGA.	21.200 MG/L.	21.000 MG/L	20.800 MG/L	21.000 MG/L	20.900 MG/L	21.400 MG/L	21.500 MG/L	21.100 MG/L	21.000 MG/L	20.900 MG/L	20.800 MGA.	20.900 MG/L	21.000 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: P)	Findings:															
09/21/1894	09/23/1894	09/26/1994	09/28/1984	09/30/1894	10/03/1994	10/03/1994	10/03/1994	1003/1994	10/03/1994	10/03/1894	10/04/1894	1005/1884	10/07/1894	10/11/1994	10/12/1994	10/14/1994	10/17/1894	10/19/1994	10/21/1994	10/24/1994	10/26/1994	10/28/1994	10/31/1894	11/01/1994
NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	NITRATE (AS NO3)	NTFATE (AS NO3)	Nitrate (As NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)									
Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Callected:	Sample Collected:				
Chemical:	Chemicat	Chemicat:	Chemicat:	Chemicat	Chemicat	Chemical:	Chemical:	Chemical:	Chamical:	Chemical:	Chemical;	Chemical:	Chemical:											

20.800 MG/L	20.800 MG/L	1.500 UG/L	.150 UG/L	36.100 UG/L	20.900 MG/L	21.000 MG/L	20.800 MG/L	20.900 MG/L	20.900 MG/L	20.900 MG/L	20.700 MG/L	20.700 MG/L.	20.800 MG/L	20.900 MG/L	24.000 MG/L	20.800 MG/L	20.800 MG/L	20.800 MG/L	20.800 MG/L	1.900 UGAL	.130 UG/L	33.900 UGA	20.800 MG/L	20.900 MG/L
Findings:	Findings:	Findings:	Findings: (OBCP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings:
11/02/1984 NITRATE (AS NO3)	NITRATE (AS NO3)	1,1-DICHLOROETHYLENE	11/07/1984 DIBROMOCHLOROPROPANE (DBCP)	11/07/1884 TRICHLOROETHYLENE	11/07/1994 NITRATE (AS NO3)	11/08/1884 NITRATE (AS NO3)	11/10/1884 NITRATE (AS NO3)	11/14/1884 NITRATE (AS NO3)	11/18/1894 NITRATE (AS NO3)	11/18/1894 NITRATE (AS NO3)	11/21/1894 NITRATE (AS NO3)	11/23/1884 NITRATE (AS NO3)	11/28/1884 NITRATE (AS NO3)	11/30/1994 NITRATE (AS NO3)	12/02/1994 NITRATE (AS NO3)	12/02/1884 NITRATE (AS NO3)	12/05/1894 NITRATE (AS NO3)	12/07/1994 NITRATE (AS NO3)	12/09/1994 NITRATE (AS NO3)	12/12/1894 1,1-DICHLOROETHYLENE	12/12/1984 DIBROMOCHLOROPROPANE (DBCP)	12/12/1884 TRICHLOROETHYLENE	12/12/1884 NITRATE (AS NO3)	12/14/1994 NITRATE (AS NO3)
Sample Collected: Chemical:	Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected. Chemical:	Sample Collected: Chemical:													

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20.500 MG/L	21.100 MG/L	21.200 MG/L	20.900 MG/L	20.800 MG/L	20.800 MG/L	17.800 C	410.000 UMHO	7.900	7.800	144.000 MG/L	175.700 MGAL	178.000 MG/L	50.500 MG/L	9.700 MG/L	15.100 MG/L	1.600 MG/L	6.800 MGA	.800 MG/L	10.700 PCIA.	1.000 PCM.	.900 UGAL	.130 UGAL	13.500 UGAL	215.000 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings;	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: YENDENT)	Findings:	Findings: OR	Findings:	Findings: BCP)	Findings:	Findings:
12/16/1994	12/19/1994	12/21/1994	12/23/1894	12/27/1884	1228/1984	01/05/1996	01/05/1995	01/05/1995	01/05/1995	01/05/1985	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1995	01/05/1985	04/05/1986	01/05/1995	01/05/1985	01/05/1995	01/05/1985	01/05/1985	01/05/1885
NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GRDSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS
Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected	Sample Collected:	Sample Collected:	Sample Collected:
Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

.930	.170	20.800 MGA,	.100 NTU	12.160	4895.000 UGA.	20.800 MG/L	20.700 MGAL	20.800 MG/L	20.600 MGAL	20.800 MG/L	21.000 MG/L	.800 UGA	.120 UG/L	7.300 UG/L	.600 UG/L	.110 UGAL	2.200 UG/L	7.100 PCI/L	2.100 PCI/L	.700 UG/L	.060 UGAL	1.300 UG/L	21.800 MG/L	.700 UG/L
01/05/1995 LANGELIER INDEX @ 60 C	01/05/1995 LANGELIER INDEX @ SOURCE TEMP,	01/05/1995 NITRATE (AS NO3)	01/05/1996 TURBIDITY (LAB)	01/05/1995 Findings: AGGRSSIVE INDEX (CORROSIVITY)	01/05/1985 NITRATE + NITRITE (AS N)	01/09/1995 NTRATE (AS NO3)	01/11/1985 Findings: NITRATE (AS NO3)	01/13/1895 NITRATE (AS NO3)	01/17/1985 Findings: NITRATE (AS NO3)	01/18/1995 NTRATE (AS NO3)	01/20/1965 NITRATE (AS NOS)	02/10/1995 1,1-DICHLOROETHYLENE	02/10/1995 Findings: DIBROMOCHLOROPROPANE (DBCP)	02/10/1995 TRICHLOROETHYLENE	03/17/1966 Findings: 1,1-DICHLOROETHYLENE	03/17/1895 Findings: DIBROMOCHLOROPROPANE (DBCP)	03/17/1995 Findings: TRICHLOROETHYLENE	04/27/1995 Findings: GROSS ALPHA	04/27/1995 GROSS ALPHA COUNTING ERROR	04/27/1995 Findings: 1,1-DICHLOROETHYLENE	04/27/1895 Findings: DIBROMOCHLOROPROPANE (DBCP)	04/Z7/1895 Findings: TRICHLOROETHYLENE	04/27/1995 NITRATE (AS NO3)	05/09/1985 1,1-DKCHLOROETHYLENE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

																			or.					
35.200 UGAL	4770.000 UGAL	1.300 UGA.	.100 UG/L	32.100 UG/L	1.100 UG/L	.110 UGA.	34.400 UGAL	4800.000 UG/L	.700 UGA.	.080 UG/L	27.600 UGAL	13.700 PC/L	3.100 PCI/L	1.300 UG/L	.090 UG/L	34.800 UGAL	4600.000 UG/L	1.100 UGAL	33,400 UGAL	8.400 PCI/L	2200 PC/IL	1.400 UGAL	.100 UGAL	34.800 UGAL
Findings:	Findings:	Findings:	Findings: (DBCP)	Findings:	Fladings:	Findings: (DBCP)	Findings:	Findings:	Findings.	Findings: (DBCP)	Findings:	Findings:	Findings: RROR	Findings:	Findings: (DBCP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: RROR	Findings:	Findings: (DBCP)	Findings:
09/01/1995 TRICHLOROETHYLENE	08/06/1995 NITRATE + NITRITE (AS N)	09/19/1995 1,1-DICHLOROETHYLENE	09/19/1996 DIBROMOCHLOROPROPANE (DBCP)	08/18/1995 TRICHLOROETHYLENE	09/21/1995 1,1-DICHLOROETHYLENE	08/21/1995 DIBROMOCHLOROPROPANE (DBCP)	08/21/1996 TRICHLOROETHYLENE	10/03/1995 NITRATE + NITRITE (AS N)	10/13/1995 1,1-DICHLOROETHYLENE	10/13/1995 DIBROMOCHLOROPROPANE (DBCP)	10/13/1995 TRICHLOROETHYLENE	10/27/1895 GROSS ALPHA	10/27/1996 GROSS ALPHA COUNTING ERROR	10/27/1886 1,1-DICHLOROETHYLENE	10/27/1995 DIBROMOCHLOROPROPANE (DBCP)	10/27/1885 TRICHLOROETHYLENE	11/07/1985 NITRATE + NITRITE (AS N)	11/15/1985 1,1-DICHLOROETHYLENE	11/15/1995 TRICHLOROETHYLENE	11/21/1985 GROSS ALPHA	11/21/1995 GROSS ALPHA COUNTING ERROR	11/21/1995 1,1-DICHLOROETHYLENE	11/21/1995 DIBROMOCHLOROPROPANE (DBCP)	11/21/1995 TRICHLOROETHYLENE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Ohernical:	Semple Collected; Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemicat:	Sample Collected: Chemical:	Sumple Collected: Chemical:	Sample Collected: Chemical:

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Chemical:	11/21/1995 NITRATE + NITRITE (AS N)	Findings:	4700.000 UG/L
Sample Collected: Chemical:	11/28/1995 1,1-DICHLOROETHYLENE	Findings:	.800 UGA.
Sample Collected: Chemical:	11/28/1995 DIBROMOCHLOROPROPANE (DBCP)	Findings: P)	.080 UGAL
Sample Collected: Chemical:	11/28/1995 TRICHLOROFTHYLENE	Findings:	35.900 UG/L
Sample Collected: Chemical:	12/05/1995 NITRATE + NITRITE (AS N)	Findings:	4800.000 UG/L
Semple Collected: Chemical:	12/27/1995 DIBROMOCHLOROPROPANE (DBCP)	Findings: P)	.110 UG/L
Sample Collected: Chemical:	12/27/1995 TRICHLOROETHYLENE	Findings:	9.200 UG/L
Sample Collected: Chemical:	02/28/1986 1,1-DICHLOROETHYLENE	Findings:	.700 UG/L
Sample Collected: Chemical:	02/28/1996 DIBROMOCHLOROPROPANE (DBCP)	Findings: P)	.080 UG/L
Sample Collected: Chemical:	02/28/1988 TRICHLOROÉTHYLENE	Findings:	2.200 UG/L
Sample Collected: Chemical:	03/12/1896 SOURCE TEMPERATURE C	Findings:	17.200 C
Sample Collected: Chemical:	03/12/1998 SPECIFIC CONDUCTANCE	Findings:	400.000 UMHO
Sample Collected: Chemical:	03/12/1986 FIELD PH	Findings:	7.700
Sample Collected: Chemical:	03/12/1996 PH (LABORATORY)	Findings:	8.000
Sample Collected: Chemical:	03/12/1996 TOTAL ALKALINITY (AS CACO3)	Findings:	148.000 MG/L
Sample Callected: Chemical:	03/12/1898 BICARBONATE ALKALINITY	Findings:	180.600 MG/L
Sample Collected: Chemical:	03/12/1996 TOTAL HARDNESS (AS CACO3)	Findings:	170.000 MG/L
Sample Collected: Chemical:	03/12/1996 CALCIUM	Findings:	56.100 MG/L
Sample Callected: Chamical:	03/12/1996 MAGNESIUM	Findings:	10.000 MG/L
Sample Collected: Chemical:	03/12/1998 SODIUM	Findings:	12.000 MGAL
Sample Collected: Chemical:	D3/12/1896 POTASSIUM	Findings:	1.700 MG/L
Sample Collected: Chemical:	03/12/1998 CHLORIDE	Findings:	7.200 MGAL
Sample Collected: Chemical:	03/12/1998 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: IDENT)	.400 MG/L
Sample Collected: Chemical:	03/12/1996 BORON	Findings:	150.000 UG/L
Sample Collected: Chemical:	03/12/1986 GROSS ALPHA	Findings:	7.500 PCM

1.800 PCIA.	1.200 PCIA.	7.000 PCM.	.080 UG/L	1.800 UGAL	222.000 MG/L	.780	.010	20.000 MG/L	.100 NTU	12.020	4520.000 UG/L	4700.000 UG/L	8.300 PCIAL	2.400 PCM.	.080 UG/L	23.300 UG/L	4500.000 UG/L	2.400 UGA	.070 UGA	38.800 UG/L	4500.000 UG/L	1.200 UG/L	.150 UG/L	38.500 UGA.
03/12/1996 GROSS ALPHA COUNTING ERROR	03/12/1996 GROSS BETA COUNTING ERROR	03/12/1996 Findings: URANIUM	03/12/1986 DIBROMOCHLOROPROPANE (DBCP)	03/12/1998 Findings: TRICHLOROETHYLENE	03/12/1896 Findings: TOTAL DISSOLVED SOLIDS	03/12/1896 Findings: LANGELIER INDEX @ 60 C	03/12/1996 Findings: LANGELIER INDEX @ SOURCE TEMP.	03/12/1996 NITRATE (AS NO3)	03/12/1996 TURBIDITY (LAB)	03/12/1996 Findings: AGGRSSIVE INDEX (CORROSIVITY)	03/12/1996 NITRATE + NITRITE (AS N)	04/23/1998 NITRATE + MITRITE (AS N)	04/29/1898 GROSS ALPHA	04/29/1996 GROSS ALPHA COUNTING ERROR	04/29/1996 Findings: DIBROMOCHLOROPROPANE (DBCP)	04/29/1986 Findings: TRICHLOROETHYLENE	05/07/1996 Findings: NITRATE + NITRITE (AS N)	05/24/1998 Findings: 1,1-DICHLOROETHYLENE	05/24/1996 Findings: DIBROMOCHLOROPROPANE (DBCP)	06/24/1996 Findings: TRICHLOROETHYLENE	08/04/1996 Findings: NITRATE + NITRITE (AS N)	06/24/1986 Findings: 1,1-DichLOROETHYLENE	08/24/1996 Findings: DBROMOCHLOROPROPANE (DBCP)	0824/1996 Findings: TRICHLOROETHYLENE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Callected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Callected: Chemical:	Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sumple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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Findings: 7.500 PCM.	Findings: 1.800 PC//L.	Findings: 1.400 UGAL	Findings: .080 UG/L.	Findings: 38.100 UG/L	Findings: 1.800 UGA.	Findings: .090 UGAL.	Findings: 32.300 UGAL	Findings: 1,900 UGA.	Findings: .100 UG/L	Findings: 35.000 UG/L	Findings: 2.600 UG/L	Findings: .080 UG/L	Findings: 26,700 UG/L	Findings: 6.800 PCI/L	Findings: 1.800 PCJAL	Findings: 1.400 UGAL	Findings: .080 UG/L	Findings: 26.300 UG/L	Findings: .800 UG/L	Findings: .100 UG/L	Findings: 4.100 UG/L	Findings: 20,000 C	Findings: 420,000 UMHO	
07/16/1996	07/15/1998	07/15/1996	07/15/1986	07/15/1996	08/02/1996	08/02/1996	08/02/1896	08/28/1996	08/28/1996	08/28/1996	09/18/1996	08/18/1996	08/18/1986	10/08/1996	10/08/1998	10/08/1998	10/08/1996	10/08/1996	12/12/1996	12/12/1998	12/12/1996	01/13/1987	01/13/1997	
GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING EFROR	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE										
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collocted:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	

7.600	149,000 MG/L	182.000 MG/L	175,000 MG/L	56.900 MG/L	9.700 MG/L	13.700 MG/L	1.400 MG/L	6.800 MG/L	.510 MG/L	5.100 PC/L	1.600 PCM.	1.000 PCM.	7.000 PCM.	.080 UGA.	2,900 UG/L	227.000 MG/L	069.	19.200 MG/L	UTM 001.	5.000 PC/L	604,000 PCI/L	11.830	4340.000 UGAL	432.000 PCM.
01/13/1997 Findings: PH (LABORATORY)	01/13/1997 TOTAL ALKALINITY (AS CACO3)	01/13/1997 BICARBONATE ALKALINITY	01/13/1997 TOTAL HARDNESS (AS CACO3)	01/13/1997 Findhgs: CALCIUM	01/13/1997 Findings: MAGNESIUM	01/13/1997 Findings: SODIUM	01/13/1997 Findings: POTASSIUM	01/13/1997 Findings: CHLORIDE	01/13/1997 Fluoride Dependent)	01/13/1997 GROSS ALPHA	01/13/1997 GROSS ALPHA COUNTING ERROR	01/13/1997 GROSS BETA COUNTING ERROR	01/13/1997 Findings: URANIUM	01/13/1997 DIBROMOCHLOROPROPANE (DBCP)	01/13/1897 Findings: TRICHLOROETHYLENE	01/13/1997 Findings: TOTAL DISSOLVED SOLIDS	01/13/1907 Findhqs: LANGELIER INDEX @ 60 C	01/13/1997 Findings: NITRATE (AS NG3)	01/13/1997 TURBIDITY (LAB)	01/13/1907 Findings: TOTAL RADON 222 COUNTING ERROR	01/13/1997 TOTAL RADON 222	01/13/1897 Findings: AGGRSSIVE INDEX (CORROSIVITY)	01/13/1997 NITRATE + NITRITE (AS N)	01/13/1987 Findings: TRITIUM
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Callected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicel:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Semple Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected. Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:

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Sample Collected: Chemical:	01/13/1987 TRITIUM COUNTING ERROR	Findings:	168.000 PCIII.
Sample Collected: Chemical:	01/13/1997 RADIUM 228	Findings:	1.550 PCIA.
Sample Collected: Chemical:	01/13/1997 RADIUM 226 COUNTING ERROR	Findings:	.750 PCIA.
Sample Collected: Chemical:	01/13/1997 RADIUM 228	Findings:	1.840 PCM.
Sample Collected: Chemical:	01/13/1997 RADYUM 228 COUNTING ERROR	Findings:	.360 PCM.
Sample Collected: Chemical:	01/13/1997 STRONTIUM-90 COUNTING ERROR	Findings:	.980 PCM
Sample Collected: Chemical:	02/18/1997 GROSS ALPHA	Findings:	4.900 PCIA
Sample Collected: Chemical:	02/18/1997 GROSS ALPHA COUNTING ERROR	Findings:	1.500 PCIA.
Sample Collacted: Chemical:	02/18/1997 1,1-DKCHLOROETHYLENE	Findings:	1.800 UG/L
Sample Collected: Chemical:	02/18/1997 DIBROMOCHLOROPROPANE (DBCP)	Findings:)	.120 UG/L
Sample Collected: Chemical:	02/18/1987 TRICHLOROETHYLENE	Findings;	2.600 UG/L
Sample Collected: Chemical:	03/06/1987 DIBROMOCHLOROPROPANE (DBCP)	Findings:)	.110 UG/L
Sample Collected: Chemical:	03/06/1/987 TRICHLOROETHYLENE	Findings:	1.700 UGAL
Sample Collected: Chemicel;	04/07/1/997 1,1-DKPHLOROETHYLENE	Findings:	1.300 UGAL
Sample Collected: Chemicst	04/07/1997 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.100 UGA.
Sample Collected: Chemicst	04/07/1997 TRICHLOROETHYLENE	Findings:	1.400 UGAL
Sample Collected: Chemicat	04/07/1997 GROSS ALPHA	Findings:	8.400 PCIA
Sample Collected: Chemical:	04/07/1997 GROSS ALPHA COUNTING ERROR	Findings:	2.800 PCIA.
Sample Collected: Chemical:	05/06/1997 GROSS ALPHA	Findings:	7.800 PC/A.
Sample Collected: Chemical:	05/06/1997 GROSS ALPHA COUNTING ERROR	Findings:	2.700 PCM.
Sample Collected: Chemical:	05/06/1997 1,1-DICHLOROETHYLENE	Findings:	1.500 UGAL
Sample Collected: Chemical:	05/06/1997 DISROMOCHLOROPROPANE (DBCP)	Findings:	110 UGL
Sample Collected: Chemical:	05/06/1897 TRICHLOROETHYLENE	Findings:	2.500 UG/L
Sample Collected: Chemical:	08/09/1997 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.100 UG/L
Sample Collected: Chemical:	06/09/1997 TRICHLOROETHYLENE	Findings:	18.700 UGAL

6.500 PC/IL	2.200 PCM.	1.100 UG/L	.110 UG/L	2.600 UG/L	.100 UG/L	2.900 UGAL	1200 UG/L	.100 UGA.	2.000 UG/L	5.700 PCIA.	2.200 PCM.	1.900 UGAL	.080 UGA.	12.400 UGAL	.082 UGA	13.900 UGAL	17.800 C	395,000 UMHO	8.000	7.680	148.000 MG/L	180.000 MG/L	181.000 MG/L	56.900 MG/L
07/15/1997 Findings: GROSS ALPHA	07/15/1997 GROSS ALPHA COUNTING ERROR	07/15/1997 1,1-DICHLOROETHYLENE	07/15/1987 Findings: DIBROMOCHLOROPROPANE (DBCP)	07/15/1987 TRICHLOROETHYLENE	08/13/1997 DIBROMOCHLOROPROPANE (DBCP)	08/13/1997 Findings: TRICHLOROETHYLENE	09/10/1997 1,1-DICHLOROETHYLENE	09/10/1997 DIBROMOCHLOROPROPANE (DBCP)	09/10/1997 Findings: TRICHLOROETHYLENE	10/06/1997 Findings: GROSS ALPHA	10/06/1997 Findings: GROSS ALPHA COUNTING ERROR	10/08/1997 Findings: 1,1-DICHLOROETHYLENE	10/06/1987 Findings: DIBROMOCHLOROPROPANE (DBCP)	10/06/1997 Findings: TRICHLOROETHYLENE	11/04/1987 Findings: DIBROMOCHLOROPROPANE (DBCP)	12/04/1897 TRICHLOROETHYLENE	01/13/1998 Findings: SOURCE TEMPERATURE C	01/13/1998 Findings: SPECIFIC CONDUCTANCE	01/13/1988 Findings:	01/13/1898 Findings: PH (LABORATORY)	01/13/1988 Findings: TOTAL ALKALINITY (AS CACO3)	01/13/1998 Findings: BICARBONATE ALXALINITY	01/13/1888 Findings: TOTAL HARDNESS (AS CACO3)	01/19/1988 Findings: CALCIUM
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical;	Semple Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:

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Sample Collected: Chemical: Sample Collected: Chemical:	01/13/1968 MACNESIUM 01/13/1968 SODIUM	Findings. Findings:	9.300 MG/L 13.400 MG/L
Ÿ	01/13/1998 CHLORIDE	Findings:	5.510 MG/L
Sample Collected: Chamical:	01/13/1998 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: DENT)	.533 MG/L
Sample Collected: Chemical:	01/13/1998 GROSS ALPHA	Findings:	8.900 PCI/L
Sample Collected: Chemical:	01/13/1898 GROSS ALPHA COUNTING ERROR	Findings:	2.500 PC//L
Sample Collected: Chemical:	01/13/1998 GROSS BETA	Findings:	4.100 PCM.
Sample Collected: Chemical:	01/13/1998 GROSS BETA COUNTING ERROR	Findings:	1.400 PC/L
Sample Collected: Chemical:	01/13/1998 URANIUM	Findings:	8.700 PC/L
Sample Collected: Chemical:	DIBROMOCHLOROPROPANE (DBCP)	Findings:	.091 UG/L
Sample Collected: Chemical:	01/13/1998 TRICHLOROETHYLENE	Findings:	3.300 UG/L
Sample Collected: Chemical:	01/13/1898 TOTAL DISSOLVED SOLIDS	Findings:	228.000 MG/L
Sample Collected: Chemical:	01/13/1998 LANGELIER INDEX @ 80 C	Findings:	1.090
Sample Collected: Chemical;	01/13/1988 FI LANGELIER INDEX @ SOURCE TEMP.	Findings: P.	330
Sample Collected: Chemical:	01/13/1998 NITRATE (AS NO3)	Findings:	18.500 MG/L
Sample Collected: Chemical:	01/13/1998 TURBIDITY (LAB)	Findings:	.100 NTU
Sample Collected: Chemical:	01/13/1898 TOTAL RADON 222 COUNTING ERROR	Findings: OR	5.000 PCIA.
Sample Collected: Chemical:	01/13/1998 TOTAL RADON 222	Findings:	769.000 PCI/L
Sample Collected: Chemical:	01/13/1998 AGGRSSIVE INDEX (CORROSIVITY)	Findings:	12.320
Sample Collected: Chemical:	01/13/1988 URANIUM COUNTING ERROR	Findings.	1.700 PCM.
Sample Collected: Chemical:	01/13/1988 NITRATE + NITRITE (AS N)	Findings:	4180.000 UG/L
Semple Collected: Chemical:	01/13/1998 TRITIUM COUNTING ERROR	Findings:	110.000 PC//L
Sample Collected: Chemical:	01/13/1898 RADIUM 226 COUNTING ERROR	Findings.	.170 PCM.
Sample Collected: Chemical:	01/13/1998 RADIUM 228 COUNTING ERROR	Findings:	.320 PCM.
Sample Collected: Chemical:	01/13/1998 STRONTIUM-90 COUNTING ERROR	Findings:	.270 PCM.

Map ID Direction Distance				
E29 55E 1/2 - 1 Mile Higher			CA WELLS	EDR ID Number
Water System Information: Prince Station Code: 3610037-1015 PRDS Number: 3610037101 District Number: 3610037101 Weller Type: Well/Groundw Source LelLong: 3404000 1179: 3500000 System Number: 3610037 System Number: 3610037 System Number: REDLAMDS COGenization That Operates System:	2810037-101GACR User 2810037-101GACR Court 13 Well/Coundwater Well 340-00.0 1171100.0 Proc 11EVAS SIREET GAC RAW INFLUENT 3610037 REDLAMDS CITY MUD-WATER DIV Perstes System:	User ID: County; Station Type: Well Status: Precision: UENT	TAN San Beernardino COMPAYELLINITAKE GR 1,000 Feet (10 Seconds)	
Pop Served: Area Served:	REDLANDS, CA 92.373 69300 REDLANDS	Connections:	18447	
sample Information: " O Sample Coffected: Chemical:	Sample Information: "Only Findings Above Detection Level Are Listed Sample Calected: 09/18/1995 Chemical: 1,1-DKCHLOROETHYLENE	tre Listed Findings:	1,800 UGAL	
Sample Collected: Chemical:	09/19/1995 TRICHLOROETHYLENE	Findings:	17.100 UG/L	

CA WELLS 18785	dino JSUPPLY seted (0 Seconds)						
ថ	TAN San Beanardino COMPNELL/SUIPPLY Combined Treated 1,000 Feet (10 Seconds)	18447	24.000 MGAL	1.000 UG/L	.700 UGAL	10.800 MG/L	1.700 UG/L
	User ID: County: Statun Type: Well Status: Precision:	Connections:	ve Listed Findings:	Findings:	Findings:	Findings:	Findings:
	III. 38410337-400GACT UJA 38410337-400GACT CC C	69300 REDLANDS	Sample Information: * Only Findings Above Detection Level Are Listed Sample Collected: 01/28/1993 Chemical: NITRATE (AS NO3)	03/31/1993 BROMOFORM (THM)	03/31/1963 DIBROMOCHLOROMETHANE (THM)	03/31/1993 Nitrate (As no3)	03/31/1993 Total Trihalomethanes
1/2 - 1 Mile Higher	Water System Information: PHINE Station Code: 3610037-1000 FRUS Number: 3610037-1000 District Number: 3340400,0 147- Source Laft Long: 340400,0 147- System Number: 3610037	Pop Served: Area Served:	Sample Information: * Or Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemicat:

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Findings: 18.200 MG/L	Findings: 22.500 MG/L	Findings: 22.600 MG/L	Findings: 23.100 MG/L	Findings: 23,000 MG/L	Findings: 23.300 MG/L	Findings: 23,300 MG/L	Findings: 23.600 MG/L	Findings: 23.200 MG/L	Findings: 23.200 MG/L.	Findings: 23.400 MG/L	Findings: 22.700 MG/L	Findings: 23.100 MG/L	Findings: 22.000 MG/L	Findings: 22.700 MG/L	Findings: 22.400 MG/L	Findings: 21,900 MG/L	Findings: 21,900 MG/L	Findings: 21,700 MG/L	Findings: 22,200 MG/L	Findings: 22.100 MG/L	Findings: 21.400 MG/L	Findings: 20.500 MG/L	Findings: 21.700 MG/L	Findings: 21,800 MG/L
04/02/1993	04/05/1993	04/07/1983	04/09/1993	04/12/1993	04/14/1983	04/16/1983	04/19/1893	04/21/1993	04/23/1883	04/28/1993	04/28/1883	04/30/1983	05/03/1963	05/05/1993	05/07/1983	05/10/1983	05/12/1993	06/14/1893	05/17/1993	05/19/1983	06/21/1983	05/28/1993	06/01/1993	DB/DZ/1983
NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NOS)	NITRATE (AS NO3)	NTRATE (AS NO3)						
Sample Collectod:	Sample Collected:	Semple Collected:	Sample Collected:																					
Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:						

GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

21.800 MG/L

06/04/1983 MTRATE (4S NO3) 06/07/1983 MTRATE (4S NO3) 06/08/1983 MTRATE (4S NO3) 06/11/1983 MTRATE (4S NO3) 06/14/1983 MTRATE (4S NO3) 06/14/1983 MTRATE (4S NO3) 06/14/1983 MTRATE (4S NO3) 06/14/1983 MTRATE (4S NO3)

21.200 MG/L

21.500 MG/L 21.000 MG/L

21.300 MG/L

Semple Collected: Chemical: 20.900 MG/L

21.100 MG/L

20.800 MG/L 21.800 MG/L

DB/23/1993 NITRATE (AS NO3) DB/25/1993 NITRATE (AS NO3)

Sample Collected: Chemical: Sample Collected: Chemical: Sample Collected: Chemical:

08/28/1993 NITRATE (AS NO3)

21.100 MG/L

Findings: Findings: Findings: 21.500 MG/L

Findings:

21.800 MG/L

21.800 MGAL

Findings:

07/08/1893 NITRATE (AS NO3) 07/07/1893 NITRATE (AS NO3)

07/08/1883
WITRATE (AS NO3)
07/12/1883
WITRATE (AS NO3)
07/16/1883
WITRATE (AS NO3)
07/16/1883
WITRATE (AS NO3)
07/16/1883

07/02/1993 NITRATE (AS NO3)

Semple Collected: Chemical: Semple Collected: Chemical: Semple Collected: Chemical:

D6/30/1893 NITRATE (AS NO3)

Sample Collected: Chemical: 21.800 MGA 21.700 MGA 22.100 MGA 21.800 MGA

Findings:

21.500 MG/L

21.500 MGAL 21.500 MGAL 21.500 MGAL 22.800 MGAL

> Findings: Findings.

07/26/1993 NITRATE (AS NOS)

07/21/1883 NITRATE (AS NO3) 07/23/1883 NITRATE (AS NO3)

21.700 MG/L

Findings:

22.700 MG	22.800 MG	22.600 MG	22.200 MG	22.300 MG	22.400 MG	22.700 MG	22.700 MG	22.400 MG	22.200 MG	22.300 MG	22.000 MG	22.100 MG	22.100 MG	22.300 MG	22.200 MG	22.200 MG	22.000 MG	22.000 MG	21.100 MG	21.800 MG	22.000 MG	22.200 MG	21.100 MG	22.400 MG
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings.	Findings;	Findings:	Findings:
08/02/1993 NITRATE (AS NO3)	08/04/1983 NITRATE (AS NO3)	08/08/1993 NITRATE (AS NO3)	08/09/1993 NITRATE (AS NO3)	08/11/1983 NITRATE (AS NO3)	08/13/1993 NITRATE (AS NO3)	08/17/1993 NITRATE (AS NO3)	08/18/1993 NITRATE (AS NO3)	08/20/1983 NITRATE (AS NO3)	08/23/1963 NITRATE (AS NO3)	08/25/1993 NITRATE (AS NO3)	08/27/1993 NITRATE (AS NO3)	08/30/1903 NITRATE (AS NO3)	09/01/1993 NFFRATE (AS NO3)	OS/OS/1993 NITRATE (AS NO3)	09/07/1983 NITRATE (AS NO3)	09/08/1993 NITRATE (AS NO3)	09/10/1983 NITRATE (AS NO3)	08/13/1983 NITRATE (AS NO3)	09/15/1983 NITRATE (AS NO3)	09/17/1993 NITRATE (AS NO3)	09/20/1983 NITRATE (AS NO3)	09/22/1983 NITRATE (AS NO3)	09/24/1993 NITRATE (AS NO3)	08/27/1993 NITRATE (AS NO3)
Semple Collected: Chemicat.	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:																					

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22.500 MG/L

07/28/1983 NITRATE (AS NO3) 07/30/1983 NITRATE (AS NO3)

22.600 MG/L	22.000 MG/L	22,000 MGA.	21.000 MG/L	Z3.000 MG/L	22.100 MG/L	6.700 PC/IL	1.900 PC/L	30.000 MGA.	28.800 MGA.	21.800 MGA.	22.000 MG/L	24.800 MG/L	22.500 MG/L	21.900 MG/L	21.800 MG/L	22.100 MG/L	22,100 MG/L	22.300 MG/L	21.800 MG/L	21.700 MG/L	21.500 MG/L	21.300 MG/L	21.000 MG/L	20.200 PCIA.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: VG ERROR	Findings:	Findings.	Findings:	Findings:	Findings:	Findings	Findings:	Findings:	Findings:								
09/29/1993 NITRATE (AS NO3)	10/01/1993 NITRATE (AS NO3)	10/04/1993 NITRATE (AS NO3)	10/06/1993 NITRATE (AS NO3)	10/08/1983 NITRATE (AS NOS)	10/12/1983 NITRATE (AS NO3)	10/13/1993 GROSS ALPHA	10/13/1993 GROSS ALPHA COUNTING ERROR	10/13/1993 NITRATE (AS NO3)	10/15/1983 NITRATE (AS NO3)	10/18/1993 NITRATE (AS NOS)	10/20/1993 NITRATE (AS NO3)	10/22/1963 NITRATE (AS NO3)	10/25/1993 NITRATE (AS NO3)	10/27/1983 NITRATE (AS NO3)	10/29/1993 NITRATE (AS NO3)	11/01/1983 NITRATE (AS NO3)	11/03/1983 NITRATE (AS NO3)	11/05/1993 NITRATE (AS NO3)	11/08/1993 NITRATE (AS NO3)	11/MO/1983 NITRATE (AS NO3)	11/12/1993 NITRATE (AS NO3)	11/15/1993 NITRATE (AS NO3)	01/11/1984 NITRATE (AS NO3)	04/19/1994 GROSS ALPHA
Sample Collected: Chemical:	Sample Collected: Chemicat:	Semple Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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age: 3.200 PC/L	986: 4.200 PCM.	ngs: 1.300 PCIA.	age: 21.000 PCIAL	sgs: 527.000 PCIAL	1895: 59.000 PCIAL	gas: .100 PCIAL	ngs: .020 PCVL	gs: 5.780 PCIA.	gs: .360 PCVL	ця: 18.900 МGЛ.	gs: 21.700 MG/L	ga: 22.000 MG/L	gs: 21.200 MG/L	gs: 22.100 MG/L	gs: 22.100 MG/L	gs: 20.800 MG/L	gs: 22.000 MG/L	gas: 5.100 PCIAL	gs: 2.000 PCIA.	gs: 1.200 PCIA.	gs: 7.000 PCIAL	gs: 21.900 MG/L	gs: 21.400 MG/L	21.300 MG/L
Findings: R	Findings:	Findings:	Findings:	Findings:	Findings	Findings	Findings	Findings	Findings:	Findings	Findings	Findings	Findings:	Findings:	Findings	Findings:	Findings	Findings	Findings	Findings	Findings	Findings:	Findings:	Findings:
04/19/1984	04/191984	04/19/1994	04/19/1894	04/19/1994	04/19/1994	04/19/1894	04/19/1994	04/19/1994	04/19/1994	04/20/1894	04/22/1894	04/25/1894	04/27/1994	04/28/1994	05/02/1894	05/03/1894	05/04/1894	05/06/1994	05/06/1994	05/06/1994	05/06/1994	05/06/1994	05/08/1994	05/11/1994
GROSS ALPHA COUNTING ERROR	GROSS BETA	GROSS BETA COUNTING ERROR	Uranium	TRITIUM	TRITIUM COUNTING ERROR	RA 228 + RA 228	RA 228 + RA 228 COUNTING ERROR	STRONTIUM-BO	STRONTIUM-80 COUNTING ERROR	NITRATE (AS NO3)	NITRATE (AS NO3)	NTRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	NITRATE (AS NO3)	NITRATE (AS NO3)	
Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	

21.600 MG/L	21.400 MG/L	21.500 MG/L	21.800 MGAL	21,800 MG/L	21.800 MG/L	21.800 MG/L	21.500 MG/L	21.700 MG/L	21.500 MG/L	21.200 MGA.	.600 UG/L	21.200 MG/L	21.500 MG/L	21.500 MG/L	21.500 MG/L	21.400 MG/L	21.400 MG/L	21.200 MG/L	21.100 MG/L	21.200 MG/L	21.200 MG/L	21.100 MG/L	21.000 MG/L	22.100 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Hndings:	Findings:	Findings:	Findings:	Hndings:	Findings:										
05/13/1984 NITRATE (AS NO3)	05/16/1964 NITRATE (AS NO3)	05/18/1994 NITRATE (AS NO3)	05/20/1994 NITRATE (AS NO3)	05/23/1984 NITRATE (AS NO3)	05/25/1984 NITRATE (AS NO3)	05/27/1994 NITRATE (AS NO3)	05/31/1984 NITRATE (AS NO3)	06/01/1994 NITRATE (AS NO3)	06/03/1884 NITRATE (AS NO3)	06/03/1984 NITRATE (AS NO3)	06/06/1994 1,1-DICHLOROETHYLENE	06/06/1984 NITRATE (AS NO3)	06/08/1894 NITRATE (AS NO3)	06/10/1994 NITRATE (AS NO3)	06/13/1994 NITRATE (AS NO3)	08/15/1984 NITRATE (AS NO3)	08/17/1994 NITRATE (AS NO3)	08/20/1994 NITRATE (AS NO3)	06/22/1984 NITRATE (AS NO3)	06/24/1994 NITRATE (AS NO3)	08/27/1994 NITRATE (AS NO3)	06/29/1994 NITRATE (AS NO3)	07/01/1994 NITRATE (AS NO3)	07/06/1994 Nitrate (as no3)
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Callected: Chemical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

gs: 21.100 MG/L	9.800 PCM	ngs: 2.600 PC//L	1.600 UG/L	1.000 UG/L	1,600 UG/L	igs: 21.000 MG/L	gs: 21.100 MG/L	gs: 21.000 MG/L	ga: 20.800 MG/L	gs: 21.000 MG/L	gs: 21.000 MG/L	ge: 21.000 MG/L	gs: 20.800 MG/L	gs: 20.800 MGAL	gs: 20.900 MG/L	gs: 21.000 MG/L	gs: 1.600 UGAL	gs: 21.000 MG/L	gs: 20.300 MG/L	ge: 21.000 MGAL	gs: 21.000 MGA.	gs: 21.100 MG/L	ga: 21.200 MG/L	gs: 21.300 MG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings	Findings:	Findings:	Findings:
07/05/1994	07/06/1994	07/06/1984	07/08/1994	07/08/1994	07/08/1994	07/08/1984	07/08/1994	07/11/1984	07/13/1984	07/16/1984	07/18/1994	07/20/1984	07/22/1884	07/25/1884	07/27/1884	07/29/1994	08/01/1894	08/01/1984	08/02/1994	DB/03/1884	08/05/1894	08/08/1894	08/10/1884	08/12/1994
NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	CHLOROFORM (THM)	1,1-DICHLOROETHYLENE	TOTAL TRIHALOMETHANES	NITRATE (AS NO3)	NITRATE (AS NOS)	Nitrate (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	1,1-DICHLOROETHYLENE	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NC3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)					
Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected.	Sample Collected:	Semple Collected					
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicel:	Chemical:	Chemical;	Chemical:														

21.200 MGAL	21.200 MG/L	21.200 MG/L	21.100 MG/L	21.100 MG/L	21.200 MG/L	21.200 MG/L	21.200 MGAL	19.700 MG/L	19.500 MG/L	19.500 MG/L	19.800 MG/L	19.600 MG/L	20.000 MG/L	20.200 MG/L	19.500 MG/L	.700 UG/L	19.500 MG/L	19.600 MG/L	19.700 MG/L	19.500 MG/L	19.700 MG/L	18.300 MG/L	8.300 PCIAL	2.200 PCIA.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Firdings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: RROR
08/15/1994 NITRATE (AS NO3)	08/17/1994 NITRATE (AS NO3)	08/18/1994 NITRATE (AS NO3)	08/22/1984 NITRATE (AS NO3)	08/24/1894 NITRATE (AS NO3)	08/26/1994 NITRATE (AS NO3)	08/29/1994 NITRATE (AS NO3)	08/31/1994 NITRATE (AS NO3)	08/02/1984 NITRATE (AS NO3)	09/02/1994 NITRATE (AS NO3)	09/06/1994 NITRATE (AS NO3)	09/07/1894 NITRATE (AS NO3)	09/09/1894 NITRATE (AS NO3)	09/12/1894 NITRATE (AS NO3)	09/14/1894 NITRATE (AS NO3)	08/16/1884 NITRATE (AS NO3)	09/19/1884 1,1-DICHLOROETHYLENE	09/19/1994 NITRATE (AS NOS)	09/21/1994 NITRATE (AS NO3)	09/23/1994 NITRATE (AS NOS)	09/26/1994 NITRATE (AS NO3)	08/28/1994 NITRATE (AS NO3)	08/30/1884 NITRATE (AS NO3)	10/03/1884 GROSS ALPHA	10/03/1994 GROSS ALPHA COUNTING ERROR
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicel:	Sample Collected: Chemicat	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Callected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collectert Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical:	Semple Collected: Chemical:

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.700 UGAL	1.300 UG/L	1.100 UGAL	.700 UG/L	21.200 MG/L	19.700 MGAL	21,200 MGAL	21.200 MG/L	20.900 MG/L	21.000 MG/L	21.000 MG/I.	21.400 MG/L	21.300 MG/L	21.100 MG/L	21.100 MG/L	21.200 MG/L	21.100 MG/L	20,900 MG/L	20.800 MG/L	21.100 MG/L	2.000 UGA	20.900 MG/L	20.900 MGAL	20.900 MGA.	21.000 MG/L
Findings:	Findings:	Findings:	Findings:	Hndings:	Findings:	Findings:	Findings:	Findings:	Findings:															
10/03/1994	10/03/1994	10/03/1994	10/03/1894	10/03/1994	10/04/1984	10/05/1994	10/07/1994	10/11/1894	10/12/1994	10/14/1994	10/17/1994	10/18/1984	1021/1994	10/24/1994	10/28/1994	10/28/1994	10/31/1984	11/02/1994	11/04/1894	11/07/1994	11/07/1994	11/09/1994	11/10/1994	11/14/1994
CHLOROFORM (THM)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	TOTAL TRIHALOMETHANES	NITRATE (AS NO3)	1,1-DICHLOROETHYLENE	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)															
Sample Collected:	Sample Collected:	Sample Collected:	Saruple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Findings: Findings: Findings: Findings: Findings: Findings: Findings:	
	TURE C
	1214/1984 NITRATE (AS NO3) 1219/1984 NITRATE (AS NO3) 12124/1984 NITRATE (AS NO3) 12224/1984

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7.800	160.400 MG/L	195.700 MG/L	196.000 MCAT.	60.600 MG/L	9.400 MG/L	18.000 MG/L	1.800 MG/L	5.500 MG/L	.500 MGA.	7.300 PCIA	2.300 PCM.	1.200 PCIA.	8.000 PCM.	.800 UGAL	1.800 UG/L	2.800 UG/L	240.000 MG/L	.950	.180	21.700 MG/L	JTM 001.	12.180	4898.000 UGA.	256.000 PG/IL
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: (NDENT)	Findings:	Findings: R	Findings:	Findings:	Findings:	Findings:	Findings:	Findings.	Findings:	Findings: SMP.	Findings:	Findings:	Findings: Y)	Findings:	Findings:
01/10/1985	01/10/1995	01/10/1995	01/10/1995	01/10/1995	01/10/1995	01/10/1985	01/10/1895	01/10/1995	01/10/1995	01/10/1996	01/10/1985	01/10/1995	01/10/1996	01/10/1995	01/10/1895	01/10/1995	01/10/1995	01/10/1996	01/10/1985	01/10/1995	01/10/1996	01/10/1995	01/10/1995	01/10/1985
PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	CHLOROFORM (THM)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)	TRITIUM
Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected.	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat	Chemicat:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

118.000 PCI/L	1,000 PCIA,	.900 PCI/L	20.600 MG/L	20.600 MG/L	20.700 MGAL	20.600 MG/L	21.000 MG/L	21.700 MG/L	9.200 PCM.	2.500 PCI/L	21.400 MG/L	7.900 PC/A.	2.000 PCM.	4780.000 UG/L	1200 UG/L	1.600 UG/L	16.800 UG/L	1.800 UGAL	10.200 UG/L	1.100 UG/L	22.300 UG/L	1.400 UG/L	4.800 UGAL	1.700 UGA.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/10/1985	01/10/1985	01/10/1995	01/11/1886	01/13/1385	01/17/1895	01/18/1985	01/20/1985	06/20/1985	08/20/1995	06/20/1995	07/05/1895	07/10/1995	07/10/1995	08/01/1995	08/18/1985	09/01/1985	08/01/1995	09/01/1995	09/01/1885	09/01/1995	09/01/1995	09/01/1995	09/01/1995	09/01/1996
TRITIUM COUNTING ERROR	RA 226 + RA 228 COUNTING ERROR	STRONTIUM-80 COUNTING ERROR	NITRATE (AS NO3)	NITRATE (AS NO3)	NTRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE (AS NO3)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE + NITRITE (AS N)	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE								
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Cullected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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Findings: 1.100 UGA,	Findings: 1.900 UG/L	Findings 030 UG/L	Findings: 31,200 UG/L	Findings: 1.800 UGA.	Findings: 3.800 UG/L	Findings: 4800.000 UGA.	Findings: 1.900 UG/L	Findings: 4.100 UG/L	Findings: 2.200 UG/L	Findings: 2.200 UG/L	Findings: 1.800 UG/L	Findings: 10,900 UGAL	Findings: 2.000 UG/L	Findings: 1.800 UG/L	Findings: 4700.000 UGAL	Findings: 1.000 UG/L.	Findings: 1.200 UGA.	Findings: 1.300 UG/L	Findings: 1.300 UG/L	Findings: 1.800 UG/L	Findings: 5.000 UGA.	Findings; 1.000 UGL	Findings: .900 UG/L	Findings: 2.100 UG/L
09/01/1995 TRICHLOROETHYLENE	09/01/1995 1,1-DICHLOROETHYLENE	09/01/1995 DIBROMOCHLOROPROPANE (DBCP)	09/01/1995 TRICHLOROETHYLENE	09/01/1995 1,1-DICHLOROETHYLENE	09/01/1995 TRICHLOROETHYLENE	09/05/1995 NITRATE + NITRITE (AS N)	09/16/1995 1,1-DICHLOROETHYLENE	09/19/1995 TRICHLOROETHYLENE	09/19/1995 1,1-DICHLOROETHYLENE	08/19/1995 TRICHLOROETHYLENE	09/19/1995 1,1-DICHLOROETHYLENE	09/19/1996 TRICHLOROETHYLENE	09/19/1995 1,1-DICHLOROETHYLENE	09/19/1995 1,1-DICHLOROETHYLENE	10/03/1985 NITRATE + NITRITE (AS N)	10/13/1995 1,1-DICHLOROETHYLENE	10/13/1985 1,1-DICHLOROETHYLENE	10/13/1986 1,1-DICHLOROETHYLENE	10/13/1995 1,1-DICHLOROETHYLENE	10/13/1996 1,1-DICHLOROETHYLENE	10/13/1995 TRICHLOROETHYLENE	10/27/1995 1,1-DICHLOROETHYLENE	10/27/1995 1,1-DICHLOROETHYLENE	10/27/1995 1,1-DICHLOROETHYLENE
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected; Chemical;	Sample Collected: Chemical:	Sample Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

.800 UGA.	.800 UG/L	1,400 UG/L	2.000 UG/L	.600 UG/L	11.900 PCM.	2.800 PC//L	5200.000 UG/L	6.200 PCM.	1.800 PCM.	4600.000 UGAL	3.200 UG/L	1.400 UGA	1.200 US/L	4700,000 UGAL	4700.000 UG/L	8.000 PCVL	2.500 PCIA.	4600.000 UGAL	.800 UGA.	1.400 UGA	.800 UG/L	4600.000 UG/L	.700 UGA.	.800 UG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
10/27/1995	1027/1995	1027/1995	1027/1985	1027/1985	10/27/1995	10/27/1996	11/07/1995	11/21/1985	11/21/1895	11/21/1985	11/28/1996	11/28/1985	11/28/1986	12/05/1995	0423/1996	04/29/1996	04/29/1996	05/07/1996	05/24/1996	05/24/1996	06/24/1896	06/04/1996	06/24/1886	08724/1896
TRICHLOROETHYLENE	1.1-DICHLOROETHYLENE	1,1-DICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE + NITRITE (AS N)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	TRICHLOROETHYLENE	NITRATE + NITRITE (AS N)	NITRATE + NITRITE (AS N)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	NITRATE + NITRITE (AS N)	CHLOROFORM (THM)	1,1-DICHLOROETHYLENE	TOTAL TRIHALOMETHANES	NITRATE + NITRITE (AS N)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

7.300 PC/L	1.800 PCIAL	.800 UG/L	1.700 UGAL	1.400 UG/L	.800 UG/L	2.300 UG/L	2.600 UGA,	1.600 UG/L	2.400 UG/L	2.000 UG/L	1.300 UG/L	3.800 UG/L	3.500 UG/L	10.600 PC//L	2.100 PC//L	20.000 C	430.000 UMHO	7.500	7.930	165,000 MG/L	201.000 MG/L	182.000 MG/L	56.900 MG/L	10.200 MG/L
Findings.	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings.	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
07/15/1998	07/15/1996	07/15/1996	07/15/1996	07/15/1996	07/15/1998	08/02/1998	08/02/1998	08/23/1996	08/23/1996	08/28/1898	08/28/1996	08/18/1996	09/18/1996	05/08/1997	05/06/1997	05/14/1987	06/14/1997	05/14/1987	05/14/1987	05/14/1897	D5/14/1997	05/14/1997	05/14/1987	05/14/1987
GROSS ALPHA	GROSS ALPHA COUNTING ERROR	CHLOROFORM (THM)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	TOTAL TRIHALOMETHANES	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coflected:	Sample Callected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Coffected:	Sample Coffected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chamical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Cheminat:	Chemical:	Chemical:	Chemical:	Chemical:

14.800 MGA.	1.200 MG/L	7.270 MG/L	.555 MG/L	14.300 PC//L	3.200 PC/IL	4.600 PCI/L	1.400 PCI/L	15.120 PCI/L	242.000 MG/L	0630	18.900 MG/L	.100 NTU	4.000 PCI/L	390.000 PC/IL	11.870	1.860 PCI/L	4270.000 UG/L	360.000 PC//L	.880 PC/II,	.230 PCIA.	.110 PC/L	6.800 PCM.	2.400 PCM.	7.240 PG/L
997 Findings: M	997 Findings:	997 Fandings: UDE	Findings: FLUORIDE (TEMPERATURE DEPENDENT)	05/14/1997 Findings: GROSS ALPHA	06/14/1997 GROSS ALPHA COUNTING ERROR	05/14/1997 Findings: GROSS BETA	05/14/1997 GROSS BETA COUNTING ERROR	997 Findings: UM	05/14/1997 Findings: TOTAL DISSOLVED SOLIDS	06/14/1997 Findings: LANGELIER INDEX @ 80 C	05/14/1897 Findings: NTRATE (AS NO3)	05/14/1997 Findings: TURBIOITY (LAB)	DS/14/1997 TOTAL RADON 222 COUNTING ERROR	05/14/1997 Findings: TOTAL RADON 222	05/14/1897 AGGRSSIVE INDEX (CORROSIVITY)	55/14/1897 Findings: JRANIUM COUNTING ERROR	05/14/1897 Findings: NITRATE + NITRITE (AS N)	05/14/1987 Findings: TRITIUM COUNTING ERROR	05/14/1997 Findings: RADIUM 228 COUNTING ERROR	05/14/1997 Findings: RADIUM 228 COUNTING ERROR	55/14/1897 Findings: STRONTKIM-90 COUNTING ERROR	06/02/1897 Findings: GROSS ALPHA	08/02/1897 GROSS ALPHA COUNTING ERROR	BB7 Findings: JM
Semple Collected: 05/14/1997 Chemical: SODIUM	Sample Collected: 05/14/1997 Chemical: POTASSIUM	Sample Collected: 05/14/1997 Chemical: CHLORIDE	Sample Collected: 05/14/1997 Chemical: FLUORIDE	Sample Collected: 05/14/1997 Chemical: GROSS AL	Sample Collected: 05/14/1997 Chemical: GROSS AL	Sample Collected: 05/14/1997 Chemicst: GROSS BE	Sample Collected: 05/14/1997 Chemical: GROSS BE	Sample Collected: 05/14/1997 Chemical: URANIUM	Sample Collected: 05/14/1997 Chemical: TOTAL DIS	Sample Collected: 05/14/1997 Chemical: LANGELIE	Sample Collected: 05/14/1997 Chemical: NITRATE (Sample Collected: 05/14/1997 Chemical: TURBIDITY	Sample Collected: 05/14/1997 Chemical: TOTAL RAI	Sample Collected: 05/14/1997 Chemical: TOTAL RAI	Sample Collected: 05/14/1897 Chemical: AGGRSSIV	Sample Collected: 05/14/1997 Chemical: URANIUM	Sample Collected: 05/14/1897 Chemical: NITRATE	Semple Collected: 05/14/1997 Chemical: TRITIUM C	Sample Collected: 05/14/1997 Chemical: RADIUM 2:	Semple Collected: 05/14/1997 Chemical: RADIUM 2:	Sample Collected: 05/14/1897 Chemical: STRONTHU	Sumple Collected: 06/02/1997 Chemical: GROSS AL	Sample Collected: 06/02/1997 Chemical: GROSS AL	Semple Collected: 06/02/1987 Chemical: URANIUM

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Sample Collected: Chemical:	06/02/1997 URANIUM COUNTING ERROR	Findings:	1.150 PGIA.
E31 SSE 1/2 - 1 Mile Higher			CA WELLS 818
Water System Information: Prime Station Code:	US03W-21H01 S	User ID:	TAN
District Number:	3610037045 13	County: Station Type:	San Beemardino WELL/AMBNT/MIJN/INTAKE/SLIPPLY
Water Type:	Well/Groundwater	Well Status:	Active Raw
Source Name:	340400.0 117 1100.0 WELL 32 3640037	-rectsion:	Undefined
System Name: REDLANDS C	REDLANDS CITY MUD-WATER DIV	AIC.	
do le la compania de compania del compania de la compania del compania del compania de la compania de la compania del c	PO BOX 3005		
Pop Served; Area Served;	REDLANDS, CA 923/3 69300 REDLANDS	Connections:	18447
Sample Information: *On Sample Collected; Chaminal:	* Only Findings Above Detection Level Are Listed 06/26/1984 64/26/1984 Findings	re Listed Findings:	550.000 UMHO
Sample Collected: Chemical:	08/28/1984 PH (LABORATORY)	Findings:	8.120
Sample Collected: Chemical:	08/26/1984 TOTAL ALKALINITY (AS CACO3)	Findings:	160.000 MG/L
Sample Collected: Chemical:	06/26/1984 TOTAL HARDNESS (AS CACO3)	Findings:	201.000 MG/L
Sample Collected: Chemical;	06/26/1984 CALCIUM	Findings:	68.799 MGA.
Sample Collected: Chemical:	08/26/1984 MAGNESIUM	Findings:	10.800 MG/L
Sample Collected: Chemical;	06/26/1984 SODIUM	Findings:	22.099 MG/L
Semple Collected: Chemical:	06/26/1984 POTASSIUM	Findings:	4.300 MG/L
Sample Collected: Chemical:	08/28/1984 CHLORIDE	Findings:	15.000 MG/L
Sample Collected; Chemical:	08/28/1884 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: DENT)	.890 MG/L
Sample Collected: Chemical:	08/28/1984 NITRATE (AS NO3)	Findings:	47.000 MG/L
Sample Collected: Chemical;	03/07/1986 TRICHLOROETHYLENE	Findings:	59.000 UG/L
Sample Collected: Chemical:	P4/24/1986 DIBROMOCHLOROPROPANE (DBCP)	Findings:)	.880 UGA.
Sample Collected: Chemicat:	06/13/1986 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.560 UG/L
Sample Collected: Chemical:	06/13/1986 GROSS ALPHA	Findings	7.700 PCM.

.800 PCVL	8.000 PCM	1.000 PCM.	525.000 UMHO	7.280	150.100 MG/L	183.100 MG/L	231.600 MG/L	73.299 MG/L	11.760 MG/L	13.200 MGA.	2.500 MG/L	30.388 MG/L	.500 MGA.	328.580 MG/L	41,500 MG/L	7.280	162.100 MG/L	188.000 MG/L	328.590 MG/L	.520	180	11.800	.420 UG/L	30.200 UG/L
08/13/1988 GROSS ALPHA COUNTING ERROR	09/23/1986 Findings: GROSS ALPHA	09/23/1986 GROSS ALPHA COUNTING ERROR	10/31/1980 Findings: SPECIFIC CONDUCTANCE	10/31/1986 Findings: PH (LABORATORY)	10/31/1986 TOTAL ALKALINITY (AS CACO3)	10/31/1986 BICARBONATE ALKALINITY	10/31/1986 TOTAL HARDNESS (AS CACO3)	10/31/1986 Findings: CALCIUM	10/31/1886 Findings: MAGNESIUM	10/31/1886 Findings: SODIUM	10/31/1986 Findings: POTASSIUM	10/31/1986 Findings: CHLORIDE	10/31/1986 FLUORIDE (TEMPERATURE DEPENDENT)	10/31/1986 Findings: TOTAL DISSOLVED SOLIDS	10/31/1886 Findings: NITRATE (AS NO3)	10/31/1986 Findings: PH (LABORATORY)	10/31/1986 TOTAL ALKALINITY (AS CACO3)	10/31/1986 TOTAL HARDNESS (AS CACO3)	10/31/1986 Findings: TOTAL DISSOLVED SOLIDS	10/31/1986 Findings: LANGELIER INDEX @ 80 C	10/31/1986 Findings: LANGELIER INDEX @ SOURCE TEMP.	10/31/1986 AGGRSSIVE INDEX (CORROSIVITY)	10/31/1986 Findings: DIBROMOCHLOROPROPANE (DBCP)	10/31/1986 Findings: TRICHLOROETHYLENE
Sample Collected: Chemical;	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Semple Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Sample Collected: Chemical:	10/31/1986 GROSS ALPHA	Findings:	9.400 PCIAL
Sample Collected: Chemical:	10/31/1986 GROSS ALPHA COUNTING ERROR	Findings:	2.700 PCIAL
Sample Collected: Chemical:	01/23/1987 1,1-DICHLOROETHYLENE	Findings:	1.500 UGAL
Sample Collected: Chemical:	01/23/1987 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.550 UGA.
Sample Collected: Chemical:	01/23/1967 TRICHLOROETHYLENE	Findings:	75.299 UGAL
Sample Collected: Chemical:	04/24/1987 1,1-DICHLOROETHYLENE	Findings:	6.400 UG/L
Sample Collected: Chemical:	04/24/1987 TRICHLOROETHYLENE	Findings:	97.089 UGAL
Semple Collected: Chemical:	04/24/1987 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.190 UGAL
Sample Collected: Chemical:	07/31/1987 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.290 UGAL
Sample Collected: Chemical:	10/23/1887 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.300 UG/L
Sample Collected: Chemical:	10/23/1887 SOURCE TEMPERATURE C	Findings:	18.900 C
Semple Collected: Chemical:	10/23/1987 SPECIFIC CONDUCTANCE	Findings:	540.000 UMHO
Sample Collected: Chemical:	1023/1887 FIELD PH	Findings:	8.020
Sample Collected: Chemical:	1023/1887 PH (LABORATORY)	Findings:	8.020
Sample Collected: Chemical:	10/23/1887 TOTAL ALKALINITY (AS CACO3)	Findings:	178.500 MG/L
Sample Collected: Chemical:	10/23/1987 BICARBONATE ALKALINITY	Findings:	217.700 MG/L
Semple Collected: Chemicai:	10/23/1987 TOTAL HARDNESS (AS CACO3)	Findings:	228.400 MG/L
Sample Collected: Chemical:	10/23/1887 CALCIUM	Findings:	76.300 MG/L
Sample Collected: Chemical:	10/23/1987 MAGNESRUM	Findings:	8.700 MGAL
Sample Collected: Chemical:	10/23/1987 SODIUM	Findings:	19.700 MG/L
Sample Collected: Chemical:	10Z3/1987 POTASSIUM	Findings:	1.100 MG/L
Sample Collected: Chemical:	10/23/1887 CHLORIDE	Findings:	8.700 MGA.
Sample Collected: Chemical:	10/23/1887 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: DENT)	.500 MG/L
Sample Collected: Chemical:	10/23/1987 GROSS ALPHA	Findings:	8.600 PCI/L
Sample Collected: Chemical:	10/23/1887 GROSS ALPHA COUNTING ERROR	Findings:	.400 PCI/L

363.400 MG/L	.910	200	38.500 MG/L	12.200	18.889 C	540.000 UMHO	8.020	8,020	178.500 MG/L	217.700 MG/L	226.400 MG/L	76.298 MG/L	8.700 MG/L	19.700 MG/L	1.100 MG/L	8.700 MG/L	.500 MG/L	8.600 PCM.	.400 PC/IL	363.390 MG/L	.910	200	38.599 MG/L	12.200
Findings:	Findings:	Findings: URCE TEMP.	Findings:	Findings: ROSIVITY)	Findings:	Findings:	Findings:	Findings:	Findings: ACO3)	Findings:	Findings: ACO3)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: RE DEPENDENT)	Findings:	Findings: G ERROR	Findings: 3S	Findings:	Findings: JRCE TEMP.	Findings:	Findings: ROSIVITY)
10/23/1987	10/23/1987	10/23/1987 FILANGELIER INDEX © SOURCE TEMP.	10/23/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1887	10/23/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1887	1023/1987	10/23/1987	10/23/1987	10/23/1987	10/23/1987	1023/1987	10/23/1967	10/23/1987
TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C		NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTABSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected.	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected;
Chemical:	Chemical:	Chemical:	Chemicat	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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3.900 UG/L	1.900 UG/L	97.000 UGAL	5.600 UGA.	135,100 UGAL	.270 UG/L	18.900 C	550.000 UMHO	7.950	7.950	181.800 MG/L	234.000 MG/L	229.200 MG/L	77.500 MG/L	8.600 MG/L	18.400 MG/L	1.700 MG/L	8.200 MG/L	.700 MG/L	.250 UG/L	5.500 PC/AL	1.500 PCM	2.500 UGAL	.280 UG/L	125.800 UG/L
Findings:	Findings:	Findings:	Findings:	Findings:	Findings: CP)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: NDENT)	Findings:	Findings:	Findings:	Findings:	Findings: 2P)	Findings:
10/23/1987	10/23/1987	10/23/1987	01/12/1988	01/12/1988	01/12/1988	05/08/1988	05/08/1988	05/06/1988	05/08/1988	05/06/1988	05/06/1988	05/06/1988	05/06/1988	05/06/1988	05/08/1988	05/06/1968	05/06/1988	05/06/1988 FINDINE DEPENDENT)	05/06/1988	05/06/1988	05/08/1988	05/06/1988	05/06/1988	05/06/1988
1,1-DICHLOROETHYLENE	1,1,1-TRICHLOROETHANE	TRICHLOROETHYLENE	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE		BORON	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1,1-TRICHLOROETHANE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Callected:
Chemical:	Chemical:	Chemical:	Chemicat.	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

325.100 MG/L	1,120	029	35.000 MG/L	12.500	5.800 UG/L	137.800 UG/L	8.300 PCM.	2.600 PCM.	4.200 UG/L	2.000 UGA	.140 UGA	82.800 UG/L	7.000 UG/L	1.200 UG/L	163.100 UG/L	5.100 PCIAL	1.200 PC/A	.110 UG/L	3.800 PCM.	1.100 PG/L	.700 UGA	7.100 UGIL	.900 UGA.	
05/06/1988 Findings: TOTAL DISSOLVED SOLIDS	05/06/1988 Findings: LANGELIER INDEX @ 80 C	05/06/1988 Findings: LANGELIER INDEX @ SOURCE TEMP,	05/08/1988 Findings: NITRATE (AS NO3)	05/06/1968 Findings: AGGRSSIVE INDEX (CORROSIVITY)	07/21/1968 Findings: 1,1-DICHLOROETHYLENE	07/24/1988 Findings: TRICHLOROETHYLENE	10/14/1988 Findings: GROSS ALPHA	10/14/1988 GROSS ALPHA COUNTING ERROR	10/14/1988 Findings: 1,1-DICHLOROETHYLENE	10/14/1988 Findings: 1,1,1-TRICHLOROETHANE	10/14/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	10/14/1988 Findings: TRICHLOROETHYLENE	01/12/1989 1,1-DICHLOROETHYLENE	01/12/1989 1,1,1-TRICHLOROETHANE	01/12/1989 Findings: TRICHLOROETHYLENE	01/13/1989 Findings: GROSS ALPHA	01/13/1988 GROSS ALPHA COUNTING ERROR	01/13/1988 Findings: DIBROMOCHLOROPROPANE (DBCP)	04/20/1989 GROSS AL PHA	04/20/1989 GROSS ALPHA COUNTING ERROR	04/20/1989 Findings: TETRACHLOROETHYLENE	04/20/1989 Findings: 1,1-DICHLOROETHYLENE	04/20/1989 Findings: 1,1,1-TRICHLOROETHANE	
Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected. Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	

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GEOCHECK®. PHYSICAL SETTING SOURCE MAP FINDINGS

Sample Coffected: Chemical:	04/28/1989 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.170 UGAL
Sample Collected: Chemical:	06/09/1989 SOURCE TEMPERATURE C	Findings:	18.900 C
Sample Collected: Chemical:	08/09/1989 SPECIFIC CONDUCTANCE	Findings:	540,000 UMHO
Sample Collected: Chemical:	06/09/1989 FireLD PH	Findings:	7.840
Sample Collected: Chemical:	08/08/1989 PH (LABORATORY)	Findings:	7.840
Sample Collected: Chemical:	06/09/1989 TOTAL ALKALINITY (AS CACO3)	Findings:	181.200 MG/L
Sample Collected: Chemical:	06/09/1989 BICARBONATE ALKALINITY	Findings:	221.100 MG/L
Semple Collected: Chemical:	06/09/1989 TOTAL HARDNESS (AS CACO3)	Findings:	225.200 MG/L
Sample Collected: Chemical;	D6/09/1989 Fir	Findings:	72,400 MGAL
Sample Collected: Chemical:	W	Findings:	10.800 MG/L
Sample Callected: Chemical:	06/09/1969 Fir SODIUM	Findings:	19.100 MG/L
Sample Collected: Chemical:	08/08/1989 Fir POTASSIUM	Findings:	2.800 MG/L
Sample Collected: Chemical:	08/09/1989 Fin CHLORIDE	Findings:	8.100 MG/L
Sample Collected: Chemicat:	(TEMPERATURE DEPEND	Findings: JENT)	.700 MG/L
Sampte Collected: Chemical:	06/09/1989 Fin BORON	Findings:	.210 UG/L
Sample Collected: Chemical:	08/09/1989 Fin GROSS ALPHA	Findings:	8.500 PCM
Sample Collected: Chemical:	06/09/1989 GROSS ALPHA COUNTING ERROR	Findings:	2.300 PCM.
Sample Collected: Chemical:	06/06/1989 Fin DIBROMOCHLOROPROPANE (DBCP)	Findings:	.200 UGA.
Sample Collected: Chemical:	06/09/1989 FIN TRICHLOROETHYLENE	Findinge:	48.000 UG/L
Sample Collected: Chemical:	08/08/1989 Fin TOTAL DISSOLVED SOLIDS	Findings:	318.600 MG/L
Sample Collected: Chemicat.	08/08/1989 Fin LANGELIER INDEX (2) 60 C	Findings:	1.120
Sample Collected: Chemical:	04/09/1989 FIN LANGELIER INDEX @ SOURCE TEMP.	Findings: P.	.410
Sample Collected: Chemical;	06/09/1989 Fin NITRATE (AS NO3)	Findings:	30.200 MG/L
Sample Collected: Chemical:	08/08/1989 Fin AGGRSSIVE INDEX (CORROSIVITY)	Findings:	12.400
Sample Collected: Chemical:	08/18/1989 RADIUM 228 COUNTING ERROR	Findings:	1.000 PCIAL

9.700 PCIF.	2.700 PCI/L	2.400 UGA.	.100 UGA.	46.100 UG/L	3.800 PC/L	1.400 PC/L	5.800 UG/L	.600 UGA.	200 UGA	38.000 UG/L	19.400 C	480.000 UMHO	8.010	8.010	172.000 MG/L	209.800 MG/L	205.200 MG/L	64.400 MG/L	10.800 MG/L	16.200 MG/L	2.800 MG/L	6.900 MG/L	.700 MG/L	.360 UGA.
10H3H989 Findings: GROSS ALPHA	10/13/1989 FINGING ERROR CHOMPING ERROR	1,1-DICHLOROETHYLENE	Findings: Pindings: DIBROMOCHLOROPROPANE (DBCP)	10/13/1989 Findings:	01/23/1990 Findings: GROSS ALPHA	01/23/1990 GROSS ALPHA COUNTING ERROR	61/23/1990 Findings: 1,1-DICHLOROETHYLENE	01/23/1990 Findings: 1,1,1-TRICHLOROETHANE	61/23/1990 Findings: DIBROMOCHLOROPROPANE (DBCP)	01/23/1990 Findings: TRICHLOROETHYLENE	M/26/1990 Findings: SOURCE TEMPERATURE C	64/28/1990 Findings: SPECIFIC CONDUCTANCE	64/26/1990 Findings:	04/26/1980 Findings: PH (LABORATORY)	0426/1990 Findings: TOTAL ALKALINITY (AS CACO3)	9428/1990 Findings: BICARBONATE ALKALINITY	0426/1990 Findings: TOTAL HARDNESS (AS CACO3)	04/26/1990 Findings: CALCIUM	04/26/1990 Findings:	04/26/1990 Findings: SODIUM	04/28/1990 Findings: POTASSIUM	0426/1990 Findings: CHLORIDE	6426/1990 Findings: FLUORIDE (TEMPERATURE DEPENDENT)	D426/1990 Findings: BORON
Sample Collected: 10/1 Chemical: GRI	Sample Collected: 10/1 Chemical: GRI	Sample Collected: 10/1 Chemical: 1,1-	Sample Cullected: 10/1 Chemical: DIB	Semple Collected: 10/1 Chemical: TRI	Sample Collected: 01/2 Chemical: GR	Sample Collected: 01/2 Chemical: GR	Sample Collected 017 Chemical: 1,1-	Sample Collected: 01/2 Chemical: 1,1,	Sample Collected: 01/2 Chemical: DIB	Semple Collected: 01/2 Chemical: TRi	Sample Collected: 04/2 Chemical: SOI	Sample Collected: 047. Chemical: SPE	Sample Collected: 04/7 Chemical: FIEI	Sample Collected: D472 Chemiçai: PH	Semple Collected: 0472 Chemical: TOT	Sample Collected: 04/2 Chemical: BIC	Semple Collected: 0472 Chemical: TOT	Sample Collected: 04/2 Chemical: CAL	Sample Collected: 04/2 Chemical: MAK	Sample Collected 04/7 Chemical: SOf	Semple Collected: 04/2 Chemical: POT	Sample Collected: 04/2 Chemical: CHL	Semple Collected 04/2 Chemical: FLU	Semple Collected 04/2 Chemical: BOF

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Chemical:	04/26/1990 GROSS ALPHA COUNTING ERROR	Findings:	1,500 PCIAL
Sample Collected: Chemical:	04/26/1990 1,1-DICHLOROETHYLENE	Findings:	3.000 UG/L
Sample Collected: Chemical:	04/26/1990 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.270 UG/L
Sample Collected: Chemicat	04/26/1990 TRICHLOROETHYLENE	Findings:	34.400 UGAL
Sample Collected: Chemical:	04/28/1990 TOTAL DISSOLVED SOLIDS	Findings:	284.200 MG/L
Sample Collected: Chemical:	04/26/1990 LANGELIER INDEX @ 60 C	Findings:	1.220
Sample Collected: Chemical:	04/28/1990 LANGELIER INDEX @ SOURCE TEMP.	Findings: P.	.520
Sample Collected: Chemical:	04/28/1990 NITRATE (AS NO3)	Findings:	29.500 MG/L
Sample Coffected: Chemical:	04/28/1990 AGGRSSIVE INDEX (CORROSIVITY)	Findings:	12.500
Sample Collected: Chemical:	07/26/1990 1,1-DICHLOROETHYLENE	Findings:	3.800 UG/L
Sample Collected: Chemical:	07/26/1990 TRICHLOROETHYLENE	Findings:	40.100 UGAL
Sample Collected: Chemical:	07/26/1990 GROSS ALPHA	Findings:	8.700 PCIA
Sample Collected: Chemical:	07/26/1990 GROSS ALPHA COUNTING ERROR	Findings:	1.600 PCIA.
Sample Collected: Chemical:	10/16/1980 GROSS ALPHA	Findings:	5.000 PCIAL
Sample Collected: Chemical:	10/16/1980 GROSS ALPHA COUNTING ERROR	Findings:	1.500 PCM.
Sample Collected: Chemical:	10/16/1990 1,1-DICHLOROETHYLENE	Findings:	2.800 UG/L
Sample Collected: Chemical:	10/16/1990 1,1,1-TRICHLOROETHANE	Findings:	.800 UG/L
Semple Collected: Chemical:	10/16/1990 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.080 UG/L
Sample Collected: Chemical:	10/16/1990 TRICHLOROETHYLENE	Findings:	11.900 UGAL
Sample Collected: Chemical:	01/15/1991 GROSS ALPHA	Findings:	5.100 PCIA
Sample Collected: Chemical:	01/15/1991 GROSS ALPHA COUNTING ERROR	Findings:	1.800 PCIA.
Sample Collected: Chemical:	01/15/1991 SOURCE TEMPERATURE C	Findings:	19.400 C
Sample Collected: Chemical:	01/15/1991 SPECIFIC CONDUCTANCE	Findings:	500.000 UMHO
Semple Collected Chemical:	01/45/1991 FIELD PH	Findings:	8.000

8.000	179,200 MG/L	218.600 MG/L	214.000 MG/L	61.80D MG/L	14.500 MG/L	16,000 MG/L	2.200 MG/L	8.400 MG/L	.800 MG/L	2.000 UG/L	63.600 UG/L	290.000 MG/L	1.190	480	25.800 MG/L	12.400	7,800 PCM.	2,200 PCM.	3.300 PC/L	1.600 PCM.	1.200 PCM.	11.000 PC/L	6.900 PCM.	2.000 PCIA.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: NDENT)	Findings:	Findings:	Findings:	Findings:	Findings: MP.	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:
01/15/1901	01/16/1991	01/15/1991	01/16/1991	01/15/1991	01/15/1891	01/15/1991	01/16/1991	01/15/1891	01/15/1991	01/15/1891	01/15/1901	01/15/1991	01/16/1991	01/15/1991	01/15/1991	01/15/1991	04/23/1991	04/23/1991	07/08/1981	07/08/1981	07/08/1981	07/08/1991	10/16/1991	10/16/1991
PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACOS)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	1,1-DICHLOROETHYLENE	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	GROSS ALPHA	GROSS ALPHA COUNTING ERROR
Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collectod:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemioal:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:

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GEOCHECK®. PHYSICAL SETTING SOURCE MAP FINDINGS

2.100 UG/L	.100 UG/L	42.400 USA	21.110 G	480.000 UMHO	8.000	8.000	194.000 MG/L	236.700 MG/L	214.000 MG/L	62.500 MGAL	14.100 MG/L	19.900 MG/L	2.600 MG/L	6.100 MG/L	.400 MG/L	105.000 UGAL	257.200 MG/L	1240	.580	25.400 MG/L	12.480	182.000 PCM.	.100 PCIAL	1,000 PCM.
Findings:	Findings: P)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: DENT)	Findings:	Findings:	Findings:	Findings:	Hndings:	Findings:	Findings:	Findings:	Findings:
10/16/1991	10/16/1991	10/16/1991	11/16/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1992	11/18/1982	11/18/1992	11/18/1992	11/18/1982	11/18/1962	11/18/1992	11/18/1992	11/16/1982	11/18/1992	11/18/1992	11/18/1992	11/18/1992
1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACOS)	BICARBONATE ALXALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	ALUMINUM	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX (@ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	AGGRSSIVE INDEX (CORROSIVITY)	TRITIUM COUNTING ERROR	RA 228 + RA 228 COUNTING ERROR	
Sample Collected:	Sample Collected;	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:
Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	

6.400 PC/L	1.900 PC/A.	1.200 PCIA.	22.220 C	480,000 UMHO	7.800	7.800	182.000 MG/L	222.000 MG/L	214,000 MG/L	58.000 MG/L	18:200 MG/L	20.800 MG/L	2.000 MG/L	7.500 MG/L	.800 MG/L	7.700 PC/IL	2.100 PCI/L	1.100 PCI/L	11.000 PCM.	1.400 UG/L	,130 UG/L	33.500 UG/L	260.500 MG/L	066:
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: ENDENT)	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: KCP)	Findings:	Findings:	Findings:
11/18/1992	11/18/1992	11/18/1992	01/27/1993	01/27/1983	01/27/1983	01/27/1993	01/27/1983	01/27/1893	01/27/1883	01/27/1993	01/27/1993	01/27/1983	01/27/1993	01/27/1993	01/27/1983	01/27/1983	01/27/1993	01/27/1903	01/27/1983	01/27/1983	01/27/1983	01/27/1983	01/27/1993	01/27/1983
GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACOS)	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C
Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected;	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicel:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

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GEOCHECK®-PHYSICAL SETTING SOURCE MAP FINDINGS

64.900 MG/L	8.800 MG/L	19,000 MG/L.	2.300 MG/L	3.700 MGA.	.700 MG/L	65.000 UGAL	4.400 PCIA.	1.900 PCI/L	4.600 UG/L	.060 UG/L	43.700 UGA	261.200 MG/L	1.120	.390	24.800 MG/L	UTN 001.	12.350	6621.000 UG/L	8.600 PCM.	2.900 PCM.	1.700 UG/L	.060 UG/L	42.500 UG/L	12.100 PCM.
02/10/1994 Findings: CALCIUM	02/10/1994 Findings: MAGNESIUM	02/10/1994 Findings: SODIUM	02/10/1994 Findings: POTASSIUM	02/10/1994 Findings: CHLORIDE	02/10/1984 FINDRESTURE DEPENDENT)	02/10/1984 Findings:	02/10/1994 Findings: GROSS ALPHA	02/10/1994 Findings: GROSS ALPHA COUNTING ERROR	02/10/1994 Findings: 1,1-DICHLOROETHYLENE	02H0H994 Findings: DIBROMOCHLOROPROPANE (DBCP)	02/10/1994 Findings: TRICHLOROETHYLENE	02/10/1994 Findings: TOTAL DISSOLVED SOLIDS	02/10/1994 Findings: LANGELIER INDEX @ 80 C	02/10/1994 Findings: LANGELIER INDEX @ SOURCE TEMP.	02/10/1994 Findings: NITRATE (AS NO3)	02/10/1994 Findings: TURBIDITY (LAB)	02/10/1994 Findings: AGGRSSNE INDEX (CORROSIVITY)	02/10/1994 Findings: NITRATE + NITRITE (AS N)	05/10/1994 Findings: GROSS ALPHA	05/10/1994 Findings: GROSS ALPHA COUNTING ERROR	05/10/1994 Findings: 1,1-DICHLOROETHYLENE	05/10/1984 Findings: DIBROMOCHLOROPROPANE (DBCP)	05/10/1984 Findings: TRICHLOROETHYLENE	07/21/1994 Findings: GROSS ALPHA
Sample Collected: Chemicat	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Coffected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected; Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Sample Collected: Chemical:	07/21/1994 GROSS ALPHA COUNTING ERROR	Findings:	2.200 PCM.
Sample Collected: Chemicat	07/21/1984 1,1-DICHLOROETHYLENE	Findings:	.900 UG/I.
Sample Collected: Chemical:	07/21/1994 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.080 UG/L
Sample Collected: Chemical:	07/21/1994 TRICHLOROETHYLENE	Findings:	18.500 UGAL
Sample Collected: Chemical:	10/07/1994 GROSS ALPHA	Findings:	11.900 PCI/L
Sample Collected: Chemical:	10/07/1994 GROSS ALPHA COUNTING ERROR	Findings:	1.600 PCIAL
Sample Coffected: Chemicat:	10/07/1994 DIBROMOCHLOROPROPANE (DBCP)	Findings:	.070 UGAL
Sample Collected: Chemical:	10/07/1994 TRICHLOROETHYLENE	Findings:	22.700 UG/L
Sample Collected: Chemical:	01/05/1995 SOURCE TEMPERATURE C	Findings:	20.000 C
Sample Collected: Chemical:	01/05/1885 SPECIFIC CONDUCTANCE	Findings:	480.000 UMHO
Sample Collected: Chemical:	01/05/1986 FIELD PH	Findings:	7.800
Semple Collected: Chemical:	01/05/1995 PH (LABORATORY)	Findlags:	7.800
Sample Collected: Chemical:	01/05/1995 TOTAL ALKALINITY (AS CACO3)	Findings:	172.000 IMG/IL
Sample Collected: Chemical:	01/06/1985 BICARBONATE ALKALINITY	Findings:	209.800 MG/L
Sample Collected: Chemical:	01/05/1995 TOTAL HARDNESS (AS CACO3)	Findings:	208.000 MG/L
Sample Collected: Chemical:	01/05/1895 CALCIUM	Findings:	48.100 IMG/L
Sample Collected: Chemical:	01/05/1895 MAGNESIUM	Findings:	20.900 MG/L
Semple Coffected: Chemical:	01/05/1995 SODIUM	Findings:	17.800 MG/L
Sample Collected; Chemical:	01/05/1985 POTASSIUM	Fladings:	2.800 MG/L
Sample Collected: Chemical:	01/05/1985 CHLORIDE	Findings:	7.500 MG/L
Sample Collected: Chemical:	01/06/1986 FLUORIDE (TEMPERATURE DEPENDENT)	Findings: DENT)	.700 MG/L
Sample Collected: Chemical:	01/05/1985 GROSS ALPHA	Findings:	9.300 PC/A
Sample Collected: Chemical:	01/05/1985 GROSS ALPHA COUNTING ERROR	Findings:	2.600 PCM.
Sample Collected: Chemical:	01/05/1886 CHLOROFORM (THM)	Findings.	1.200 UG/L
Sample Collected: Chemical:	01/05/1985 TETRACHLOROETHYLENE	Findings:	.BOD UGAL

1.700 UG/L	.080 UG/L	50.700 UGA.	259,000 MG/L	.880	.180	32.600 MG/L	J100 NTU	1.200 UG/L	12,110	7359.000 UG/L	10.500 PCM.	2.700 PCM.	2.700 UG/L	.040 UG/L	63.500 UGAL	28.900 MG/L	13.700 PCIA.	1.800 PCM.	.060 UGAL	9870.000 UGAL	10,800 PC/IL	2.800 PCM.	.800 UG/L	.040 UG/L
01/05/1995 1,1-DICHLOROETHYLENE	01/05/1995 Findings: DIBROMOCHLOROPROPANE (DBCP)	01/05/1995 Findings: TRICHLOROETHYLENE	01/05/1986 Findings: TOTAL DISSOLVED SOLIDS	01/05/1896 LANGELIER INDEX @ 60 C	01/05/1995 Findings: LANGELIER INDEX @ SOURCE TEMP.	01/05/1996 NITRATE (AS NO3)	01/05/1995 TURBIDITY (LAB)	01/05/1995 TOTAL TRIHALOMETHANES	01/05/1995 Findings: AGGRSSIVE INDEX (CORROSIVITY)	01/05/1985 Findings: NITRATE + NITRITE (AS N)	04/27/1995 Findings: GROSS ALPHA	04/27/1985 GROSS ALPHA COUNTING ERROR	04/27/1885 1,1-DICHLOROETHYLENE	04/27/1885 DIBROMOCHLOROPROPANE (DBCP)	04/27/1985 TRICHLOROETHYLENE	04/27/1995 NITRATE (AS NQ3)	09/29/1895 Findings: GROSS ALPHA	09/29/1995 FINDING ERROR	09/29/1995 Findings: DIBROMOCHLOROPROPANE (DBCP)	09/29/1985 NITRATE + NITRITE (AS N)	12/27/1995 GROSS ALPHA	12/27/1995 GROSS ALPHA COUNTING ERROR	12/27/1985 Findings: 1,1-DICHLOROETHYLENE	12/27/1995 DIBROMOCHLOROPROPANE (DBCP)
Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Semple Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Cullected: Chemical:	Sample Collected: Chemicat:	Sample Collected: Chemical:

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GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

42.100 UG/L	19.400 C	470.000 UMHO	7.800	8.000	172.000 MG/L	209,800 MG/L	210.000 MG/L	87.100 MG/L	11.000 MG/L	15.000 MG/L	2.400 MG/L	7.800 MG/L	.500 MG/L	390.000 UG/L	7.800 PCM.	2.000 PCIA	1.300 PCIA.	8.000 PCIAL	.800 UG/L	.020 UG/L	49.100 UGA.	265.000 MG/L	1.020	300
Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: ENDENT)	Findings:	Findings:	Findings: R	Findings:	Findings:	Findings:	Findings: CP)	Findings:	Findings:	Findings:	Findings: EMP.
12/27/1995	03/12/1996	03/12/1996	03/12/1996	03/12/1996	03/12/1996	03/12/1998	03/12/1996	03/12/1996	03/12/1996	03/12/1996	03/12/1996	03/12/1996	03/12/1996	03/12/1998	03/12/1996	03/12/1998	03/12/1996	03/12/1996	03/12/1998	03/12/1996	03/12/1996	03/12/1986	03/12/1996	03/12/1988 Findings:
TRICHLOROETHYLENE	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	MAGNESIUM	SODIUM	Potassium	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	BORON	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA COUNTING ERROR	URANIUM	1,1-DICHLOROETHYLENE	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 80 C	LANGELIER INDEX @ SOURCE TEMP.
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:				
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

28.000 MG/L	.200 NTU	12,250	6320.000 UGAL	14.400 PC//L	.900 PCI/L	.040 UG/L	8.600 UG/L	10000.000 UGAL	11.600 PCM.	1.600 PC/L	.800 UGA.	.050 UGA.	11.000 UGAL	41.800 MG/L	1.200 UG/L	.020 UG/L	29.800 UGA.	22.000 C	510.000 UMHO	7.800	7.820	187.000 MG/L	228.000 MG/L	244.000 MG/L
03/12/1996 NITRATE (AS NO3)	03/12/1996 TURBIDITY (CAB)	03/12/1996 AGGRESSIVE INDEX (CORROSIVITY)	03/12/1996 Findings: NITRATE + NITRITE (AS N)	06/26/1996 GROSS ALPHA	06/26/1996 GROSS ALPHA COUNTING ERROR	06/26/1996 Findings: DIBROMOCHLOROPROPANE (DBCP)	06/26/1996 TRICHLOROETHYLENE	06/26/1998 Findings: NITRATE + NITRITE (AS N)	D9/25/1996 Findings: GROSS ALPHA	09/25/1996 GROSS ALPHA COUNTING ERROR	09/25/1996 1,1-DICHLOROETHYLENE	09/25/1996 DIBROMOCHLOROPROPANE (DBCP)	09/25/1996 TRICHLOROETHYLENE	09/25/1996 Findings: NITRATE (AS NO3)	12/17/1996 Findings: 1,1-DICHLOROETHYLENE	12/17/1996 Findings: DIBROMOCHLOROPROPANE (DBCP)	12/17/1996 Findings: TRICHLOROETHYLENE	02/19/1997 Findings: SOURCE TEMPERATURE C	02/19/1997 Findhgs: SPECIFIC CONDUCTANCE	02/19/1997 FireLD PH	02/19/1997 Findings: PH (LABORATORY)	02/19/1997 TOTAL ALKALINITY (AS CACO3)	02/19/1997 Findings: BICARBONATE ALKALINITY	02/18/1997 Findings: TOTAL HARDNESS (AS CACO3)
Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Colfacted: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:	Semple Cullected: Chemical:	Sample Collected: Chemical:	Sample Collected: Chemical:

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

73.700 MG/L	10.500 MG/L	14.200 MGA.	5.700 MG/L	7.800 MG/L	.970 MG/L	8.500 PCM	2.100 PCM.	4.100 PCM	1.200 PCM	9.000 PCM.	.100 UGAL	24.000 UG/L	295.000 MG/L	.890	.230	35.400 MG/L	JTN 001.	5.000 PCM.	559.000 PCI/L	12.140	7980.000 UG/L	247.000 PCI/L	158.000 PC/L	.650 PCIA.
Findings:	Findings:	Findings:	Findings:	Findings:	Findings: URE DEPENDENT)	Findings:	Findinge: NG ERROR	Findings:	Findings: IG ERROR	Findings:	Findings: PANE (DBCP)	Findings:	Findings: JDS	Findings:	Findings: OURCE TEMP.	Findings:	Findings:	Findings:	Findings:	Findings: RROSIVITY)	Findings: N)	Findings:	Findings	Findings:
02/19/1997	02/19/1997	02/19/1997	02/19/1897	02/19/1897	02/19/1997	02/19/1997	02/19/1997	02/19/1997	02/19/1997	02/16/1997	02/19/1997	02/19/1997	02/19/1997	02/19/1987	02/19/1997	02/19/1997	02/19/1987	02/19/1997	02/19/1997	02/19/1997	02/19/1997	02/19/1987	02/19/1997	02/19/1997
CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS BETA	GROSS BETA COUNTING ERROR	URANIUM	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	LANGELIER INDEX @ SOURCE TEMP.	NITRATE (AS NO3)	TURBIDITY (LAB)	TOTAL RADON 222 COUNTING ERROR	TOTAL RADON 222	AGGRSSIVE INDEX (CORROSIVITY)	NTTRATE + NITRITE (AS N)	TRITIUM	TRITIUM COUNTING ERROR	RADKUM 226
Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Semple Collected:	Semple Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Coffected:	Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical;	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

.390 PCM.	.140 PCML	.390 PCM,	5.200 UG/L	.040 UG/L	42.800 UG/L	5.200 UG/L	8.100 PCM	2.700 PCIA.	7.200 PCM.	2,000 PCIA.	1.000 UGAL	.030 UG/L	17.300 UG/L	9.600 PCM.	2.200 PCM.	.036 UG/L	4.100 UG/L
Findings:	Findings:	Findings: R	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings:	Findings: (P)	Findings:
02/19/1997	02/19/1997	02/19/1997	04/14/1997	04/14/1997	04/14/1997	04/14/1987	04/14/1997	04/14/1987	08/26/1997	08/26/1997	08/26/1997	08/26/1987	08/28/1987	12/08/1997	12/08/1997	12/08/1997	12/08/1987
RADIUM 228 COUNTING ERROR	RADIUM 228 COUNTING ERROR	STRONTIUM-90 COUNTING ERROR	CHLOROFORM (THM)	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	TOTAL TRIHALOMETHANES	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	1,1-DICHLOROETHYLENE	DIBROMDCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE	GROSS ALPHA	GROSS ALPHA COUNTING ERROR	DIBROMOCHLOROPROPANE (DBCP)	TRICHLOROETHYLENE
Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:
Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:

NW 1/2 - 1 Hilb

FED USG8 USGS3135149

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GEOCHECK®-PHYSICAL SETTING SOURCE MAP FINDINGS

340513117115701	34.08695696 M	NAD27	90	120	Not Reported	Not Reported	3	NGVD28			19310101	PST	Single usell other than collector or Densey has	arks former or company or the same from the same		400	Not Renorted	0000-00-00		000070070	1975-05-28		00-00-0000	
Site no:	Dec lat: Coor math:	Lettono detum:	District	County:	Land net:	Map scale:	Althude method:	Alitude datum:	680 sq.ml.		g Date construction:	Mean greenwich time offset:	Type of ground water site:			Hote depth:	Project number:	Daily flow data begin date:	Daily flow data count:	Peak flow data end date:	Water quality data begin date: 1975-05-28	Water quality data count:	Ground water data end date: 0000-00-00	
USGS 001S003W16FD01S 340513	1171157 -117,2000393	S	NAD83	8	ns	Not Reported	1257.00	Not Reported	Santa Ana. Celifornia. Area = 1880 so.ml.	Not Reported	Ground-water other than Spring	Not Reported	· .	Not Reported	Not Reported	Not Reported	Not Reported		00-00-0000	00-00-0000	0	r:1976-05-28	ate: 0000-00-00	•
Agency od: Site name: Letitude:	Longitude: Dec lon:	Coor acor:	Dec lationg datum:	State:	Country:	Location map:	Althude:	Altitude accuracy:	Hydrologie:	Topographic:	Site type:	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquifer:	Well depth:	Source of depth data:	Real time data flag:	Daily flow data end date:	Peak flow data begin date: 0000-00-00	Peak flow data count:	Water quality data end date: 1976-05-28	Ground water data begin date: 0000-00-00	CONTRACTOR AND

Ground-water levels, Number of Messurements: 0

	USG83135211											Single well, other than collector or Ranney has						
	FED USGS 1	340438117103001	34.07723505 M	NAD27 06	071 Mot Become	24000	2	NGVD29		19810101	PST	Single well, other than o	•	928	9479335800	00-00-0000	0	00-00-0000
		Site no:	Declat Coor meth:	Lationg datum: District:	County:	Map soale:	Altitude method:	Altitude datum:	0 aq.ml.	Date construction:	Mean greenwich time offset:	Type of ground water site:		Hole depth:	Project number:	Dally flow data begin date:	Daily flow data count:	Peak flow data end date:
		USGS 0015003WZZA002S 340438	1171030	S NAD83	90 SI	REDLANDS	1390.00	Not Reported	Santa Ana. California. Area = 1680 aq.ml. Not Reported	other than Spring	Not Reported	>	Not Reported Not Reported	808	Not Reported	0	00-00-0000	00-00-0000
8	Esst 1/2 - 1 Mile Higher	Agency cd: Site name; Latitude:	Longitude: Dec lon:	Coor acer: Dec lattong datum:	State: Country:	Location map:	Altitude:	Allitude accuracy:	Hydrologic: Topographic:	Site type:	Date Inventoried:	Local standard time flag:	Aquifer Type: Aquifer:	Well depth:	Source of depth data:	Real time data flag:	Daily flow data end date:	Peak flow data begin date:

Peak flow data count: 0
Water quality data and date:1975-06.28
Ground water data begin date: 0000-00-00
Ground water data count: 0

Water quality data begin date: 1974-10-16 Water quality data count: 3 Ground water data end date: 0000-00-00

Ground-water levels, Number of Measurements: 0

CA WELLS 18784

TAN
San Beerrardino
WELLAMBHTMJUNINTANG-KSUPPLY
Active Raw
1,000 Feet (10 Seconds) 450.000 UMHO 137.000 MG/L 167.000 MG/L 190.000 MG/L 58.200 MG/L 13.000 MG/L 13.100 MG/L 17.700 MG/L .797 MG/L 1.400 MG/L 17.800 C 7.300 7.750 User ID: County; Stallon Type: Well Status; Precision; Connections: Water Stylen Information.

Prime Station Code: 3810b..
FRDS Number: 3810037054
District Number: 3810037054
District Number: 17171010
Source Name: REDIANIOS CITY NUD-WATER DIV System Number: 3810037
System Number: 3810037
System Number: 3810037
System Number: 4810037
System N Findings: Sample Information: * Only Findings Above Detection Level Are Listed Sample Colected: 06/05/1997 Chemical: SOURCE TEMPERATURE C Findings: Findings: Findings: Findings: Findings: Findings: Findings: Findings: 66/05/1997 Fruoride Dependent) Findings: 08/05/1987 TOTAL ALKALINITY (AS CACO3) 08/05/1997 TOTAL HARDNESS (AS CACO3) 06/05/1997 SPECIFIC CONDUCTANCE 06/05/1997 FIELD PH 06/05/1997 BICARBONATE ALKALINITY 06/05/1997 PH (LABORATORY) 06/05/1997 MAGNESIUM D6/05/1997 SUDIUM 06/05/1997 POTASSIUM 06/05/1997 CALCIUM 06/05/1997 CHLORIDE Sample Collected: Chemical: Sample Collected: Chemicat: Sample Collected: Chemical: Semple Collected: Chemical: Semple Collected: Chemical: Sample Collected: Chemical: Sample Collected: Chemical: Sample Collected: Chemical:

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TC1432255.2s Page A-138

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

5.800 PCM.	1.800 PCIAL	1.800 PCM	6.830 PC/A	243.000 MG/L	.350	31.100 MG/L	UTN 001.	5.000 PCIA	858.000 PCM.	11.580	1.180 PCM.	7020.000 UG/L	390.000 PCM.	.950 PCI/L	. 270 PCIL .	230 PCIL	3.000 PCI/L	2.200 PCIAL	2.700 PCM.	.800 PCI/L	3.400 PCI/L	1.800 PCML	3.500 PCIAL	.020 UGAL
06/05/1997 Findings: GROSS ALPHA	08/05/1997 GROSS ALPHA COUNTING ERROR	08/05/1997 Findings: GROSS BETA COUNTING ERROR	Findings:	MANSA PROPERTY SOLEDS Findings:	D&V5/1997 Findings: LANGELIER INDEX @ 60 C	NAVS/1997 Findings: VITRATE (AS NO3)	NAVS/1997 Findings: TURBIDITY (LAB)	08/05/1897 Findings: TOTAL RADON 222 COUNTING ERROR	06/05/1987 Findings: TOTAL RADON 222	Pindings: Findings: AGGRSSIVE (CORROSIVITY)	NAVISTA FINGINGS: URANIUM COUNTING ERROR	96/05/1997 Findings: NITRATE + NITRITE (AS N)	06/05/1987 Findings: FRITIUM COUNTING ERROR	06/05/1997 Findings: RADIUM ZZB COUNTING ERROR	06/05/1997 Findings: RADIUM 228 COUNTING ERROR	5405/1997 Findings: STRONTIUM-90 COUNTING ERROR	97 Findings: ALPHA	07/08/1997 GROSS ALPHA COUNTING ERROR	Findings: W	07/08/1997 Findings: URANIUM COUNTING ERROR	97 Findings: ALPHA	Findings: GROSS ALPHA COUNTING ERROR	97 Findings:	Findings: DBROMOCHLOROPROPANE (DBCP)
Sample Collected: 06/05/1997 Chemical: GROSS AL	Sample Collected: 06/05/1997 Chemical: GROSS AL	Sample Collected: 06/05/1997 Chemical: GROSS BE	Sample Collected: 06/05/1997 Chemical: URANIUM	Sample Collected: 06/05/1997 Chemical: TOTAL DIS	Sample Collected: 06/05/1997 Chemical: LANGELE	Sample Collected: 06/05/1997 Chemical: NITRATE (Sample Collected: 06/05/1997 Chemical: TURBIDITY	Sample Collected: 06/05/1997 Chemical: TOTAL RAI	Sample Collected: 06/05/1987 Chemical: TOTAL RAI	Sample Collected: 06/05/1997 Chemioal: AGGRSSN	Semple Collected: 06/05/1997 Chemical: URANIUM	Sample Collected: 06/05/1897 Chemical: NITRATE +	Semple Collected; 06/05/1997 Chemical: TRITIUM C	Sample Collected: 06/05/1997 Chemical: RADIUM Z	Sample Collected: 06/05/1997 Chemicel: RADIUM 2	Sample Collected; 06/05/1997 Chemical: STRONTIU	Sample Collected: 07/08/1897 Chemical: GROSS ALPHA	Sample Collected: 07/08/1997 Chemical: GROSS AL	Sample Collected: 07/08/1997 Chemicel: URANIUM	Sample Collected: 07/08/1997 Chemicel: URANIUM	Sample Collected: 10/01/1997 Chemicet: GROSS ALPHA	Sample Collected: 10/01/1997 Chemical: GROSS AL	Sample Collected: 10/01/1997 Chemicat: URANIUM	Sample Coffected: 10/01/1997 Chemical: DIBROMO

	2.100 PCM.	17.800 C	390,000 UMHO	7.600	7.740	131.000 MG/L	160.000 MG/L	174.000 MG/L	52.400 MG/L	10.400 MG/L	12.000 MG/L	2.000 MG/L	15,100 MG/L	.738 MG/L	229.000 MG/L	.610	28.500 MG/L	.100 NTU	11.830	6440,000 UGAL
	Findings:	Rndings:	Findings:	Hndings:	Findings:	Findings: 203)	Findings:	Findings: :03)	Findings:	Findings:	Findings:	Findings:	Findings:	Rndings: DEPENDENT)	Findings:	Rndings:	Andings:	Findings:	Findings:)SIVITY)	Findings:
	10/01/1987	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1988	02/04/1988	02/04/1998	02/04/1988	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998	02/04/1998
	URANIUM COUNTING ERROR	SOURCE TEMPERATURE C	SPECIFIC CONDUCTANCE	FIELD PH	PH (LABORATORY)	TOTAL ALKALINITY (AS CACO3)	BICARBONATE ALKALINITY	TOTAL HARDNESS (AS CACO3)	CALCIUM	Magnestum	SODIUM	POTASSIUM	CHLORIDE	FLUORIDE (TEMPERATURE DEPENDENT)	TOTAL DISSOLVED SOLIDS	LANGELIER INDEX @ 60 C	NITRATE (AS NO3)	TURBIDITY (LAB)	AGGRSSIVE INDEX (CORROSIVITY)	NITRATE + NITRITE (AS N)
;	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Sample Collected:	Sample Collected;	Sample Collected:	Sample Collected:	Sample Collected:	Semple Collected:	Sample Collected:	Semple Collected:
	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:	Chemicat:	Chemical:	Chemicat:	Chemical:	Chemical:	Chemical:	Chemical:

35 WSW 1/2 - 1 Mile Lower

FED USGS USGS3135491

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GEOCHECK®-PHYSICAL SETTING SOURCE MAP FINDINGS

340412117121301	34.07001318 M	NAD27	96	120	Not Reported	Not Reported	2	NGVD29			19280104	- Sal	Single well, other than collector or Renney has			304	Not Reported	00-00-0000	0	00-00-0000	1975-06-11	-	00-00-0000	
Site no:	Dec lat Coor meth:	Lationg detum:	District:	County	Land net:	Map scale:	Attitude method:	Alfilude dahum:	380 aq.ml.		Date construction:	Mean greenwich time offset:	Type of ground water site:			Hole depth:	Project number:	Daily flow data begin date:	Daily flow data count:	Peak flow data end date:	Water quality data begin date: 1975-06-11	Water quality data count:	Ground water data end date: 0000-00-00	
USGS 0015003W21M002S 340412	1171213	Ø	NAD83	90	us	Not Reported	1253.00	Not Reported	Senta Ana. California. Area = 1680 aq.ml.	Not Reported	Ground-water other than Spring	Not Reported		Not Reported	Not Reported	270	Not Reported		00-00-0000	00-00-0000	0	11975-06-11	ate: 0000-00-00	•
Agency cd: Site name: Lattucie:	Longitude: Dec fon:	Coor accr:	Dec lationg detum:	State:	Country:	Location map:	Attude:	Altitude accuracy:	Hydrologic:	Topographic:	Site type:	Data inventoried:	Local standard time fing:	Aquifer Type:	Aquifer:	Well depth:	Source of depth data:	Real time data flag:	Dally flow data and date:	Peak flow data begin date:	Peak flow data count:	Water quality data end date:1975-06-11	Ground water data begin date; 0000-00-00	Ground water data count: 0

Ground-water levels, Number of Measurements: 0

U8G83135312					19970313 PST Single well, other than collector or Ranney type	
FED USGS	340503117104102	34.08432222 D NAD83	071 071 Not Reported	24000 D NAVD88		7100 0000-00-00 0 0 0000-00-00
	Site no:	Declat: Coor meth; Lettorn datum:	District: County: Land net:	Map scale: Althufe method: Althufe detum: 30 eq.mi.	Date construction: Mean greenwich time offset. Type of ground water site:	nue cepti Spoject number; Dally flow data begin data: Dally flow data count; Peak flow data end date:
	USGS 0015003W15K002S 340603.56	1171037.92 -117.1772 H	NAD83 06 US	REDLANDS Map social 1388.78 Altitude Altitude Saha Ana. Celliomia. Area = 1680 eq.m.	Ground-water other than Spring 19970313 Y Unconfined single aquifer Not Reported	new organism. Dally flow data h O000-00-00 Dally flow data b O000-00-00 Peak flow data o
F36 ENE 1/2 - 1 Mile Higher	Agency cd: Site name: Latitude:	Longitude: Decion: Coor scor:	Dec lettong detum: State; Country:	Location map: Altude: Altude accuracy: Hydrologic: Topographic:	Site type: Date inventoried: Local standard time flag: Aquifer Type: Aquifer: Wall facility	Source of depth date: reporting ag Real time date lag: 0 Delly flow date end date: 0000-00-00 Peak flow date begin date: 0000-00-00

0	te:2000-08-08	date: 1997-05-13	88
Peak flow data count:	Weter quality data and date: 2000-08-08	Ground water data begin date: 1997-05-1	Ground water data count:

Water quality data begin date: 1998-03-17 Water quality data count: 3 Ground water data end date: 2004-12-21

	Feet below	Feet to
Date	Surface	Sealaved
2004-12-21	229.50	
2004-10-26	228.43	
2004-08-24	222.60	
2004-06-23	221.43	
2004-05-20	219.02	
2004-03-24	213,22	
2004-02-20	211.72	
2003-12-16	210.00	
2003-10-21	211.33	
2003-08-21	210.65	
2003-06-24	203.02	
2003-04-17	203 52	

	Feet below	Ground-water severs, number of Measurements: 98 Feat below Feat to		East holon	1
Date	Surface	Sealavel	Date		Sealevel
2004-12-21	229.50		2004-11-24	228.13	
2004-10-26	228.43		2004-09-22	227.10	
2004-08-24	222.60		2004-07-21	220.30	
2004-06-23	21.43		2004-06-04	220.20	
2004-05-20	219.02		2004-04-22	213.21	
2004-03-24	232		2004-03-11	213.00	
2004-02-20	240.00		2004-01-21	210.59	
2003-10-21	211.83		2003-11-18	210.49	
2003-08-21	210.65		2003-07-23	208.10	
2003-06-24	203.02		2003-05-21	202.00	
2003-04-17	203.52		2003-03-19	204.26	
2003-02-21	204.98		2003-01-21	205.30	
2002-12-19	205.80		2002-11-20	205.23	
2002-10-09	207.64		2002-09-19	208.48	
2002-00-10	20.00		70-70-707	200.54	
2002-08-19	19/190		2002-05-21	195.65	
2002-04-18	195.09		2002-03-20	189.00	
2004-42-20	100.02		71-10-2002	187.84	
2001-10-15	10/.44		2001-11-30	187.10	
2004-08-22	485.64		2001-03-10	104.11	
2001-06-42	3 2		DI-10-1002	182.37	
2001-04-10	72.05		2001-00-24	474 47	
2001-02-23	171.36		2001-03-13	474.00	
2000-12-19	171.23		2000-11-24	470 86	
2000-10-05	173.12		2000-08-14	172 01	
2000-08-14	169.33		2000-07-28	167.98	
2000-07-18	168.22		2000-07-07	165,65	
2000-06-13	163.49		2000-05-18	158.28	
2000-04-20	155.10		2000-03-14	153.91	
2000-02-16	163.57		2000-01-18	152.80	
1999-12-16	151.51		1999-11-05	149.54	
1999-10-04	150.79		1999-09-14	149.29	
1989-06-19	146.29		1999-07-21	142.83	
4000 00 06	138.00		13-90-66EL	138.87	
1999-03-05	130.77		1888-04-50	130.37	
1898-01-11	130.63		100R-12-14	120.43	
1998-11-05	130.38		1998-10-06	130.08	
1098-09-15	134.43		1998-08-13	133.78	
1998-07-22	133.89		1988-08-26	131.61	
1998-08-18	138.34		1998-05-18	138.18	
1998-05-05	145.04		1998-04-02	151.06	
1888-03-17	153.22		1988-03-16	153.13	
1898-03-05	155.32		1988-01-07	158.31	
1997-12-03	159.57		1997-11-05	163.06	
1987-10-06	167.07		1997-10-04	168.86	
1997-09-24	256.41		1997-05-13	150.90	

GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Man ID	Direction	

Distance Elevation

Elevation			Database	EDR ID Number
F37 ENE 1/2 - 1 Mile Migher		2	FED USGS	U9053135311
Agency cd: Site name: Lethiote:	USGS 001S003W15K001S 34F403 FG	Site no:	340503117104101	
Longitude:	1171037.92	Dec lat:	34.08432222	
Coor accr.	2//L/7th- H	Coor meth: Lettong detum:	D NAD83	
Dec lationg datum:	NAD83	District	8	
State:	8	County:	07.1	
Country:	Sh	Land net:	Not Reported	
Location map:	REDLANDS	Map scale:	24000	
Aithude:	1368.78	Althude method:	Ω	
Altitude accuracy:	rvi	Altitude datum:	NAVD88	
Hydrologic:	Santa Ana. California. Area = 1680 sq.mi.	30 sq.mt.		
Topognaphic:	Flat surface			
Sile type:	Ground-water other than Spring	Date construction:	19970313	
Date inventoried:	19970327	Mean greenwich time offset:	PST	
Local standard time flag:	>	Type of ground water site:	Sindle well, other than	Single well, other than collector or Ranney type
Aquifier Type:	Not Reported			adle farmer in the
Aquifer:	Not Reported			
Well depth:	1085	Hole depth:	1100	
Source of depth data:	reporting agency (generally USGS) roject number	Shoed number	470846723	
Real time data flag:	0	Daily flow data bectin date:	00-00-000	
Daily flow data and date:	00-00-0000	Daily flow data count:		
Peak flow data begin date:	00-00-0000	Peak flow deta end date:	0000-0000	20
Peak flow data count:		Water quality date begin date:		
Water quality date and date:1997-06-05	e:1997-06-05	Weter quality date count:		
Ground water data begin date: 1997-05-13	late: 1997-05-13	9	2004-12-21	
Ground water data count:	187			

	Feet below	Feet to		Feet below	Feet to
æ	Surface	Sealevel	Dete	Surface	Sealevel
2004-12-21	229.04		2004-11-24	4 228.74	
2004-10-26	228.00		2004-09-22		
004-08-24	222.75		2004-07-21	220.49	
2004-06-23	221,12		2004-06-04	_	
004-05-20	218.68		2004-04-2		
2004-03-24	213.22		2004-03-1	_	
004-02-20	211.75		2004-01-27	_	
2003-12-16	209.76		2003-11-18		
2003-10-21	211.34		2003-09-18		
003-08-21	210.50		2003-07-23	•••	
003-08-24	202.46		2003-05-21	_	
003-04-17	202.9		2003-03-19	_	
003-02-21	204.62		2003-01-21	•	
002-12-19	205.75		2002-11-20	-	
002-10-09	207.30		2002-08-19	-	
002-08-16	204.00		2002-07-17		
002-08-19	197.70		2002-05-21	•	
002-04-18	193.28		2002-03-20		
002-02-20	1R8 4.8		20. Pro-Crinic	ľ	

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Foot holow	Lane D	i	
Surface	Sealevel	Date	Surface Sealevel
187.40		2001-11-30 18	87.05
188.03		_	84.11
185.16		•	81.83
178.79		2001-05-24 17	07.77
171.99			171.09
171.26		2001-01-24 17	71.78
171.17		Ξ	F7.07
172.62		_	71.50
168.80		•	67.38
165.39		•	65.02
162.88		_	158.21
154.98		-	153.97
153.45		_	152.65
151.35		_	149.39
150.09		1999-09-14 14	148.68
145.87		1999-07-21 14	42.29
139.00		1999-06-21 13	38,30
132.57		1999-04-20 13	54.73
130.43		1999-02-16 13	130.11
130.20		1998-12-14 12	129.94
129.80		Ī	129.41
133,25		1996-08-13 13	132.46
132,57		1986-06-26 13	130,79
135.10			137.50
144.B4		1998-04-02 15	150.68
155.13		_	58.06
159.36		-	162.45
167.51		_	57.78
160.61		1997-06-03 14	47.89
145.22			

FED USGS U8GS3138102	340503117104105	34.08432222	NAD83	80	1/0	Not Reported	24000	٥	NAVD88			19970313	PST	Single well, other than collamor or Rannov two		1100	470646723	00-00-0000		00-00-0000
	Site no:	Deciat:	Lationg datum:	District:	County:	Land net:	Map scale:	Altitude method:	Alitude datum:	680 sq.mi.		Date construction:	Mean greenwich time offset:	Type of ground water site:		Hole depth;	GS/roject number:	Daily flow data begin date:	Daily flow data count:	Peak flow data and date:
	USGS 001S003W16K005S 340503.56	1171037.92		NAD83	88	SS SS	REDLANDS	1368.78	rοί	Santa Ana. California. Area = 1680 sq.mi.	Flat surface	Ground-water other them Spring Date construction:	18970331	>	Not Reported Not Reported	240	reporting agency (generally USGS)roject number.	0	00-00-0000	00-00-0000
F38 ENE 1/2 - 1 Mile Higher	Agenoy od: Site name: Lettitude:	Longitude: Dec ho:	Coor soor:	Dec lationg datum:	State:	Country:	Location map:	Atttude:	Allflude accuracy:	Hydrologia:	Topognaphic:	Site type:	Date Inventoried:	Local standard time flag:	Aquifer Type: Aquifer:	Well depth:	Source of depth data:	Real time data flag:	Daily flow data and date:	Peak flow data begin date:

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Fige 1986, Number of Messurements: 100 Surface Sealewel Cent to Surface Surfac	CIONEN MONES COMO COURT.					
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186,73 2007,01-17 186,73 2007,01-17 186,73 2007,01-17 186,73 2007,01-17 186,73 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-30 2001,01-16-	2002-04-18	191.82		2002-03-20		
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(156.29 (1986.03-16) (1987.37 (1986.01-17) (1917.37 (1986.10-17) (1917.10-18) (1987.10-18)	1998-05-05	148 59		1009 OF 10		
157.37 (1986-01-07) 181.23 (1987-11-05) 188.79 (1987-10-06) 188.79 (1987-10-06)	1998-03-17	156.28		1999-03-16	•	
161.23 1997-11-05 190.80 1987-09-08 158.79 1987-09-25	1998-03-05	157.37		1998-01-07		
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Database	FED USGS	340503117104104	34.08432222 D	NADB3	8 6	Not Reported	24000	۵	NAVD88		40070040	PST	Single well, other			1100	470646723	00-00-0000	0	00-00-0000	1997-06-03	6	2004-12-21	
		Site no:	Declat: Coor meth:	Lettong datum:	County	Land net:	Map scale:	Altitude method:	Altitude datum:	20 sq.mi.	The second second	Mean onemaich fine offset-	Type of ground water site:			Hote depth:	Spoject number:	Daily flow data begin date:	Delly flow data count:	Peak flow data end date:	Water quality data begin date: 1997-06-03	Water quality data count:	Ground water data end date:	
	 	USGS 001S003W15K004S 340503.56	1171037.92	H NAD83	200	NS .	REDLANDS	1368.78	rō	Santa Ana. California. Aree = 1680 sq.mi.	Construction of her than Contra. Date sensitives	19970331	>	Unconfined single aquifer	Not Reported	510	reporting agency (generally USGS)roject number:	0	00-00-0000	00-00-000	•	2000-08-08	le: 1997-05-13	66
Mep IU Diraction Distance Elevation	F39 ENE 1/2 - 1 Mite Higher	Agency cd: Site name: Latitude:	Longitude: Dec ion:	Coor scor:	State:	Country:	Location map:	Alttude:	Althude accuracy:	Hydrologic:	Sile true.	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquifer:	Well depth:	Source of depth date:	Real time data flag:		lete:	Peak flow data count:	Water quality data end date: 2000-08-08	-99	Ground water data count:

217.85	220.50	Surface Sealewel	Feet below	2004-11-24 2004-01-24 2004-07-21 2004-06-04 2004-04-02-02	Seatervel	<u> </u>	2004-12-21 2004-10-26 2004-08-24 2004-08-23 2004-06-23
	217.85	228.78 227.72 222.21 220.60 277.85	Surface Seafevel 228.78 228.72 222.27 222.27 221.85			200	700 00 000
220,50		228.78 227.72	Surface Sealewel 228.78 227.72	2004-07-21		222.21	04-08-24
222.21 220.50	222.21	228.78	Surface Sealevel	2004-09-22		227.72	304-10-26
227.72 222.21 220.50	227.72 222.21		Surface Sealewel	2004-11-24		228.78	004-12-21

ate	Surface	Sealevel	Date	Feet below Surface	Feet to Sealevel
004-12-21	228.78		2004-11-24	228.32	
004-10-26	227.72		2004-09-22	228.21	
004-08-24	222.21		2004-07-21	219.98	
004-06-23	220.50		2004-06-04	219.00	
004-05-20	217.85		2004-04-22		
004-03-24	213.00		2004-03-11		
004-02-20	211.55		2004-01-21		
003-12-16	209.91		2003-11-18		
903-10-21	211.11		2003-08-18		
003-08-21	209.75		2003-07-23		
003-08-24	203.08		2003-06-21		
2003-04-17	203.58		2003-03-19	204.30	
003-02-21	205.00		2003-01-21		
002-12-19	205.83		2002-11-20		
2002-10-09	206.84		2002-08-19		
002-08-16	203.08		2002-07-17		
902-06-19	197.15		2002-05-21		
002-04-18	192.72		2002-03-20		
002-00-000	188 82		2000 04 43		

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

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20000 20000 1989 1989 1989 1988 1988 1988 1988	20002 20003 1 1989 1 1989 1 1989 1 1989 1 1989 1 1989 1 1989	20000 20000 1989 1989 1989 1989 1989 1989 1989	20000 20000 1989 1989 1989 1989 1989 1989 1989
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1999 1999 1999 1999 1999 1999 1999	19899 1980 1980 1980 1980 1980 1980 1980	19999 1998 1998 1998 1998 1998 1999 1997 1997	98981 1988 1988 1988 1988 1989 1987 1989 1989
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1986 1986 1986 1986 1986 1986 1986 1988	1989 1999 1999 1999 1999 1999 1999	1988 1988 1988 1988 1988 1988 1989 1989	1986 1986 1986 1986 1986 1987 1987 1987 1987
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1998 1990 1990 1990 1990 1990	1998 1998 1998 1998 1998 1997	1998 1998 1998 1998 1998 1998 1998 1998	19989 1988 1988 1989 1997 1997 1997
1998 1998 1988 1988 1989 1989	1998 1990 1990 1990 1997	1998 1998 1998 1998 1997 1997 1997	98681 1986 1986 1987 1987 1987 1987
1998 1998 1986 1996 1997	1998 1988 1988 1989 1991	1988 1988 1988 1987 1997 1987	1998 1986 1986 1986 1987 1987 1987
1986 1985 1995	1986 1886 1989 1987 1987	1998 1980 1980 1997 1997	1988 1986 1987 1987 1987
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1998	1998 1997 1997	1998 1997 1987 1987	1998 1997 1997 1997
1997	1997	1997 1987 1987	1997 1997 1997
	1997	1997	1987

F40 ENE 1/2 - 1 Mila Hgher			FED USGS	USGS3135100
Agency cd: Site name: Latitude:	USGS 0015003W15K003S 340503.56	Site no:	340503117104103	
Longitude:	1171037.92	Dec lat:	34.08432222	
Coor Boor.		Lettona datum:	NADR3	
Dec lationg datum:	NAD83	District:	90	
State:	96 <u>-</u>	County:	071	
Location map:	REDLANDS	Land net: Map scale:	Not Reported 24000	
Althude:		Altitude method:	۵	
Altitude accuracy:	τĊ	Altitude datum:	NAVD86	
Hydrologic:	Salifornia. Area = 16	80 sq.ml.		
Тородтарніс	Flat surface			
Site type:	Ground-water other than Spring Date construction:	Dafte construction:	19970313	
Date inventoried:	19970331	Mean greenwich time offset:	PST	

Type of ground water site: Single well, other than collector or Bancey type			1100	nber: 470646723	Daily flow data begin date: 0000-00-00		Peak flow data and date: 0000-00-00	late:	Water quality data count: 3	Ground water data end date: 2004-12-21	
Type of grou	Not Reported	Not Reported	70 Hole depth:	reporting agency (generally USGS) roject number:	Daily flow de	0000-00-00 Daily flow data count:	7	Water qualit			
Local standard time flag: Y	Aquiler Type: N	Aquifer: N	Well depth: 77		Real time data flag: 0	Dally flow data end date: 00	Peak flow data begin date: 0000-00-00	Peak flow data count: 0	Water quality data end date:2000-08-08	Ground water data begin date: 1997-05-13	Contract contract date and

ound-water levels, Number of Measurements:

	Surface	Seatevel	Date	Surface	Seefevel
2004-12-21	229.44		2004-11-24	229.04	
2004-10-28	228.40		2004-09-22	227.00	
2004-08-24	222.48		2004-07-21	220.16	
2004-06-23	221.12		2004-06-04	219.90	
	218.72		2004-04-22	213.00	
	213.20		2004-03-11	212.90	
	211.75		2004-01-21	210.36	
2003-12-16	209.80		2003-11-18	210.23	
	211.32		2003-09-18	209.74	
2003-08-21	210.68		2003-07-23	208.04	
2003-08-24	202.70		2003-05-21	201.63	
2003-04-17	203.12		2003-03-19	204,00	
2003-02-21	204.77		2003-01-21	205.16	
2002-12-19	205.74		2002-11-20	205.12	
2002-10-09	207.72		2002-08-19	208.51	
	204.28		2002-07-17	200 69	
	198.11		2002-05-21	195.48	
2002-04-18	183.50		2002-03-20	188.14	
2002-02-20	188.70		2002-01-17	188.00	
2001-12-20	187.86		2001-11-30	187.24	
2001-10-15	186,15		2001-09-18	184.27	
2001-08-22	185.55		2001-07-10	182.19	
2001-06-12	179.14		2001-05-24	177.99	
2001-04-10	172.25		2001-03-15	171.42	
2001-02-23	171.61		2001-01-24	172.08	
2000-12-19	171.45		2000-11-28	171.09	
2000-10-05	173.08		2000-09-14	171.95	
2000-08-14	169.32		2000-07-28	167.90	
2000-07-18	168.51		2000-07-07	165.65	
2000-08-13	163.50		2000-05-18	158.46	
2000-04-20	156.31		2000-03-14	153.92	
2000-02-18	153.81		2000-01-18	153.06	
1999-12-16	151.79		1999-11-05	149.85	
1999-10-04	150.79		1999-09-14	149.22	
1999-08-19	146.18		1999-07-21	142.82	
988-06-25	139.75		1999-06-21	138.91	
1989-05-25	133.17		1999-04-20	135.60	
989-03-05	131.27		1999-02-18	131.00	
999-01-11	131.21		1988-12-14	131.09	
988-11-05	131.14		1998-10-08	130.89	
988-09-15	134.91		1998-08-13	134 44	
00 00 000					

TC1432255.2s Page A-145

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

	:	Leef to		Peet Delow	/ Feelb	
Date Surface		Sealevel	Date	Surface		
1998-06-18 136.88			1988-05-18	139.07		
1998-05-05 147.23	г		1988-04-02	151.80		
1998-03-05 155.78	ø		1998-01-07	158.60		
	<u>.</u>		1997-11-05	162.62		
1997-10-06 158.32	21		1997-10-04	57.95		
1997-09-25 158.32	2		1997-09-24	180 95		
1997-06-03 148.19	6		1997-05-13	146.97		
						1
SW 1/2 - 1 Mile Lower					FED USGS	U8G35135457
Agency od:	5	nsos	Site no:	8	340406117121101	
Site name:	<i>6</i> 5 25	SANDYS RESTURANT		í		
ongitude	÷	1171211	Declar	2	34 06924857	
Dec lon:	7	117,20392812	Coor meth:	5 3		
Coor accr.	2		Lationg datum:	Ž	NAD27	
Dec lationg datum:	Z	NAD83	District	8	_	
State:	8		County:	6	071	
Country:	3	SA SA	Land net:	ž	Not Reported	
Location map:	2	Not Reported	Map scale:	ž	Not Reported	
Althude:	Ž	Not Reported	Altitude method:	Ž	Not Reported	
Altitude accuracy:	F	9	Althude deturn:	ž	Not Reported	
Hydrologic:	Ø	Santa Ana. California. Area = 1680 sq.mi.	0 sq.mi.			
opognaphic:	Ž					
Site type:	Ø:	other than Spring	Date construction:	_	Not Reported	
Date Inventoried:		Not Reported	Mean greenwich time offset:	_	PST	
.ocal standard time flag:			Type of ground water site:		ngle well, other the	Single well, other than collector or Ranney type
Aquifer Type:	2	Not Reported				
Aquifer:	Ž	Not Reported				
Well depth:		Vot Reported	Hote depth:	ž	Not Reported	
Source of depth data:		Not Reported	Project number:	_	Not Reported	
Real time data flag:			Dally flow data begin date:	_	00-00-000	
Daily flow data end date:	chate:	00-00-0000	Daily flow data count:	_		
Peak flow data begin date: 0000-00-00	n date: 00	00-00-00	Peak flow data end date:	8	00-00-0000	
Peak flow data count.	0		Water quality data begin date: 1975-06-12	n date: 19	175-06-12	
Water quality data end date: 1975-06-12	and date: 1	175-06-12	Water quality data count			
nd water data n	begin date	Ground water data begin date; 0000-00-00	Ground water data and date		0000000	

Ground-water levels, Number of Measurements: 0

42 WSW 1/2 - 1 kile Lower

FED USGS USGS3135324

340420117122101	34.07223532	2	NAD27	90	140	Not Reported	Not Reported		NGVD29			19110101	PST	Single well, other than collector or Ranney type			308	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported		
Site no:	Dec lat:	Coor meth:	Lettong datum:	District:	County:	Land net:	Map scale:	Althude method:	Althude datum:	80 aq.ml.		Date construction:	Mean greatwich time offset:	Type of ground water site:			Hole depth:	Project number.	Daily flow data begin date:	Daily flow data count:	Peak flow data end date:	Water quality data begin date: Not Reported	Weter quality data count:	Ground water data end date:	
USGS 001S003W21E003S 340420	1171221	-117.20870607	S	NAD83	90	ns	Not Reported	1243.00	Not Reported	Santa Ana. California. Area = 1680 aq.ml.	Valley flat	Ground-water other than Spring	Not Reported	>	Not Reported	Not Reported	306	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	:Not Reported	ste: Not Reported	Not Reported
Agency cd: Site name: Latitude:	Longitude:	Dec lon:	Coor accr.	Dec lattong datum:	State:	Country:	Location map:	Altitude:	Altitude accuracy:	Hydrologic:	Topographic:	Site type:	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquifer	Well depth:	Source of depth data:	Real time data flag:	Daily flow data end date:	Peak flow data begin date:	Peak flow data count:	Water quality data end date: Not Reported	Ground water data begin date: Not Reported	Ground water data count:

Ground-water levels, Number of Measurements: 0

FED USGS USGS3135432	34035B117120501	34.0864022 M	NAD27	88	Not Reported	Not Reported		NGVD29			19350101	offset: PST	site: Single well, other than collector or Ranney type			388	Not Reported		Not Reported	
	Site no:	Dec lat.	Lattong datum:	District:	Land net:	Map ecals:	Altitude method:	Althude datum:	1680 sq.ml.		ng Date construction:	Mean greenwich time offset:	Type of ground water site:	,		Hole depth:	Project number:	Dally flow data begin date:	Daily flow data count.	Peak flow data end date:
	USGS 0015003W21P001S 340250	1171205	8	NAD83	8 S	Not Reported	1269.00	τ.	Sents Ans. Cellfornia. Area = 1680 sq.ml.	Not Reported	Ground-water other than Spring	Not Reported	*	Not Reported	Not Reported	356	Not Reported	Not Reported	Not Reported	Not Reported
43 SW 1/2 - 1 Mile Lower	Agency cd: Site name: Laffitide:	Longitude: Declon:	Coor scor.	Dec lattong datum:	Country:	Location map:	Alitude:	Altitude accuracy:	Hydrologic:	Topographic:	Site type:	Date inventoried:	Local standard time flag:	Aquifer Type:	Aquifer:	Well depth:	Source of depth data:	Real time data flag:	Daily flow data end date:	Peak flow data begin date:

GEOCHECK®- PHYSICAL SETTING SOURCE MAP FINDINGS

Peak flow data count: Not Reported Water quality data end date. Not Reported Ground water data begin date: Not Reported Ground water data count: Not Reported

Water quality data begin date: Not Reported Water quality data count. Not Reported Ground water data end date: Not Reported

Cround-water levels, Number of Messurements: 0

44 East 1/2 - 1 Mile Higher			PED USGS USGS3135245
Agency cd: Site name:	USGS 001S003W15R001S	Silve no:	340442117102301
Longitude:	1171023	Dockst	34 0703443
Dec lon:	-117.17392694	Coor meth:	Z-10-10-10-10-10-10-10-10-10-10-10-10-10-
Coor scor:	ø	Lettono detum:	NAD27
Dec lationg datum:	NAD83	District	98
State:	98	County	071
Country:	ns	Land net:	Not Recorted
Location map:	Not Reported	Map scale:	Not Recerted
Affinde:	1394.00	Altitude method:	3
Althude accuracy.	Not Reported	Altitude detum:	NGVD29
Hydrologic:	Santa Ana, California. Area = 1680 eq.mi.	10 eq.mi.	
Topographic:	All wish or marine terrace		
Site type:	Ground-water other than Spring	Date construction:	19300101
Date Inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	*	Type of ground water site:	Sincie well, other than collector or Ranney type
Aquiter Type:	Not Reported		
Aquiter.	Not Reported		
Well depth:	386	Hole depth:	400
Source of depth data:	Not Reported	Project number.	Not Reported
Real time data flag:	Not Reported	Dally flow data begin date:	Not Reported
Daily flow data and date:	Not Reported	Delly flow data count:	Not Reported
Peak flow data begin date:		Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Weter quality data begin date:	
Water quality data end date: Not Reported	::Not Reported	Wefer quality data count:	
Ground water data begin date: Not Reported	ate: Not Reported	Ground water data end date:	Not Reported
GIOGRA Water vete count	Public Region and		

Ground-water levels, Number of Measurements: 0

U8G83136392								
FED U8GS	340432117102301	34 07556844	2	NAD27	8	120	Not Reported	Not Reported
	Sittle no:	Doc lat:	Coor meth:	Lettong datum:	District	County:	Land net:	Map scale:
	USGS 001S003W22A001S 340432	1171023	-117,17392689	ø	NAD83	8	Sn	Not Reported
45 East 1/2 - 1 Mile Higher	Agency cd: Site name: Lettude:	Longitude:	Dec lon:	Coor acor.	Dec lationg datum:	State:	Country	Location map:

TC1432255.2s Page A-148

M NGVD28	19260101 PST Single well, other than collector or Ranney type	314 Not Reported
Attude method: Attude datum: 30 sq.ml.	Date construction: Mean greenwich time offset: Type of ground water site:	Hole depth: Project humber: Project humber: Project humber: Post humbe
Atitude Not Reported Atitude Sents Ave Celifornia. Area = 1680 sq.mi.	Ground-water other than Spring Date construction: Not Reported Mean greenwich til Y Not Reported Not Reported	300 my New Reported New Reporte
Alibude: Alibude accuracy: Hydrologic: Topographic:	Site type: Date inventoried: Local standard time flag: Aquiter Type: Anuller:	th: * depth data: * depth data: * data fag: * data begin data: * data begin data: * data count: * which data begin data * data count: * data begin data * which data begin data * which data begin data * when data begin data

Ground-water levels, Number of Measurements: 0

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS RADON

AREA RADON INFORMATION

State Database: CA Radon

Radon Test Results

Pct. > 4 Pcift. 000 > 4 Pc/L Total Sites Zlp — 92374

Federal EPA Radon Zone for SAN BERNARDINO County: 2
Note: Zone 1 Indioor nerespe level > 4 CPUL.
: Zone 2 Indoor everage level > 2 CPUL and <= 4 PCML.
: Zone 3 Indoor everage level > 2 PCML and <= 4 PCML.

Federal Area Radon Information for Zip Code: 92374 Number of sites tested: 2

% >20 pc/l. 0% Not Reported Not Reported 0% Not Reported Not Reported % 4-20 pc/n. % <4 pCt/L 100% Not Reported Not Reported Average Activity 0.500 pCI/L. Not Reported Not Reported Area Living Area - 1st Floor Living Area - 2nd Floor Basement

TC1432255.2s Page A-150

PHYSICAL SETTING SOURCE RECORDS SEARCHED

OPOGRAPHIC INFORMATION

U8G8 7.5 Digital Elevation Model (DEM)
Source: United States declope Survey
Source: United States declope Survey
EDR acquired the USGS 7.5 Digital Elevation Model in 2002. 7.5-Minute DEMs correspond to the USGS
1:24,000- and 1:25,000-scale topographic quadrangle maps.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Deta depicts 100-year and 500-year flood zones as defined by FEMA.

NWF: National Waltands Inventory. This data, evaliable in select counties across the country, was obtained by EDR in 2002 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW[®] Information System
Source: EDR proprietary databases of groundwater flow information
Source: EDR proprietary databases of groundwater flow information System (AIS) to provide deta on the general direction of groundwater
Flow at specific points. EDR has reviewed reports authritised to regulatory authoritises at select sites and has
extracted the date of the report hydrogeologically determined groundwater flow direction and depth to water tieble

SEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphie Unit Source: P.G. Schrüben, R.E. Andtl and W.J. Bawtec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - Adigital representation of the 1974 P.B. King and H.M. Beldman Map, USGS Digital Data Series DDS - 11 (1994).

STATBGO: State Soil Geographic Detablese
Source: Department of Agriculum, Natural Resources Conservation Services
Source: Department of Agriculum, Natural Resources Conservation Services
(NRCS) leads the national
Conservation Soil Survey (VICSS) and is responsible for collecting, storing, markstaining and distributing sell
survey information for privately counsed lands in the United States. A soil map in e soil survey is a representation
of soil patterns in a tendecape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURCC)

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: Exholfine of Drinking Water
Teephone: 222-564-3750
Teephone: 222-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days amusely. PWSs provide water from webs, three and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data Source: EPAOfitics of Drinking Water

Telephone: 202-584-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1985. Prior to August 1985, the data came from the Federal Reporting Data System (FRICS).

UBGS Water Welte: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the UBGS collects or has collected data on surface water and/or groundwater, The groundwater, The groundwater.

TC1432255.2s Page A-151

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STATE RECORDS

California Drinking Water Quality Database Source: Department of Health Services Telephone: 916-224-2219
Telephone: 916-224-2219
The databases include and drinking weter compliance and apacial studies monitoring for the state of California alnoe 1984. It consists of over 3,200,000 includual analyses along with well and water system information.

Celifornia Oil and Gas Well Locations for District 2, 3, 5 and 6 Source: Department of Conservation Telephone: 916-223-1779

RADOM

State Database: CA Redon Source: Department of Health Services Telephone: 916-324-2208 Radon Database for California

Wes Radon Information Source: USGS

Telephone: 705-366-4020
The National Kacho Database has been developed by the U.S. Environmental Proaction Agency
(USEPA) and is a compliation of the EPA/State Readential Radon Survey and the National Residential Radon Survey.
The study owners the years 1968-1992. When necessary data has been supplemented by information collected at private sources such as universities and research institutions.

PA Retiden Zowes

Source: E9

Source: Totalshorse: T03-356-4020

Sendors 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor redon levals.

OTHER

Alroort Lending Facilities: Private and public use tanding facilities Sourca: Federal Avistion Administration, 800-457-4856

Epicentera: World earthquake epicenters, Richter 5 or greater Source: Department of Commerce, National Oceanic and Amospheric Administration

California Earthquake Fault Lines: The fault ines displayed on EDR's Topographic map are digitized quaternary fault lines, prepared in 1975 by the United State Geological Survey. Additional Information (also from 1975) regarding achity at specific fault lines comes from California's Prelimbrary Fault Activity Map prepared by the California DiMeton of Mines and Geology.



EDR Site ReportTM

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374

Inquiry Number:

June 15, 2005

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road Milford, Connecticut 06460

Nationwide Customer Service

Telephone: 1-800-352-0050 Fax: 1-800-231-6802 Internet: www.edmet.com

TABLE OF CONTENTS

The EDR-Site Report^{**} is a comprehensive presentation of government filings on a facility identified in a search of over 4 million government records from more than 600 federal, state and local environmental databases. The report is divided into three sections:

Thank you for your business. Please contact EDR at 1-800-352-0050 with any questions or comments.

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SECTION 1: FACILITY SUMMARY

AREA WASTE MANAGEMENT WASTE MANAGEMENT WASTE WANAGEMENT WASTE WANAGEMENT Fieldly promises heartweeth waste (FCRA) Fieldly promises heartweeth waste (FCRA) Fieldly has been eabled to Chromoso of harantweeth (FCRANICA) Fieldly has been eabled to Chromoso of Parametrica waste Fieldly has been eabled to Chromoso of Parametrica waste Fieldly has been eabled to Chromoso of Parametrica waste Fieldly has been eabled to Chromoso of Parametrica of Par	2007 - 1
(CLS)	
CTS)	
CTS)	
RHS)	
CTS)	
SHA!	
(S)	
RNS)	
(6)	
SS	
RNS)	
Facility has a reported Superfund Lien on it (LIENS)	
Facility is fisted as a state hazardous waste alto (SHWS)	
Fedity has disposed of solid waste on-site (SWF/LF) NO	
anu Tiletto VESS - P12 Ficially uses both chemicals and has notified EPA VESS - p12 under SARA Tiles III, Section 313 (TPUS)	
Facility produces pasticides and has notified EPA NO under Section 7 of FIFEA (SSTS)	
Facility manufactures or imports looks chemicals on the TSCA list (TSCA)	
Facility has inspections under FIFRA, TSCA or EPCRA (FTTS) NO	
Facility is listed in EPA's index system (FINDS) YES - p15	
Facility is listed in a county/local unique database (LOCAL) YES - p16	
POTENTIAL SUPERFUND LIABILITY Facility has a list of potentially responsible parties PRP NO	
TOTAL (YEB) 8	

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SECTION 2: FACILITY DETAIL REPORTS

WASTE MANAGEMENT

Facility generates hazardous waste

Facility treats, stores, or disposes of hazardous wasta on-site

DATABASE: Resource Conservation and Recovery Information (RCRAInfo)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374 EDR ID #1000921584

acility Name:

TELEDYNE CONTINENTAL MOTORS BATTERY PROD 840 W BROCKTON AVE REDLANDS, CA 92374 **Aailing Address**:

P O BOX 7950 REDLANDS, CA 82375

Not reported Not reported Contact

CAD008386641 EPA-Di

Large Quantity Generator, TSDF Classification:

Description:

Not reported **ISDF Activities:** Legal Status:

TELEDYNE INDUSTRIES INC 1901 AVE OF THE STARS LOS ANGELES, CA 21327 - 7331 (213) 277-3311 Operator:

BIENNIAL REPORTS

Last Biennial Reporting Year 2001

Annual Waste Handled:

353490.00 Amount (Lbs) Waste Code D008

Amount (Lbs)

Waste Code

CORRECTIVE ACTION SUMMARY

RFI Workplan Approved 10/25/1985 Event: Event Date:

RFI Imposition 02/24/1989 Event Event Date:

CA Prioritization, Facility or area was essigned a high corrective action priority. 12/18/1981 Event Event Date:

RFI Workplan Approved 11/10/1992 Event: Event Date: Report# Prepared for / June 15, 2005 Page# 4 of 31

SECTION 2: FACILITY DETAIL REPORTS

RFI Approved 12/17/1993

Event Event Date: Event Event Event Event:

RFI Workplan Approved 10/25/1995

Current Human Exposures under Orditol Year, Current Human Exposures Under Control has been welfide. Bestel on a melwe of information contained in the II determination current cutter of exposures are exposures are exposures and under control of the facility under current and meannably expected condition. This determination will be re-evaluated when the Agency/State bocomes aware of Significant changes at the facility.

Event

Every Date:

Ignation of Contembrated Counchman under Councy, Vs.a. Mignation of Contembrated Counchman Under Council and England or Contembrated Counchman Under Council Land Season and Season Seas

Event Date:

RFI Approved 01/19/2000 Event: Event Date:

Curront Hamal Expogrates under Control, Veg. Durnet Human Expograte busined: Control has been welfied. Based on a review of information contained in the El determination, current human exposures are exposures are exposures. The determination of information contained in the facility under current and resecrately expocated conditions will be re-evaluated when the Agency/State becomes sween of definition changes at the facility. Event:

Event Date:

Event:

gration of Contractational of Countration Lands and Countration of Continuinated Countration of Contractation of Contractation of Countration Countration Lands and Countration Lands and
Event Date:

Event: Event Date:

CMI Workpian Approved 08/28/2004 Event: Event Date: Report# Prepared for / June 15, 2005 Page# 5 of 31

SECTION 2: FACILITY DETAIL REPORTS ...Continued...

WASTE MANAGEMENT

Facility Has Received Notices of Violations

DATABASE: Resource Conservation and Recovery Information (RCRAInfo)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374 EDR 1D #1000821684

264.140-150.H 20-PHANICIAL RESPONSIBILITY REQUIREMENTS 287A/1984 08728/1984

WRITTEN INFORMAL 38/04/1984 Enforcement Action; Enforcement Action Date:

288 ALL TSD-LAND BAN REQUIREMENTS 04/15/1993 05/07/1993 Regulation Violated: Area of Violation: Dets Violation Determined: Aduel Date Achieved Compilance: Enforcement Action: Enforcement Action Date:

NITIAL 3008(A) COMPLIANCE ORDER 37/14/1883 ARITTEN INFORMAL Enforcement Action: Enforcement Action Date:

284.90-94.F SPG-GOUNDWATER MONITORING REQUIREMENTS 77/08/1982 1207/1989 Regulation Wolated: Area of Violation: Data Violation Determined: Actual Data Achieved Compliance:

284.140-150.H TSD-FINANCIAL RESPONSIBILITY REQUIREMENTS Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Achieved Compliance:

284.140-160.H 25-PINANGAL RESPONSIBILITY REQUIREMENTS 03/10/1982 03/11/1983 188-140-150.H ISD-FINANCIAL RESPONSIBILITY REQUIREMENTS Regulation Violated: Area of Violation: Date Violation Determined: Actual Date Achieved Compliance: Regulariton Violated: Area of Violation: Date Violation Determined: Actual Date Achieved Compilance:

284.170-177.1 TSD-OTHER REQUIREMENTS (OVERSIGHT) 11/21/1991 08/13/1803 WRITTEN INFORMAL Regulation Violated: Area of Violation: Date Violation Determined: Actual Date Actieved Compitence: Enforcement Action: Enforcement Action Date:

INITIAL 3008(A) COMPLIANCE ORDER 02/20/1982 CIVIL ACTION FOR COMPLIANCE 02/20/1992 Enforcement Action: Enforcement Action Date: Enforcement Action: Enforcement Action Date:

WRITTEN INFORMAL

Enforcement Action: Enforcement Action Date:

282.40-43.D GENERATOR-ALL REQUIREMENTS (OVERSIGHT) 09/13/1983 Regulation Violated: Area of Violation: Date Violation Determined: Actual Date Achieved Compitance:

SECTION 2: FACILITY DETAIL REPORTS

VITIAL 3008(A) COMPLIANCE ORDER 2/20/1992 CIVIL ACTION FOR COMPLIANCE 32/20/1992 WRITTEN INFORMAL Enforcement Action: Enforcement Action Date: Enforcement Action: Enforcement Action Date: Enforcement Action: Enforcement Action Date:

284.56-56.D TIZTIONER REQUIREMENTS (OVERSIGHT) M121/1831 Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Achieved Compliance:

CIVIL ACTION FOR COMPLIANCE 32/20/1992 WRITTEN INFORMAL Enforcement Action: Enforcement Action Date: Enforcement Action: Enforcement Action Date:

264.10-18.B TSC-OTHER REQUIREMENTS (OVERSIGHT) 11.12/1991 09/13/1993 NITIAL 3008(A) COMPLIANCE ORDER 2220/1992 Enforcement Action: Enforcement Action Date:

Regulation Violated: Area of Violation: Date Violation Determined: Actual Date Achieved Compliance:

NITIAL 3008(A) COMPLIANCE ORDER 2220/1992 Enforcement Action: Enforcement Action Date:

SS-OTHER REQUIREMENTS (OVERSIGHT) 1/08/1990 1/31/1991 Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Achieved Compliance:
Enforcement Action:
Enforcement Action Date:

WRITTEN INFORMAL 12/23/1990

270 1790-OTHER REQUIREMENTS (OVERSIGHT) 14/30/1899 02/02/1890 WRITTEN INFORMAL 01/12/1990 Regulation Violated:
Area of Violation:
Date Violation Determined:
Actual Date Actieved Compliance:
Enforcement Action:
Enforcement Action:

SD-OTHER REQUIREMENTS (OVERSIGHT) 1/1/2/1989 Regulation Violeted: Area of Violation: Date Violation Determined: Actual Date Achieved Compilance:

INITIAL 3008(A) COMPLIANCE ORDER 95/25/1989 Enforcement Action: Enforcement Action Date:

264.90-94.F SPACCOUNDWATER MONITORING REQUIREMENTS 301/12/1989 Regulation Violated: Area of Violation: Date Violation Determined: Actual Date Achieved Compliance:

NITIAL 3008(A) COMPLIANCE ORDER 5/25/1889 Enforcement Action: Enforcement Action Date:

288 AL. TSD-LAND BAN REQUIREMENTS 12/08/1988 02/09/1989 Regulation Violated: Area of Violation: Date Violation Determined: Actual Date Achteved Compliance:

WRITTEN INFORMAL Regulation Violetad: Area of Violation: Date Violation Determinad: Actual Date Achieved Compliance: Enforcement Action: Enforcement Action Date:

283.7 GENERATOR-LAND BAN REQUIREMENTS 22/08/1989 22/08/1989

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SECTION 2: FACILITY DETAIL REPORTS ...Continued...

WRITTEN INFORMAL 01/20/1989	270 TSD-OTHER REQUIREMENTS (OVERSIGHT) 12/206/1988 02/09/1988	WRITTEN INFORMAL 01/20/1989	284.140-150.H TSD-FRANCIAL RESPONSIBILITY REQUIREMENTS 1170/1987 11/08/1988	WRITTEN INFORMAL 12/30/1987	INITIAL 3008(A) COMPLIANCE ORDER 04/14/1988	FINAL 3008(A) COMPLIANCE ORDER 07/01/1988	270 TSD-OTHER REQUIREMENTS (OVERSIGHT) 10/19/1887	WRITTEN INFORMAL 10/01/1987
Enforcement Action: Enforcement Action Date:	Regulation Viotated: Area of Viotation: Date Viotation Determined: Actual Date Achieved Compilance:	Enforcement Action: Enforcement Action Date:	Regulation Violated: Area of Violation: Date Violation: Actual Date Achieved Compilance:	Enforcement Action; Enforcement Action Date:	Enforcement Action: Enforcement Action Date:	Enforcement Action: Enforcement Action Date:	Reguistion Violeted: Area of Violetion: Date Violetion Determined: Actual Date Actived Compliance:	Enforcement Action: Enforcement Action Date:

PENALTY SUMMARY

Penalty Description	Date	Amount	Leed	Leed Agency
tality (1000 37725 3000 11320	STATE STATE STATE STATE	10 to 10 to
Final Monetary Penalty 2/20/1982 COMPLIANCE AND ENFORCEMENT SUMMARY	2/20/1992 SEMENT SUMMARY	15000	STATE	101
Responsible Agency:		ŧs	State	
Compliance Evaluation Inspection Financial Record Review Operation and Maintenance Inspection	blon blon blon blon bliden blon specifien	ជាប្រក្បាញ ជាប្រ	Evaluation Date: Evaluation Date: Evaluation Date: Evaluation Date: Evaluation Date: Evaluation Date: Evaluation Date: Evaluation Date: Evaluation Date:	01/05/199 08/73/199 08/73/199 08/74/199 04/28/199 08/26/198

Compliance Evaluation Inspection	Compliance Evaluation Inspection	Evaluation	Eventuation	Compliance Evaluation Inspection		Operation and Maintenance Inspection	Financial Record Review	Compliance Evaluation Inspection	ompliance Evaluation Inspection	Inancial Record Review	Compliance Evaluation inspection	Financial Record Review	Compliance GW Monitoring Eval	Compliance Evaluation Inspection	Financial Record Review	ompliance Evaluation inspection	Financial Record Review
S	Comp	8	3	S	Financ	Opera	Firance	Comp	S	FIRETR	Comp	Finance	Comp	Comp	Finance	S S	Finance

04.052/1999 08.054/1959 08.054/1959 04.054/1959 06.054/1959 06.054/1959 07.054/1959 07.054/1959 07.054/1959 07.054/1959 07.054/1959 07.054/1959 07.054/1959 08.054/1959
Double Control of Cont
Evaluation

SECTION 2: FACILITY DETAIL REPORTS

WASTE MANAGEMENT

Facility has been subject to corrective actions

DATABASE: Corrective Actions (CORRACTS)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374 EDR 1D #1000821584

CAD008386641
ENTIRE FACILITY
11/10/1982
CA150 - RFI Workqian Approved
Storage Battery Manufacturing

GAD008398641 ENTIRE FACILITY 10227/1985 CA150 - RFI Wortplan Approved Storage Battery Manufacturing CAD008386841 EPA Id: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Tate:

WHSE SITE 10/25/1885 CA150 - RFI Workplan Approved Storage Battery Manufacturing EPA Id: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title:

CAD008386541

BITIRE FACILITY
641-5277F.: Chreet Human Exposures Under Control, Yes, Current Human Exposures Under
50-778.: Control has been werfled.
50-778.: Chreet Human Exposures Under Control is a separate Human Exposures Under
50-7 EPA Id: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title:

GADO08288641
PITIRE FACILITY
SETTING FACILITY
CAVENTE THE ANNO Exposures Under Control , Yes, Current Human Exposures Under Storage Battery Manifecturing EPA ki: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title:

ENTIRE FACILITY
08/20/1983
CA200 - IRI Approved
Storage Battery Marufacturing
CAD008398641 CAD008386541 EPA Id: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title:

ENTIRE SITE
01/19/2000
CA200 - RFI Approved
Storage Battery Menufacturing
CADOBS986841

ENTIRE FACILITY 12/17/1983 CA200 - RFI Approved Storage Battery Manufacturing

CAD008386841

ETTIRE FACILITY

EVANCES AND CONTRACT OF C

CAD008386641

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SECTION 2: FACILITY DETAIL REPORTS ...Continued...

Area Name: ENTIRE FACILITY
Added Date: (847/2196 Higher of Contentrated Goundwater under Control , Yea, Migration of Contentrated
Connective Action: CAYSTYE - Migration of Contentrated Goundwater under Control , Yea, Migration of Contentrated
2002 NAICS Titler: Storage Behavy Missule Studies and Security of Storage Definition of Contentrated Contentrated Control (1997)

2002 NAICS Titler: Storage Behavy Missule Studies (1997)

EPA ld: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title:

CADO08398841
BYTHEE FACILITY
CATTHEE FACILITY
ANTHEE FACILITY
SETTED THE FACILITY
SETTED Bettery Manufacturing

CAD008388641

9
ENTIRE FACILITY
08/28/2004
CA350 - CMB Approved
Storage Bettery Manufacturing EPA Id: Region: Area Name: Actual Date: Corrective Action: 2002 NAICS Title:

CAD008388641

ENTIRE FACILITY
06/29/2004
CA500 - CMI Workplan Approved
Storage Battery Menufacturing

CAD008388641

SURFACE IMPOUNDMENTS 02/24/1989 CA100 - RFI Imposition Storage Battery Manufacturing

SECTION 2: FACILITY DETAIL REPORTS
...Continued...

WASTE DISPOSAL

DATABASE: Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374 EDR 1D #1000921584

CERCLIS Name:

TELEDYNE INC TELEDYNE BATTERY PRODUCT BAD W BROCHON AVE REDLANDS, CA 92373 SAN BERNARDINO COURTY

Congressional Dist:

IFMS ID:

Not Reported 18070203 USGS Hydro Unit: NPL Update Num:

Not a Federal Facility

Federal Facility: RCRA Facility: SMSA Num:

Federal Register Date: Not Reported

Site Incident:

Removal Only Site (No Site Assess CAD008386641 Non NPL Status: EPA-ID:

Fed Haz Weste:

EPA Region:

Not reported

Lationg:

Region 9 76 Hawthome St. San Frandsco, CA 94105 Not on the NPL.

Not reported

Ownership Status:

Classification: Site Description: NPL Status;

ENFORCEMENT ACTIVITY

RCRA FACILITY ASSESSMENT in reported Not reported Not reported Not reported STEWNIO STEWNIO Not reported Not Action Type: RCRA
Action Anomaly: Not reg
Planning Status: Not reg
Priority Level: STEW
Urgenzy: STEW
Urgenzy: Actual Statu Date: Not reg
Actual Complete Date: Not reg
Actual Complete Date: Not reg
Actual Complete Date: 1997 107

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SECTION 2: FACILITY DETAIL REPORTS

MULTIMEDIA

Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313

DATABASE: Toxic Chemical Release Inventory System (TRIS)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374 EOR 1D #1000921684

CAD008388641 2002 Malling Name: TELEDYNE CONTINENTAL MOTORS BATTERY PRODS.
Malling Addr: PGD.ANDS. CA 8237
THSI D: CAND. S. CA 8237
THSI D: SALE A SECTION 4.3
Contact I SALE A SECTION 4.3
EPA ID: CAND. SALE A SECTION 5.3
EPA ID: UIC ID: Reported Longitude:

Chemical Summary (All amounts are in pounds)

2.44 Zanga wash to santa ana River Other offsite momnt: Tot. offsite transfers: 242052 Chemical name: LEAD COMPOUNDS

CAS Namber: MAZO

Indicates whether channed is importuned in Indity: NO

Indicates whether channed is importuned in Indity: NO

Indicates whether channed is importuned in Indity: NO

Indicates whether channed is furgious but the use;

Indicates whether channed is furgious but the use;

Theia are missions: ZANGA WASH TO SANTA ANA RIVER

Water stream release: 2.44

Water stream release: 3.44

Cotas Ill'Ave all underground releases: 100

Class Ill'Ave all underground releases: 104

Class Ill'Ave all underground releases: 107

Class Ill'Ave all underground releases 107

Class Ill'Ave all underground releases 107

Class Ill'Ave al

Waste Management and Source Reduction Activities

Chemical Name: LEAD COMPOUNDS
On released for year: 152
On relaced current yr. 152
On relaced current yr. 152
On relaced current yr. 152
On relaced Conscient of Conscient yr. 164
On relaced yr. 1

Off-site Transfers in pounds (non-POTW);

Offsite RCRA ID: CAS Number: Offsite name: Offsite Address:

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SECTION 2: FACILITY DETAIL REPORTS

G	, ,		,	0		0	0	0	0	0	0	0	0	0	0	0	Not reporte	o	0	0	242052	0	0	0	L	0	0	0	0	0	0	0	0	0	0	0	•	•	•
CITY OF INDUSTRY, CA 9/745 Offsile County: LOS ANGELES Estimated the city of resorted chemical in waste	transferred offsite for storage:	tentimend for the property of reported chemical in waste transferred of fisher for solidification/stablization:	Enumerical for, 4ty of reported chemical in wasts transferred to Offsite wastewater treatment.	Estimated for, city of reported chemical in waste transferred to offsite undecoround injection:	Estimated tot, qty of reported chemical in waste	Estimated tot, quy of reported chemical in waste	Estimated tol. 4ty of reported chemical in wester an interest and all the control of the control	Subjection to turn large properties. Estimated for they of reported chemical in waste	Subjection to bird of size menagement. Estimated for day of reported charactering in waste	Estimated but any organisms. Estimated but any of reported chemical Frankfared of fifth for informer processing.	namics only to the management of the second	Estimated for any of reported chemical transferred offile for inclusively control control transferred	Estimated for invariant and investment in the investment Estimated for a proported chemical franciented confidence of the investment of th	Constant for invarious models to the value of value. Entimated for, city of reported chemical transferred to offsite wastweeter transment arranged property.	Estimated tot, qty of reported chemical transferred offsite for warfa treatment	Estimated tot, qty of reported chemical subjected to waste high and the control of the control o	Amount range of toxic chemical sent offsite	System generated tot, dfy of reported chemical in	the watte sett offsite to energy recovery: System generated to, qty of reported chemical	Sells to waste broken for energy recovery. System generated but (by of reported chemical in the system generated by the characteristic money.)	System generated but on overgreat operations in the wester prenafed but my of reported chemical in the wester prenaferned for maintain monumer.	use waste usustensed, for install reduction? System generated but offy of reported chemical in the wastel instructured for other on restructured in	System generated for cyt of reported chemical in the waste transferred for extra reported chemical in the waste transferred for extra resonanciation.	System generated tot, diy of reported chamical in the waste transferred to broker for recycling.	Offise RCDA ID: CATOOSASTAT CASA UND CASA Warber CASS Warber CASS Warber CASS WARD CASS OF CAS	Citate County: Estimated tot, day of reported chemical in waste frankfirmed offices for storate.	Estimated for one provided chemical in waste transferred for of periods for exclusions.	Estimated to: qty of reported chemical in waste transferred to offsite wastewater treatment	Estimated tot, city of reported chemical in waste	Estimated by Lipse undergooding agoston. Estimated by Lipse Indonesia Chemical in Waste transferant in Offsite landfill innocuoniments nonle:	Estimated for on or reported chemical in waste exhibited to the drawners.	Estimated for city of reported chemical in waste authorized for city of reported chemical in waste	Estimated for thy of reported Chemical in waste subjected to thy of reported Chemical in waste subjected to other office menoment:	Estimated for upon closed chemical in waste enthanced for under the control of th	authorized to waste to over useryous: Estimated for typ of reported chemical transferrated official over universe monococien.	mainstance change in this form processing. Estimated tot, city of reported chemical transferred offsite for solidification/stabilization:	Estimated tot, dy of reported chemical transferred offsite for inchestation/chemical transferred	Estimated tot, dy of reported chemical transferred offsite for inchestion/instrumitizant transferred	Estimated for my of reported chemical transferred to offsite westewater treatment excluding POTW:

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SECTION 2: FACILITY DETAIL REPORTS ...Continued...

Estimated for, qty of reported chemical transferred	0
offette for waste treatment.	
Estimated tot, qty of reported chemical subjected	0
to waste broker disposal:	
Amount nange of toxic chemical sent offsite	Not report
for energy recovery:	
System generated tot, aty of recorded chemical in	0
the weste sent offsite for energy recovery:	,
System generated tol. aty of reported chemical	0
sent to waste broker for energy recovery:	,
System generated tot, qty of reported chemical in	0
the waste transferred for solventa/organics recovery:	,
System generated tot, any of reported chemical in	0
the waste transferred for metal recovery:	
System generated tot, gty of reported chemical in	
the waste transferred for other reuse/recovery:	•
System generated tot, gly of reported chemical in	0
the waste transferred for acid receneration:	
System generated tot, qty of reported chemical in	0
the weste transferred to broker for recycling:	

Transfers to Publicly Owned Treatment Works (POTW)

ame: CITY OF REDLANDS WASTE WATER FACELITY 1950 NEVADA STREET REDLANDS, CA 92373	early facility FES early facilit
POTW name: POTW Address:	Data covers entire find a covers part of Facility is federal: Facility is GOCO: Facility is GOCO: Tachnical Contact Tech. Contact Tei:

SECTION 2: FACILITY DETAIL REPORTS ...Continued...

Facility is listed in EPA's index system

DATABASE: Facility Index System (FINDS)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 92374 EDR 1D #1900921584

This site is listed in the Federal FINDS database. The FINDS database may contain references to records from government databases included asserting or in the report. Please note: the FINDS database may also contain references to out of date records formerly associated with the site.

110000479401 Registery ID:

Feelilly Marne: TELEDVIK CONTINENTAL MOTORS BATTERY PRODUCTS OPERATION Estably Address: SERIO MONTORS BATTERY PRODUCTS OPERATION AND MONTORS BATTERY PRODUCTS OPERATION TELEDVIC CONTINENTAL MOTORS BATTERY PRODUCTS OPERATION TELEDVICE CONTINENTAL MOTORS BATTERY PRODUCTS OPERATION TELEDVICE CONTINENTAL MOTORS BATTERY PRODUCTS OF TELEDVICE CONTINENTAL MOTORS BATT

EPA Records Indicate Facility is Listed in:
TOXIC CHEMICAL RELEASE INVENTORY SYSTEM
TOXIC CHEMICAL RELEASE INVENTORY SYSTEM
TOXIC CHEMICAL RELEASE INVENTORY AND RECOVERY ACT INFORMATION SYSTEM
TOXIC CHEMICAL BUILD STORY TOXIC AND RECOVERY ACT INFORMATION SYSTEM
NATIONAL BUILD STORY SYSTEM AND RECOVERY ACT INFORMATION SYSTEM
RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM
Fecility SIC Codes:
3881
Fecility NAICS COdes:
3881
8881

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SECTION 2: FACILITY DETAIL REPORTS

To maintain currency of the following federral, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

Elapsed ASTM days: Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

WASTE MANAGEMENT

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

MULTIMEDIA

Facility is tisted in a county/local unique database

DATABASE: State/County (LOCAL)

TELEDYNE CONTINENTAL MOTORS 840 W BROCKTON AVE REDLANDS, CA 82374 EDR 1D #1000821584

Database: CA San Bern, Co. Permit

FACCOGEGOR ACTIVE F. EPCRA FACILITY PT0013335 2005-07-31 SAN BERNARDINO DEHS Permit:
Fecility ID:
Fecility ID:
Fecility Status:
Fermit Category:
Fermit Number:
Fermit Number:
Region:
Sy

Facility ID: Facility Status: / Permit Catagory: Permit Number: Expiration Date: 2 Region:

GENERATOR - 28-50 EMPLOYEES PT0001485 2005-07-31 SAN BERNARDINO

FADDOBGOS ACTIVE HAZDAR HANDLER 26-60 EMPLOYEES (WIGEN PRINT) PRO01494 2006-77-31 SAN BERNANDINO Facility ID:
Facility Status: A
Permit Catagory: H
Permit Number: P
Expiration Date: 2
Region:

RCRBS: Resource Conservation and Recovery Act Information Source: EPA Source: EPA Teappoint (EPA Teappoint) to EPA is comprehensive information system, providing access to date supporting the Resource RCRAINLIG to EPA's comprehensive information system, providing access to date supporting the Resource Conservation and Recovery Act (RCRAI) of 1976 and the Hexantous and Solid Waste Amendments (HSMA) of 1984, KCRAINLIG respices for data montaing and inspiriting biblises of the Resource Conservation and Recovery information System (RCRAIS, The database includes askedive information on sizes which spendix Instagric and an advantage of the stage of the waste. In the stage of the waste, or deter the stage of the stage of the waste. In the stage of the waste, or dispose of the waste. In the stage of the waste. It is not the stage of the waste. It is a stage of the stage of the waste. It is not the stage of the waste. Date of Government Version: 05/20/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 05/24/0405 Date of Next Scheduled Update: 09/22/2005

BRRS: Blermial Reporting System
Source: EPAND Sources SPAND
To Bleimber Reporting System is a national system administered by the EPA that collects data on the
The Bleimber Reporting System is a national system administered by the EPA that collects data on the
generation and management of hiszardous waste, BRS captures detailed data from two groups: Large Quantity
Generation (LQG) and Treatment, Storage, and Disposal Featilities.

Date of Government Version: 12/01/2001 Database Release Frequency: Biennially

Date of Last EDR Confect: 04/15/2005 Date of Next Scheduled Update: 06/13/2005

RAATS: RCRA Administrative Action Tracking System

Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA Source: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOURCE: EPA SOU

Date of Government Version: 04/17/1995 Datebese Release Frequency: No Lipdate Planned

Date of Lest EDR Contact: 03/07/2005 Date of Next Scheduled Update: 06/06/2005

CORRACTS: Corrective Action Report Source: EPA

Telephone: 800-424-9346 CORRACTS Identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/29/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update: 06/06/2005

PADS: PCB Activity Detabases System

Search of Carlot System

Fig. 1 (1997) Detabases System

Fig. 1 (1997) Detabases System

and disposers of PCB's who are required to notify the EPA of such subhibites.

Date of Government Version: 03/30/2005 Database Release Frequency: Annually

Date of Last EDR Contact: 05/10/2005 Date of Next Scheduled Update: 08/08/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

MLTS, indexied Licentup (Tacidio System)
Source: Nuclear (propatory Commission
Telephone; 301-415-Tipp Commission
Telephone; 301-415-Tipp Commission
Telephone; 301-415-Tipp Commission
MLTS is maintrianed by the Nuclear Regulatory Commission and contains a list of approximately 8,100
also widely possess or the indexident maintrials and widely are subject to NRC Remaing requirements.
To maintain autory, EDR combiss the Agency on a quantary basis.

Date of Government Version: 04/14/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/04/2005 Date of Next Scheduled Update: 07/04/2005

CA AST: Aboveground Petroleum Storage Tank Facilities Source, State Water Resources Control Board Telephrane: 816-341-5712 Registered Aboveground Storage Tenks.

Date of Government Version: 02/01/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 02/24/2005 Date of Next Scheduled Update: 05/02/2005

CA UST: Adhre UST Facilities Source: SWRCB Tatephone: 816-341-5351 Adhre UST facilities gathered from the local regulatory agencies

Date of Government Version: 04/12/2005 Database Release Frequency: Semi-Annually

Date of Lest EDR Contact: 04/13/2005 Date of Next Scheduled Update: 07/11/2005

CA_LUST: Geotraction's Leaking Underground Fuel Tenk Report
Source: State Water Resources Control Board
Telephone: 816-84-87-87-82
Telephone: 816-84-87-82
Telephone: 816-87-82
T

Date of Government Version: 05/12/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/13/2005 Date of Next Scheduled Update: 07/11/2005

ERNS: Energency Response Notification System
Source: National Response Center, United States Coast Guard
Source: Notice Response Center, United States Coast Guard
Energency Response Volication System. ERNS records and stores information on reported releases of
Gland Prazzorase authentoes.

Date of Government Version: 12/31/2004 Detabase Release Frequency: Annually

Date of Last EDR Contact: 04/25/2005 Date of Next Scheduled Update: 07/25/2005

HINRS: Hazandous Maisriais Information Reporting System
Source: U.S. Department of Transportation
Source: U.S. Department of Transportation
Source: Abstraction and Source: So

Date of Government Version: 12/31/2004 Database Release Frequency: Annually

Date of Last EDR Contact: 04/19/2005 Date of Next Scheduted Update: 07/19/2005

WASTE DISPOSAL

WPL: National Phorty List
Source: Experiment of the property
Inspirator Pix reported
National Pix Reported National Pix reported National Reported National National Pix Reported National National National Pix Reported National National Pix Reported National Natio

Date of Data Arrival at EDR: 05/04/2005 Bepsed ASTM Days: 12 Date of Last EDR Contact: 05/04/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

..Continued...

PROPOSED NPL: Proposed National Priority List Sites Source: EPA Telephone: Not reported

Date of Government Version: 04/27/2005 Date Made Active at EDR: 05/16/2005 Database Release Frequency: Quarterly

Date of Data Arrival at EDR: 05/04/2005 Elapsed ASTM Days: 12 Date of Last EDR Contact: 05/04/2005

DELISTED NPL. National Priority List Detections
Source: EPA
Source: EPA
The National Off and Heazerdous Substances Polation Contingency Plan (NCP) establishes the criteria
The Netional Off and Heazerdous Substances Polation Contingency Plan (NCP) establishes the criteria
and since the Netion of
Date of Government Version: 04/28/2005 Date Made Active at EDR: 05/16/2005 Database Retease Frequency: Quarterly

Date of Date Arrival at EDR: 05/04/2005 Elapsed ASTM Days: 12 Date of Last EDR Confact: 05/04/2005

Date of Data Arrival at EDR: 03/22/2005 Elapsed ASTM Days: 15 Date of Last EDR Contact: 03/22/2005

Date of Government Version: 02/15/2005 Date Made Active at EDR: 04/06/2005 Database Release Frequency: Quarterly

EXECUS. AFRAP. CERCLIS No Further Remedial Action Plenned
Secretical APIRAP. CERCLIS No Further Remedial Action Plenned
Tolestycom. 703.43-24223
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Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tolestycom. And Tole

Date of Last EDR Contact: 04/01/2005 Date of Next Scheduled Update: 06/20/2005

Date of Government Version: 03/22/2005 Database Release Frequency: Quarterly

Near LENSs: Federal Superfund Liens
Near LENSs: Federal Superfund Liens
Telephone: 202_564_493T
Teleph

Date of Data Arrival at EDR: 02/02/1994 Elapsed ASTM Days: 56 Date of Lest EDR Contact: 02/22/2005 Date of Government Version: 10/16/1991 Date Made Active at EDR: 03/30/1994 Database Release Frequency: No Update Planned

CA SWFILF: Solid Weste Information System

Source: Hindprind Whete Management Board
Telephone: 9 (6-541-6320
Telephone: 9 (6-541-6320
Telephone: 9 (6-541-6320
Telephone: 1
Date of Government Version: 03/14/2005 Database Release Frequency: Quarterly

Date of Lest EDR Contact: 03/15/2005 Date of Next Scheduled Update: 06/13/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

IRIS: Toxic Chemical Release Inventory System Source: FPA

Tolephone: 202-966-0259 Ton Release Inventory System. TRUS identifies facilities which release todo chemicals to the air, water and start in reportable quantifies under SARA Title III Section 313.

Date of Government Version: 12/31/2002 Database Release Frequency: Annuelly

Date of Last EDR Contact: 03/22/2005 Date of Next Scheduled Update: 08/20/2005

SSTS: Section 7 Tracking Systems
Section 7 Tracking Systems
Telephone: 22C 564 4220
Telephone: 22C 564

Date of Government Version: 12/31/2003 Database Release Frequency: Annually

Date of Last EDR Contact: 04/19/2005 Date of Next Scheduled Update: 07/18/2005

T9CA: Toxic Sthetanoes Control Act
Source: EPAr.22280-S521
Teleptone: SA2.2280-S521
Toxic Statemens Control Act T9CA identifies manufacturen and importers of chemical substances included
on the T9CA Chemical Substance inventory list. It includes data on the production volume of these substances
by plant site.

Date of Government Version: 12/31/2002 Database Release Frequency: N/A

Date of Last EDR Contact: 04/05/2005 Date of Next Scheduled Update: 06/06/2005

FTTS: FIFRA TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act) Source: EPACINE of Prevention, Pesticides and Toxic Substances FORTS of Prevention - Pesticides and Toxic Substances FORTS backs administrative case and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA, (Emergency Plening and Community Right-to-Krow Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/13/2006 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/21/2005 Date of Next Scheduled Update: 06/20/2005

FTT8 INSP: FIFAV TSCA Tracking System - FIFAA (Faderal Insacticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act) Source, Ed. 2012; FIFAA TSCA Tracking System - FIFAA (Faderal Insacticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act) Telephone: 2012-668-1687

Date of Government Version; 04/13/2005 Database Release Frequency; Quarterly

Date of Last EDR Contact: 03/21/2005 Date of Next Scheduled Update: 06/20/2005

ENG CONTROLS: Engineering Controls Siles List.
Source: Environmental Production Agency
Telephone: 70:5060-26807
Altisting of siles with regimening controls in place. Engineering controls include various forms of
case, building foundations, illners, and freetiment melitode to mean settiment environmental media or offers benthy resetting to enter environmental media or effect furnamental media or effect furnamental media or effect furnamental media.

Date of Lest EDR Content: 04/04/2005 Date of Next Scheduled Update: 07/04/2005 Date of Government Version: 01/10/2005 Database Release Frequency: Varies

NRT CONTROL: Sizes with institutional Controls
Source: Environmental Protection Agency
Source: Environmental Protection Agency
Source: Environmental Protection Agency
Foreign of these with restitutional controls in piece, institutional controls in protection and an additional protection and
Date of Government Version: 01/10/2005 Database Release Frequency: Varies

Date of Last EDR Contact: 04/04/2005 Date of Next Scheduled Update: 07/04/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

INDS: Facility Index System/Facility Identification Initiative Program Summary Report Source: EPA

Telephone: Not reported
Telephone: Not reported
Telephone: Not reported
Telephone: Not prepared
Telephone: Not prepar

Date of Government Version: 04/11/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/04/2005 Date of Next Scheduled Update: 07/04/2005

Date of Government Version: 02/07/2005 Database Release Frequency: Annually

CA AWP: Annual Workplan Sites
Source: California Environmental Protection Agency
Source: California Environmental Protection Agency
Telephone: 916-22-3-4400
Nown Hezerstous Weethe Sites: California DTSC/s Annual Workplan (AWP), formerly BEP, identifies Innown
Hazardous authelance sites Iurgebed for cleanup.

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005

CA INDIAN LUST: Leaking Underground Slorage Tanks on Indian Land Source: Environmental Protection Agency Telephone: 41:647-337 Telephone: 41:647-337 LUSTs on Indian land in Afzons, California, New Mexico and Newada

Date of Government Version: 03/18/2005 Database Release Frequency: Varies

Date of Last EDR Contact: 02/22/2005 Date of Next Scheduled Update: 05/23/2005

CA REF: Unconfirmed Properties Referred to Another Agency
Source. Department of Took Substances Control
Telephone. 19 (1923-140)
This calegory conclusing properties where onellamination has not been confirmed and which were determined
as not requiring direct DTSC Site Militagen Program action or oversight. Accordingly, these sites
have been referred to enother state or local regulatory agency.

Date of Government Version: 02/07/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005

CA MEA. No Enther Adult Determination
Source: Department of not became or of the Carol
Telephone; 916-223-3400 Substances Control
Telephone; 916-223-3400 Substances at which DTSC has made a clear determination that the property does not pose a problem to the environment or to public health.

Date of Government Version: 02/07/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005

CA NPE: Properties Needing Further Evaluation
Society Operation of Toba Substances Control
Telephone: 16-022-400
This calegory contains properties that are suspected of being conteminated. These are unconfirmed contaminated
properties properties and that are suspected of being conteminated. These are unconfirmed contaminated
properties that need to be assessed using the PEA process. PEA. In Progress Indicates properties where
DTIGs is purpose that of contamination underway.

Date of Government Version: 02/07/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005

CA 8CH: School Property Evaluation Program
Source: Operational of Took Substances Control
Telephone: 916-323-3400
This catalogy contains proceed and exiging school files that are being evaluated by DTSC for possible
This catalogy contains proceed and exiging school files but are being evaluated by DTSC for possible
Instantous materiales contemination. In some cases, these properties may be listed in the Calibras calegory
depending on the level of threat to public health and safety or the environment heap pose.

Data of Government Version: 02/07/2005 Database Release Frequency: Quanterly

Date of Lest EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES ...Continued...

CA INDIAN UST: Underground Storage Tenks on Indian Land Source: EPA Region 9 Telephone: 415-872-3368

Date of Government Version: 04/18/2005 Database Release Frequency: Varies

Data of Last EDR Contact: 05/16/2005 Data of Next Scheduled Update: 08/22/2005

CA BEP: Bond Expenditure Plan Source: Department of Health Services Telephone: 916-255-2118

Department of Health Services developed a site-specific expenditure plan as the besis for an appropriation of Hezardous Substance Cleanup Bond Act Ninds. It is not updated.

Date of Government Verston: 01/01/1989 Database Retease Frequency: No Update Planned

Date of Last EDR Contact: 05/31/1994 Date of Next Scheduled Update:

CA, BWT: Business Plan, Hezardous Wesse Producer, and Operating Underground Tanks
Source: Venime County Environmental Health Division
The Approver 186 624-2810 3 and Performental Health Division
The BWT list indicates by 8the address whether the Puriformental Health Division has Business Plan
(B), Wesse Producer (M), and/or Underground Tank (T) information.

Date of Last EDR Contect: 03/18/2005 Date of Next Scheduled Update: 06/13/2005 Date of Government Version: 03/01/2005 Database Release Frequency: Quarterly

C.A. CLITTE: Catalise Deablese:
Seuron: The Catalise Deablese:
Genron: The CLITTE: Catalise Deablese:
The CLITTE: Catalise Clitter protective for confirmed hezordous substance release properties. In 1996,
Catalion EPA reenduated and algorithmathy reduced the number of stees in the Catalise databases.

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005 Date of Government Version: 02/07/2005 Datebase Release Frequency: Quarterly

A CHMIRDS: California Hazardous Material incident Report System
Soutner: Office of Efricagency Services
Telephones 195 645-645-600.
California Mazardous Macardous Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (leaders) telebesses or upfall).

Date of Last EDR Contact: 02/23/2005 Date of Next Scheduled Update: 05/23/2005

Date of Government Version: 12/31/2003 Database Release Frequency: Varies

CA CONTRA COSTA 81. Sile List
Source: Corne Costa Heelih Savices Department
Expres: Corner Costa Heelih Savices Department
List includes siles from the underground tent, hezardous weste generator and businese plan/2185 programs.

Date of Government Version: 03/04/2005 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 02/28/2005 Date of Next Scheduled Update: 05/30/2005

CONTESE: "Corless" Hazardous Weste & Substances Stee List
 Counce: CAL EPACING of Energency information
 The sizes for the fils me designed by the State Water Resource Control Board (LUST), the Integrated
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Date of Government Version: 04/01/2001 Database Release Frequency: No Update Planned

Date of Lest EDR Contact: 04/25/2005 Date of Next Scheduled Update: 07/25/2005

CA Filty Frestly Inventoy Databases
Source: California Environment Protection Agency
Telephone: 916-941-6826
Telephone: 916-941-6826
Telephone: 916-941-6826
Telephone: 916-941-6826
Telephone: 916-941-9426
Telephone: 916-9426
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Date of Government Version: 10/31/1894 Detabase Release Frequency: No Update Planned

Date of Last EDR Contact: 12/28/1998 Date of Next Scheduled Update:

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

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- Hilling in Fuzzindus Materials Management Division Delabese

Source: Hezardous Materials Management Division Delabese
Telephone: 1819-392-208

Telephone: 1819-392-208

The delabese includes: HESB - This report contains the business name, site address, business proce number, establishment Virginia provided in the HESB isting, HET provides impaction dates, violations to providing the seame information provided in the HESB isting, HETS provides impaction dates, violations received by the establishment hazardous wassing penetrated, the quantify method of alongs, treatment deport of weste and the hand, and information on underground sturge strate. Unauthorized Reference Lettine from the received as numbered or providerability of the provided in the HESB isting, the Control of the provided in the HESB isting, the study of the provided in the HESB isting, the study in the provided in the HESB isting, and include and included the provided in the HESB isting, the study indeptround the provided in the HESB isting, and and include the provided in the HESB isting, and and include the provided in the HESB isting, and and include the provided in the HESB isting, and include the HESB istin

Date of Government Version: 08/29/2004 Database Release Frequency: Quarterly

Date of Lest EDR Contact: 04/22/2005 Date of Next Scheduled Update: 07/04/2005

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Telephone: Sil S.232-5400 Actions a Lethian Searchtain Sear

Date of Government Version: 04/05/2005 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/04/2005 Date of Next Schoduled Update; 07/04/2005

CA HAZNET: Facility and Manifest Data Source: California Eristonmental Protection Agency
Telephone: 016-255-136 (1)
Telephone: 01

Date of Last EDR Contact: 02/17/2005 Date of Next Scheduled Update: 05/09/2005

CA INDUSTRIAL: List of industrial Site Chanups Source: Health Care Apercy Source: Health Care Agency Telephone: 714-834-3446 Petroleum and non-petroleum spills.

Date of Government Version: 12/31/2002 Database Release Frequency: Annually

Date of Last EDR Contact: 03/11/2005 Date of Next Scheduled Update: 09/05/2005 Date of Government Version: 03/01/2005 Database Release Frequency: Annually

CA WOTIFY: Proposition 65 Records
Source: State Wight Resources Control Board
Telephoner: 916-445-9466 in WOTIFY 85 contains fieldly nollifications about any release which
Proposition of Notification Records. NOTIFY 85 contains fieldly nollifications about any release which
Proposition of Notification Peacetta. NOTIFY 85 contains fieldly nollifications about any release which
could impact friending water and finestly repose the public to a potential health risk.

Date of Government Version: 10/21/1993 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 04/18/2005 Date of Next Scheduled Update: 07/18/2005

CA SAN JOSE MAZMAT: Hazardous Material Facilities Source: City of San Jose Fire Department Telephone: 408-277-4659

Date of Government Version: 01/14/2005 Detabase Release Frequency: Annually

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update; 08/08/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

	Division
	Services
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wentory	Wronments
Business is	County En
N MATEO BI:	San Mateo Count
A SAN M	Source:
O	

elephone: 650-369-1921* List includes Hazardous Maieriais Business Plan, hazardous waste generators, and underground storage

Date of Government Version, 05/12/2005 Database Release Frequency: Annually

Date of Last EDR Contact: 04/11/2005 Date of Next Scheduled Update: 07/11/2005

CA SITE MIT: Ske Mittgation List Source: Community health Services 10ephone: 223-802-7806 Industrial alies that have had some scat of spill or comptaint.

Date of Government Version: 03/09/2005 Database Release Frequency: Annually

Date of Last EDR Contact: 02/14/2005 Date of Next Scheduled Update: 05/16/2005

CA SOUTH BAY: South Bay Site Management System
Source: California Regional Water Chaility Control Board Sen Frencisco Bay Region (2)
Tatepriorne: 51:0286-457
Tetepriorne: 52:0286-457
Tetepriorne:

Date of Government Version: 05/21/1999 Database Release Frequency. Annually

Date of Last EDR Contact: 01/31/2000 Date of Next Scheduled Update:

CA TOXIC: To the Cheanup Act Sibes Source Control Board Source State Wile Resource Control Board Towns 16 Page 17 Cheanup Act Sibes TOXIC Professional Sibes State
Date of Last EDR Contact: 02/01/2005 Date of Next Scheduled Update: 05/02/2005 Date of Government Version: 07/01/1995 Database Release Frequency: No Update Planned

CA VENTURA CIARS: Inventory of Blogal Abandoned and Inactive Sites Source: Environmental Health Division
Telephone: 805-654-253
Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Last EDR Context: 02/23/2005 Date of Next Scheduled Update: 05/23/2005 Date of Government Version: 08/01/2004 Database Release Frequency: Annually

CA WDS: Weste Discharge System
Source: State Water Resources Control Board
Tetephone: 916-341-5227
Sites which have been issued waste discharge requirements.

Date of Government Version: 03/21/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/22/2005 Date of Next Scheduled Update: 06/20/2005

C.A. WRIUDS/SEWNT: Weath Management Unit Database
Source: Statistic Resources Corticol Board
Februaries (1992)
Februarie

Date of Government Version: 04/01/2000 Database Release Frequency: Quartarly

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update: 06/06/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

CA ALAMEDA UST: Underground Tenks Source: Alameda County Environmental Health Services Telephone: 510-567-6700

Date of Government Version: 02/15/2005 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/25/2006 Date of Next Scheduled Update: 07/25/2005

CA ALAMEDA LUST: Local Oversight Program Listing of UGT Cleanup Sites Source: Aametal Courty Environmental Health Services Telephone, 510-567-4710

Date of Last EDR Contact: 04/25/2005 Date of Next Scheduled Update: 07/25/2005

Date of Government Version: 02/14/2005 Database Release Frequency: Senti-Annually

CA ORANGE LUST: Liet of Underground Storage Tank Cleanups Source: Health Cere Agency Telephone: 714-534-5446 Orange County Underground Storage Tank Cleanups (LUST).

Date of Last EDR Contact: 03/11/2005 Date of Next Scheduled Update: 06/06/2005

Date of Government Version: 02/01/2005 Database Release Frequency: Quarterly

CA RIVERSIDE LUST: Liniting of Underground Tank Cleanup Sites Source: Lopertment of Unite Health Telephone: 851-358-5055 Riverside Courty Underground Starsge Tank Cleanup Sites (LUST).

Data of Government Version: 02/14/2005 Database Release Frequency: Quartarly

Date of Last EDR Contect: 04/18/2005 Date of Next Scheduled Update: 07/18/2006

CA VENTURA LUBT: Listing of Underground Tenk Clearup Stees Source: Environmental Health Division Telephone: 86-564-2913 Ventura Ccurry Underground Storage Tenk Cleanup Siles (LUST).

Date of Government Version: 03/01/2005 Detabase Release Frequency: Quarterly

Date of Last EDR Contact: 03/18/2005 Date of Next Scheduled Update; 06/13/2005

Date of Last EDR Contact: 03/29/2005 Date of Next Scheduled Update: 06/27/2005

CA SANTA CLARA LLIST: Fuel Leak Site Activity Report Source: Santa Clera Velley Water District Telephone: 408-265-2600

Date of Government Version: 03/29/2005 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/11/2005 Date of Next Scheduled Update: 07/11/2005

CA SAN MATEO LUST: Fuel Leak List Source: San Mateo County Environmental Health Services Division Telephone: 600-363-1821 Date of Government Version: 05/05/2005 Database Release Frequency: Semi-Annually

CA SAN FRANCISCO LUST: Local Oversite Facilities Source: Department Of Public Health San Francisco County Telephone: 415-252-3820

Date of Government Version; 03/09/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update: 06/06/2005

CA SOLANO LUST. Leaking Underground Storage Tanks Source: Solaro County Department of Environmental Management Telephone: 707-784-6770

Data of Government Version: 04/18/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/18/2005 Date of Next Scheduled Update: 06/13/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES ...Continued...

CA SONOMA LUST: Leaking Underground Storage Tank Sites Source: Department of Health Services Telephone: 707-565-6565

Date of Last EDR Contact: 04/25/2005 Date of Next Scheduled Update: 07/25/2005 Date of Government Version: 04/25/2005 Database Release Frequency: Quarterly

CA LIST REG 1: Active Tool: Site investigation
Subserved California Propinal Water duality Control Board North Coast (1)
Teleptone 17 AT-516-2270
Teleptone 17 AT-516-220
Teleptone 17 AT-516-22

Date of Government Version: 02/01/2001 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 02/23/2005 Date of Next Scheduled Update: 05/23/2005

CA LUST REG 2: Fuel Leak List Source: California Regions Water Quality Control Board San Francisco Bay Region (2) Telephone: 510-288-4451

Date of Last EDR Contact: 04/11/2005 Date of Next Scheduled Update: 07/11/2005 Date of Government Version: 09/30/2004 Database Release Frequency: Quarterly

CA LUST REG 1. Leaking Underground Stonage Tank Database
Soure: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-546-3147

Date of Government Vension: 05/19/2003 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 02/14/2005 Date of Next Scheduled Update: 05/16/2005 C.A. LUST REG. 4. Usorground Storago Tank Leak List.
Souns: California Regional Water (Jauliy Control Board Los Angeles Region (4)
Berghoner. 2157-6260.
List Angeles, Ventura courties. For more current information, please refer to the State Water Resources
Control Board: LUST distables.

Date of Government Version: 09/07/2004 Database Release Frequency: No Update Planned

Date of Lest EDR Contact: 03/23/2005 Date of Next Scheduled Update: DB/27/2005

CA LUST REG 5: Lasking Underground Storage Tank Database Source: California Regional Water Quality Control Board Central Valley Region (5) Telephone: 916-464-5281

Date of Last EDR Contact: 04/19/2005 Date of Next Scheduled Update: 07/04/2005 Date of Government Version: 04/01/2005 Database Ralease Frequency: Quarterly

CA LUST REG 6L: Leading Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Lahonian Region (6)
Teephone: 915-24-2424
For more current Information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/2003 Database Release Frequency: No Update Plenned

CA 1187 RFG 8V: Leaking Underground Stonege Tark Case Listing Bouroe: Cellonia Regional Weber Quality Comfrol Board Victorville Brench Office (6) Teleptoms: 790:346-7481

Date of Last EDR Contact: 04/16/2005 Date of Next Scheduted Update: 07/04/2005 Date of Government Version; 08/09/2004 Database Release Frequency; No Update Planned

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

CA LUST REG 7: Leaking Underground Stonage Tank Case Listing Source: Calfornie Raponel Water Duality Control Board Colorado River Basin Region (7) Telephone: 780-246-7491

Date of Government Version: 02/28/2004 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 03/29/2005 Date of Next Scheduled Update: 08/27/2005

CA. Little REG 8: Leafung Underground Storage Tanica
Seuror: Celfornia Reging Underground Storage Tanica
Telephone: Celfornia Reging Water Chaelity Control Board Senta Ana Region (8). For more current information,
California Regional Water Chaelity Control Board Senta Ana Region (8). For more current information,
please refe for the State Water Resources Control Board's LUST database.

Date of Lest EDR Contact: 02/08/2005 Date of Next Scheduled Update: 05/08/2005

Date of Government Version: 02/14/2005 Database Release Frequency: Varies

CA. LUST REG 9: Leaking Underground Storage Tank Report
Source: California Regional Water Canally Centrol Board San Diago Region (9)
Fortioners (85 047-290)
Fortioners (85 04

Date of Government Version: 03/01/2001 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 04/19/2005 Date of Naut Scheduled Update: 07/18/2005

a BLC 91: Statewide SUC Cases

Source: Seaw Witter Para-Argounces Control Board
Telephores: 916-344, Argounces Control Board
Telephores: 916-344, Leaks, Investigations, and Cosenups (SUC) listings hobustes unsuthorized discharges
from spills and besits, other than from underground stronge larins or other regulated alless.

Date of Government Version; 04/12/2005 Database Release Frequency: Varies

Date of Last EDR Contact: 04/13/2005 Date of Next Scheduled Update: 07/11/2005

CA SLIC REG 1: Active Todo Sile Investigations
Source: California Regional Water Chality Control Board, North Coast Region (1)
Telenfower. 707-579-6220

Date of Last EDR Contact: 02/23/2005 Date of Next Scheduled Update: 05/23/2005 Date of Government Version: 04/03/2003 Database Release Frequency: Semi-Annually

CA SLIC REQ 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing.
Source: Replace Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-228-Ad7.
Adry contaminated alte that Impacts groundwater or has the potential to impact groundwater.

Date of Lest EDR Contact: 04/11/2005 Date of Next Scheduled Update: 07/11/2005 Date of Government Version: 09/30/2004 Database Release Frequency: Quarterly

CA SLUC REG 3: Spills, Leads, investigation & Cleamp Cost Recovery Lieting
Source: Californie Regional Water Cleality Control Board Central Coast Region (3)
Telephone: 805-569-5147
Any contamhalled sits that impects groundwater or has the potential to impact groundwater.

Date of Last EDR Contact: 05/16/2006 Date of Next Scheduled Update: 08/15/2006 Date of Government Vereion; DE/16/2005 Database Release Frequency; Semi-Amuelly

CA SLIC REG 4: Spills, Leats, Investigation & Clearup Cost Recovery Listing Source: Region Vels Floribus Control Board Los Angeles Region (4) Teleprone. 213-675-6800.

Any contaminated site that impects groundwater or has the potential to impact groundwater.

Date of Government Version: 11/17/2004 Database Release Frequency. Varies

Date of Last EDR Contact: 04/25/2005 Date of Next Scheduled Update: 07/25/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

2A SLIC REG 5: Spills, Leats, Investigation & Cheanp Cost Recovery Listing Source: Reportal Water Quality Control Board Central Valley Region (5) Sephone: 914-48-3291
Unregulated sites that Impact groundwater or have the potential to Impact groundwater.

Date of Last EDR Contact: 04/05/2005 Date of Next Scheduled Update: 07/04/2005 Date of Government Version: 04/01/2005 Database Release Frequency: Semi-Annually

CA SLIC REG 81: SLIC Stees Source: California Ragional Water Ouality Control Board, Lahonian Region Telephone: 530-542-557-4

Date of Government Version: 09/07/2004 Database Release Frequency: No Update Planned

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update: 08/08/2005

CA SLIC REG BY: Solls, Leats, Investigation & Clearup Cost Recovery Listing Source: Negloral Water Cuality Control Board, Victor/file Branch Telephone: 619-241-6563

Date of Government Version: 01/25/2005 Database Release Frequency: Semi-Amuelly

Data of Last EDR Contact: 04/18/2005 Data of Next Scheduled Update: 07/04/2005

CA SLIC REG 8: Spile, Leaks, Investigation & Cleanup Cost Recovery Listing Source - California Replan Weier Quality Control Board Senta Ana Region (B) Temphren: 951-782-5298

Date of Last EDR Contact: 04/06/2005 Date of Next Scheduled Update: 07/04/2005 Date of Government Version: 07/01/2004 Database Release Frequency: Semi-Annually

CA SLO REG 8: Spills I cade, investigation & Cleanup Cost Recovery Listing Source: California Replonal Water Guality Control board San Diago Region (9) Heapfores: S84-467-2580

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005 Data of Government Version: 09/10/2004 Database Release Frequency: Annually

CA SAN DIEGO SWF/LF: Solid Weste Facilities Source: Department of Health Services Telephone: 619-338-2209 Sen Diego County Solid Weste Facilities.

Data of Government Version: 08/01/2000 Database Release Frequency: Varies

Date of Last EDR Contact: 02/22/2005 Date of Next Scheduled Update; 05/23/2005

CA LOS ANGELES SWF/LF: List of Solid Waste Facilities Source: La County Department of Publio Works Telephone: 818-458-5185

Date of Last EDR Contact: 02/18/2005 Date of Next Scheduled Update; 05/16/2005 Date of Government Version: 02/01/2005 Database Release Frequency: Varies

CA DENS PETRIBIT: Hazardous Material Permba Source: Sen Permedino County Fire Department Hazardous Materials Division Halphories: 695-897-904 | The permedino Senze at tariks, medical weath handler/generations, hazardous materials handlers, hazardous waste generation; and weste oil generatival/handlers.

Date of Government Version; 03/25/2005 Database Release Frequency; Cluarlerly

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update: 06/06/2005

CA KERN UST: Underground Storage Tent Sites & Tent Listing Source: Ken Courty Environment Health Services Department Telephone: 661-862-8700 Telephone: 661-862-8700 Ken Courty Sites and Tenta Listing.

Date of Government Version: 05/10/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 05/02/2005 Date of Next Scheduled Update: 09/05/2005

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES

CA SUTTER UST: Underground Storage Tentas Source: Sutter County Department of Agriculture Telephone: 530-822-7500

Date of Government Version: 01/29/2004 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/18/2005 Date of Next Scheduled Update: 07/04/2005

CA HMS: HMS: Street Number List Source. Department of Public Works Teleptones: 2824-58-3517 Industrial Wade and Underground Storage Tenk Siles.

Date of Leat EDR Contract: 02/14/2005 Date of Next Scheduled Lipidate: 05/16/2005

Date of Government Version: 02/28/2005 Database Release Frequency: Semi-Amually

CA VCP: Voluntary Cleanup Program Properties
Source: Opportment of Took Substances Control
Control: Opportment of Took Substances Control
Control to the treet leave tropedies with either confirmed or unconfirmed releases and the project
proporterts have request that DRSC overses investigation and/or cleanup activities and have agreed to
provide coverage for DTSC's costs.

Date of Government Version: 02/07/2005 Detabase Release Frequency: Quarterly

Date of Last EDR Contact: 03/01/2005 Date of Next Scheduled Update: 05/30/2005

CA ORANGE UBT: List of Underground Storage Tank Facilities Source: Health Case Agancy Telephone: 1714-824-3446 Ovenge County Underground Storage Tank Facilities (UST).

Data of Government Veraion: 03/01/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 03/11/2005 Date of Next Scheduled Update: 06/06/2005

CA 8AN FRANCISCO UST: Underground Storage Tank Information Source: Department of Public Health Telephone: 415-252-3920

Date of Last EDR Contact: 03/07/2005 Date of Next Scheduled Update: 09/06/2005 Date of Government Version: 03/09/2005 Database Release Frequency: Quarterly

CA SOLANO UST: Undergound Storage Tanks Source: Soleino County Department of Environmental Management Telephone: 707-784-6770

Date of Last EDR Contact: 04/18/2005 Date of Next Scheduled Update: 06/13/2005 Date of Government Version: 04/18/2005 Database Release Frequency: Quarterly

CA VENTURA UST: Underground Tenk Closed Sites List
Souries Environmental Health Division
Tietychore; 80542-2813
Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Last EDR Contact: 04/15/2005 Date of Next Scheduled Update: 07/11/2005 Date of Government Version: 03/30/2005 Database Release Frequency: Quarterly

CA RIVERSIDE UST: Underground Storage Tank Tank List Source: Health Services Agency Telephone: 951-358-5065

Date of Lest EDR Contact: 04/18/2005 Date of Next Scheduled Update: 07/18/2005

Date of Government Version: 02/14/2005 Database Release Frequency: Quarterly

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SECTION 3: DATABASES SEARCHED AND UPDATE DATES ...Continued...

CA MARIN UST: Underground Storage Tank Sites Source: Fublic Works Department Waste Manage Teleptrone: 415-499-6647 Currently permitted USTs in Marin County.

Date of Government Version: 02/08/2005 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 01/31/2005 Date of Next Scheduled Update: 05/02/2005

CA NAPA LUST: Sites With Peported Contemination Source: Napa County Department of Environmental Management Telephone: 707-253-4269

Date of Government Version: 03/29/2005 Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 03/28/2005 Date of Next Scheduled Update: 08/27/2005

CA NAPA UST: Cksed and Operating Underground Storage Tank Sites Bouros: Nape County Department of Environmental Management Telephone: 707-253-4289

Date of Government Version: 03/29/2005 Database Release Frequency: Annually

Data of Last EDR Contact: 03/28/2005 Date of Next Scheduled Update: 09/27/2005

CA PLACER MS: Meater List of Facilities Source: Horse Courts: Horse Courts: Horse Courts: House Courts: Tolephone: 530-680-7312
List includes aboveground tranks, underground tenks and cleanup sites.

Data of Government Version: 04/05/2005 Databese Release Frequency: Semi-Annually

Date of Last EDR Contact: 03/21/2005 Date of Next Scheduled Update; 06/20/2005

CA SACRAMENTO LUST: CS - Contaminated Stes Source: Sacramento County Environmental Management Telephone: 916-875-8406

Date of Government Version: 04/06/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 05/06/2005 Date of Next Scheduled Update: 08/01/2005

CA SACRAMENTO NIL. MI. - Regulatory Compilance Mester List
Source: Secretario County Environmental Management
Teleprone; 916-916-916
Teleprone; 916-916-918
Any business that has hazardous materials on site - hazardous material storage sites, underground storage
units, waste governations.

Date of Government Version: 03/28/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 05/06/2005 Date of Next Scheduled Update: 08/01/2005

Former Manufacturind Gas (Cost Gas) Sites: The existence and location of Cost Gas sites is provided excitatively to DEDNy Page in F. For a schilded description of the DEDNy Sear, in F. For a schilder description of the Nazarias winds may be found at such sites, contact your EDR automat service representative.

Disclaimer Provided by Real Property Scan, Inc.

The Information contained in this report has predominantly been obtained from publicly available sources produced by entities of other than Real Property Scan. While responsible steps finare benefit taken to be accuracy of this report, Real Property Scan. Abose not guerantee the socrarys of this report. Any thatfilty on the part of Real Property Scan is extrafy limited to a return of the amount paid. No daim is made for the actual existence of toxins at any site. This report does not constitute a legal oppositor.

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Confinued...

POTENTIAL SUPERFUND LIABILITY

PRP: Potentially Responsible Parties Source: EPA

Telephone: 202-564-6084
A listing of verified Potentially Responsible Parties

Data of Government Version: 04/05/2005 Database Release Frequency: Quarterly

Date of Last EDR Contact: 04/04/2005 Date of Next Scheduled Update: 07/04/2005

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Appendix F

Geotechnical Study

GEOTECHNICAL STUDY TO SUPPORT THE ENVIRONMENTAL IMPACT REPORT, REDLANDS COMMONS AND TROJAN GROVES PROJECT, WEST OP TEXAS STREET, NORTH OF SAN BERNARDING AVENUE, CITY OF REDLANDS, CALIFORNIA

Si,

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Prepared for

ULTRASYSTEMS ENVIRONMENTAL

100 Pacifica, Suite 250 Irvine, California 92618

Project No. 021972-001

June 21, 2006



Leighton and Associates, Inc.

A LEIGHTON GROUP COMPANY



Leighton and Associates, Inc.

June 21, 2006

Project No. 021972-001

To:

UltraSystems Environmental, Inc.

100 Pacifica, Suite 250 | Irvine, California 92618

Attention:

Ms. Betsy Lindsay

Subject:

Geotechnical Study to Support the Environmental Impact Report, Redlands

Commons and Trojan Groves Project, West of Texas Street, North of San

Bernardino Avenue, City of Redlands, California

In accordance with your request and authorization, Leighton and Associates, Inc. has conducted a geotechnical study to support the Environmental Impact Report (EIR) for the Redlands Commons and Trojan Groves Project, located west of Texas Street, east of State Route 30, north of San Bernardino Avenue and south of Pioneer Avenue, in the City of Redlands; California (see Figure 1). The purpose of this study has been to assist in the preparation of the Geology and Soils sections of the Environmental Impact Report (EIR) for the project. In performing the review, we have referred to California Geologic Survey (CGS) Mote 46, Guidelines for Geologic/Seismic Considerations in Environmental Impact Reports. Specific items addressed in our study include:

- · Cosite earth units and their engineering characteristics
- · Faulting and seismicity
- Secondary spismic bazards
- Slope stability
- Geologic structure
- · Groundwater conditions and
- * Erosion

This report summarizes our findings and conclusions, and presents possible mitigation measures for the potentially adverse geotechnical restraints identified for the project. Our review has incorporated the data collected during our background review and field investigation and laboratory testing for the site. In addition, we have reviewed the geotechnical report for the Redlands Commons site previously prepared by NorCal Engineering (2005). Geotechnical reports for the Trojan Groves site (if any) were not available for our review at the time of this investigation.

The most significant potential geotechnical hazards affecting the project are compressible soils, and strong seismic shaking. These and other issues are discussed in the accompanying report.

We have not identified any major geologic conditions that would preclude development of the project. Based on the final development plans for the Redlands Commons site, additional geotechnical investigation may be required to fully evaluate potential geotechnical impacts to site development, and in order to provide detailed recommendations specific to the development to be implemented during grading and construction. A detailed geotechnical investigation will be required for the Trojan Groves site if one has not yet been completed.

We appreciate the opportunity to provide our services for this interesting project. If you have any questions, please contact this office at your convenience.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

Daniel P. Jankly, CEG 2365 Senior Project Geologist

Jason D. Hertzberg, GE 2711

Associate Engineer

SFR/DPJ/JDH/Ish

Distribution: (2) Addressee



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1.0 INTRODUCTION

1.1 Purpose and Scope of Work

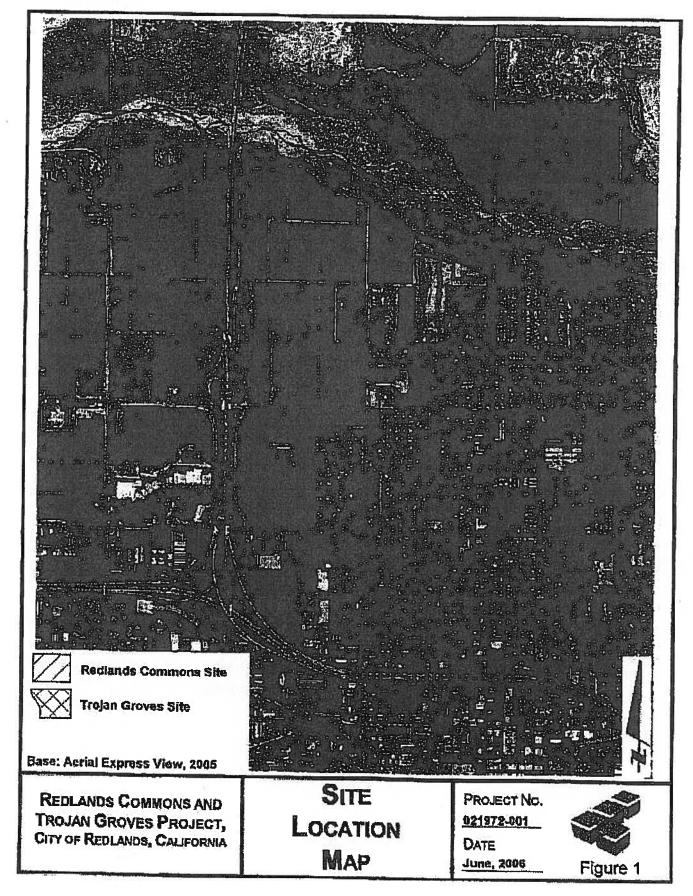
The purpose of this study has been to provide a preliminary assessment of the potential geologic, soils, and seismic impacts that may affect the design and construction of the Trojan Groves and Redlands Commons projects (site) as shown on Figure 1 (Site Location Map). The information provided herein is intended for use as part of the Environmental Impact Report (EIR) for the project. We have identified several potentially significant impacts to the development, and where applicable, provided possible remedial measures. Our Geotechnical Map (Figure 2) is based on the Conceptual Site Plan prepared for the Redlands Commons site by KTGY Group (dated January 12, 2006), and an aerial photograph covering the overall site.

1.2 Methodology

This study was conducted in general accordance with the guidelines set forth by the California Geological Survey (CGS, 1982) for preparation of Environmental Impact Reports. This report addresses both the Redlands Commons and Trojan Grove properties, however, the field portion of our study was limited to the Redlands Commons portion of the project as we were not given permission to energiach upon the Trojan Groves property. In preparation of this study, we have extrapolated the field and laboratory data obtained from the Redlands Commons portion of the site to the Trojan Groves property. This geotechnical study was conducted as follows:

- Available published reports and geologic maps were reviewed and the data analyzed with respect to the proposed development. The literature search also included teview and analysis of limited aerial photographs from flights between 1965 and 1986 obtained from our in-house library. A detailed analysis of previous site uses was not included in the scope of our work. The references and aerial photographs reviewed are listed in Appendix A.
- Coordination with Underground Service Alert in order to have existing underground utilities located and marked prior to our subsurface investigation.





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- Excavation, logging and sampling of 4 hollow-stem auger borings on the Redlands Commons property. The borings were excavated using a subcontracted drill rig to depths of 21.5 to 51.5 feet below the existing ground surface. The borings were logged by a member of our technical staff. Relatively undisturbed soil samples were obtained at selected intervals within the borings using a California Ring Sampler. Standard Penetration Tests (SPT) were also conducted within the borings. Bulk samples of representative soil types were also obtained from the borings. Logs of the geotechnical borings are provided in Appendix B. The boring locations were limited to the perimeter of the Redlands Commons property due to the existing grange grove onsite and access limitations to the Trojan Groves site (see Figures 1 and 2).
- Laboratory Tests Laboratory tests were performed on selected representative bulk and relatively undisturbed soil samples obtained during our field, investigation. The laboratory testing program was designed to evaluate the engineering characteristics of the soils onsite. Tests performed include:
 - In situ moisture content and dry density.
 - Maximum dry density and optimum moisture content.
 - Grain Size Analysis:
 - Expansion Index.
 - Consolidation and hydrocollapse.
 - Soluble sulfate concentration.
 - Chloride, resistivity and pH.

The laboratory test results are provided in Appendix C.

- The data obtained from our background review, field exploration and laboratorytesting program was evaluated and analyzed by a Professional Geotechnical Engineer and Certified Engineering Geologist.
- Preparation of this report addressing the geologic, seismic, groundwater, and soil
 engineering aspects of the site. This report is based on our experience in the general
 site vicinity, and the data obtained from the above-mentioned sources. The various
 geotechnical aspects of the site were evaluated, and where appropriate, potential
 mitigation measures were provided.



1.3 Site Location, Description and Previous Uses

The Redlands Commons and Trojan Groves sites are two contiguous land parcels bounded by Pioneer Avenue on the north. San Bernardino Avenue on the south, Texas Street on the east and State Route 30 on the west, in the City of Redlands, California (as shown on Figure 1). The square shaped, approximately 38-acre Redlands Commons site is currently occupied by and active orange grove and associated improvements including irrigation lines, concrete ditches and dirt roads. The irregularly shaped, approximately 29-acre Trojan Groves site is located immediately west of the Redlands Commons site and is currently vacant, covered by sensonal grasses. The Trojan Groves site is bisected north-south by Tennessee Street. The sites are relatively flat, regionally draining towards the west-northwest, towards the Santa Ana River. A listing of the respective Assessor's Parcel Numbers (APN's) for each site is listed below:

Redlands Commons	312	Trojan Groves	
APN: 0167-091-02 APN: 0167-091-04 APN: 0167-091-05 APN: 0167-091-08		APN: 0167-091-09 APN: 0167-091-10 APN: 0167-091-11 APN: 0167-091-12	

Based on our review of limited aerial photographs covering the site. State Route 30 was constructed sometime between 1978 and 1986. Between 1965 and 1986, both sites were occupied by orange groves. At some point between 1986 and the present the orange grove on the Trojan Groves site had been abandoned.

1.4 Proposed Development

Development plans for the Trojan Groves site were unavailable at the time of this investigation. Based on the Conceptual Site Plan prepared by KTGY Group (dated January 12, 2006), a residential development consisting of multi-family housing is planned for the coural and northern portion of the property. A commercial development is planned for the southern portion for the Redlands Commons site, fronting San Bernardino Avenue.



2.0 GEOTECHNICAL CONDITIONS

This report addresses both the Redlands Commons and Trojan Grove properties, however, the field portion of our study was limited to the Redlands Commons portion of the project as we were not given permission to encroach upon the Trojan Groves property. Based on the proximity of the Redlands Commons and Trojan Groves sites, and our experience in the area, the soils underlying the Trojan Groves site are expected to have similar engineering characteristics as those encountered on the Redlands Commons site.

2.1 Regional Geologic Setting

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The site is located in the San Bernardino Valley area in the Peninsular Ranges geomorphic province of Southern California. The San Bernardino Valley is a large irregular structural depression that is bounded on the northwest by the San Gabriel Mountains, on the north and east by the San Bernardino Mountains, and on the south by an irregular group of hills. The San Bernardino and San Gabriel Mountains are separated by the San Andreas fault which forms the southwestern margin of the San Bernardino Mountains and the northeastern margin of the San Gabriel Mountains. The rocks that make up these two mountain chains are of different composition, indicating that these regions formed at a considerable distance from each other and have since been juxtaposed by lateral movement along San Andreas fault. The site is located roughly 8 kilometers northeast of the San Jacinto Fault Zone and 6 kilometers southwest of the San Andreas Fault Zone.

As the mountains bordering the San Bernardino Valley rose due to regional tectonic activity, they shed large quantities of debris (sediment). These sediments falled the valley, forming a variety of landforms, such as the large alluvial fans formed by the Santa Ana River to the north and San Timoteo wash located to the south. The site is located roughly % mile south of the Santa Ana River, which is one of the major drainage routes for the valley, and this region of Southern California. The site is implectain by a thick accumulation (over 600 feet) of alluvial soil, consisting of silt, sand, gravel, combles, and boulders that have graded from the San Gabriel and San Bernardino Mountains (Rife and Rodgers, 1976). The site is relatively flat and drains regionally towards the west-northwest, to the Santa Ana River. The present landscape at the site has been formed by croston, tectonic forces and in more recent times, human activity.



2.2 Earth Units

The upper, approximately one to two feet of the onsite soils has been disturbed due to the agricultural activities onsite. Based upon our field investigation, soils encountered within our borings were generally observed to consist of loose to medium dense sand with varying amount of silt, and gravel, and scarce cobbles. The in-situ moisture content of the soil within the upper 5 feet ranged from 1 to 5 percent, 3 to 4 percent on average.

2.3 Regional Faulting and Seismicity

Southern California is a geologically complex area with numerous fault systems, including strike-slip, oblique, throat and blind thrust faults. Any specific area is subject to selamic hazards of varying degree, depending on the proximity and earthquake potential of nearby active faults and the local geologic and topographic conditions. Seismic hazards include primary bazards from surface rupturing of rock and soil materials along active fault traces, and secondary hazards resulting from strong ground shaking.

2.3.1 Surface Rupture

The site is not located within a State of California designated Alquist-Priolo Earthquake Fault Zone (COS, 2000), nor a County of San Bernardino designated Earthquake Fault Zone (County of San Bernardino, undated).

2.3.2 Seismie Shaking

The probability that the site will be subject to strong seismic shaking from a moderate to large earthquake on a major active fault in southern California is high. The intensity of ground shaking at a given focation depends primarily on the earthquake magnitude, faulting mechanism, distance and depth from the source (hypocenter) and the site response characteristics. The intensity of shaking is generally amplified in areas underlain by deep deposits of loose, unconsplicated soils. The most common secondary effects of strong seismic shaking include liquefaction and its related ground deformations, dynamic settlement, and landsliding, which are addressed in section 3.0.

A probabilistic seismic hazard analysis was performed to estimate the Peak Horizontal Ground Acceleration (PHGA) for the site based on currently available earthquake and fault information. The analysis computes the site PHGA that



could be expected to result from an earthquake with a 10 percent probability of exceedance in 50 years. The computer program PRISKSP (Blake, 2000) was used for the analysis. Attenuation relationships used in the computer analysis were developed by Abrahamson and Silva (1997) for soil, Campbell (1997 and 2000) for alluvium, and Sadigh et al. (1997) for deep soil deposits. The analysis indicated an average value of 0.73g for peak horizontal ground acceleration (PHGA) with a 10 percent probability of exceedance in 50 years. The predominant magnitude is approximately 7.5 (Mw) at a distance on the order of 6 kilometers.

PHGA for the site was also estimated using California Geologic Survey (CGS) Probabilistic Seismic Hazards Mapping Ground Motion data (CGS, 2003), which utilizes: a probabilistic seismic hazard analysis approach based on currently available earthquake and fault information. Based on information from the CGS, the PHGA with a 10 percent probability of being exceeded in 50 years is estimated to be approximately 0.78g.

2.3.3 Nearby Active Faults

Numerous faults have been mapped within this area of southern California. The most significant and major active fault systems that could produce significant ground shaking at the site include the San Andreas and San Jacinto. The locations and distance of these faults with respect to the site are shown on the Regional Fault Map (Figure 3). The approximate locations of the epicenters of major historical carthquake events in the general site vicinity are shown on the Regional Scismicity Map (Figure 4). Characteristics of the known nearby, individual fault systems are discussed below.

General information regarding the individual faults discussed below was gathered from the Southern California Earthquake Data Center website (http://www.data.scec.org/index.html).

San Andreas Fault (Southern and San Bernardino Segments)

The San Andreas fault is widely recognized as the most extensive fault in the State of California. Its activity is known from historic carthquakes (some of which have caused rupture of the ground surface), and from many fault smidles that have shown that the San Andreas offsets or displaces recently deposited sediments. The San Andreas fault has been mapped from Cape Mendocine in



Northern California to an area near the Mexican border, a distance of about 1,200 km (750 miles). Recent work indicates that large earthquakes have occurred along the fault at intervals averaging about 140 years, and that during these major earthquakes, the fault breaks along distinct segments. The Southern and San Bernardino segments of the San Andreas fault are located approximately 6 kilometers northeast of the site. These segments of the San Andreas fault are thought to be capable of producing a maximum credible carthquake of magnitude (Mw) 6,8 to 8,0.

San Jacinto Fault Zone

The San Jacinto fault is located approximately 8 kilometers southwest of the site. The San Jacinto fault is approximately 210 km (130 miles) in length, and is made up of numerous individual fault strands, the eastern end of which joins with the San Andreas fault system near Wrightwood. The most recent known surface movement along this fault zone has occurred within the last few hundred years. The Coyote Creek segment of the fault in the vicinity of Borrego Mountain experienced a magnitude (Mw) 6.5 carthquake in April 1968. The San Jacinto fault is located approximately 8 kilometers southwest of the site The San Jacinto fault. San Bernardino Valley segment is estimated to be capable of generating a maximum credible enthquake of magnitude (Mw) 6.5 to 7.5.

2.4 Existing Stope Stability

The site is naturally relatively flat with no significant natural slopes present.

2.5 Groundwater

Based on our review of regional groundwater data (Fife and Rodgers, 1976), in 1960 groundwater levels in the general site vicinity were on the order of 150 to 200 feet below the existing ground surface: Groundwater was on the order of 100 feet below the ground surface approximately 100 years ago (Mendenhall, 1907). Based on this, groundwater is not expected to be a constraint to development of the site.



2.6 Soil Engineering Characteristics

2.6.1 Compressible and Collapsible Soil

Soil compressibility refers to a soil's potential for settlement when subjected to increased loads, such as from a fill surcharge. Based on our field investigation, laboratory testing and experience in the general site vicinity, the upper 5 to 10 feet of the alluvial soils is generally considered to be slightly to moderately compressible. Uncontrolled fill, if encountered ensite, would be considered compressible throughout the entire depth.

Hydrocollapse potential refers to the potential sattlement of the alluvial soil under existing stresses (loads) upon being wetted. Based on our laboratory testing and experience in the general site vicinity, the onsite soil has a slight collapse potential. The potential for significant collapse is expected to be low.

2.6.2 Overexcavation Estimates

To reduce the potential for adverse differential settlement of the proposed development, the underlying subgrade soils must be prepared (overexcavated) in such a manner that a uniform response to the applied loads is achieved: Based on our experience in the general site vicinity and our field investigation and laboratory testing, we are providing the following removal depth estimates for planning purposes. These estimates should be verified during future geotechnical investigations of the site and during grading of the site by the projects geotechnical consultant. The soil within residential pads should be overexcavated and recompacted to a minimum depth of 2 feet below the bottom of footings or 4 feet below existing grade, whichever is greater. The overexcavation and tecompaction should extend a minimum lateral distance of 5 feet from the footings. Local conditions may require that deeper overexcavation be performed.

Overexcavation depths for the proposed commercial structures will be dependent on the actual design of the buildings. We would expect the overexcavation depths for typical one and two story commercial structures to be similar to those listed above.



Areas outside the overexcavation limits of the pads planned for asphalt or concrete pavement and flatwork and areas to receive fill should be overexcavated to a minimum depth of 24 inches below the existing ground surface or 12 inches below the proposed finish grade, whichever is deeper.

After completion of the overexcavation, and prior to fill placement, the exposed surfaces should be scattified to a minimum depth of 6 inches, moisture conditioned to or slightly above optimum moisture content, and recompacted to a minimum 90 percent relative compaction. Prior to site removals, all uncontrolled fill should be removed.

2.6.3 Expansive Soils

Based on our experience in the general site vicinity and the results of our laboratory testing (Expansion Index of C), the soils encountered during our investigation (sand with local silt and gravel), are expected to exhibit a very low expansion potential. Onsite Expansion Index tests performed by NorCal Engineering (2005) also indicate an Expansion Index in the very low range.

2.6.4 Corrosive Solls.

Water-soluble sulfates in soil can react adversely with concrete. However, concrete in contact with soil containing sulfate concentrations of less than 0.10 percent are considered to have negligible sulfate exposure (UBC: 1997 edition, Chapter 19).

A near-surface soil sample was tested for soluble sulfate content during our investigation of the site. Test results indicated a sulfate content of less than 0.01 percent by weight, indicating negligible sulfate exposure. Onsite sulfate content tests performed by NorCal Engineering (2005) also indicate a sulfate content of less than 0.01 percent by weight. As such, the soils exposed at pad grade are not expected to pose a significant potential for sulfate reaction with concrete.

Soil corrosivity to ferrous metals can be estimated by the soil's pH level, electrical resistivity, and chloride content. In general, soil having a minimum resistivity less than 2,000 ohm cm is considered corrosive. Soil with a chloride content of 500 ppm or more is considered corrosive to ferrous metals.



As a screening for potentially corrosive soil, a representative soil sample was tested during our investigation of the site for minimum resistivity, chloride content, and pH level. Test results indicate a chloride content of 65 ppm, pH value of 7.7, and minimum resistivity of 11,468 ohm-cm. Qualte corrosivity tests for the site performed by NorCal Engineering (2005) indicate the onsite soils are moderately corrosive. The onsite soil is considered mildly to moderately corrosive to ferrous metals.

2.6.5 Rippability and Oversized Rock

Based on our investigation and our experience the general site vicinity, the alluvial soils onsite are expected to be readily excavated using conventional earthmoving methods. Oversized rock (rock or rock fragments greater than 8 inches in diameter) was not encountered in our exploratory borings.

2.6.6 Suitability as Fill Material

The onsite soil is generally suitable for use as compacted structural fill, provided it is free of debris, significant organic material, and oversized material (greater 8 inches). Moisture conditioning (cither moistening or drying) may be needed in order to obtain the optimum maisture content peeded for compaction.

2.6.7 Erosion

The unconsolidated alluvial deposits exposed on potential cutslopes onsite are expected to be highly susceptible to erosion. Manufactured slopes composed of compacted fill are also expected to be producted to highly susceptible to crossion.



3.0 SUMMARY OF POTENTIAL GEOTECHNICAL IMPACTS AND MITIGATION MEASURES

This section summarizes the principal geotechnical conditions that occur in the project area. The potential impact that each condition may have on the site development is subjectively rated as less-than-significant or potentially significant. The California Geological Survey (formerly the California Division of Mines and Geology) has prepared guidelines for geologic and seismic considerations in environmental impact reports (CGS, 1975), in order to identify potential geologic hazards and assist in recognizing data needed for design analysis and mitigation measures. These guidelines have been used during preparation of in this report.

3.1 Seismic Hazards

3.1.1 Fault-Induced Ground Rupture

The site is not located within an Alquist-Priolo Earthquake Fault Zone (CGS, 2000), nor a County of San Bernardino Earthquake Fault Zone (County of San Bernardino, undated). As such, the potential for fault induced ground rupture is considered to be less than significant.

Mitigation Measures: No special precautions or restrictions are required.

3,1.2 Selsmic Ground Shaking

The intensity of ground shaking at a given location depends on several factors, but primarily on the earthquake magnitude, the distance from the hypocenter to the site of interest, and the response characteristics of the soil or bedrock units underlying the site. The San Andreas Fault Zone is currently known to be potentially capable of producing the most intense ground accelerations at the site, due to its location and potential magnitude. The maximum earthquake expected from the San Andreas Fault Zone in this area is of magnitude (Mw) 7.5. Such an earthquake could cause a peak horizontal ground acceleration at the site of about 0.73g. The site is located within Seismic Zone 4 of the Uniform Building Code, 1997 edition.

In the site area, the hazard posed by seismic shaking is considered high, due to the proximity of known active faults. Therefore, seismic ground shaking is considered to be a potentially significant impact.



Mitigation Measures: There is no realistic way in which the hazard of seismic shaking can be totally avoided. However, exposure to future ground shaking at the site is no greater than at many other sites in southern California. Furthermore, it should be recognized that while it is not considered feasible to make structures totally resistant to seismic shaking, they are designed not to collapse. The effects of seismic shaking on structures can be reduced through conformance with the recommendations of the gentechnical consultant for the project, the California/Uniform Building Code, and/or other local governing agencies' codes or requirements. This will promote safety in the event of a large earthquake and minimize damage. Design in accordance with these measures is expected to reduce the impact of ground shaking to less than significant.

3.1.3 Secondary Effects of Selsmic Shaking

Secondary effects of seismic shaking are non-testonic processes that are directly related to strong seismic shaking. Ground deformation, including fissures, settlement, displacement and loss of bearing strength are common expressions of these processes, and are among the leading causes of damage to structures during moderate to large earthquakes. Secondary effects leading to ground deformation include liquefaction, lateral spreading, settlement, and landsliding. Other hazards indirectly related to seismic shaking are intendation, tsunainis, and seiches.

Equalization. Liquefaction occurs when loose cohesionless, water-saturated soils (generally fine-grained sand and silt) are subjected to strong seismic ground motion of significant duration. These soils essentially behave similar to liquids, losing bearing strength. Structures built on these soils may tilt or settle when the soils liquefy. Liquefaction more often occurs in earthquake-prone areas underlain by young sandy alluvium where the groundwater table is less than 50 feet below the ground surface.

The site has not been identified as being in an area identified as potentially susceptible liquefaction (County of San Bernardine, undated). In addition, regional groundwater maps, and groundwater data indicate that shallow groundwater conditions do not exist locally, nor have they existed historically. As such, the potential for liquefaction to occur onsite is considered very low and the onsite liquefaction hazard is considered less than significant.

Mitigation Measures: No special precautions or restrictions are required.



Lateral Spreading. Lateral spreading is a phenomenon where large blocks of intact, nonliquefied soil move downslope on a liquefied substrate of relatively large aerial extent. The mass moves toward an unconfined area, such as a descending slope or stream-cut bluff, and is known to move on slope gradients as gentle as 1 degree. Due to the excess depth of groundwater beneath the site, and the lack of any unconfined areas onsite the potential for lateral spreading onsite is considered less than significant.

Mitigation Measures: No special precautions or restrictions are required.

Seismically Induced Settlement. Strong ground shaking can cause settlement by allowing sediment particles to become more tightly packed, thereby reducing pore space. Unconsolidated, loosely packed granular alluvial deposits are especially susceptible to this phenomenon. Poorly compacted artificial fills may also experience scianically induced settlement. Settlement caused by ground shaking is often nonuniformly distributed, which can result in differential settlement. If settlement occurs it could result in damage to structures. As such the risk associated with seismically induced settlement is considered to be potentially significant.

Mitigation Measures We have performed analyses to estimate seismically induced settlement using the method set forth by Tokimatsu and Seed (1987). Based on this study, the potential total settlement resulting from seismic leading is considered minor (between less than 2 inches). Differential settlement resulting from seismic loading is generally assumed to be one-half of the total seismically induced settlement over a distance of 40 feet. Typical mitigation measures include overexcavation of potentially compressible soils and foundation designs to limit distress of structures. Implementation of the overexcavation recommendations presented in this and future geotechnical reports for the project would reduce the potential for damage resulting from seismically induced settlement to be less than significant.

Seismically Induced Landslides. Marginally stable, slopes may be subject to landsliding caused by seismic shaking. In most cases, this is limited to relatively shallow soil failures on the steeper natural slopes although deep-seated failures of oversteepened slopes are also possible. The site is relatively flat and lacks natural slopes, as such the impact of seismically induced landslides is considered less than significant.



Mitigation Measures: No special precautions or restrictions are required.

Salsmically Induced Inundation: Strong sciencic ground motion can cause dams and levees to fail, resulting in damage to structures and properties located downstream. The site is located approximately 6.5 miles west-southwest of the Seven Oaks Dam. The dam was completed in 2000 and is a runoff control dam. The dam will rarely be filled and since recently constructed should withstand the design based earthquake for this area. As such, this hazard is considered to be less than significant.

Mitigation Measures: No special precautions or restrictions are required.

Tsurantis and Seiches: A tsunami, or seismically generated sea wave, is generally created by a large, distant earthquake occurring near a deep occur trough. A seiche is an earthquake induced wave in a confined body of water, such as a take or reservoir. Damage from tsunamis is confined to constal areas that are 20 feet or less above sea level. Since the project area is not located near the coast or any confined bodies of water, the risk of inundation from a tsunami or seiche is less than significant.

Whitigation Measures: No special precautions or restrictions are required.

3.2—Slope Stability

3.2.1 Stability of Natural Slopes

The site is relatively flat and lacks significant natural stopes, as such the risk of impact to the project due to natural slope stability is less than significant.

Mitigation Measures: No special precautions or restrictions are required.

3.2.2 Stability of Proposed Slopes

Development plans were not available at the time of this report. However, if thial design plans include the construction of manufactured slopes, slope stability hazards may exist onsite. Consequently, the hazard posed by unstable manufactured slopes is considered to be potentially significant.



Mitigation Measures: Future site-specific geotechnical investigations for the development should be conducted. These investigations should analyze this potential hazard in light of the proposed grading and development plans and present recommendations to protect the residences on a per lot basis.

Slopes should be constructed in accordance with the recommendations of the project geotechnical engineer, California Building Code and any City and/or County guidelines. We expect that manufactured slopes typical to this type of development would be stable from a gross standpoint. However, the slope would require remediation from a surficial stability standpoint. A discussion of this potential constraint is presented in Section 3.1.4. Implementation of slope stabilization measures during design and grading of the project will reduce the impact of slope instability in manufactured slopes to less than significant.

3.2.3 Stability of Temporary Slopes

Slope or sidewall failure in temporary excavations for underground utilities or other structures could occur in unconsolidated soils. The risk of failure in temporary slopes is higher because they are generally cut at a much steeper gradient vetasis permanent manufactured slopes. Consequently, the hazard from temporary slopes is considered to be potentially significant.

Mitigation Measures: Where excavations are made for underground utilities, the excavation wall may be shored, with shoring designed to withstand the additional loads, or the excavation walls may be flattened or "laid-back" to a shallower gradient. Excavation spoils should not be placed immediately adjecent to the excavation walls unless the excavation is shored to support the added load. Other measures used to reduce the potential for temporary slope failure include cutting and backfilling excavations in sections, and not leaving temporary excavations open for long periods of time. All Cal-OSEA regulations must be observed for excavations that will be entered by people. Following these measures is expected to reduce the impact posed by temporary slopes to less than significant.

3.3 Foundation Stability

3.3.1 Compressible Soils

When a load, such as fill soil or a building is placed, the underlying soil layers undergo a certain amount of compression. This compression is due to the



deformation of the soil particles, the relocation of soil particles, and the expulsion of water or air from the void spaces between the grains. As a result, settlement can occur. Some of this settlement occurs immediately after a load is applied, while some of the settlement occurs over a period of time after placement of the load. For engineering applications, it is important to estimate the total amount of settlement that will occur upon placement of a given load, and the rate of compression (consolidation).

Based on our investigation and experience and work in the general site vicinity, we expect the upper portion of the surficial soils onsite to be slightly too moderately compressible. Organic material and uncompacted fills are also compressible, and are unsuitable for foundation support. Therefore, the impact posed by compressible soils is considered to be notentially significant.

Mitigation Measures: Overexcavation of potentially compressible soil will be required prior to construction onsite. All undocumented fill onsite is considered compressible and should be removed to firm, competent native material. Based on our experience in the general site vicinity, and the results of our investigation and laboratory testing program, we have provided preliminary removal estimates for the project (see Section 2.6.2). Actual removal depths may vary based on future geotechnical investigation and on development plans. Implementation of the recommended removal and recompaction of the near surface soils should mitigate the significant portion of the soils that are prope to compression onsite. With the implementation of the recommended removals and overexcavation, the impact posed by compressible soils is expected to be less than significant.

3.3.2 Expansive Soils

Expansive soils underlying a foundation or slah, if left untreated, can cause damage to the structure, including heaving, tilting and cracking of the foundation. Differential movement in the building can result in damage to floors and walls, as well as door, and window frames. Based on our investigation and experience in the general site vicinity, we expect the onsite soils to have a very low expansion potential. Therefore, the impact from expansive soils is considered to be less than significant.

Mitigation Measures: No special precautions or restrictions are required



3.3.3 Corresive Soils

Comosive soils contain constituents or physical characteristics that react with concrete (water-soluble sulfates) or ferrous metals (chlorides, low pH levels and low electrical resistivity). Based on our investigation, the onsite soils are expected to have soluble sulfate contents in the negligible range. However, the onsite soils are expected to be mildly to moderately corrosive to ferrous metal. Consequently, the hazard to underground improvements from corrosive soil is expected to be potentially significant.

Mitigation Measures: All metals in contact with corrosive soil should be protected in accordance with the recommendations of the manufacturer or a corrosion engineer. Implementing these measures during design and construction of the project is expected to reduce this impact to less than significant.

3.3.4 Erosion

The native soils ensite, as well as any fill slopes constructed with native soils, will have a moderate to high susceptibility to erosion. These materials will be particularly prone to erosion during the site development, especially during heavy rains. Therefore, the impact of crosion at the site is considered to be potentially significant:

Mitigation Measures: The potential for crossion can typically be reduced by appropriate paving of exposed ground surfaces, landscaping, providing terraces on slopes, placing berms or V-ditches at the tops of slopes, and installing adequate storm drain systems. Graded slopes should be protected until healthy plant growth is established. Typically, protection can be provided by the use of sprayed polymers, straw waddles, jute mesh or by other measures.

Temporary erosion control measures should be provided during construction, as required by current grading codes. Such measures typically include temporary catchment basins and/or sandbagging to control runoff and contain sediment transport within the project site. Correct implementation of these erosion control measures is expected to reduce the impact resulting from erosion to less than significant.



3.3.5 Rippability and Oversized Rock

The onsite alluvial soils are expected to be rippable with modern earthmoving equipment. Oversized materials (larger than 8 inches in dimension) were not encountered however they may be encountered locally during rough grading of the site. Such materials are common in numerous portions of the San Bernardino County and will require special handling and placement or disposal offsite during grading. The handling of potential oversized material is common and should not adversely effect development of the site. Therefore, rippability and oversized mock disposal is considered to be a less than significant impact.

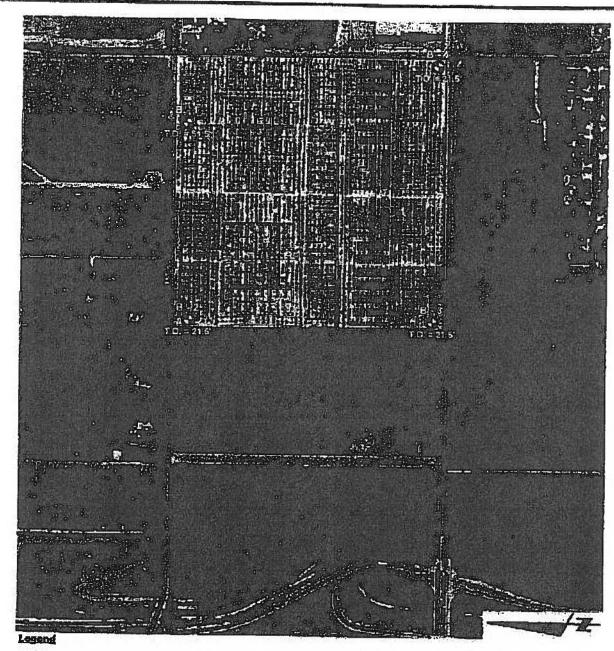
Mitigation Measures: No special precautions or restrictions are required.

3.3.6 Regional Subsidence

Regional ground subsidence general occurs due to rapid, and intensive removal of subterranean fluids, typically water or oil. It is generally attributed to the consolidation of sediments as the fluid in the sediment is removed. The total load of the soils in partially saturated or saturated deposits is born by their granular structure and the fluid. When the fluid is removed, the load is horn by the sediment alone and it settles. We are unaware of reports of regional subsidence in the site vicinity. Lack of intense removal of significant quantities of water or oil in the area makes the potential for ground subsidence very low and less than a significant impact.

Mitigation Measures: None required.





with total dupth (T.D.)



Redlands Commons Site



Trojan Groves Site

GEOTECHNICAL MAP

Basut Aerial Express View, 2005, and Conceptual Sile Plan, KTGY Group, 1/12/95

REDLANDS COMMONS AND TROJAN GROVES PROJECT, CITY OF REDLANDS, CALIFORNIA Project No.

Scale

Engr /Chol. Drafted By

Duto

021972-001

Not to Scale

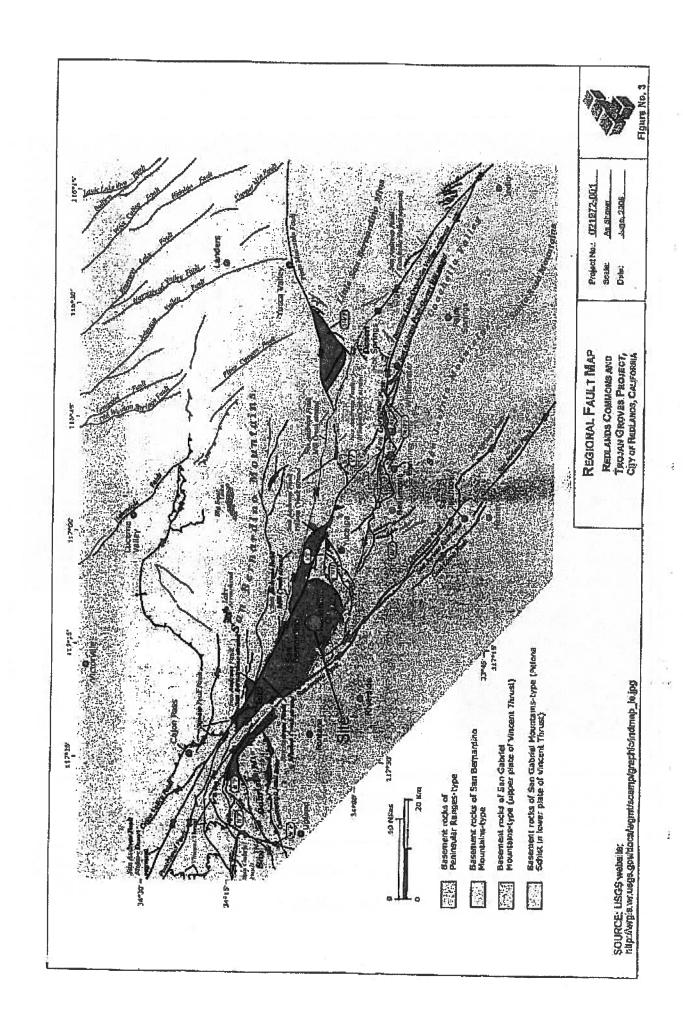
JDH/DPJ DPJ

June, 2006

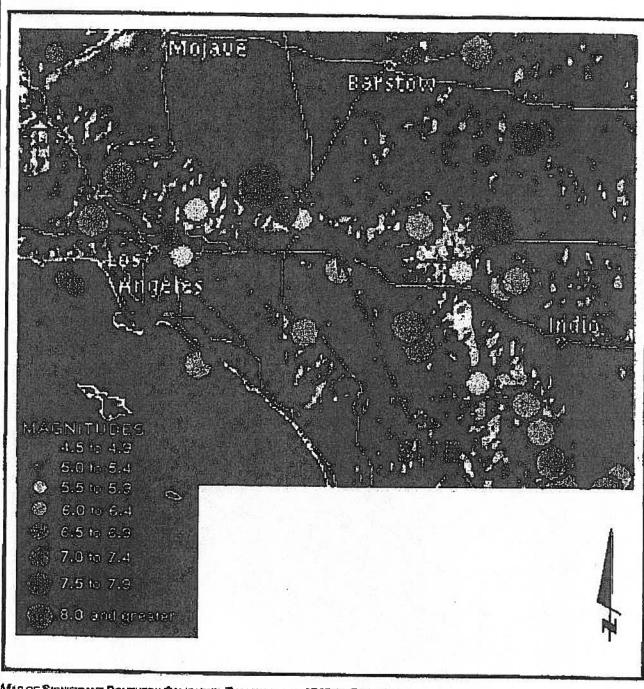


Leighton and Associates, Inc.

Figure No. 2



1 /



MAR OF SIGNIFICANT SOUTHERN CALIFORNIA EARTHQUAKES, 1812 TO PRESENT FROM SOUTHERN CALIFORNIA EARTHQUAKE CENTER (SCEC) WEB SITE WAVY BATA SCEC.ORD/CLICKMAP.HTML

REDLANDS COMMONS AND TROJAN GROVES PROJECT, CITY OF REDLANDS, CALIFORNIA

100

REGIONAL SEISMICITY MAP PROJECT No.

021972-001

DATE

June, 2008



FIGURE NO. 4

APPENDIX A

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APPENDIX A

References

-17

- Abrahamson, N. A. and Silva, W. J., 1997, Empirical Response Spectral Attenuation Relations for Shallow Crustal Earthquakes: Scismological Research Letters, Volume 68, No. 1, pp. 94-127.
- Blake, T. F., 2000, FRISKSP, A Computer Program for the Probabilistic Estimation of Peak Acceleration and Uniform Hazard Spectra Using 3-D Faults as Earthquake Sources, Version 4.00, User's Manual.
- Campbell, K. W., 1997, Empirical Near-Source Attenuation Relationships for Horizontal and Vertical Components of Peak Ground Acceleration, Peak Ground Velocity, and Pseudo-Absolute Acceleration Response Spectra: Seismological Research Letters, Volume 68, No. 1, pp. 154-179.
- California Geological Survey (CGS), (Formerly the California Division of Mines and Geology), California Department of Conservation, 1975, (Revised, 1982), Guidelines for Geologic/Seismic Considerations in Environmental Impact Reports, CDMG Note 46.
- 2000, CD-ROM containing digital images of Official Maps of Alquist-Priolo Earthquake Fault Zones that affect the Southern Region, DMG CD 2000-003, 2000.
- 2003, Cao, T., Bryant, W.A., Rowshandel, B., Bramun, D., and Wills, C.J., 2003, The Revised 2002 California Probabilistic Seismic Hazard Maps, dated June 2003, 11p. Accessible at http://www.consrv.ca.gov/cgs/rghm/psha/index.htm
- County of San Bernardino, Undated, General Plan, Geologic Hazard Overlay, Redlands Quadrangle (Map No. FH31).
- Fife, D. L. and Rodgers, D. A., 1976, Geologic Hazards in Southwestern San Bernardino County, California, California Geological Survey Special Report 113, 1976.
- Hart, E. W., and Bryant, W. A., 1999, Fault-Rupture Hazard Zones, California, Division of Mines and Geology Special Publication 42, Revised 1997 with Supplements 1 and 2 added 1999.

- Matti, J. C., Morton, D. M., Cox, B. F., and Kendrick K. J., 2003, Geologic Map of the Redlands 7.5' quadrangle, San Bernardino and Riverside Counties, California: U.S. Geological Survey Open-File Report 03-302, U.S. Geological Survey, Menlo Park, California, dated 2003.
- Mondenhall, 1907, Map Showing the Artesian Areas and Hydrographic Contours in the Valley of Southern California, Water Supply Paper 219 Plate 3, dated 1907.
- NorCal Engineering, 2005, Geotechnical Engineering Investigation Proposed Industrial Development Located at the Northwest Corner of Texas Street and San Bernardino Avenue, in the City of Redlands, California, Project Number 12227-05, dated June 15, 2005.
- Sadigh, K., Chang, C. Y., Egan, J. A., Makdisi, F., and Young R. R., 1997, "Attenuation Relations for Shallow Crustal Earthquakes Based on California Strong Motion Data" Seismological Research Letters, Vol 68, No. 1, January/February, pp. 180-189.
- Southern California Earthquake Center (SCEC), 2006, website: http://www.data.sccc.org/index.html
- Tokimatsu, K., Seed, H. B., 1987, "Evaluation of Settlements in Sands Due to Earthquake Shaking," *Journal of the Geotechnical Engineering*, American Society of Civil Engineers, Vol. 113, No. 8, pp. 861-878.

Aerial Photos Reviewed:

Date:	Flight:	Frame:	Scale:	Source:
12/3/1965	C-137	89	1:24,000	SBCFCD
2/27/1969	C-295	80	1:24,000	SBCFCD
10/30/1972	C-194	57	1:24,000	SBCFCD
1/21/1978	C-279	85	1:24,000	SBCFCD
2/25/1986	C-450	83, 84	1:24,000	SBCFCD

APPENDIX B

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Hole (g Co. Diameter ion Top o		Inch			2R Dr Veight	iling		-75 p_30
Feet	Craphic Log	Aftitudes	Sample No.	Blows Per Six Inches	Dry Dansily por	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
5-		es à the	Bag-1 R-1 R-2	4556 668	107.0	5.0	SM	O'ARTECIAL FILL (A) Sity SAND, fine-to medium-grained, some coarse grains, grayesh brown, noist, non-plantic, steme sub-engular grayet to 1 lnch, some sub-rounded colibbes O'Sity SAND, fine-to medium-grained, some coarse grains, brown, losse, model, num-plastic O'ALLEVIUM (Only Sity SAND, fine-to medium-grained, some crassa grains, grayish brown, losse, wet due to damaged imigation line; sand with sill interbackled (30% -200)	S
10-			R-3	8 9 15	105.0	16.0	SM	(30% -200) Of Sifty SAND as above, grayish brown, maist, mexicum dorse, trace sub-angular gravel in 1 inch	
15-	- 1.1		R-4	16 16 17			SI*	@ 15' Poorly graded SAND, fine-to medium-grained, some coarse grains, olive brown, moist, medium dense, increasing gravel	
20-			R-5	10 16 17	109.0	3.0	SP	@ 20' Poorly graded SAND as above	
15-			2-1	9 7 7			SM	(in 25° Silty SAND, fire-to course-grained, brown/gray/reddish bessure (layered), moist, specialize deuse, trace sub-angular gravel to 1 meh (14% -200)	S/

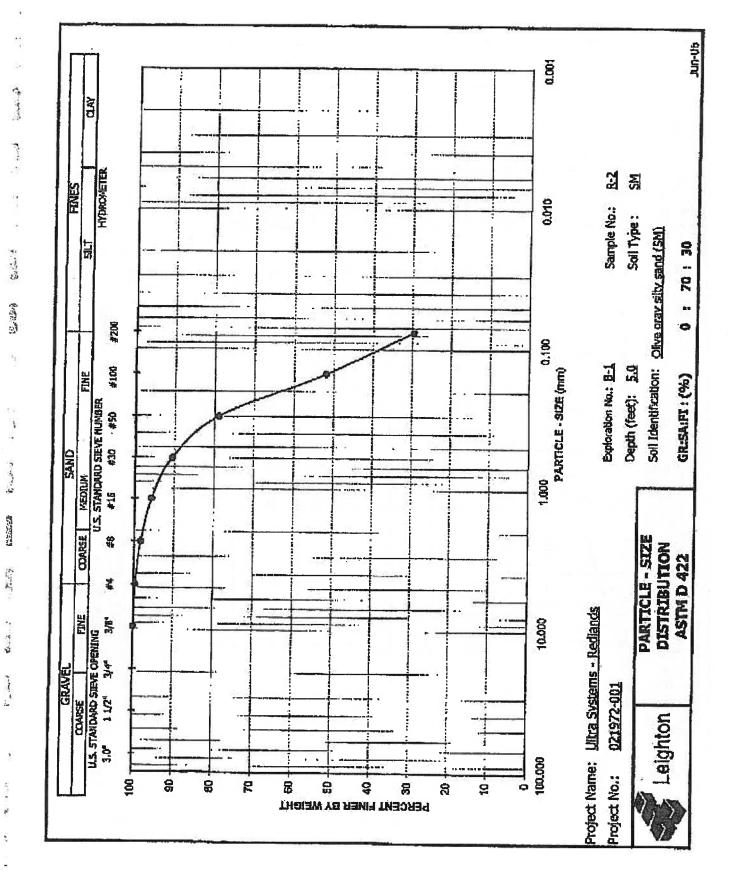
Dn	illing (Co.		U			2R D	rilling	inons Site Sheet Z of 2 Project No. 02197 Type of Rig CMI	2-001 2-75
		meter n Top of		8 inch		Orive V Locatio		t	And the second s	p <u>30</u>
Feet	Depth Fact	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class.	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
	30-			R-6	14 15 18	105.0	4.0	SP	(2) 30° Poorly graded SAND, maint, medium dense, trace subangular gravel to 1 inch; thin alternating mount/gray layers, decreasing coacse soul	
	35			S-2	14 16 18			SP	@35' Foorly graded SAND as above, gray, moist, trace sub-ungular gravet to 1 inch	
	40-			R-7	29 34 50/6			sp	@ 40° Poorly graded SAND as above, very dense	
	45			\$-3	8 [1 9			SP-SM	(a) 45° Poorly graded SAND with silt lenser, gray brown, medium dense, moist	
	50-			R-8	14 16 26			SP-SM	@ 50° Pupily graded SAND with silt losses as above	
**	55								Total depth S1.5 feet No ground water encountered Backfilled with soil cuttings	
LE NO	TYPES: T SPOOL SAMPL K SAMPL SAMPL	E LE						DE DIR	ETESTS: CR CORROSION SECT SHEAR SA SHEVE ANALYSIS AXMUM DENSITY AL ATTERBERG LIMITS INSOLIDATION ES EXPANSION INDEX ALAPSE RV R-VALUE	

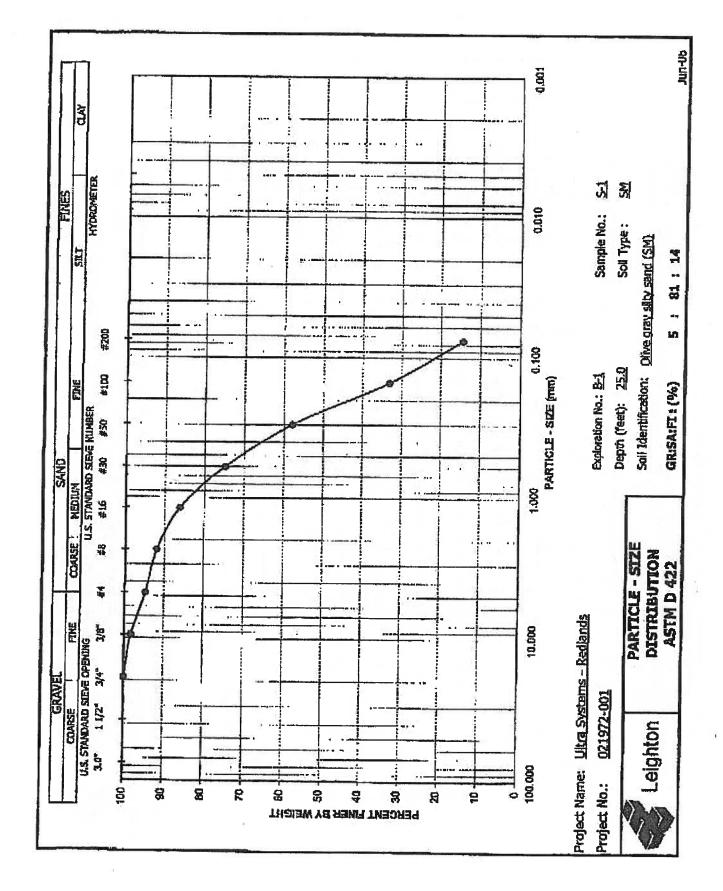
Dri	oject Illing C		5-26-06 R				2R Dr	Illing	nmons Site Sheet 1 of 1 Project No. 02197 Type of Rig CMI			
	THE RESERVE	Top of		1		Locatio			140 lb. Automatic Hammer Dro See Geotechnical Map	p 30		
Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Bensity pcf	Moisture Contem, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests		
	-			134E-1	4 67	110.0	5.0	522	O'ALLUVIUM (Qal) Poundy graded SAND with Sill, fine-to median-grained, some course graine, brown, slightly moise to moiet, silt loues (A 2' Poorly graded SAND with Silt as above	МС		
	5			R-2	5 8 9	110.0	20	SP	Foorty gradual SAND, fine-to course-grained, gray, moist, medium dense, trace sub-angular gravel to 1 inch	CN		
	10			R-3	4 5 7	92.0	13.0	SP	@ 10' Proorly graded SAND, fine-to medium-grained, some coarse grains, gray, moist, loose, silly clay lens in tip of sampler.	Col		
	15			\$-1 \$-1	5 7 8		3.0	sr	(4) 15 Poorly graded SAND, gray/brown, fine to medium grained, moist, medium dense			
	20-			R-4	10 14 20	109.0	3.0	SP	@ 20' Poorty graded SAND, fine-to medium-grained, some course grains, gray, moist, dense.			
	25								Total depth 21.5 fest No grand water encountered Backfilled with soil cuttings			

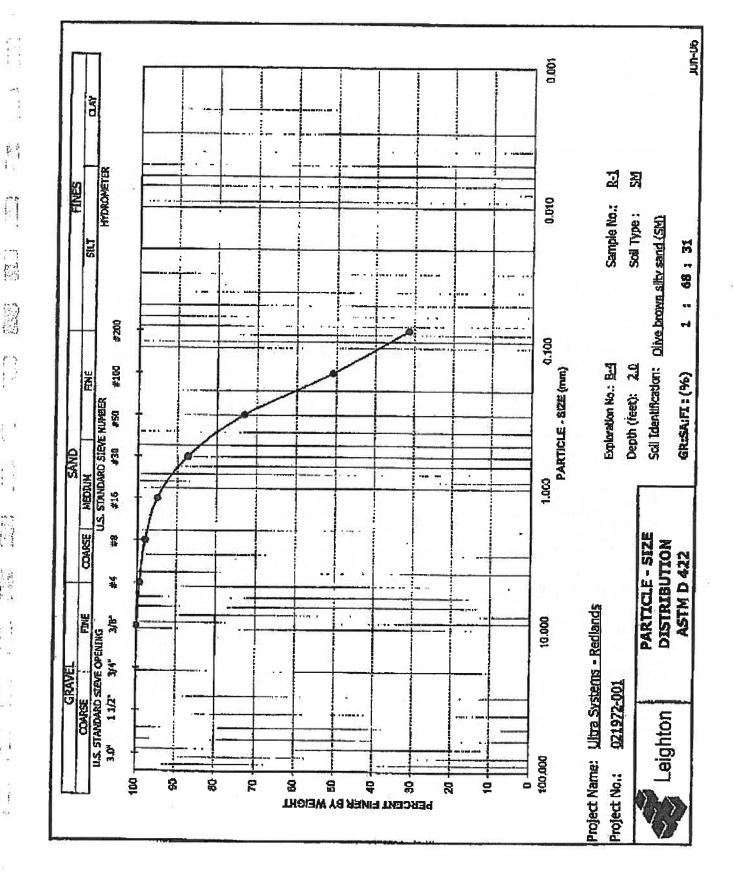
Project Drilling Co	3-20-00	U(rasyste		dland: 2R Dr		sheet 1 of 1 mons Site Project No. 02197 Type of Rig CM	2-001 E-75
Hole Diameter Elevation Top of		inch '		Orive V .ocatic	Veight	S 17.4		op 30
Depth Feet Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pol	Moisture Content, %	Soll Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
		Æı	657	114.0	5.0	Sir	TALLUYIUM (Onlifectly graded SAND with Sill, fine-to restlum-granezt, some course grains, brown, trace sub-augular gravel to I inch Teachy graded SAND with Sill, hower, maist, large, fine to madium grained	
3		R-2	6 10 10	1120	1.0	SP	(?) 5' Poorly graded SAND, fine-to medium-prained, some course grains, grayish howen, moist, medium dense, some sub-angular gravel to 1½ inches	C
10		RJ	9 11 13	104.0	3,0	SP	@ LO Poorty graded SAND as alrowe	
15—	·	R-4	7 8 9	0.80	6.0	SP	@ 15 Pourly graded SAND as above, dark grayish brown, moist, lonso to medium dense, decreasing course sand, trace gravel to 1 inch	
20-		\$-1	13 16 12		151	SP .	@ 20' Proofly graded SAND as always, meetium dense, increasing gravel, poor recovery due to 1% inch gravel in tip of sampler	
25—		-	WASHINGTON TO THE PARTY OF THE				Total depth 21.5 feet No ground water encountered Backfilled with soli curriage	
30							· ·	
ETYPES: UT SPOON IG SAMPLE LK BAMPLE BE SAMPLE		20 12				DB DIR MD MU CN GC	ETESTS: CR CORROSION ECT SHEAR SA SIEVE AKALYSIS VAINAUM CENSITY AL ATTERBERG LIMITS DESCLIDATION EI EXPANSION INDEX LLAPSE RY R-VALUE	

Pr Dr	oject rilling	Ço.	5-26-06	Uit			SK Di	Ming	mons Site Sheet 1 of 1 Project No. 02197 Type of Rig CMI	
		imeter in Top o		inch		ocatic				p <u>30</u> "
Elevation	Test Test	Graphic Log	Affitudes	Sample No.	Blows Per Sir Inches	Dry Density pci	Moisture Content, %	Soll Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
	-								@7 ALLUVIUM (Oan Silty SAND, fine to medium-grained, grayish brown, slightly moist, some sub-rounded grayes to 1 inch	
	_			R-1	556			SM	 2° Sitty SAND, fine-to medium-grained, some coarse grains, brown, knse, пизац кви-plastic (3 f % -200) 	SA
	5			R-2 Bag-1	7 8 7	117,0	3.5	SM	@ 5 Siky SAND with Convel, fine-to-medium grained, some coarse grains, grayish brown, loose, maist, sub-angular gravel to 1 inch, non-plantic	Cai Ei CR
	10-			R-3	11 15 18	107.0	3.0	SP	இ IU Pourly graded SAND with extrest, fine-to course-grained, guy, moist, medium dense, sub-angular gravel to 1 inch	
	15-			S-1	56 7			72	(6) Fourly graded SAND with gravel as above, some brown silty lenses	
	20-			R.4	19 24 28	116.0	5.0	SP	@ 20 foorly graded SAND with gravel as above, dense, 2 inch gerval in tip of samples.	
	25								Total depth drifted 21.5 feet No ground water encountered Backfilled with soil custings	
	-								æ	
SPL RIN BUL	E TYPE IT SPOX G SAMP K SAMP E SAMP	LE PLE PLE	u.l	1	<u> </u>			DE DAN MID MI CH CC	ETERIE: CR CORROSION ECT SHEAR SA SIEVE ANALYSIS EXIMUM DENSITY AL ATTERBERG LIMITS INSCLIDATION EL EXPANSION INDEX LLAPSE RV R-VALUE	

APPENDIX C







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Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Ultra Systems	- Redlands		_	GEB/RSM	Date:	06/05/06
Project No.: Boring No.: Sample No. :	021972-001 6-2 8ag-1	-		Input By : Depth (ft.)		Date:	06/12/06
Soil Identification:	Olive poorly gr	aded sand w	ith silt (SP-Si	<u>ዛ</u> }			
Preparation Method:	X	Moist Dry			X	Mechanics	
	Mold Volu		0.03307]. Ram	Weight = 10 l	Manual Ra b.; Drop =	
TEST N	The state of the s	1	2	3-	4	5	6
Wt. Compacted Sc	# Mold (g)	3738.0	3817.0	3857,0	3804.0	* 11* 1	i =
Weight of Mold	(9)	1810.0	1810.0	1810.0	1810.0		711 1 200 12
Net Weight of Soil	(g)	1928.0	2007.0	2047.0	1994.0	-	1
Wet Weight of Soil		449.80	497.10	458.10	540.10	PH 16	
Dry Weight of Soil	+ Cont. (g)	432.00	466.50	431.40	486.70		
Weight of Containe	er (g)	54,40	52.30	54:20	51.60		7/2-2
Moisture Content	(%)	4.71	7.39	9.73	12.27		1
Wet Density	(pcf)	128-5	133.8	136.5	132.9		<u> </u>
Dry Density	(pcf)	122.7	124.6	124.4	118.4		 -
PROCEDURE USI X Procedure A Scii Passing No. 4 (4.75 mi		0.0		4-	M	SP. CR.	
Mold: 4 in. (101.6 mm)	diameter		- -		111	SP. GR.	= 2.75
layers: 5 (Five) ≥ows per layer: 25 (two	ntv-five)			- - -	1111	+	
Nay be used if +#4 is 20%	or less 12	3.0	+++-		1 1 1 1 1	++	
Procedure B					1111	\	
Cil Passing 3/8 in. (9.5 mg fold : 4 in. (101,6 mm)	n) Sieve 😅		9		1 1	NI 1-	1 1 1
ayers: 5 (Five)						177	
liows per layer: 25 (byer lso if +44 is >20% and +:	18y-five) ± 120	0.0				IVI	
20% or less	S	H			111	1/1/1	
Procedure C	<u>*</u>	-		- -	8	11/1	
oli Passing 3/4 in. (19.0 m loid : 6 in. (152.4 mm) ayers : 5 (Five)	m) Slew					1-14	\ :
ions per layer: 56 (nity- se if +3/8 in. is >20% and is <30%	six) 115 i +34 in.	.0					H
article-Size Distrib	ution:						1
GR:SA:FI	110.	。口口			 	1 1 +-	
tterberg Limits:	r I M.	0.0	5.0	1	0.0	15.0	20/
LLPLPI			0.05		Content (%)	14.0	501



EXPANSION INDEX of SOILS ASTM D 4829

Project Name:

Ultra Systems - Redlands

Tested By:

Depth (ft.)

Date:

06/08/06

Project No. :

021972-001

GEB Checked By: UF 5-10

Date: 06/12/06

Boring No.: Sample No. : B-4

Bag-1

Soil Identification:

Olive silty sand (SM)

Dry Wt. of Soil + Cont. Wt. of Container No.	(g)	1000.00	m nj	
Dry Wt. of Soil	(g)	1000,00		
Weight Soll Retained on #4	0.00			
Percent Passing # 4	A - 90	100.00		

Molded Specimen		Before Test	After Test	
Specimen Diameter	(in.)	4.01	4.01	
Specimen Height	(in.)	1.0000	0.9990	
Wt. Comp. Soil + Mold	(g)	593.40	430.20	
Wt. of Mold	(9)	190.50	0.00	
Specific Gravity (Assun	ied)	2.70	2.70	
Container No.		O	0	
Wet WL of Soil + Cont	. (g)	841.90	620.70	
Dry Wt. of Soil + Cont.	(g)	779.30	563.60	
Wt. of Container	(g)	0.00	190-50	
Moisture Content	(%)	8.03	15.30	
Wet Density	(pcf)	121.5	129.9	
Dry Density	(pcf)	112.5	112,7	
Vold Ratio		0.499	0.496	
Total Porosity		0.333	0.332	
Pore Volume	(00)	68.9	68.6	
Degree of Saturation (9	6) [S meas]	43.5	83.2	

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
06/08/06	10:31	1.0	0	0.4810
06/08/05	10:41	1.0	10	0.4810
		vdd Distilled Water to the	Spedimen	
06/08/06	16:54	1.0	373	0.4800
06/09/06	8:51	1.0	1330	0.4800
06/09/06	9:55	1.0	1394	0.4800

Expansion Index (EI meas)	=	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-1.0
Expansion Index (EL)	=	EI meas + (50 -S meas)x((65+EI meas) / (220-S meas))	0



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name:

Ultra Systems - Redlands

021972-001

Tested By:

FT, ESS Date: 06/08/06

Project No.: Boring No.:

B-2

Checked By: Sample Type: Date: 06/12/08

Drive

Sample No.:

R-3

Depth (ft.)

10.0

Sample Description:

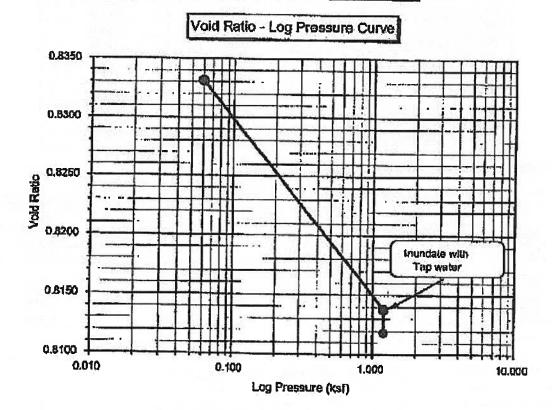
Grayish brown silty sand (SM)

initial Dry Density (pcf):	91.9
initial Moisture (%):	13.42
Initial Length (In.):	1,0000
Initial Dial Reading:	0.1080
Diameter(in):	2 418

Final Dry Density (pcf):	68.9
Final Moisture (%):	32.7
Initial Void ratio:	0.8335
Specific Gravity(assumed):	2.70
Initial Saturation (%)	43.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compilance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1082	0.9998	0.00	-0.02	0.8331	-0.02
1,200	0.1188	0.9893	0.00	-1,08	0.8138	-1.08
. H2O	0.1198	0.9882	0.00	-1.18	0.8118	-1.18

Percent Swell (+) / Settlement (-) After inundation = -0.11





One-Dimensional Swell or Settlement Potential of Cobesive Soils

(ASTM T) 4546)

Project Name: Ultra Systems - Redlands

021972-001

Tested By:

FT, ESS Date:

06/08/06

Project No.: Boring No.:

B-3

Checked By:

06/12/06 Date:

Sample Type: Depth (Rt.)

Drive

5.0

Sample No.:

R-2

Sample Description:

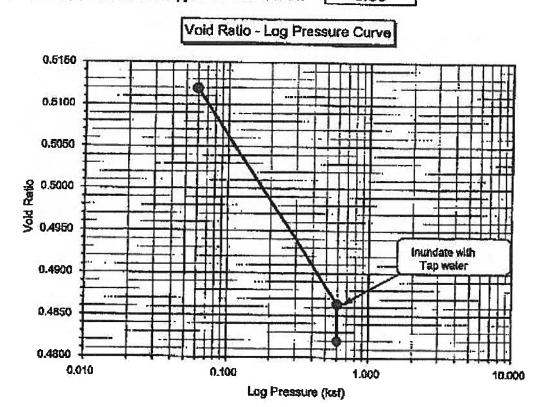
Brown silty sand (8M)

tnitial Dry Density (pcf):	111.5
Initial Moisture (%):	1.35
Initial Length (in.);	1.0000
Initial Dial Reading:	0.1346
Diameter(in):	2418

Final Dry Density (pcf):	111.5
Final Moisture (%):	17.2
Initial Vold ratio:	0.5120
Specific Gravity(assumed):	2.70
Initial Saturation (%)	7.1

Pressure (p) (Ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1347	0.9999	0.00	-0.01	0.5119	-0.01
0.600	0.1516	0.9830	0.00	-1.70	0.4863	-1.70
H2Q	0.1545	0.9801	0.00	-1.99	0,4820	-1.99

Percent Swell (+) / Settlement (-) After inundation = -0.30





One-Dimensional Swell or Settlement Potential of Collesive Soils

(ASTM D 4546)

Project Name:

Ultra Systems - Redlands

Tested By:

FT, ESS Date:

06/08/06

Project No.:

021972-001

Chacked By:

06/12/06

Boring No.:

8-4

Sample Type:

Date:

Sample No.:

R-2

Depth (IL)

Drive 5.0

Sample Description:

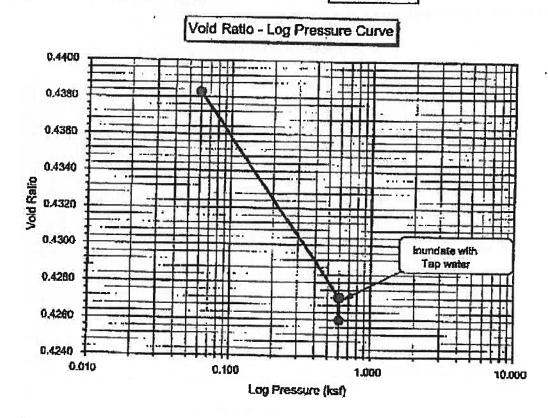
Offive brown silly sand with gravel (SM)g

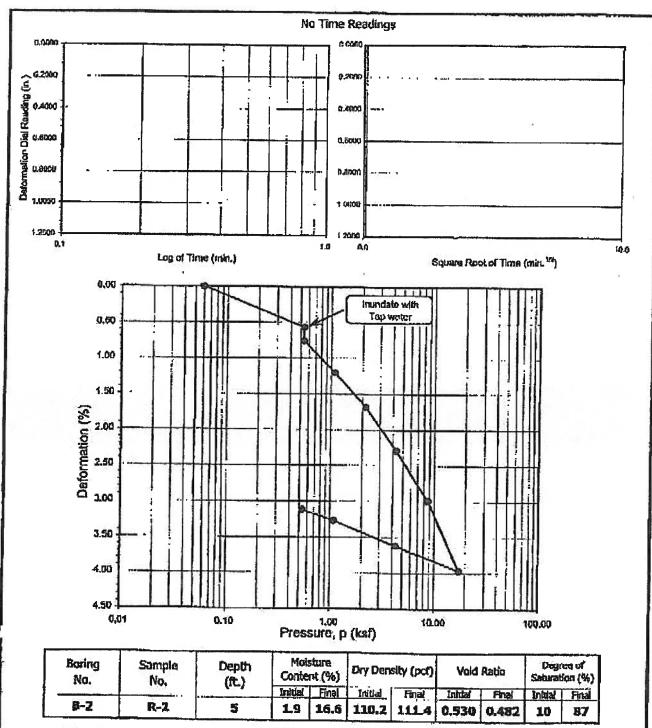
Initial Dry Density (pcf):	117.1
Initial Moisture (%):	12.54
initial Length (in.):	1,0000
Initial Dial Reading:	0.1523
Diameter(in):	2418

Final Dry Density (pcf):	117.0
Final Moisture (%):	14.2
Initial Void ratio:	0.4389
Specific Gravity(assumed):	2.70
initiel Saturation (%)	77.2

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1527	0,9996	0.00	-0.04	0.4383	-0.04
0.600	0.1604	0.9919	0.00	-0.81	0.4272	-0.81
H2O	0.1613	0.9911	0.00	-0.90	0.4260	-0.90

Percent Swell (+) / Settlement (-) After inundation = -0.09





Soil Identification: Brown Silty Sand (SM)



ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS (ASTM D 2436) Project Na.:

021972-001

Ultra Systems - Redlands

06-06

Appendix E Cultural Resources Technical Report

Betsy Lindsay UltraSystems Environmental 100 Pacifica, Suite 250 Irvine, CA 92618

Re: Historical/Archaeological Resources Survey
Trojan Groves, Assessor's Parcel Nos. 0167-091-09 through -12
City of Redlands, San Bernardino County, California
CRM TECH Contract #1872

Dear Betsy:

In conjunction with the historical/archaeological resources survey for the Redlands Commons project, we have also completed a similar survey on the adjacent property known as Trojan Groves. The subject property of this survey, consisting of Assessor's Parcel Nos. 0167-091-09 through -12, extends from the west boundary of the Redlands Commons project area to the east side of State Route 30, as illustrated in Figure 1. The Trojan Groves property is covered by the records search and historical background research conducted for the Redlands Commons project (see Tang et al. 2006), and an intensive-level, on-foot field survey was carried out on this property at the same time as the survey of the Redlands Commons project area.

The results of the records search indicate that the Trojan Groves property had not been surveyed systematically for cultural resources prior to this study, although a linear survey had apparently crossed a small portion of the land. A historic-period irrigation line known as Berry Roberts Ditch, built in 1868, was previously noted as possibly traversing across a portion of the subject property. However, that observation was based on historical records only, and the continued presence of the ditch was never confirmed through archaeological fieldwork. For that reason, it remained a "pending" site. Historical sources consulted for the study suggest that the subject property was likely used only for citrus cultivation or other agricultural activities during the historic period, and the first building to be noted within the property boundary, located on the north side of San Bernardino Avenue, did not appear until sometime between 1952 and 1966 (USGS 1954; 1967).

On June 26, 2006, CRM TECH archaeologists Nicholas Hearth, M.A., and Laurie Taylor, M.A., conducted the field survey of the Trojan Groves property. During the survey, Hearth and Taylor walked parallel north-south transects spaced 15 meters (approx. 50 feet) apart. In this way, the ground surface of the subject property was systematically and carefully examined for any evidence of human activities dating to the prehistoric or historic periods (i.e., 50 years or older). Ground visibility was fair (50%) at the time of the survey.

During the field survey, no evidence of the Berry Roberts Ditch, or of any prehistoric—i.e., Native American—archaeological remains, was observed on the subject property. The building that occupied a portion of the property in the 1950s-1960s is no longer in

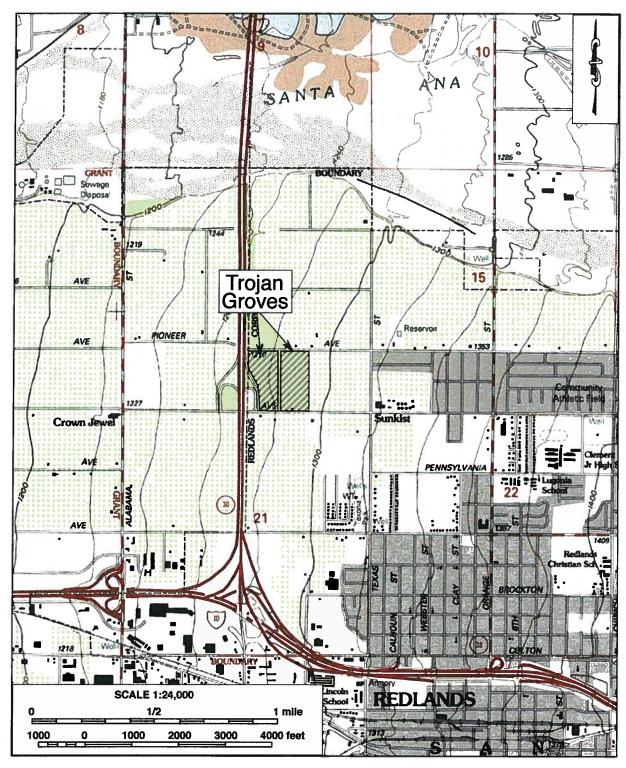


Figure 1. Location and configuration of the Trojan Groves property. (Based on USGS Redlands, Calif., 1:24,000 quadrangle, 1996 edition)

existence. Near its former location, the field personnel found the remnants of two concrete foundations. Although they may date to the late historic period, these minor, fragmented, and ubiquitous features, surviving out of context and without any associated artifact deposits, demonstrate no potential for historic significance, and were therefore not formally recorded during the survey.

In conclusion, no "historical resources," as defined by the California Environmental Quality Act (Title 14 CCR §15064.5(a)(1)-(3)), were encountered on the Trojan Groves property during this study. Based on these findings, no further cultural resources investigation will be necessary on the subject property. However, if buried cultural materials are encountered during future earth-moving operations on the property, all work in that area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

Thank you for this opportunity to be of service.

Sincerely,

Bai "Tom" Tang, M.A. Principal Investigator

Reference:

Tang, Bai, Michael Hogan, Deirdre Encarnación, and Nicholas Hearth
 2006 Historical/Archaeological Resources Survey Report: The Redlands Commons
 Project, Assessor's Parcel Nos. 0167-091-02, -04, -05, and -08, City of Redlands, San
 Bernardino County, California.

USGS (United States Geological Survey, U.S. Department of the Interior)

1954 Map: Redlands, Calif. (15', 1:62,500); aerial photographs taken in 1952.

1967 Map: Redlands, Calif. (7.5', 1:24,000); aerial photographs taken in 1966, field-checked in 1967.



HISTORICAL/ARCHAEOLOGICAL RESOURCES SURVEY REPORT

REDLANDS COMMONS PROJECT

Assessor's Parcel Nos. 0167-091-02, -04, -05, and -08 City of Redlands, San Bernardino County, California

For Submittal to:

City of Redlands Planning Department P.O. Box 3005 Redlands, CA 92373

Prepared for:

Betsy Lindsay UltraSystems Environmental 100 Pacifica, Suite 250 Irvine, CA 92618

Prepared by:

CRM TECH 4472 Orange Street Riverside, CA 92501

Bai "Tom" Tang, Principal Investigator Michael Hogan, Principal Investigator

July 3, 2006

Author(s): Deirdre Encarnación, Archaeologist/Report Writer

Nicholas Hearth, Archaeologist

Consulting Firm: CRM TECH

4472 Orange Street Riverside, CA 92501 (951) 784-3051

Date: July 3, 2006

Title: Historical/Archaeological Resources Survey Report: Redlands

Commons Project, Assessor's Parcel Nos. 0167-091-02, -04, -05, and

-08, City of Redlands, San Bernardino County, California

For Submittal to: City of Redlands

Planning Department

P.O. Box 3005

Redlands, CA 92373

Prepared for: Betsy Lindsay

UltraSystems Environmental

100 Pacifica, Suite 250 Irvine, CA 92618

Contract No.: CRM TECH No. 1872

USGS Quadrangle: Redlands, Calif., 7.5' quadrangle (Section 16, T1S R3W, San

Bernardino Base Meridian)

Project Size: Approximately 37 acres

Keywords: Redlands area, San Bernardino County; historical/archaeological

resources survey; Site CRM TECH 1872-1H (temporary designation): historic-era irrigation system; no "historical resources" under CEQA

MANAGEMENT SUMMARY

Between May and July 2006, at the request of UltraSystems Environmental, CRM TECH performed a cultural resources study on approximately 37 acres of agricultural land in the City of Redlands, San Bernardino County, California. The subject property of the study, encompassing Assessor's Parcel Nos. 0167-091-02, -04, -05, and -08, is located on the west side of Texas Street between Pioneer Street and San Bernardino Avenue, in the southeast quarter of Section 16, T1S R3W, San Bernardino Base Meridian. The study is part of the environmental review process for a proposed development project known as Redlands Commons. The City of Redlands, as Lead Agency for the project, required the study in compliance with the California Environmental Quality Act (CEQA) and the City's Historic and Scenic Preservation Ordinance.

The purpose of the study is to provide the City of Redlands with the necessary information and analysis to determine whether the proposed project would cause substantial adverse changes to any historical/archaeological resources that may exist in or around the project area, as mandated by CEQA and the City Ordinance. In order to identify and evaluate such resources, CRM TECH initiated a historical/archaeological resources records search, pursued historical background research, contacted local Native American representatives, and carried out an intensive-level field survey.

As a result of these procedures, four abandoned historic-era irrigation flumes with associated weir boxes were recorded within the project area and temporarily designated Site CRM TECH 1872-1H. In the citrus-growing areas of southern California, such minor, fragmented elements of the historic infrastructure are virtually ubiquitous, and these specimens do not demonstrate any particular potential for important archaeological data for the study of local history. Therefore, Site CRM TECH 1872-1H does not appear eligible for listing in the California Register of Historical Resources or for local designation under provisions of the City Ordinance, and does not constitute a "historical resource," as defined by CEQA. No other potential "historical resources" were encountered within or adjacent to the project area.

Based on the research results summarized above, CRM TECH recommends to the City of Redlands a finding of *No Impact* regarding cultural resources. No further cultural resources investigation is recommended for the project unless development plans undergo such changes as to include areas not covered by this study. However, if buried cultural materials are encountered during any earth-moving operations associated with the project, all work in that area should be halted or diverted until a qualified archaeologist can evaluate the nature and significance of the finds.

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INTRODUCTION

Between May and July 2006, at the request of UltraSystems Environmental, CRM TECH performed a cultural resources study on approximately 37 acres of agricultural land in the City of Redlands, San Bernardino County, California (Fig. 1). The subject property of the study, encompassing Assessor's Parcel Nos. 0167-091-02, -04, -05, and -08, is located on the west side of Texas Street between Pioneer Street and San Bernardino Avenue, in the southeast quarter of Section 16, T1S R3W, San Bernardino Base Meridian (Fig. 2). The study is part of the environmental review process for a proposed development project known as Redlands Commons. The City of Redlands, as Lead Agency for the project, required the study in compliance with the California Environmental Quality Act (CEQA; PRC §21000, et seq.) and the City's Historic and Scenic Preservation Ordinance (Chapter 2.62, Redlands Municipal Code).

CRM TECH performed the present study to provide the City of Redlands with the necessary information and analysis to determine whether the proposed project would cause substantial adverse changes to any historical/archaeological resources that may exist in or around the project area, as mandated by CEQA and the City Ordinance. In order to identify and evaluate such resources, CRM TECH initiated a historical/archaeological resources records search, pursued historical background research, contacted local Native American representatives, and carried out an intensive-level field survey. The following report is a complete account of the methods, results, and final conclusion of the study.

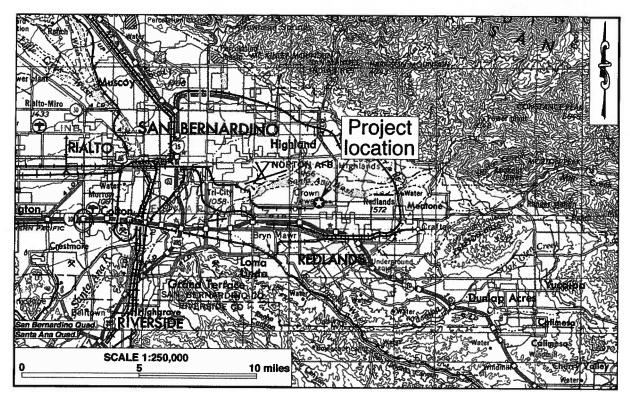


Figure 1. Project vicinity. (Based on USGS San Bernardino and Santa Ana, Calif., 1:250,000 quadrangles [USGS 1969; 1979])

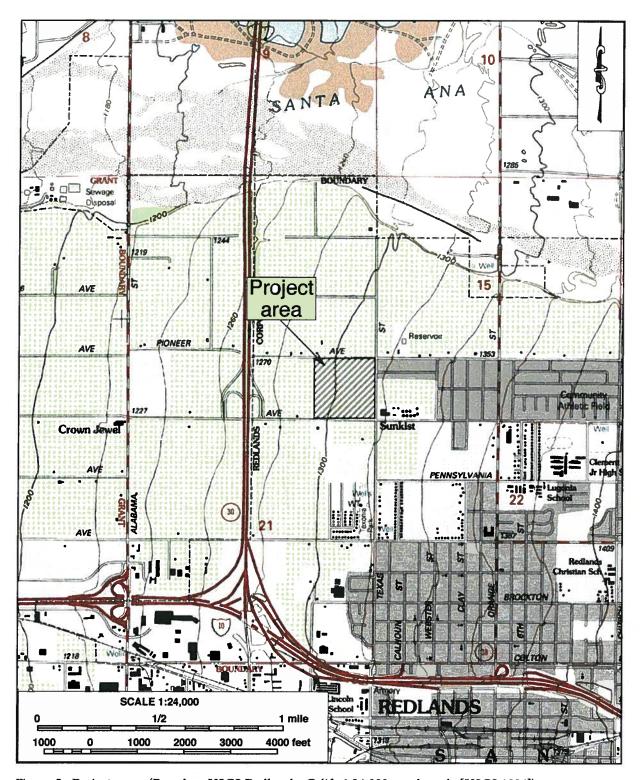


Figure 2. Project area. (Based on USGS Redlands, Calif., 1:24,000 quadrangle [USGS 1996])

SETTING

CURRENT NATURAL SETTING

The project area is situated near the eastern end of the San Bernardino Valley, a broad inland valley extending from the southern base of the San Bernardino and San Gabriel Mountains. The average maximum temperature in July reaches the high 90s in this region, and the average minimum temperature in January hovers around 30°F. Rainfall is typically less than 20 inches annually.

The project area is bounded on the south by San Bernardino Avenue, on the east by Texas Street, on the north by Pioneer Avenue, and on the west by vacant land. The terrain in the project area is relatively level, with elevations of approximately 1,300-1,310 feet above mean sea level. Soils are predominantly a grey-brown fine sandy loam with gravel on the edges due to disturbances by road construction. Most of the property is currently under cultivation as citrus groves (Fig. 3), and other vegetation in the area includes wild mustard, jimsonweed, and wild grasses and weeds.



Figure 3. Typical landscape in the project area. (Photo taken on June 26, 2006, view to the west)

CULTURAL SETTING

Prehistoric Context

The Redlands area lies in the traditional homeland of the Serrano Indians, although the Native population found in the area at the time of European contact are believed to have been Gabrielinos from the San Gabriel Valley, who were later succeeded by Mountain Cahuillas from the San Jacinto and Santa Rosa Mountains around 1846 (Strong 1929:8). The Serranos' territory is centered at the San Bernardino Mountains, but also includes the southern rim of the Mojave Desert, extending from today's Victorville eastward to

Twentynine Palms. The name "Serrano" was derived from a Spanish term meaning "mountaineer" or "highlander." The basic written sources on Serrano culture are Kroeber (1925), Strong (1929), and Bean and Smith (1978).

Prior to European contact, the Serranos were primarily gatherers and hunters, and occasional fishers, who settled mostly where flowing water emerged from the mountains. They were loosely organized into exogamous clans, which were led by hereditary heads, and the clans in turn were affiliated with one of two exogamous moieties. The exact nature of the clans, their structure, function, and number are not known, except that each clan was the largest autonomous political and landholding unit, the core of which was the patrilineage. There was no pan-tribal political union among the clans. Despite their linguistic differences from the Serranos, the Gabrielino and Cahuilla societies exhibited many of the same characteristics in social organization and material culture.

Although contact with Europeans may have occurred as early as 1771 or 1772, Spanish influence on Native lifeways in this area was negligible until the 1810s, when a mission asistencia was established on the western edge of present-day Redlands. Between then and the end of the mission era in 1834, almost all of the Native Americans in the area were removed to the nearby missions, including most of the Serranos in the San Bernardino Mountains. At present, most Serrano descendants are found on the San Manuel and the Morongo Indian Reservations, where they participate in ceremonial and political affairs with other Native American groups on an inter-reservation basis.

Historic Context

The San Bernardino Valley, including the Redlands area, received its first European visitors in 1772, when a small force of Spanish soldiers traveled through the area under the command of Pedro Fages, the military *comandante* of Alta California. The name "San Bernardino" was bestowed on the valley when the San Bernardino *asistencia*, along with a mission rancho bearing the same name, came into being in 1819. In 1842, after secularization of the mission system, the Mexican authorities in Alta California granted Rancho San Bernardino, along with several other adjacent former mission ranchos, to members of a prominent Los Angeles family, the Lugos.

After nine years of cattle raising on their 35,000-acre domain, the Lugo family sold the entire rancho in 1851 to Amasa M. Lyman and Charles C. Rich, leaders of a Mormon colony that was to become today's City of San Bernardino. In the early 1880s, Frank E. Brown and Edward G. Judson purchased a portion of the rancho and, combining it with other land acquisitions in the vicinity, founded the town of Redlands. Thanks to the great southern California land boom of the 1880s, a thriving citrus industry that began in the 1870s, and especially the construction of the Bear Valley Reservoir in 1883-1884, the new town was an instant success. The City of Redlands, incorporated in 1888, soon became the best-known winter retreat in the nation. The influx of affluent winter residents from the eastern United States perpetuated for Redlands a popular image characterized by vast stretches of citrus groves surrounding the elegant mansions of the "gentlemen farmers."

Since the mid-20th century, with the increasing diversification of Redlands' economic livelihood, much of the once extensive citrus acreage has given way to urban expansion. Over the last few decades of the 20th century, like many other former small rural towns in

southern California, Redlands increasingly took on the characteristics of a "bedroom community." Nevertheless, the "citrus culture" that developed during the late 19th and early 20th centuries continues to be an integral part of the City's identity to the present time.

RESEARCH METHODS

RECORDS SEARCH

The Archaeological Information Center (AIC) at the San Bernardino County Museum, Redlands, provided the records search service for this study. The AIC is the official cultural resource records repository for San Bernardino County, and a part of the California Historical Resource Information System, established and maintained under the auspices of the Office of Historic Preservation.

During the records search, Robin Laska, AIC Assistant Coordinator, checked the Center's electronic database for previously identified historical/archaeological resources in or near the project area, and existing cultural resources reports pertaining to the vicinity. Previously identified historical/archaeological resources include properties designated as California Historical Landmarks, Points of Historical Interest, or San Bernardino County Historical Landmarks, as well as those listed in the National Register of Historic Places, the California Register of Historical Resources, or the California Historical Resource Information System.

HISTORICAL RESEARCH

Historical background research for this study was conducted by CRM TECH historian Bai "Tom" Tang (see App. 1 for qualifications) on the basis of published literature in local and regional history and historic maps depicting the project vicinity. Among maps consulted for this study were the U.S. General Land Office's (GLO) land survey plat map dated 1858 and the U.S. Geological Survey's (USGS) topographic maps dated 1901, 1943, and 1954. These maps are collected at the Science Library of the University of California, Riverside, and the California Desert District of the U.S. Bureau of Land Management, located in Moreno Valley.

NATIVE AMERICAN CONTACT

As a part of the research procedures, CRM TECH contacted Ann Brierty of the San Manuel Band of Mission Indians, the Native American group closest to the project location, by fax on May 11, 2006, to inform the Band of the upcoming fieldwork as well as to request information on potential sites of Native American cultural significance in the project vicinity. As of this time, no response has been received from Ms. Brierty or any other members of the San Manuel Band.

FIELD SURVEY

On June 26, 2006, CRM TECH archaeologists Nicholas Hearth and Laurie Taylor (see App. 1 for qualifications) carried out the intensive-level, on-foot field survey of the project area.

During the survey, Hearth and Taylor walked parallel north-south transects spaced 15 meters (approx. 50 feet) apart. In this way, the ground surface in the entire project area was systematically and carefully examined for any evidence of human activities dating to the prehistoric or historic periods (i.e., 50 years ago or older). Ground visibility was poor (20%).

When potential historic-era features were identified through the survey efforts, an appropriate level of field recordation was completed on such features. At a minimum, the field recordation included a description of the resource and a location map. Scaled sketch maps were also produced for locations with more extensive archaeological remains. The field maps and descriptions were then compiled into standard site record forms and submitted to the AIC for inclusion in the California Historical Resources Information System.

RESULTS AND FINDINGS

RECORDS SEARCH

According to records on file at the Archaeological Information Center, the project area had not been surveyed for cultural resources prior to this study, and no cultural resources had been recorded on or adjacent to the property. Outside the project boundaries but within a one-mile radius, AIC records show at least 18 previous cultural resources studies covering various tracts of land and linear features (Fig. 4). As a result of these and other similar studies in the vicinity, 13 archaeological sites were previously recorded within the scope of the records search.

All 13 of the previously recorded sites were historic—i.e., non-Native American—in nature, consisting predominantly of agricultural complexes, in some cases with associated residences and irrigation systems. Three water conveyance systems and one trash scatter were also recorded within the scope of the records search. None of these previously recorded sites was located within or adjacent to the project area, and thus none of them requires further consideration during this study.

HISTORICAL RESEARCH

Historic maps consult for this study suggest that the project area remained vacant and undeveloped, except as agricultural fields, throughout the historic period (Figs. 5-8). In the 1850s, when the U.S. government conducted the earliest official land surveys in the present-day Redlands area, some scattered evidence of human activities, such as roads and fences, were noted in the general vicinity, but no indication of any settlement or land development endeavors was found in or near the project area (Fig. 5).

Between the 1880s and the 1950s, the town of Redlands, about a mile to the southeast, grew steadily (Figs. 6-8). During the late 19th and early 20th centuries, the area immediately to the northwest of the town center, including the subject property, became a part of the vast acreage of citrus land surrounding the city, and much of this area remains a stronghold of Redlands' citrus heritage to the present time despite the accelerated urbanization sweeping across southern California in the post-WWII era.

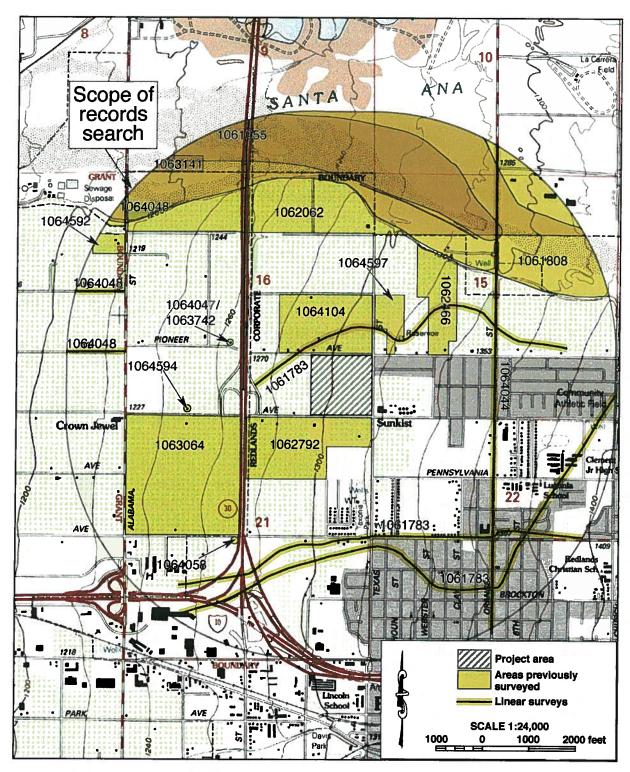


Figure 4. Previous cultural resources studies in the vicinity of the project area, listed by AIC file number. Locations of historical/archaeological sites are not shown as a protective measure.

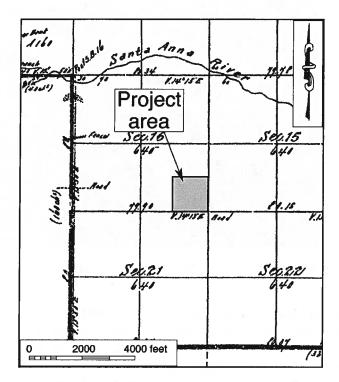


Figure 5. The project area and vicinity in 1853-1857 (Source: GLO 1858)

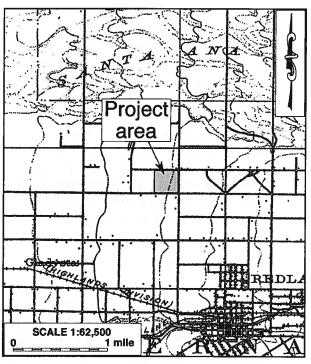


Figure 6. The project area and vicinity in 1898-1899. (Source: USGS 1901)

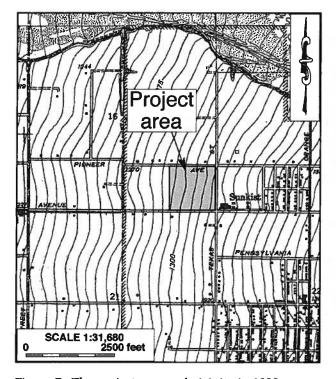


Figure 7. The project area and vicinity in 1939. (Source: USGS 1943)

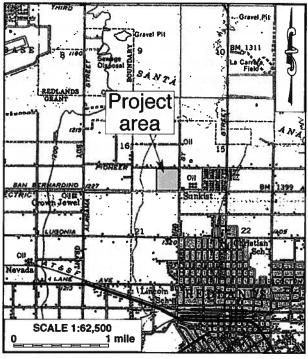


Figure 8. The project area and vicinity in 1952. (Source: USGS 1954)

Throughout the early and mid-20th century, the area around the project location demonstrated a development pattern that was typical for rural southern California at the time, featuring crisscrossing roads lined by scattered farmhouses and citrus groves (Figs. 7, 8). The forerunners of today's San Bernardino Avenue, Texas Street, and Pioneer Avenue had appeared along the project boundaries at least by the late 1890s, and several buildings have been noted in the vicinity since then (Figs. 6-8). However, none of these buildings was found within the project area.



Figure 9. Irrigation flume in the project area.

FIELD SURVEY

During the field survey, no prehistoric archaeological sites, features, or artifacts were discovered on the subject property, but an abandoned historic-era irrigation system for the citrus groves was recorded as an archaeological site and designated temporarily as Site CRM TECH 1872-1H. The site consists of four concrete-and-stone flumes (Fig. 9) oriented in the north-south direction, running between rows of orange trees, along with such associated features as weir boxes. The flumes are no longer in use and are in a state of disrepair.

In addition to the irrigation system, scattered smudge pots, once used to protect the fruits from winter freeze before that function was gradually taken over by wind machines in the mid-20th century, were also found throughout the site area. Like the practice of smudge burning, gravity-flow irrigation was the standard practice in citrus cultivation in southern California throughout the historic period and well into modern times, supplanted by the mini-sprinkler drip system only in the 1970s. None of the irrigation features found at Site CRM TECH 1872-1H bears any distinctive characteristics associated with a particular time period. Coupled with the usual lack of specific documentation in historical sources, the precise age of this irrigation system is difficult to ascertain.

DISCUSSION

The purpose of this study is to identify any cultural resources within or adjacent to the project area, and to assist the City of Redlands in determining whether such resources meet the official definitions of "historical resources," as provided in the California Public Resources Code, in particular CEQA, and the City's Historic and Scenic Preservation Ordinance.

DEFINITION

According to PRC §5020.1(j), "'historical resource' includes, but is not limited to, any object, building, site, area, place, record, or manuscript which is historically or archaeologically

significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California." More specifically, CEQA guidelines state that the term "historical resources" applies to any such resources listed in or determined to be eligible for listing in the California Register of Historical Resources, included in a local register of historical resources, or determined to be historically significant by the Lead Agency (Title 14 CCR §15064.5(a)(1)-(3)).

Regarding the proper criteria of historical significance, CEQA guidelines mandate that "a resource shall be considered by the lead agency to be 'historically significant' if the resource meets the criteria for listing on the California Register of Historical Resources" (Title 14 CCR §15064.5(a)(3)). A resource may be listed in the California Register if it meets any of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

(2) Is associated with the lives of persons important in our past.

(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

(4) Has yielded, or may be likely to yield, information important in prehistory or

history. (PRC §5024.1(c))

A local register of historical resources, as defined by PRC §5020.1(k), "means a list of properties officially designated or recognized as historically significant by a local government pursuant to a local ordinance or resolution." For properties within the City of Redlands, the City's Historic and Scenic Preservation Ordinance (Ch. 2.62, Redlands Municipal Code) provides for a "list of nominated resources" as the official local register. A property may be considered for inclusion in the list based on one or more of the following criteria:

- A. It has significant character, interest, or value as part of the development, heritage or cultural characteristics of the City of Redlands, State of California,. or the United States;:
- B. It is the site of a significant historic event:
- C. It is strongly identified with a person or persons who significantly contributed to the culture, history or development of the City;
- D. It is one of the few remaining examples in the City possessing distinguishing characteristics of an architectural type or specimen;
- E. It is a notable work of an architect or master builder whose individual work has significantly influenced the development of the City;
- F. It embodies elements of architectural design, detail, materials, or craftsmanship that represents a significant architectural innovation;
- G. It has a unique location or singular physical characteristics representing an established and familiar visual feature of a neighborhood, community, or the City;
- H. It has unique design or detailing;
- I. It is a particularly good example of a period or style;
- J. It contributes to the historical or scenic heritage or historical or scenic properties of the City (to include, but not limited to landscaping, light standards, trees, curbings, and signs);
- K. It is located within a historic and scenic or urban conservation district, being a geographically definable area possessing a concentration of historic or scenic

properties which contribute to each other and are unified aesthetically by plan or physical development. (RMC §2.62.170)

Pursuant to these statutory and regulatory guidelines, Site CRM TECH 1872-1H was evaluated under both the criteria for the California Register and those for the City of Redlands' local register. The results of the evaluation are discussed below.

SITE EVALUATION

As stated above, Site CRM TECH 1872-1H represents a localized irrigation system built for the surrounding groves. The age and historical background of these irrigation features are unclear, and none of them bears any distinctive characteristics associated with a specific time period. In the citrus-growing areas of southern California, such minor, fragmented elements of the historic infrastructure are virtually ubiquitous, and these specimens do not demonstrate any particular potential for important archaeological data for the study of local history.

Based on these considerations, the present study concludes that Site CRM TECH 1872-1H does not appear eligible for listing in the California Register of Historical Resources or for local designation under provisions of the City Ordinance, and does not qualify as a "historical resource," as defined above.

CONCLUSION AND RECOMMENDATIONS

CEQA establishes that "a project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment" (PRC §21084.1). "Substantial adverse change," according to PRC §5020.1(q), "means demolition, destruction, relocation, or alteration such that the significance of a historical resource would be impaired."

Since Site CRM TECH 1872-1H has been determined not to constitute a "historical resource," as defined by CEQA, and no other potential "historical resources" were encountered during this study, CRM TECH presents the following recommendations to the City of Redlands:

- No historical resources exist within or adjacent to the project area, and thus the project as currently proposed will not cause a substantial adverse change to any known historical resources.
- No further cultural resources investigation is necessary for the proposed project unless development plans undergo such changes as to include areas not covered by this study.
- If buried cultural materials are discovered during any earth-moving operations
 associated with the project, all work in that area should be halted or diverted until a
 qualified archaeologist can evaluate the nature and significance of the finds.

REFERENCES

Bean, Lowell John, and Charles R. Smith

1978 Serrano. In Robert F. Heizer (ed.): *Handbook of North American Indians*, Vol. 8: *California*; pp. 570-574. Smithsonian Institution, Washington, D.C.

GLO (General Land Office, U.S. Department of the Interior)

1858 Plat Map: Township No. I South Range No. III West, San Bernardino Meridian, surveyed in 1853-1857.

Kroeber, Alfred L.

1925 *Handbook of the Indians of California.* Bureau of American Ethnology Bulletin 78. Washington, D.C.

Strong, William Duncan

1929 Aboriginal Society in Southern California. University of California Publications in American Archaeology and Ethnology 26. Reprinted by Malki Museum Press, Banning, Calif., 1972.

USGS (United States Geological Survey, U.S. Department of the Interior)

- 1901 Map: Redlands, Čalif. (15', 1:62,500); surveyed in 1898-1899.
- 1943 Map: Redlands and Vicinity, Calif. (1:31,680); surveyed in 1939.
- 1954 Map: Redlands, Calif. (15', 1:62,500); aerial photographs taken in 1952.
- 1969 Map: San Bernardino, Calif. (1:250,000); 1958 edition revised.
- 1979 Map: Santa Ana, Calif. (1:250,000); 1959 edition revised.
- 1996 Map: Redlands, Calif. (7.5', 1:24,000); 1967 edition photorevised in 1994.

APPENDIX 1: PERSONNEL QUALIFICATIONS

PRINCIPAL INVESTIGATOR/HISTORIAN Bai "Tom" Tang, M.A.

Education

1988-1993 1987 1982	Graduate Program in Public History/Historic Preservation, UC Riverside. M.A., American History, Yale University, New Haven, Connecticut. B.A., History, Northwestern University, Xi'an, China.
2000	"Introduction to Section 106 Review," presented by the Advisory Council on Historic Preservation and the University of Nevada, Reno.
1994	"Assessing the Significance of Historic Archaeological Sites," presented by the Historic Preservation Program, University of Nevada, Reno.

Professional Experience

2002-	Principal Investigator, CRM TECH, Riverside, California.
1993-2002	Project Historian/Architectural Historian, CRM TECH, Riverside, California.
1993-1997	Project Historian, Greenwood and Associates, Pacific Palisades, California.
1991-1993	Project Historian, Archaeological Research Unit, UC Riverside.
1990	Intern Researcher, California State Office of Historic Preservation,
	Sacramento.
1990-1992	Teaching Assistant, History of Modern World, UC Riverside.
1988-1993	Research Assistant, American Social History, UC Riverside.
1985-1988	Research Assistant, Modern Chinese History, Yale University.
1985-1986	Teaching Assistant, Modern Chinese History, Yale University.
1982-1985	Lecturer, History, Xi'an Foreign Languages Institute, Xi'an, China.

Honors and Awards

1988-1990	University of California Graduate Fellowship, UC Riverside.
1985-1987	Yale University Fellowship, Yale University Graduate School.
1980, 1981	President's Honor List, Northwestern University, Xi'an, China.

Cultural Resources Management Reports

Preliminary Analyses and Recommendations Regarding California's Cultural Resources Inventory System (With Special Reference to Condition 14 of NPS 1990 Program Review Report). California State Office of Historic Preservation working paper, Sacramento, September 1990.

Numerous cultural resources management reports with the Archaeological Research Unit, Greenwood and Associates, and CRM TECH, since October 1991.

Membership

California Preservation Foundation.

PRINCIPAL INVESTIGATOR/ARCHAEOLOGIST Michael Hogan, Ph.D., RPA*

Education

1991	Ph.D., Anthropology, University of California, Riverside.
1981	B.S., Anthropology, University of California, Riverside; with honors.
1980-1981	Education Abroad Program, Lima, Peru.
2002	Section 106—National Historic Preservation Act: Federal Law at the Local
	Level. UCLA Extension Course #888.
2002	"Recognizing Historic Artifacts," workshop presented by Richard Norwood,
	Historical Archaeologist.
2002	"Wending Your Way through the Regulatory Maze," symposium presented
	by the Association of Environmental Professionals.
1992	"Southern California Ceramics Workshop," presented by Jerry Schaefer.
1992	"Historic Artifact Workshop," presented by Anne Duffield-Stoll.

Professional Experience

2002-	Principal Investigator, CRM TECH, Riverside, California.
1999-2002	Project Archaeologist/Field Director, CRM TECH, Riverside.
1996-1998	Project Director and Ethnographer, Statistical Research, Inc., Redlands.
1992-1998	Assistant Research Anthropologist, University of California, Riverside
1992-1995	Project Director, Archaeological Research Unit, U. C. Riverside.
1993-1994	Adjunct Professor, Riverside Community College, Mt. San Jacinto College,
	U.C. Riverside, Chapman University, and San Bernardino Valley College.
1991-1992	Crew Chief, Archaeological Research Unit, U. C. Riverside.
1984-1998	Archaeological Technician, Field Director, and Project Director for various
	southern California cultural resources management firms.

Research Interests

Cultural Resource Management, Southern Californian Archaeology, Settlement and Exchange Patterns, Specialization and Stratification, Culture Change, Native American Culture, Cultural Diversity.

Cultural Resources Management Reports

Author and co-author of, contributor to, and principal investigator for numerous cultural resources management study reports since 1986.

Memberships

* Register of Professional Archaeologists. Society for American Archaeology. Society for California Archaeology. Pacific Coast Archaeological Society. Coachella Valley Archaeological Society.

PROJECT ARCHAEOLOGIST/REPORT WRITER Deirdre Encarnación, M.A.

Education

2003	M.A., Anthropology, San Diego State University, California.
2000	B.A., Anthropology, minor in Biology, with honors; San Diego State University, California.
1993	A.A., Communications, Nassau Community College, Garden City, N.Y.
2001	Archaeological Field School, San Diego State University.
2000	Archaeological Field School, San Diego State University.

Professional Experience

2004-	Project Archaeologist/Report Writer, CRM TECH, Riverside, California.
2001-2003	Part-time Lecturer, San Diego State University, California.
2001	Research Assistant, Dr. Lynn Gamble, San Diego State University.
2001	Archaeological Collection Catalog, SDSU Foundation.

PROJECT ARCHAEOLOGIST Laurie Taylor, M.A.

Education

2004-	Ph.D. program in Anthropology, University of California, Riverside.
2004	M.A. with Distinction, Anthropology, University of California, Riverside.
2001	B.A., Anthropology, Southern Methodist University, Dallas, Texas.

Professional Experience

2006-	Project Archaeologist/Report Writer, CRM TECH, Riverside, CA.
2004-	Teaching Assistant, UC Riverside.
2004	Instructor, Introduction to Biological Anthropology, UC Riverside.
2003	Archaeological Laboratory/Office Assistant, EarthTech, Colton, CA.
2003	Field Crew Member, Brian F. Smith and Asssoc., Poway, CA.
2002	Field Crew Member, ASM Affiliates, Encinitas, CA.
2002	Field Crew Member, TRC Mariah, Ft. Irwin, CA.
2002	Field Crew Member, WCRM, Farmington, NM.
2001-2002	Field Crew Member, PBS&J, Dallas, TX.
2001	Crew Chief, Blackman Eddy Project, Cayo District, Belize.
2000	Field Crew Member, Agricultural Feature Survey for SMU, Taos, NM.
2000	Archaeological Field School, Pot Creek Pueblo, SMU-in-Taos, NM.

Honors and Awards

2007	Eugene Cota-Robles Graduate Fellowship, UC Riverside.
2006	Outstanding Teaching Assistant for 2005-2006, CHASS Connect program.
2004	Master of Arts with Distinction.
2003	Eugene Cota-Robles Graduate Fellowship.
2000	Scholarship for Academic Excellence, SMU, Dallas, TX.
1999	Scholarship for Academic Excellence, SMU, Dallas, TX.

Research Interest

Prehistory of the California Channel Islands; late-Holocene settlement pattern of San Nicolas Island; prehistory of the American Southwest; human evolution; migration of Homo erectus and the impact of environment on hominid skeletal morphology.

Memberships

Society for American Archaeology. Society for California Archaeology. Association of American Physical Anthropologists.

PROJECT ARCHAEOLOGIST Nicholas F. Hearth, M.A.

Education

2006	M.A., Anthropology, University of California, Riverside.
2003	B.A., Anthropology, Cum Laude, University of Massachusetts, Amherst.

Professional Experience

2006-	Project Archaeologist, CRM TECH, Riverside, California.
2005	Crew Chief, Yalahau Regional Human Ecology Project, Quintana Roo,
	Mexico.
2004	Field Crew Member, Yalahau Regional Human Ecology Project, Quintana
	Roo, Mexico.
2003-2005	Field and Laboratory Crew Member, Public Archaeology Survey Team,
	Storrs, Connecticut.
2002-2004	Field Crew Member, Laboratory Assistant, and Laboratory Director,
	University of Massachusetts Archaeological Service, Amherst, Massachusetts.
2001	Field Archaeologist, Proyecto Calacalapa, Pueblo Nuevo Honduras

Honors and Awards

2005-2006	Deans Distinguished Fellowship, University of California Riverside
	Twice recipient of Ansin Travel Grant, University of Massachusetts, Amherst

Research Interests

Ancient Maya lithic technology, agriculture, settlement strategies and political ecology; southern Californian lithic technology, agriculture and political ecology; northeastern settlement strategies and political ecology; site-formation processes.

Appendix D2

Special-Status Wildlife and Plant Species Potentially Occurring within the Study Area

	Appendix D2	Special Status Wildlife	tus Wildlife and Plant Species Potentially Occurring within the Study Area	udy Area
Common Name	Scientific Name	Statuse Fed/CA/other	Habilat and Seasonal Distribution in California	Likelihood of Occurrence within the Study Area
			WILDLIFE	
Amphibians				
California red-legged frog	Rana aurora draytonii	threatened/CSC/none	Breed in stock ponds, pools, and slow-moving streams with emergent vegetation for escape cover and egg attachment. Where water is seasonal, often utilizes mammal burrows in upland habitat for aestivation. Require a permanent water source for successful reproduction.	Absent; insufficient habitat.
mountain yellow- legged frog	Rana muscosa	endangered/CSC/none	ithem California. ften in locations with of water.	Absent; insufficient habitat.
western spadefoot	Spea hammondii	none/CSC/none	Populations are localized, but widespread. Prefers grassland, scrub and chaparral locally but could occur in oak woodlands. Noctumal. Activity limited to wet season, summer storms, or during evenings with elevated substrate moisture levels.	Absent; insufficient habitat.
Birds				
Cooper's hawk	Accipiter cooperii	none/CSC/none	Inhabits open, interrupted, or marginal woodlands. Nest sites are mainly in riparian growths of deciduous trees.	Moderate; not suitable for nesting
tricolored blackbird	Agelaius tricolor	none/CSC/none	Frequents marshy habitats in summer, open habitats at other times of year. Often flocks with other species of blackbirds	Absent; insufficient habitat.
Southem California rufous-crowned sparrow	Aimophila ruficeps canescens	none/CSC/none	Breed in sparsely vegetated scrubland on hillsides and canyons ranging from 60-1,400m in elevation. Prefer coastal sage scrub dominated by California sagebrush (<i>Artemisia californica</i>). Thrive in areas that have recently been burned.	Absent; insufficient habitat.
Bell's sage sparrow	Amphispiza belli belli	none/CSC/none	Frequents low, fairly dense stands of shrubs within coastal sage scrub or chaparral habitat.	Absent; insufficient habitat.
burrowing owl	Athene cunicularia	none/CSC/none	Dry grasslands, desert habitats, and open-pinyon/juniper and ponderosa 2 pine woodlands below.	Moderate: surveys performed on 2006 and 2007 did not identify this species but suitable habitat exists.
ferruginous hawk	Buteo regalis	none/CSC/none	Occur in semiarid grasslands with scattered trees, rocky mounds or outcrops, and shallow canyons that overlook open valleys. May occur along streams or in agricultural areas in migration.	Low; foraging possible but not suitable for nesting
Lawrence's goldfinch	Carduelis lawrencei	none/CSC/none	Typically nest in arid, open woodlands near chaparral, weed fields, and small hodies of water. Breeding generally occurs between mid-April and late July	Absent; insufficient habitat.

	Appellary DZ	special status Wildlife	Special Status Wildlife and Plant Species Potentially Occurring within the Study Area	tudy Area
Common Name	Scientific Name	Status Fed/CA/other	Habitet and Seasonal Distribution in California	Ukelhood of Occurrence within the Study Area
western yellow-billed cuckoo	Coccyzus americanus occidentalis	candidate/endangered/none	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow; often mixed with cottonwoods with lower story of blackberry, nettles, or wild grape.	Absent; insufficient habitat.
yellow warbler	Dendroica petechia brewsteri	none/CSC/none	Inhabits ruderal, riparian, and other terrestrial habitats. It favors wet habitats, especially alders, open woodlands, and gardens.	Absent; insufficient habitat
southwestern willow flycatcher	Empidonax traillii extimus	endangered/endangered/none	Inhabits extensive thickets of low, dense willows on the edge of rivers, wet meadows, ponds, and backwaters.	Absent; insufficient habitat.
California homed lark	Eremophila alpestris actia	none/CSC/none	The horned lark is a common to abundant resident in a variety of open habitats, usually where trees and large shrubs are absent, such as row-crop fields.	Low. foraging unlikely due to disking of site, not suitable for nesting
Peregrine falcon	Falco pereginus	None/CFP/	Found in alarge variety of open habitats, including tundra, marshes, seacoasts, savannahs and high mountains. The species breeds mostly in woodland, forest, and coastal habitats	Observed
yellow-breasted chat	Icteria virens	none/CSC/none	Occurs in woodland edges, neglected pastures, thick shrubbery, briar thickets, willow thickets, and shrubby wet meadows.	Absent; insufficient habitat
loggerhead shrike	Lanius Iudovicianus	none/CSC/none	Broken woodlands, savannah, pinyon/juniper, Joshua tree, riparian woodlands, desert Oases, scrub, and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	Low.
coastal California gnatcatcher	Polioptila californica californica	threatened/CSC/none	Coastal sage scrub vegetation below 800m elevation in Riverside County and generally below 300m elevation along the coastal slope; generally avoids steep slopes and dense vegetation for nesting.	Absent; insufficient habitat.
least Bell's vireo	Vireo bellii pusillus	endangered/endangered/none	Summer resident of southern California in low riparian; in vicinity of water or in dry river bottoms; below 700m. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, baccharis, and mesquite.	Absent; insufficient habitat.
Fish				
Santa Ana sucker	Catostomus santaanae	threatened/CSC/none	Prefer sand-rubble-boulder bottoms, cool, clear water, and algae. Streams of varying width and depth with appropriate substrate (mix of sand, gravel, cobble, and boulder).	Absent; insufficient habitat.
arroyo chub	Gila orcuttii	none/CSC/none	Slow water stream sections with mud or sand bottoms. Feed heavily on aquatic vegetation and associated invertebrates.	Absent; insufficient habitat.
Santa Ana speckled dace	Rhinichthys osculus ssp.	none/CSC/none	Prefer stony habitat where there are hiding spaces between stones washed by moderate current.	Absent; insufficient habitat.

`	Appendix D2	Special Status Wildlife	Special Status Wildlife and Plant Species Potentially Occurring within the Study Area	tudy Area
Common Name	Scientific Name	Status Fed/CA/other	Habilat and Seasonal Distribution in California	Likelhood of Occurence within the Study Area
Invertebrate	,			Table in the second of the sec
Busck's gallmoth	Carolella busckana	none/CSC/none	Sand dunes.	Absent; insufficient habitat
Andrew's marble butterfly	Euchloe hyantis andrewsi	none/CSC/none	Inhabits yellow pine forest near Lake Arrowhead and Big Bear Lake, San Bernardino Mountains, San Bernardino county. 1700-2000m.	Absent; insufficient habitat and outside elevation.
Delhi Sands flower- loving fly	Rhaphiomidas terminatus abdominalis	endangered/none/none	Found in areas of the Delhi Sands formation in southwestern San Bernardino and northwestern Riverside counties. Requires fine, sandy soils, often with wholly or partly consolidated dunes and sparse vegetation.	Absent; insufficient habitat.
Mammals				
pallid bat	Antrozous pallidus	none/CSC/none	Open, dry habitats with rocky outcrops, cliffs, caverns, and crevices for roosting; most commonly in deserts, grasslands, and shrublands, in addition to woodlands and forest.	Moderate; possible foraging but unsuitable roosting habitat.
northwestern San Diego pocket mouse	Chaetodipus fallax fallax	none/CSC/none	Chaparral, coastal sage scrub (Riversidean and Diegan), desert scrub, grassland, juniper woodland and scrub, and Riversidean alluvial fan sage scrub.	Absent; insufficient habitat.
San Bernardino kangaroo rat	Dipodomys merriami parvus	endangered/CSC/none	Alluvial scrub vegetation on sandy loam substrates characteristic of alluvial fans and flood plains.	Absent; insufficient habitat.
Stephens' kangaroo rat	Dipodomys stephensi	endangered/threatened/none	Is found almost exclusively in open grasslands or sparse shrublands with cover of less than 50% during the summer. Typically is found in sandy and sandy loam soils with a low clay to gravel content	Absent; insufficient habitat.
western mastiff bat	Eumops perotis californicus	none/CSC/none	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, and chaparral. Roosts in crevices in cliff faces, high buildings, trees, and tunnels.	Moderate; possible foraging but unsuitable roosting habitat
San Bernardino flying squirrel	Glaucomys sabrinus californicus	none/CSC/none	Black oak or white fir dominated woodlands. San Bernardino and San Jacinto ranges. Need cavities in trees/snags for nests and cover. Needs nearby water. 1800 – 2800m.	Absent; insufficient habitat and outside elevation.
westem yellow bat	Lasiurus xanthinus	none/CSC/none	Western yellow bats are thought to be non-colonial. Individuals usually roost in palm trees, hanging from the underside of a frond. They are commonly found in the southwestem U.S., roosting in the skirt of dead fronds in both native and non-native palm trees.	Moderate; possible foraging but unsuitable roosting habitat.
San Diego black- tailed jackrabbit	Lepus californicus bennettii	none/CSC/none	Open brushlands and scrub habitats. 0-1300m.	Low; outside of coastal range
San Diego desert woodrat	Neotoma lepida intermedia	none/CSC/none	Found in a variety of shrub and desert habitats, primarily associated with rock outcroppings, boulders, cacti, or areas of dense undergrowth; prefer moderate to dense canopies.	Absent; insufficient habitat.

Ą	Appendix D2	Special Status Wildlife	tus Wildlife and Plant Species Potentially Occurring within the Study Area	tudy Area
Corrimon Name	Scientific Name	Status: Fed/CA/other	Habitat and Seasonal Distribution in California	Likelihood of Occurrence within the Study Area
pocketed free-tailed bat	Nyctinomops femorosaccus	none/CSC/none	Big free-tailed bats roost mainly in crevices and rocks in cliff situations, although there is some documentation of roosts in buildings, caves, and tree cavities.	Low; unsuitable roosting habitat
southern grasshopper mouse	Onychomys torridus	none/CSC/none	Desert areas, especially scrub habitats with friable soils for digging. Prefers low to moderate shrub cover. Feeds almost exclusively on arthropods, especially scorpions and orthopteran insects.	Low; lacks scrub habitat.
white-eared pocket mouse	Perognathus alticolus alticolus	none/CSC/none	Ponderosa and Jeffrey pine habitats; also in mixed chaparral and sagebrush habitats in the San Bernardino Mountains. Burrows are constructed in loose soil.	Absent; insufficient habitat.
Los Angeles pocket mouse	Perognathus Iongimembris brevinasus	none/CSC/none	Coastal sage scrub, grasslands, desert cactus, creosote bush, and sagebrush habitats.	Absent; insufficient habitat.
American badger	Taxidea taxus	none/CSC/none	Most abundant in drier, open stages of most shrub, forest, and herbaceous habitats, with friable soils. Need sufficient food, friable soils, and open, uncultivated ground. Prey on burrowing rodents. Digs burrows.	Absent; insufficient habitat.
Reptiles				
silvery legless lizard	Anniella pulchra pulchra	none/CSC/none	Sandy or loose loamy soils under sparse vegetation. Soil moisture is essential. Prefers soils with high moisture content.	Moderate; marginal habitat exists in the orchards.
orange-throated whiptail	Aspidoscelis hyperythra	none/CSC/none	Inhabits low-elevation coastal scrub, chaparral, and valley-foothill hardwood habitats. Prefers washes and other sandy areas with patches of brush and rocks. Perennial plants necessary for its major food-termites. California buckwheat (<i>Eriogonum fasciculatum</i>), a colonizing species of disturbed, sandy soils, is an important indicator of favorable habitat	Absent; insufficient habitat
coastal westem whiptail	Aspidoscelis tigris stejnegeri	none/CSC/none	Found in deserts and semiarid areas with sparse vegetation and open areas. Also found in woodland and riparian areas. Ground may be firm soil, sandy, or rocky.	Low; habitat is marginal at best
southem rubber boa	Charina umbratica	none/threatened/none	Restricted to the San Bernardino and San Jacinto Mountains; found in a variety of montane forest habitats, in vicinity of streams or wet meadows. The southern rubber boa requires loose, moist soil for burrowing; seeks cover in rotting logs.	Absent; insufficient habitat.

٩	Appendix D2	Special Status Wildlife	Special Status Wildlife and Plant Species Potentially Occurring within the Study Area	udy Area
Common Name	Scientific Name	Status Fed/CA/other	Habitat and Seasonal Distribution in California	Ukelhood of Occumence within the Study Area
northem red- diamond rattlesnake	Crotalus ruber rubber	none/CSC/none	Associated with chaparral, woodland, grassland, and desert communities from coastal San Diego county to the eastern slopes of the mountains. Is most commonly associated with heavy brush with large rocks or boulders. Dense chaparral in the foothills, cactus or boulder associated coastal sage scrub and desert slope scrub associations. Needs rodent burrows, cracks in rocks or surface cover objects for shelter.	Low, habitat is marginal at best
San Bernardino ringneck snake	Diadophis punctatus modestus	none/CSC/none	Found in moist habitats including woodlands, forest, grassland, chaparral, farms, and gardens; sea level to 2,150m.	Absent; insufficient habitat.
California mountain kingsnake (San Bernardino population)	Lampropeltis zonata (parvirubra)	none/CSC/none	Inhabits moist woods from sea level to extremely high elevations. In the southern portion of their range, the California Mountain Kingsnake is not found near the coast, instead preferring conferous forests and woodlands above 1,000m. This species appears to prefer rocky areas, but also is found beneath logs and under bark.	Absent; insufficient habitat.
coast (San Diego) horned lizard	Phynosoma coronatum (blainvillii population)	none/CSC/none	Valley/foothill hardwood, conifer, riparian, pine/cypress, juniper, and annual grassland habitats. Open country, especially sandy areas, washes, flood plains, and windblown deposits. 0-2000m.	Low; habitat is marginal at best, site lacks harvester ants.
two-striped garter snake	Thamnophis hammondii	none/CSC/none	Found in or near permanent or intermittent freshwater, often along streams with rocky beds bordered by willows or other streamside growth. Frequents oak woodland, brushlands, and sparse coniferous forests.	Absent; insufficient habitat.
			PLANTS	
chaparral sand- verbena	Abronia villosa var. aurita	none/none/1B	Chaparral, coastal scrub. Sandy areas. 80-1600m. Blooming March to August.	Absent; though the study area could support this species, the species would have been observed within the study area during general botanical surveys.
marsh sandwort	Arenaria paludicola	endangered/endangered/1B	Marshes and swamps. Growing up through dense mats of typha, juncus, scirpus. In freshwater marsh. 10-170m. Blooming May to August.	Absent; insufficient habitat and outside elevation.
Nevin's barberry	Berberis nevinii	endangered/endangered/1B	Chaparral, cismontane woodland, and coastal scrub, riparian scrub. On steep, north facing slopes, or in low grade sandy washes. 290-1575m. Blooming March to June.	Absent, insufficient habitat.
thread-leaved brodiaea	Brodiaea filifolia	threatened/endangered/1B	This species typically occurs on gentle hillsides, valleys, and floodplains in semi-alkaline mudflats, vernal pools, mesic southern needlegrass grassland, mixed native-nonnative grassland, and alkali grassland plant communities in association with clay, loamy sand, or alkaline sity-clay soils. Blooming March to June.	Absent, insufficient habitat.

1	Appendix D2	Special Status Wildlife	us Wildlife and Plant Species Potentially Occurring within the Study Area	udy Area
Common Name	Scientific Name	Status Fed/CA/other	Habitat and Seasonal Distribution in Cattornia	Likelihood of Occumence within the Study Area
Plummer's mariposa lily	Calochortus plummerae	none/none/1B	Perennial herb; coastal scrub, chaparral, valley and foothill grassland, cismontane woodland, and lower montane coniferous forest. Blooming May to July.	Absent; though the study area could support this species, the species would have been observed within the study area during general botanical surveys.
bristly sedge	Сагех сотоѕа	none/none/2	Marshes and swamps. Lake margins, and wet places; site below sea level is on a delta island5-1005m. Blooming May to September.	Absent; insufficient habitat.
San Bernardino Mountains owl's- clover	Castilleja Iasiorhyncha	none/none/1B	Meadows, pebble plain, upper montane coniferous forest, and chaparral. Mesic to drying soils in open areas of stream and meadow margins or of vernally wet areas. 1135-2390m. Blooming May to August.	Absent: insufficient habitat and outside elevation.
smooth tarplant	Centromadia pungens ssp. laevis	none/none/1B	Valley and foothill grassland, chenopod scrub, meadows, playas, and riparian woodland. Alkali meadow, alkali scrub; also in disturbed places. 0-480m. Blooming April to September.	Absent; insufficient habitat.
salt marsh bird's- beak	Cordylanthus maritimus ssp. maritimus	endangered/endangered/1B	Coastal salt marsh, coastal dunes. Limited to the higher zones of the salt marsh habitat. 0-30m. Blooming May to October.	Absent; insufficient habitat and outside elevation.
slender-homed spineflower	Dodecahema leptoceras	endangered/endangered/1B	Chaparral, alluvial fan sage scrub. Flood deposited terraces and washes; associates include <i>encelia, dalea,</i> and <i>lepidospartum.</i> 200-760m. Blooming April to June.	Absent; insufficient habitat.
Santa Ana River woollystar	Eriastrum densifolium ssp. sanctorum	endangered/endangered/1B	Found only within open washes and early-successional alluvial fan scrub on open slopes above main watercourses on fluvial deposits where flooding and scouring occur at a frequency that allows the persistence of open shrublands. Suitable habitat is comprised of a patchy distribution of gravelly soils, sandy soils, rock mounds, and boulder fields. 150–610m. Blooming June to September.	Absent; insufficient habitat.
California bedstraw	Galium californicum ssp. primum	none/none/1B	Chaparral and lower montane coniferous forest. Grows in shade of trees and shrubs at the lower edge of the pine belt, in pine forest-chaparral ecotone. 360m. Blooming May to July.	Absent; insufficient habitat and outside elevation.
mesa horkelia	Horkelia cuneata ssp. puberula	none/none/1B	Chaparral, cismontane woodland, and coastal scrub. Sandy or gravelly sites. 70-810m. Blooming February to July.	Absent; though the study area could support this species, the species would have been observed within the study area during general botanical surveys.

Joint Program/Project EIR for Concept Plan No. 7 (Redlands Commons/Trojan Groves) and the Redlands Commons Development Plan

	Appendix D2	Special Status Wildlife	tus Wildlife and Plant Species Potentially Occurring within the Study Area	tody Area
Common Name	Scientific Name	Status Fed/CA/other	Habital and Seasonal Distribution in Confirmin	Likelihood of Occumence within
California satintail	Imperata brevifolia	none/none/2	Coastal scrub, chaparral, riparian scrub, Mojavean scrub, meadows, and seeps (alkali). Mesic sites, alkali seeps, and riparian areas. 0-500m. Blooming September to May.	Absent; insufficient habitat.
Robinson's pepper- grass	Lepidium virginicum var. robinsonii	none/none/1B	Chaparral and coastal scrub. Dry soils and shrubland. 1-945m. Blooming January to July.	Absent; though the study area could support this species, the species would have been observed within the study area during general botanical surveys
Parish's desert-thom	Lycium parishii	none/none/2	Coastal scrub and Sonoran desert scrub. 300-1000m. Blooming March to April.	Absent; insufficient habitat.
Parish's bush mallow	Malacothamnus parishii	none/none/1A	Chaparral and coastal sage scrub. In a wash. One site known. 485m. Blooming June to July.	Absent; insufficient habitat.
Hall's monardella	Monardella macrantha ssp. hallii	none/none/1B	Broadleaved upland forest, chaparral, lower montane coniferous forest, cismontane woodland, and valley and foothill grassland. Dry slopes and ridges in openings within the above communities. 695-2195m. Blooming June to August.	Absent; insufficient habitat and outside elevation.
Pringle's monardella	Monardella pringlei	none/none/1A	Coastal scrub. Sandy hills. 300-400m. Blooming May to June.	Absent; outside elevation.
Gambel's watercress	Nasturtium gambelii	endangered/threatened/1B	Marshes and swamps. Freshwater and brackish marshes at the margins of lakes and along streams; in or just above the water level. 5-1305m. Blooming April to September.	Absent; insufficient habitat.
Parish's yampah	Perideridia parishii ssp. parishii	none/none/2	Lower montane coniferous forest, meadows, and upper montane coniferous forest. Damp meadows or along streambeds; prefers an open pine canopy. 1390-3000m. Blooming June to August.	Absent; insufficient habitat and outside elevation.
Parish's gooseberry	Ribes divaricatum var. parishii	none/none/1A	Riparian woodland. Salix swales in riparian habitats. 65-100m. Blooming February to April.	Absent; insufficient habitat and outside elevation.
Salt Spring checkerbloom	Sidalcea neomexicana	none/none/2	Alkali playas, brackish marshes, chaparral, coastal scrub, lower montane coniferous forest, and Mojavean desert scrub. Alkali springs and marshes. 0-1500m. Blooming March to June.	Absent; insufficient habitat.
southem jewel- flower	Streptanthus campestris	none/none/1B	Chaparral, lower montane coniferous forest, pinyon-juniper woodland. Open, rocky areas. 600-2790m. Blooming May to July.	Absent; insufficient habitat and outside elevation.
San Bernardino aster	Symphyotrichum defoliatum	none/none/1B	Meadows and seeps, marshes and swamps, coastal scrub, cismontane woodland, lower montane coniferous forest, and grassland. Vernally mesic grassland or near ditches, streams and springs; disturbed areas. 2-2040m. Blooming: July to November.	Absent; insufficient habitat.

4	Appendix D2	Special Status Wildlife	tus Wildlife and Plant Species Potentially Occurring within the Study Area	tudy Area
Common Name	Scientific Name	Status Fed/CA/other	Habiliat and Seasonal Distribution in California	Likelihood of Occumence within the Study Area
Sonoran maiden fem	Thelypteris puberula var. sonorensis	none/none/2	Meadows and seeps. Along streams, seepage areas. 50-550m. Blooming January to September.	Absent; insufficient habitat.
		IS	SENSITIVE PLANT COMMUNITIES	
Canyon Live oak Ravine Forest	1	CDFG Sensitive	1	Absent.
Riversidian Alluvial Fan Sage Scrub	-	CDFG Sensitive	1	Absent.
Southern Coast Live Oak Riparian Forest	1	CDFG Sensitive	ľ	Absent.
Southern Cottonwood Willow Riparian Forest	-	CDFG Sensitive		Absent.
Southem Mixed Riparian Forest	_	CDFG Sensitive		Absent.
Southern Riparian Forest		CDFG Sensitive	l	Absent.
Southem Riparian Scrub		CDFG Sensitive		Absent.
Southern Sycamore Alder Riparian Woodland	_	CDFG Sensitive	I	Absent.
Southern Willow Scrub	1	CDFG Sensitive		Absent.

	4	ppendix D2	Special Status Wildlife	Special Status Wildlife and Plant Species Potentially Occurring within the Study Area	udy Area
Common	Common Name	Scientific Name	Fed/CA/other	Habitat and Seasonal Distribution in California	the Strok Amo
Special Stat	tus Wildlife	Special Status Wildlife and Plant Species: Wildlife and plants	llife and plants that were include	that were included in this table were either observed within the study area by UltraSystems' and/or PBS&J biologists, or	d/or PBS&J biologists, or
	WILLIE EIG	comained within the CNDOB, CNPS, and/or ifferature query i	retature query for the tive listed U	tor the tive listed USGS quadrangles.	
Status:					
Federal					
出	Federally	Federally listed as Endangered			
Ħ	Federally	Federally listed as Threatened			
Б	Federal C	Federal Candidate Species			
FSC	U.S. Fish a	and Wildlife Service design	J.S. Fish and Wildlife Service designated "Species of Concern"		
State		,			
S	State liste	State listed as Endangered			
ST	State liste	State listed as Threatened			
P.	California	1 Department of Fish and	d Game designated "Fully Protect	California Department of Fish and Game designated "Fully Protected" or "Protected" – Permit required for "take"	
CSC	California	1 Department of Fish and	California Department of Fish and Game designated "Species of Special Concern"	Special Concern"	
SAL	California	1 Department of Fish and	California Department of Fish and Game designated "Special Animals List"	imals List"	
Other			-		
CNPS					
<u></u>	Presumed	Presumed extinct in California			
18	California	California Native Plant Society (CNPS) Ranking.	NPS) Ranking. Defined as plants	Defined as plants that are rare, threatened, or endangered in California and elsewhere	
2	California	California Native Plant Society (CNPS) Ranking.	NPS) Ranking. Defined as plants	Defined as plants that are rare, threatened, or endangered in Colligornia, but more common elsewhere	aradwas

Appendix D1 Biological Technical Report

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BIOLOGICAL TECHNICAL REPORT

Redlands Commons/Trojan Groves City of Redlands

Prepared For:

City of Redlands

Community Development Department

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June 1, 2006 Rev. October 3[,] 2006

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INTRODUCTION

This biological technical report describes the potential for threatened, endangered and other special status species and habitats to occur on the Redlands Commons/Trojan Groves development project site. It also addresses the potential of the project to adversely impact those biological resources, determines the level of significance of those impacts, and recommends mitigations to reduce the level of significance of potential impacts.

PROJECT DESCRIPTION

The proposed project consists of two separate properties that are held in separate private ownership and will be developed separately: Redlands Commons and Trojan Groves. Redlands Commons is a proposed mixed-use project that includes single-family residential, open space consisting of a small park and meandering walkways, single-story office, restaurant, and retail land uses. Trojan Groves is a proposed commercial project that may include a mix of major commercial, inline retail, neighborhood commercial, restaurant, and/or office uses.

ENVIRONMENTAL SETTING

Project Location

The project site is within the U.S. Geological Survey (USGS) Redlands, CA, 7.5-minute series topographic quadrangle (Township 1S, Range 3W, Section 16). The project study area is located east of and adjacent to Interstate 210 (I-210). The 68.93-acre project site is located in the City of Redlands, San Bernardino, California. **Figure 1** (Regional Vicinity Map) depicts the project region, and **Figure 2** (Local Vicinity Map) shows the project site and immediate surroundings.

The Redlands Commons property is located on the eastern portion of the project site and is bound by San Bernardino Avenue to the south, Texas Street to the east, Pioneer Avenue to the north, and the Trojan Groves project site to the west. The Trojan Groves property is on the western portion of the project site and is bound by San Bernardino Avenue to the south, I-210 to the west, Pioneer Avenue to the north, and the Redlands Commons project site to the east. Figure 3 (Assessor's Parcel Map) illustrates the relationship between the two properties.

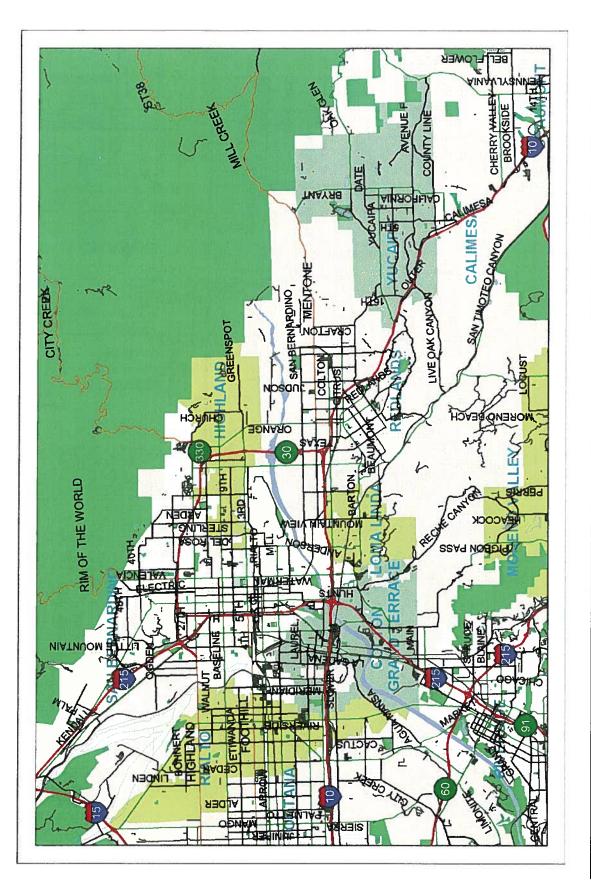
Site Description

The project site has historically been used for agricultural purposes and is presently surrounded by both agricultural and residential uses. Both the project site and surrounding areas are within the City of Redland's East Valley Corridor Specific Plan (EVCSP) planning area.

¹ Redlands, California, Topographic Quadrangle Map. Source: All Topo Maps. Contact: IGAGE Mapping Corporation, P.O. Box 58596, Salt Lake City, UT 84158-9912.

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Figure 1. Regional Vicinity Map



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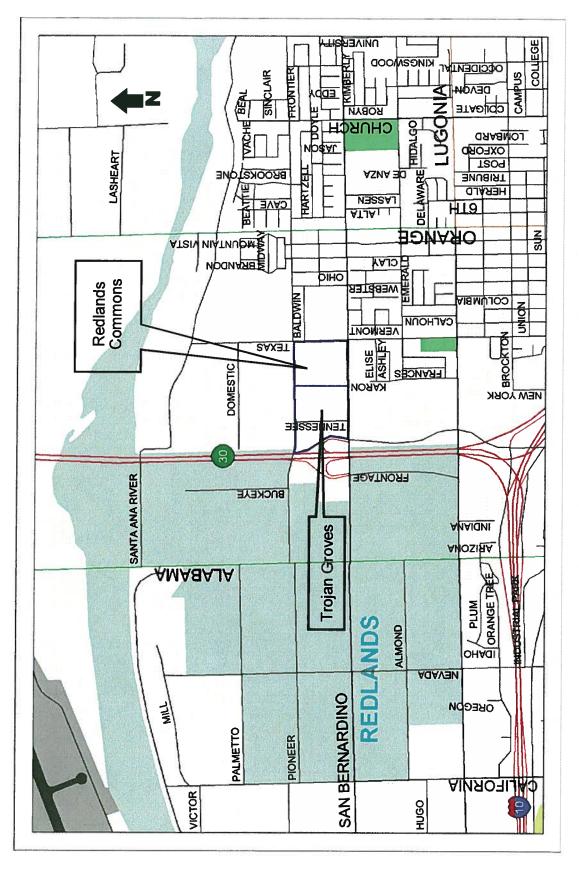
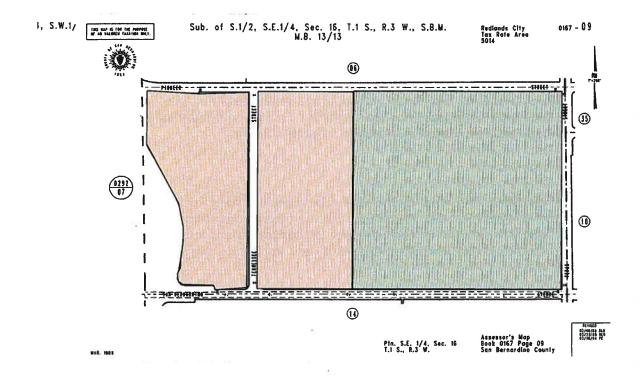


Figure 2. Local Vicinity Map

Figure 3. Assessor Parcel Map



Trojan Groves

APN: 0167-091-09 APN: 0167-091-10 APN: 0167-091-11

APN: 0167-091-12



Redlands Commons

APN: 0167-091-02 APN: 0167-091-08 APN: 0167-091-04 APN: 0167-091-05

Trojan Groves

The Trojan Groves portion of the project site includes four parcels totaling 31.69 acres. These four parcels together form a former citrus grove that has had all trees removed and been tilled such that all vegetation is disturbed. The site is divided by Tennessee Street, which runs north to south through the project site. The portion east of Tennessee Street had been recently tilled at the time of the field survey and has very soft soils with only a few species of plants revegetating the area. The portion west of Tennessee Street has more compacted soils and a greater number of plant species. A chain-link fence creates the western border of the Trojan Groves site. Outside of this fence, creating the northwestern border of the property is a concrete-lined wash with sparse riparian vegetation. The San Bernardino Avenue on-ramp to l-210 borders the southern half of the western property boundary.

Redlands Commons

The Redlands Commons property includes four parcels totaling 37.24 acres. This site is an actively managed citrus grove. The orange trees are planted in rows and understory vegetation has been routinely cleared, through the use of herbicides and cutting. Three dry irrigation canals run north to south through the property and numerous irrigation pumps are scattered throughout.

METHODS

Literature Review

UltraSystems reviewed available literature to identify any special status plants, wildlife, or sensitive habitats known to occur in the vicinity of the project site. Resources used in the review include the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants² and the California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB)³ for the Redlands, Harrison Mountain, Yucaipa, Sunnymead and San Bernardino South 7.5-minute series topographic quadrangles. UltraSystems also reviewed the City of Redlands General Plan (RGP) and East Valley Corridor Specific Plan (EVCSP) and any designated critical habitats for endangered or threatened species in or near the project site.

Field Survey

On May 26, 2006 UltraSystems' biologists Sandra Murcia and Sarah Flack conducted a field survey of the project site. The survey assessed existing on-site conditions and the potential for sensitive biological resources to be present within the project site. The assessment included a 100% pedestrian survey of the project study area. Field notes and photos were taken on the general biological conditions of these areas with particular focus on sensitive plant and wildlife species, sensitive habitats, and potential jurisdictional areas present on site.

² Tibor, D.P. 2001. *Inventory of Rare and Endangered Plants of California* (sixth edition). Sacramento, CA. California Native Plant Society. Available online at: http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi

³ California Department of Fish and Game (CDFG), March 2006. RareFind 3: A Database Application for the Use of the California Department of Fish and Game Natural Diversity Base. Sacramento, CA: California Department of Fish and Game.

RESULTS

Literature review

The results of the literature review indicate the potential occurrence of six (6) special status plants species and twelve (12) special status wildlife species. Appendix A: Sensitive Species Potentially Occurring in Project Area presents the special status species known to occur in the region and their agency status designations, habitat requirements and potential for occurrence based on the presence of suitable habitat in the project area proposed for development.

Critical Habitat

The project site is outside of any federally designated critical habitat.⁴ The project site is located just south of critical habitat for San Bernardino Merriam's Kangaroo rat (*Diopdomys merriami parvus*) and the Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*). Both of these species are found in alluvial fan habitats, which do not occur on the project site.

Flora

The following descriptions for sensitive plants potentially occurring in the project area are taken from the CNPS Inventory of Rare, Threatened and Endangered Plants of California.⁵

1. Plummer's mariposa lily (Calochortus plummerae)

Plummer's mariposa lily is designated as a CNPS List 1B species. List 1B includes species that are considered by CNPS to be rare, threatened, or endangered in California and elsewhere. Plummer's Mariposa lily occurs in rocky and sandy soils in low elevation coastal sage scrub and chaparral communities.

Plummer's mariposa lily is a bulbiferous perennial herb that occurs in rocky and sandy soils in low elevation coastal sage scrub and chaparral communities. Plummer's mariposa lily also occurs in cismontane woodlands, lower montane coniferous forests, and valley and foothill grasslands. The lily's flowering period is May through July. The lily often exhibits a scattered distribution with flowering individuals 30 to 100 feet apart. It has been estimated that only one-third to one-tenth of the lily bulbs on a site may flower in a given year. Thus there may be three to ten times as many lily bulbs underground than are observed flowering in a given year at a given site. The lily develops acorn shaped bulbs with a dark brown tunic (paper-like outer cover). The tunic helps protect the bulb from desiccation during drought.

2. Parry's spineflower (Chorizanthe parryi var. parryi)

Parry's spineflower is an annual herb designated as a CNPS List 3 species. It is known from Los Angeles, Riverside and San Bernardino counties. It is found in coastal scrub and chaparral habitats on dry slopes and flats. It is associated with dry sandy soils and found at elevations of 130-5600 feet. Its blooming period is April to June.

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⁴ U.S. Fish & Wildlife Service. 2006. U.S. FWS Critical Habitat Portal. Map accessed May 24, 2006. Available online at: http://criticalhabitat.fws.gov/

⁵ Tibor D.P. 2001. *Inventory of Rare and Endangered Plants of California* (sixth edition). Sacramento, CA. California Native Plant Society. Available online at: http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi

3. Slender-horned spineflower (Dodecahema leptoceras)

Slender-horned spineflower is listed as a federally endangered; state endangered, and CNPS List 1B species. It is an annual herb that is endemic to California, and has been reported from a variety of natural communities including chaparral, cismontane woodland, and alluvial fan sage scrub. Slender-horned spineflower occurs on sandy alluvial benches, and floodplain terraces with alluvial scrub vegetation, and on well-drained slopes in chaparral. It flowers from April to June. It has not been reported from the project region for over 80 years.

4. Robinson's pepper grass (Lepidium virginicum var. robinsonii)

Robinson's pepper grass is an annual herb designated as a CNPS List 1B species. It is found in Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties as well as on Santa Cruz Island and Baja California, Mexico. It prefers chaparral and coastal scrub habitats at elevations from 3-2900 feet. Its blooming period is from January to July.

5. Parish's bush mallow (Malacothamnus parishii)

Parish's bush mallow is an endemic deciduous shrub designated as a CNPS List 1a species. It is presumed extinct in Californiaand the only known record of it in Riverside County is probably erroneous. It prefers chaparral and coastal scrub habitats and grows from 1000 to 1500 feet in elevation. Its blooming period is from June to July.

Wildlife

The following descriptions for sensitive wildlife potentially occurring in the project area are taken from the California Department of Fish and Game Species Accounts:⁶

1. Cooper's Hawk (Accipiter cooperii)

The Cooper's hawk is a CDFG Species of Special Concern. It is a medium-sized bird of prey that specializes in preying on small birds, generally capturing them in flight. It is adapted to woodlands, with short, rounded wings and a long, rounded tail that allows a high degree of maneuverability in dense cover. Cooper's hawks have been found breeding at low densities virtually throughout California, predominantly in areas with oaks and pines. Preferred nesting habitats are oak and riparian woodlands. Both resident and migratory populations exist in Southern California. Wintering Cooper's hawks are often seen in woodled urban areas and native woodland habitats.

2. Silvery legless lizard (Anniella pulchra pulchra)

The silvery legless lizard is a CDFG species of special concern. It is a small, secretive, snake-like lizard that lives that forages under bushes, in leaf litter, under debris, or within sandy soil. It occurs in a variety of habitats, including sandy washes, coastal scrub habitats, and woodlands. The silvery legless lizard preys on insect larvae, small adult insects, and spiders (CDFG 1991).

3. Orange-throated whiptail (Aspidoscelis hyperythra)

The orange-throated whiptail is a CDFG species of special concern. Its preferred habitat

⁶ Habitat Conservation Planning Branch Species Account Search. Sacramento, CA. Department of Fish and Game. 2005. Available from: http://www.dfg.ca.gov/hcpb/species/search_species.shtml

types include chaparral, non-native grassland, Riversidian coastal sage scrub, juniper woodland and oak woodland in alluvial fan scrub and riparian areas. This species is presumably tied to perennial vegetation because its major food source, termites, requires perennial plants as a food base. California buckwheat (*Eriogonum fasciculatum*), a colonizing species of disturbed, sandy soils, is an important indicator of favorable habitat. The current range includes southwestern California from the southern edges of Orange and San Bernardino counties southward into Baja California. They are located on the coastal slope of the Peninsular Ranges, and extend from near sea level to 1040m.

4. Burrowing Owl (Athene cunicularia)

The burrowing owl is a CDFG Species of Special Concern. It is a year-long resident of open, dry grassland and desert habitats and grass, forb and open shrub stages of pinyon-juniper and ponderosa pine habitats. It is also often found along irrigation channels in agricultural areas. It feeds primarily on insects as well as small mammals, reptiles, birds and carrion. This species uses abandoned rodent or other burrows for roosting and nesting cover.

5. Northwestern San Diego pocket mouse (Chaetodipus fallax)

The Northwestern San Diego pocket mouse is a CDFG Species of Special Concern. It inhabits coastal sage scrub and chaparral communities in open, sandy areas. This species occurs throughout western Riverside County and has been collected at elevations from 138 meters (452 ft) at Palm Springs, Riverside County, to 1,835 meters (6,018 ft) on the northern slopes of the San Bernardino Mountains in San Bernardino County.

6. Yellow warbler (Dendroica petechia brewsteri)

The yellow warbler is a CDFG Species of Special Concern. It prefers riparian habitats and is associated with willows, cottonwoods, aspens, sycamores and alders for nesting and foraging. It also nests in montane shrubbery in open conifer forests. This species was once a common to locally abundant summer resident in riparian areas virtually throughout California, but today populations are much reduced and even extirpated in some areas.

7. San Bernardino kangaroo rat (Dipodomys merriami parvus)

The San Bernardino kangaroo rat is listed as a federally endangered species and a CDFG Species of Special Concern. It is a small, nocturnal, burrowing subspecies of Merriam's kangaroo rat. It prefers alluvial scrub or coastal sage scrub habitats on gravelly and sandy soils adjoining river and stream terraces, and on alluvial fans; and rarely occurs in dense vegetation or rocky washes. Historically, its range included over 300,000 acres of alluvial scrub habitat in San Bernardino and Riverside counties. The remaining occupied habitat is threatened by habitat loss, degradation, and fragmentation due to sand and gravel mining operations, flood control projects, and urban development. This species primarily feeds on seeds, often storing large quantities of food for future use. Its breeding period is from January through late November.

8. Stephen's kangaroo rat (Dipodomys stephensi)

The Stephen's kangaroo rat is listed as federally endangered and state threatened. The Stephen's kangaroo rat is a small burrowing rodent adapted for arid environments with long, strong hind legs, and short, relatively small front legs. The kangaroo rat will occupy burrows of other animals such as pocket gophers and ground squirrels. It

primarily consumes seeds, which it gathers in cheek pouches and storesunderground. The Stephen's kangaroo rat occupies open areas of sparse perennial cover, with soils at least 18 inches deep.

9. California horned lark (Eremophila alpestris actia)

California horned lark is a CDFG Species of Special Concern and is found along the coast of northern California, in the San Joaquin Valley, in the Coast Ranges south of San Francisco Bay, and in southern California west of the deserts. In southern California, this subspecies is a fairly common breeding resident in grasslands and other dry, open habitats.

10. Western mastiff bat (Eumops perotis californicus)

The Western mastiff bat is a CDFG Species of Special Concern. It is the largest North American bat. This species ranges across the southwestern United States and into central Mexico. The distribution of *E. perotis* is likely geomorphically determined, with the species being present only where there are significant rock features offering suitable roosting habitat. It is found roosting in a variety of habitats, from desert scrub to chaparral to oak woodland and into the ponderosa pine and mid-elevation conifer (e.g., giant sequoia) belts. It forages seasonally at higher elevations.

11. Loggerhead shrike (Lanius Iudovicianus)

The loggerhead shrike is a CDFG Species of Special Concern. This species is a fairly common resident of lowlands and foothills in Southern California. Shrikes inhabit grasslands and other dry, open habitats. They can often be found perched on fences and posts from which prey items (large insects, small mammals, lizards) can be seen.

12. San Diego desert woodrat (Neotoma lepida intermedia)

The San Diego desert woodrat is a CDFG Species of Special Concern. It inhabits CSS, chaparral, woodlands and desert areas from San Diego County to the eastern slopes of the mountains covering essentially all of southern and portions of central California.

13. Los Angeles pocket mouse (Perognathus longimembris brevinasus)

The Los Angeles pocket mouse is listed as a Federal Species of Concern and a CDFG Species of Special Concern. The pocket mouse occurs in grasslands and coastal sage habitats within the Los Angeles basin from Burbank and San Fernando to San Bernardino south to Cabazon and Hemet.

14. San Diego coast horned lizard (Phrynosoma coronatum blainvillei)

The San Diego coast horned lizard is a CDFG Species of Special Concern. It inhabits CSS and chaparral habitats associated with sandy, rocky, or shallow soils that support native harvester ants (*Pogonomyrmex* spp.).

15. American badger (Taxidea taxus)

The American badger is a CDFG Species of Special Concern. It is an uncommon, permanent resident found throughout much of California. This species is most abundant in drier open stages of most shrub, forest and herbaceous habitats with friable soils. It feeds mostly on fossorial rodents and digs burrows in friable soil.

Field Survey

Vegetation Communities

Trojan Groves

The entire Trojan Groves portion of the project site has been tilled for weed abatement. The approximately 18 acres east of Tennessee Street have been recently tilled and consist of a high percentage of bare ground with very few, sparse plant species, all associated with highly disturbed areas. The vegetation community of this site is barren, but would likely become ruderal with time. The remaining portion west of Tennessee Street has not been tilled recently and significant regrowth has occurred. This portion is more densely vegetated with approximately thirty percent ground cover of plant species associated with ruderal vegetation communities. Dominant species include summer mustard (*Brassica geniculata*), red brome (*Bromus madritensis* ssp. *rubens*), horseweed (*Conyza canadensis*), foxtail barley (*Hordeum murinum*), sow thistle (*Sonchus oleraceus*) and puncture vine (*Tribulus terestris*).

The following reference descriptions for the natural/vegetation communities present on-site are taken from The Guide to Wildlife Habitats of California⁹ and Preliminary Descriptions of the Terrestrial Natural Communities of California.¹⁰

Barren

Barren habitat is defined by the absence of vegetation. Any habitat with less than two percent total vegetation cover by herbaceous, desert, or non-wildland species and less than ten percent cover by tree or shrub species is considered barren. Where there is little or no vegetation, structure of the non-vegetated substrate becomes a critical component of the habitat for wildlife. In the desert, open sandy soil is used by many species for burrowing and is critical as burrowing and egg-laying substrate for horned lizards and fringe-toed lizards. The physical settings for barren habitat represent extreme environments for vegetation. An extremely hot or cold climate, a near-vertical slope, an impermeable substrate, constant disturbance by either human or natural forces, or a soil either lacking in organic matter or excessively saline can each contribute to a habitat being inhospitable to plants.

Ruderal Vegetation

Ruderal vegetation is usually found in disturbed areas that have been significantly altered by construction, landscaping, or other types of land-clearing activities. Ruderal habitats often occur along roadsides and fence-lines, near developments, and in other areas experiencing severe ground surface disturbance. Typical species in this habitat are introduced Mediterranean species exhibit clinging seeds, adhesive stems, and rough leaves to assist their invasion and colonization of disturbed lands. These areas are dominated by introduced species such as redstem filaree (Erodium cicutarium) and red brome. Other species tolerant of disturbance in these ruderal areas include Russian thistle (Salsola tragus), cheeseweed (Malva parviflora), and

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Mayer K.E. & Laudenslayer W.F. (Ed.) 1988. A Guide to Wildlife Habitats of California. State of California, Resources Agency, Department of Fish and Game. Sacramento, CA. 166pp.

⁸Holland, R. H. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. The Resources Agency, Department of Fish and Game, Natural Heritage Division, Sacramento, CA.

⁹Mayer K.E. & Laudenslayer W.F. (Ed.) 1988. A Guide to Wildlife Habitats of California. State of California, Resources Agency, Department of Fish and Game. Sacramento, CA. 166pp.

Holland, R. H. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. The Resources Agency, Department of Fish and Game, Natural Heritage Division, Sacramento, CA.

horehound (*Marrubium vulgare*). Ruderal areas typically do not support sensitive plant species. Sensitive wildlife species may occasionally forage in ruderal habitats. Wildlife found in ruderal areas includes species tolerant of disturbance, such as western fence lizard (*Sceloporus occidentalis*), and California ground squirrel (*Spermophilus beecheyi*).

Redlands Commons

The Redlands Commons portion of the project site consists of rows of orange trees (Citrus sinensis) with a very sparse, disturbed understory that is periodically cleared using herbicides or by cutting. This habitat is typical of an evergreen orchard in California. Dominant understory species include red brome, everlasting cudweed (*Gnaphalium stramineum*, *Hordeum murinum*, and *Sonchus oleraceus*.

The following reference description for the natural/vegetation communities is taken from The Guide to Wildlife Habitats of California:¹¹

Evergreen Orchard

Evergreen orchards in California are typically open single species tree dominated habitats. They are usually low, bushy trees with an open understory to facilitate harvest and include trees such as avocados, dates, grapefruit, lemons, limes, olives, oranges, and tangerines. The understory is usually composed of low-growing grasses, legumes, and other herbaceous plants but may be managed to prevent understory growth, such as along tree rows. Most vegetation classification systems include evergreen orchards in more general categories such as Agriculture or Urban/Agriculture.

Evergreen orchards are planted in uniform patterns and intensively managed. They are usually established as sapling trees and most are managed to grow to small tree size. As trees become old or damaged or diseased they are usually replaced. Orchards are typically associated with other agricultural types such as Irrigated Grain and Seed Crops (GRI), Row and Field Crops (RFC), Pasture (PAS), and some are near urban (URB) types.

Evergreen orchards have historically been planted on deep fertile soils, which once supported productive and diverse natural habitats. Larger and more diverse populations of wildlife were also supported by these native habitats. However, some species of birds and mammals have adapted to the orchard habitats. Many have become "agricultural pests" which has resulted in intensive efforts to reduce crop losses. Wildlife such as deer and rabbit browse on the trees, while others such as squirrel and numerous birds feed on fruit. Cover crops can provide a source of food for wildlife that feed on seeds or herbaceous vegetation. Some wildlife (e.g. mourning dove, California quail) are more passive in their use of the habitat for cover and nesting sites. Evergreen orchards can be especially beneficial to wildlife during inclement weather in winter or hot summer periods. Water can be beneficial in irrigated orchards. Many wildlife species act as biological control agents by feeding on weed seeds and insect pests.

¹¹Mayer K.E. & Laudenslayer W.F. (Ed.) 1988. A Guide to Wildlife Habitats of California. State of California, Resources Agency, Department of Fish and Game. Sacramento, CA. 166pp.

Flora

A total of twenty (20) plant species were found within the project site. (Table 1: Observed Flora). Most of the species were found in both the Trojan Groves and Redlands Commons portions of the project site. Sweet orange was only found on the Redlands Commons portion. These trees were planted as orchard trees. There is potential for bird species to use the trees on site for nesting habitat.

TABLE 1. OBSERVED FLORA			
Scientific Name	Common Name		
Amaranthus blitoides	mat amaranth		
Amaranthus palmeri	Palmer's amaranth		
Ambrosia acanthicarpa	annual burweed		
Amsinckia menziesii ssp. intermedia	common fiddleneck		
Brassica geniculata*	summer mustard		
Bromus madritensis ssp. rubens*	red brome		
Chenopodium murale*	nettle-leaved goosefoot		
Citrus sinensis	sweet orange		
Conyza Canadensis	horseweed		
Eremocarpus setigerus	turkey mullein		
Eriogonum fasciculatum ssp. foliolosum	California buckwheat		
Euphorbia nutans*	small eyebane		
Gnaphalium stramineum	everlasting cudweed		
Hordeum murinum*	foxtail barley		
Malva parviflora*	cheeseweed		
Senecio vulgaris*	common groundsel		
Sisymbrium irio*	London rocket		
Solanum americanum	common nightshade		
Sonchus oleraceus*	sow thistle		
Tribulus terestris*	puncture vine		
* non-native species			

Wildlife

A total of twenty-nine (29) wildlife species or their signs (including tracks, scat, burrows, nests, excavations, and vocalizations) were observed within the project site (Table 2: Observed Fauna).

TABLE 2. OBSERVED FAUNA				
Scientific Name	Common Name			
Birds				
Buteo jamaicensis	red-tailed hawk			
Calypte anna	Anna's hummingbird			
Carduelis psaltria	lesser goldfinch			
Chamaea fasciata	wrentit			
Columbina passerina	common ground-dove			
Corvus corax	common raven			
Falco peregrinus	peregrine falcon			
Falco sparverius	American kestrel			
lcterus cucullatus	hooded oriole			
Melospiza melodia	song sparrow			
Myiarchus cinerascens	ash-throated flycatcher			
Passer domesticus	house sparrow			
Petrochelidon pyrrhonota	cliff swallow			
Phainopepla nitens	phainopepla			
Pipilo crissalis	California towhee			
Pipilo maculates	spotted towhee			
Psatriparus minimus	bushtit			
Sayomis nigricans	black phoebe			
Sayornis saya	Say's phoebe			
Tyrannus verticalis	western kingbird			
Zenaida macroura	mourning dove			
Insects				
Papilio eurymedon	pale swallowtail			
Pieris rapae	cabbage white			
Mammals				
Lepus californicus	black-tailed jackrabbit			
Spermophilus beecheyi	California ground squirrel			
Thomomys bottae	Botta's pocket gopher			
Reptiles				
Lichanura trivirgata	rosy boa			
Sceloporus occidentalis	western fence lizard			
Uta stansburiana	common side-blotched lizard			

SENSITIVE BIOLOGICAL RESOURCES

Sensitive Habitats

There are no riparian or other sensitive habitats within the project area. The project will not significantly impact riparian areas or other habitats considered sensitive by the California Department of Fish and Game.

Sensitive Species

No threatened, endangered or other sensitive species were observed during the field survey. This survey was not intended to determine the presence/absence of threatened or endangered species, only assess the potential for them to occur based on habitat suitability. Focused surveys to determine presence/absence of species would be at the discretion of the appropriate State or federal resource agencies. As previously mentioned, the project site does not lie within federally designated critical habitat for listed species.

POTENTIAL IMPACTS

Trees/Nesting Birds

The citrus trees on site may provide song perches, lookout posts, and nest sites for a variety of birds. In particular, the California towhee and phainopepla were observed throughout the orchard portion of the site and could likely be nesting in various trees on or adjacent to the project site. (See Table 2: Observed Fauna.) Removal of the trees on the project site may impact native bird nests, and therefore would potentially be significant under CEQA. There are no other trees within the project site, aside from the citrus trees found in the orchard. A row of planted Deodar cedar trees occurs off-site, within 250 feet of the northern border of the Trojan Groves project site. The property these cedars are on is owned by Redlands Unified School District (RUSD) and is proposed for development of a high school prior to construction activities on the Trojan Groves property. Site plans contained in the Initial Study for Redlands Unified School District New High School No. 3¹² do not show this row of trees and the biological resources section mentions removal of trees adjacent to Pioneer Avenue. These trees will likely be removed prior to the time of development activities within Trojan Groves.

Migratory avian species and raptors, which may use the native trees on site or areas directly adjacent to the site during breeding season, are protected under the Migratory Bird Treaty Act (MBTA) while nesting. Project implementation and construction-related activities including, but not limited to, grading, materials laydown, facilities construction, and construction vehicle traffic and noise may result in the disturbance of MBTA-protected avian species that could occur within or adjacent to the project site. The loss or disturbance of an MBTA-protected occupied nest, or substantial interference with roosting and foraging opportunities for migratory species, sensitive avian species, or raptors would constitute a significant impact.

¹² The Planning Center, 2004. Initial Study for Redlands Unified School District New High School No. 3. Prepared for Redlands Unified School District. Redlands, CA.

Jurisdictional Areas

There are no jurisdictional areas (including waters of the U.S., streambed or other jurisdictional waterway), within the project site. No significant impacts to jurisdictional areas are expected from development of the proposed project.

Threatened, Endangered and Sensitive Species

The ruderal vegetation and orchard portions of the site do not have suitable physical and biological characteristics to support the majority of threatened, endangered or sensitive species expected in the area. Some sensitive species listed, such as burrowing owl and loggerhead shrike, are known from disturbed, agricultural areas. However, neither of these species or their sign was observed within the project site. The project will not significantly impact any sensitive plant or wildlife species

Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local, Regional, or State Habitat Conservation Plan

The City of Redlands 1995 General Plan¹³ identifies biotic resources considered sensitive by the City; however, none of the biotic resources covered by this plan exist within the project area. The East Valley Corridor Specific Plan¹⁴ also covers the project area but does not address management of biotic resources. Other conservation plans near the project site include the Western Riverside County Multiple Species Habitat Conservation Plan (WRMSHCP)¹⁵ and San Bernardino County General Plan (SBGP)¹⁶. Neither of these plans is applicable to the project areas. The WRMSHCP covers only Riverside County while the SBGP covers only unincorporated areas of San Bernardino County. The project will not have a significant impact on any habitat conservation plan or any other local conservation plan.

RECOMMENDED MITIGATION MEASURES

The following are recommended mitigation measures to ensure that impacts to potential bird nests on or adjacent to the project site would be less than significant.

Trees/Nesting Birds

It is recommended that construction activities take place between August 16th and March 14th to avoid the nesting season of federally and state protected migratory birds. All native breeding birds (except game birds), regardless of their listing status, are protected under the Migratory Bird Treaty Act (MBTA).¹⁷ Potential impacts to breeding birds are considered significant under CEQA. If construction occurs between March 15th and August 15th, the following mitigation measures should be implemented:

¹³ City of Redlands. 1995, amended 1997. City of Redlands 1995 General Plan. Accessed June 6, 2006. Available online at: http://www.ci.redlands.ca.us/plans/general_plan.htm

City of Redlands. 1996, updated 2004. East Valley Corridor Specific Plan. Accessed June 6, 2006. Available online at: http://www.ci.redlands.ca.us/plans/east_valley_plan.htm

¹⁵ County of Riverside. 2003. Western Riverside County Multiple Species Habitat Conservation Plan. Accessed May 24, 2006. Available online at: http://www.rctlma.org/mshcp/index.html

County of San Bernardino Land Use Services Department. 1989. San Bernardino General Plan. Accessed June 6, 2006. Available online at: http://www.co.san-bernardino.ca.us/landuseservices/general_plan/Default.asp

Migratory Bird Treaty Act (16 U.S.C. 703-711). This treaty with Canada, Mexico and Japan makes it unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, or kill migratory birds. The law applies to the removal of nests (such as swallow nests on bridges) occupied by migratory birds during the breeding season.

- A pre-construction survey (within three days prior to commencement of construction activities) should be conducted by a qualified biologist to determine the presence or absence of active nests within or adjacent to the project site, in order to avoid nesting activities of federally and state threatened migratory birds.
- 2. If no breeding or nesting activities are detected within 200 feet of the proposed work area, construction activities may proceed.
- 3. If breeding/nesting activity is confirmed, work activities within 200 feet of the active nest(s) should be delayed until the young birds have fledged and left the nest.

CONCLUSION

A total of twenty plant species and twenty-nine wildlife species or their signs (including tracks, scat, burrows, nests, excavations, and vocalizations) were observed within the project site. No threatened, endangered or other sensitive species were observed during the field survey, and the project site does not lie within federally designated critical habitat for listed species.

The Redlands Commons development would disturb the ruderal vegetation and citrus trees on the project site, and any resulting potential impacts to nesting birds would be reduced to a less than significant level through the recommended mitigation measures provided. The Trojan Groves project would only disturb the ruderal vegetation on the project site, which would not constitute a significant biological impact. The Deodar cedar trees on the property north of Trojan Groves will be removed by the property owner prior to construction activities at Trojan Groves, therefore no nesting birds would be impacted. No mitigation measures are required for the Trojan Groves site.

APPENDIX A: SENSITIVE SPECIES POTENTIALLY OCCURING IN PROJECT AREA

Appendix A	SENSITIVE AN	SENSITIVE AND SPECIAL STATUS SPECIES POTENTIALLY OCCURING IN THE STUDY AREA	IN THE STUDY
SPECIES	STATUS USFWS/CDFG/CNPS	GENERAL HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE
PLANTS			
Calochortus plummerae Plummer's mariposa lily	USFWS: - CDFG: - CNPS: List 1B	Bulbiferous herb; Chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, valley and foothill grassland on granitic or rocky substrates. Elevation 330-5600 feet.	Low
Chorizanthe parryi var. parryi Parry's spineflower	USFWS: - CDFG: - CNPS: List 3	Annual herb, endemic to California; Chaparral and coastal scrub on sandy or rocky substrates. Elevation 130-5600 feet.	Low
Dodecahema leptoceras slender-horned spineflower	USFWS: Endangered CDFG: Endangered CNPS: List 1B	Annual herb, endemic to California; Chaparral, cismontane woodland, and coastal scrub on sandy soils and alluvial fan substrates. Elevation 650-2500 feet.	Low
Lepidium virginicum var. robinsonii Robinson's pepper grass	USFWS: - CDFG: - CNPS: List 1B	Annual herb; Chaparral and coastal scrub. Elevation 0-2900 feet.	Low
ANIMALS			
Accipiter cooperii Cooper's hawk	USFWS: - CDFG: SC	Nest in oak and riparian woodlands, occasionally throughout southern California including Mojave desert. Winter in wooded urban areas and native woodland habitats.	Low
Anniella pulchra pulchra silvery legless lizard	USFWS: - CDFG: SC	Found in variety of habitats including sandy washes, coastal scrub, and woodlands. Lives and forages in leaf litter, under debris or within sandy soil.	Low
Cnemidophorus hyperythrus Orange-throated whiptail	USFWS: - CDFG: SC	Inhabits low-elevation coastal scrub, chaparral, and valley-foothill hardwood habitats. Prefers washes and other sandy areas with patches of brush and rocks. Perennial plants necessary for its major food – termites.	Low
Athene cunicularia burrowing owl	USFWS: - CDFG: SC	Inhabits open, dry grassland and desert habitats. Also found in agricultural areas along irrigation channels. Requires soft sand to dig burrows or uses abandoned rodent and man-made burrows.	Low

Appendix A	SENSITIVE AN	SENSITIVE AND SPECIAL STATUS SPECIES POTENTIALLY OCCURING IN THE STUDY AREA	IN THE STUDY
SPECIES	STATUS USFWS/CDFG/CNPS	GENERAL HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE
Chaetodipus fallax fallax Northwestern San Diego pocket mouse	USFWS: - CDFG: SC	Inhabits coastal sage scrub, sage scrub/grassland ecotones and chaparral communities. Strong microhabitat affinity for moderately gravelly and rocky substrates and shrubby areas. Also occur in nonnative grassland. (Western Riverside Co MSHCP)	Low
Dendroica petechia brewsteri yellow warbler	USFWS: - CDFG: SC	Prefers riparian areas with willows, cottonwoods, aspens, sycamores, & alders for nesting and foraging. Also nests in montane shrubbery in open conifer forests. During migration occur in many disturbed habitats including orchards and groves of exotic trees.	Low
Dipodomys merriami parvus San Bernardino kangaroo rat	USFWS: Endangered CDFG: SC	Typically found in Riversidian alluvial fan sage scrub and sandy loam soils, alluvial fans and flood plains, and along washes with nearby sage scrub.	Low
Dipodomys stephensi Stephen's kangaroo rat	USFWS: Endangered CDFG: Endangered	Found almost exclusively in open grasslands or sparse shrublands with less than 50 percent cover in summer.	Low
Eremophila alpestris actia California horned lark	USFWS: - CDFG: SC	Common resident in a variety of open habitats, usually where trees and shrubs are absent. Often found in row-crop fields.	Low
Eumops perofis californicus Western mastiff bat	USFWS: - CDFG: SC	Lives in rocky areas and cliff faces in southern California and Arizona south to Mexico. Roosts in cliff crevices and buildings. Feeds mostly on moths, crickets, grasshoppers and other insects.	Low
Lanius Iudovicianus loggerhead shrike	USFWS: - CDFG: SC	Forages over open ground near areas with short vegetation such as pastures, old orchards, open woodland, agricultural fields, desert washes, desert scrub and grassland.	Low
Neotoma lepida San Diego desert woodrat	USFWS: - CDFG: SC	Coastal southern California from San Diego county to San Lius Obispo county. Moderate to dense canopies preferred. They are particularly abubdant in rock outcrops and rocky cliffs and slopes.	Low
Perognathus longimembris brevinasus Los Angeles pocket mouse	USFWS: - CDFG: SC	Often inhabits open ground of fine sandy composition. Likely prefers sparsely vegetated areas and may be restricted to lower elevation grassland and coastal sage scrub.	Low

SC: CDFG Species of Special Concern

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List 1B: Rare, threatened, or endangered in California and elsewhere.

-ist 2: Rare, threatened or endangered in California, but more common elsewhere.

List 3: Need more information

-ist 4: Plants of Limited Distribution

otential for Occurrence

Low: Not likely to occur in impacted project area. No recent or historical records exist of the species occurring in the project area. The diagnostic habitat requirements strongly associated with the species do not occur in the project area.

Moderate: May occur in impacted project area. Either a historical record exists of the species in the project area or the diagnostic habitat requirements associated with the species occur in the project area.

High: Very likely to occur in impacted project area. Both a historical record exists of the species in the project area or its immediate vicinity and the diagnostic habitat requirements strongly associated with the species occur in the project area or its vicinity.

APPENDIX B: SITE PHOTOGRAPHS



Photo 1: Western portion of Trojan Groves site from south to north. Ruderal vegetation that has regrown after grading covers the site.



Photo 2: Eastern portion of Trojan Groves site from southeast to northwest. This section has been recently graded and has very little vegetation.



Photo 3: Boundary between the Trojan Groves site (left of irrigation ditch) and Redlands Commons site (right of irrigation ditch) from north to south.



Photo 4: Redlands Commons project site. Overall vegetation consisted of rows of orange trees with a sparse understory of ruderal vegetation.



Photo 5: Deodar cedars (*Cedrus deodara*) and a Mexican fan palm (*Washingtonia robusta*) north of project area. In the background is a residential lot with agricultural land to the west.

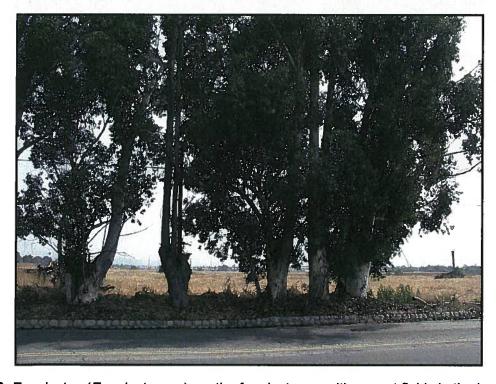


Photo 6: Eucalyptus (Eucalyptus sp.) south of project area with vacant fields in the background.

Appendix H1

Preliminary Hydrology Study and Drainage Analysis

Appendix E2 Phase I Environmental Site Assessment Peer Review Letter

HERITAGE SPECIFIC PLAN
INITIAL STUDY



To: Emily Elliott, Michael Baker International (Michael Baker)

From: Kristen Bogue, Michael Baker

Date: July 19, 2019

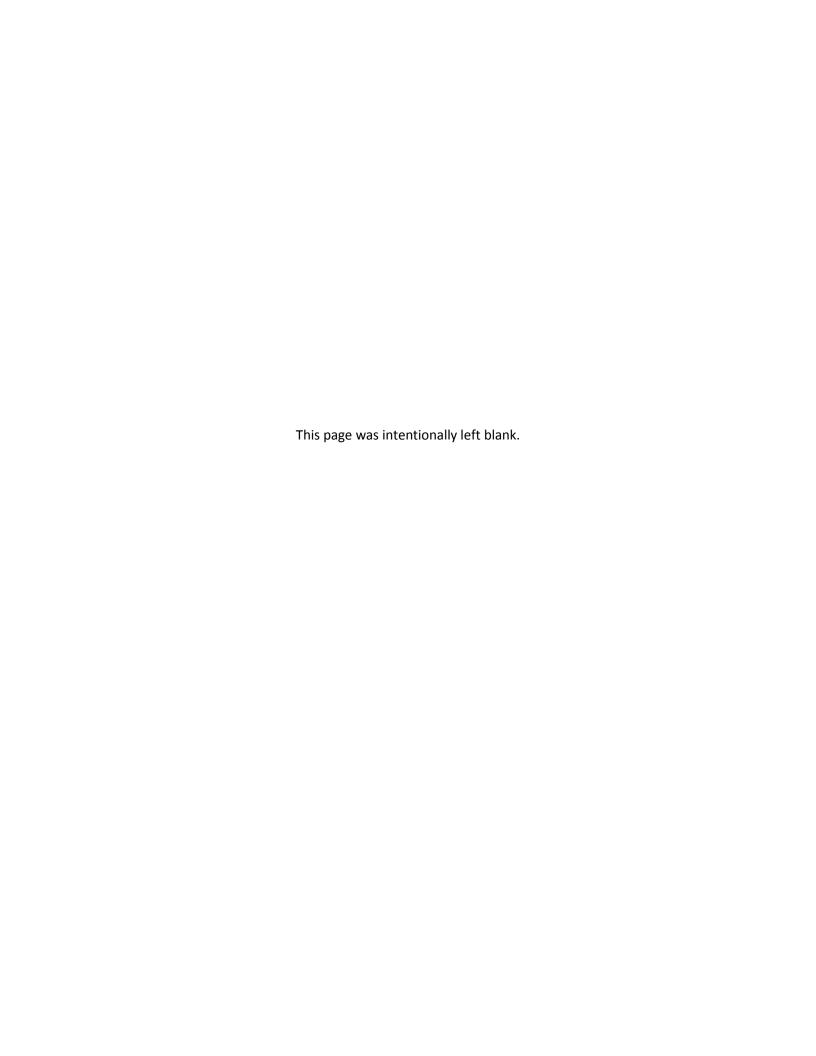
Project: Griffin Homes Heritage Specific Plan IS/MND

Subject: Phase I ESA CEQA Adequacy Review

After reviewing the Phase I ESA for the Griffin Homes Heritage Specific Plan project, I have the following concerns:

- Date of the Phase I ESA. The Phase I ESA is greater than a year old. This is fine for the
 purposes of CEQA, as long as the existing conditions have not changed. The document
 mentions the site as vacant with no structures. However, based on aerial imagery, there
 is evidence of soil movement on the site and it may be prudent of someone to document
 somewhere what these current activities are and that they would not affect the findings
 presented in the Phase I ESA.
- The Phase I ESA should document that there is no evidence of storage facilities/maintenance areas on the project site for the purposes of the on-site past agricultural activities (I can't actually verify any of this because the decade aerials in the appendix are not legible); and
- The Phase I ESA mentions multiple areas of adjoining past industrial uses, but then dismisses them as a concern based on the EDR database records. The findings section should include other sources of information to better address what these uses were and why they aren't a concern (other than just EDR database records) (note, since the Appendix is not legible, I can't review any of the backup).
- The Phase I ESA notes that sampling is being conducted, or will be conducted. I
 recommend the Lead Agency confirm the timing of this investigation and if necessary, roll
 it into the CEQA document (it may remove the need for further investigation on the residual
 agricultural herbicide/pesticide issue.
- The Appendix notes that the property is in an airport influence area. Confirm with the Leady Agency whether any specific mitigation language or conditions apply.
- Finally, include mitigation for the potential asbestos in irrigation pipes (this issue is noted, but under a separate heading).

Please do not hesitate to contact me at (949) 855-5747 or kbogue@mbakerintl.com if you have any further questions or if above statement needs further clarification.



Appendix F1 Hydraulics and Hydrology Report

HERITAGE SPECIFIC PLAN
INITIAL STUDY

Hydrology & Hydraulics Preliminary Report

City of Redlands
County of San Bernardino

Prepared: December 2018 (Preliminary Report)

Revised: -

FOR: Griffin Residential III, LLC Tract 20257

Prepared For:
Griffin Residential III, LLC
Michael Vairin, Senior Vice President
110 North Lincoln Avenue, Suite 100
Corona, CA 92882
951-547-3517

Prepared by: Hicks & Hartwick, Inc. 37 E Olive Ave. STE C Redlands, CA 92373 909-793-2257



Tract 20257 JN 10217

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

Prepared: December, 2018 (Preliminary Report)

FOR:

Griffin Residential III, LLC Tract 20257

Prepared for:
Griffin Residential III, LLC
Michael Vairin, Senior Vice President
110 North Lincoln Avenue, Suite 100
Corona, CA 92882
951-547-3517

Prepared by: Hicks & Hartwick, Inc. 37 E Olive Ave. STE C Redlands, CA 92373 909-793-2257

Dated: December 17, 2018







Tract 20257 JN 10217

City of Redlands **Tract No. 20257**

Hydrology & Hydraulics Preliminary Report

GENERAL

The subject property of this report is an approximately 40 acre parcel of land on the west side of Texas Street between Pioneer Avenue and San Bernardino Avenue. The parcel is an old orange grove on the west. The area generally drains to the west; however, there are north-south channels as part of the groves that intercept and divert the runoff north.

This report covers the drainage conditions including the existing conditions and with the proposed development. The watershed runoff rates are determined using San Bernardino County standards and computer calculations. Rational Method Hydrology Computer Program Package, developed by Advanced Engineering Software (AES), is used to calculate the storm runoff rates.

The hydrologic soil type, ground cover and development type are user specified. Rational Hydrology analysis was performed for the theoretical 10-year and 100-year storm events. Small Area Unit Hydrograph calculations are performed for the proposed 100-year storm events for select watersheds. The detailed summary computer output for each analysis is attached as Exhibits. Maps are provided, illustrating the layout for, and as referenced by, the computer models.

EXISTING CONDITIONS

This drainage study includes runoff analysis of offsite areas that drain to those portions of the surrounding streets that are immediately adjacent to the subject property. These include San Bernardino Avenue on the south, Texas Street on the east and Pioneer Avenue on the north.

The existing onsite watershed is orange groves. The eastern half of the subject property has fair coverage. The westeren half of the subject property has poor coverage.

The street flow depth in is calculated for the 10-year and 100-year storm events, for both the interim street section and the proposed street section. These calculations are included in the section "Surface Hydraulics".

The existing hydrology is calculated based on the existing coverage as illustrated on the accompanying map. The calculated 10-year and 100-year runoff for the existing conditions is attached hereto. The existing conditions reference map is also attached.

PROPOSED CONDITIONS

The development proposed in conjunction with this study is a single family residential subdivision. The existing flow patterns will have only minor changes.

The offsite existing flow patterns will be retained. It is calculated that the 10-year storm will be retained within the streets and within the curb face of the streets. It is also calculated that the 100-year storm will be retained within the streets and within the street right-of-ways.

The proposed development includes minor onsite storm drains, which connect to proposed detention basins at the northwest and southwest corners of the proposed development. These proposed basins ultimately discharge into the adjacent streets, Pioneer Avenue and San Bernardino Avenue respectively.

The proposed development, as described above, is shown on the proposed conditions map. The calculated 10-year and 100-year runoff for the proposed conditions is attached hereto. The proposed conditions reference maps are also attached.

NOAA Atlas 14, Volume 6, Version 2 Location name: Redlands, California, USA*



Latitude: 34.0792°, Longitude:

-117.1925° Elevation: 1310.63 ft**



* source: ESRI Maps ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PD	OS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹ Average recurrence interval (years)									
Duration	4	2		10	ge recurren	50		200	500	1000
	1		5				100	200	500	
5-min	0.099 (0.082-0.120)	0.128 (0.107-0.156)	0.168 (0.139-0.205)	0.201 (0.165-0.247)	0.246 (0.196-0.313)	0.283 (0.220-0.367)	0.320 (0.243-0.427)	0.360 (0.265-0.494)	0.416 (0.293-0.595)	0.460 (0.313-0.682)
10-min	0.142 (0.118-0.172)	0.184 (0.153-0.224)	0.241 (0.199-0.293)	0.288 (0.236-0.354)	0.353 (0.280-0.449)	0.405 (0.315-0.526)	0.459 (0.348-0.612)	0.516 (0.380-0.708)	0.596 (0.420-0.852)	0.659 (0.449-0.977)
15-min	0.172 (0.143-0.209)	0.223 (0.185-0.271)	0.291 (0.241-0.355)	0.348 (0.286-0.428)	0.427 (0.339-0.543)	0.490 (0.381-0.637)	0.555 (0.421-0.740)	0.624 (0.460-0.856)	0.720 (0.508-1.03)	0.797 (0.543-1.18)
30-min	0.256 (0.213-0.310)	0.331 (0.275-0.403)	0.433 (0.359-0.528)	0.517 (0.425-0.636)	0.635 (0.504-0.808)	0.729 (0.566-0.947)	0.826 (0.626-1.10)	0.928 (0.684-1.27)	1.07 (0.756-1.53)	1.19 (0.808-1.76)
60-min	0.370 (0.308-0.449)	0.480 (0.399-0.583)	0.627 (0.519-0.764)	0.749 (0.616-0.921)	0.920 (0.730-1.17)	1.06 (0.820-1.37)	1.20 (0.906-1.59)	1.34 (0.990-1.84)	1.55 (1.10-2.22)	1.72 (1.17-2.55)
2-hr	0.528 (0.439-0.641)	0.678 (0.563-0.824)	0.877 (0.727-1.07)	1.04 (0.857-1.28)	1.27 (1.01-1.62)	1.45 (1.13-1.88)	1.63 (1.24-2.18)	1.83 (1.35-2.51)	2.09 (1.48-3.00)	2.30 (1.57-3.41)
3-hr	0.649 (0.540-0.788)	0.830 (0.690-1.01)	1.07 (0.888-1.31)	1.27 (1.04-1.56)	1.54 (1.23-1.96)	1.76 (1.37-2.28)	1.98 (1.50-2.63)	2.20 (1.62-3.02)	2.52 (1.78-3.60)	2.76 (1.88-4.09)
6-hr	0.908 (0.756-1.10)	1.16 (0.964-1.41)	1.49 (1.24-1.82)	1.77 (1.45-2.17)	2.14 (1.70-2.72)	2.42 (1.89-3.15)	2.72 (2.06-3.62)	3.03 (2.23-4.15)	3.44 (2.43-4.92)	3.77 (2.57-5.58)
12-hr	1.21 (1.01-1.47)	1.56 (1.29-1.89)	2.01 (1.66-2.44)	2.37 (1.95-2.91)	2.87 (2.28-3.65)	3.25 (2.53-4.22)	3.64 (2.76-4.85)	4.04 (2.97-5.53)	4.58 (3.23-6.55)	5.00 (3.40-7.40)
24-hr	1.63 (1.44-1.88)	2.11 (1.86-2.43)	2.73 (2.41-3.16)	3.24 (2.83-3.77)	3.92 (3.32-4.72)	4.44 (3.69-5.46)	4.97 (4.03-6.26)	5.51 (4.34-7.13)	6.24 (4.72-8.42)	6.81 (4.98-9.49)
2-day	2.01 (1.78-2.32)	2.64 (2.33-3.04)	3.46 (3.05-4.01)	4.14 (3.62-4.82)	5.05 (4.28-6.09)	5.76 (4.78-7.09)	6.48 (5.25-8.16)	7.23 (5.70-9.36)	8.24 (6.24-11.1)	9.03 (6.61-12.6)
3-day	2.18 (1.93-2.51)	2.89 (2.56-3.34)	3.85 (3.39-4.45)	4.63 (4.05-5.40)	5.72 (4.85-6.89)	6.57 (5.45-8.08)	7.45 (6.03-9.38)	8.36 (6.59-10.8)	9.62 (7.28-13.0)	10.6 (7.76-14.8)
4-day	2.35 (2.08-2.71)	3.15 (2.78-3.63)	4.21 (3.72-4.87)	5.10 (4.46-5.95)	6.34 (5.37-7.63)	7.31 (6.07-8.99)	8.32 (6.74-10.5)	9.37 (7.39-12.1)	10.8 (8.20-14.6)	12.0 (8.78-16.7)
7-day	2.71 (2.40-3.13)	3.67 (3.24-4.23)	4.95 (4.36-5.72)	6.01 (5.26-7.01)	7.50 (6.35-9.03)	8.66 (7.19-10.7)	9.88 (8.00-12.4)	11.2 (8.79-14.4)	12.9 (9.78-17.4)	14.3 (10.5-20.0)
10-day	2.94 (2.60-3.38)	3.99 (3.53-4.60)	5.41 (4.77-6.25)	6.59 (5.77-7.68)	8.24 (6.98-9.92)	9.54 (7.92-11.7)	10.9 (8.82-13.7)	12.3 (9.71-15.9)	14.3 (10.8-19.3)	15.9 (11.6-22.1)
20-day	3.63 (3.21-4.18)	4.97 (4.40-5.74)	6.79 (5.99-7.86)	8.31 (7.27-9.69)	10.4 (8.85-12.6)	12.1 (10.1-14.9)	13.9 (11.3-17.5)	15.8 (12.4-20.4)	18.4 (13.9-24.7)	20.4 (14.9-28.5)
30-day	4.27 (3.78-4.92)	5.87 (5.19-6.77)	8.03 (7.08-9.29)	9.84 (8.61-11.5)	12.4 (10.5-14.9)	14.4 (12.0-17.7)	16.5 (13.4-20.8)	18.8 (14.8-24.3)	21.9 (16.6-29.6)	24.4 (17.9-34.1)
45-day	5.11 (4.53-5.89)	7.00 (6.19-8.07)	9.56 (8.44-11.1)	11.7 (10.3-13.7)	14.8 (12.5-17.8)	17.2 (14.3-21.1)	19.7 (16.0-24.8)	22.4 (17.7-29.0)	26.2 (19.8-35.3)	29.2 (21.4-40.8)
60-day	5.99 (5.30-6.90)	8.15 (7.21-9.40)	11.1 (9.78-12.8)	13.6 (11.9-15.8)	17.1 (14.5-20.6)	19.9 (16.5-24.4)	22.8 (18.5-28.7)	25.9 (20.4-33.5)	30.3 (22.9-40.8)	33.8 (24.7-47.1)

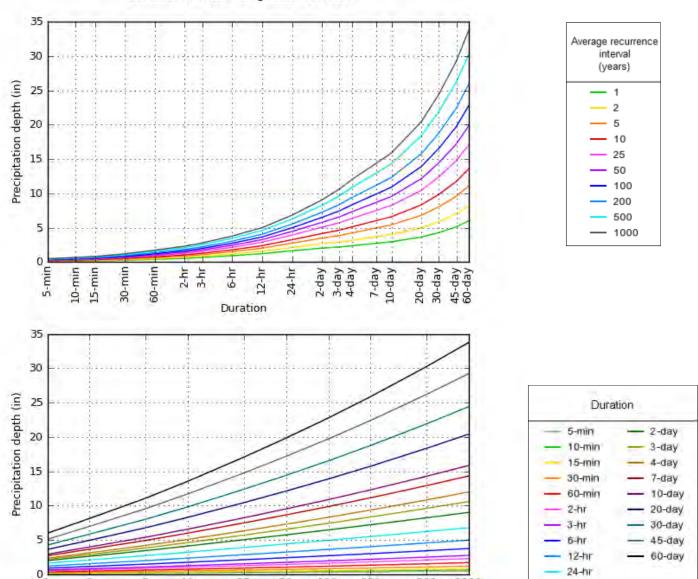
Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves Latitude: 34.0792°, Longitude: -117.1925°



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Dec 20 22:14:57 2018

500

1000

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Average recurrence interval (years)

200

Maps & aerials

Small scale terrain







Large scale aerial



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US Department of Commerce

National Oceanic and Atmospheric Administration

National Weather Service
National Water Center

1325 East West Highway
Silver Spring, MD 20910

Questions?: HDSC.Questions@noaa.gov

Disclaimer

Hydrology & Hydraulics Preliminary Report

City of Redlands
County of San Bernardino

EXISTING HYDROLOGY 2-YEAR RUNOFF



Tract 20257 JN 10217

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
(c) Copyright 1983-2015 Advanced Engineering Software (aes)
Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HEA2.DAT

TIME/DATE OF STUDY: 11:57 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4800

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0312	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0312	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A

```
ELEVATION DATA: UPSTREAM(FEET) = 1370.50 DOWNSTREAM(FEET) = 1359.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.987
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.540
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp Ap SCS Tc
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                                               0.200 56 9.99
                              0.50 0.75
 APARTMENTS
                        В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 0.63
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 0.63
******************
 FLOW PROCESS FROM NODE 2.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1359.20 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 1264.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.08
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.30
   HALFSTREET FLOOD WIDTH(FEET) = 5.92
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.66
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.50
 STREET FLOW TRAVEL TIME(MIN.) = 12.72 Tc(MIN.) = 22.70
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.903
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 6.39 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 6.39 SUBAREA RUNOFF(CFS) = 2.61 
EFFECTIVE AREA(ACRES) = 6.89 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) =
                                                          2.95
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33 HALFSTREET FLOOD WIDTH(FEET) = 7.15
 FLOW VELOCITY(FEET/SEC.) = 1.77 DEPTH*VELOCITY(FT*FT/SEC.) = 0.58
                   Tract No. 20257 – Griffin Residential III
```

Existing 2-year Hydrology – Area A

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Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A Page **3** of **26**

```
В
                                1.41
                                        0.75
 "3-4 DWELLINGS/ACRE"
                                                0.600
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.243
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.61
 AVERAGE FLOW DEPTH(FEET) = 0.69 TRAVEL TIME(MIN.) = 3.26
 Tc(MIN.) =
           13.67
 SUBAREA AREA(ACRES) = 13.11 SUBAREA RUNOFF(CFS) = 12.67

EFFECTIVE AREA(ACRES) = 16.75 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 16.29
 GIVEN CHANNEL BASE(FEET) = 2.00 CHANNEL FREEBOARD(FEET) = 1.0
 "Z" FACTOR = 2.000 MANNING'S FACTOR = 0.015
 *ESTIMATED CHANNEL HEIGHT(FEET) = 1.85
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.85 FLOW VELOCITY(FEET/SEC.) = 5.17
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1505.00 FEET.
*********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1353.90 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 163.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.87
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 15.32
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.40
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.56
 STREET FLOW TRAVEL TIME(MIN.) = 0.80 Tc(MIN.) = 14.47
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.210
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
                                                         SCS
                                                  qД
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                1.69 0.75
                                                        56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.69 SUBAREA RUNOFF(CFS) = 1.16
 EFFECTIVE AREA(ACRES) = 18.44 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.27
```

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>>>>(STREET TABLE SECTION # 1 USED) <<<<

UPSTREAM ELEVATION(FEET) = 1351.60 DOWNSTREAM ELEVATION(FEET) = 1346.00 STREET LENGTH(FEET) = 312.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 32.00

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A Page **5** of **26**

```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 20.31
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.47
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.91
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.82
 STREET FLOW TRAVEL TIME(MIN.) = 1.33 Tc(MIN.) = 15.80
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.143
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
               GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.91 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.91 SUBAREA RUNOFF(CFS) = 1.19
EFFECTIVE AREA(ACRES) = 24.74 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 19.71
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.46 HALFSTREET FLOOD WIDTH(FEET) = 15.48
 FLOW VELOCITY(FEET/SEC.) = 3.90 DEPTH*VELOCITY(FT*FT/SEC.) = 1.80
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
***********************
 FLOW PROCESS FROM NODE 9.00 TO NODE 9.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.80
 RAINFALL INTENSITY(INCH/HR) = 1.14
 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 24.74
 TOTAL STREAM AREA(ACRES) = 27.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 19.71
************************
 FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A Page **6** of **26**

```
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 967.00
 ELEVATION DATA: UPSTREAM(FEET) = 1360.40 DOWNSTREAM(FEET) = 1348.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.578
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.153
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fp
                                               Ap SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              2.84 0.75
                                              0.600 56 15.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.80
 TOTAL AREA(ACRES) = 2.84 PEAK FLOW RATE(CFS) = 1.80
******************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1348.70 DOWNSTREAM ELEVATION(FEET) = 1346.00
 STREET LENGTH(FEET) = 654.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.04
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.35
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.54
 STREET FLOW TRAVEL TIME(MIN.) = 7.07 Tc(MIN.) = 22.64
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.904
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                      SCS
                                                Αр
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               5.96 0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.96 SUBAREA RUNOFF(CFS) = 2.44 EFFECTIVE AREA(ACRES) = 8.80 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
                   8.8 PEAK FLOW RATE(CFS) = 3.61
 TOTAL AREA(ACRES) =
```

```
END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37 HALFSTREET FLOOD WIDTH(FEET) = 8.62
  FLOW VELOCITY(FEET/SEC.) = 1.59 DEPTH*VELOCITY(FT*FT/SEC.) = 0.59
  LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 1621.00 FEET.
********************
  FLOW PROCESS FROM NODE 9.00 TO NODE 9.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 22.64
  RAINFALL INTENSITY(INCH/HR) = 0.90
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.80
  TOTAL STREAM AREA(ACRES) = 8.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.61
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        19.71
        15.80
        1.143
        0.75( 0.26)
        0.35
        24.7
        3.00

        1
        14.61
        24.13
        0.868
        0.75( 0.27)
        0.37
        27.2
        1.00

        2
        3.61
        22.64
        0.904
        0.75( 0.45)
        0.60
        8.8
        7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        23.32
        15.80
        1.143
        0.75(0.30)
        0.40
        30.9
        3.00

        2
        19.13
        22.64
        0.904
        0.75(0.32)
        0.42
        35.6
        7.00

        3
        17.93
        24.13
        0.868
        0.75(0.32)
        0.42
        36.0
        1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 23.32 Tc(MIN.) = 15.80 EFFECTIVE AREA(ACRES) = 30.88 AREA-AVERAGED Fm(INCH/HR) = 0.30
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.40
  TOTAL AREA(ACRES) = 36.0
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
******************
  FLOW PROCESS FROM NODE 9.00 TO NODE 12.00 IS CODE = 62
  ._____
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1346.00 DOWNSTREAM ELEVATION(FEET) = 1339.80
  STREET LENGTH(FEET) = 344.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
```

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A Page **8** of **26**

```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 23.75
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.07
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 1.41 Tc(MIN.) = 17.21
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.081
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Дp
               GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.49 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.49 SUBAREA RUNOFF(CFS) = 0.85 
EFFECTIVE AREA(ACRES) = 32.37 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 23.32
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 16.57
 FLOW VELOCITY(FEET/SEC.) = 4.07 DEPTH*VELOCITY(FT*FT/SEC.) = 1.96
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 2600.00 FEET.
***********************
 FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.21
 RAINFALL INTENSITY(INCH/HR) = 1.08
 AREA-AVERAGED fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) = 32.37
 TOTAL STREAM AREA(ACRES) = 37.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 23.32
*******************
 FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

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```
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 503.00
 ELEVATION DATA: UPSTREAM(FEET) = 1355.40 DOWNSTREAM(FEET) = 1347.10
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.273
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.423
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                   Fp
                                                  SCS
                                             Аp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             0.74 0.75
                                            0.600 56 11.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.65
 TOTAL AREA(ACRES) = 0.74 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1347.10 DOWNSTREAM ELEVATION(FEET) = 1339.80
 STREET LENGTH(FEET) = 1135.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.84
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.81
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.59
 STREET FLOW TRAVEL TIME(MIN.) = 10.45 Tc(MIN.) = 21.72
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.929
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fρ
                                                    SCS
                                              Αр
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             9.49 0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
                  10.2
 TOTAL AREA(ACRES) =
                            PEAK FLOW RATE(CFS) =
```

```
END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37 HALFSTREET FLOOD WIDTH(FEET) = 8.54
  FLOW VELOCITY(FEET/SEC.) = 1.98 DEPTH*VELOCITY(FT*FT/SEC.) = 0.73
  LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1638.00 FEET.
*********************
  FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 21.72
  RAINFALL INTENSITY(INCH/HR) = 0.93
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 10.23
  TOTAL STREAM AREA(ACRES) = 10.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.42
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        23.32
        17.21
        1.081
        0.75(0.30)
        0.41
        32.4
        3.00

    19.13
    24.12
    0.868
    0.75( 0.32) 0.43
    37.1
    7.00

    17.93
    25.64
    0.834
    0.75( 0.32) 0.43
    37.5
    1.00

    4.42
    21.72
    0.929
    0.75( 0.45) 0.60
    10.2
    10.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 27.74 17.21 1.081 0.75(0.33) 0.45 40.5 3.00

2 25.01 21.72 0.929 0.75(0.35) 0.46 45.7 10.00

3 22.99 24.12 0.868 0.75(0.35) 0.47 47.3 7.00

4 21.48 25.64 0.834 0.75(0.35) 0.47 47.8 1.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 27.74 Tc(MIN.) = 17.21
  EFFECTIVE AREA(ACRES) = 40.47 AREA-AVERAGED Fm(INCH/HR) = 0.33
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.45
  TOTAL AREA(ACRES) = 47.8
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                                     12.00 = 2600.00 FEET.
*********************
  FLOW PROCESS FROM NODE 12.00 TO NODE
                                                15.00 \text{ IS CODE} = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) << <<
______
  UPSTREAM ELEVATION(FEET) = 1339.80 DOWNSTREAM ELEVATION(FEET) = 1334.40
  STREET LENGTH(FEET) = 301.00 CURB HEIGHT(INCHES) = 8.0
```

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```
STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 27.93
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.51
   HALFSTREET FLOOD WIDTH(FEET) = 17.90
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.21
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.14
 STREET FLOW TRAVEL TIME(MIN.) = 1.19 Tc(MIN.) = 18.40
   2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.035
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                 Αр
      LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.29 0.75
                                                0.600
                                                        56
 AGRICULTURAL FAIR COVER
                        В
 "ORCHARDS"
                                0.58
                                        0.63
                                                1.000
                                                        65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.867
 SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 0.36
 EFFECTIVE AREA(ACRES) = 41.34 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 48.6 PEAK FLOW RATE(CFS) = 27.74
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51 HALFSTREET FLOOD WIDTH(FEET) = 17.82
 FLOW VELOCITY(FEET/SEC.) = 4.22 DEPTH*VELOCITY(FT*FT/SEC.) = 2.14
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
************************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.40
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.45
 EFFECTIVE STREAM AREA(ACRES) = 41.34
 TOTAL STREAM AREA(ACRES) = 48.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 27.74
```

Existing 2-year Hydrology – Area A

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```
EFFECTIVE AREA(ACRES) = 8.10 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 3.53
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 7.35
  FLOW VELOCITY(FEET/SEC.) = 2.02 DEPTH*VELOCITY(FT*FT/SEC.) = 0.68
  LONGEST FLOWPATH FROM NODE 13.00 TO NODE
                                                      15.00 = 1612.00 FEET.
*********************
 FLOW PROCESS FROM NODE 15.00 TO NODE
                                                 15.00 \text{ IS CODE} = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 21.59
  RAINFALL INTENSITY(INCH/HR) = 0.93
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.10
  TOTAL STREAM AREA(ACRES) = 8.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.53
  ** CONFLUENCE DATA **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 27.74 18.40 1.035 0.74(0.34) 0.45 41.3 3.00

1 25.01 22.93 0.897 0.74(0.35) 0.47 46.5 10.00

1 22.99 25.37 0.840 0.74(0.35) 0.47 48.2 7.00

1 21.48 26.90 0.809 0.75(0.35) 0.47 48.6 1.00

2 3.53 21.59 0.933 0.75(0.45) 0.60 8.1 13.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  ** PEAK FLOW RATE TABLE **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 31.27 18.40 1.035 0.75(0.35) 0.47 48.2 3.00

2 29.35 21.59 0.933 0.75(0.36) 0.49 53.1 13.00

3 28.28 22.93 0.897 0.75(0.36) 0.49 54.6 10.00

4 25.84 25.37 0.840 0.75(0.37) 0.49 56.3 7.00

5 24.10 26.90 0.809 0.75(0.37) 0.49 56.7 1.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 31.27 Tc(MIN.) = 18.40
EFFECTIVE AREA(ACRES) = 48.25 AREA-AVERAGED Fm(INCH/HR) = 0.35
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.47
  TOTAL AREA(ACRES) = 56.7
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
********************
 FLOW PROCESS FROM NODE 15.00 TO NODE 18.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1334.40 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 686.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 32.64
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.55
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.05
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.21
 STREET FLOW TRAVEL TIME(MIN.) = 2.83 Tc(MIN.) = 21.22
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.943
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Αр
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                             0.76 0.75 0.100 56
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.23 0.75 0.600 56
 AGRICULTURAL POOR COVER
                       В
                               2.87
                                       0.50
                                                1.000
                                                       73
 "ORCHARDS"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.731
 SUBAREA AREA(ACRES) = 5.86 SUBAREA RUNOFF(CFS) = 2.73
 EFFECTIVE AREA(ACRES) = 54.11 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 62.6 PEAK FLOW RATE(CFS) = 31.27
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.54 HALFSTREET FLOOD WIDTH(FEET) = 19.54
 FLOW VELOCITY(FEET/SEC.) = 4.00 DEPTH*VELOCITY(FT*FT/SEC.) = 2.16
 LONGEST FLOWPATH FROM NODE
                         1.00 TO NODE
                                          18.00 = 3587.00 FEET.
*****************
 FLOW PROCESS FROM NODE 18.00 TO NODE
                                       18.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 21.22
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED fm(INCH/HR) = 0.36
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.72
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 54.11
 TOTAL STREAM AREA(ACRES) = 62.59
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 31.27
************************
 FLOW PROCESS FROM NODE 16.00 TO NODE
                                    17.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 984.00
 ELEVATION DATA: UPSTREAM(FEET) = 1343.50 DOWNSTREAM(FEET) = 1333.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.343
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.118
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.22 0.75
                                           0.600 56 16.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.94
 TOTAL AREA(ACRES) = 3.22 PEAK FLOW RATE(CFS) = 1.94
******************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1333.80 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 923.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.04
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.31
   HALFSTREET FLOOD WIDTH(FEET) = 6.33
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.20
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.68
 STREET FLOW TRAVEL TIME(MIN.) = 7.01 Tc(MIN.) = 23.35
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.886
 SUBAREA LOSS RATE DATA(AMC II):
```

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	NT TYPE/ JSE						
RESIDENTIAL "3-4 DWELL	L INGS/ACRE"						
NATURAL POO			1.12				86
	ERAGE PERVIOU ERAGE PERVIOU		_				
SUBAREA ARI	EA(ACRES) = AREA(ACRES) =	5.09 = 8.31	SUBARE AREA	A RUNOE -AVERAC	FF(CFS) GED Fm(I	= 2.1 NCH/HR)	L8 = 0.42
AREA-AVERA	GED Fp(INCH/H (ACRES) =	IR) = 0.65	AREA-A	VERAGEI) Ap =	0.65	
				K FLOW	RAIE (CF	5) =	3.45
	AREA STREET H) = 0.32 H			TH(FEET	r) = 6	.74	
FLOW VELOC	TY(FEET/SEC DWPATH FROM 1	.) = 2.27	DEPTH*	VELOCIT	TY(FT*FT	/SEC.) =	
*****	*****	*****	*****	*****	*****	*****	*****
	SS FROM NODE		TO NODE	18.	.00 IS C	ODE =	1
>>>>AND C	NATE INDEPENI OMPUTE VARIOU	JS CONFLUEN	CED STRE	AM VALU	JES<<<<		
TOTAL NUMBI	======== ER OF STREAMS		======	======	======	======	=======
	VALUES USED			REAM 2	2 ARE:		
	NCENTRATION(N NTENSITY(INCE						
	GED Fm(INCH/F GED Fp(INCH/F						
AREA-AVERAG	$\frac{1}{\text{GED Ap}} = 0.6$	55					
	STREAM AREA(A AM AREA(ACRES						
	RATE(CFS) AT			3.45			
	NCE DATA **						
	Q To				_		
NUMBER 1		N.) (INCH/H .22 0.94		0.36)		ACRES) 54.1	NODE 3.00
1		.45 0.86	-	0.37)		59.0	13.00
1		.82 0.83	0 0.72(0.37)	0.51	60.5	10.00
1		.34 0.78		0.37)		62.1	
1		.91 0.75		0.37)		62.6	
2	3.45 23	.35 0.88	6 0.65(0.42)	0.65	8.3	16.00
	NTENSITY AND FORMULA USEI			ION RAT	ΓΙΟ		
** PEAK FI.(OW RATE TABLI	. **					
STREAM	Q To		ty Fp(Fm)	Ар	Ae	HEADWATER
NUMBER		N.) (INCH/H			_	ACRES)	
1		.22 0.94		0.37)		61.7	
2			6 0.71(65.6	
3			0 0.71(67.3	
4 5		.82 0.83 .34 0.78	0 0.71(2 0.71(0.38)		68.8 70.5	10.00 7.00
J	20.01 20		_ 0./1(0.50/	5.55	, , , ,	,

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 34.72 Tc(MIN.) = 21.22 EFFECTIVE AREA(ACRES) = 61.66 AREA-AVERAGED Fm(INCH/HR) = 0.37 AREA-AVERAGED Fp(INCH/HR) = 0.71 AREA-AVERAGED Ap = 0.52 TOTAL AREA(ACRES) = 70.9 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET. ********************** FLOW PROCESS FROM NODE 18.00 TO NODE 22.00 IS CODE = 62 ______ >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA< >>>>(STREET TABLE SECTION # 1 USED) << << ______ UPSTREAM ELEVATION(FEET) = 1324.40 DOWNSTREAM ELEVATION(FEET) = 1316.60 STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 32.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200 **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 35.44 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.53HALFSTREET FLOOD WIDTH(FEET) = 18.84 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.85 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.56 STREET FLOW TRAVEL TIME(MIN.) = 1.20 Tc(MIN.) = 22.42 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.910 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fρ SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN NATURAL POOR COVER В 2.48 0.27 1.000 86 "BARREN" SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000 SUBAREA AREA(ACRES) = 2.48 SUBAREA RUNOFF(CFS) = 1.42 EFFECTIVE AREA(ACRES) = 64.14 AREA-AVERAGED Fm(INCH/HR) = 0.37 AREA-AVERAGED Fp(INCH/HR) = 0.68 AREA-AVERAGED Ap = 0.54 TOTAL AREA(ACRES) = 73.4 PEAK FLOW RATE(CFS) = 34.72 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 18.68 FLOW VELOCITY(FEET/SEC.) = 4.83 DEPTH*VELOCITY(FT*FT/SEC.) = 2.53 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET. *******************

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1

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```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =
 RAINFALL INTENSITY(INCH/HR) = 0.91
 AREA-AVERAGED fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.68
 AREA-AVERAGED Ap = 0.54
 EFFECTIVE STREAM AREA(ACRES) = 64.14
 TOTAL STREAM AREA(ACRES) = 73.38
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
*******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1059.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1329.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.190
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                SCS Tc
                                 Fp
                                           Аp
     LAND USE
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                            0.78
                                    0.75
                                          0.600 56 14.84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.52
 TOTAL AREA(ACRES) = 0.78 PEAK FLOW RATE(CFS) = 0.52
******************
                     20.00 TO NODE
 FLOW PROCESS FROM NODE
                                   21.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1329.90 DOWNSTREAM ELEVATION(FEET) = 1322.90
 STREET LENGTH(FEET) = 956.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.13
```

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```
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.35
   HALFSTREET FLOOD WIDTH(FEET) = 8.01
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.06
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.73
 STREET FLOW TRAVEL TIME(MIN.) = 7.73 Tc(MIN.) = 22.57
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.906
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Аp
                                                       SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 14.50 0.75 0.600
                                                      56
 NATURAL POOR COVER
                       B 1.79 0.27 1.000 86
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.67
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.644
 SUBAREA AREA(ACRES) = 16.29 SUBAREA RUNOFF(CFS) = 6.99
 EFFECTIVE AREA(ACRES) = 17.07 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.67 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 17.1 PEAK FLOW RATE(CFS) =
                                                         7.31
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41 HALFSTREET FLOOD WIDTH(FEET) = 10.39
 FLOW VELOCITY(FEET/SEC.) = 2.34 DEPTH*VELOCITY(FT*FT/SEC.) =
 LONGEST FLOWPATH FROM NODE 19.00 TO NODE 21.00 = 2015.00 FEET.
******************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1322.90 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 615.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.86
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 11.33
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.58
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.01
 STREET FLOW TRAVEL TIME(MIN.) = 3.97 Tc(MIN.) = 26.54
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.816
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Аp
                                                     SCS
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
```

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```
NATURAL POOR COVER
   "BARREN" B 2.22 0.27 1.000 86
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 2.22 SUBAREA RUNOFF(CFS) = 1.09
EFFECTIVE AREA(ACRES) = 19.29 AREA-AVERAGED Fm(INCH/HR) = 0.41
   AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.68
   TOTAL AREA(ACRES) = 19.3 PEAK FLOW RATE(CFS) = 7.31
   NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.39 HALFSTREET FLOOD WIDTH(FEET) = 11.05
   FLOW VELOCITY(FEET/SEC.) = 2.51 DEPTH*VELOCITY(FT*FT/SEC.) = 0.97
   LONGEST FLOWPATH FROM NODE 19.00 TO NODE 22.00 = 2630.00 FEET.
************************
   FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
   >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
   TOTAL NUMBER OF STREAMS = 2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
   TIME OF CONCENTRATION(MIN.) = 26.54
  RAINFALL INTENSITY(INCH/HR) = 0.82
   AREA-AVERAGED fm(INCH/HR) = 0.41
   AREA-AVERAGED Fp(INCH/HR) = 0.60
  AREA-AVERAGED Ap = 0.68
   EFFECTIVE STREAM AREA(ACRES) = 19.29
  TOTAL STREAM AREA(ACRES) = 19.29
   PEAK FLOW RATE(CFS) AT CONFLUENCE =
   ** CONFLUENCE DATA **
    STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        34.72
        22.42
        0.910
        0.68(0.37)
        0.54
        64.1
        3.00

        1
        33.46
        24.56
        0.858
        0.68(0.37)
        0.54
        68.1
        16.00

        1
        32.61
        25.68
        0.833
        0.68(0.37)
        0.54
        69.8
        13.00

        1
        31.31
        27.05
        0.806
        0.68(0.37)
        0.55
        71.3
        10.00

        1
        28.51
        29.59
        0.760
        0.69(0.37)
        0.55
        72.9
        7.00

        1
        26.57
        31.19
        0.734
        0.69(0.38)
        0.55
        73.4
        1.00

        2
        7.31
        26.54
        0.816
        0.60(0.41)
        0.68
        19.3
        19.00

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR 2 STREAMS.
   ** PEAK FLOW RATE TABLE **
   ** PEAK FLOW RATE TABLE **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 42.04 22.42 0.910 0.66(0.38) 0.57 80.4 3.00
2 40.77 24.56 0.858 0.66(0.38) 0.57 85.9 16.00
3 39.92 25.68 0.833 0.66(0.38) 0.57 88.4 13.00
4 39.11 26.54 0.816 0.66(0.38) 0.57 90.0 19.00
5 38.44 27.05 0.806 0.66(0.38) 0.57 90.6 10.00
6 34.81 29.59 0.760 0.67(0.38) 0.58 92.2 7.00
7 32.41 31.19 0.734 0.67(0.38) 0.58 92.7 1.00
```

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```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 42.04 Tc(MIN.) = 22.42
 EFFECTIVE AREA(ACRES) = 80.44 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.66 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 92.7
                           1.00 TO NODE 22.00 = 3937.00 FEET.
 LONGEST FLOWPATH FROM NODE
******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.60 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1041.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 45.51
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.59
   HALFSTREET FLOOD WIDTH(FEET) = 21.88
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.68
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.74
 STREET FLOW TRAVEL TIME(MIN.) = 3.70 Tc(MIN.) = 26.13
   2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.824
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Аp
                                                     SCS
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
                       B 12.11 0.27
 "BARREN"
                                              1.000
                                                      86
 AGRICULTURAL POOR COVER
                       В
                               3.18
                                       0.50
                                              1.000
                                                      73
 "ORCHARDS"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.29 SUBAREA RUNOFF(CFS) = 6.94
 EFFECTIVE AREA(ACRES) = 95.73 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 108.0
                              PEAK FLOW RATE(CFS) = 42.04
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 21.18
 FLOW VELOCITY(FEET/SEC.) = 4.61 DEPTH*VELOCITY(FT*FT/SEC.) = 2.64
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
```

```
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 26.13
 RAINFALL INTENSITY(INCH/HR) = 0.82
 AREA-AVERAGED fm(INCH/HR) = 0.37
 AREA-AVERAGED fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.64
 EFFECTIVE STREAM AREA(ACRES) = 95.73
 TOTAL STREAM AREA(ACRES) = 107.96
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
*************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 639.00
 ELEVATION DATA: UPSTREAM(FEET) = 1324.10 DOWNSTREAM(FEET) = 1321.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.821
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.097
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                           Ap SCS
                                  Fp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
                    В
 "3-4 DWELLINGS/ACRE"
                                          0.600 56 16.82
                            1.77
                                   0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.03
 TOTAL AREA(ACRES) = 1.77 PEAK FLOW RATE(CFS) = 1.03
***********************
 FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1321.80 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1594.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
```

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```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.30
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.60
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.78
 STREET FLOW TRAVEL TIME(MIN.) = 10.23 Tc(MIN.) = 27.05
      2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.806
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                 SCS
                                                          Ар
      LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 13.48 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 13.48 SUBAREA RUNOFF(CFS) = 4.33
 EFFECTIVE AREA(ACRES) = 15.25 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 4.90
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 7.35
 FLOW VELOCITY(FEET/SEC.) = 2.81 DEPTH*VELOCITY(FT*FT/SEC.) = 0.94
 LONGEST FLOWPATH FROM NODE 23.00 TO NODE 25.00 = 2233.00 FEET.
*********************
                           25.00 TO NODE
 FLOW PROCESS FROM NODE
                                                25.00 IS CODE = 1
   ______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 27.05
 RAINFALL INTENSITY(INCH/HR) = 0.81
 AREA-AVERAGED fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 15.25
 TOTAL STREAM AREA(ACRES) = 15.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.90
  ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 42.04 26.13 0.824 0.57(0.37) 0.64 95.7 3.00

1 40.77 28.29 0.783 0.58(0.37) 0.64 101.2 16.00

1 39.92 29.41 0.763 0.58(0.37) 0.64 103.7 13.00

1 39.11 30.31 0.748 0.58(0.37) 0.64 105.3 19.00

1 38.44 30.83 0.740 0.59(0.37) 0.64 105.9 10.00

1 34.81 33.47 0.701 0.59(0.37) 0.64 107.5 7.00

1 32.41 35.14 0.680 0.59(0.37) 0.64 108.0 1.00

2 4.90 27.05 0.806 0.75(0.45) 0.60 15.2 23.00
```

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A Page **24** of **26**

```
** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm)
                                                                  Ap Ae HEADWATER

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        46.94
        26.13
        0.824
        0.60(0.38)
        0.63
        110.5
        3.00

        2
        46.40
        27.05
        0.806
        0.60(0.38)
        0.63
        113.3
        23.00

        3
        45.35
        28.29
        0.783
        0.60(0.38)
        0.63
        116.5
        16.00

        4
        44.23
        29.41
        0.763
        0.60(0.38)
        0.63
        119.0
        13.00

        5
        43.22
        30.31
        0.748
        0.60(0.38)
        0.63
        120.5
        19.00

        6
        42.50
        30.83
        0.740
        0.60(0.38)
        0.63
        121.1
        10.00

        7
        38.66
        33.47
        0.701
        0.61(0.38)
        0.63
        122.8
        7.00

        8
        36.14
        35.14
        0.680
        0.61(0.38)
        0.63
        123.2
        1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 46.94 Tc(MIN.) =
                                                                     26.13
  EFFECTIVE AREA(ACRES) = 110.46 AREA-AVERAGED Fm(INCH/HR) = 0.38
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.63
  TOTAL AREA(ACRES) = 123.2
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
******************
                                     25.00 TO NODE
  FLOW PROCESS FROM NODE
                                                              26.00 \text{ IS CODE} = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1291.40
  STREET LENGTH(FEET) = 405.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
  INSIDE STREET CROSSFALL(DECIMAL) = 0.015
  OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
  STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
                                                                              47.03
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) = 0.59
     HALFSTREET FLOOD WIDTH(FEET) = 22.12
     AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.75
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.80
  STREET FLOW TRAVEL TIME(MIN.) = 1.42 Tc(MIN.) = 27.55
        2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.796
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                            Аp
                                                                                     SCS
        LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
  AGRICULTURAL FAIR COVER
  "ORCHARDS"
                                                  1.26 0.63
                                                                         1.000 65
                                     В
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 1.26 SUBAREA RUNOFF(CFS) = 0.19
  EFFECTIVE AREA(ACRES) = 111.72 AREA-AVERAGED Fm(INCH/HR) = 0.38
```

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area A Page **25** of **26** AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.64

TOTAL AREA(ACRES) = 124.5 PEAK FLOW RATE(CFS) = 46.94

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 22.12

FLOW VELOCITY(FEET/SEC.) = 4.74 DEPTH*VELOCITY(FT*FT/SEC.) = 2.80

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 26.00 = 5383.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 124.5 TC(MIN.) = 27.55

EFFECTIVE AREA(ACRES) = 111.72 AREA-AVERAGED Fm(INCH/HR) = 0.38

AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.637

PEAK FLOW RATE(CFS) = 46.94

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	46.94	27.55	0.796	0.60(0.38)	0.64	111.7	3.00
2	46.40	28.47	0.779	0.60(0.38)	0.64	114.6	23.00
3	45.35	29.72	0.758	0.60(0.38)	0.64	117.7	16.00
4	44.23	30.85	0.740	0.60(0.38)	0.64	120.2	13.00
5	43.22	31.76	0.726	0.60(0.38)	0.64	121.8	19.00
6	42.50	32.29	0.718	0.61(0.38)	0.64	122.4	10.00
7	38.66	34.97	0.682	0.61(0.39)	0.63	124.0	7.00
8	36.14	36.66	0.661	0.61(0.39)	0.63	124.5	1.00
=========	======	======		:======:	=====	========	========

END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0217HEB2.DAT

TIME/DATE OF STUDY: 11:58 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4800

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPER	FLOW ANI	STREET	rflow	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	-GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	===========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
=== 1 2	32.0 18.0	10.0 5.5	0.015/0.019/0.020 0.015/0.026/0.020	0.67 0.67				0.0150 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 687.00

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area B Page **1** of **7**

```
ELEVATION DATA: UPSTREAM(FEET) = 1339.70 DOWNSTREAM(FEET) = 1328.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.395
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.602
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
                                    Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                      B 1.89 0.75
                                             0.100 56 9.40
 COMMERCIAL
 AGRICULTURAL FAIR COVER
                              0.67 0.63
 "ORCHARDS"
                      В
                                             1.000 65 21.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.336
 SUBAREA RUNOFF(CFS) = 3.18
 TOTAL AREA(ACRES) = 2.56 PEAK FLOW RATE(CFS) =
*********************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1328.20
 DOWNSTREAM NODE ELEVATION(FEET) = 1316.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 656.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.403
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                              αA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL
                      В
                              1.18 0.75
                                             0.100
 NATURAL POOR COVER
                              4.29 0.27
 "BARREN"
                      В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.806
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.15
 AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 2.12 Tc(MIN.) = 11.52
 SUBAREA AREA(ACRES) = 5.47 SUBAREA RUNOFF(CFS) = 5.78 EFFECTIVE AREA(ACRES) = 8.03 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.35 AREA-AVERAGED Ap = 0.66
 TOTAL AREA(ACRES) = 8.0 PEAK FLOW RATE(CFS) = 8.50
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH
       IN A FLOWING-FULL GUTTER (NORMAL DEPTH = GUTTER HIKE)
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 5.15 DEPTH*VELOCITY(FT*FT/SEC) = 4.12
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1343.00 FEET.
******************
```

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area B Page **2** of **7**

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area B Page 3 of 7

```
AREA-AVERAGED Fp(INCH/HR) = 0.53
 AREA-AVERAGED Ap = 0.76
 EFFECTIVE STREAM AREA(ACRES) = 20.63
 TOTAL STREAM AREA(ACRES) = 20.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.88
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE
                                    5.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 607.00
 ELEVATION DATA: UPSTREAM(FEET) = 1337.20 DOWNSTREAM(FEET) = 1326.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.062
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.362
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fp Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.85 0.75
                                           0.600 56 12.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.16
 TOTAL AREA(ACRES) = 3.85 PEAK FLOW RATE(CFS) = 3.16
******************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1326.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 674.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.55
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) = 6.70
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.02
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.96
 STREET FLOW TRAVEL TIME(MIN.) = 3.72 Tc(MIN.) = 15.79
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.143
 SUBAREA LOSS RATE DATA(AMC II):
```

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area B Page **4** of **7**

```
DEVELOPMENT TYPE/ SCS SOIL AREA
                                        Fp
                       GROUP (ACRES) (INCH/HR) (DECIMAL) CN
      LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                  4.42 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 4.42 SUBAREA RUNOFF(CFS) = 2.76
 EFFECTIVE AREA(ACRES) = 8.27 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.3 PEAK FLOW RATE(CFS) = 5.17
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33 HALFSTREET FLOOD WIDTH(FEET) = 7.15
 FLOW VELOCITY(FEET/SEC.) = 3.10 DEPTH*VELOCITY(FT*FT/SEC.) = 1.02
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1281.00 FEET.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.79
 RAINFALL INTENSITY(INCH/HR) = 1.14
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.27
 TOTAL STREAM AREA(ACRES) = 8.27
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.17
 ** CONFLUENCE DATA **
                                             Ap Ae HEADWATER
  STREAM Q Tc Intensity Fp(Fm)
          (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

12.88 16.84 1.096 0.53(0.40) 0.76 20.6 1.00

5.17 15.79 1.143 0.75(0.45) 0.60 8.3 4.00
  NUMBER
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

    18.05
    15.79
    1.143
    0.59( 0.42) 0.71
    27.6
    4.00

    17.70
    16.84
    1.096
    0.58( 0.42) 0.71
    28.9
    1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 18.05 Tc(MIN.) = 15.79
 EFFECTIVE AREA(ACRES) = 27.61 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.71
 TOTAL AREA(ACRES) = 28.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1953.00 FEET.
```

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA< >>>>(STREET TABLE SECTION # 3 USED) << << ______ UPSTREAM ELEVATION(FEET) = 1314.40 DOWNSTREAM ELEVATION(FEET) = 1313.90 STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 20.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250 **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 18.13 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 20.00 AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.78 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.08 STREET FLOW TRAVEL TIME(MIN.) = 2.24 Tc(MIN.) = 18.03 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.049 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fρ LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL В "3-4 DWELLINGS/ACRE" 0.30 0.75 0.600 56 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600 SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 0.16 EFFECTIVE AREA(ACRES) = 27.91 AREA-AVERAGED Fm(INCH/HR) = 0.42 AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.71TOTAL AREA(ACRES) = 29.2 PEAK FLOW RATE(CFS) = 18.05 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 20.00 FLOW VELOCITY(FEET/SEC.) = 1.77 DEPTH*VELOCITY(FT*FT/SEC.) = 1.07 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 2193.00 FEET. ______ END OF STUDY SUMMARY: TOTAL AREA(ACRES) = 29.2 TC(MIN.) = 18.03 EFFECTIVE AREA(ACRES) = 27.91 AREA-AVERAGED Fm(INCH/HR) = 0.42 AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.710 PEAK FLOW RATE(CFS) = 18.05 ** PEAK FLOW RATE TABLE ** STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
 18.05
 18.03
 1.049
 0.59(0.42) 0.71
 27.9

 17.70
 19.11
 1.010
 0.58(0.42) 0.71
 29.2
 1 4.00 2 1.00

> Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area B Page **6** of **7**

END OF RATIONAL METHOD ANALYSIS

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Redlands, CA 92373
(909) 793-2257

FILE NAME: 0217HEC2.DAT

TIME/DATE OF STUDY: 11:58 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4800

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 973.00

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area C

```
ELEVATION DATA: UPSTREAM(FEET) = 1315.60 DOWNSTREAM(FEET) = 1311.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 32.294
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.718
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
                                     Fp Ap SCS
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                          Tc
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 AGRICULTURAL FAIR COVER
                       В
                               5.50 0.63 1.000 65 32.29
 "ORCHARDS"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 0.44
TOTAL AREA(ACRES) = 5.50 PEAK FLOW RATE(CFS) = 0.44
************************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1311.00
 DOWNSTREAM NODE ELEVATION(FEET) = 1289.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1386.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.500
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.639
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Ар
                                                      SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 AGRICULTURAL POOR COVER
                       в 19.03 0.50
                                              1.000
 "ORCHARDS"
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                             12.26 0.63
                                                      65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.55
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.67
 AVERAGE FLOW DEPTH(FEET) = 0.50 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 6.30 Tc(MIN.) = 38.59
 SUBAREA AREA(ACRES) = 31.29 SUBAREA RUNOFF(CFS) = 2.46
EFFECTIVE AREA(ACRES) = 36.79 AREA-AVERAGED Fm(INCH/HR) = 0.56
 AREA-AVERAGED Fp(INCH/HR) = 0.56 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 36.8 PEAK FLOW RATE(CFS) = 2.50
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH
       IN A FLOWING-FULL GUTTER (NORMAL DEPTH = GUTTER HIKE)
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 0.50 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 3.67 DEPTH*VELOCITY(FT*FT/SEC) = 1.83
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 2359.00 FEET.
```

Tract No. 20257 – Griffin Residential III Existing 2-year Hydrology – Area C Page **2** of **3**

```
FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1289.00 DOWNSTREAM ELEVATION(FEET) = 1280.50
 STREET LENGTH(FEET) = 566.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.76
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.33
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.67
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 3.54 Tc(MIN.) = 42.13
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.604
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                            Аp
                                                   SCS
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
                     в 15.22
                                     0.27
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.22 SUBAREA RUNOFF(CFS) = 4.55
 EFFECTIVE AREA(ACRES) = 52.01 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.48 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 52.0 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.35 HALFSTREET FLOOD WIDTH(FEET) = 9.08
 FLOW VELOCITY(FEET/SEC.) = 2.81 DEPTH*VELOCITY(FT*FT/SEC.) = 0.97
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 2925.00 FEET.
______
 END OF STUDY SUMMARY:
 AREA-AVERAGED Fp(INCH/HR) = 0.48 AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS) = 5.88
______
______
```

END OF RATIONAL METHOD ANALYSIS

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

EXISTING HYDROLOGY 10-YEAR RUNOFF



Tract 20257 JN 10217

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HEAT.DAT

TIME/DATE OF STUDY: 10:27 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7490

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00

```
ELEVATION DATA: UPSTREAM(FEET) = 1370.50 DOWNSTREAM(FEET) = 1359.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.987
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.402
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp Ap SCS Tc
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                                               0.200 56 9.99
                              0.50 0.75
 APARTMENTS
                        В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 1.01
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 1.01
******************
 FLOW PROCESS FROM NODE 2.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1359.20 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 1264.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.17
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.36
   HALFSTREET FLOOD WIDTH(FEET) = 8.46
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.90
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.69
 STREET FLOW TRAVEL TIME(MIN.) = 11.09 Tc(MIN.) = 21.08
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.478
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 6.39 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 6.39 SUBAREA RUNOFF(CFS) = 5.92 
EFFECTIVE AREA(ACRES) = 6.89 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 6.52
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41 HALFSTREET FLOOD WIDTH(FEET) = 10.31
 FLOW VELOCITY(FEET/SEC.) = 2.11 DEPTH*VELOCITY(FT*FT/SEC.) = 0.87
                   Tract No. 20257 - Griffin Residential III
```

Existing 10-year Hydrology – Area A

Page **2** of **26**

Tract No. 20257 – Griffin Residential III Existing 10-year Hydrology – Area A Page **3** of **26**

```
В
                                1.41
                                        0.75
 "3-4 DWELLINGS/ACRE"
                                                0.600
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.243
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.28
 AVERAGE FLOW DEPTH(FEET) = 0.90 TRAVEL TIME(MIN.) = 2.85
 Tc(MIN.) =
           13.26
 SUBAREA AREA(ACRES) = 13.11 SUBAREA RUNOFF(CFS) = 21.43

EFFECTIVE AREA(ACRES) = 16.75 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 27.49
 GIVEN CHANNEL BASE(FEET) = 2.00 CHANNEL FREEBOARD(FEET) = 1.0
 "Z" FACTOR = 2.000 MANNING'S FACTOR = 0.015
 *ESTIMATED CHANNEL HEIGHT(FEET) = 2.10
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 1.10 FLOW VELOCITY(FEET/SEC.) = 5.92
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1505.00 FEET.
********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1353.90 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 163.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.62
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.53
   HALFSTREET FLOOD WIDTH(FEET) = 18.91
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.89
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.05
 STREET FLOW TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 13.96
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.933
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
                                                        SCS
                                                 Дp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                1.69 0.75
                                                        56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.69 SUBAREA RUNOFF(CFS) = 2.26
 EFFECTIVE AREA(ACRES) = 18.44 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.27
```

Tract No. 20257 – Griffin Residential III Existing 10-year Hydrology – Area A Page **4** of **26** END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.53 HALFSTREET FLOOD WIDTH(FEET) = 18.99

FLOW VELOCITY(FEET/SEC.) = 3.88 DEPTH*VELOCITY(FT*FT/SEC.) = 2.05 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 6.00 = 1668.00 FEET.

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1

._____

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <---

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 13.96

RAINFALL INTENSITY(INCH/HR) = 1.93

AREA-AVERAGED fm(INCH/HR) = 0.20

AREA-AVERAGED Fp(INCH/HR) = 0.75

AREA-AVERAGED Ap = 0.27

EFFECTIVE STREAM AREA(ACRES) = 18.44

TOTAL STREAM AREA(ACRES) = 18.44

PEAK FLOW RATE(CFS) AT CONFLUENCE = 28.76

** CONFLUENCE DATA **

STREAM	Q	Tc	Intensity	Fp(Fm) Ap		Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	6.52	21.08	1.478	0.75(0.43)	0.57	6.9	1.00
2	28.76	13.96	1.933	0.75(0.20)	0.27	18.4	3.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	34.94	13.96	1.933	0.75(0.24)	0.33	23.0	3.00
2	27.73	21.08	1.478	0.75(0.26)	0.35	25.3	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 34.94 Tc(MIN.) = 13.96

EFFECTIVE AREA(ACRES) = 23.00 AREA-AVERAGED Fm(INCH/HR) = 0.24

AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.33

TOTAL AREA(ACRES) = 25.3

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1944.00 FEET.

FLOW PROCESS FROM NODE 6.00 TO NODE 9.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<

>>>>(STREET TABLE SECTION # 1 USED) << <<

UPSTREAM ELEVATION(FEET) = 1351.60 DOWNSTREAM ELEVATION(FEET) = 1346.00 STREET LENGTH(FEET) = 312.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

Tract No. 20257 – Griffin Residential III Existing 10-year Hydrology – Area A Page **5** of **26**

```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.13
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.55
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.48
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.45
 STREET FLOW TRAVEL TIME(MIN.) = 1.16 Tc(MIN.) = 15.12
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.835
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Дp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.91 0.75 0.600
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.91 SUBAREA RUNOFF(CFS) = 2.38
 EFFECTIVE AREA(ACRES) = 24.91 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 35.30
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.54 HALFSTREET FLOOD WIDTH(FEET) = 19.62
 FLOW VELOCITY(FEET/SEC.) = 4.48 DEPTH*VELOCITY(FT*FT/SEC.) = 2.43
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE 9.00 = 2256.00 FEET.
******************
 FLOW PROCESS FROM NODE
                     9.00 TO NODE
                                     9.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.12
 RAINFALL INTENSITY(INCH/HR) = 1.84
 AREA-AVERAGED fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 27.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE
                     7.00 TO NODE
                                   8.00 \text{ IS CODE} = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 967.00
 ELEVATION DATA: UPSTREAM(FEET) = 1360.40 DOWNSTREAM(FEET) = 1348.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.578
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.799
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fр
                                                Ар
                                                      SCS Tc
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               2.84 0.75 0.600 56 15.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.45
 TOTAL AREA(ACRES) =
                     2.84 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1348.70 DOWNSTREAM ELEVATION(FEET) = 1346.00
 STREET LENGTH(FEET) = 654.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.17
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.43
   HALFSTREET FLOOD WIDTH(FEET) = 10.92
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.80
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.77
 STREET FLOW TRAVEL TIME(MIN.) = 6.04 Tc(MIN.) = 21.62
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.454
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fρ
                                                qД
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                            5.96
                                               0.600 56
                                       0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.96 SUBAREA RUNOFF(CFS) = 5.39
 EFFECTIVE AREA(ACRES) = 8.80 AREA-AVERAGED Fm(INCH/HR) = 0.45
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.8 PEAK FLOW RATE(CFS) = 7.96
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.46 HALFSTREET FLOOD WIDTH(FEET) = 12.19
  FLOW VELOCITY(FEET/SEC.) = 1.91 DEPTH*VELOCITY(FT*FT/SEC.) = 0.88
  LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 1621.00 FEET.
******************
  FLOW PROCESS FROM NODE 9.00 TO NODE
                                                      9.00 IS CODE =
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 21.62
  RAINFALL INTENSITY(INCH/HR) = 1.45
  AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.80
  TOTAL STREAM AREA(ACRES) = 8.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.96
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        35.30
        15.12
        1.835
        0.75(0.26)
        0.35
        24.9
        3.00

        1
        28.20
        22.31
        1.425
        0.75(0.27)
        0.37
        27.2
        1.00

        2
        7.96
        21.62
        1.454
        0.75(0.45)
        0.60
        8.8
        7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

      NUMBER
      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      1
      42.98
      15.12
      1.835
      0.75( 0.30) 0.40
      31.1
      3.00

      2
      36.84
      21.62
      1.454
      0.75( 0.32) 0.42
      35.8
      7.00

      3
      35.93
      22.31
      1.425
      0.75( 0.32) 0.42
      36.0
      1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 42.98 Tc(MIN.) = 15.12 EFFECTIVE AREA(ACRES) = 31.06 AREA-AVERAGED Fm(INCH/HR) = 0.30
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.40
  TOTAL AREA(ACRES) = 36.0
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
************************
  FLOW PROCESS FROM NODE 9.00 TO NODE 12.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1346.00 DOWNSTREAM ELEVATION(FEET) = 1339.80
  STREET LENGTH(FEET) = 344.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
```

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```
INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 43.84
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.58
   HALFSTREET FLOOD WIDTH(FEET) = 21.41
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.70
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.71
 STREET FLOW TRAVEL TIME(MIN.) = 1.22 Tc(MIN.) = 16.34
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.745
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                  SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.49 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.49 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 32.55 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 42.98
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 21.18
 FLOW VELOCITY(FEET/SEC.) = 4.71 DEPTH*VELOCITY(FT*FT/SEC.) = 2.69
 LONGEST FLOWPATH FROM NODE
                          1.00 TO NODE 12.00 = 2600.00 FEET.
******************
 FLOW PROCESS FROM NODE
                     12.00 TO NODE
                                   12.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.34
 RAINFALL INTENSITY(INCH/HR) = 1.74
 AREA-AVERAGED fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 37.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE
                    10.00 TO NODE
                                   11.00 IS CODE = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 503.00
 ELEVATION DATA: UPSTREAM(FEET) = 1355.40 DOWNSTREAM(FEET) = 1347.10
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.273
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.221
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
                                                Дp
                                                     SCS
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.74 0.75 0.600 56 11.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.18
 TOTAL AREA(ACRES) = 0.74 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1347.10 DOWNSTREAM ELEVATION(FEET) = 1339.80
 STREET LENGTH(FEET) = 1135.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.92
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.40
   HALFSTREET FLOOD WIDTH(FEET) = 9.73
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.12
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.84
 STREET FLOW TRAVEL TIME(MIN.) = 8.92 Tc(MIN.) = 20.19
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.520
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fρ
                                               Дp
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                              9.49
                                              0.600 56
                                       0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 9.49 SUBAREA RUNOFF(CFS) = 9.15
 EFFECTIVE AREA(ACRES) = 10.23 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 10.2 PEAK FLOW RATE(CFS) = 9.87
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.46 HALFSTREET FLOOD WIDTH(FEET) = 12.15
 FLOW VELOCITY(FEET/SEC.) = 2.38 DEPTH*VELOCITY(FT*FT/SEC.) = 1.09
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1638.00 FEET.
******************
                           12.00 TO NODE
 FLOW PROCESS FROM NODE
                                             12.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.19
 RAINFALL INTENSITY(INCH/HR) = 1.52
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 10.23
 TOTAL STREAM AREA(ACRES) = 10.23
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.87
 ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 42.98 16.34 1.745 0.75(0.30) 0.41 32.6 3.00

1 36.84 22.88 1.402 0.75(0.32) 0.43 37.3 7.00

1 35.93 23.58 1.374 0.75(0.32) 0.43 37.5 1.00

2 9.87 20.19 1.520 0.75(0.45) 0.60 10.2 10.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 52.63 16.34 1.745 0.75(0.33) 0.45 40.8 3.00
2 49.23 20.19 1.520 0.75(0.34) 0.46 45.6 10.00
3 45.61 22.88 1.402 0.75(0.35) 0.47 47.5 7.00
4 44.45 23.58 1.374 0.75(0.35) 0.47 47.8 1.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 52.63 Tc(MIN.) = 16.34
 EFFECTIVE AREA(ACRES) = 40.83 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 47.8
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 2600.00 FEET.
************************
 FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1339.80 DOWNSTREAM ELEVATION(FEET) = 1334.40
 STREET LENGTH(FEET) = 301.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 53.06
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.61
   HALFSTREET FLOOD WIDTH(FEET) = 23.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.91
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.00
 STREET FLOW TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 17.36
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.677
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACKE
AGRICULTURAL FAIR COVER
 "3-4 DWELLINGS/ACRE" B 0.29 0.75 0.600 56
                               0.58 0.63
                                               1.000 65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.867
 SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 0.87 EFFECTIVE AREA(ACRES) = 41.70 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.46
 TOTAL AREA(ACRES) = 48.6 PEAK FLOW RATE(CFS) = 52.63
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 23.37
 FLOW VELOCITY(FEET/SEC.) = 4.90 DEPTH*VELOCITY(FT*FT/SEC.) = 2.98
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
******************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.36
 RAINFALL INTENSITY(INCH/HR) = 1.68
 AREA-AVERAGED fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.46
 EFFECTIVE STREAM AREA(ACRES) = 41.70
 TOTAL STREAM AREA(ACRES) = 48.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 52.63
********************
 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 21
```

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```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 715.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1341.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.955
   10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.933
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                     SCS
                                       Fρ
                                               Ар
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               2.36
                                        0.75
                                              0.600 56 13.95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.15
 TOTAL AREA(ACRES) = 2.36 PEAK FLOW RATE(CFS) =
*******************
                        14.00 TO NODE
 FLOW PROCESS FROM NODE
                                       15.00 \text{ IS CODE} = 62
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1341.30 DOWNSTREAM ELEVATION(FEET) = 1334.40
 STREET LENGTH(FEET) = 897.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
                                                 5.90
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 9.36
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.26
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.88
 STREET FLOW TRAVEL TIME(MIN.) = 6.61 Tc(MIN.) = 20.56
   10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.502
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fρ
                                                      SCS
                                                Αр
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                               5.74
                                       0.75
                                              0.600
                                                      56
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.74 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 8.10 AREA-AVERAGED Fm(INCH/HR) = 0.45
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) =
                                                                    7.68
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.42 HALFSTREET FLOOD WIDTH(FEET) = 10.51
 FLOW VELOCITY(FEET/SEC.) = 2.40 DEPTH*VELOCITY(FT*FT/SEC.) = 1.00
 LONGEST FLOWPATH FROM NODE 13.00 TO NODE 15.00 = 1612.00 FEET.
*******************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.56
 RAINFALL INTENSITY(INCH/HR) = 1.50
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.10
 TOTAL STREAM AREA(ACRES) = 8.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                           7.68
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 52.63 17.36 1.677 0.74(0.34) 0.46 41.7 3.00
1 49.23 21.23 1.472 0.74(0.35) 0.47 46.5 10.00
1 45.61 23.94 1.361 0.75(0.35) 0.47 48.4 7.00
1 44.45 24.64 1.336 0.75(0.35) 0.47 48.6 1.00
2 7.68 20.56 1.502 0.75(0.45) 0.60 8.1 13.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 60.19 17.36 1.677 0.75(0.35) 0.48 48.5 3.00
2 57.49 20.56 1.502 0.75(0.36) 0.49 53.7 13.00
3 56.68 21.23 1.472 0.75(0.36) 0.49 54.6 10.00
4 52.26 23.94 1.361 0.75(0.37) 0.49 56.5 7.00
5 50.92 24.64 1.336 0.75(0.37) 0.49 56.7 1.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 60.19 Tc(MIN.) = 17.36
 EFFECTIVE AREA(ACRES) = 48.54 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.48
 TOTAL AREA(ACRES) = 56.7
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
***********************
 FLOW PROCESS FROM NODE 15.00 TO NODE 18.00 IS CODE = 62
______
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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1334.40 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 686.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 63.12
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.66
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.67
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
                                       3.10
 STREET FLOW TRAVEL TIME(MIN.) = 2.45 Tc(MIN.) = 19.81
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.539
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                     SCS
                                               Ар
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN B 0.76 0.75 0.100 56
 COMMERCIAL
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.23 0.75 0.600 56
 "3-4 DWELLINGS/FOLL
AGRICULTURAL POOR COVER

B 2.87 0.50
                                              1.000 73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.731
 SUBAREA AREA(ACRES) = 5.86 SUBAREA RUNOFF(CFS) = 5.87
 EFFECTIVE AREA(ACRES) = 54.40 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 62.6 PEAK FLOW RATE(CFS) = 60.19
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 26.41
 FLOW VELOCITY(FEET/SEC.) = 4.62 DEPTH*VELOCITY(FT*FT/SEC.) = 3.02
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET.
*********************
 FLOW PROCESS FROM NODE 18.00 TO NODE 18.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 19.81
 RAINFALL INTENSITY(INCH/HR) = 1.54
 AREA-AVERAGED fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.72
```

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```
AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 54.40
 TOTAL STREAM AREA(ACRES) = 62.59
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 60.19
************************
 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 984.00
 ELEVATION DATA: UPSTREAM(FEET) = 1343.50 DOWNSTREAM(FEET) = 1333.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.343
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.744
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                  SCS Tc
                                    Fρ
                                             Дp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              3.22
                                     0.75
                                            0.600 56 16.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.75
TOTAL AREA(ACRES) = 3.22 PEAK FLOW RATE(CFS) = 3.75
********************
 FLOW PROCESS FROM NODE
                      17.00 TO NODE
                                     18.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <>>>
______
 UPSTREAM ELEVATION(FEET) = 1333.80 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 923.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.08
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
   HALFSTREET FLOOD WIDTH(FEET) = 8.91
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.95
 STREET FLOW TRAVEL TIME(MIN.) = 6.06 Tc(MIN.) = 22.41
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.421
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Ap SCS
```

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LAND RESIDENTIA	USE L	G	ROUP (A	CRES)	(INCH	/HR)	(DECIMAL)	CN
	INGS/ACRE"		В	3.97	0	.75	0.600	56
"BARREN"			В	1.12	0	. 27	1.000	86
SUBAREA AV	ERAGE PERVI	OUS L	OSS RATE,	Fp(INC	CH/HR)	= 0.0		
SUBAREA AV				_			\	62
EFFECTIVE .	EA(ACRES) - NDFN(NCDFC)	- S	ν.υθ . Ω 21	ADAKEA - KUDK	- VALLOY - VALLOY	TED Em	/ - 4.(/ TNCU /UD)	- 0 42
AREA-AVERA	GED Fr/INCL	1/HR)	= 0.65	78-878 78-8788	AVERACEI	λυ =	0 65	- 0.42
TOTAL AREA								7.45
END OF SUB								
DEPTH (FEET								
FLOW VELOC								
LONGEST FL	OWPATH FROM	I NODE	16.0	O TO NO	ODE	18.00	0 = 190	07.00 FEET.

FLOW PROCE								т
>>>>DESIG								
>>>>AND C								
=========								========
TOTAL NUMB	ER OF STREA	AMS =	2					
CONFLUENCE				ENT STE	REAM 2	2 ARE:		
TIME OF CO	NCENTRATION	J(MIN.) = 22.	41				
RAINFALL I								
AREA-AVERA								
AREA-AVERA								
AREA-AVERA	_							
EFFECTIVE	STREAM AREA	A(ACRE	IS) =	8.31				
TOTAL STRE	AM AREA(ACF	RES) =	8.	31				
PEAK FLOW	RATE(CFS) A	AT CON	FLUENCE =		7.45			
	NCE DATA **							
	Q							
	(CFS) (N							
1	60.19 1	9.81	1.539	0.72(0.36)	0.50	54.4	3.00
7								
1	57.49 2	23.04	1.395	0.72(0.37)	0.51	59.6	13.00
1	57.49 2 56.68 2	23.71	1.370	0.72(0.72(0.37) 0.37)	0.51 0.51	59.6 60.4	13.00 10.00
1 1	57.49 2 56.68 2 52.26 2	23.71 26.47	1.370 1.275	0.72(0.72(0.72(0.37) 0.37) 0.37)	0.51 0.51 0.51	59.6 60.4 62.4	13.00 10.00 7.00
1 1 1	57.49 2 56.68 2 52.26 2 50.92 2	23.71 26.47 27.17	1.370 1.275 1.253	0.72(0.72(0.72(0.72(0.37) 0.37) 0.37) 0.37)	0.51 0.51 0.51 0.51	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00
1 1	57.49 2 56.68 2 52.26 2 50.92 2	23.71 26.47	1.370 1.275 1.253	0.72(0.72(0.72(0.72(0.37) 0.37) 0.37) 0.37)	0.51 0.51 0.51 0.51	59.6 60.4 62.4	13.00 10.00 7.00 1.00
1 1 1 2	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2	23.71 26.47 27.17 22.41	1.370 1.275 1.253 1.421	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00
1 1 2 RAINFALL II	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2	23.71 26.47 27.17 22.41 ND TIM	1.370 1.275 1.253 1.421	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00
1 1 1 2	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2	23.71 26.47 27.17 22.41 ND TIM	1.370 1.275 1.253 1.421	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00
1 1 2 RAINFALL II CONFLUENCE	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN	23.71 26.47 27.17 22.41 JD TIM SED FO	1.370 1.275 1.253 1.421 IE OF CONCE	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FL	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US	23.71 26.47 27.17 22.41 ND TIM SED FO	1.370 1.275 1.253 1.421 IE OF CONCI	0.72(0.72(0.72(0.72(0.65(ENTRAT)	0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6 8.3	13.00 10.00 7.00 1.00 16.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US	23.71 26.47 27.17 22.41 ND TIM SED FO 3LE **	1.370 1.275 1.253 1.421 E OF CONC OR 2 STREA	0.72(0.72(0.72(0.72(0.65(ENTRAT) AMS.	0.37) 0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6 8.3	13.00 10.00 7.00 1.00 16.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAE Q (CFS) (N	23.71 26.47 27.17 22.41 JD TIM SED FO BLE ** TC	1.370 1.275 1.253 1.421 E OF CONC OR 2 STRE	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F	0.37) 0.37) 0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6 8.3	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N	23.71 26.47 27.17 22.41 ND TIM SED FO 3LE ** TC MIN.)	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREATED Intensity (INCH/HR) 1.539	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F	0.37) 0.37) 0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.51 0.51 0.65 FIO Ap 0.52	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1 2	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2	23.71 26.47 27.17 22.41 ND TIM SED FO BLE ** TC MIN.) 19.81 22.41	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREAT (INCH/HR) 1.539 1.421	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F (INCH/ 0.71(0.71(0.37) 0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1 2 3	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2 64.75 2	23.71 26.47 27.17 22.41 ND TIM SED FO BLE ** TC MIN.) -9.81 22.41 23.04	1.370 1.275 1.253 1.421 IE OF CONCI OR 2 STREAT Intensity (INCH/HR) 1.539 1.421 1.395	0.72(0.72(0.72(0.72(0.65(ENTRAT) AMS. Fp(F (INCH) 0.71(0.71(0.71(0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9 67.9	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLOOR STREAM NUMBER 1 2 3 4	57.49 2 56.68 2 52.26 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2 64.75 2 63.75 2	23.71 26.47 27.17 22.41 ND TIM SED FO 3LE ** TC 4IN.) 19.81 22.41 23.04 23.71	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREA (INCH/HR) 1.539 1.421 1.395 1.370	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F (INCH/ 0.71(0.71(0.71(0.71(0.37) 0.37) 0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53 0.53 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9 67.9 68.7	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00 10.00
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1 2 3	57.49 2 56.68 2 52.26 2 7.45 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2 64.75 2 63.75 2 58.62 2	23.71 26.47 27.17 22.41 ND TIM SED FO BLE ** TC MIN.) 9.81 22.41 23.04 23.71	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREA (INCH/HR) 1.539 1.421 1.395 1.370	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F (INCH/ 0.71(0.71(0.71(0.71(0.71(0.37) 0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53 0.53 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9 67.9 68.7 70.7	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00 10.00

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 67.56 Tc(MIN.) = 19.81
 EFFECTIVE AREA(ACRES) = 61.74 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.71 AREA-AVERAGED Ap = 0.52
 TOTAL AREA(ACRES) = 70.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET.
************************
 FLOW PROCESS FROM NODE 18.00 TO NODE 22.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1324.40 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 68.92
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.64
   HALFSTREET FLOOD WIDTH(FEET) = 25.40
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.63
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.60
 STREET FLOW TRAVEL TIME(MIN.) = 1.04 Tc(MIN.) = 20.84
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.489
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Ap SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
                       В
                              2.48 0.27
 "BARREN"
                                              1.000
                                                     86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 2.48 SUBAREA RUNOFF(CFS) = 2.72
 EFFECTIVE AREA(ACRES) = 64.22 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.68 AREA-AVERAGED Ap = 0.54
 TOTAL AREA(ACRES) = 73.4 PEAK FLOW RATE(CFS) = 67.56
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 25.16
 FLOW VELOCITY(FEET/SEC.) = 5.60 DEPTH*VELOCITY(FT*FT/SEC.) = 3.56
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET.
**********************
 FLOW PROCESS FROM NODE
                      22.00 TO NODE
                                     22.00 \text{ IS CODE} = 1
```

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```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.84
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.68
 AREA-AVERAGED Ap = 0.54
 EFFECTIVE STREAM AREA(ACRES) = 64.22
 TOTAL STREAM AREA(ACRES) = 73.38
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 67.56
FLOW PROCESS FROM NODE
                    19.00 TO NODE
                                   20.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1059.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1329.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.838
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.857
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fρ
                                           Αp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                            0.78 0.75
                                          0.600 56 14.84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.99
 TOTAL AREA(ACRES) =
                   0.78 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1329.90 DOWNSTREAM ELEVATION(FEET) = 1322.90
 STREET LENGTH(FEET) = 956.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.70
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

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```
STREET FLOW DEPTH(FEET) = 0.43
   HALFSTREET FLOOD WIDTH(FEET) = 11.21
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.43
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.06
 STREET FLOW TRAVEL TIME(MIN.) = 6.57 Tc(MIN.) = 21.40
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.464
 SUBAREA LOSS RATE DATA(AMC II):
                                                Аp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 14.50 0.75 0.600 56
 NATURAL POOR COVER
                       B 1.79 0.27 1.000 86
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.67
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.644
 SUBAREA AREA(ACRES) = 16.29 SUBAREA RUNOFF(CFS) = 15.16
 EFFECTIVE AREA(ACRES) = 17.07 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.67 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 17.1 PEAK FLOW RATE(CFS) = 15.88
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 16.15
 FLOW VELOCITY(FEET/SEC.) = 2.67 DEPTH*VELOCITY(FT*FT/SEC.) = 1.40
 LONGEST FLOWPATH FROM NODE 19.00 TO NODE 21.00 = 2015.00 FEET.
********************
 FLOW PROCESS FROM NODE 21.00 TO NODE
                                     22.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1322.90 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 615.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.93
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) = 16.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.01
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.46
 STREET FLOW TRAVEL TIME(MIN.) = 3.41 Tc(MIN.) = 24.82
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.330
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
```

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SUBAREA AVI SUBAREA ARI SUBAREA ARI EFFECTIVE A	ERAGE PERV ERAGE PERV EA(ACRES) AREA(ACRES	VIOUS LOVIOUS AND	OSS RATE, REA FRACTI .22	2.22 0 Fp(INCH/HR) ION, Ap = 1 SUBAREA RUNO AREA-AVERA AREA-AVERAGE PEAK FLOW	= 0.2 .000 FF(CFS) GED Fm(27) = 2.1 (INCH/HR) 0.68	11 = 0.41
FLOW VELOC) = 0.48 ITY(FEET/S	HALFS'	TREET FLOO 2.97 I	CS: DD WIDTH(FEE DEPTH*VELOCI) TO NODE	TY(FT*I	FT/SEC.) =	
********				**************************************			
				NODE 22			
	OMPUTE VAI	RIOUS C	ONFLUENCEI	OR CONFLUENC O STREAM VAL	UES<<<	<<	
TIME OF COI RAINFALL II AREA-AVERAG AREA-AVERAG EFFECTIVE S TOTAL STRES PEAK FLOW I ** CONFLUEN STREAM NUMBER 1 1 1 1 1 2 RAINFALL II CONFLUENCE	VALUES US NCENTRATION TENSITY (I) GED Fm (INC) GED AP = STREAM ARE AM AREA (AC) RATE (CFS) NCE DATA Q (CFS) 67.56 65.47 64.75 63.75 58.62 57.11 15.93 NTENSITY AF FORMULA I	SED FOR ON (MIN. INCH/HR) (CH/HR) (CH/	INDEPENDE) = 24.8) = 1.33 = 0.41 = 0.60 S) = 19.2 FLUENCE = Intensity (INCH/HR) 1.489 1.379 1.356 1.332 1.243 1.222 1.330 E OF CONCE	19.29 15.93 Fp(Fm) (INCH/HR) 0.68(0.37) 0.68(0.37) 0.68(0.37) 0.68(0.37) 0.69(0.38) 0.69(0.38) 0.60(0.41) ENTRATION RA	Ap 0.54 0.54 0.55 0.55 0.68	(ACRES) 64.2 69.4 70.4 71.2 73.2 73.4	NODE 3.00 16.00 13.00 10.00 7.00 1.00
** PEAK FLO STREAM NUMBER 1 2 3 4 5 6 7	Q (CFS) 83.26	Tc	(INCH/HR) 1.489 1.379 1.356 1.332 1.330	Fp(Fm) (INCH/HR) 0.66(0.38) 0.66(0.38) 0.66(0.38) 0.66(0.38) 0.67(0.38)	0.57 0.57 0.57 0.57 0.57 0.58	89.1 90.4 90.5 92.4	3.00 16.00 13.00 10.00 19.00 7.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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```
PEAK FLOW RATE(CFS) = 83.26 Tc(MIN.) = 20.84
EFFECTIVE AREA(ACRES) = 80.42 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.66 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 92.7
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET.
******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.60 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1041.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 90.39
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.72
   HALFSTREET FLOOD WIDTH(FEET) = 33.32
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.37
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.86
 STREET FLOW TRAVEL TIME(MIN.) = 3.23 Tc(MIN.) = 24.07
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.356
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
                      B 12.11 0.27 1.000 86
 "BARREN"
 AGRICULTURAL POOR COVER
                      в 3.18 0.50
 "ORCHARDS"
                                             1.000 73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.29 SUBAREA RUNOFF(CFS) = 14.26
 EFFECTIVE AREA(ACRES) = 95.71 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 108.0 PEAK FLOW RATE(CFS) = 85.26
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 31.95
 FLOW VELOCITY(FEET/SEC.) = 5.30 DEPTH*VELOCITY(FT*FT/SEC.) = 3.75
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
*****************
 FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
______
```

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>

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```
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =
 RAINFALL INTENSITY(INCH/HR) = 1.36
 AREA-AVERAGED fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.64
 EFFECTIVE STREAM AREA(ACRES) = 95.71
 TOTAL STREAM AREA(ACRES) = 107.96
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 85.26
************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 639.00
 ELEVATION DATA: UPSTREAM(FEET) = 1324.10 DOWNSTREAM(FEET) = 1321.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.821
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.712
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fρ
                                                 SCS Tc
                                            Ар
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.77 0.75 0.600 56 16.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.01
TOTAL AREA(ACRES) = 1.77 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE
                    24.00 TO NODE
                                   25.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1321.80 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1594.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.32
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
```

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```
HALFSTREET FLOOD WIDTH(FEET) = 8.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.15
  STREET FLOW TRAVEL TIME(MIN.) = 8.70 Tc(MIN.) = 25.53
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.305
  SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                           Ap SCS
       LAND USE
                          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 13.48 0.75 0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 13.48 SUBAREA RUNOFF(CFS) = 10.39 EFFECTIVE AREA(ACRES) = 15.25 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 11.76
 END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43 HALFSTREET FLOOD WIDTH(FEET) = 11.00
  FLOW VELOCITY(FEET/SEC.) = 3.39 DEPTH*VELOCITY(FT*FT/SEC.) = 1.46
  LONGEST FLOWPATH FROM NODE 23.00 TO NODE 25.00 = 2233.00 FEET.
******************
  FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 25.53
 RAINFALL INTENSITY(INCH/HR) = 1.31
  AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 15.25
  TOTAL STREAM AREA(ACRES) = 15.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.76
  ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 85.26 24.07 1.356 0.57(0.37) 0.64 95.7 3.00

1 83.07 26.70 1.268 0.58(0.37) 0.64 102.9 16.00

1 82.39 27.34 1.249 0.58(0.37) 0.64 104.4 13.00

1 81.49 28.02 1.229 0.59(0.37) 0.64 105.7 10.00

1 81.38 28.08 1.227 0.59(0.37) 0.64 105.8 19.00

1 75.67 30.85 1.154 0.59(0.37) 0.64 107.7 7.00

1 74.14 31.57 1.137 0.59(0.37) 0.64 108.0 1.00

2 11.76 25.53 1.305 0.75(0.45) 0.60 15.2 23.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
```

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```
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE 1 97.00 24.07 1.356 0.60(0.38) 0.63 110.1 3

      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      97.00
      24.07
      1.356
      0.60( 0.38) 0.63
      110.1
      3.00

      95.81
      25.53
      1.305
      0.60( 0.38) 0.63
      114.9
      23.00

      94.31
      26.70
      1.268
      0.60( 0.38) 0.63
      118.1
      16.00

      93.37
      27.34
      1.249
      0.60( 0.38) 0.63
      119.6
      13.00

      92.19
      28.02
      1.229
      0.60( 0.38) 0.63
      121.0
      10.00

      92.06
      28.08
      1.227
      0.60( 0.38) 0.63
      121.1
      19.00

      85.35
      30.85
      1.154
      0.61( 0.38) 0.63
      123.0
      7.00

      83.59
      31.57
      1.137
      0.61( 0.38) 0.63
      123.2
      1.00

       2 3
       4
       5
       6
       7
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 97.00 Tc(MIN.) = 24.07 EFFECTIVE AREA(ACRES) = 110.10 AREA-AVERAGED Fm(INCH/HR) = 0.38
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.63
  TOTAL AREA(ACRES) = 123.2
                                        1.00 TO NODE 25.00 = 4978.00 FEET.
  LONGEST FLOWPATH FROM NODE
******************
  FLOW PROCESS FROM NODE 25.00 TO NODE 26.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) << <<
______
  UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1291.40
  STREET LENGTH(FEET) = 405.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
  INSIDE STREET CROSSFALL(DECIMAL) = 0.015
  OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
  STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 97.39
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.73
    HALFSTREET FLOOD WIDTH(FEET) = 35.10
    AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.00
  STREET FLOW TRAVEL TIME(MIN.) = 1.24 Tc(MIN.) = 25.31
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.312
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                                SCS
                                                                      Ар
        LAND USE
                              GROUP (ACRES) (INCH/HR) (DECIMAL) CN
  AGRICULTURAL FAIR COVER

B

1.26

0.63

1.000

- 'TYGU /UD | = 0.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 1.26 SUBAREA RUNOFF(CFS) = 0.77
EFFECTIVE AREA(ACRES) = 111.36 AREA-AVERAGED Fm(INCH/HR) = 0.38
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.64
  TOTAL AREA(ACRES) = 124.5 PEAK FLOW RATE(CFS) = 97.00
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
```

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END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 124.5 TC(MIN.) = 25.31

EFFECTIVE AREA(ACRES) = 111.36 AREA-AVERAGED Fm(INCH/HR) = 0.38

AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.637

PEAK FLOW RATE(CFS) = 97.00

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	97.00	25.31	1.312	0.60(0.38)	0.64	111.4	3.00
2	95.81	26.76	1.266	0.60(0.38)	0.64	116.2	23.00
3	94.31	27.95	1.231	0.60(0.38)	0.64	119.4	16.00
4	93.37	28.58	1.213	0.60(0.38)	0.64	120.9	13.00
5	92.19	29.27	1.194	0.61(0.38)	0.64	122.2	10.00
6	92.06	29.33	1.193	0.61(0.38)	0.64	122.3	19.00
7	85.35	32.12	1.124	0.61(0.39)	0.63	124.2	7.00
8	83.59	32.84	1.108	0.61(0.39)	0.63	124.5	1.00

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HEBT.DAT

TIME/DATE OF STUDY: 10:28 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7490

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 687.00

```
ELEVATION DATA: UPSTREAM(FEET) = 1339.70 DOWNSTREAM(FEET) = 1328.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.395
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.500
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                       B 1.89 0.75
                                              0.100 56 9.40
 COMMERCIAL
 AGRICULTURAL FAIR COVER
                               0.67 0.63
 "ORCHARDS"
                       В
                                              1.000 65 21.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.336
 SUBAREA RUNOFF(CFS) = 5.25
 TOTAL AREA(ACRES) =
                     2.56 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1328.20
 DOWNSTREAM NODE ELEVATION(FEET) = 1316.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 656.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.190
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                αA
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                       В
                               1.18 0.75
                                              0.100
 NATURAL POOR COVER
                               4.29 0.27
 "BARREN"
                                                      86
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.806
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 10.08
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.15
 AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 2.12 Tc(MIN.) = 11.52
 SUBAREA AREA(ACRES) = 5.47 SUBAREA RUNOFF(CFS) = 9.65
EFFECTIVE AREA(ACRES) = 8.03 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.35 AREA-AVERAGED Ap = 0.66
 TOTAL AREA(ACRES) = 8.0 PEAK FLOW RATE(CFS) = 14.19
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
       DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 7.43 DEPTH*VELOCITY(FT*FT/SEC) = 8.92 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1343.00 FEET.
******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 6.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1316.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 610.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 21.44
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.58
   HALFSTREET FLOOD WIDTH(FEET) =
                               20.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.31
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 4.41 Tc(MIN.) = 15.93
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.774
 SUBAREA LOSS RATE DATA(AMC II):
                                     Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                Аp
                                                      SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                       B 2.46 0.75 0.100 56
 NATURAL POOR COVER
                               0.24
                                       0.27
 "BARREN"
                       В
                                               1.000
                                                       86
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                               9.90
                                       0.63
                                               1.000
                                                        65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.62
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.824
 SUBAREA AREA(ACRES) = 12.60 SUBAREA RUNOFF(CFS) = 14.28
 EFFECTIVE AREA(ACRES) = 20.63 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.53 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 20.6
                               PEAK FLOW RATE(CFS) = 25.46
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 20.00
 FLOW VELOCITY(FEET/SEC.) = 2.47 DEPTH*VELOCITY(FT*FT/SEC.) = 1.50
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE
                                            6.00 = 1953.00 \text{ FEET}.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.93
 RAINFALL INTENSITY(INCH/HR) = 1.77
 AREA-AVERAGED fm(INCH/HR) = 0.40
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.53
 AREA-AVERAGED Ap = 0.76
 EFFECTIVE STREAM AREA(ACRES) = 20.63
 TOTAL STREAM AREA(ACRES) = 20.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 25.46
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE
                                    5.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 607.00
 ELEVATION DATA: UPSTREAM(FEET) = 1337.20 DOWNSTREAM(FEET) = 1326.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.062
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.125
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.85 0.75
                                           0.600 56 12.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 5.81
 TOTAL AREA(ACRES) = 3.85 PEAK FLOW RATE(CFS) = 5.81
******************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1326.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 674.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.54
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
   HALFSTREET FLOOD WIDTH(FEET) = 9.08
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.45
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.31
 STREET FLOW TRAVEL TIME(MIN.) = 3.25 Tc(MIN.) = 15.31
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.820
 SUBAREA LOSS RATE DATA(AMC II):
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```
DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fp
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                 4.42 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 4.42 SUBAREA RUNOFF(CFS) = 5.45
 EFFECTIVE AREA(ACRES) = 8.27 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.3 PEAK FLOW RATE(CFS) = 10.20
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.40 HALFSTREET FLOOD WIDTH(FEET) = 9.81
 FLOW VELOCITY(FEET/SEC.) = 3.60 DEPTH*VELOCITY(FT*FT/SEC.) = 1.44
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1281.00 FEET.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.31
 RAINFALL INTENSITY(INCH/HR) = 1.82
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.27
 TOTAL STREAM AREA(ACRES) = 8.27
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.20
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
         (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
25.46 15.93 1.774 0.53( 0.40) 0.76 20.6 1.00
10.20 15.31 1.820 0.75( 0.45) 0.60 8.3 4.00
  NUMBER
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

    35.50
    15.31
    1.820
    0.58( 0.42) 0.71
    28.1
    4.00

    35.32
    15.93
    1.774
    0.58( 0.42) 0.71
    28.9
    1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 35.50 Tc(MIN.) = 15.31
 EFFECTIVE AREA(ACRES) = 28.11 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.58 AREA-AVERAGED Ap = 0.71
 TOTAL AREA(ACRES) = 28.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1953.00 FEET.
******************
```

```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
```

>>>>(STREET TABLE SECTION # 3 USED) << <<

UPSTREAM ELEVATION(FEET) = 1314.40 DOWNSTREAM ELEVATION(FEET) = 1313.90 STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 35.67

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.73

HALFSTREET FLOOD WIDTH(FEET) = 23.14

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.30

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.69

STREET FLOW TRAVEL TIME(MIN.) = 1.74 Tc(MIN.) = 17.05

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.697

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fρ Αр LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL

В "3-4 DWELLINGS/ACRE" 0.30 0.75 0.600 56

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600

SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 0.34

EFFECTIVE AREA(ACRES) = 28.41 AREA-AVERAGED Fm(INCH/HR) = 0.42 AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.71

TOTAL AREA(ACRES) = 29.2 PEAK FLOW RATE(CFS) = 35.50

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 23.08

FLOW VELOCITY(FEET/SEC.) = 2.30 DEPTH*VELOCITY(FT*FT/SEC.) = 1.68

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 2193.00 FEET. ______

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 29.2 TC(MIN.) = 17.05 EFFECTIVE AREA(ACRES) = 28.41 AREA-AVERAGED Fm(INCH/HR) = 0.42

AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.711

35.50 PEAK FLOW RATE(CFS) =

** PEAK FLOW RATE TABLE **

STREAM	Q	TC	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	35.50	17.05	1.697	0.59(0.42)	0.71	28.4	4.00
2	35.32	17.67	1.658	0.58(0.42)	0.71	29.2	1.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Analysis prepared by:

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FILE NAME: 0217HECT.DAT

TIME/DATE OF STUDY: 10:29 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7490

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

U	SER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	rflow	MODEL	
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING	
	WIDTH	CROSSFALL	IN- / OUT-/PARK-				HIKE	FACTOR	
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)	
===	=====	=======	==========	=====	=====	=====	=====	======	
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150	
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150	
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150	

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>DATIONAL METROD INTERNAL CUDADEN ANALYCICA....

INITIAL SUBAREA FLOW-LENGTH(FEET) = 973.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1315.60 DOWNSTREAM(FEET) = 1311.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 32.294
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.120
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                      Fp Ap SCS
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                            Tc
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 AGRICULTURAL FAIR COVER
                        В
                                5.50 0.63 1.000 65 32.29
 "ORCHARDS"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 2.43
TOTAL AREA(ACRES) = 5.50 PEAK FLOW RATE(CFS) = 2.43
************************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1311.00
 DOWNSTREAM NODE ELEVATION(FEET) = 1289.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1386.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.500
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.045
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                 Ар
                                                        SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 AGRICULTURAL POOR COVER
                       B 19.03 0.50 1.000
 "ORCHARDS"
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                        В
                               12.26 0.63
                                                        65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.55
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.29
 AVERAGE FLOW DEPTH(FEET) = 0.90 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 3.67 Tc(MIN.) = 35.97
 SUBAREA AREA(ACRES) = 31.29 SUBAREA RUNOFF(CFS) = 13.87 
EFFECTIVE AREA(ACRES) = 36.79 AREA-AVERAGED Fm(INCH/HR) = 0.56
 AREA-AVERAGED Fp(INCH/HR) = 0.56 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 36.8 PEAK FLOW RATE(CFS) = 15.92
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
       DEPTH EOUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 0.90 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 6.29 DEPTH*VELOCITY(FT*FT/SEC) = 5.66 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 2359.00 FEET.
******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1289.00 DOWNSTREAM ELEVATION(FEET) = 1280.50
 STREET LENGTH(FEET) = 566.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
                                                  20.89
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.65
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 2.59 Tc(MIN.) = 38.55
   10 YEAR RAINFALL INTENSITY(INCH/HR) = 0.998
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fρ
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
                               15.22
 "BARREN"
                                        0.27
                                                1.000
                                                       86
                        В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.22 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 52.01 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.48 AREA-AVERAGED Ap = 1.00
                   52.0
 TOTAL AREA(ACRES) =
                               PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51 HALFSTREET FLOOD WIDTH(FEET) = 18.17
 FLOW VELOCITY(FEET/SEC.) = 3.77 DEPTH*VELOCITY(FT*FT/SEC.) =
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 2925.00 FEET.
______
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 52.0 TC(MIN.) = 38.55
EFFECTIVE AREA(ACRES) = 52.01 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.48 AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS) = 24.35
______
______
```

END OF RATIONAL METHOD ANALYSIS

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

EXISTING HYDROLOGY 100-YEAR RUNOFF



Tract 20257 JN 10217

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION) (c) Copyright 1983-2015 Advanced Engineering Software (aes) Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HEAH.DAT

TIME/DATE OF STUDY: 10:09 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPER	FLOW AND	STREE:	FFLOW	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

______ INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00

> Tract No. 20257 - Griffin Residential III Existing 100-year Hydrology – Area A

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```
ELEVATION DATA: UPSTREAM(FEET) = 1370.50 DOWNSTREAM(FEET) = 1359.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.987
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.849
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fp Ap SCS Tc
      LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                              0.50 0.42 0.200 76 9.99
 APARTMENTS
                        В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 1.69
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 1.69
******************
 FLOW PROCESS FROM NODE 2.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1359.20 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 1264.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.29
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.44
   HALFSTREET FLOOD WIDTH(FEET) = 11.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.22
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.98
 STREET FLOW TRAVEL TIME(MIN.) = 9.48 Tc(MIN.) = 19.46
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.495
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 6.39 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 6.39 SUBAREA RUNOFF(CFS) = 12.89 
EFFECTIVE AREA(ACRES) = 6.89 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 13.97
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 15.81
 FLOW VELOCITY(FEET/SEC.) = 2.42 DEPTH*VELOCITY(FT*FT/SEC.) = 1.25
                   Tract No. 20257 - Griffin Residential III
```

Existing 100-year Hydrology – Area A
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Tract No. 20257 – Griffin Residential III Existing 100-year Hydrology – Area A Page **3** of **26**

```
В
                                1.41
                                        0.42
 "3-4 DWELLINGS/ACRE"
                                                0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.243
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.09
 AVERAGE FLOW DEPTH(FEET) = 1.16 TRAVEL TIME(MIN.) = 2.47
 Tc(MIN.) =
           12.88
 SUBAREA AREA(ACRES) = 13.11 SUBAREA RUNOFF(CFS) = 37.28 
EFFECTIVE AREA(ACRES) = 16.75 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 47.69
 GIVEN CHANNEL BASE(FEET) = 2.00 CHANNEL FREEBOARD(FEET) = 1.0
 "Z" FACTOR = 2.000 MANNING'S FACTOR = 0.015
 *ESTIMATED CHANNEL HEIGHT(FEET) = 2.43
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 1.43 FLOW VELOCITY(FEET/SEC.) = 6.85
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1505.00 FEET.
********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1353.90 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 163.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 49.90
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.62
   HALFSTREET FLOOD WIDTH(FEET) = 24.23
   AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.39
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.73
 STREET FLOW TRAVEL TIME(MIN.) = 0.62 Tc(MIN.) = 13.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.164
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fρ
                                                         SCS
                                                  Дp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                1.69 0.42
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.69 SUBAREA RUNOFF(CFS) = 4.43
 EFFECTIVE AREA(ACRES) = 18.44 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.27
```

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>>>>(STREET TABLE SECTION # 1 USED) << <<

UPSTREAM ELEVATION(FEET) = 1351.60 DOWNSTREAM ELEVATION(FEET) = 1346.00

STREET LENGTH(FEET) = 312.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 32.00

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 65.59
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.65
   HALFSTREET FLOOD WIDTH(FEET) = 26.18
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.11
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.33
 STREET FLOW TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 14.52
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.018
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                            qД
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.91 0.42 0.600
                                                  76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.91 SUBAREA RUNOFF(CFS) = 4.75
 EFFECTIVE AREA(ACRES) = 25.13 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 64.91
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 26.02
 FLOW VELOCITY(FEET/SEC.) = 5.10 DEPTH*VELOCITY(FT*FT/SEC.) = 3.31
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE 9.00 = 2256.00 FEET.
******************
 FLOW PROCESS FROM NODE
                    9.00 TO NODE
                                    9.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.52
 RAINFALL INTENSITY(INCH/HR) = 3.02
 AREA-AVERAGED fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 27.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
FLOW PROCESS FROM NODE
                    7.00 TO NODE
                                   8.00 \text{ IS CODE} = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 967.00
 ELEVATION DATA: UPSTREAM(FEET) = 1360.40 DOWNSTREAM(FEET) = 1348.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.578
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.883
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fр
                                                Дp
                                                      SCS Tc
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               2.84 0.42
                                               0.600 76 15.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 6.72
 TOTAL AREA(ACRES) =
                     2.84 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1348.70 DOWNSTREAM ELEVATION(FEET) = 1346.00
 STREET LENGTH(FEET) = 654.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.43
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.53
   HALFSTREET FLOOD WIDTH(FEET) = 16.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.02
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.07
 STREET FLOW TRAVEL TIME(MIN.) = 5.39 Tc(MIN.) = 20.97
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.376
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fp
                                                Дp
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                            5.96
                                       0.42
                                               0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.96 SUBAREA RUNOFF(CFS) = 11.39
 EFFECTIVE AREA(ACRES) = 8.80 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.8 PEAK FLOW RATE(CFS) = 16.81
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 18.00
  FLOW VELOCITY(FEET/SEC.) = 2.21 DEPTH*VELOCITY(FT*FT/SEC.) = 1.26
  LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 1621.00 FEET.
******************
  FLOW PROCESS FROM NODE 9.00 TO NODE
                                                     9.00 IS CODE =
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 20.97
  RAINFALL INTENSITY(INCH/HR) = 2.38
  AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.80
  TOTAL STREAM AREA(ACRES) = 8.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.81
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        64.91
        14.52
        3.018
        0.42(0.15)
        0.35
        25.1
        3.00

        1
        55.29
        20.51
        2.411
        0.42(0.16)
        0.37
        27.2
        1.00

        2
        16.81
        20.97
        2.376
        0.42(0.25)
        0.60
        8.8
        7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

      NUMBER
      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      1
      80.07
      14.52
      3.018
      0.42(0.17)
      0.40
      31.2
      3.00

      2
      72.00
      20.51
      2.411
      0.42(0.18)
      0.42
      35.8
      1.00

      3
      71.26
      20.97
      2.376
      0.42(0.18)
      0.42
      36.0
      7.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 80.07 Tc(MIN.) = 14.52
  EFFECTIVE AREA(ACRES) = 31.22 AREA-AVERAGED Fm(INCH/HR) = 0.17
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.40
  TOTAL AREA(ACRES) = 36.0
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
************************
  FLOW PROCESS FROM NODE 9.00 TO NODE 12.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1346.00 DOWNSTREAM ELEVATION(FEET) = 1339.80
  STREET LENGTH(FEET) = 344.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
```

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```
INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 81.83
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.69
   HALFSTREET FLOOD WIDTH(FEET) = 30.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.36
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.72
 STREET FLOW TRAVEL TIME(MIN.) = 1.07 Tc(MIN.) = 15.59
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.882
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                  SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.49 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.49 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 32.71 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 80.07
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.69 HALFSTREET FLOOD WIDTH(FEET) = 30.04
 FLOW VELOCITY(FEET/SEC.) = 5.32 DEPTH*VELOCITY(FT*FT/SEC.) = 3.67
 LONGEST FLOWPATH FROM NODE
                          1.00 TO NODE 12.00 = 2600.00 FEET.
******************
 FLOW PROCESS FROM NODE
                     12.00 TO NODE
                                   12.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.59
 RAINFALL INTENSITY(INCH/HR) = 2.88
 AREA-AVERAGED fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 37.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
******************
 FLOW PROCESS FROM NODE
                    10.00 TO NODE
                                   11.00 IS CODE = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 503.00
 ELEVATION DATA: UPSTREAM(FEET) = 1355.40 DOWNSTREAM(FEET) = 1347.10
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.273
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.558
 SUBAREA TC AND LOSS RATE DATA(AMC III):
                                                          Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fр
                                                Дp
                                                     SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.74 0.42
                                              0.600 76 11.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.20
 TOTAL AREA(ACRES) = 0.74 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1347.10 DOWNSTREAM ELEVATION(FEET) = 1339.80
 STREET LENGTH(FEET) = 1135.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.05
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) = 13.92
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.44
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.19
 STREET FLOW TRAVEL TIME(MIN.) = 7.75 Tc(MIN.) = 19.02
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.532
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fp
                                                Др
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                               9.49
                                       0.42
                                              0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 9.49 SUBAREA RUNOFF(CFS) = 19.46
 EFFECTIVE AREA(ACRES) = 10.23 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 10.2 PEAK FLOW RATE(CFS) = 20.98
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 18.00
 FLOW VELOCITY(FEET/SEC.) = 2.76 DEPTH*VELOCITY(FT*FT/SEC.) = 1.57
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1638.00 FEET.
******************
                           12.00 TO NODE
 FLOW PROCESS FROM NODE
                                             12.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 19.02
 RAINFALL INTENSITY(INCH/HR) = 2.53
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 10.23
 TOTAL STREAM AREA(ACRES) = 10.23
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 20.98
 ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 80.07 15.59 2.882 0.42(0.17) 0.41 32.7 3.00

1 72.20 21.61 2.331 0.42(0.18) 0.43 37.3 1.00

1 71.49 22.07 2.299 0.42(0.18) 0.43 37.5 7.00

2 20.98 19.02 2.532 0.42(0.25) 0.60 10.2 10.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 99.90 15.59 2.882 0.42(0.19) 0.45 41.1 3.00
2 96.56 19.02 2.532 0.42(0.20) 0.46 45.6 10.00
3 91.32 21.61 2.331 0.42(0.20) 0.47 47.6 1.00
4 90.32 22.07 2.299 0.42(0.20) 0.47 47.8 7.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 99.90 Tc(MIN.) = 15.59
 EFFECTIVE AREA(ACRES) = 41.09 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 47.8
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 2600.00 FEET.
***********************
 FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1339.80 DOWNSTREAM ELEVATION(FEET) = 1334.40
 STREET LENGTH(FEET) = 301.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 100.87
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.74
   HALFSTREET FLOOD WIDTH(FEET) = 35.61
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.09
 STREET FLOW TRAVEL TIME(MIN.) = 0.91 Tc(MIN.) = 16.49
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.778
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                 Ар
      LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                       В
                               0.29 0.42
                                                0.600
                                                        76
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                        В
                                0.58
                                        0.32
                                                1.000
                                                        83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.34
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.867
 SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 1.94
 EFFECTIVE AREA(ACRES) = 41.96 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.46
 TOTAL AREA(ACRES) = 48.6 PEAK FLOW RATE(CFS) = 99.90
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 35.37
 FLOW VELOCITY(FEET/SEC.) = 5.53 DEPTH*VELOCITY(FT*FT/SEC.) = 4.08
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
***********************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.49
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.46
 EFFECTIVE STREAM AREA(ACRES) = 41.96
 TOTAL STREAM AREA(ACRES) = 48.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 99.90
```

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```
EFFECTIVE AREA(ACRES) = 8.10 AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 16.26
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 16.15
  FLOW VELOCITY(FEET/SEC.) = 2.74 DEPTH*VELOCITY(FT*FT/SEC.) = 1.43
  LONGEST FLOWPATH FROM NODE 13.00 TO NODE
                                                            15.00 = 1612.00 FEET.
***********************
  FLOW PROCESS FROM NODE
                                15.00 TO NODE
                                                      15.00 \text{ IS CODE} = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 19.59
  RAINFALL INTENSITY(INCH/HR) = 2.48
  AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.10
  TOTAL STREAM AREA(ACRES) = 8.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.26
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        99.90
        16.49
        2.778
        0.42(0.19)
        0.46
        42.0
        3.00

      96.56
      19.93
      2.456
      0.42( 0.20) 0.47
      46.4
      10.00

      91.32
      22.53
      2.268
      0.42( 0.20) 0.47
      48.4
      1.00

      90.32
      22.99
      2.238
      0.42( 0.20) 0.47
      48.6
      7.00

      16.26
      19.59
      2.484
      0.42( 0.25) 0.60
      8.1
      13.00

       1
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 115.39 16.49 2.778 0.42(0.20) 0.48 48.8 3.00
2 113.15 19.59 2.484 0.42(0.20) 0.49 54.1 13.00
3 112.61 19.93 2.456 0.42(0.21) 0.49 54.5 10.00
4 106.00 22.53 2.268 0.42(0.21) 0.49 56.5 1.00
5 104.79 22.99 2.238 0.42(0.21) 0.49 56.7 7.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 115.39 Tc(MIN.) = 16.49
  EFFECTIVE AREA(ACRES) = 48.78 AREA-AVERAGED Fm(INCH/HR) = 0.20
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.48
  TOTAL AREA(ACRES) = 56.7
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
*********************
  FLOW PROCESS FROM NODE 15.00 TO NODE 18.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1334.40 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 686.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 121.60
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.79
   HALFSTREET FLOOD WIDTH(FEET) = 38.23
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.50
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 2.08 Tc(MIN.) = 18.57
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.572
 SUBAREA LOSS RATE DATA(AMC III):
                                     Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                 Аp
                                                       SCS
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                            0.76 0.42 0.100
                                                        76
                        В
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                      В
                                2.23 0.42
                                                0.600
                                                        76
 AGRICULTURAL POOR COVER
                                                 1.000
 "ORCHARDS"
                        В
                                2.87
                                        0.23
                                                         89
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.731
 SUBAREA AREA(ACRES) = 5.86 SUBAREA RUNOFF(CFS) = 12.43 EFFECTIVE AREA(ACRES) = 54.64 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.40 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 62.6
                               PEAK FLOW RATE(CFS) = 116.56
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 37.81
 FLOW VELOCITY(FEET/SEC.) = 5.44 DEPTH*VELOCITY(FT*FT/SEC.) = 4.25
 LONGEST FLOWPATH FROM NODE
                         1.00 TO NODE
                                           18.00 = 3587.00 FEET.
******************
 FLOW PROCESS FROM NODE 18.00 TO NODE
                                        18.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.57
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED fm(INCH/HR) = 0.20
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.40
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 54.64
 TOTAL STREAM AREA(ACRES) = 62.59
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 116.56
************************
 FLOW PROCESS FROM NODE 16.00 TO NODE
                                    17.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 984.00
 ELEVATION DATA: UPSTREAM(FEET) = 1343.50 DOWNSTREAM(FEET) = 1333.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.343
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.795
 SUBAREA To AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.22 0.42
                                           0.600 76 16.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 7.36
 TOTAL AREA(ACRES) = 3.22 PEAK FLOW RATE(CFS) = 7.36
******************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1333.80 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 923.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.23
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 12.07
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.98
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.36
 STREET FLOW TRAVEL TIME(MIN.) = 5.16 Tc(MIN.) = 21.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.338
 SUBAREA LOSS RATE DATA(AMC III):
```

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	ENT TYPE/ USE AI.						
"3-4 DWEL	LINGS/ACRE" OOR COVER	В	3.97	0	.42	0.600	76
"BARREN"						1.000	97
	VERAGE PERVIOU		_			-	
SUBAREA AI	REA(ACRES) =	5.09	SUBARE	A RUNO	FF(CFS)	= 9.	70
EFFECTIVE	AREA(ACRES) = AGED Fp(INCH/H	8.31	AREA	-AVERA(GED Fm(INCH/HR)	= 0.23
TOTAL AREA	A(ACRES) =	8.3	PEA	K FLOW	RATE(C	!FS) =	15.74
	BAREA STREET F						
	$\Gamma) = 0.49 HA$						1 50
	CITY(FEET/SEC. LOWPATH FROM N						
****	*****	*****	*****	*****	*****	****	*****
	ESS FROM NODE		O NODE	18	.00 IS	CODE =	1
>>>>DESI	GNATE INDEPEND	ENT STREAM					
	COMPUTE VARIOU						========
	BER OF STREAMS	_					
	E VALUES USED	-		REAM :	2 ARE:		
	ONCENTRATION(MINTENSITY(INCH						
	AGED Fm(INCH/H		J 1				
	AGED Fp(INCH/H						
	AGED Ap = 0.6 STREAM AREA(A		0 21				
	SIREAM AREA(A EAM AREA(ACRES						
	RATE(CFS) AT			15.74			
** CONFLU	ENCE DATA **						
	Q To				Ap	Ae	HEADWATER
		.) (INCH/HR			0 50	(ACRES)	NODE
1 1	116.56 18. 114.38 21.		0.40(0.20)		54.6 60.0	
1	113.93 22.		0.40(
1	108.40 24.		0.40(· · · · · · · · · · · · · · · · · · ·			
1	107.27 25.	14 2.112	0.40(0.21)	0.51	62.6	7.00
2	15.74 21.	50 2.338	0.36(0.23)	0.65	8.3	16.00
RAINFALL :	INTENSITY AND	TIME OF CON	CENTRAT	ION RA	TIO		
CONFLUENCE	E FORMULA USED	FOR 2 STR	EAMS.				
	LOW RATE TABLE						
STREAM	Q To				_	Ae	HEADWATER
NUMBER 1	(CFS) (MIN 131.66 18.) (INCH 0.39((ACRES) 61.8	
2	130.25 21.		0.39(
3	130.23 21.	68 2.325	0.40(0.21)	0.53		
4	129.39 22.						
5	122.65 24.		0.40(

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 131.66 Tc(MIN.) = 18.57EFFECTIVE AREA(ACRES) = 61.82 AREA-AVERAGED Fm(INCH/HR) = 0.21 AREA-AVERAGED Fp(INCH/HR) = 0.39 AREA-AVERAGED Ap = 0.52TOTAL AREA(ACRES) = 70.9 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET. ********************** FLOW PROCESS FROM NODE 18.00 TO NODE 22.00 IS CODE = 62 ______ >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA< >>>>(STREET TABLE SECTION # 1 USED) << << ______ UPSTREAM ELEVATION(FEET) = 1324.40 DOWNSTREAM ELEVATION(FEET) = 1316.60 STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 32.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200 **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 134.33 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 37.13 AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.57 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 5.06 STREET FLOW TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 19.46 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.495 SUBAREA LOSS RATE DATA(AMC III): DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE NATURAL POOR COVER 2.48 0.11 "BARREN" 1.000 97 В SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000 SUBAREA AREA(ACRES) = 2.48 SUBAREA RUNOFF(CFS) = 5.33 EFFECTIVE AREA(ACRES) = 64.30 AREA-AVERAGED Fm(INCH/HR) = 0.20 AREA-AVERAGED Fp(INCH/HR) = 0.37 AREA-AVERAGED Ap = 0.54 TOTAL AREA(ACRES) = 73.4 PEAK FLOW RATE(CFS) = 132.72END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 37.07 FLOW VELOCITY(FEET/SEC.) = 6.52 DEPTH*VELOCITY(FT*FT/SEC.) = 5.01 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET. *********************

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1

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```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =
                          19.46
 RAINFALL INTENSITY(INCH/HR) = 2.50
 AREA-AVERAGED fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.37
 AREA-AVERAGED Ap = 0.54
 EFFECTIVE STREAM AREA(ACRES) = 64.30
 TOTAL STREAM AREA(ACRES) = 73.38
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 132.72
******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1059.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1329.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.976
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                 Fp Ap SCS Tc
     LAND USE
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                            0.78
                                    0.42
                                          0.600 76 14.84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.91
 TOTAL AREA(ACRES) = 0.78 PEAK FLOW RATE(CFS) = 1.91
******************
                     20.00 TO NODE
 FLOW PROCESS FROM NODE
                                   21.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1329.90 DOWNSTREAM ELEVATION(FEET) = 1322.90
 STREET LENGTH(FEET) = 956.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 17.97
```

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```
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.54
   HALFSTREET FLOOD WIDTH(FEET) = 17.44
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.73
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.48
 STREET FLOW TRAVEL TIME(MIN.) = 5.84 Tc(MIN.) = 20.68
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.398
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                     SCS
                                                Дp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 14.50 0.42 0.600 76
 NATURAL POOR COVER
                       B 1.79 0.11 1.000 97
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.37
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.644
 SUBAREA AREA(ACRES) = 16.29 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 17.07 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.37 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 17.1 PEAK FLOW RATE(CFS) = 33.18
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 18.00
 FLOW VELOCITY(FEET/SEC.) = 3.44 DEPTH*VELOCITY(FT*FT/SEC.) =
 LONGEST FLOWPATH FROM NODE 19.00 TO NODE 21.00 = 2015.00 FEET.
******************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1322.90 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 615.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 35.28
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.59
   HALFSTREET FLOOD WIDTH(FEET) = 20.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.74
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 2.74 Tc(MIN.) = 23.43
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.211
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/
                    SCS SOIL AREA
                                       Fp
                                                Ар
                                                       SCS
```

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```
GROUP (ACRES) (INCH/HR) (DECIMAL) CN
       LAND USE
  NATURAL POOR COVER
                                          2.22 0.11 1.000 97
  "BARREN"
                                В
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 2.22 SUBAREA RUNOFF(CFS) = 4.21
  EFFECTIVE AREA(ACRES) = 19.29 AREA-AVERAGED Fm(INCH/HR) = 0.22
  AREA-AVERAGED Fp(INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.68
  TOTAL AREA(ACRES) = 19.3 PEAK FLOW RATE(CFS) = 34.52
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.58 HALFSTREET FLOOD WIDTH(FEET) = 20.00
  FLOW VELOCITY(FEET/SEC.) = 3.71 DEPTH*VELOCITY(FT*FT/SEC.) = 2.16
  LONGEST FLOWPATH FROM NODE 19.00 TO NODE 22.00 = 2630.00 FEET.
************************
  FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 23.43
  RAINFALL INTENSITY(INCH/HR) = 2.21
  AREA-AVERAGED Fm(INCH/HR) = 0.22
  AREA-AVERAGED Fp(INCH/HR) = 0.33
  AREA-AVERAGED Ap = 0.68
  EFFECTIVE STREAM AREA(ACRES) = 19.29
  TOTAL STREAM AREA(ACRES) = 19.29
  PEAK FLOW RATE (CFS) AT CONFLUENCE = 34.52
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 132.72 19.46 2.495 0.37(0.20) 0.54 64.3 3.00
1 131.35 22.39 2.277 0.38(0.21) 0.54 70.4 16.00
1 131.14 22.58 2.265 0.38(0.21) 0.54 70.8 13.00
1 130.53 22.92 2.243 0.38(0.21) 0.55 71.2 10.00
1 123.89 25.59 2.088 0.38(0.21) 0.55 73.2 1.00
1 122.59 26.05 2.064 0.38(0.21) 0.55 73.4 7.00
2 34.52 23.43 2.211 0.33(0.22) 0.68 19.3 19.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 165.48 19.46 2.495 0.36(0.21)0.57 80.3 3.00
2 165.43 22.39 2.277 0.36(0.21)0.57 88.9 16.00
3 165.31 22.58 2.265 0.36(0.21)0.57 89.3 13.00
4 164.84 22.92 2.243 0.37(0.21)0.57 90.1 10.00
5 163.79 23.43 2.211 0.37(0.21)0.57 90.9 19.00
6 156.27 25.59 2.088 0.37(0.21)0.58 92.5 1.00
7 154.55 26.05 2.064 0.37(0.21)0.58 92.7 7.00
```

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```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 165.48 Tc(MIN.) = 19.46
 EFFECTIVE AREA(ACRES) = 80.32 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 0.36 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 92.7
                           1.00 TO NODE 22.00 = 3937.00 FEET.
 LONGEST FLOWPATH FROM NODE
******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.60 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1041.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 180.39
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.85
   HALFSTREET FLOOD WIDTH(FEET) = 41.41
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.64
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 5.68
 STREET FLOW TRAVEL TIME(MIN.) = 2.61 Tc(MIN.) = 22.07
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.299
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fр
                                                    SCS
                                               Ар
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
                      B 12.11 0.11 1.000
 "BARREN"
 AGRICULTURAL POOR COVER
                              3.18 0.23
                                             1.000 89
 "ORCHARDS"
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.13
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.29 SUBAREA RUNOFF(CFS) = 29.82
 EFFECTIVE AREA(ACRES) = 95.61 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 108.0 PEAK FLOW RATE(CFS) = 181.12
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.86 HALFSTREET FLOOD WIDTH(FEET) = 41.47
 FLOW VELOCITY(FEET/SEC.) = 6.65 DEPTH*VELOCITY(FT*FT/SEC.) = 5.69
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
***********************
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```
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 22.07
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED fm(INCH/HR) = 0.19
 AREA-AVERAGED fp(INCH/HR) = 0.30
 AREA-AVERAGED Ap = 0.64
 EFFECTIVE STREAM AREA(ACRES) = 95.61
 TOTAL STREAM AREA(ACRES) = 107.96
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
*************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 639.00
 ELEVATION DATA: UPSTREAM(FEET) = 1324.10 DOWNSTREAM(FEET) = 1321.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.821
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.743
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                           Ap SCS
                                  Fρ
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
                    В
 "3-4 DWELLINGS/ACRE"
                            1.77 0.42
                                          0.600 76 16.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.96
 TOTAL AREA(ACRES) = 1.77 PEAK FLOW RATE(CFS) = 3.96
************************
 FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1321.80 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1594.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
```

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```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.47
   HALFSTREET FLOOD WIDTH(FEET) = 12.40
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.69
 STREET FLOW TRAVEL TIME(MIN.) = 7.32 Tc(MIN.) = 24.14
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.169
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                 SCS
                                                          Аp
       LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 13.48 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 13.48 SUBAREA RUNOFF(CFS) = 23.23
 EFFECTIVE AREA(ACRES) = 15.25 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 26.28
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.55 HALFSTREET FLOOD WIDTH(FEET) = 17.79
 FLOW VELOCITY(FEET/SEC.) = 3.88 DEPTH*VELOCITY(FT*FT/SEC.) = 2.12
 LONGEST FLOWPATH FROM NODE 23.00 TO NODE 25.00 = 2233.00 FEET.
********************
 FLOW PROCESS FROM NODE 25.00 TO NODE
                                                25.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 24.14
 RAINFALL INTENSITY(INCH/HR) = 2.17
 AREA-AVERAGED fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 15.25
 TOTAL STREAM AREA(ACRES) = 15.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 26.28
 ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 181.12 22.07 2.299 0.30(0.19) 0.64 95.6 3.00

1 180.14 25.01 2.119 0.31(0.20) 0.64 104.2 16.00

1 179.96 25.20 2.109 0.31(0.20) 0.64 104.6 13.00

1 179.44 25.54 2.091 0.31(0.20) 0.64 105.4 10.00

1 178.19 26.06 2.064 0.31(0.20) 0.64 106.2 19.00

1 170.56 28.25 1.958 0.31(0.20) 0.64 107.8 1.00

1 168.79 28.73 1.937 0.31(0.20) 0.64 108.0 7.00

2 26.28 24.14 2.169 0.42(0.25) 0.60 15.2 23.00
```

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

Tract No. 20257 – Griffin Residential III Existing 100-year Hydrology – Area A Page **24** of **26**

```
** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm)
                                                        Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 206.78 22.07 2.299 0.32(0.20) 0.63 109.6 3.00
2 206.71 24.14 2.169 0.32(0.20) 0.63 116.9 23.00
3 205.75 25.01 2.119 0.32(0.20) 0.63 119.4 16.00
4 205.42 25.20 2.109 0.32(0.21) 0.63 119.9 13.00
5 204.65 25.54 2.091 0.33(0.21) 0.63 120.6 10.00
6 203.03 26.06 2.064 0.33(0.21) 0.63 121.4 19.00
7 193.95 28.25 1.958 0.33(0.21) 0.63 123.0 1.00
8 191.89 28.73 1.937 0.33(0.21) 0.63 123.2 7.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 206.78 Tc(MIN.) =
                                                    22.07
 EFFECTIVE AREA(ACRES) = 109.55 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 123.2
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
******************
                            25.00 TO NODE
 FLOW PROCESS FROM NODE
                                               26.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1291.40
 STREET LENGTH(FEET) = 405.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 207.87
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.89
   HALFSTREET FLOOD WIDTH(FEET) = 43.05
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 6.17
 STREET FLOW TRAVEL TIME(MIN.) = 0.97 Tc(MIN.) = 23.04
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.235
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                          Αp
                                                                  SCS
      LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 AGRICULTURAL FAIR COVER
                                      1.26 0.32
  "ORCHARDS"
                             В
                                                        1.000
                                                                 83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 1.26 SUBAREA RUNOFF(CFS) = 2.17
```

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EFFECTIVE AREA(ACRES) = 110.81 AREA-AVERAGED Fm(INCH/HR) = 0.20 AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.64 TOTAL AREA(ACRES) = 124.5 PEAK FLOW RATE(CFS) = 206.78 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.89 HALFSTREET FLOOD WIDTH(FEET) = 42.99 FLOW VELOCITY(FEET/SEC.) = 6.93 DEPTH*VELOCITY(FT*FT/SEC.) = 6.15 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 26.00 = 5383.00 FEET. ______ END OF STUDY SUMMARY: AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.637 PEAK FLOW RATE(CFS) = 206.78** PEAK FLOW RATE TABLE ** STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NOT 1 206.78 23.04 2.235 0.32(0.20) 0.64 110.8 2 206.71 25.11 2.114 0.32(0.21) 0.64 118.1 3 205.75 25.99 2.067 0.32(0.21) 0.64 120.7 4 205.42 26.18 2.058 0.32(0.21) 0.64 121.1 5 204.65 26.52 2.040 0.33(0.21) 0.64 121.9 6 203.03 27.03 2.015 0.33(0.21) 0.64 122.7 7 193.95 29.24 1.915 0.33(0.21) 0.63 124.3 191.89 29.72 1.894 0.33(0.21) 0.63 124.5 (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE 3.00 23.00 16.00 13.00 10.00 19.00 1.00 ______

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

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FILE NAME: 0217HEBH.DAT

TIME/DATE OF STUDY: 10:09 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPER	FLOW ANI	STREET	TFLOW	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	-GEOMETF	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	===========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
=== 1 2	32.0 18.0	10.0 5.5	0.015/0.019/0.020 0.015/0.026/0.020	0.67 0.67				0.0150 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 687.00

Tract No. 20257 – Griffin Residential III Existing 100-year Hydrology – Area B

```
ELEVATION DATA: UPSTREAM(FEET) = 1339.70 DOWNSTREAM(FEET) = 1328.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.395
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.005
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
                                              0.100 76 9.40
                            1.89 0.42
 COMMERCIAL
                       В
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                               0.67 0.32
                                               1.000 83 21.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.34
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.336
 SUBAREA RUNOFF(CFS) = 8.96
 TOTAL AREA(ACRES) =
                     2.56 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1328.20
 DOWNSTREAM NODE ELEVATION(FEET) = 1316.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 656.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.644
 SUBAREA LOSS RATE DATA(AMC III):
                                     Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                αA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL
                       В
                               1.18 0.42
                                               0.100
 NATURAL POOR COVER
                               4.29 0.11
                                                       97
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.806
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 17.70
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.43
 AVERAGE FLOW DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 1.47 Tc(MIN.) = 10.87
 SUBAREA AREA(ACRES) = 5.47 SUBAREA RUNOFF(CFS) = 17.48 EFFECTIVE AREA(ACRES) = 8.03 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.15 AREA-AVERAGED Ap = 0.66
 TOTAL AREA(ACRES) = 8.0 PEAK FLOW RATE(CFS) = 25.61
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
       DEPTH EOUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 7.43 DEPTH*VELOCITY(FT*FT/SEC) = 8.92 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1343.00 FEET.
*******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 6.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 610.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 41.53
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.70
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.98
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 3.41 Tc(MIN.) = 14.28
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.051
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Аp
                                                      SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                       B 2.46 0.42 0.100 76
 NATURAL POOR COVER
                               0.24
                                       0.11
 "BARREN"
                       В
                                               1.000
                                                       97
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                               9.90
                                       0.32
                                               1.000
                                                       83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.824
 SUBAREA AREA(ACRES) = 12.60 SUBAREA RUNOFF(CFS) = 31.63
 EFFECTIVE AREA(ACRES) = 20.63 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.26 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) =
                   20.6
                               PEAK FLOW RATE(CFS) = 52.97
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 24.01
 FLOW VELOCITY(FEET/SEC.) = 3.24 DEPTH*VELOCITY(FT*FT/SEC.) = 2.43
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE
                                            6.00 = 1953.00 \text{ FEET}.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.28
 RAINFALL INTENSITY(INCH/HR) = 3.05
 AREA-AVERAGED fm(INCH/HR) = 0.20
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.26
 AREA-AVERAGED Ap = 0.76
 EFFECTIVE STREAM AREA(ACRES) = 20.63
 TOTAL STREAM AREA(ACRES) = 20.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 52.97
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE
                                    5.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 607.00
 ELEVATION DATA: UPSTREAM(FEET) = 1337.20 DOWNSTREAM(FEET) = 1326.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.405
 SUBAREA To AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS Tc
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.85 0.42 0.600 76 12.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 10.92
 TOTAL AREA(ACRES) = 3.85 PEAK FLOW RATE(CFS) = 10.92
******************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1326.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 674.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.33
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 12.03
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.01
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.83
 STREET FLOW TRAVEL TIME(MIN.) = 2.80 Tc(MIN.) = 14.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.972
 SUBAREA LOSS RATE DATA(AMC III):
```

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```
DEVELOPMENT TYPE/ SCS SOIL AREA
                                              Fp
                          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
      LAND USE
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B
                                      4.42 0.42 0.600 76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 4.42 SUBAREA RUNOFF(CFS) = 10.81
  EFFECTIVE AREA(ACRES) = 8.27 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.3 PEAK FLOW RATE(CFS) = 20.23
 END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.49 HALFSTREET FLOOD WIDTH(FEET) = 13.83
  FLOW VELOCITY(FEET/SEC.) = 4.13 DEPTH*VELOCITY(FT*FT/SEC.) = 2.02
  LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1281.00 FEET.
******************
  FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE =
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 14.86
  RAINFALL INTENSITY(INCH/HR) = 2.97
 AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42
  AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.27
 TOTAL STREAM AREA(ACRES) = 8.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 20.23
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        52.97
        14.28
        3.051
        0.26(0.20)
        0.76
        20.6
        1.00

        2
        20.23
        14.86
        2.972
        0.42(0.25)
        0.60
        8.3
        4.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

    72.97
    14.28
    3.051
    0.30( 0.21) 0.71
    28.6
    1.00

    71.73
    14.86
    2.972
    0.30( 0.21) 0.71
    28.9
    4.00

      1
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 72.97 Tc(MIN.) = 14.28
 EFFECTIVE AREA(ACRES) = 28.57 AREA-AVERAGED Fm(INCH/HR) = 0.21
  AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.71
 TOTAL AREA(ACRES) = 28.9
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1953.00 FEET.
******************
```

Treat No. 20257 Criffin Docidential III

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<

>>>>(STREET TABLE SECTION # 3 USED) << <<

UPSTREAM ELEVATION(FEET) = 1314.40 DOWNSTREAM ELEVATION(FEET) = 1313.90 STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 73.32

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.93

HALFSTREET FLOOD WIDTH(FEET) = 32.50

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.77

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.58

STREET FLOW TRAVEL TIME(MIN.) = 1.44 Tc(MIN.) = 15.72

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.866

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL

В "3-4 DWELLINGS/ACRE" 0.600 76 0.30 0.42 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600 SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 0.71

EFFECTIVE AREA(ACRES) = 28.87 AREA-AVERAGED Fm(INCH/HR) = 0.21

AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.71

TOTAL AREA(ACRES) = 29.2 PEAK FLOW RATE(CFS) = 72.97

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.93 HALFSTREET FLOOD WIDTH(FEET) = 32.38

FLOW VELOCITY(FEET/SEC.) = 2.78 DEPTH*VELOCITY(FT*FT/SEC.) = 2.57

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 2193.00 FEET.

______ END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 29.2 TC(MIN.) = 15.72 EFFECTIVE AREA(ACRES) = 28.87 AREA-AVERAGED Fm(INCH/HR) = 0.21

AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.713

72.97 PEAK FLOW RATE(CFS) =

** PEAK FLOW RATE TABLE **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE 72.97 15.72 2.866 0.30(0.21)0.71 28.9 71.73 16.31 2.798 0.30(0.21)0.71 29.2 1 1.00 4.00 2

> Tract No. 20257 – Griffin Residential III Existing 100-year Hydrology - Area B Page **6** of **7**

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0217HECH.DAT

TIME/DATE OF STUDY: 10:08 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPEE	FLOW AND	STREET	rflow	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0312	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0312	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 973.00

Tract No. 20257 – Griffin Residential III Existing 100-year Hydrology – Area C Page 1 of 3

```
ELEVATION DATA: UPSTREAM(FEET) = 1315.60 DOWNSTREAM(FEET) = 1311.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 32.294
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.795
 SUBAREA TC AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS TC
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 AGRICULTURAL FAIR COVER
                       В
                              5.50 0.32 1.000 83 32.29
 "ORCHARDS"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 7.30
TOTAL AREA(ACRES) = 5.50 PEAK FLOW RATE(CFS) = 7.30
************************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1311.00
 DOWNSTREAM NODE ELEVATION(FEET) = 1289.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1386.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.500
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.680
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 AGRICULTURAL POOR COVER
                      B 19.03 0.23 1.000
 "ORCHARDS"
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                      В
                             12.26 0.32
                                                     83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 27.13
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.64
 AVERAGE FLOW DEPTH(FEET) = 1.01 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 3.48 Tc(MIN.) = 35.77
 SUBAREA AREA(ACRES) = 31.29 SUBAREA RUNOFF(CFS) = 39.83 EFFECTIVE AREA(ACRES) = 36.79 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 36.8 PEAK FLOW RATE(CFS) = 46.56
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.23 FLOOD WIDTH(FEET) = 18.17
 FLOW VELOCITY(FEET/SEC.) = 6.59 DEPTH*VELOCITY(FT*FT/SEC) = 8.10
                          1.00 TO NODE 3.00 = 2359.00 FEET.
 LONGEST FLOWPATH FROM NODE
*******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
```

E SECTION # 3 USED) << < <

```
______
 UPSTREAM ELEVATION(FEET) = 1289.00 DOWNSTREAM ELEVATION(FEET) = 1280.50
 STREET LENGTH(FEET) = 566.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 56.96
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.63
   HALFSTREET FLOOD WIDTH(FEET) = 20.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.09
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.20
 STREET FLOW TRAVEL TIME(MIN.) = 1.85 Tc(MIN.) = 37.63
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.625
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fρ
                                                   SCS
                                              Дp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
                      В
                             15.22 0.11
                                                   97
 "BARREN"
                                             1.000
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.22 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 52.01 AREA-AVERAGED Fm(INCH/HR) = 0.22
 AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 52.0
                             PEAK FLOW RATE(CFS) =
                                                     65.57
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 20.00
 FLOW VELOCITY(FEET/SEC.) = 5.39 DEPTH*VELOCITY(FT*FT/SEC.) =
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 2925.00 FEET.
______
 END OF STUDY SUMMARY:
 AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS) =
                        65.57
______
______
```

END OF RATIONAL METHOD ANALYSIS

Hydrology & Hydraulics Preliminary Report

City of Redlands
County of San Bernardino

PROPOSED HYDROLOGY 2-YEAR RUNOFF



Tract 20257 JN 10217

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HPA2.DAT

TIME/DATE OF STUDY: 11:59 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4800

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area A Page **1** of **29**

```
ELEVATION DATA: UPSTREAM(FEET) = 1370.50 DOWNSTREAM(FEET) = 1359.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.987
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.540
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
                                      Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                                               0.200 56 9.99
                              0.50 0.75
 APARTMENTS
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 0.63
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 0.63
******************
 FLOW PROCESS FROM NODE 2.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1359.20 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 1264.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.08
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.30
   HALFSTREET FLOOD WIDTH(FEET) = 5.92
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.66
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.50
 STREET FLOW TRAVEL TIME(MIN.) = 12.72 Tc(MIN.) = 22.70
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.903
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 6.39 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 6.39 SUBAREA RUNOFF(CFS) = 2.61 
EFFECTIVE AREA(ACRES) = 6.89 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 2.95
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33 HALFSTREET FLOOD WIDTH(FEET) = 7.15
 FLOW VELOCITY(FEET/SEC.) = 1.77 DEPTH*VELOCITY(FT*FT/SEC.) = 0.58
                   Tract No. 20257 – Griffin Residential III
```

Proposed 2-year Hydrology – Area A
Page 2 of 29

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area A Page **3** of **29**

```
В
                                1.41
                                        0.75
 "3-4 DWELLINGS/ACRE"
                                                0.600
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.243
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.61
 AVERAGE FLOW DEPTH(FEET) = 0.69 TRAVEL TIME(MIN.) = 3.26
 Tc(MIN.) =
           13.67
 SUBAREA AREA(ACRES) = 13.11 SUBAREA RUNOFF(CFS) = 12.67

EFFECTIVE AREA(ACRES) = 16.75 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 16.29
 GIVEN CHANNEL BASE(FEET) = 2.00 CHANNEL FREEBOARD(FEET) = 1.0
 "Z" FACTOR = 2.000 MANNING'S FACTOR = 0.015
 *ESTIMATED CHANNEL HEIGHT(FEET) = 1.85
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.85 FLOW VELOCITY(FEET/SEC.) = 5.17
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1505.00 FEET.
*********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1353.90 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 163.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.87
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 15.32
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.40
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.56
 STREET FLOW TRAVEL TIME(MIN.) = 0.80 Tc(MIN.) = 14.47
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.210
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fρ
                                                        SCS
                                                 qД
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                1.69 0.75
                                                        56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.69 SUBAREA RUNOFF(CFS) = 1.16
 EFFECTIVE AREA(ACRES) = 18.44 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.27
```

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area A Page **4** of **29**

UPSTREAM ELEVATION(FEET) = 1351.60 DOWNSTREAM ELEVATION(FEET) = 1346.00

STREET LENGTH(FEET) = 312.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area A Page **5** of **29**

```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 20.31
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.47
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.91
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.82
 STREET FLOW TRAVEL TIME(MIN.) = 1.33 Tc(MIN.) = 15.80
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.143
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
               GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.91 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.91 SUBAREA RUNOFF(CFS) = 1.19
EFFECTIVE AREA(ACRES) = 24.74 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 19.71
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.46 HALFSTREET FLOOD WIDTH(FEET) = 15.48
 FLOW VELOCITY(FEET/SEC.) = 3.90 DEPTH*VELOCITY(FT*FT/SEC.) = 1.80
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
************************
 FLOW PROCESS FROM NODE 9.00 TO NODE 9.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.80
 RAINFALL INTENSITY(INCH/HR) = 1.14
 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 24.74
 TOTAL STREAM AREA(ACRES) = 27.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 19.71
************************
 FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area A Page **6** of **29**

```
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 967.00
 ELEVATION DATA: UPSTREAM(FEET) = 1360.40 DOWNSTREAM(FEET) = 1348.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.578
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.153
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fp
                                               Ap SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              2.84 0.75
                                              0.600 56 15.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.80
 TOTAL AREA(ACRES) = 2.84 PEAK FLOW RATE(CFS) = 1.80
******************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1348.70 DOWNSTREAM ELEVATION(FEET) = 1346.00
 STREET LENGTH(FEET) = 654.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.04
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.35
   HALFSTREET FLOOD WIDTH(FEET) = 7.93
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.54
 STREET FLOW TRAVEL TIME(MIN.) = 7.07 Tc(MIN.) = 22.64
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.904
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                      SCS
                                                Aр
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              5.96 0.75 0.600
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.96 SUBAREA RUNOFF(CFS) = 2.44 EFFECTIVE AREA(ACRES) = 8.80 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
                   8.8 PEAK FLOW RATE(CFS) = 3.61
 TOTAL AREA(ACRES) =
```

```
END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37 HALFSTREET FLOOD WIDTH(FEET) = 8.62
  FLOW VELOCITY(FEET/SEC.) = 1.59 DEPTH*VELOCITY(FT*FT/SEC.) = 0.59
  LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 1621.00 FEET.
*********************
  FLOW PROCESS FROM NODE 9.00 TO NODE 9.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 22.64
  RAINFALL INTENSITY(INCH/HR) = 0.90
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.80
  TOTAL STREAM AREA(ACRES) = 8.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.61
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        19.71
        15.80
        1.143
        0.75( 0.26)
        0.35
        24.7
        3.00

        1
        14.61
        24.13
        0.868
        0.75( 0.27)
        0.37
        27.2
        1.00

        2
        3.61
        22.64
        0.904
        0.75( 0.45)
        0.60
        8.8
        7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        23.32
        15.80
        1.143
        0.75(0.30)
        0.40
        30.9
        3.00

        2
        19.13
        22.64
        0.904
        0.75(0.32)
        0.42
        35.6
        7.00

        3
        17.93
        24.13
        0.868
        0.75(0.32)
        0.42
        36.0
        1.00

                                                                                       1.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 23.32 Tc(MIN.) = 15.80 EFFECTIVE AREA(ACRES) = 30.88 AREA-AVERAGED Fm(INCH/HR) = 0.30
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.40
  TOTAL AREA(ACRES) = 36.0
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
*****************
  FLOW PROCESS FROM NODE 9.00 TO NODE 12.00 IS CODE = 62
 -----
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1346.00 DOWNSTREAM ELEVATION(FEET) = 1339.80
  STREET LENGTH(FEET) = 344.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 23.75
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) = 16.73
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.07
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.97
 STREET FLOW TRAVEL TIME(MIN.) = 1.41 Tc(MIN.) = 17.21
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.081
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Дp
               GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.49 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.49 SUBAREA RUNOFF(CFS) = 0.85 
EFFECTIVE AREA(ACRES) = 32.37 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 23.32
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 16.57
 FLOW VELOCITY(FEET/SEC.) = 4.07 DEPTH*VELOCITY(FT*FT/SEC.) = 1.96
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 2600.00 FEET.
********************
 FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.21
 RAINFALL INTENSITY(INCH/HR) = 1.08
 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) = 32.37
 TOTAL STREAM AREA(ACRES) = 37.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 23.32
******************
 FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

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```
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 503.00
 ELEVATION DATA: UPSTREAM(FEET) = 1355.40 DOWNSTREAM(FEET) = 1347.10
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.273
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.423
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                   Fp
                                             Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             0.74 0.75
                                            0.600 56 11.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.65
 TOTAL AREA(ACRES) = 0.74 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1347.10 DOWNSTREAM ELEVATION(FEET) = 1339.80
 STREET LENGTH(FEET) = 1135.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.84
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.81
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.59
 STREET FLOW TRAVEL TIME(MIN.) = 10.45 Tc(MIN.) = 21.72
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.929
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                   SCS
                                              Αр
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             9.49 0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
                  10.2
 TOTAL AREA(ACRES) =
                           PEAK FLOW RATE(CFS) =
```

```
END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37 HALFSTREET FLOOD WIDTH(FEET) = 8.54
  FLOW VELOCITY(FEET/SEC.) = 1.98 DEPTH*VELOCITY(FT*FT/SEC.) = 0.73
  LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1638.00 FEET.
*********************
  FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 21.72
  RAINFALL INTENSITY(INCH/HR) = 0.93
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 10.23
  TOTAL STREAM AREA(ACRES) = 10.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.42
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        23.32
        17.21
        1.081
        0.75(0.30)
        0.41
        32.4
        3.00

        1
        19.13
        24.12
        0.868
        0.75(0.32)
        0.43
        37.1
        7.00

        1
        17.93
        25.64
        0.834
        0.75(0.32)
        0.43
        37.5
        1.00

        2
        4.42
        21.72
        0.929
        0.75(0.45)
        0.60
        10.2
        10.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 27.74 17.21 1.081 0.75(0.33) 0.45 40.5 3.00
2 25.01 21.72 0.929 0.75(0.35) 0.46 45.7 10.00
3 22.99 24.12 0.868 0.75(0.35) 0.47 47.3 7.00
4 21.48 25.64 0.834 0.75(0.35) 0.47 47.8 1.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 27.74 Tc(MIN.) = 17.21
  EFFECTIVE AREA(ACRES) = 40.47 AREA-AVERAGED Fm(INCH/HR) = 0.33
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.45
  TOTAL AREA(ACRES) = 47.8
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                                         12.00 = 2600.00 FEET.
***********************
  FLOW PROCESS FROM NODE 12.00 TO NODE
                                                    15.00 \text{ IS CODE} = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) << <<
______
  UPSTREAM ELEVATION(FEET) = 1339.80 DOWNSTREAM ELEVATION(FEET) = 1334.40
  STREET LENGTH(FEET) = 301.00 CURB HEIGHT(INCHES) = 8.0
```

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```
STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 27.93
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.51
   HALFSTREET FLOOD WIDTH(FEET) = 17.90
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.21
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.14
 STREET FLOW TRAVEL TIME(MIN.) = 1.19 Tc(MIN.) = 18.40
   2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.035
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                 Аp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
      LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.29 0.75
                                                0.600
                                                        56
 AGRICULTURAL FAIR COVER
                        В
 "ORCHARDS"
                                0.58 0.63 1.000
                                                        65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.867
 SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 0.36
 EFFECTIVE AREA(ACRES) = 41.34 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 48.6 PEAK FLOW RATE(CFS) = 27.74
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51 HALFSTREET FLOOD WIDTH(FEET) = 17.82
 FLOW VELOCITY(FEET/SEC.) = 4.22 DEPTH*VELOCITY(FT*FT/SEC.) = 2.14
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
************************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.40
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.45
 EFFECTIVE STREAM AREA(ACRES) = 41.34
 TOTAL STREAM AREA(ACRES) = 48.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 27.74
```

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```
EFFECTIVE AREA(ACRES) = 8.10 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 3.53
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 7.35
  FLOW VELOCITY(FEET/SEC.) = 2.02 DEPTH*VELOCITY(FT*FT/SEC.) = 0.68
  LONGEST FLOWPATH FROM NODE 13.00 TO NODE
                                                      15.00 = 1612.00 FEET.
********************
 FLOW PROCESS FROM NODE 15.00 TO NODE
                                                 15.00 \text{ IS CODE} = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 21.59
  RAINFALL INTENSITY(INCH/HR) = 0.93
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.10
 TOTAL STREAM AREA(ACRES) = 8.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.53
  ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 27.74 18.40 1.035 0.74(0.34) 0.45 41.3 3.00

1 25.01 22.93 0.897 0.74(0.35) 0.47 46.5 10.00

1 22.99 25.37 0.840 0.74(0.35) 0.47 48.2 7.00

1 21.48 26.90 0.809 0.75(0.35) 0.47 48.6 1.00

2 3.53 21.59 0.933 0.75(0.45) 0.60 8.1 13.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  ** PEAK FLOW RATE TABLE **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 31.27 18.40 1.035 0.75(0.35) 0.47 48.2 3.00

2 29.35 21.59 0.933 0.75(0.36) 0.49 53.1 13.00

3 28.28 22.93 0.897 0.75(0.36) 0.49 54.6 10.00

4 25.84 25.37 0.840 0.75(0.37) 0.49 56.3 7.00

5 24.10 26.90 0.809 0.75(0.37) 0.49 56.7 1.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 31.27 Tc(MIN.) = 18.40
EFFECTIVE AREA(ACRES) = 48.25 AREA-AVERAGED Fm(INCH/HR) = 0.35
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.47
  TOTAL AREA(ACRES) = 56.7
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
*********************
 FLOW PROCESS FROM NODE 15.00 TO NODE 18.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1334.40 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 686.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 32.64
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.55
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.05
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.21
 STREET FLOW TRAVEL TIME(MIN.) = 2.83 Tc(MIN.) = 21.22
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.943
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Ар
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
                             0.76 0.75 0.100 56
 COMMERCIAL
                      В
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.23 0.75 0.600 56
 AGRICULTURAL POOR COVER
                       В
                               2.87
                                       0.50
                                                1.000
                                                      73
 "ORCHARDS"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.731
 SUBAREA AREA(ACRES) = 5.86 SUBAREA RUNOFF(CFS) = 2.73
 EFFECTIVE AREA(ACRES) = 54.11 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 62.6 PEAK FLOW RATE(CFS) = 31.27
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.54 HALFSTREET FLOOD WIDTH(FEET) = 19.54
 FLOW VELOCITY(FEET/SEC.) = 4.00 DEPTH*VELOCITY(FT*FT/SEC.) = 2.16
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE
                                        18.00 = 3587.00 FEET.
*****************
 FLOW PROCESS FROM NODE 18.00 TO NODE
                                       18.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 21.22
 RAINFALL INTENSITY(INCH/HR) = 0.94
 AREA-AVERAGED fm(INCH/HR) = 0.36
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.72
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 54.11
 TOTAL STREAM AREA(ACRES) = 62.59
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 31.27
************************
 FLOW PROCESS FROM NODE 16.00 TO NODE
                                    17.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 984.00
 ELEVATION DATA: UPSTREAM(FEET) = 1343.50 DOWNSTREAM(FEET) = 1333.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.343
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.118
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.22 0.75
                                           0.600 56 16.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.94
 TOTAL AREA(ACRES) = 3.22 PEAK FLOW RATE(CFS) = 1.94
******************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1333.80 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 923.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.04
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.31
   HALFSTREET FLOOD WIDTH(FEET) = 6.33
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.20
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.68
 STREET FLOW TRAVEL TIME(MIN.) = 7.01 Tc(MIN.) = 23.35
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.886
 SUBAREA LOSS RATE DATA(AMC II):
```

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DEVELOPME	NT TYPE/	SCS SOIL	AREA	Fp		Ap	SCS
LAND	USE	GROUP	(ACRES)	(INCH/	/HR) (DECIMAL)	CN
RESIDENTIA							
	INGS/ACRE"	R	3 97	0	75	0 600	56
		Б	3.57	0.	. 75	0.000	50
NATURAL PO		_		•		1 000	
"BARREN"		В					86
SUBAREA AV	ERAGE PERVIC	US LOSS RATI	E, Fp(ING	CH/HR)	= 0.6	50	
SUBAREA AV	ERAGE PERVIC	US AREA FRAC	CTION, A	o = 0	.688		
	EA(ACRES) =					= 2.1	8
	AREA(ACRES)	- Ω 21	ADEA.	_	TED Em/	TMCU/UD)	- 0 42
TI.I.FCITAR	AREA (ACRES)	- 0.51	ALLA		אווויד מהדב	INCII/III()	- 0.42
	GED Fp(INCH/						
TOTAL AREA	(ACRES) =	8.3	PEA	K FLOW	RATE (C	CFS) =	3.45
END OF SUB	AREA STREET	FLOW HYDRAUI	LICS:				
DЕРТН (БЕЕТ) = 0.32 H	ALESTREET FI	יחדש חסס.	гн (ввег	r) =	6 74	
							0 72
	ITY(FEET/SEC						
LONGEST FL	OWPATH FROM	NODE 16	.00 TO NO	ODE	18.00) = 190)7.00 FEET.
******	******	*****	*****	* * * * * *	*****	******	******
FLOW PROCE	SS FROM NODE	18.00 5	TO NODE	18.	.00 TS	CODE =	1
· · · · · DEGIO	NATE INDEPEN		EOD COM	T TIDNOT			
>>>>AND C	OMPUTE VARIO	US CONFLUENC	CED STREA	JAAV MA	JES<<<	<<	
========	========	========	======	======	======	=======	========
TOTAL NUMB	ER OF STREAM	IS = 2					
CONFILIENCE	VALUES USED	FOR INDEPE	NDENT STI	REAM 2	ARE:		
	NCENTRATION(=					
	NTENSITY(INC		. 69				
	GED Fm(INCH/						
AREA-AVERA	GED Fp(INCH/	HR) = 0.65					
AREA-AVERA	GED Ap = 0 .	65					
	STREAM AREA(8 31				
	AM AREA(ACRE						
				2 4 5			
PEAK FLOW	RATE(CFS) AT	CONFLUENCE	=	3.45			
** CONFLUE	NCE DATA **						
STREAM	Q T	c Intensit	zy Fp(l	∃m)	qД	Ae	HEADWATER
NUMBER			R) (INCH,		-	(ACRES)	NODE
1		.22 0.943		0.36)	0 50	54.1	3.00
1		.45 0.860		0.37)		59.0	13.00
1		.82 0.830	1 0 72/				
-					0.51	60.5	
1		.34 0.782		0.37)		60.5 62.1	
	25.84 28	.34 0.782	2 0.72(0.37)	0.51	62.1	7.00
1	25.84 28 24.10 29	.34 0.782 .91 0.755	0.72(0.72(0.37) 0.37)	0.51 0.51	62.1 62.6	7.00 1.00
	25.84 28 24.10 29	.34 0.782	0.72(0.72(0.37)	0.51 0.51	62.1	7.00 1.00
1 2	25.84 28 24.10 29 3.45 23	.34 0.782 .91 0.755 .35 0.886	2 0.72(5 0.72(6 0.65(0.37) 0.37) 0.42)	0.51 0.51 0.65	62.1 62.6	7.00 1.00
1 2 RAINFALL I	25.84 28 24.10 29 3.45 23 NTENSITY AND	.34 0.782 .91 0.759 .35 0.886	2 0.72(5 0.72(5 0.65(NCENTRAT	0.37) 0.37) 0.42)	0.51 0.51 0.65	62.1 62.6	7.00 1.00
1 2 RAINFALL I	25.84 28 24.10 29 3.45 23	.34 0.782 .91 0.759 .35 0.886	2 0.72(5 0.72(5 0.65(NCENTRAT	0.37) 0.37) 0.42)	0.51 0.51 0.65	62.1 62.6	7.00 1.00
1 2 RAINFALL I	25.84 28 24.10 29 3.45 23 NTENSITY AND	.34 0.782 .91 0.759 .35 0.886	2 0.72(5 0.72(5 0.65(NCENTRAT	0.37) 0.37) 0.42)	0.51 0.51 0.65	62.1 62.6	7.00 1.00
1 2 RAINFALL I CONFLUENCE	25.84 28 24.10 29 3.45 23 NTENSITY AND	.34 0.782 .91 0.759 .35 0.886 TIME OF COM D FOR 2 STR	2 0.72(5 0.72(5 0.65(NCENTRAT	0.37) 0.37) 0.42)	0.51 0.51 0.65	62.1 62.6	7.00 1.00
1 2 RAINFALL I CONFLUENCE ** PEAK FL	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL	.34 0.782 .91 0.755 .35 0.886 TIME OF COLD FOR 2 STE	2 0.72(5 0.72(6 0.65(NCENTRAT:	0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65	62.1 62.6 8.3	7.00 1.00 16.00
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T	.34 0.782 .91 0.759 .35 0.886 TIME OF COI DD FOR 2 STE	2 0.72(5 0.72(6 0.65(NCENTRAT: REAMS.	0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65	62.1 62.6 8.3	7.00 1.00 16.00 HEADWATER
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM NUMBER	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T (CFS) (MI	.34 0.782 .91 0.759 .35 0.886 TIME OF COMED FOR 2 STREE E ** C Intensit N.) (INCH/HR	2 0.72(5 0.72(6 0.65(NCENTRATE REAMS.	0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65 FIO	62.1 62.6 8.3 Ae (ACRES)	7.00 1.00 16.00 HEADWATER NODE
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM NUMBER 1	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T (CFS) (MI 34.72 21	.34 0.782 .91 0.755 .35 0.886 TIME OF COMED FOR 2 STREET ** CC Intensit N.) (INCH/HR22 0.942	2 0.72(5 0.72(6 0.65(NCENTRATE REAMS. Ty Fp(1 R) (INCH, 3 0.71(0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65 FIO Ap 0.52	62.1 62.6 8.3 Ae (ACRES) 61.7	7.00 1.00 16.00 HEADWATER NODE 3.00
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM NUMBER 1 2	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T (CFS) (MI 34.72 21	.34 0.782 .91 0.759 .35 0.886 TIME OF COMED FOR 2 STREE E ** C Intensit N.) (INCH/HR	2 0.72(5 0.72(6 0.65(NCENTRATE REAMS. Ty Fp(1 R) (INCH, 3 0.71(0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65 FIO Ap 0.52	62.1 62.6 8.3 Ae (ACRES)	7.00 1.00 16.00 HEADWATER NODE 3.00
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM NUMBER 1	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T (CFS) (MI 34.72 21 33.46 23	.34 0.782 .91 0.755 .35 0.886 TIME OF COMED FOR 2 STREET ** CC Intensit N.) (INCH/HR22 0.942	2 0.72(5 0.72(5 0.65(NCENTRATE REAMS. Ey Fp(1 R) (INCH, 3 0.71(5 0.71(0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65 FIO Ap 0.52 0.53	62.1 62.6 8.3 Ae (ACRES) 61.7	7.00 1.00 16.00 HEADWATER NODE 3.00 16.00
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM NUMBER 1 2 3	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T (CFS) (MI 34.72 21 33.46 23 32.61 24	.34 0.782 .91 0.755 .35 0.886 TIME OF COL DE FOR 2 STE E ** C Intensit N.) (INCH/HE .22 0.942 .35 0.886	2 0.72(5 0.72(5 0.65(NCENTRAT: REAMS. EY Fp(I R) (INCH, 3 0.71(5 0.71(0 0.71(0.37) 0.37) 0.42) ION RAT Fm) /HR) 0.37) 0.37) 0.38)	0.51 0.51 0.65 TIO Ap 0.52 0.53 0.53	Ae (ACRES) 61.7 65.6 67.3	7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00
1 2 RAINFALL I CONFLUENCE ** PEAK FL STREAM NUMBER 1 2	25.84 28 24.10 29 3.45 23 NTENSITY AND FORMULA USE OW RATE TABL Q T (CFS) (MI 34.72 21 33.46 23 32.61 24 31.31 25	.34 0.782 .91 0.759 .35 0.886 TIME OF COMED FOR 2 STEAM EE ** CC Intensit N.) (INCH/HH .22 0.942 .35 0.886	2 0.72(5 0.72(6 0.65(NCENTRAT: REAMS. EY Fp(I R) (INCH, 3 0.71(5 0.71(0 0.71(0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.65 TIO Ap 0.52 0.53 0.53 0.53	62.1 62.6 8.3 Ae (ACRES) 61.7 65.6	7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 34.72 Tc(MIN.) = 21.22 EFFECTIVE AREA(ACRES) = 61.66 AREA-AVERAGED Fm(INCH/HR) = 0.37 AREA-AVERAGED Fp(INCH/HR) = 0.71 AREA-AVERAGED Ap = 0.52 TOTAL AREA(ACRES) = 70.9 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET. ********************** FLOW PROCESS FROM NODE 18.00 TO NODE 22.00 IS CODE = 62 ______ >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA< >>>>(STREET TABLE SECTION # 1 USED) << << ______ UPSTREAM ELEVATION(FEET) = 1324.40 DOWNSTREAM ELEVATION(FEET) = 1316.60 STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 32.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200 **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 35.47 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.53HALFSTREET FLOOD WIDTH(FEET) = 18.84 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.86 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.56 STREET FLOW TRAVEL TIME(MIN.) = 1.20 Tc(MIN.) = 22.42 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.910 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fр SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN NATURAL POOR COVER В 2.58 0.27 1.000 86 "BARREN" SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000 SUBAREA AREA(ACRES) = 2.58 SUBAREA RUNOFF(CFS) = 1.48 EFFECTIVE AREA(ACRES) = 64.24 AREA-AVERAGED Fm(INCH/HR) = 0.37 AREA-AVERAGED Fp(INCH/HR) = 0.68 AREA-AVERAGED Ap = 0.54 TOTAL AREA(ACRES) = 73.5 PEAK FLOW RATE(CFS) = 34.72 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 18.68 FLOW VELOCITY(FEET/SEC.) = 4.83 DEPTH*VELOCITY(FT*FT/SEC.) = 2.53 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET. *******************

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1

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```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =
 RAINFALL INTENSITY(INCH/HR) = 0.91
 AREA-AVERAGED fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.68
 AREA-AVERAGED Ap = 0.54
 EFFECTIVE STREAM AREA(ACRES) = 64.24
 TOTAL STREAM AREA(ACRES) = 73.48
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 34.72
******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1059.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1329.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.838
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.190
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                 Fp Ap SCS Tc
     LAND USE
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                            0.78
                                    0.75
                                          0.600 56 14.84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.52
 TOTAL AREA(ACRES) = 0.78 PEAK FLOW RATE(CFS) = 0.52
******************
                     20.00 TO NODE
 FLOW PROCESS FROM NODE
                                   21.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1329.90 DOWNSTREAM ELEVATION(FEET) = 1322.90
 STREET LENGTH(FEET) = 956.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.13
```

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```
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.35
   HALFSTREET FLOOD WIDTH(FEET) = 8.01
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.06
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.73
 STREET FLOW TRAVEL TIME(MIN.) = 7.73 Tc(MIN.) = 22.57
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.906
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Ар
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 14.50 0.75 0.600 56
 NATURAL POOR COVER
                       B 1.79 0.27 1.000 86
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.67
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.644
 SUBAREA AREA(ACRES) = 16.29 SUBAREA RUNOFF(CFS) = 6.99
 EFFECTIVE AREA(ACRES) = 17.07 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.67 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 17.1 PEAK FLOW RATE(CFS) =
                                                    7.31
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41 HALFSTREET FLOOD WIDTH(FEET) = 10.39
 FLOW VELOCITY(FEET/SEC.) = 2.34 DEPTH*VELOCITY(FT*FT/SEC.) = 0.97
 LONGEST FLOWPATH FROM NODE 19.00 TO NODE 21.00 = 2015.00 FEET.
******************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1322.90 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 615.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.86
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 11.33
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.58
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.01
 STREET FLOW TRAVEL TIME(MIN.) = 3.97 Tc(MIN.) = 26.54
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.816
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Ap SCS
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
```

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```
NATURAL POOR COVER
   "BARREN" B 2.22 0.27 1.000 86
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 2.22 SUBAREA RUNOFF(CFS) = 1.09
EFFECTIVE AREA(ACRES) = 19.29 AREA-AVERAGED Fm(INCH/HR) = 0.41
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.68
   TOTAL AREA(ACRES) = 19.3 PEAK FLOW RATE(CFS) = 7.31
   NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.39 HALFSTREET FLOOD WIDTH(FEET) = 11.05
  FLOW VELOCITY(FEET/SEC.) = 2.51 DEPTH*VELOCITY(FT*FT/SEC.) = 0.97
   LONGEST FLOWPATH FROM NODE 19.00 TO NODE 22.00 = 2630.00 FEET.
************************
   FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
   >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
   TOTAL NUMBER OF STREAMS = 2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 26.54
  RAINFALL INTENSITY(INCH/HR) = 0.82
   AREA-AVERAGED fm(INCH/HR) = 0.41
   AREA-AVERAGED Fp(INCH/HR) = 0.60
  AREA-AVERAGED Ap = 0.68
   EFFECTIVE STREAM AREA(ACRES) = 19.29
  TOTAL STREAM AREA(ACRES) = 19.29
   PEAK FLOW RATE(CFS) AT CONFLUENCE =
   ** CONFLUENCE DATA **
    STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        34.72
        22.42
        0.910
        0.68(0.37)
        0.54
        64.2
        3.00

        1
        33.46
        24.56
        0.858
        0.68(0.37)
        0.54
        68.2
        16.00

        1
        32.61
        25.68
        0.833
        0.68(0.37)
        0.54
        69.9
        13.00

        1
        31.31
        27.05
        0.806
        0.68(0.37)
        0.55
        71.4
        10.00

        1
        28.51
        29.60
        0.760
        0.68(0.37)
        0.55
        73.0
        7.00

        1
        26.57
        31.19
        0.734
        0.68(0.38)
        0.55
        73.5
        1.00

        2
        7.31
        26.54
        0.816
        0.60(0.41)
        0.68
        19.3
        19.00

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR 2 STREAMS.
   ** PEAK FLOW RATE TABLE **
   ** PEAK FLOW RATE TABLE **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 42.04 22.42 0.910 0.66(0.37) 0.57 80.5 3.00
2 40.77 24.56 0.858 0.66(0.38) 0.57 86.0 16.00
3 39.92 25.68 0.833 0.66(0.38) 0.57 88.5 13.00
4 39.11 26.54 0.816 0.66(0.38) 0.58 90.1 19.00
5 38.44 27.05 0.806 0.66(0.38) 0.58 90.7 10.00
6 34.81 29.60 0.760 0.66(0.38) 0.58 92.3 7.00
7 32.41 31.19 0.734 0.66(0.38) 0.58 92.8 1.00
```

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```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 42.04 Tc(MIN.) = 22.42
 EFFECTIVE AREA(ACRES) = 80.54 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.66 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 92.8
                          1.00 TO NODE 22.00 = 3937.00 FEET.
 LONGEST FLOWPATH FROM NODE
*******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.60 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1041.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 45.37
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.58
   HALFSTREET FLOOD WIDTH(FEET) = 21.80
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.70
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.75
 STREET FLOW TRAVEL TIME(MIN.) = 3.69 Tc(MIN.) = 26.11
   2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.824
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
                      B 12.11 0.27
 "BARREN"
                                             1.000
                                                     86
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              1.93
                                      0.75
                                             0.600
                                                     56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.945
 SUBAREA AREA(ACRES) = 14.04 SUBAREA RUNOFF(CFS) = 6.67
 EFFECTIVE AREA(ACRES) = 94.58 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.58 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 106.8 PEAK FLOW RATE(CFS) = 42.04
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 21.18
 FLOW VELOCITY(FEET/SEC.) = 4.61 DEPTH*VELOCITY(FT*FT/SEC.) = 2.64
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
*********************
```

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```
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 26.11
 RAINFALL INTENSITY(INCH/HR) = 0.82
 AREA-AVERAGED fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.58
 AREA-AVERAGED Ap = 0.63
 EFFECTIVE STREAM AREA(ACRES) = 94.58
 TOTAL STREAM AREA(ACRES) = 106.81
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
*************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 639.00
 ELEVATION DATA: UPSTREAM(FEET) = 1324.10 DOWNSTREAM(FEET) = 1321.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.821
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.097
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fp Ap SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
                    В
 "3-4 DWELLINGS/ACRE"
                            1.77 0.75
                                          0.600 56 16.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.03
 TOTAL AREA(ACRES) = 1.77 PEAK FLOW RATE(CFS) = 1.03
************************
 FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1321.80 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1594.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
```

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```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.30
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.60
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.78
 STREET FLOW TRAVEL TIME(MIN.) = 10.23 Tc(MIN.) = 27.05
      2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.806
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                 SCS
                                                          Αp
      LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 13.48 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 13.48 SUBAREA RUNOFF(CFS) = 4.33
 EFFECTIVE AREA(ACRES) = 15.25 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 4.90
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 7.35
 FLOW VELOCITY(FEET/SEC.) = 2.81 DEPTH*VELOCITY(FT*FT/SEC.) = 0.94
 LONGEST FLOWPATH FROM NODE 23.00 TO NODE 25.00 = 2233.00 FEET.
*******************
 FLOW PROCESS FROM NODE 25.00 TO NODE
                                                25.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 27.05
 RAINFALL INTENSITY(INCH/HR) = 0.81
 AREA-AVERAGED fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 15.25
 TOTAL STREAM AREA(ACRES) = 15.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.90
  ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 42.04 26.11 0.824 0.58(0.36) 0.63 94.6 3.00

1 40.77 28.30 0.782 0.59(0.37) 0.62 100.1 16.00

1 39.92 29.42 0.763 0.59(0.37) 0.62 102.6 13.00

1 39.11 30.31 0.748 0.59(0.37) 0.62 104.2 19.00

1 38.44 30.84 0.740 0.59(0.37) 0.62 104.7 10.00

1 34.81 33.49 0.701 0.59(0.37) 0.62 106.4 7.00

1 32.41 35.14 0.680 0.59(0.37) 0.62 106.8 1.00

2 4.90 27.05 0.806 0.75(0.45) 0.60 15.2 23.00
```

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

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```
** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        46.94
        26.11
        0.824
        0.60(0.37)
        0.62
        109.3
        3.00

        2
        46.39
        27.05
        0.806
        0.61(0.38)
        0.62
        112.2
        23.00

        3
        45.35
        28.30
        0.782
        0.61(0.38)
        0.62
        115.3
        16.00

        4
        44.23
        29.42
        0.763
        0.61(0.38)
        0.62
        117.8
        13.00

        5
        43.21
        30.31
        0.748
        0.61(0.38)
        0.62
        119.4
        19.00

        6
        42.50
        30.84
        0.740
        0.61(0.38)
        0.62
        120.0
        10.00

        7
        38.66
        33.49
        0.701
        0.61(0.38)
        0.62
        121.6
        7.00

        8
        36.14
        35.14
        0.680
        0.61(0.38)
        0.62
        122.1
        1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 46.94 Tc(MIN.) =
  EFFECTIVE AREA(ACRES) = 109.30 AREA-AVERAGED Fm(INCH/HR) = 0.37
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.62
  TOTAL AREA(ACRES) = 122.1
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
******************
                                     25.00 TO NODE
                                                              29.00 \text{ IS CODE} = 62
  FLOW PROCESS FROM NODE
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1291.40
  STREET LENGTH(FEET) = 405.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
  INSIDE STREET CROSSFALL(DECIMAL) = 0.015
  OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
  STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) = 0.59
     HALFSTREET FLOOD WIDTH(FEET) = 22.20
     AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.74
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.80
  STREET FLOW TRAVEL TIME(MIN.) = 1.43 Tc(MIN.) = 27.54
        2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.796
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                            Аp
                                                                                     SCS
                          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
         LAND USE
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"
                                    В
                                                  1.08 0.75
                                                                         0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 1.08 SUBAREA RUNOFF(CFS) =
  EFFECTIVE AREA(ACRES) = 110.38 AREA-AVERAGED Fm(INCH/HR) = 0.38
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 123.1 PEAK FLOW RATE(CFS) =
                                               46.94
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 22.12
 FLOW VELOCITY(FEET/SEC.) = 4.74 DEPTH*VELOCITY(FT*FT/SEC.) = 2.80
 LONGEST FLOWPATH FROM NODE
                      1.00 TO NODE
                                    29.00 = 5383.00 FEET.
********************
 FLOW PROCESS FROM NODE 29.00 TO NODE
                                  29.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 27.54
 RAINFALL INTENSITY(INCH/HR) = 0.80
 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.60
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 110.38
 TOTAL STREAM AREA(ACRES) = 123.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 26.00 TO NODE
                                  27.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 545.00
 ELEVATION DATA: UPSTREAM(FEET) = 1313.20 DOWNSTREAM(FEET) = 1305.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.857
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.377
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.86 0.75 0.600 56 11.86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.55
 TOTAL AREA(ACRES) =
                  1.86 PEAK FLOW RATE(CFS) = 1.55
***********************
 FLOW PROCESS FROM NODE 27.00 TO NODE 28.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1305.00 DOWNSTREAM ELEVATION(FEET) = 1299.60
 STREET LENGTH(FEET) = 667.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.61
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.31
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.96
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.60
 STREET FLOW TRAVEL TIME(MIN.) = 5.68 Tc(MIN.) = 17.54
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.068
 SUBAREA LOSS RATE DATA(AMC II):
                                      Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               3.73
                                       0.75
                                               0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.73 SUBAREA RUNOFF(CFS) = 2.08
 EFFECTIVE AREA(ACRES) = 5.59 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.6 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.32 HALFSTREET FLOOD WIDTH(FEET) = 6.78
 FLOW VELOCITY(FEET/SEC.) = 2.03 DEPTH*VELOCITY(FT*FT/SEC.) = 0.65
 LONGEST FLOWPATH FROM NODE 26.00 TO NODE 28.00 = 1212.00 FEET.
***********************
 FLOW PROCESS FROM NODE 28.00 TO NODE 29.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1299.60
 DOWNSTREAM NODE ELEVATION(FEET) = 1291.40
 CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00
 "V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) = 2.00
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.038
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                       SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                0.74
                                               0.600
                                      0.75
                                                        56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.31
```

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```
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.57

AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 3.00

"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.77 Tc(MIN.) = 18.31

SUBAREA AREA(ACRES) = 0.74 SUBAREA RUNOFF(CFS) = 0.39

EFFECTIVE AREA(ACRES) = 6.33 AREA-AVERAGED Fm(INCH/HR) = 0.45

AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60

TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 3.36
```

NOTE:TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH
IN A FLOWING-FULL GUTTER(NORMAL DEPTH = GUTTER HIKE)

END OF SUBAREA "V" GUTTER HYDRAULICS:

DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 3.00

FLOW VELOCITY(FEET/SEC.) = 7.57 DEPTH*VELOCITY(FT*FT/SEC) = 6.06

LONGEST FLOWPATH FROM NODE 26.00 TO NODE 29.00 = 1562.00 FEET.

FLOW PROCESS FROM NODE 29.00 TO NODE 29.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 18.31

RAINFALL INTENSITY(INCH/HR) = 1.04

AREA-AVERAGED fm(INCH/HR) = 0.45

AREA-AVERAGED fp(INCH/HR) = 0.75

AREA-AVERAGED Ap = 0.60

EFFECTIVE STREAM AREA(ACRES) = 6.33

TOTAL STREAM AREA(ACRES) = 6.33

PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.36

** CONFLUENCE DATA **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	46.94	27.54	0.796	0.60(0.38)	0.62	110.4	3.00
1	46.39	28.48	0.779	0.61(0.38)	0.62	113.3	23.00
1	45.35	29.73	0.758	0.61(0.38)	0.62	116.4	16.00
1	44.23	30.86	0.739	0.61(0.38)	0.62	118.9	13.00
1	43.21	31.77	0.726	0.61(0.38)	0.62	120.5	19.00
1	42.50	32.29	0.718	0.61(0.38)	0.62	121.1	10.00
1	38.66	34.98	0.682	0.61(0.38)	0.62	122.7	7.00
1	36.14	36.66	0.661	0.61(0.38)	0.62	123.1	1.00
2	3.36	18.31	1.038	0.75(0.45)	0.60	6.3	26.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	50.29	18.31	1.038	0.62(0.38)	0.62	79.7	26.00
2	48.91	27.54	0.796	0.61(0.38)	0.62	116.7	3.00
3	48.27	28.48	0.779	0.61(0.38)	0.62	119.6	23.00

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4	47.11	29.73	0.758	0.62(0.38) 0	.62 122.7	16.00
5	45.91	30.86	0.739	0.62(0.38) 0	.62 125.2	13.00
6	44.87	31.77	0.726	0.62(0.38) 0	.62 126.8	19.00
7	44.14	32.29	0.718	0.62(0.38) 0	.62 127.4	10.00
8	40.21	34.98	0.682	0.62(0.38) 0	.62 129.0	7.00
9	37.65	36.66	0.661	0.62(0.38) 0	.62 129.5	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 50.29 Tc(MIN.) = 18.31 EFFECTIVE AREA(ACRES) = 79.73 AREA-AVERAGED Fm(INCH/HR) = 0.38

AREA-AVERAGED Fp(INCH/HR) = 0.62 AREA-AVERAGED Ap = 0.62

TOTAL AREA(ACRES) = 129.5

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 29.00 = 5383.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 129.5 TC(MIN.) = 18.31 EFFECTIVE AREA(ACRES) = 79.73 AREA-AVERAGED Fm(INCH/HR) = 0.38

AREA-AVERAGED Fp(INCH/HR) = 0.62 AREA-AVERAGED Ap = 0.620

PEAK FLOW RATE(CFS) = 50.29

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	50.29	18.31	1.038	0.62(0.38)	0.62	79.7	26.00
2	48.91	27.54	0.796	0.61(0.38)	0.62	116.7	3.00
3	48.27	28.48	0.779	0.61(0.38)	0.62	119.6	23.00
4	47.11	29.73	0.758	0.62(0.38)	0.62	122.7	16.00
5	45.91	30.86	0.739	0.62(0.38)	0.62	125.2	13.00
6	44.87	31.77	0.726	0.62(0.38)	0.62	126.8	19.00
7	44.14	32.29	0.718	0.62(0.38)	0.62	127.4	10.00
8	40.21	34.98	0.682	0.62(0.38)	0.62	129.0	7.00
9	37.65	36.66	0.661	0.62(0.38)	0.62	129.5	1.00

______ ______

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
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(909) 793-2257

FILE NAME: 0217HPB2.DAT

TIME/DATE OF STUDY: 11:59 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4800

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPER	LOW ANI	STREE?	rflow	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	-GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 687.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1339.70 DOWNSTREAM(FEET) = 1328.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.395
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.602
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
                                    Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                      B 1.89 0.75
                                             0.100 56 9.40
 COMMERCIAL
 AGRICULTURAL FAIR COVER
                              0.67 0.63
 "ORCHARDS"
                      В
                                             1.000 65 21.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.336
 SUBAREA RUNOFF(CFS) = 3.18
 TOTAL AREA(ACRES) =
                    2.56 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1328.20
 DOWNSTREAM NODE ELEVATION(FEET) = 1316.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 656.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.403
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                              αA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL
                      В
                              1.18 0.75
                                             0.100
 NATURAL POOR COVER
                              4.44 0.27
 "BARREN"
                      В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.811
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.15
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.15
 AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 2.12 Tc(MIN.) = 11.52
 SUBAREA AREA(ACRES) = 5.62 SUBAREA RUNOFF(CFS) = 5.93
EFFECTIVE AREA(ACRES) = 8.18 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.34 AREA-AVERAGED Ap = 0.66
 TOTAL AREA(ACRES) = 8.2 PEAK FLOW RATE(CFS) = 8.66
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH
       IN A FLOWING-FULL GUTTER (NORMAL DEPTH = GUTTER HIKE)
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 5.15 DEPTH*VELOCITY(FT*FT/SEC) = 4.12
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1343.00 FEET.
******************
```

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area B Page **2** of **7**

Proposed 2-year Hydrology – Area B
Page 3 of 7

```
AREA-AVERAGED Fp(INCH/HR) = 0.53
 AREA-AVERAGED Ap = 0.76
 EFFECTIVE STREAM AREA(ACRES) = 21.24
 TOTAL STREAM AREA(ACRES) = 21.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.26
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE
                                    5.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 607.00
 ELEVATION DATA: UPSTREAM(FEET) = 1337.20 DOWNSTREAM(FEET) = 1326.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.062
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.362
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.85 0.75
                                           0.600 56 12.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.16
 TOTAL AREA(ACRES) = 3.85 PEAK FLOW RATE(CFS) = 3.16
******************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1326.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 674.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.55
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) = 6.70
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.02
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.96
 STREET FLOW TRAVEL TIME(MIN.) = 3.72 Tc(MIN.) = 15.79
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.143
 SUBAREA LOSS RATE DATA(AMC II):
```

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area B Page **4** of **7**

```
DEVELOPMENT TYPE/ SCS SOIL AREA
                                        Fρ
                       GROUP (ACRES) (INCH/HR) (DECIMAL) CN
      LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                 4.42 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 4.42 SUBAREA RUNOFF(CFS) = 2.76
 EFFECTIVE AREA(ACRES) = 8.27 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.3 PEAK FLOW RATE(CFS) = 5.17
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33 HALFSTREET FLOOD WIDTH(FEET) = 7.15
 FLOW VELOCITY(FEET/SEC.) = 3.10 DEPTH*VELOCITY(FT*FT/SEC.) = 1.02
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1281.00 FEET.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.79
 RAINFALL INTENSITY(INCH/HR) = 1.14
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.27
 TOTAL STREAM AREA(ACRES) = 8.27
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.17
 ** CONFLUENCE DATA **
  STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER
          (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

13.26 16.80 1.098 0.53(0.40) 0.76 21.2 1.00

5.17 15.79 1.143 0.75(0.45) 0.60 8.3 4.00
  NUMBER
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

    18.43
    15.79
    1.143
    0.58( 0.42) 0.72
    28.2
    4.00

    18.09
    16.80
    1.098
    0.58( 0.42) 0.72
    29.5
    1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 18.43 Tc(MIN.) = 15.79
 EFFECTIVE AREA(ACRES) = 28.22 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.58 AREA-AVERAGED Ap = 0.72
 TOTAL AREA(ACRES) = 29.5
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1953.00 FEET.
```

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<

>>>>(STREET TABLE SECTION # 3 USED) << <<

UPSTREAM ELEVATION(FEET) = 1314.40 DOWNSTREAM ELEVATION(FEET) = 1313.90 STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 18.58

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.61

HALFSTREET FLOOD WIDTH(FEET) = 20.00

AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.80

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.09

STREET FLOW TRAVEL TIME(MIN.) = 2.22 Tc(MIN.) = 18.01

2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.050

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Αp LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL

В "3-4 DWELLINGS/ACRE" 0.56 0.75 0.600 56 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600

SUBAREA AREA(ACRES) = 0.56 SUBAREA RUNOFF(CFS) = 0.30

EFFECTIVE AREA(ACRES) = 28.78 AREA-AVERAGED Fm(INCH/HR) = 0.42 AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.71

TOTAL AREA(ACRES) = 30.1 PEAK FLOW RATE(CFS) = 18.43

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 20.00

FLOW VELOCITY(FEET/SEC.) = 1.79 DEPTH*VELOCITY(FT*FT/SEC.) = 1.09

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 2193.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 30.1 TC(MIN.) = 18.01 EFFECTIVE AREA(ACRES) = 28.78 AREA-AVERAGED Fm(INCH/HR) = 0.42

AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.713

PEAK FLOW RATE(CFS) = 18.43

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	18.43	18.01	1.050	0.59(0.42)	0.71	28.8	4.00
2	18.09	19.05	1.012	0.58(0.42)	0.72	30.1	1.00

Tract No. 20257 - Griffin Residential III Proposed 2-year Hydrology – Area B Page **6** of **7**

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HPC2.DAT

TIME/DATE OF STUDY: 12:00 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4800

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 469.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1314.20 DOWNSTREAM(FEET) = 1308.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.573
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.399
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                       В
                               1.20 0.75 0.600 56 11.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.03
TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 1.03
************************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1308.30 DOWNSTREAM ELEVATION(FEET) = 1303.30
 STREET LENGTH(FEET) = 580.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.70
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.27
   HALFSTREET FLOOD WIDTH(FEET) = 4.65
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.87
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.50
 STREET FLOW TRAVEL TIME(MIN.) = 5.17 Tc(MIN.) = 16.74
   2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.100
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                     SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.29
                                      0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.29 SUBAREA RUNOFF(CFS) = 1.34
 EFFECTIVE AREA(ACRES) = 3.49 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 3.5 PEAK FLOW RATE(CFS) = 2.05
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.28 HALFSTREET FLOOD WIDTH(FEET) = 5.26
```

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```
FLOW VELOCITY(FEET/SEC.) = 1.92 DEPTH*VELOCITY(FT*FT/SEC.) = 0.54
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1049.00 FEET.
******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 7.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1303.30 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 478.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.39
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.29
   HALFSTREET FLOOD WIDTH(FEET) = 5.51
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.11
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.61
 STREET FLOW TRAVEL TIME(MIN.) = 3.78 Tc(MIN.) = 20.53
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.964
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                            Аp
                                                  SCS
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.48 0.75
                                                  56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.48 SUBAREA RUNOFF(CFS) = 0.69
 EFFECTIVE AREA(ACRES) = 4.97 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.0
                             PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29 HALFSTREET FLOOD WIDTH(FEET) = 5.38
 FLOW VELOCITY(FEET/SEC.) = 2.09 DEPTH*VELOCITY(FT*FT/SEC.) = 0.60
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 1527.00 FEET.
***********************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE =
_____
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.53
 RAINFALL INTENSITY(INCH/HR) =
```

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```
AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 4.97
 TOTAL STREAM AREA(ACRES) = 4.97
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                  2.30
*************************
 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 460.00
 ELEVATION DATA: UPSTREAM(FEET) = 1316.00 DOWNSTREAM(FEET) = 1308.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.846
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.459
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                   Fp Ap SCS Tc
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              1.54
                                             0.600 56 10.85
                                     0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.40
TOTAL AREA(ACRES) = 1.54 PEAK FLOW RATE(CFS) = 1.40
***********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1308.30 DOWNSTREAM ELEVATION(FEET) = 1301.50
 STREET LENGTH(FEET) = 651.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.65
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.30
   HALFSTREET FLOOD WIDTH(FEET) = 5.79
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.17
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.64
 STREET FLOW TRAVEL TIME(MIN.) = 4.99 Tc(MIN.) = 15.83
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.141
```

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```
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                      SCS
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               3.97 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.97 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 5.51 AREA-AVERAGED Fm(INCH/HR) = 0.45
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.5 PEAK FLOW RATE(CFS) = 3.43
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.32 HALFSTREET FLOOD WIDTH(FEET) = 6.70
 FLOW VELOCITY(FEET/SEC.) = 2.28 DEPTH*VELOCITY(FT*FT/SEC.) = 0.73
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1111.00 FEET.
***********************
 FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1301.50 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 255.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.70
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 9.40
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.81
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.09
 STREET FLOW TRAVEL TIME(MIN.) = 1.51 Tc(MIN.) = 17.34
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.075
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                        SCS
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
                       B 1.34 0.75 0.850 56
 PUBLIC PARK
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 1.34 SUBAREA RUNOFF(CFS) = 0.53
 EFFECTIVE AREA(ACRES) = 6.85 AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.65
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 3.64
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.39 HALFSTREET FLOOD WIDTH(FEET) = 9.32
 FLOW VELOCITY(FEET/SEC.) = 2.81 DEPTH*VELOCITY(FT*FT/SEC.) = 1.09
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 7.00 = 1366.00 FEET.
******************
                           7.00 TO NODE
                                             7.00 \text{ IS CODE} = 81
 FLOW PROCESS FROM NODE
______
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
______
 MAINLINE Tc(MIN.) = 17.34
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.075
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
      LAND USE
                        GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 0.49 0.75
                                                     0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 0.28
 TOTAL AREA(ACRES) = 7.3 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.34
 RAINFALL INTENSITY(INCH/HR) = 1.08
 AREA-AVERAGED fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.65
 EFFECTIVE STREAM AREA(ACRES) = 7.34
TOTAL STREAM AREA(ACRES) = 7.34
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.91
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

      2.30
      20.53
      0.964
      0.75( 0.45) 0.60
      5.0
      1.00

      3.91
      17.34
      1.075
      0.75( 0.48) 0.65
      7.3
      4.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        6.22
        17.34
        1.075
        0.75(0.47)
        0.63
        11.5
        4.00

        2
        5.48
        20.53
        0.964
        0.75(0.47)
        0.63
        12.3
        1.00
```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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```
PEAK FLOW RATE(CFS) = 6.22 Tc(MIN.) = 17.34
EFFECTIVE AREA(ACRES) = 11.54 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 12.3
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 1527.00 FEET.
******************
 FLOW PROCESS FROM NODE 7.00 TO NODE 10.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 358.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.58
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.42
   HALFSTREET FLOOD WIDTH(FEET) = 10.51
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.06
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.86
 STREET FLOW TRAVEL TIME(MIN.) = 2.90 Tc(MIN.) = 20.24
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.973
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.53 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.53 SUBAREA RUNOFF(CFS) = 0.72 EFFECTIVE AREA(ACRES) = 13.07 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 13.8 PEAK FLOW RATE(CFS) = 6.22
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41 HALFSTREET FLOOD WIDTH(FEET) = 10.26
 FLOW VELOCITY(FEET/SEC.) = 2.03 DEPTH*VELOCITY(FT*FT/SEC.) = 0.83
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 1885.00 FEET.
FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
```

```
TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.24
 RAINFALL INTENSITY(INCH/HR) = 0.97
 AREA-AVERAGED fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.63
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 13.84
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 8.00 TO NODE
                                   9.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 619.00
 ELEVATION DATA: UPSTREAM(FEET) = 1311.70 DOWNSTREAM(FEET) = 1302.50
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.507
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.330
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fр
                                             Ap SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.39 0.75
                                            0.600 56 12.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.10
 TOTAL AREA(ACRES) = 1.39 PEAK FLOW RATE(CFS) =
                                               1.10
******************
 FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1302.50 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 456.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.96
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) =
```

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```
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.82
  STREET FLOW TRAVEL TIME(MIN.) = 2.95 Tc(MIN.) = 15.46
       2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.159
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap
                                                                           SCS
        LAND USE
                             GROUP (ACRES) (INCH/HR) (DECIMAL) CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 2.68 0.75
                                                                   0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 2.68 SUBAREA RUNOFF(CFS) = 1.71 EFFECTIVE AREA(ACRES) = 4.07 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 4.1 PEAK FLOW RATE(CFS) =
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35 HALFSTREET FLOOD WIDTH(FEET) = 7.80
  FLOW VELOCITY(FEET/SEC.) = 2.71 DEPTH*VELOCITY(FT*FT/SEC.) = 0.94
  LONGEST FLOWPATH FROM NODE 8.00 TO NODE 10.00 = 1075.00 FEET.
********************
  FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 15.46
  RAINFALL INTENSITY(INCH/HR) = 1.16
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 4.07
  TOTAL STREAM AREA(ACRES) = 4.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.60
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        6.22
        20.24
        0.973
        0.75(0.47)
        0.63
        13.1
        4.00

    1
    6.22
    20.24
    0.973
    0.75( 0.47) 0.63
    13.1
    4.00

    1
    5.48
    23.51
    0.882
    0.75( 0.47) 0.62
    13.8
    1.00

    2
    2.60
    15.46
    1.159
    0.75( 0.45) 0.60
    4.1
    8.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

      NUMBER
      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      1
      8.82
      15.46
      1.159
      0.75( 0.46) 0.62
      14.0
      8.00

      2
      8.14
      20.24
      0.973
      0.75( 0.46) 0.62
      17.1
      4.00

      3
      7.07
      23.51
      0.882
      0.75( 0.46) 0.62
      17.9
      1.00
```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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```
PEAK FLOW RATE(CFS) = 8.82 Tc(MIN.) = 15.46
EFFECTIVE AREA(ACRES) = 14.05 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 17.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 1885.00 FEET.
******************
 FLOW PROCESS FROM NODE 10.00 TO NODE 14.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.50 DOWNSTREAM(FEET) = 1292.20
 FLOW LENGTH(FEET) = 21.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.54
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 8.82
 PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 15.50
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1906.00 FEET.
************************
 FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.50
 RAINFALL INTENSITY(INCH/HR) = 1.16
 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 14.05
 TOTAL STREAM AREA(ACRES) = 17.91
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.82
***********************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 538.00
 ELEVATION DATA: UPSTREAM(FEET) = 1316.00 DOWNSTREAM(FEET) = 1307.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.794
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.382
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS Tc
     LAND USE
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.45 0.75 0.600 56 11.79
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
```

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```
SUBAREA RUNOFF(CFS) = 1.22
TOTAL AREA(ACRES) = 1.45 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1307.90 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.91
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.31
   HALFSTREET FLOOD WIDTH(FEET) = 6.41
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.70
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.84
 STREET FLOW TRAVEL TIME(MIN.) = 4.63 Tc(MIN.) = 16.42
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.114
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Аp
                                                   SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             2.28 0.75
                                                    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.28 SUBAREA RUNOFF(CFS) = 1.37
 EFFECTIVE AREA(ACRES) = 3.73 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) =
                   3.7
                              PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33 HALFSTREET FLOOD WIDTH(FEET) = 6.94
 FLOW VELOCITY(FEET/SEC.) = 2.80 DEPTH*VELOCITY(FT*FT/SEC.) = 0.91
 LONGEST FLOWPATH FROM NODE 11.00 TO NODE 13.00 = 1288.00 FEET.
************************
 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << <<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.50 DOWNSTREAM(FEET) = 1292.20
 FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```

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```
DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) = 4.88
  ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
  PIPE-FLOW(CFS) =
                         2.23
 PIPE TRAVEL TIME(MIN.) = 0.09 Tc(MIN.) = 16.51
  LONGEST FLOWPATH FROM NODE 11.00 TO NODE 14.00 = 1314.00 FEET.
*********************
  FLOW PROCESS FROM NODE 14.00 TO NODE
                                                 14.00 IS CODE =
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.51
 RAINFALL INTENSITY(INCH/HR) = 1.11
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 3.73
TOTAL STREAM AREA(ACRES) = 3.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 8.82 15.50 1.157 0.75(0.46) 0.62 14 0 8 0
             8.82 15.50 1.157 0.75( 0.46) 0.62 14.0 8.00

8.14 20.29 0.971 0.75( 0.46) 0.62 17.1 4.00

7.07 23.56 0.881 0.75( 0.46) 0.62 17.9 1.00

2.23 16.51 1.110 0.75( 0.45) 0.60 3.7 11.00
     1
      1
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

    11.05
    15.50
    1.157
    0.75( 0.46) 0.61
    17.6
    8.00

    10.91
    16.51
    1.110
    0.75( 0.46) 0.61
    18.4
    11.00

    9.90
    20.29
    0.971
    0.75( 0.46) 0.62
    20.9
    4.00

    8.53
    23.56
    0.881
    0.75( 0.46) 0.62
    21.6
    1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 11.05 Tc(MIN.) = 15.50
EFFECTIVE AREA(ACRES) = 17.55 AREA-AVERAGED Fm(INCH/HR) = 0.46
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.61
 TOTAL AREA(ACRES) = 21.6
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1906.00 FEET.
*******************
 FLOW PROCESS FROM NODE
                           14.00 TO NODE
                                               19.00 IS CODE = 31
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
```

```
ELEVATION DATA: UPSTREAM(FEET) = 1292.20 DOWNSTREAM(FEET) = 1288.30
 FLOW LENGTH(FEET) = 250.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.14
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 11.05
 PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 16.01
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                    19.00 = 2156.00 FEET.
***********************
 FLOW PROCESS FROM NODE 19.00 TO NODE
                                19.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.01
 RAINFALL INTENSITY(INCH/HR) = 1.13
 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.61
 EFFECTIVE STREAM AREA(ACRES) = 17.55
 TOTAL STREAM AREA(ACRES) = 21.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 15.00 TO NODE
                                16.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 571.00
 ELEVATION DATA: UPSTREAM(FEET) = 1307.70 DOWNSTREAM(FEET) = 1301.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.979
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.298
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.25 0.75 0.600 56 12.98
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.96
 TOTAL AREA(ACRES) =
                  1.25 PEAK FLOW RATE(CFS) = 0.96
***********************
 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1301.70 DOWNSTREAM ELEVATION(FEET) = 1296.00
 STREET LENGTH(FEET) = 606.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.81
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.27
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.96
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.52
 STREET FLOW TRAVEL TIME(MIN.) = 5.15 Tc(MIN.) = 18.13
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.045
 SUBAREA LOSS RATE DATA(AMC II):
                                   Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             3.15 0.75
                                           0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.15 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 4.40 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 4.4 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29 HALFSTREET FLOOD WIDTH(FEET) = 5.59
 FLOW VELOCITY(FEET/SEC.) = 2.04 DEPTH*VELOCITY(FT*FT/SEC.) = 0.59
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE 17.00 = 1177.00 FEET.
************************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.00 DOWNSTREAM(FEET) = 1288.70
 FLOW LENGTH(FEET) = 328.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.71
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.36
 PIPE TRAVEL TIME(MIN.) = 1.16 Tc(MIN.) = 19.29
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE
                                       18.00 = 1505.00 FEET.
******************
 FLOW PROCESS FROM NODE 18.00 TO NODE 18.00 IS CODE = 81
______
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
______
```

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```
MAINLINE Tc(MIN.) = 19.29
  * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.004
  SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 1.63 0.75 0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 1.63 SUBAREA RUNOFF(CFS) = 0.81
  EFFECTIVE AREA(ACRES) = 6.03 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 6.0 PEAK FLOW RATE(CFS) =
*******************
 FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
  >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
  ELEVATION DATA: UPSTREAM(FEET) = 1288.70 DOWNSTREAM(FEET) = 1288.30
 FLOW LENGTH(FEET) = 34.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.34
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.01
 PIPE TRAVEL TIME(MIN.) = 0.11 Tc(MIN.) = 19.39
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE 19.00 = 1539.00 FEET.
******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 19.39
 RAINFALL INTENSITY(INCH/HR) = 1.00
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 6.03
  TOTAL STREAM AREA(ACRES) = 6.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.01
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        11.05
        16.01
        1.133
        0.75( 0.46)
        0.61
        17.6
        8.00

        1
        10.91
        17.02
        1.089
        0.75( 0.46)
        0.61
        18.4
        11.00

        1
        9.90
        20.81
        0.955
        0.75( 0.46)
        0.62
        20.9
        4.00

        1
        8.53
        24.10
        0.868
        0.75( 0.46)
        0.62
        21.6
        1.00

        2
        3.01
        19.39
        1.000
        0.75( 0.45)
        0.60
        6.0
        15.00
```

Tract No. 20257 – Griffin Residential III Proposed 2-year Hydrology – Area C Page **15** of **21** RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

```
** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

      14.07
      16.01
      1.133
      0.75( 0.46) 0.61
      22.5
      8.00

      13.92
      17.02
      1.089
      0.75( 0.46) 0.61
      23.7
      11.00

      13.29
      19.39
      1.000
      0.75( 0.46) 0.61
      26.0
      15.00

      12.67
      20.81
      0.955
      0.75( 0.46) 0.61
      26.9
      4.00

      10.82
      24.10
      0.868
      0.75( 0.46) 0.61
      27.7
      1.00

     4
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 14.07 Tc(MIN.) = 16.01
EFFECTIVE AREA(ACRES) = 22.53 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.61
 TOTAL AREA(ACRES) = 27.7
 LONGEST FLOWPATH FROM NODE
                                1.00 TO NODE 19.00 = 2156.00 FEET.
************************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
 ELEVATION DATA: UPSTREAM(FEET) = 1288.30 DOWNSTREAM(FEET) = 1288.00
 FLOW LENGTH(FEET) = 31.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.17
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 14.07
 PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 16.09
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                                20.00 = 2187.00 FEET.
******************
 FLOW PROCESS FROM NODE
                          20.00 TO NODE
                                            23.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1293.40
 DOWNSTREAM NODE ELEVATION(FEET) = 1291.70
 CHANNEL LENGTH THRU SUBAREA(FEET) = 170.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) = 2.00
     2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.113
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                              SCS
                                                       Дp
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN PUBLIC PARK B 0.59 0.75 0.850 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 14.19
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.52
 AVERAGE FLOW DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) =
```

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```
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.38 Tc(MIN.) = 16.46
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 0.25 EFFECTIVE AREA(ACRES) = 23.12 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 14.07
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
      NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
      DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 7.52 DEPTH*VELOCITY(FT*FT/SEC) = 9.02
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 23.00 = 2357.00 FEET.
***********************
 FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.46
 RAINFALL INTENSITY(INCH/HR) = 1.11
 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 23.12
 TOTAL STREAM AREA(ACRES) = 28.26
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 648.00
 ELEVATION DATA: UPSTREAM(FEET) = 1313.20 DOWNSTREAM(FEET) = 1302.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.520
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.329
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fp Ap SCS
     LAND USE
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
                    В
 "3-4 DWELLINGS/ACRE"
                         1.26 0.75
                                           0.600 56 12.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.00
 TOTAL AREA(ACRES) = 1.26 PEAK FLOW RATE(CFS) = 1.00
***********************
                     22.00 \text{ TO NODE} 23.00 \text{ IS CODE} = 62
 FLOW PROCESS FROM NODE
______
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1302.70 DOWNSTREAM ELEVATION(FEET) = 1291.70
 STREET LENGTH(FEET) = 627.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.35
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.21
   HALFSTREET FLOOD WIDTH(FEET) = 2.52
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.67
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.56
 STREET FLOW TRAVEL TIME(MIN.) = 3.92 Tc(MIN.) = 16.44
    2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.114
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                    SCS
                                               Дp
                GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.20 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.20 SUBAREA RUNOFF(CFS) = 0.72
 EFFECTIVE AREA(ACRES) = 2.46 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 2.5 PEAK FLOW RATE(CFS) = 1.47
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.22 HALFSTREET FLOOD WIDTH(FEET) = 3.08
 FLOW VELOCITY(FEET/SEC.) = 2.57 DEPTH*VELOCITY(FT*FT/SEC.) = 0.57
 LONGEST FLOWPATH FROM NODE
                         21.00 TO NODE 23.00 = 1275.00 FEET.
***********************
 FLOW PROCESS FROM NODE 23.00 TO NODE
                                     23.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.44
 RAINFALL INTENSITY(INCH/HR) = 1.11
 AREA-AVERAGED fm(INCH/HR) = 0.45
 AREA-AVERAGED fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 2.46
```

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		,					
** CONFLUE	NCE DATA	* *					
			Intensity	Fp(Fm)	Aρ	Ae	HEADWATER
				(INCH/HR)			
				0.75(0.46)			
				0.75(0.46)			
				0.75(0.46)			
				0.75(0.46)			
				0.75(0.46)			
				0.75(0.45)			
RAINFALL II	NTENSITY	AND TI	ME OF CONC	ENTRATION RA	TIO		
CONFLUENCE	FORMULA	USED FO	OR 2 STRE	AMS.			
** PEAK FLO							
STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	15.54	16.44	1.114	0.75(0.46)	0.62	25.5	21.00
2	15.54	16.46	1.113	0.75(0.46)	0.62	25.6	8.00
3	15.30	17.47	1.070	0.75(0.46)	0.62	26.8	11.00
4	14.48	19.84	0.985	0.75(0.46)	0.62	29.0	15.00
5	13.76	21.26	0.942	0.75(0.46)	0.62	29.9	4.00
6	11.73	24.55	0.858	0.75(0.46)	0.62	30.7	1.00
TOTAL AREA LONGEST FLO	(ACRES) = OWPATH FI	= ROM NODI ****** NODE	30.7 E 1.00 ***********************************	NODE 24	23.0 *****	0 = 235 ************************************	*****
>>>>COMPU'		r flow :	TRAVEL TIM	E THRU SUBAR			
========	======	======	=======	========	=====	=======	========
							= 1280.50
STREET LENG				RB HEIGHT(IN	ICHES)	= 8.0	
DISTANCE FI INSIDE STRI OUTSIDE STR	EET CROSS	SFALL(DI	ECIMAL) =		!T) =	6.00	
				RYING RUNOFF	= 2		
STREET PARI		-	· · · · · · · · · · · · · · · · · · ·	= 0.021 tflow Sectio	n / gurb	to gurb)	- 0.0150
_				of-Walk Flow			
STREETFL(STREET F) HALFSTRE	OW MODEL LOW DEPTI ET FLOOD	RESULT: H(FEET) WIDTH(1	S USING ES			20.69)

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AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.76

```
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
  STREET FLOW TRAVEL TIME(MIN.) = 3.07 Tc(MIN.) = 19.51
  * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.996
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                     SCS
                                                             Дp
                          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
       LAND USE
  NATURAL POOR COVER
  "BARREN"
                             В
                                      15.81
                                                 0.27
                                                           1.000
                                                                     86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 15.81 SUBAREA RUNOFF(CFS) = 10.31
  EFFECTIVE AREA(ACRES) = 41.35 AREA-AVERAGED Fm(INCH/HR) = 0.39
  AREA-AVERAGED Fp(INCH/HR) = 0.51 AREA-AVERAGED Ap = 0.76
  TOTAL AREA(ACRES) = 46.5 PEAK FLOW RATE(CFS) = 22.62
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.49 HALFSTREET FLOOD WIDTH(FEET) = 17.14
  FLOW VELOCITY(FEET/SEC.) = 3.82 DEPTH*VELOCITY(FT*FT/SEC.) = 1.89
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 24.00 = 3051.00 FEET.
______
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES) = 46.5 TC(MIN.) = 19.51
EFFECTIVE AREA(ACRES) = 41.35 AREA-AVERAGED Fm(INCH/HR) = 0.39
  AREA-AVERAGED Fp(INCH/HR) = 0.51 AREA-AVERAGED Ap = 0.763
                               22.62
  PEAK FLOW RATE(CFS) =
  ** PEAK FLOW RATE TABLE **
            Q TC Intensity Fp(Fm) Ap Ae HEADWATER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
   STREAM Q Tc Intensity Fp(Fm)
   NUMBER
             22.62 19.51 0.996 0.51( 0.39) 0.76 41.4 21.00
             22.60 19.54 0.995 0.51(0.39)0.76
                                                              41.4
                                                                          8.00

      22.60
      19.54
      0.995
      0.51( 0.39) 0.76
      41.4

      21.93
      20.57
      0.963
      0.51( 0.39) 0.76
      42.6

      20.27
      22.96
      0.896
      0.52( 0.39) 0.75
      44.8

      19.18
      24.41
      0.861
      0.53( 0.40) 0.75
      45.8

      16.55
      27.79
      0.792
      0.53( 0.40) 0.75
      46.5

      3
                                                                         11.00
                                                                         15.00
                                                                           4.00
______
```

END OF RATIONAL METHOD ANALYSIS

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

PROPOSED HYDROLOGY 10-YEAR RUNOFF



Tract 20257 JN 10217

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0217HPAT.DAT

TIME/DATE OF STUDY: 10:29 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7490

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

FLOW PROCESS FROM NODE

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

1.00 TO NODE

2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1370.50 DOWNSTREAM(FEET) = 1359.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.987
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.402
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp Ap SCS Tc
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                                               0.200 56 9.99
                              0.50 0.75
 APARTMENTS
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 1.01
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 1.01
******************
 FLOW PROCESS FROM NODE 2.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1359.20 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 1264.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.17
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.36
   HALFSTREET FLOOD WIDTH(FEET) = 8.46
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.90
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.69
 STREET FLOW TRAVEL TIME(MIN.) = 11.09 Tc(MIN.) = 21.08
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.478
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 6.39 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 6.39 SUBAREA RUNOFF(CFS) = 5.92 
EFFECTIVE AREA(ACRES) = 6.89 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 6.52
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41 HALFSTREET FLOOD WIDTH(FEET) = 10.31
 FLOW VELOCITY(FEET/SEC.) = 2.11 DEPTH*VELOCITY(FT*FT/SEC.) = 0.87
```

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```
В
                                1.41
                                        0.75
 "3-4 DWELLINGS/ACRE"
                                                0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.243
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.28
 AVERAGE FLOW DEPTH(FEET) = 0.90 TRAVEL TIME(MIN.) = 2.85
 Tc(MIN.) =
           13.26
 SUBAREA AREA(ACRES) = 13.11 SUBAREA RUNOFF(CFS) = 21.43

EFFECTIVE AREA(ACRES) = 16.75 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 27.49
 GIVEN CHANNEL BASE(FEET) = 2.00 CHANNEL FREEBOARD(FEET) = 1.0
 "Z" FACTOR = 2.000 MANNING'S FACTOR = 0.015
 *ESTIMATED CHANNEL HEIGHT(FEET) = 2.10
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 1.10 FLOW VELOCITY(FEET/SEC.) = 5.92
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1505.00 FEET.
********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1353.90 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 163.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.62
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.53
   HALFSTREET FLOOD WIDTH(FEET) = 18.91
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.89
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.05
 STREET FLOW TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 13.96
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.933
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
                                                        SCS
                                                 Дp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                1.69 0.75
                                                        56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.69 SUBAREA RUNOFF(CFS) = 2.26
 EFFECTIVE AREA(ACRES) = 18.44 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.27
```

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FLOW PROCESS FROM NODE 6.00 TO NODE 9.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<

>>>>(STREET TABLE SECTION # 1 USED) <<<<

______ UPSTREAM ELEVATION(FEET) = 1351.60 DOWNSTREAM ELEVATION(FEET) = 1346.00 STREET LENGTH(FEET) = 312.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.13
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.55
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.48
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.45
 STREET FLOW TRAVEL TIME(MIN.) = 1.16 Tc(MIN.) = 15.12
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.835
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                            Ap SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.91 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.91 SUBAREA RUNOFF(CFS) = 2.38
 EFFECTIVE AREA(ACRES) = 24.91 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 35.30
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.54 HALFSTREET FLOOD WIDTH(FEET) = 19.62
 FLOW VELOCITY(FEET/SEC.) = 4.48 DEPTH*VELOCITY(FT*FT/SEC.) = 2.43
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE 9.00 = 2256.00 FEET.
******************
 FLOW PROCESS FROM NODE
                    9.00 TO NODE
                                    9.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.12
 RAINFALL INTENSITY(INCH/HR) = 1.84
 AREA-AVERAGED fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 27.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
FLOW PROCESS FROM NODE
                    7.00 TO NODE
                                   8.00 \text{ IS CODE} = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 967.00
 ELEVATION DATA: UPSTREAM(FEET) = 1360.40 DOWNSTREAM(FEET) = 1348.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.578
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.799
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fр
                                                Ар
                                                      SCS Tc
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               2.84 0.75 0.600 56 15.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.45
 TOTAL AREA(ACRES) =
                     2.84 PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1348.70 DOWNSTREAM ELEVATION(FEET) = 1346.00
 STREET LENGTH(FEET) = 654.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.17
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.43
   HALFSTREET FLOOD WIDTH(FEET) = 10.92
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.80
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.77
 STREET FLOW TRAVEL TIME(MIN.) = 6.04 Tc(MIN.) = 21.62
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.454
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fρ
                                                ąΑ
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                            5.96 0.75
                                               0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.96 SUBAREA RUNOFF(CFS) = 5.39
 EFFECTIVE AREA(ACRES) = 8.80 AREA-AVERAGED Fm(INCH/HR) = 0.45
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.8 PEAK FLOW RATE(CFS) = 7.96
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.46 HALFSTREET FLOOD WIDTH(FEET) = 12.19
  FLOW VELOCITY(FEET/SEC.) = 1.91 DEPTH*VELOCITY(FT*FT/SEC.) = 0.88
  LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 1621.00 FEET.
******************
                              9.00 TO NODE
                                                     9.00 \text{ IS CODE} =
  FLOW PROCESS FROM NODE
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 21.62
  RAINFALL INTENSITY(INCH/HR) = 1.45
  AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.80
  TOTAL STREAM AREA(ACRES) = 8.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.96
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        35.30
        15.12
        1.835
        0.75(0.26)
        0.35
        24.9
        3.00

        1
        28.20
        22.31
        1.425
        0.75(0.27)
        0.37
        27.2
        1.00

        2
        7.96
        21.62
        1.454
        0.75(0.45)
        0.60
        8.8
        7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

      NUMBER
      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      1
      42.98
      15.12
      1.835
      0.75( 0.30) 0.40
      31.1
      3.00

      2
      36.84
      21.62
      1.454
      0.75( 0.32) 0.42
      35.8
      7.00

      3
      35.93
      22.31
      1.425
      0.75( 0.32) 0.42
      36.0
      1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 42.98 Tc(MIN.) = 15.12
  EFFECTIVE AREA(ACRES) = 31.06 AREA-AVERAGED Fm(INCH/HR) = 0.30
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.40
  TOTAL AREA(ACRES) = 36.0
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
*********************
  FLOW PROCESS FROM NODE 9.00 TO NODE 12.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1346.00 DOWNSTREAM ELEVATION(FEET) = 1339.80
  STREET LENGTH(FEET) = 344.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
```

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```
INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 43.84
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.58
   HALFSTREET FLOOD WIDTH(FEET) = 21.41
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.70
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.71
 STREET FLOW TRAVEL TIME(MIN.) = 1.22 Tc(MIN.) = 16.34
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.745
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                  SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.49 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.49 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 32.55 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 42.98
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 21.18
 FLOW VELOCITY(FEET/SEC.) = 4.71 DEPTH*VELOCITY(FT*FT/SEC.) = 2.69
 LONGEST FLOWPATH FROM NODE
                          1.00 TO NODE 12.00 = 2600.00 FEET.
******************
 FLOW PROCESS FROM NODE
                     12.00 TO NODE
                                   12.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.34
 RAINFALL INTENSITY(INCH/HR) = 1.74
 AREA-AVERAGED fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 37.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE
                    10.00 TO NODE
                                   11.00 IS CODE = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 503.00
 ELEVATION DATA: UPSTREAM(FEET) = 1355.40 DOWNSTREAM(FEET) = 1347.10
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.273
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.221
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
                                               Ар
                                                     SCS Tc
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.74 0.75 0.600 56 11.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.18
 TOTAL AREA(ACRES) = 0.74 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1347.10 DOWNSTREAM ELEVATION(FEET) = 1339.80
 STREET LENGTH(FEET) = 1135.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.92
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.40
   HALFSTREET FLOOD WIDTH(FEET) = 9.73
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.12
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.84
 STREET FLOW TRAVEL TIME(MIN.) = 8.92 Tc(MIN.) = 20.19
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.520
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fρ
                                               Дp
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                              9.49
                                              0.600 56
                                       0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 9.49 SUBAREA RUNOFF(CFS) = 9.15
 EFFECTIVE AREA(ACRES) = 10.23 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 10.2 PEAK FLOW RATE(CFS) = 9.87
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.46 HALFSTREET FLOOD WIDTH(FEET) = 12.15
 FLOW VELOCITY(FEET/SEC.) = 2.38 DEPTH*VELOCITY(FT*FT/SEC.) = 1.09
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1638.00 FEET.
******************
                          12.00 TO NODE
 FLOW PROCESS FROM NODE
                                             12.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.19
 RAINFALL INTENSITY(INCH/HR) = 1.52
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 10.23
 TOTAL STREAM AREA(ACRES) = 10.23
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.87
 ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 42.98 16.34 1.745 0.75(0.30) 0.41 32.6 3.00

1 36.84 22.88 1.402 0.75(0.32) 0.43 37.3 7.00

1 35.93 23.58 1.374 0.75(0.32) 0.43 37.5 1.00

2 9.87 20.19 1.520 0.75(0.45) 0.60 10.2 10.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 52.63 16.34 1.745 0.75(0.33) 0.45 40.8 3.00
2 49.23 20.19 1.520 0.75(0.34) 0.46 45.6 10.00
3 45.61 22.88 1.402 0.75(0.35) 0.47 47.5 7.00
4 44.45 23.58 1.374 0.75(0.35) 0.47 47.8 1.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 52.63 Tc(MIN.) = 16.34
 EFFECTIVE AREA(ACRES) = 40.83 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 47.8
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 2600.00 FEET.
***********************
 FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1339.80 DOWNSTREAM ELEVATION(FEET) = 1334.40
 STREET LENGTH(FEET) = 301.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 53.06
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.61
   HALFSTREET FLOOD WIDTH(FEET) = 23.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.91
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.00
 STREET FLOW TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 17.36
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.677
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACKE
AGRICULTURAL FAIR COVER
 "3-4 DWELLINGS/ACRE" B 0.29 0.75 0.600 56
                               0.58 0.63
                                               1.000 65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.867
 SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 0.87 EFFECTIVE AREA(ACRES) = 41.70 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.46
 TOTAL AREA(ACRES) = 48.6 PEAK FLOW RATE(CFS) = 52.63
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 23.37
 FLOW VELOCITY(FEET/SEC.) = 4.90 DEPTH*VELOCITY(FT*FT/SEC.) = 2.98
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
******************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.36
 RAINFALL INTENSITY(INCH/HR) = 1.68
 AREA-AVERAGED fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.46
 EFFECTIVE STREAM AREA(ACRES) = 41.70
 TOTAL STREAM AREA(ACRES) = 48.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 52.63
*******************
 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 21
```

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```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 715.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1341.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.955
   10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.933
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fp
                                                     SCS
                                               Ар
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                              0.600 56 13.95
                               2.36
                                        0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.15
 TOTAL AREA(ACRES) = 2.36 PEAK FLOW RATE(CFS) =
*******************
                       14.00 TO NODE
 FLOW PROCESS FROM NODE
                                       15.00 \text{ IS CODE} = 62
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1341.30 DOWNSTREAM ELEVATION(FEET) = 1334.40
 STREET LENGTH(FEET) = 897.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 9.36
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.26
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.88
 STREET FLOW TRAVEL TIME(MIN.) = 6.61 Tc(MIN.) = 20.56
   10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.502
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fp
                                               Αp
                                                      SCS
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                               5.74
                                      0.75
                                              0.600
                                                      56
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.74 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 8.10 AREA-AVERAGED Fm(INCH/HR) = 0.45
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```
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) =
                                                                    7.68
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.42 HALFSTREET FLOOD WIDTH(FEET) = 10.51
 FLOW VELOCITY(FEET/SEC.) = 2.40 DEPTH*VELOCITY(FT*FT/SEC.) = 1.00
 LONGEST FLOWPATH FROM NODE 13.00 TO NODE 15.00 = 1612.00 FEET.
*******************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.56
 RAINFALL INTENSITY(INCH/HR) = 1.50
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.10
 TOTAL STREAM AREA(ACRES) = 8.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                           7.68
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 52.63 17.36 1.677 0.74(0.34) 0.46 41.7 3.00
1 49.23 21.23 1.472 0.74(0.35) 0.47 46.5 10.00
1 45.61 23.94 1.361 0.75(0.35) 0.47 48.4 7.00
1 44.45 24.64 1.336 0.75(0.35) 0.47 48.6 1.00
2 7.68 20.56 1.502 0.75(0.45) 0.60 8.1 13.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 60.19 17.36 1.677 0.75(0.35) 0.48 48.5 3.00
2 57.49 20.56 1.502 0.75(0.36) 0.49 53.7 13.00
3 56.68 21.23 1.472 0.75(0.36) 0.49 54.6 10.00
4 52.26 23.94 1.361 0.75(0.37) 0.49 56.5 7.00
5 50.92 24.64 1.336 0.75(0.37) 0.49 56.7 1.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 60.19 Tc(MIN.) = 17.36
 EFFECTIVE AREA(ACRES) = 48.54 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.48
 TOTAL AREA(ACRES) = 56.7
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
***********************
 FLOW PROCESS FROM NODE 15.00 TO NODE 18.00 IS CODE = 62
______
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1334.40 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 686.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 63.12
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.66
   HALFSTREET FLOOD WIDTH(FEET) =
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.67
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.10
 STREET FLOW TRAVEL TIME(MIN.) = 2.45 Tc(MIN.) = 19.81
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.539
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                     SCS
                                                Ар
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN B 0.76 0.75 0.100 56
 COMMERCIAL
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.23 0.75 0.600 56
 "3-4 DWELLINGS/FOLL
AGRICULTURAL POOR COVER

B 2.87 0.50

TOTAL HR) = 0.
                                               1.000 73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.731
 SUBAREA AREA(ACRES) = 5.86 SUBAREA RUNOFF(CFS) = 5.87
 EFFECTIVE AREA(ACRES) = 54.40 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.72 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 62.6 PEAK FLOW RATE(CFS) = 60.19
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 26.41
 FLOW VELOCITY(FEET/SEC.) = 4.62 DEPTH*VELOCITY(FT*FT/SEC.) = 3.02
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET.
***********************
 FLOW PROCESS FROM NODE 18.00 TO NODE 18.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 19.81
 RAINFALL INTENSITY(INCH/HR) = 1.54
 AREA-AVERAGED fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.72
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```
AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 54.40
 TOTAL STREAM AREA(ACRES) = 62.59
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 60.19
************************
 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 984.00
 ELEVATION DATA: UPSTREAM(FEET) = 1343.50 DOWNSTREAM(FEET) = 1333.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.343
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.744
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                  SCS Tc
                                    Fρ
                                             Дp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              3.22 0.75
                                            0.600 56 16.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.75
TOTAL AREA(ACRES) = 3.22 PEAK FLOW RATE(CFS) = 3.75
*********************
 FLOW PROCESS FROM NODE
                      17.00 TO NODE
                                     18.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <>>>
______
 UPSTREAM ELEVATION(FEET) = 1333.80 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 923.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.08
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
   HALFSTREET FLOOD WIDTH(FEET) = 8.91
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.95
 STREET FLOW TRAVEL TIME(MIN.) = 6.06 Tc(MIN.) = 22.41
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.421
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Ap SCS
```

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LAND RESIDENTIA	USE L	G	ROUP (A	CRES)	(INCH	/HR)	(DECIMAL)	CN	
	INGS/ACRE"		В	3.97	0	.75	0.600	56	
"BARREN"			В	1.12	0	. 27	1.000	86	
SUBAREA AV	ERAGE PERVI	OUS L	OSS RATE,	Fp(INC	CH/HR)	= 0.0			
SUBAREA AV							\	62	
EFFECTIVE .	EA(ACRES) - NDFN(NCDFC)	- S	ν.υθ . Ω 21	ADAKEA - KUDK	- VALLOY - VALLOY	TED Em	/ - 4.(/ TNCU /UD)	- 0 42	
AREA-AVERA	GED Fr/INCL	1/HR)	= 0.65	78-878 78-8788	AVERACEI	λη =	0 65	- 0.42	
TOTAL AREA								7.45	
END OF SUBAREA STREET FLOW HYDRAULICS:									
DEPTH (FEET									
FLOW VELOC									
LONGEST FL	OWPATH FROM	I NODE	16.0	O TO NO	ODE	18.00	0 = 190	07.00 FEET.	

FLOW PROCE								т	
>>>>DESIG									
>>>>AND C									
=========								========	
TOTAL NUMB	ER OF STREA	AMS =	2						
CONFLUENCE				ENT STE	REAM 2	2 ARE:			
TIME OF CO	NCENTRATION	J(MIN.) = 22.	41					
RAINFALL I									
AREA-AVERA									
AREA-AVERA									
AREA-AVERA	_								
EFFECTIVE	STREAM AREA	A(ACRE	IS) =	8.31					
TOTAL STRE	AM AREA(ACF	RES) =	8.	31					
PEAK FLOW	RATE(CFS) A	AT CON	FLUENCE =		7.45				
	NCE DATA **								
	Q								
	(CFS) (N								
1	60.19 1	9.81	1.539	0.72(0.36)	0.50	54.4	3.00	
7									
1	57.49 2	23.04	1.395	0.72(0.37)	0.51	59.6	13.00	
1	57.49 2 56.68 2	23.71	1.370	0.72(0.72(0.37) 0.37)	0.51 0.51	59.6 60.4	13.00 10.00	
1 1	57.49 2 56.68 2 52.26 2	23.71 26.47	1.370 1.275	0.72(0.72(0.72(0.37) 0.37) 0.37)	0.51 0.51 0.51	59.6 60.4 62.4	13.00 10.00 7.00	
1 1 1	57.49 2 56.68 2 52.26 2 50.92 2	23.71 26.47 27.17	1.370 1.275 1.253	0.72(0.72(0.72(0.72(0.37) 0.37) 0.37) 0.37)	0.51 0.51 0.51 0.51	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00	
1 1	57.49 2 56.68 2 52.26 2 50.92 2	23.71 26.47	1.370 1.275 1.253	0.72(0.72(0.72(0.72(0.37) 0.37) 0.37) 0.37)	0.51 0.51 0.51 0.51	59.6 60.4 62.4	13.00 10.00 7.00 1.00	
1 1 2	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2	23.71 26.47 27.17 22.41	1.370 1.275 1.253 1.421	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00	
1 1 2 RAINFALL II	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2	23.71 26.47 27.17 22.41 ND TIM	1.370 1.275 1.253 1.421	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00	
1 1 2	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2	23.71 26.47 27.17 22.41 ND TIM	1.370 1.275 1.253 1.421	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00	
1 1 2 RAINFALL II CONFLUENCE	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN	23.71 26.47 27.17 22.41 JD TIM SED FO	1.370 1.275 1.253 1.421 IE OF CONCE	0.72(0.72(0.72(0.72(0.65(0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6	13.00 10.00 7.00 1.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FL	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US	23.71 26.47 27.17 22.41 ND TIM SED FO	1.370 1.275 1.253 1.421 IE OF CONCI	0.72(0.72(0.72(0.72(0.65(ENTRAT)	0.37) 0.37) 0.37) 0.37) 0.42)	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6 8.3	13.00 10.00 7.00 1.00 16.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US	23.71 26.47 27.17 22.41 ND TIM SED FO 3LE **	1.370 1.275 1.253 1.421 E OF CONC OR 2 STREA	0.72(0.72(0.72(0.72(0.65(ENTRAT) AMS.	0.37) 0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6 8.3	13.00 10.00 7.00 1.00 16.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAE Q (CFS) (N	23.71 26.47 27.17 22.41 JD TIM SED FO BLE ** TC	1.370 1.275 1.253 1.421 E OF CONC OR 2 STRE	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F	0.37) 0.37) 0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.51 0.51 0.65	59.6 60.4 62.4 62.6 8.3	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N	23.71 26.47 27.17 22.41 ND TIM SED FO 3LE ** TC MIN.)	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREATED Intensity (INCH/HR) 1.539	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F	0.37) 0.37) 0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.51 0.51 0.65 FIO Ap 0.52	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1 2	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2	23.71 26.47 27.17 22.41 ND TIM SED FO BLE ** TC MIN.) 19.81 22.41	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREAT (INCH/HR) 1.539 1.421	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F (INCH/ 0.71(0.71(0.37) 0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1 2 3	57.49 2 56.68 2 52.26 2 50.92 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2 64.75 2	23.71 26.47 27.17 22.41 ND TIM SED FO BLE ** TC MIN.) -9.81 22.41 23.04	1.370 1.275 1.253 1.421 IE OF CONCI OR 2 STREAT Intensity (INCH/HR) 1.539 1.421 1.395	0.72(0.72(0.72(0.72(0.65(ENTRAT) AMS. Fp(F (INCH) 0.71(0.71(0.71(0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9 67.9	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLOOR STREAM NUMBER 1 2 3 4	57.49 2 56.68 2 52.26 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2 64.75 2 63.75 2	23.71 26.47 27.17 22.41 ND TIM SED FO 3LE ** TC 4IN.) 19.81 22.41 23.04 23.71	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREA (INCH/HR) 1.539 1.421 1.395 1.370	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F (INCH/ 0.71(0.71(0.71(0.71(0.37) 0.37) 0.37) 0.37) 0.42) ION RAT	0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53 0.53 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9 67.9 68.7	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00 10.00	
1 1 2 RAINFALL II CONFLUENCE ** PEAK FLO STREAM NUMBER 1 2 3	57.49 2 56.68 2 52.26 2 7.45 2 7.45 2 NTENSITY AN FORMULA US OW RATE TAR Q (CFS) (N 67.56 1 65.47 2 64.75 2 63.75 2 58.62 2	23.71 26.47 27.17 22.41 ND TIM SED FO BLE ** TC MIN.) 9.81 22.41 23.04 23.71	1.370 1.275 1.253 1.421 E OF CONCE OR 2 STREA (INCH/HR) 1.539 1.421 1.395 1.370	0.72(0.72(0.72(0.72(0.65(ENTRATI AMS. Fp(F (INCH/ 0.71(0.71(0.71(0.71(0.71(0.37) 0.37) 0.37) 0.37) 0.42) ION RAS	0.51 0.51 0.51 0.65 FIO Ap 0.52 0.53 0.53 0.53	59.6 60.4 62.4 62.6 8.3 Ae (ACRES) 61.7 66.9 67.9 68.7 70.7	13.00 10.00 7.00 1.00 16.00 HEADWATER NODE 3.00 16.00 13.00 10.00	

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```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 67.56 Tc(MIN.) = 19.81
 EFFECTIVE AREA(ACRES) = 61.74 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.71 AREA-AVERAGED Ap = 0.52
 TOTAL AREA(ACRES) = 70.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET.
************************
 FLOW PROCESS FROM NODE 18.00 TO NODE 22.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1324.40 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 68.97
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.64
   HALFSTREET FLOOD WIDTH(FEET) = 25.40
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.64
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.60
 STREET FLOW TRAVEL TIME(MIN.) = 1.03 Tc(MIN.) = 20.84
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.489
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                              Ap SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
                      B 2.58 0.27
 "BARREN"
                                             1.000
                                                    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 2.58 SUBAREA RUNOFF(CFS) = 2.83
 EFFECTIVE AREA(ACRES) = 64.32 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.68 AREA-AVERAGED Ap = 0.54
 TOTAL AREA(ACRES) = 73.5 PEAK FLOW RATE(CFS) = 67.56
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 25.16
 FLOW VELOCITY(FEET/SEC.) = 5.60 DEPTH*VELOCITY(FT*FT/SEC.) = 3.56
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET.
************************
 FLOW PROCESS FROM NODE
                      22.00 TO NODE
                                     22.00 \text{ IS CODE} = 1
 ______
```

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```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 20.84
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.68
 AREA-AVERAGED Ap = 0.54
 EFFECTIVE STREAM AREA(ACRES) = 64.32
 TOTAL STREAM AREA(ACRES) = 73.48
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 67.56
FLOW PROCESS FROM NODE
                    19.00 TO NODE
                                   20.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1059.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1329.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.838
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.857
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fρ
                                           Дp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 0.78 0.75
                                          0.600 56 14.84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 0.99
 TOTAL AREA(ACRES) =
                   0.78 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1329.90 DOWNSTREAM ELEVATION(FEET) = 1322.90
 STREET LENGTH(FEET) = 956.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.70
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

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```
STREET FLOW DEPTH(FEET) = 0.43
   HALFSTREET FLOOD WIDTH(FEET) = 11.21
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.43
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.06
 STREET FLOW TRAVEL TIME(MIN.) = 6.57 Tc(MIN.) = 21.40
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.464
 SUBAREA LOSS RATE DATA(AMC II):
                                               Аp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 14.50 0.75 0.600 56
 NATURAL POOR COVER
                       B 1.79 0.27 1.000 86
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.67
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.644
 SUBAREA AREA(ACRES) = 16.29 SUBAREA RUNOFF(CFS) = 15.16
 EFFECTIVE AREA(ACRES) = 17.07 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.67 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 17.1 PEAK FLOW RATE(CFS) = 15.88
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 16.15
 FLOW VELOCITY(FEET/SEC.) = 2.67 DEPTH*VELOCITY(FT*FT/SEC.) = 1.40
 LONGEST FLOWPATH FROM NODE 19.00 TO NODE 21.00 = 2015.00 FEET.
******************
 FLOW PROCESS FROM NODE 21.00 TO NODE
                                     22.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1322.90 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 615.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.93
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) = 16.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.01
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.46
 STREET FLOW TRAVEL TIME(MIN.) = 3.41 Tc(MIN.) = 24.82
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.330
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 NATURAL POOR COVER
```

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SUBAREA AVI SUBAREA ARI SUBAREA ARI EFFECTIVE AREA-AVERA	ERAGE PER ERAGE PER EA(ACRES) AREA(ACRE GED ED(IN	VIOUS L VIOUS A = 2 S) =	OSS RATE, AREA FRACTI 2.22 S 19.29 = 0.60 7	2.22 0 Fp(INCH/HR) ION, Ap = 1 SUBAREA RUNO: AREA-AVERAGE AREA-AVERAGE PEAK FLOW	= 0.2 .000 FF(CFS) GED Fm(27 = 2.1 [INCH/HR]	11 = 0.41
FLOW VELOC) = 0.48 ITY(FEET/	HALFS	TREET FLOCE 2.97 I	CS: DD WIDTH(FEE' DEPTH*VELOCI') TO NODE	TY(FT*E	TT/SEC.) =	
******				**************************************			
				NODE ZZ			
	OMPUTE VA	RIOUS C	CONFLUENCE	OR CONFLUENCE O STREAM VALI	JES<<<	<<	
TIME OF COI RAINFALL II AREA-AVERAGAREA-AVERAGEFFECTIVE GOTAL STREAM NUMBER 1 1 1 1 1 2 RAINFALL II CONFLUENCE	VALUES UNCENTRATI NTENSITY(GED Fm(IN GED Fp(IN GED AP = STREAM AR AM AREA(A RATE(CFS) NCE DATA Q (CFS) 67.56 65.47 64.75 63.75 58.62 57.11 15.93 NTENSITY FORMULA	SED FOR ON (MIN. INCH/HR) CH/HR) 0.68 EA (ACRE CRES) = AT CON ** TC (MIN.) 20.84 23.45 24.09 24.76 27.53 28.25 24.82 AND TIMUSED FOR The Control of the Con	E INDEPENDE) = 24.8 2) = 1.33 = 0.41 = 0.60 ES) = : 19.2 IFLUENCE = Intensity (INCH/HR) 1.489 1.379 1.356 1.331 1.243 1.222 1.330 ME OF CONCE	19.29 15.93 Fp(Fm) (INCH/HR) 0.68(0.37) 0.68(0.37) 0.68(0.37) 0.68(0.37) 0.68(0.37) 0.68(0.38) 0.60(0.41) ENTRATION RA	Ap 0.54 0.55 0.55 0.55 0.68	(ACRES) 64.3 69.5 70.5 71.3 73.3 73.5	NODE 3.00 16.00 13.00 10.00 7.00 1.00
** PEAK FLO STREAM	OW RATE T. Q	ABLE ** Tc		Fp(Fm)	7\20	Ae	HEADWATER
			_	(INCH/HR)	_	(ACRES)	
1		20.84		0.66(0.38)		80.5	
2	81.34	23.45	1.379	0.66(0.38)	0.57	87.7	16.00
3	80.65	24.09		0.66(0.38)			
4	79.67	24.76		0.66(0.38)			
5	79.58	24.82		0.66(0.38)			
6 7	73.04 71.18	27.53 28.25	1.243 1.222	0.66(0.38) 0.66(0.38)			
,	, 1.10	20.23	1.222	0.00(0.30)	0.50	72.0	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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```
PEAK FLOW RATE(CFS) = 83.26 Tc(MIN.) = 20.84
EFFECTIVE AREA(ACRES) = 80.52 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.66 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 92.8
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET.
******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.60 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1041.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 89.96
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.72
   HALFSTREET FLOOD WIDTH(FEET) = 33.19
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.37
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.85
 STREET FLOW TRAVEL TIME(MIN.) = 3.23 Tc(MIN.) = 24.07
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.356
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
                      B 12.11 0.27 1.000 86
 "BARREN"
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.93
                                     0.75
                                             0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.945
 SUBAREA AREA(ACRES) = 14.04 SUBAREA RUNOFF(CFS) = 13.39
 EFFECTIVE AREA(ACRES) = 94.56 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.58 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 106.8 PEAK FLOW RATE(CFS) = 84.49
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.70 HALFSTREET FLOOD WIDTH(FEET) = 31.68
 FLOW VELOCITY(FEET/SEC.) = 5.30 DEPTH*VELOCITY(FT*FT/SEC.) = 3.74
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
*****************
 FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
______
```

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><

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```
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =
 RAINFALL INTENSITY(INCH/HR) = 1.36
 AREA-AVERAGED fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.58
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 94.56
 TOTAL STREAM AREA(ACRES) = 106.81
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 639.00
 ELEVATION DATA: UPSTREAM(FEET) = 1324.10 DOWNSTREAM(FEET) = 1321.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.821
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.712
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                                 SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                   Fρ
                                            Дp
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.77 0.75 0.600 56 16.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.01
TOTAL AREA(ACRES) = 1.77 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE
                    24.00 TO NODE
                                   25.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1321.80 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1594.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.32
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
```

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```
HALFSTREET FLOOD WIDTH(FEET) = 8.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.15
  STREET FLOW TRAVEL TIME(MIN.) = 8.70 Tc(MIN.) = 25.53
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.305
  SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                           Ap SCS
       LAND USE
                          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 13.48 0.75 0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 13.48 SUBAREA RUNOFF(CFS) = 10.39 EFFECTIVE AREA(ACRES) = 15.25 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 11.76
 END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43 HALFSTREET FLOOD WIDTH(FEET) = 11.00
  FLOW VELOCITY(FEET/SEC.) = 3.39 DEPTH*VELOCITY(FT*FT/SEC.) = 1.46
  LONGEST FLOWPATH FROM NODE 23.00 TO NODE 25.00 = 2233.00 FEET.
******************
 FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 25.53
 RAINFALL INTENSITY(INCH/HR) = 1.31
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 15.25
  TOTAL STREAM AREA(ACRES) = 15.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.76
  ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 84.49 24.07 1.356 0.58( 0.36) 0.62 94.6 3.00

1 82.39 26.70 1.268 0.59( 0.37) 0.62 101.7 16.00

1 81.70 27.35 1.248 0.59( 0.37) 0.62 103.2 13.00

1 80.84 28.02 1.229 0.59( 0.37) 0.62 104.6 10.00

1 80.75 28.08 1.227 0.59( 0.37) 0.62 104.7 19.00

1 75.11 30.85 1.154 0.59( 0.37) 0.62 106.6 7.00

1 73.57 31.58 1.137 0.59( 0.37) 0.62 106.8 1.00

2 11.76 25.53 1.305 0.75( 0.45) 0.60 15.2 23.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER
```

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```
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE 1 96.23 24.07 1.356 0.60(0.37) 0.62 108.9 3

      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      96.23
      24.07
      1.356
      0.60( 0.37)
      0.62
      108.9
      3.00

      95.09
      25.53
      1.305
      0.61( 0.38)
      0.62
      113.8
      23.00

      93.64
      26.70
      1.268
      0.61( 0.38)
      0.62
      117.0
      16.00

      92.67
      27.35
      1.248
      0.61( 0.38)
      0.62
      118.5
      13.00

      91.55
      28.02
      1.229
      0.61( 0.38)
      0.62
      119.8
      10.00

      91.43
      28.08
      1.227
      0.61( 0.38)
      0.62
      119.9
      19.00

      84.79
      30.85
      1.154
      0.61( 0.38)
      0.62
      121.8
      7.00

      83.01
      31.58
      1.137
      0.61( 0.38)
      0.62
      122.1
      1.00

       2 3
       4
       5
       6
       7
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 96.23 Tc(MIN.) = 24.07 EFFECTIVE AREA(ACRES) = 108.95 AREA-AVERAGED Fm(INCH/HR) = 0.37
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.62
  TOTAL AREA(ACRES) = 122.1
                                        1.00 TO NODE 25.00 = 4978.00 FEET.
  LONGEST FLOWPATH FROM NODE
******************
  FLOW PROCESS FROM NODE 25.00 TO NODE 29.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) << <<
______
  UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1291.40
  STREET LENGTH(FEET) = 405.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
  INSIDE STREET CROSSFALL(DECIMAL) = 0.015
  OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
  STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 96.65
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.73
    HALFSTREET FLOOD WIDTH(FEET) = 34.83
    AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.99
  STREET FLOW TRAVEL TIME(MIN.) = 1.24 Tc(MIN.) = 25.31
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.313
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                      Ар
                                                                                 SCS
        LAND USE
                              GROUP (ACRES) (INCH/HR) (DECIMAL) CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 1.08 0.75 0.600
                                                                                56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 1.08 SUBAREA RUNOFF(CFS) = 0.84 EFFECTIVE AREA(ACRES) = 110.03 AREA-AVERAGED Fm(INCH/HR) = 0.38
  AREA-AVERAGED Fp(INCH/HR) = 0.60 AREA-AVERAGED Ap = 0.62
  TOTAL AREA(ACRES) = 123.1 PEAK FLOW RATE(CFS) = 96.23
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
```

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```
END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 34.83
 FLOW VELOCITY(FEET/SEC.) = 5.43 DEPTH*VELOCITY(FT*FT/SEC.) = 3.97
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 29.00 = 5383.00 FEET.
***********************
 FLOW PROCESS FROM NODE 29.00 TO NODE
                                  29.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 25.31
 RAINFALL INTENSITY(INCH/HR) = 1.31
 AREA-AVERAGED fm(INCH/HR) = 0.38
 AREA-AVERAGED fp(INCH/HR) = 0.60
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 110.03
 TOTAL STREAM AREA(ACRES) = 123.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 96.23
******************
 FLOW PROCESS FROM NODE 26.00 TO NODE
                                  27.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 545.00
 ELEVATION DATA: UPSTREAM(FEET) = 1313.20 DOWNSTREAM(FEET) = 1305.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.149
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                Fp
                                         Ap SCS
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.86 0.75
                                        0.600 56 11.86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.85
 TOTAL AREA(ACRES) = 1.86 PEAK FLOW RATE(CFS) =
********************
 FLOW PROCESS FROM NODE 27.00 TO NODE 28.00 IS CODE = 62
-----
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1305.00 DOWNSTREAM ELEVATION(FEET) = 1299.60
 STREET LENGTH(FEET) = 667.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
```

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```
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.37
   HALFSTREET FLOOD WIDTH(FEET) = 8.54
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.23
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.82
 STREET FLOW TRAVEL TIME(MIN.) = 4.98 Tc(MIN.) = 16.84
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.711
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fр
                                                 Αр
                 GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               3.73 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.73 SUBAREA RUNOFF(CFS) = 4.24
 EFFECTIVE AREA(ACRES) = 5.59 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.6 PEAK FLOW RATE(CFS) = 6.35
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39 HALFSTREET FLOOD WIDTH(FEET) = 9.57
 FLOW VELOCITY(FEET/SEC.) = 2.34 DEPTH*VELOCITY(FT*FT/SEC.) = 0.92
 LONGEST FLOWPATH FROM NODE 26.00 TO NODE 28.00 = 1212.00 FEET.
*****************
                       28.00 TO NODE 29.00 IS CODE = 91
 FLOW PROCESS FROM NODE
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1299.60
 DOWNSTREAM NODE ELEVATION(FEET) = 1291.40
 CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00
 "V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) = 2.00
    10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.662
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fρ
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
                                0.74
 "3-4 DWELLINGS/ACRE"
                                      0.75
                                               0.600
                                                        56
                        В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.75
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.57
 AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.77 Tc(MIN.) = 17.61
```

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```
SUBAREA AREA(ACRES) = 0.74 SUBAREA RUNOFF(CFS) = 0.81

EFFECTIVE AREA(ACRES) = 6.33 AREA-AVERAGED Fm(INCH/HR) = 0.45

AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60

TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 6.91
```

NOTE:TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH
IN A FLOWING-FULL GUTTER(NORMAL DEPTH = GUTTER HIKE)

FLOW PROCESS FROM NODE 29.00 TO NODE 29.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 17.61

RAINFALL INTENSITY(INCH/HR) = 1.66

AREA-AVERAGED Fm(INCH/HR) = 0.45

AREA-AVERAGED Fp(INCH/HR) = 0.75

AREA-AVERAGED Ap = 0.60

EFFECTIVE STREAM AREA(ACRES) = 6.33

TOTAL STREAM AREA(ACRES) = 6.33

PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.91

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	96.23	25.31	1.313	0.60(0.38)	0 62	110.0	3.00
1				, ,			
Т	95.09	26.77	1.266	0.61(0.38)	0.62	114.9	23.00
1	93.64	27.94	1.231	0.61(0.38)	0.62	118.1	16.00
1	92.67	28.60	1.212	0.61(0.38)	0.62	119.6	13.00
1	91.55	29.27	1.194	0.61(0.38)	0.62	120.9	10.00
1	91.43	29.33	1.193	0.61(0.38)	0.62	121.0	19.00
1	84.79	32.12	1.124	0.61(0.38)	0.62	122.9	7.00
1	83.01	32.86	1.108	0.61(0.38)	0.62	123.1	1.00
2	6.91	17.61	1.662	0.75(0.45)	0.60	6.3	26.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Аp	Ae (ACRES)	HEADWATER NODE
1	98.80	17.61	1.662	0.61(0.38)	0.62	82.9	26.00
2	101.15	25.31	1.313	0.61(0.38)	0.62	116.4	3.00
3	99.74	26.77	1.266	0.61(0.38)	0.62	121.2	23.00
4	98.09	27.94	1.231	0.62(0.38)	0.62	124.4	16.00
5	97.02	28.60	1.212	0.62(0.38)	0.62	125.9	13.00
6	95.79	29.27	1.194	0.62(0.38)	0.62	127.3	10.00

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7	95.66	29.33	1.193	0.62(0.38)	0.62	127.3	19.00
8	88.64	32.12	1.124	0.62(0.38)	0.62	129.2	7.00
9	86.76							1.00
COMPUTED	CONFLUENCE	E ESTIMA	TES ARE A	S FOLLO	OWS:			
PEAK FLOW	RATE (CFS) =	101.15	Tc(MIN	1.) =	25.	31	
EFFECTIVE	AREA (ACR	ES) =	116.36	AREA-	-AVERA	GED Fm	(INCH/HR)	= 0.38
AREA-AVER	AGED Fp(I	NCH/HR)	= 0.61	AREA-AV	/ERAGEI	Ap =	0.62	
TOTAL ARE	A(ACRES) :	= 1:	29.5			_		
LONGEST F	LOWPATH F	ROM NODE	1.0	0 TO NO	DDE	29.0	0 = 538	3.00 FEET.
========	=======	======	=======	======	=====	=====	=======	=======
END OF ST	UDY SUMMAI	RY:						
TOTAL ARE	A(ACRES)	=	129.5	TC(MIN	1.) =	25	.31	
EFFECTIVE	AREA (ACR	ES) =	116.36	AREA-AV	/ERAGEI	O Fm(I	NCH/HR)=	0.38
AREA-AVER	AGED Fp(I	NCH/HR)	= 0.61	AREA-AV	/ERAGEI	Ap =	0.620	
PEAK FLOW	RATE (CFS) =	101.15					
	LOW RATE							
								HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/	/HR)		(ACRES)	NODE
								26.00
								3.00
	99.74						121.2	
	98.09			0.62(0.38)	0.62	124.4	16.00
	97.02						125.9	
	95.79						127.3	
	95.66						127.3	
	88.64				0.38)	0.62	129.2	7.00
9	86.76	32.86	1.108	0.62(0.38)	0.62	129.5	1.00
========	=======	======	=======	======	=====	=====	=======	========

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION) (c) Copyright 1983-2015 Advanced Engineering Software (aes) Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HPBT.DAT

TIME/DATE OF STUDY: 10:30 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7490

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

* [JSER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	CFLOW	MODEL*
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 687.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1339.70 DOWNSTREAM(FEET) = 1328.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.395
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.500
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                      B 1.89 0.75
                                              0.100 56 9.40
 COMMERCIAL
 AGRICULTURAL FAIR COVER
                               0.67 0.63
 "ORCHARDS"
                       В
                                              1.000 65 21.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.66
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.336
 SUBAREA RUNOFF(CFS) = 5.25
 TOTAL AREA(ACRES) =
                     2.56 PEAK FLOW RATE(CFS) =
*********************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1328.20
 DOWNSTREAM NODE ELEVATION(FEET) = 1316.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 656.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.190
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               αA
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                       В
                               1.18 0.75
                                              0.100
 NATURAL POOR COVER
                               4.44 0.27
 "BARREN"
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.811
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 10.21
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.15
 AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 2.12 Tc(MIN.) = 11.52
 SUBAREA AREA(ACRES) = 5.62 SUBAREA RUNOFF(CFS) = 9.91 
EFFECTIVE AREA(ACRES) = 8.18 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.34 AREA-AVERAGED Ap = 0.66
 TOTAL AREA(ACRES) = 8.2 PEAK FLOW RATE(CFS) = 14.45
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
       DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 7.43 DEPTH*VELOCITY(FT*FT/SEC) = 8.92 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1343.00 FEET.
******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 6.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1316.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 610.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 21.98
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.59
   HALFSTREET FLOOD WIDTH(FEET) = 20.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.33
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 4.37 Tc(MIN.) = 15.89
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.777
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Аp
                                                      SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                      B 2.52 0.75 0.100 56
 NATURAL POOR COVER
                               0.28
                       В
                                       0.27
 "BARREN"
                                               1.000
                                                       86
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                              10.26
                                       0.63
                                               1.000
                                                        65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.62
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.826
 SUBAREA AREA(ACRES) = 13.06 SUBAREA RUNOFF(CFS) = 14.83
 EFFECTIVE AREA(ACRES) = 21.24 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.53 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 21.2
                              PEAK FLOW RATE(CFS) = 26.23
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 20.00
 FLOW VELOCITY(FEET/SEC.) = 2.49 DEPTH*VELOCITY(FT*FT/SEC.) = 1.53
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                           6.00 = 1953.00 \text{ FEET}.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.89
 RAINFALL INTENSITY(INCH/HR) = 1.78
 AREA-AVERAGED fm(INCH/HR) = 0.40
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.53
 AREA-AVERAGED Ap = 0.76
 EFFECTIVE STREAM AREA(ACRES) = 21.24
 TOTAL STREAM AREA(ACRES) = 21.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 26.23
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE
                                    5.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 607.00
 ELEVATION DATA: UPSTREAM(FEET) = 1337.20 DOWNSTREAM(FEET) = 1326.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.062
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.125
 SUBAREA To AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.85 0.75 0.600 56 12.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 5.81
 TOTAL AREA(ACRES) = 3.85 PEAK FLOW RATE(CFS) = 5.81
******************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1326.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 674.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.54
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
   HALFSTREET FLOOD WIDTH(FEET) = 9.08
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.45
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.31
 STREET FLOW TRAVEL TIME(MIN.) = 3.25 Tc(MIN.) = 15.31
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.820
 SUBAREA LOSS RATE DATA(AMC II):
```

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```
DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fρ
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                 4.42 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 4.42 SUBAREA RUNOFF(CFS) = 5.45
 EFFECTIVE AREA(ACRES) = 8.27 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.3 PEAK FLOW RATE(CFS) = 10.20
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.40 HALFSTREET FLOOD WIDTH(FEET) = 9.81
 FLOW VELOCITY(FEET/SEC.) = 3.60 DEPTH*VELOCITY(FT*FT/SEC.) = 1.44
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1281.00 FEET.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.31
 RAINFALL INTENSITY(INCH/HR) = 1.82
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.27
 TOTAL STREAM AREA(ACRES) = 8.27
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.20
 ** CONFLUENCE DATA **
  STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER
         (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
26.23 15.89 1.777 0.53( 0.40) 0.76 21.2 1.00
10.20 15.31 1.820 0.75( 0.45) 0.60 8.3 4.00
  NUMBER
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

    36.28
    15.31
    1.820
    0.58( 0.42) 0.72
    28.7
    4.00

    36.12
    15.89
    1.777
    0.58( 0.42) 0.72
    29.5
    1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 36.28 Tc(MIN.) = 15.31
 EFFECTIVE AREA(ACRES) = 28.74 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.58 AREA-AVERAGED Ap = 0.72
 TOTAL AREA(ACRES) = 29.5
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1953.00 FEET.
******************
```

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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<

>>>>(STREET TABLE SECTION # 3 USED) << <<

UPSTREAM ELEVATION(FEET) = 1314.40 DOWNSTREAM ELEVATION(FEET) = 1313.90 STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.60

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.74

HALFSTREET FLOOD WIDTH(FEET) = 23.43

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.32

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.71

STREET FLOW TRAVEL TIME(MIN.) = 1.73 Tc(MIN.) = 17.04

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.698

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Αp LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL

В "3-4 DWELLINGS/ACRE" 0.56 0.75 0.600 56 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600

SUBAREA AREA(ACRES) = 0.56 SUBAREA RUNOFF(CFS) = 0.63

EFFECTIVE AREA(ACRES) = 29.30 AREA-AVERAGED Fm(INCH/HR) = 0.42 AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.71

TOTAL AREA(ACRES) = 30.1 PEAK FLOW RATE(CFS) = 36.28

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 23.31

FLOW VELOCITY(FEET/SEC.) = 2.31 DEPTH*VELOCITY(FT*FT/SEC.) = 1.70

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 2193.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 30.1 TC(MIN.) = 17.04 EFFECTIVE AREA(ACRES) = 29.30 AREA-AVERAGED Fm(INCH/HR) = 0.42

AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 0.714

PEAK FLOW RATE(CFS) = 36.28

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	36.28	17.04	1.698	0.59(0.42)	0.71	29.3	4.00
2	36.12	17.61	1.661	0.58(0.42)	0.72	30.1	1.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0217HPCT.DAT

TIME/DATE OF STUDY: 10:57 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7490

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

U	SER-DEF	INED STREET	-SECTIONS FOR COUPL	ED PIPEE	FLOW AND	STREET	rflow	MODEL
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 469.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1314.20 DOWNSTREAM(FEET) = 1308.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.573
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.183
 SUBAREA TC AND LOSS RATE DATA(AMC II):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                       В
                               1.20 0.75 0.600 56 11.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.87
TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 1.87
************************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1308.30 DOWNSTREAM ELEVATION(FEET) = 1303.30
 STREET LENGTH(FEET) = 580.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.23
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) = 6.82
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.08
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.67
 STREET FLOW TRAVEL TIME(MIN.) = 4.65 Tc(MIN.) = 16.22
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.753
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Ap SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.29
                                      0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.29 SUBAREA RUNOFF(CFS) = 2.69
 EFFECTIVE AREA(ACRES) = 3.49 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 3.5 PEAK FLOW RATE(CFS) = 4.10
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 7.68
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```
FLOW VELOCITY(FEET/SEC.) = 2.19 DEPTH*VELOCITY(FT*FT/SEC.) = 0.75
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1049.00 FEET.
*******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 7.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1303.30 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 478.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.83
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.35
   HALFSTREET FLOOD WIDTH(FEET) = 8.01
   AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.41
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.85
 STREET FLOW TRAVEL TIME(MIN.) = 3.31 Tc(MIN.) = 19.53
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.554
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                            Аp
                                                  SCS
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.48 0.75
                                                   56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.48 SUBAREA RUNOFF(CFS) = 1.47
 EFFECTIVE AREA(ACRES) = 4.97 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.0
                              PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.35 HALFSTREET FLOOD WIDTH(FEET) = 8.09
 FLOW VELOCITY(FEET/SEC.) = 2.42 DEPTH*VELOCITY(FT*FT/SEC.) = 0.86
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 1527.00 FEET.
***********************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE =
_____
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 19.53
 RAINFALL INTENSITY(INCH/HR) =
```

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```
AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 4.97
 TOTAL STREAM AREA(ACRES) = 4.97
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                  4.94
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 460.00
 ELEVATION DATA: UPSTREAM(FEET) = 1316.00 DOWNSTREAM(FEET) = 1308.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.846
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.277
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.54
                                             0.600 56 10.85
                                     0.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.53
 TOTAL AREA(ACRES) = 1.54 PEAK FLOW RATE(CFS) = 2.53
************************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1308.30 DOWNSTREAM ELEVATION(FEET) = 1301.50
 STREET LENGTH(FEET) = 651.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.01
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.35
   HALFSTREET FLOOD WIDTH(FEET) = 8.09
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.46
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.87
 STREET FLOW TRAVEL TIME(MIN.) = 4.42 Tc(MIN.) = 15.26
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.824
```

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```
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                      SCS
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                3.97 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.97 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 5.51 AREA-AVERAGED Fm(INCH/HR) = 0.45
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.5 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39 HALFSTREET FLOOD WIDTH(FEET) = 9.32
 FLOW VELOCITY(FEET/SEC.) = 2.63 DEPTH*VELOCITY(FT*FT/SEC.) = 1.02
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1111.00 FEET.
***********************
 FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1301.50 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 255.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.48
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.48
   HALFSTREET FLOOD WIDTH(FEET) = 12.97
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.29
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.56
 STREET FLOW TRAVEL TIME(MIN.) = 1.29 Tc(MIN.) = 16.55
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.730
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                        SCS
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
                       B 1.34 0.75
 PUBLIC PARK
                                               0.850 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 1.34 SUBAREA RUNOFF(CFS) = 1.32
 EFFECTIVE AREA(ACRES) = 6.85 AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.65
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) =
                                                         7.67
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 13.23
 FLOW VELOCITY(FEET/SEC.) = 3.30 DEPTH*VELOCITY(FT*FT/SEC.) = 1.58
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 7.00 = 1366.00 FEET.
******************
                       7.00 TO NODE
                                      7.00 \text{ IS CODE} = 81
 FLOW PROCESS FROM NODE
______
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
______
 MAINLINE Tc(MIN.) = 16.55
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.730
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                          0.49 0.75
                                             0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 0.56
 TOTAL AREA(ACRES) = 7.3 PEAK FLOW RATE(CFS) =
*********************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.55
 RAINFALL INTENSITY(INCH/HR) = 1.73
 AREA-AVERAGED fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.65
 EFFECTIVE STREAM AREA(ACRES) = 7.34
TOTAL STREAM AREA(ACRES) = 7.34
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                  8.24
 ** CONFLUENCE DATA **
  STREAM O TC Intensity Fp(Fm) Ap Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

      4.94
      19.53
      1.554
      0.75( 0.45) 0.60
      5.0
      1.00

      8.24
      16.55
      1.730
      0.75( 0.48) 0.65
      7.3
      4.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
                                        Ap Ae HEADWATER
  STREAM Q Tc Intensity Fp(Fm)
         (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

13.09 16.55 1.730 0.75( 0.47) 0.63 11.6 4.00

12.02 19.53 1.554 0.75( 0.47) 0.63 12.3 1.00
  NUMBER
```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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```
PEAK FLOW RATE(CFS) = 13.09 Tc(MIN.) = 16.55
EFFECTIVE AREA(ACRES) = 11.55 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 12.3
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 1527.00 FEET.
******************
 FLOW PROCESS FROM NODE 7.00 TO NODE 10.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 358.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 13.87
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.52
   HALFSTREET FLOOD WIDTH(FEET) = 16.15
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.33
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.22
 STREET FLOW TRAVEL TIME(MIN.) = 2.56 Tc(MIN.) = 19.11
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.576
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
     LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.53 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.53 SUBAREA RUNOFF(CFS) = 1.55 EFFECTIVE AREA(ACRES) = 13.08 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 13.8 PEAK FLOW RATE(CFS) = 13.09
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51 HALFSTREET FLOOD WIDTH(FEET) = 15.55
 FLOW VELOCITY(FEET/SEC.) = 2.32 DEPTH*VELOCITY(FT*FT/SEC.) = 1.19
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 1885.00 FEET.
FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
```

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```
TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 19.11
 RAINFALL INTENSITY(INCH/HR) = 1.58
 AREA-AVERAGED fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.63
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 13.84
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 619.00
 ELEVATION DATA: UPSTREAM(FEET) = 1311.70 DOWNSTREAM(FEET) = 1302.50
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.507
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.076
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fρ
                                            Ap SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.39 0.75
                                           0.600 56 12.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.04
 TOTAL AREA(ACRES) = 1.39 PEAK FLOW RATE(CFS) =
********************
 FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1302.50 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 456.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.71
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.38
   HALFSTREET FLOOD WIDTH(FEET) =
```

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```
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.12
  STREET FLOW TRAVEL TIME(MIN.) = 2.59 Tc(MIN.) = 15.10
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.837
  SUBAREA LOSS RATE DATA(AMC II):
   DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap
                                                                            SCS
        LAND USE
                              GROUP (ACRES) (INCH/HR) (DECIMAL) CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 2.68 0.75
                                                                   0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 2.68 SUBAREA RUNOFF(CFS) = 3.35 
EFFECTIVE AREA(ACRES) = 4.07 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 4.1 PEAK FLOW RATE(CFS) =
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42 HALFSTREET FLOOD WIDTH(FEET) = 10.55
  FLOW VELOCITY(FEET/SEC.) = 3.16 DEPTH*VELOCITY(FT*FT/SEC.) = 1.32
  LONGEST FLOWPATH FROM NODE 8.00 TO NODE 10.00 = 1075.00 FEET.
***********************
  FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 15.10
  RAINFALL INTENSITY(INCH/HR) = 1.84
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 4.07
  TOTAL STREAM AREA(ACRES) = 4.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.08
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        13.09
        19.11
        1.576
        0.75(0.47)
        0.63
        13.1
        4.00

        1
        12.04
        22.11
        1.433
        0.75(0.47)
        0.62
        13.8
        1.00

        2
        5.08
        15.10
        1.837
        0.75(0.45)
        0.60
        4.1
        8.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

    NUMBER
    (CFS)
    (MIN.)
    (INCH/HR)
    (INCH/HR)
    (ACRES)
    NODE

    1
    17.86
    15.10
    1.837
    0.75(0.46)
    0.62
    14.4
    8.00

    2
    17.22
    19.11
    1.576
    0.75(0.46)
    0.62
    17.2
    4.00

    3
    15.64
    22.11
    1.433
    0.75(0.46)
    0.62
    17.9
    1.00
```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

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```
PEAK FLOW RATE(CFS) = 17.86 Tc(MIN.) = 15.10
EFFECTIVE AREA(ACRES) = 14.41 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 17.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 1885.00 FEET.
*******************
 FLOW PROCESS FROM NODE 10.00 TO NODE 14.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.50 DOWNSTREAM(FEET) = 1292.20
 FLOW LENGTH(FEET) = 21.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.74
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 17.86
 PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 15.14
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1906.00 FEET.
************************
 FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.14
 RAINFALL INTENSITY(INCH/HR) = 1.83
 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 14.41
 TOTAL STREAM AREA(ACRES) = 17.91
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 17.86
************************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 538.00
 ELEVATION DATA: UPSTREAM(FEET) = 1316.00 DOWNSTREAM(FEET) = 1307.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.794
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.156
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap
     LAND USE
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.45 0.75 0.600 56 11.79
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
```

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```
SUBAREA RUNOFF(CFS) = 2.23
TOTAL AREA(ACRES) = 1.45 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1307.90 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.60
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.37
   HALFSTREET FLOOD WIDTH(FEET) = 8.79
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.08
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.15
 STREET FLOW TRAVEL TIME(MIN.) = 4.06 Tc(MIN.) = 15.86
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.779
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Аp
                                                    SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             2.28 0.75
                                                    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.28 SUBAREA RUNOFF(CFS) = 2.73
 EFFECTIVE AREA(ACRES) = 3.73 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) =
                   3.7
                               PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39 HALFSTREET FLOOD WIDTH(FEET) = 9.65
 FLOW VELOCITY(FEET/SEC.) = 3.25 DEPTH*VELOCITY(FT*FT/SEC.) = 1.28
 LONGEST FLOWPATH FROM NODE 11.00 TO NODE 13.00 = 1288.00 FEET.
***********************
 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << <<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.50 DOWNSTREAM(FEET) = 1292.20
 FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```

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```
DEPTH OF FLOW IN 18.0 INCH PIPE IS 8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) = 5.90
  ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
  PIPE-FLOW(CFS) =
                           4.46
  PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 15.93
  LONGEST FLOWPATH FROM NODE 11.00 TO NODE 14.00 = 1314.00 FEET.
********************
  FLOW PROCESS FROM NODE 14.00 TO NODE
                                                      14.00 IS CODE =
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 15.93
  RAINFALL INTENSITY(INCH/HR) = 1.77
  AREA-AVERAGED fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 3.73
TOTAL STREAM AREA(ACRES) = 3.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

      NUMBER
      (CFS)
      (MIN.)
      (INCH/HR)
      (INCH/HR)
      (ACRES)
      NODE

      1
      17.86
      15.14
      1.833
      0.75( 0.46) 0.62
      14.4
      8.00

      1
      17.22
      19.15
      1.573
      0.75( 0.46) 0.62
      17.2
      4.00

      1
      15.64
      22.15
      1.431
      0.75( 0.46) 0.62
      17.9
      1.00

      2
      4.46
      15.93
      1.773
      0.75( 0.45) 0.60
      3.7
      11.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

      22.30
      15.14
      1.833
      0.75( 0.46) 0.61
      17.9
      8.00

      22.20
      15.93
      1.773
      0.75( 0.46) 0.61
      18.7
      11.00

      21.01
      19.15
      1.573
      0.75( 0.46) 0.62
      20.9
      4.00

      18.95
      22.15
      1.431
      0.75( 0.46) 0.62
      21.6
      1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 22.30 Tc(MIN.) = 15.14
EFFECTIVE AREA(ACRES) = 17.95 AREA-AVERAGED Fm(INCH/HR) = 0.46
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.61
  TOTAL AREA(ACRES) = 21.6
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1906.00 FEET.
*******************
  FLOW PROCESS FROM NODE
                              14.00 TO NODE
                                                      19.00 IS CODE = 31
 -----
  >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
```

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```
ELEVATION DATA: UPSTREAM(FEET) = 1292.20 DOWNSTREAM(FEET) = 1288.30
 FLOW LENGTH(FEET) = 250.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.76
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) =
                 22.30
 PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 15.56
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                    19.00 = 2156.00 FEET.
***********************
 FLOW PROCESS FROM NODE 19.00 TO NODE
                                19.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.56
 RAINFALL INTENSITY(INCH/HR) = 1.80
 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.61
 EFFECTIVE STREAM AREA(ACRES) = 17.95
 TOTAL STREAM AREA(ACRES) = 21.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
*******************
 FLOW PROCESS FROM NODE 15.00 TO NODE
                                 16.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 571.00
 ELEVATION DATA: UPSTREAM(FEET) = 1307.70 DOWNSTREAM(FEET) = 1301.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.979
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.026
 SUBAREA To AND LOSS RATE DATA(AMC II):
                                Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.25 0.75 0.600 56 12.98
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.77
 TOTAL AREA(ACRES) =
                  1.25 PEAK FLOW RATE(CFS) = 1.77
***********************
 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1301.70 DOWNSTREAM ELEVATION(FEET) = 1296.00
 STREET LENGTH(FEET) = 606.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.51
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.33
   HALFSTREET FLOOD WIDTH(FEET) = 6.94
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.20
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.72
 STREET FLOW TRAVEL TIME(MIN.) = 4.59 Tc(MIN.) = 17.57
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.664
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                   Fp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             3.15 0.75
                                           0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.15 SUBAREA RUNOFF(CFS) =
                                                3.45
 EFFECTIVE AREA(ACRES) = 4.40 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 4.4 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36 HALFSTREET FLOOD WIDTH(FEET) = 8.13
 FLOW VELOCITY(FEET/SEC.) = 2.34 DEPTH*VELOCITY(FT*FT/SEC.) = 0.83
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE 17.00 = 1177.00 FEET.
***********************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.00 DOWNSTREAM(FEET) = 1288.70
 FLOW LENGTH(FEET) = 328.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 8.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.72
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.81
 PIPE TRAVEL TIME(MIN.) = 0.96 Tc(MIN.) = 18.53
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE
                                       18.00 = 1505.00 FEET.
************************
 FLOW PROCESS FROM NODE 18.00 TO NODE 18.00 IS CODE = 81
______
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
______
```

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```
MAINLINE Tc(MIN.) = 18.53
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.608
  SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 1.63 0.75 0.600 56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
  SUBAREA AREA(ACRES) = 1.63 SUBAREA RUNOFF(CFS) = 1.70
  EFFECTIVE AREA(ACRES) = 6.03 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 6.0 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
  >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
  ELEVATION DATA: UPSTREAM(FEET) = 1288.70 DOWNSTREAM(FEET) = 1288.30
 FLOW LENGTH(FEET) = 34.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) = 6.48
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 6.29
 PIPE TRAVEL TIME(MIN.) = 0.09 Tc(MIN.) = 18.62
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE 19.00 = 1539.00 FEET.
******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.62
 RAINFALL INTENSITY(INCH/HR) = 1.60
 AREA-AVERAGED Fm(INCH/HR) = 0.45
  AREA-AVERAGED Fp(INCH/HR) = 0.75
  AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 6.03
  TOTAL STREAM AREA(ACRES) = 6.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.29
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        22.30
        15.56
        1.801
        0.75( 0.46)
        0.61
        17.9
        8.00

        1
        22.20
        16.36
        1.743
        0.75( 0.46)
        0.61
        18.7
        11.00

        1
        21.01
        19.58
        1.551
        0.75( 0.46)
        0.62
        20.9
        4.00

        1
        18.95
        22.61
        1.413
        0.75( 0.46)
        0.62
        21.6
        1.00

        2
        6.29
        18.62
        1.603
        0.75( 0.45)
        0.60
        6.0
        15.00
```

Tract No. 20257 – Griffin Residential III Proposed 10-year Hydrology – Area C Page **15** of **20** RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

```
** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
          28.46 15.56 1.801 0.75(0.46) 0.61 23.0 8.00

28.40 16.36 1.743 0.75(0.46) 0.61 24.0 11.00

27.66 18.62 1.603 0.75(0.46) 0.61 26.3 15.00

27.02 19.58 1.551 0.75(0.46) 0.61 26.9 4.00

24.21 22.61 1.413 0.75(0.46) 0.61 27.7 1.00
     1
     2.
     3
     4
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 28.46 Tc(MIN.) = 15.56
EFFECTIVE AREA(ACRES) = 22.99 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.61
 TOTAL AREA(ACRES) = 27.7
 LONGEST FLOWPATH FROM NODE
                            1.00 TO NODE 19.00 = 2156.00 FEET.
********************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << <<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1288.30 DOWNSTREAM(FEET) = 1288.00
 FLOW LENGTH(FEET) = 31.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 21.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.50
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 28.46
 PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 15.62
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                           20.00 = 2187.00 FEET.
******************
 FLOW PROCESS FROM NODE
                       20.00 TO NODE
                                       23.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1293.40
 DOWNSTREAM NODE ELEVATION(FEET) = 1291.70
 CHANNEL LENGTH THRU SUBAREA(FEET) = 170.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) = 2.00
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.768
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                       SCS
                                                 Дp
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
PUBLIC PARK B 0.59 0.75 0.850 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.76
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.52
 AVERAGE FLOW DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) =
```

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```
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.38 Tc(MIN.) = 16.00
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 0.60 EFFECTIVE AREA(ACRES) = 23.58 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 28.46
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
      NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
      DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 7.52 DEPTH*VELOCITY(FT*FT/SEC) = 9.02 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 23.00 = 2357.00 FEET.
************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.00
 RAINFALL INTENSITY(INCH/HR) = 1.77
 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 23.58
 TOTAL STREAM AREA(ACRES) = 28.26
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
************************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 648.00
 ELEVATION DATA: UPSTREAM(FEET) = 1313.20 DOWNSTREAM(FEET) = 1302.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.520
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.074
 SUBAREA TC AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fp Ap SCS
     LAND USE
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
                    В
 "3-4 DWELLINGS/ACRE"
                         1.26 0.75
                                           0.600 56 12.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.84
 TOTAL AREA(ACRES) = 1.26 PEAK FLOW RATE(CFS) = 1.84
***********************
                     22.00 \text{ TO NODE} 23.00 \text{ IS CODE} = 62
 FLOW PROCESS FROM NODE
______
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1302.70 DOWNSTREAM ELEVATION(FEET) = 1291.70
 STREET LENGTH(FEET) = 627.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.53
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.27
   HALFSTREET FLOOD WIDTH(FEET) = 5.42
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.57
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.69
 STREET FLOW TRAVEL TIME(MIN.) = 4.07 Tc(MIN.) = 16.59
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.727
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                    SCS
                                               Ар
                GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.20 0.75 0.600 56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.20 SUBAREA RUNOFF(CFS) = 1.38
 EFFECTIVE AREA(ACRES) = 2.46 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 2.5 PEAK FLOW RATE(CFS) = 2.83
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.28 HALFSTREET FLOOD WIDTH(FEET) = 5.89
 FLOW VELOCITY(FEET/SEC.) = 2.58 DEPTH*VELOCITY(FT*FT/SEC.) = 0.72
 LONGEST FLOWPATH FROM NODE
                         21.00 TO NODE 23.00 = 1275.00 FEET.
***********************
 FLOW PROCESS FROM NODE 23.00 TO NODE
                                     23.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.59
 RAINFALL INTENSITY(INCH/HR) = 1.73
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.75
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 2.46
```

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```
** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
               28.46 16.00 1.768 0.75( 0.46) 0.62 23.6 8.00

28.40 16.80 1.713 0.75( 0.46) 0.62 24.6 11.00

27.66 19.05 1.579 0.75( 0.46) 0.62 26.8 15.00

27.02 20.02 1.529 0.75( 0.46) 0.62 27.5 4.00

24.21 23.05 1.395 0.75( 0.46) 0.62 28.3 1.00

2.83 16.59 1.727 0.75( 0.45) 0.60 2.5 21.00
        1
        1
        1
        1
        1
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
   ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        31.28
        16.00
        1.768
        0.75( 0.46) 0.62
        26.0
        8.00

        2
        31.25
        16.59
        1.727
        0.75( 0.46) 0.62
        26.8
        21.00

        3
        31.20
        16.80
        1.713
        0.75( 0.46) 0.62
        27.0
        11.00

        4
        30.16
        19.05
        1.579
        0.75( 0.46) 0.62
        29.3
        15.00

        5
        29.41
        20.02
        1.529
        0.75( 0.46) 0.62
        30.0
        4.00

        6
        26.30
        23.05
        1.395
        0.75( 0.46) 0.62
        30.7
        1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 31.28 Tc(MIN.) = 16.00

EFFECTIVE AREA(ACRES) = 25.95 AREA-AVERAGED Fm(INCH/HR) = 0.46

AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.62
  TOTAL AREA(ACRES) = 30.7
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                                                      23.00 = 2357.00 FEET.
*****************
  FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 3 USED) << <<
______
  UPSTREAM ELEVATION(FEET) = 1291.70 DOWNSTREAM ELEVATION(FEET) = 1280.50
  STREET LENGTH(FEET) = 694.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 20.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
  INSIDE STREET CROSSFALL(DECIMAL) = 0.015
  OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
  STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 40.77
     ***STREET FLOWING FULL***
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) = 0.57
     HALFSTREET FLOOD WIDTH(FEET) = 20.00
```

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```
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.55
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
                                             2.61
 STREET FLOW TRAVEL TIME(MIN.) = 2.54 Tc(MIN.) = 18.54
  * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.607
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL
                                   AREA
                                                        Aр
                                                               SCS
                                             Fρ
      LAND USE
                        GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
  "BARREN"
                           В
                                   15.81 0.27
                                                      1.000
                                                              86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.81 SUBAREA RUNOFF(CFS) = 18.99
 EFFECTIVE AREA(ACRES) = 41.76 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.51 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 46.5 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 20.00
 FLOW VELOCITY(FEET/SEC.) = 4.77 DEPTH*VELOCITY(FT*FT/SEC.) = 2.82
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                               24.00 = 3051.00 FEET.
______
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 46.5 TC(MIN.) = 18.54
EFFECTIVE AREA(ACRES) = 41.76 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.51 AREA-AVERAGED Ap = 0.761
 PEAK FLOW RATE(CFS) =
                            45.77
  ** PEAK FLOW RATE TABLE **
            Q Tc Intensity Fp(Fm) Ap Ae (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES)
  STREAM Q Tc
                                                              HEADWATER
  NUMBER
                                                      (ACRES) NODE
            45.77 18.54 1.607 0.51( 0.39) 0.76 41.8
                                                                   8.00

      45.37
      19.13
      1.574
      0.51(0.39) 0.76
      42.6

      45.19
      19.35
      1.563
      0.52(0.39) 0.76
      42.8

      42.97
      21.65
      1.453
      0.53(0.39) 0.75
      45.1

      43.03
      0.53(0.39) 0.75
      45.1

     2
                                                                   21.00
     3
                                                                   11.00
                                                                  15.00
            41.83 22.65 1.411 0.53( 0.40) 0.75
                                                         45.8
            37.69 25.79 1.297 0.53( 0.40) 0.75 46.5
______
______
```

END OF RATIONAL METHOD ANALYSIS

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

PROPOSED HYDROLOGY 100-YEAR RUNOFF



Tract 20257 JN 10217

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HPAH.DAT

TIME/DATE OF STUDY: 10:22 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

0	SEK-DEF	INED SIKEFI	-SECTIONS FOR COUPL	PD BIBER	LIOM AIVI) SIKEE.	TETOM	MODET.
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	-GEOMETI	RIES:	MANNING
	WIDTH	CROSSFALL	IN- / OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE	FACTOR
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
===	=====	=======	==========	=====	=====	=====	=====	======
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150

HIGED_DEFINED CTDEFT_CECTIONS FOR COHDIED DIDEFLOW AND CTDEFTED W MODEL

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1370.50 DOWNSTREAM(FEET) = 1359.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.987
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.849
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fp Ap SCS Tc
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
                             0.50 0.42 0.200 76 9.99
 APARTMENTS
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 1.69
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 1.69
******************
 FLOW PROCESS FROM NODE 2.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1359.20 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 1264.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.29
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.44
   HALFSTREET FLOOD WIDTH(FEET) = 11.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.22
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.98
 STREET FLOW TRAVEL TIME(MIN.) = 9.48 Tc(MIN.) = 19.46
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.495
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 6.39 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 6.39 SUBAREA RUNOFF(CFS) = 12.89
 EFFECTIVE AREA(ACRES) = 6.89 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 13.97
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 15.81
 FLOW VELOCITY(FEET/SEC.) = 2.42 DEPTH*VELOCITY(FT*FT/SEC.) = 1.25
                   Tract No. 20257 - Griffin Residential III
```

Proposed 100-year Hydrology – Area A
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```
В
                                1.41
                                        0.42
 "3-4 DWELLINGS/ACRE"
                                                0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.243
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.09
 AVERAGE FLOW DEPTH(FEET) = 1.16 TRAVEL TIME(MIN.) = 2.47
 Tc(MIN.) =
           12.88
 SUBAREA AREA(ACRES) = 13.11 SUBAREA RUNOFF(CFS) = 37.28

EFFECTIVE AREA(ACRES) = 16.75 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 47.69
 GIVEN CHANNEL BASE(FEET) = 2.00 CHANNEL FREEBOARD(FEET) = 1.0
 "Z" FACTOR = 2.000 MANNING'S FACTOR = 0.015
 *ESTIMATED CHANNEL HEIGHT(FEET) = 2.43
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 1.43 FLOW VELOCITY(FEET/SEC.) = 6.85
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1505.00 FEET.
************************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1353.90 DOWNSTREAM ELEVATION(FEET) = 1351.60
 STREET LENGTH(FEET) = 163.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 49.90
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.62
   HALFSTREET FLOOD WIDTH(FEET) = 24.23
   AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.39
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.73
 STREET FLOW TRAVEL TIME(MIN.) = 0.62 Tc(MIN.) = 13.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.164
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fρ
                                                         SCS
                                                  Дp
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                1.69 0.42
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.69 SUBAREA RUNOFF(CFS) = 4.43
 EFFECTIVE AREA(ACRES) = 18.44 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.27
```

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EFFECTIVE AREA(ACRES) = 23.22 AREA-AVERAGED Fm(INCH/HR) = 0.14 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.33

TOTAL AREA(ACRES) = 25.3

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 1944.00 FEET.

FLOW PROCESS FROM NODE 6.00 TO NODE 9.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<

>>>>(STREET TABLE SECTION # 1 USED) <<<<

______ UPSTREAM ELEVATION(FEET) = 1351.60 DOWNSTREAM ELEVATION(FEET) = 1346.00

STREET LENGTH(FEET) = 312.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 65.59
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.65
   HALFSTREET FLOOD WIDTH(FEET) = 26.18
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.11
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.33
 STREET FLOW TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 14.52
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.018
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                            qД
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.91 0.42 0.600
                                                  76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.91 SUBAREA RUNOFF(CFS) = 4.75
 EFFECTIVE AREA(ACRES) = 25.13 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 64.91
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 26.02
 FLOW VELOCITY(FEET/SEC.) = 5.10 DEPTH*VELOCITY(FT*FT/SEC.) = 3.31
 LONGEST FLOWPATH FROM NODE
                        1.00 TO NODE 9.00 = 2256.00 FEET.
******************
 FLOW PROCESS FROM NODE
                    9.00 TO NODE
                                    9.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.52
 RAINFALL INTENSITY(INCH/HR) = 3.02
 AREA-AVERAGED fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 27.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
FLOW PROCESS FROM NODE
                    7.00 TO NODE
                                   8.00 \text{ IS CODE} = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 967.00
 ELEVATION DATA: UPSTREAM(FEET) = 1360.40 DOWNSTREAM(FEET) = 1348.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.578
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.883
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fр
                                                 Дp
                                                      SCS Tc
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               2.84 0.42
                                               0.600 76 15.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 6.72
 TOTAL AREA(ACRES) =
                     2.84 PEAK FLOW RATE(CFS) =
************************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1348.70 DOWNSTREAM ELEVATION(FEET) = 1346.00
 STREET LENGTH(FEET) = 654.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.43
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.53
   HALFSTREET FLOOD WIDTH(FEET) = 16.58
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.02
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.07
 STREET FLOW TRAVEL TIME(MIN.) = 5.39 Tc(MIN.) = 20.97
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.376
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fp
                                                 Дp
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                            5.96 0.42
                                               0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 5.96 SUBAREA RUNOFF(CFS) = 11.39
 EFFECTIVE AREA(ACRES) = 8.80 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.8 PEAK FLOW RATE(CFS) = 16.81
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 18.00
  FLOW VELOCITY(FEET/SEC.) = 2.21 DEPTH*VELOCITY(FT*FT/SEC.) = 1.26
  LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 1621.00 FEET.
******************
                                 9.00 TO NODE
                                                          9.00 \text{ IS CODE} =
  FLOW PROCESS FROM NODE
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 20.97
  RAINFALL INTENSITY(INCH/HR) = 2.38
  AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.80
  TOTAL STREAM AREA(ACRES) = 8.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.81
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        64.91
        14.52
        3.018
        0.42(0.15)
        0.35
        25.1
        3.00

        1
        55.29
        20.51
        2.411
        0.42(0.16)
        0.37
        27.2
        1.00

        2
        16.81
        20.97
        2.376
        0.42(0.25)
        0.60
        8.8
        7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        80.07
        14.52
        3.018
        0.42(0.17)
        0.40
        31.2
        3.00

        2
        72.00
        20.51
        2.411
        0.42(0.18)
        0.42
        35.8
        1.00

        3
        71.26
        20.97
        2.376
        0.42(0.18)
        0.42
        36.0
        7.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 80.07 Tc(MIN.) = 14.52
  EFFECTIVE AREA(ACRES) = 31.22 AREA-AVERAGED Fm(INCH/HR) = 0.17
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.40
  TOTAL AREA(ACRES) = 36.0
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 9.00 = 2256.00 FEET.
************************
  FLOW PROCESS FROM NODE 9.00 TO NODE 12.00 IS CODE = 62
______
  >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
  >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
  UPSTREAM ELEVATION(FEET) = 1346.00 DOWNSTREAM ELEVATION(FEET) = 1339.80
  STREET LENGTH(FEET) = 344.00 CURB HEIGHT(INCHES) = 8.0
  STREET HALFWIDTH(FEET) = 32.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
```

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```
INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 81.83
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.69
   HALFSTREET FLOOD WIDTH(FEET) = 30.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.36
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.72
 STREET FLOW TRAVEL TIME(MIN.) = 1.07 Tc(MIN.) = 15.59
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.882
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                  SCS
                                             Ар
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.49 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.49 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 32.71 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 80.07
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.69 HALFSTREET FLOOD WIDTH(FEET) = 30.04
 FLOW VELOCITY(FEET/SEC.) = 5.32 DEPTH*VELOCITY(FT*FT/SEC.) = 3.67
 LONGEST FLOWPATH FROM NODE
                          1.00 TO NODE 12.00 = 2600.00 FEET.
******************
 FLOW PROCESS FROM NODE
                     12.00 TO NODE
                                    12.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.59
 RAINFALL INTENSITY(INCH/HR) = 2.88
 AREA-AVERAGED fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) =
 TOTAL STREAM AREA(ACRES) = 37.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
******************
 FLOW PROCESS FROM NODE
                     10.00 TO NODE
                                   11.00 IS CODE = 21
._____
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
```

```
INITIAL SUBAREA FLOW-LENGTH(FEET) = 503.00
 ELEVATION DATA: UPSTREAM(FEET) = 1355.40 DOWNSTREAM(FEET) = 1347.10
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.273
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.558
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                      Fр
                                                Дp
                                                     SCS Tc
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
                               0.74 0.42
                                              0.600 76 11.27
 "3-4 DWELLINGS/ACRE" B
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 2.20
 TOTAL AREA(ACRES) =
                     0.74 PEAK FLOW RATE(CFS) =
************************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <---
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1347.10 DOWNSTREAM ELEVATION(FEET) = 1339.80
 STREET LENGTH(FEET) = 1135.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.05
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.49
   HALFSTREET FLOOD WIDTH(FEET) = 13.92
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.44
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.19
 STREET FLOW TRAVEL TIME(MIN.) = 7.75 Tc(MIN.) = 19.02
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.532
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fp
                                                qД
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                      В
 "3-4 DWELLINGS/ACRE"
                              9.49
                                       0.42
                                              0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 9.49 SUBAREA RUNOFF(CFS) = 19.46
 EFFECTIVE AREA(ACRES) = 10.23 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 10.2 PEAK FLOW RATE(CFS) = 20.98
```

END OF SUBAREA STREET FLOW HYDRAULICS:

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```
DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 18.00
 FLOW VELOCITY(FEET/SEC.) = 2.76 DEPTH*VELOCITY(FT*FT/SEC.) = 1.57
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1638.00 FEET.
******************
                           12.00 TO NODE
 FLOW PROCESS FROM NODE
                                             12.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 19.02
 RAINFALL INTENSITY(INCH/HR) = 2.53
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 10.23
 TOTAL STREAM AREA(ACRES) = 10.23
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 20.98
 ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 80.07 15.59 2.882 0.42(0.17) 0.41 32.7 3.00

1 72.20 21.61 2.331 0.42(0.18) 0.43 37.3 1.00

1 71.49 22.07 2.299 0.42(0.18) 0.43 37.5 7.00

2 20.98 19.02 2.532 0.42(0.25) 0.60 10.2 10.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 99.90 15.59 2.882 0.42(0.19) 0.45 41.1 3.00
2 96.56 19.02 2.532 0.42(0.20) 0.46 45.6 10.00
3 91.32 21.61 2.331 0.42(0.20) 0.47 47.6 1.00
4 90.32 22.07 2.299 0.42(0.20) 0.47 47.8 7.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 99.90 Tc(MIN.) = 15.59
 EFFECTIVE AREA(ACRES) = 41.09 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 47.8
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 2600.00 FEET.
***********************
 FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1339.80 DOWNSTREAM ELEVATION(FEET) = 1334.40
 STREET LENGTH(FEET) = 301.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 100.87
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.74
   HALFSTREET FLOOD WIDTH(FEET) = 35.61
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.09
 STREET FLOW TRAVEL TIME(MIN.) = 0.91 Tc(MIN.) = 16.49
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.778
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                 Аp
      LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.29 0.42
                                                0.600
                                                        76
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                        В
                                0.58 0.32
                                                1.000
                                                        83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.34
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.867
 SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 1.94
 EFFECTIVE AREA(ACRES) = 41.96 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.46
 TOTAL AREA(ACRES) = 48.6 PEAK FLOW RATE(CFS) = 99.90
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 35.37
 FLOW VELOCITY(FEET/SEC.) = 5.53 DEPTH*VELOCITY(FT*FT/SEC.) = 4.08
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
************************
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE =
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.49
 RAINFALL INTENSITY(INCH/HR) =
                             2.78
 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.46
 EFFECTIVE STREAM AREA(ACRES) = 41.96
 TOTAL STREAM AREA(ACRES) = 48.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 99.90
```

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```
EFFECTIVE AREA(ACRES) = 8.10 AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
  TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 16.26
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.52 HALFSTREET FLOOD WIDTH(FEET) = 16.15
  FLOW VELOCITY(FEET/SEC.) = 2.74 DEPTH*VELOCITY(FT*FT/SEC.) = 1.43
  LONGEST FLOWPATH FROM NODE 13.00 TO NODE
                                                            15.00 = 1612.00 FEET.
**********************
  FLOW PROCESS FROM NODE 15.00 TO NODE
                                                      15.00 \text{ IS CODE} = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 19.59
  RAINFALL INTENSITY(INCH/HR) = 2.48
  AREA-AVERAGED Fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 8.10
  TOTAL STREAM AREA(ACRES) = 8.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.26
  ** CONFLUENCE DATA **

        STREAM
        Q
        Tc
        Intensity
        Fp(Fm)
        Ap
        Ae
        HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        99.90
        16.49
        2.778
        0.42(0.19)
        0.46
        42.0
        3.00

      96.56
      19.93
      2.456
      0.42( 0.20) 0.47
      46.4
      10.00

      91.32
      22.53
      2.268
      0.42( 0.20) 0.47
      48.4
      1.00

      90.32
      22.99
      2.238
      0.42( 0.20) 0.47
      48.6
      7.00

      16.26
      19.59
      2.484
      0.42( 0.25) 0.60
      8.1
      13.00

       1
       1
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 115.39 16.49 2.778 0.42(0.20) 0.48 48.8 3.00
2 113.15 19.59 2.484 0.42(0.20) 0.49 54.1 13.00
3 112.61 19.93 2.456 0.42(0.21) 0.49 54.5 10.00
4 106.00 22.53 2.268 0.42(0.21) 0.49 56.5 1.00
5 104.79 22.99 2.238 0.42(0.21) 0.49 56.7 7.00
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) = 115.39 Tc(MIN.) = 16.49
  EFFECTIVE AREA(ACRES) = 48.78 AREA-AVERAGED Fm(INCH/HR) = 0.20
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.48
  TOTAL AREA(ACRES) = 56.7
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 15.00 = 2901.00 FEET.
*******************
  FLOW PROCESS FROM NODE 15.00 TO NODE 18.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1334.40 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 686.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 121.60
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.79
   HALFSTREET FLOOD WIDTH(FEET) = 38.23
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.50
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 2.08 Tc(MIN.) = 18.57
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.572
 SUBAREA LOSS RATE DATA(AMC III):
                                     Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                 Аp
                                                       SCS
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 COMMERCIAL
                       B 0.76 0.42 0.100 76
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                      В
                               2.23 0.42
                                                0.600
                                                        76
 AGRICULTURAL POOR COVER
                                                 1.000
 "ORCHARDS"
                        В
                                2.87
                                        0.23
                                                         89
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.731
 SUBAREA AREA(ACRES) = 5.86 SUBAREA RUNOFF(CFS) = 12.43 EFFECTIVE AREA(ACRES) = 54.64 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.40 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 62.6 PEAK FLOW RATE(CFS) = 116.56
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 37.81
 FLOW VELOCITY(FEET/SEC.) = 5.44 DEPTH*VELOCITY(FT*FT/SEC.) = 4.25
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                           18.00 = 3587.00 FEET.
******************
 FLOW PROCESS FROM NODE 18.00 TO NODE
                                        18.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.57
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED fm(INCH/HR) = 0.20
```

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```
AREA-AVERAGED Fp(INCH/HR) = 0.40
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 54.64
 TOTAL STREAM AREA(ACRES) = 62.59
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 116.56
************************
 FLOW PROCESS FROM NODE 16.00 TO NODE
                                    17.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 984.00
 ELEVATION DATA: UPSTREAM(FEET) = 1343.50 DOWNSTREAM(FEET) = 1333.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.343
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.795
 SUBAREA To AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS Tc
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 3.22 0.42 0.600 76 16.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 7.36
 TOTAL AREA(ACRES) = 3.22 PEAK FLOW RATE(CFS) = 7.36
******************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1333.80 DOWNSTREAM ELEVATION(FEET) = 1324.40
 STREET LENGTH(FEET) = 923.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.23
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 12.07
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.98
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.36
 STREET FLOW TRAVEL TIME(MIN.) = 5.16 Tc(MIN.) = 21.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.338
 SUBAREA LOSS RATE DATA(AMC III):
```

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LAND	ENT TYPE/ USE						
	LINGS/ACRE"	В	3.97	0 .	.42	0.600	76
"BARREN"		В					97
	VERAGE PERVIOU VERAGE PERVIOU		_			2	
SUBAREA A	REA(ACRES) = AREA(ACRES) =	5.09	SUBARE.	A RUNOI	FF(CFS)	= 9.7	70 - 0 23
AREA-AVER	AGED Fp(INCH/H	R) = 0.36	AREA-A	VERAGEI	Ap =	0.65	
TOTAL ARE	A(ACRES) =	8.3	PEA	K FLOW	RATE(C	!FS) =	15.74
END OF SU	BAREA STREET F	LOW HYDRAU	LICS:				
	T) = 0.49 HA CITY(FEET/SEC.						- 152
	LOWPATH FROM N						
*****	*****	******	*****	****	*****	******	****
FLOW PROC	ESS FROM NODE	18.00	TO NODE	18.	.00 IS	CODE =	1
>>>>DESI	GNATE INDEPEND	ENT STREAM	FOR CON	FLUENCE	Ξ< <<<		
	COMPUTE VARIOU						
CONFLUENCE TIME OF CO	BER OF STREAMS E VALUES USED ONCENTRATION(M	FOR INDEPEIN.) = 2	1.50	REAM 2	2 ARE:		
	INTENSITY(INCH AGED Fm(INCH/H						
AREA-AVER	AGED Fp(INCH/H	R) = 0.36					
	AGED Ap = 0.6 STREAM AREA(A		Ω 31				
TOTAL STR	EAM AREA(ACRES) =	8.31				
PEAK FLOW	RATE(CFS) AT	CONFLUENCE	=	15.74			
	ENCE DATA **						
STREAM NUMBER	Q Tc (CFS) (MIN	Intensi .) (INCH/H			Ар	Ae (ACRES)	HEADWATER NODE
1	116.56 18.			0.20)	0.50	54.6	3.00
1	114.38 21.			0.21)		60.0	
1	113.93 22.			0.21)		60.4	
1		67 2.13		0.21)		62.4	
1 2	107.27 25. 15.74 21.	14 2.1150 2.33		0.21)	0.51 0.65	62.6 8.3	
	INTENSITY AND E FORMULA USED			ION RAT	1.10		
** PEAK F	LOW RATE TABLE						
STREAM	Q Tc		ty Fp(_		HEADWATER
		.) (INCH/H				(ACRES)	
1 2	131.66 18. 130.25 21.			0.21)		61.8 68.0	
3	130.25 21.			0.21)		68.3	
4	129.39 22.			0.21)		68.7	
5	122.65 24.			0.21)		70.7	

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 131.66 Tc(MIN.) = 18.57EFFECTIVE AREA(ACRES) = 61.82 AREA-AVERAGED Fm(INCH/HR) = 0.21 AREA-AVERAGED Fp(INCH/HR) = 0.39 AREA-AVERAGED Ap = 0.52TOTAL AREA(ACRES) = 70.9 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 18.00 = 3587.00 FEET. ******************** FLOW PROCESS FROM NODE 18.00 TO NODE 22.00 IS CODE = 62 ______ >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA< >>>>(STREET TABLE SECTION # 1 USED) << << ______ UPSTREAM ELEVATION(FEET) = 1324.40 DOWNSTREAM ELEVATION(FEET) = 1316.60 STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 32.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200 **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 134.43 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 37.13 AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.58 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 5.06 STREET FLOW TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 19.46 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.495 SUBAREA LOSS RATE DATA(AMC III): DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE NATURAL POOR COVER 2.58 0.11 "BARREN" 1.000 97 В SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000 SUBAREA AREA(ACRES) = 2.58 SUBAREA RUNOFF(CFS) = 5.55 EFFECTIVE AREA(ACRES) = 64.40 AREA-AVERAGED Fm(INCH/HR) = 0.20 AREA-AVERAGED Fp(INCH/HR) = 0.37 AREA-AVERAGED Ap = 0.54 TOTAL AREA(ACRES) = 73.5 PEAK FLOW RATE(CFS) = 132.93END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 37.07 FLOW VELOCITY(FEET/SEC.) = 6.53 DEPTH*VELOCITY(FT*FT/SEC.) = 5.02 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 22.00 = 3937.00 FEET. ******************

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1

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```
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) =
                          19.46
 RAINFALL INTENSITY(INCH/HR) = 2.50
 AREA-AVERAGED fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.37
 AREA-AVERAGED Ap = 0.54
 EFFECTIVE STREAM AREA(ACRES) = 64.40
 TOTAL STREAM AREA(ACRES) = 73.48
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 132.93
*******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1059.00
 ELEVATION DATA: UPSTREAM(FEET) = 1349.50 DOWNSTREAM(FEET) = 1329.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.838
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.976
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                 Fp Ap SCS Tc
     LAND USE
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                          0.600 76 14.84
                            0.78
                                    0.42
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 1.91
 TOTAL AREA(ACRES) = 0.78 PEAK FLOW RATE(CFS) = 1.91
******************
                     20.00 TO NODE
 FLOW PROCESS FROM NODE
                                   21.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1329.90 DOWNSTREAM ELEVATION(FEET) = 1322.90
 STREET LENGTH(FEET) = 956.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 17.97
```

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```
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.54
   HALFSTREET FLOOD WIDTH(FEET) = 17.44
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.73
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.48
 STREET FLOW TRAVEL TIME(MIN.) = 5.84 Tc(MIN.) = 20.68
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.398
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                     SCS
                                                Дp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 14.50 0.42 0.600 76
 NATURAL POOR COVER
                       B 1.79 0.11 1.000 97
 "BARREN"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.37
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.644
 SUBAREA AREA(ACRES) = 16.29 SUBAREA RUNOFF(CFS) = 31.67
 EFFECTIVE AREA(ACRES) = 17.07 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.37 AREA-AVERAGED Ap = 0.64
 TOTAL AREA(ACRES) = 17.1 PEAK FLOW RATE(CFS) = 33.18
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 18.00
 FLOW VELOCITY(FEET/SEC.) = 3.44 DEPTH*VELOCITY(FT*FT/SEC.) =
 LONGEST FLOWPATH FROM NODE 19.00 TO NODE 21.00 = 2015.00 FEET.
******************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1322.90 DOWNSTREAM ELEVATION(FEET) = 1316.60
 STREET LENGTH(FEET) = 615.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 35.28
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.59
   HALFSTREET FLOOD WIDTH(FEET) = 20.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.74
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.19
 STREET FLOW TRAVEL TIME(MIN.) = 2.74 Tc(MIN.) = 23.43
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.211
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fp
                                                Aр
                                                       SCS
```

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```
GROUP (ACRES) (INCH/HR) (DECIMAL) CN
       LAND USE
  NATURAL POOR COVER
                               В
                                          2.22 0.11 1.000 97
  "BARREN"
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
  SUBAREA AREA(ACRES) = 2.22 SUBAREA RUNOFF(CFS) = 4.21
  EFFECTIVE AREA(ACRES) = 19.29 AREA-AVERAGED Fm(INCH/HR) = 0.22
  AREA-AVERAGED Fp(INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.68
  TOTAL AREA(ACRES) = 19.3 PEAK FLOW RATE(CFS) = 34.52
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.58 HALFSTREET FLOOD WIDTH(FEET) = 20.00
  FLOW VELOCITY(FEET/SEC.) = 3.71 DEPTH*VELOCITY(FT*FT/SEC.) = 2.16
  LONGEST FLOWPATH FROM NODE 19.00 TO NODE 22.00 = 2630.00 FEET.
************************
  FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 1
______
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
  >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 23.43
  RAINFALL INTENSITY(INCH/HR) = 2.21
  AREA-AVERAGED Fm(INCH/HR) = 0.22
  AREA-AVERAGED Fp(INCH/HR) = 0.33
  AREA-AVERAGED Ap = 0.68
  EFFECTIVE STREAM AREA(ACRES) = 19.29
  TOTAL STREAM AREA(ACRES) = 19.29
  PEAK FLOW RATE (CFS) AT CONFLUENCE = 34.52
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap
                                                                Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 132.93 19.46 2.495 0.37(0.20) 0.54 64.4 3.00
1 131.53 22.39 2.277 0.38(0.21) 0.55 70.5 16.00
1 131.34 22.58 2.265 0.38(0.21) 0.55 70.9 13.00
1 130.71 22.92 2.243 0.38(0.21) 0.55 71.3 10.00
1 124.07 25.59 2.088 0.38(0.21) 0.55 73.3 1.00
1 122.77 26.05 2.064 0.38(0.21) 0.55 73.5 7.00
2 34.52 23.43 2.211 0.33(0.22) 0.68 19.3 19.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWAT NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
                                                                Ae HEADWATER
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 165.70 19.46 2.495 0.36(0.21)0.57 80.4 3.00
2 165.62 22.39 2.277 0.36(0.21)0.57 89.0 16.00
3 165.51 22.58 2.265 0.36(0.21)0.57 89.4 13.00
4 165.02 22.92 2.243 0.36(0.21)0.57 90.2 10.00
5 163.98 23.43 2.211 0.36(0.21)0.58 91.0 19.00
6 156.46 25.59 2.088 0.37(0.21)0.58 92.6 1.00
7 154.73 26.05 2.064 0.37(0.21)0.58 92.8 7.00
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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 165.70 Tc(MIN.) = 19.46
 EFFECTIVE AREA(ACRES) = 80.42 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 0.36 AREA-AVERAGED Ap = 0.57
 TOTAL AREA(ACRES) = 92.8
                           1.00 TO NODE 22.00 = 3937.00 FEET.
 LONGEST FLOWPATH FROM NODE
******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.60 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1041.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 179.42
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.85
   HALFSTREET FLOOD WIDTH(FEET) = 41.35
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.63
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 5.66
 STREET FLOW TRAVEL TIME(MIN.) = 2.62 Tc(MIN.) = 22.07
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.299
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                    Fр
                                                    SCS
                                               Ар
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL POOR COVER
 "BARREN"
                       B 12.11 0.11
                                             1.000
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              1.93 0.42
                                                     76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.13
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.945
 SUBAREA AREA(ACRES) = 14.04 SUBAREA RUNOFF(CFS) = 27.45
 EFFECTIVE AREA(ACRES) = 94.46 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.31 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 106.8 PEAK FLOW RATE(CFS) = 178.93
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.85 HALFSTREET FLOOD WIDTH(FEET) = 41.35
 FLOW VELOCITY(FEET/SEC.) = 6.62 DEPTH*VELOCITY(FT*FT/SEC.) = 5.65
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
***********************
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```
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 22.07
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED fm(INCH/HR) = 0.19
 AREA-AVERAGED fp(INCH/HR) = 0.31
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 94.46
 TOTAL STREAM AREA(ACRES) = 106.81
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 178.93
************************
 FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 639.00
 ELEVATION DATA: UPSTREAM(FEET) = 1324.10 DOWNSTREAM(FEET) = 1321.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.821
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.743
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                  Fp Ap SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
                    В
 "3-4 DWELLINGS/ACRE"
                            1.77 0.42
                                          0.600 76 16.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.96
 TOTAL AREA(ACRES) = 1.77 PEAK FLOW RATE(CFS) = 3.96
************************
 FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1321.80 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 1594.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
```

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```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.47
   HALFSTREET FLOOD WIDTH(FEET) = 12.40
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.69
 STREET FLOW TRAVEL TIME(MIN.) = 7.32 Tc(MIN.) = 24.14
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.169
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                                 SCS
                                                          Ар
       LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B 13.48 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 13.48 SUBAREA RUNOFF(CFS) = 23.23
 EFFECTIVE AREA(ACRES) = 15.25 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 26.28
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.55 HALFSTREET FLOOD WIDTH(FEET) = 17.79
 FLOW VELOCITY(FEET/SEC.) = 3.88 DEPTH*VELOCITY(FT*FT/SEC.) = 2.12
 LONGEST FLOWPATH FROM NODE 23.00 TO NODE 25.00 = 2233.00 FEET.
**********************
 FLOW PROCESS FROM NODE 25.00 TO NODE
                                                25.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 24.14
 RAINFALL INTENSITY(INCH/HR) = 2.17
 AREA-AVERAGED fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 15.25
 TOTAL STREAM AREA(ACRES) = 15.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 26.28
  ** CONFLUENCE DATA **
  ** CONFLUENCE DATA **

STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 178.93 22.07 2.299 0.31(0.19) 0.62 94.5 3.00

1 178.13 25.02 2.119 0.32(0.20) 0.62 103.0 16.00

1 177.97 25.20 2.109 0.32(0.20) 0.62 103.5 13.00

1 177.45 25.55 2.090 0.32(0.20) 0.62 104.2 10.00

1 176.24 26.06 2.063 0.32(0.20) 0.62 105.0 19.00

1 168.73 28.25 1.958 0.32(0.20) 0.62 106.6 1.00

1 166.99 28.73 1.937 0.32(0.20) 0.62 106.8 7.00

2 26.28 24.14 2.169 0.42(0.25) 0.60 15.2 23.00
```

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area A Page **24** of **29**

```
** PEAK FLOW RATE TABLE **
                                                        Ae HEADWATER
  STREAM Q Tc Intensity Fp(Fm)
  NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 204.59 22.07 2.299 0.32(0.20) 0.62 108.4 3.00
2 204.65 24.14 2.169 0.33(0.20) 0.62 115.7 23.00
3 203.72 25.02 2.119 0.33(0.20) 0.62 118.3 16.00
4 203.43 25.20 2.109 0.33(0.21) 0.62 118.7 13.00
5 202.66 25.55 2.090 0.33(0.21) 0.62 119.5 10.00
6 201.08 26.06 2.063 0.33(0.21) 0.62 120.3 19.00
7 192.12 28.25 1.958 0.33(0.21) 0.62 121.9 1.00
8 190.08 28.73 1.937 0.33(0.21) 0.62 122.1 7.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 204.65 Tc(MIN.) =
                                                    24.14
 EFFECTIVE AREA(ACRES) = 115.72 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 122.1
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 25.00 = 4978.00 FEET.
*******************
                            25.00 TO NODE
                                               29.00 \text{ IS CODE} = 62
 FLOW PROCESS FROM NODE
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 1 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1291.40
 STREET LENGTH(FEET) = 405.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.019
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 205.55
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.89
   HALFSTREET FLOOD WIDTH(FEET) = 42.93
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 6.12
 STREET FLOW TRAVEL TIME(MIN.) = 0.98 Tc(MIN.) = 25.12
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.114
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                         Αр
                                                                  SCS
                         GROUP (ACRES) (INCH/HR) (DECIMAL) CN
      LAND USE
 RESIDENTIAL
  "3-4 DWELLINGS/ACRE" B
                                      1.08 0.42
                                                       0.600
                                                                76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.08 SUBAREA RUNOFF(CFS) = 1.81
```

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```
EFFECTIVE AREA(ACRES) = 116.80 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 123.1 PEAK FLOW RATE(CFS) = 204.65
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.88 HALFSTREET FLOOD WIDTH(FEET) = 42.87
 FLOW VELOCITY(FEET/SEC.) = 6.91 DEPTH*VELOCITY(FT*FT/SEC.) = 6.11
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 29.00 = 5383.00 FEET.
******************
 FLOW PROCESS FROM NODE 29.00 TO NODE 29.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 25.12
 RAINFALL INTENSITY(INCH/HR) = 2.11
 AREA-AVERAGED fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.33
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 116.80
 TOTAL STREAM AREA(ACRES) = 123.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                              204.65
*******************
 FLOW PROCESS FROM NODE 26.00 TO NODE 27.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 545.00
 ELEVATION DATA: UPSTREAM(FEET) = 1313.20 DOWNSTREAM(FEET) = 1305.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.857
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.443
 SUBAREA To AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                Fр
                                         Ар
                                              SCS Tc
    LAND USE
                 GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
                           1.86 0.42
                                        0.600 76 11.86
 "3-4 DWELLINGS/ACRE" B
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 5.34
 TOTAL AREA(ACRES) = 1.86 PEAK FLOW RATE(CFS) =
*******************
 FLOW PROCESS FROM NODE 27.00 TO NODE
                                28.00 \text{ IS CODE} = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1305.00 DOWNSTREAM ELEVATION(FEET) = 1299.60
 STREET LENGTH(FEET) = 667.00 CURB HEIGHT(INCHES) = 8.0
```

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```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.66
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.44
   HALFSTREET FLOOD WIDTH(FEET) = 11.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.59
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.14
 STREET FLOW TRAVEL TIME(MIN.) = 4.29 Tc(MIN.) = 16.15
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.816
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                               Ap SCS
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               3.73
                                              0.600
                                       0.42
                                                      76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.73 SUBAREA RUNOFF(CFS) = 8.60
 EFFECTIVE AREA(ACRES) = 5.59 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.6 PEAK FLOW RATE(CFS) = 12.89
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 13.40
 FLOW VELOCITY(FEET/SEC.) = 2.73 DEPTH*VELOCITY(FT*FT/SEC.) = 1.31
 LONGEST FLOWPATH FROM NODE 26.00 TO NODE 28.00 = 1212.00 FEET.
*******************
                      28.00 TO NODE
                                     29.00 \text{ IS CODE} = 91
 FLOW PROCESS FROM NODE
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1299.60
 DOWNSTREAM NODE ELEVATION(FEET) = 1291.40
 CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00
 "V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) = 2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.755
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Αр
                                                       SCS
     LAND USE
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                               0.74
                                     0.42
                                              0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
```

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```
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 13.72

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 10.44

AVERAGE FLOW DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 3.00

"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.56 Tc(MIN.) = 16.71

SUBAREA AREA(ACRES) = 0.74 SUBAREA RUNOFF(CFS) = 1.67

EFFECTIVE AREA(ACRES) = 6.33 AREA-AVERAGED Fm(INCH/HR) = 0.25

AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60

TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 14.25
```

NOTE:TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]

END OF SUBAREA "V" GUTTER HYDRAULICS:

DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 3.00

FLOW VELOCITY(FEET/SEC.) = 10.44 DEPTH*VELOCITY(FT*FT/SEC) = 12.53

LONGEST FLOWPATH FROM NODE 26.00 TO NODE 29.00 = 1562.00 FEET.

FLOW PROCESS FROM NODE 29.00 TO NODE 29.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 16.71

RAINFALL INTENSITY(INCH/HR) = 2.75

AREA-AVERAGED fm(INCH/HR) = 0.25

AREA-AVERAGED Fp(INCH/HR) = 0.42

AREA-AVERAGED Ap = 0.60

EFFECTIVE STREAM AREA(ACRES) = 6.33

TOTAL STREAM AREA(ACRES) = 6.33

PEAK FLOW RATE(CFS) AT CONFLUENCE = 14.25

** CONFLUENCE DATA **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	204.59	23.05	2.235	0.33(0.20)	0.62	109.5	3.00
1	204.65	25.12	2.114	0.33(0.20)	0.62	116.8	23.00
1	203.72	26.00	2.067	0.33(0.21)	0.62	119.4	16.00
1	203.43	26.18	2.057	0.33(0.21)	0.62	119.8	13.00
1	202.66	26.53	2.040	0.33(0.21)	0.62	120.5	10.00
1	201.08	27.04	2.015	0.33(0.21)	0.62	121.3	19.00
1	192.12	29.25	1.914	0.33(0.21)	0.62	122.9	1.00
1	190.08	29.73	1.894	0.33(0.21)	0.62	123.1	7.00
2	14.25	16.71	2.755	0.42(0.25)	0.60	6.3	26.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	200.48	16.71	2.755	0.33(0.21)	0.62	85.7	26.00
2	215.88	23.05	2.235	0.33(0.21)	0.62	115.8	3.00
3	215.24	25.12	2.114	0.33(0.21)	0.62	123.1	23.00

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4	214.05	26.00	2.067	0.34(0.21)	0.62	125.7	16.00
5	213.71	26.18	2.057	0.34(0.21)	0.62	126.1	13.00
6	212.83	26.53	2.040	0.34(0.21)	0.62	126.9	10.00
7	211.11	27.04	2.015	0.34(0.21)	0.62	127.7	19.00
8	201.58	29.25	1.914	0.34(0.21)	0.62	129.3	1.00
9	199.43	29.73	1.894	0.34(0.21)	0.62	129.5	7.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 215.88 Tc(MIN.) = 23.05 EFFECTIVE AREA(ACRES) = 115.81 AREA-AVERAGED Fm(INCH/HR) = 0.21

AREA-AVERAGED Fp(INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.62

TOTAL AREA(ACRES) = 129.5

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 29.00 = 5383.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 129.5 TC(MIN.) = 23.05 EFFECTIVE AREA(ACRES) = 115.81 AREA-AVERAGED Fm(INCH/HR) = 0.21

AREA-AVERAGED Fp(INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.620

PEAK FLOW RATE(CFS) = 215.88

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	200.48	16.71	2.755	0.33(0.21)	0.62	85.7	26.00
2	215.88	23.05	2.235	0.33(0.21)	0.62	115.8	3.00
3	215.24	25.12	2.114	0.33(0.21)	0.62	123.1	23.00
4	214.05	26.00	2.067	0.34(0.21)	0.62	125.7	16.00
5	213.71	26.18	2.057	0.34(0.21)	0.62	126.1	13.00
6	212.83	26.53	2.040	0.34(0.21)	0.62	126.9	10.00
7	211.11	27.04	2.015	0.34(0.21)	0.62	127.7	19.00
8	201.58	29.25	1.914	0.34(0.21)	0.62	129.3	1.00
9	199.43	29.73	1.894	0.34(0.21)	0.62	129.5	7.00

______ ______

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HPBH.DAT

TIME/DATE OF STUDY: 10:24 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

U	SER-DEF:	INED STREET	-SECTIONS FOR COUPL	ED PIPEF	LOW AND	STREET	rflow	MODEL	
	HALF-	CROWN TO	STREET-CROSSFALL:	CURB	GUTTER-	GEOMETE	RIES:	MANNING	
	WIDTH	CROSSFALL	IN- / OUT-/PARK-				HIKE	FACTOR	
NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)	
===	=====	=======	==========	=====	=====	=====	=====	======	
1	32.0	10.0	0.015/0.019/0.020	0.67	2.00	0.0313	0.167	0.0150	
2	18.0	5.5	0.015/0.026/0.020	0.67	2.00	0.0313	0.167	0.0150	
3	20.0	6.0	0.015/0.021/0.021	0.67	2.00	0.0313	0.167	0.0150	

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

FLOW PROCESS FROM NODE

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

1.00 TO NODE

2.00 IS CODE = 21

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 687.00

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```
ELEVATION DATA: UPSTREAM(FEET) = 1339.70 DOWNSTREAM(FEET) = 1328.20
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.395
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.005
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
                                              0.100 76 9.40
                            1.89 0.42
 COMMERCIAL
                       В
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                               0.67 0.32
                                               1.000 83 21.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.34
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.336
 SUBAREA RUNOFF(CFS) = 8.96
 TOTAL AREA(ACRES) =
                     2.56 PEAK FLOW RATE(CFS) =
*********************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 91
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1328.20
 DOWNSTREAM NODE ELEVATION(FEET) = 1316.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 656.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0200
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
 MAXIMUM DEPTH(FEET) = 2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.644
 SUBAREA LOSS RATE DATA(AMC III):
                                     Fp
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                                αA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL
                       В
                               1.18
                                     0.42
                                               0.100
 NATURAL POOR COVER
                               4.44 0.11
 "BARREN"
                                                      97
                       В
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.811
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 17.94
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.43
 AVERAGE FLOW DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) =
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 1.47 Tc(MIN.) = 10.87
 SUBAREA AREA(ACRES) = 5.62 SUBAREA RUNOFF(CFS) = 17.96 EFFECTIVE AREA(ACRES) = 8.18 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.15 AREA-AVERAGED Ap = 0.66
 TOTAL AREA(ACRES) = 8.2 PEAK FLOW RATE(CFS) = 26.09
       NOTE: TRAVEL TIME ESTIMATES BASED ON NORMAL
       DEPTH EOUAL TO [GUTTER-HIKE + PAVEMENT LIP]
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 5.00
 FLOW VELOCITY(FEET/SEC.) = 7.43 DEPTH*VELOCITY(FT*FT/SEC) = 8.92 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1343.00 FEET.
******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 6.00 IS CODE = 62
```

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```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 3 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1316.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 610.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 42.61
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.70
   HALFSTREET FLOOD WIDTH(FEET) = 21.68
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.01
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 3.37 Tc(MIN.) = 14.24
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.056
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                     SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
                       B 2.52 0.42 0.100 76
 COMMERCIAL
 NATURAL POOR COVER
                       В
                               0.28 0.11
 "BARREN"
                                               1.000
                                                      97
 AGRICULTURAL FAIR COVER
 "ORCHARDS"
                       В
                              10.26
                                       0.32
                                               1.000
                                                      83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.826
 SUBAREA AREA(ACRES) = 13.06 SUBAREA RUNOFF(CFS) = 32.85
 EFFECTIVE AREA(ACRES) = 21.24 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.26 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 21.2 PEAK FLOW RATE(CFS) = 54.61
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 24.36
 FLOW VELOCITY(FEET/SEC.) = 3.27 DEPTH*VELOCITY(FT*FT/SEC.) = 2.48
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
       AND L = 610.0 FT WITH ELEVATION-DROP = 2.4 FT, IS 37.1 CFS,
       WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE
 LONGEST FLOWPATH FROM NODE
                          1.00 TO NODE 6.00 = 1953.00 FEET.
************************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
```

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area B Page 3 of 7

```
TIME OF CONCENTRATION(MIN.) = 14.24
 RAINFALL INTENSITY(INCH/HR) = 3.06
 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.26
 AREA-AVERAGED Ap = 0.76
 EFFECTIVE STREAM AREA(ACRES) = 21.24
 TOTAL STREAM AREA(ACRES) = 21.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
***********************
 FLOW PROCESS FROM NODE 4.00 TO NODE
                                     5.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 607.00
 ELEVATION DATA: UPSTREAM(FEET) = 1337.20 DOWNSTREAM(FEET) = 1326.80
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.062
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.405
 SUBAREA TC AND LOSS RATE DATA(AMC III):
                                   Fp Ap SCS Tc
 DEVELOPMENT TYPE/ SCS SOIL AREA
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             3.85 0.42 0.600 76 12.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 10.92
 TOTAL AREA(ACRES) =
                    3.85 PEAK FLOW RATE(CFS) = 10.92
***********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1326.80 DOWNSTREAM ELEVATION(FEET) = 1314.40
 STREET LENGTH(FEET) = 674.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.33
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 12.03
   AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.01
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
```

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```
STREET FLOW TRAVEL TIME(MIN.) = 2.80 Tc(MIN.) = 14.86
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.972
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 4.42 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 4.42 SUBAREA RUNOFF(CFS) = 10.81
 EFFECTIVE AREA(ACRES) = 8.27 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 8.3 PEAK FLOW RATE(CFS) = 20.23
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.49 HALFSTREET FLOOD WIDTH(FEET) = 13.83
 FLOW VELOCITY(FEET/SEC.) = 4.13 DEPTH*VELOCITY(FT*FT/SEC.) = 2.02
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1281.00 FEET.
******************
 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.86
 RAINFALL INTENSITY(INCH/HR) = 2.97
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 8.27
 TOTAL STREAM AREA(ACRES) = 8.27
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 20.23
  ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

      54.61
      14.24
      3.056
      0.26( 0.20) 0.76
      21.2
      1.00

      20.23
      14.86
      2.972
      0.42( 0.25) 0.60
      8.3
      4.00

     1
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 74.60 14.24 3.056 0.30(0.21) 0.72 29.2 1.00
2 73.24 14.86 2.972 0.30(0.21) 0.72 29.5 4.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 74.60 Tc(MIN.) = 14.24
EFFECTIVE AREA(ACRES) = 29.16 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.72
 TOTAL AREA(ACRES) = 29.5
```

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area B Page 5 of 7 ****************** FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 62 ______ >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA< >>>>(STREET TABLE SECTION # 3 USED) <<<< ______ UPSTREAM ELEVATION(FEET) = 1314.40 DOWNSTREAM ELEVATION(FEET) = 1313.90 STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 20.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250 **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 75.26 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.94HALFSTREET FLOOD WIDTH(FEET) = 32.90 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.79 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.61 STREET FLOW TRAVEL TIME(MIN.) = 1.44 Tc(MIN.) = 15.68 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.871 SUBAREA LOSS RATE DATA(AMC III): DEVELOPMENT TYPE/ SCS SOIL AREA Fp Аp SCS GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE RESIDENTIAL "3-4 DWELLINGS/ACRE" B 0.56 0.42 76 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600 SUBAREA AREA(ACRES) = 0.56 SUBAREA RUNOFF(CFS) = 1.32 EFFECTIVE AREA(ACRES) = 29.72 AREA-AVERAGED Fm(INCH/HR) = 0.21 AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.72 TOTAL AREA(ACRES) = 30.1 PEAK FLOW RATE(CFS) = 74.60 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.93 HALFSTREET FLOOD WIDTH(FEET) = 32.73 FLOW VELOCITY(FEET/SEC.) = 2.79 DEPTH*VELOCITY(FT*FT/SEC.) = 2.60 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 2193.00 FEET. ______ END OF STUDY SUMMARY: TOTAL AREA(ACRES) = 30.1 TC(MIN.) = 15.68 EFFECTIVE AREA(ACRES) = 29.72 AREA-AVERAGED Fm(INCH/HR) = 0.21 AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.717 PEAK FLOW RATE(CFS) = 74.60** PEAK FLOW RATE TABLE ** STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER Tract No. 20257 – Griffin Residential III

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area B Page **6** of **7**

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	74.60	15.68	2.871	0.30(0.21) 0.72	29.7	1.00
2	73.24	16.30	2.799	0.30(0.22) 0.72	30.1	4.00
========	======	======	========	-=========		=======
========	======	======	=======	-=========	=======	=======

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc. 37 East Olive Avenue, Suite C Redlands, CA 92373 (909) 793-2257

FILE NAME: 0217HPCH.DAT

TIME/DATE OF STUDY: 10:56 12/31/2018

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6500 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
 - as (Maximum Allowable Street Flow Depth) (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
- *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN UPSTREAM TRIBUTARY PIPE.*
- *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 469.00

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area C

```
ELEVATION DATA: UPSTREAM(FEET) = 1314.20 DOWNSTREAM(FEET) = 1308.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.573
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.497
 SUBAREA To AND LOSS RATE DATA(AMC III):
                                     Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"
                       В
                               1.20 0.42 0.600 76 11.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.50
TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 3.50
************************
 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1308.30 DOWNSTREAM ELEVATION(FEET) = 1303.30
 STREET LENGTH(FEET) = 580.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.22
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 9.32
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.40
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.93
 STREET FLOW TRAVEL TIME(MIN.) = 4.02 Tc(MIN.) = 15.60
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.881
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                Аp
                                                     SCS
                     GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.29
                                      0.42
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.29 SUBAREA RUNOFF(CFS) = 5.41
 EFFECTIVE AREA(ACRES) = 3.49 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 3.5 PEAK FLOW RATE(CFS) = 8.25
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.42 HALFSTREET FLOOD WIDTH(FEET) = 10.59
```

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```
FLOW VELOCITY(FEET/SEC.) = 2.55 DEPTH*VELOCITY(FT*FT/SEC.) = 1.07
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1049.00 FEET.
******************
 FLOW PROCESS FROM NODE 3.00 TO NODE 7.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1303.30 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 478.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.80
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.43
   HALFSTREET FLOOD WIDTH(FEET) = 11.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.83
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.21
 STREET FLOW TRAVEL TIME(MIN.) = 2.82 Tc(MIN.) = 18.41
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.586
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Αp
                                                  SCS
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.48 0.42
                                                   76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.48 SUBAREA RUNOFF(CFS) = 3.11
 EFFECTIVE AREA(ACRES) = 4.97 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) =
                  5.0
                              PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.44 HALFSTREET FLOOD WIDTH(FEET) = 11.33
 FLOW VELOCITY(FEET/SEC.) = 2.85 DEPTH*VELOCITY(FT*FT/SEC.) = 1.25
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 1527.00 FEET.
************************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.41
 RAINFALL INTENSITY(INCH/HR) =
```

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```
AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 4.97
 TOTAL STREAM AREA(ACRES) = 4.97
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.43
************************
 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 460.00
 ELEVATION DATA: UPSTREAM(FEET) = 1316.00 DOWNSTREAM(FEET) = 1308.30
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.846
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.648
 SUBAREA To AND LOSS RATE DATA(AMC III):
                                   Fp Ap SCS Tc
  DEVELOPMENT TYPE/ SCS SOIL AREA
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.54
                                             0.600 76 10.85
                                     0.42
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 4.70
 TOTAL AREA(ACRES) = 1.54 PEAK FLOW RATE(CFS) = 4.70
***********************
 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1308.30 DOWNSTREAM ELEVATION(FEET) = 1301.50
 STREET LENGTH(FEET) = 651.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.63
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.43
   HALFSTREET FLOOD WIDTH(FEET) =
                             10.84
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.85
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.21
 STREET FLOW TRAVEL TIME(MIN.) = 3.80 Tc(MIN.) = 14.65
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.001
```

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```
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                       SCS
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                3.97 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.97 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 5.51 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 5.5 PEAK FLOW RATE(CFS) = 13.62
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.47 HALFSTREET FLOOD WIDTH(FEET) = 12.63
 FLOW VELOCITY(FEET/SEC.) = 3.08 DEPTH*VELOCITY(FT*FT/SEC.) = 1.45
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1111.00 FEET.
***********************
 FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1301.50 DOWNSTREAM ELEVATION(FEET) = 1298.50
 STREET LENGTH(FEET) = 255.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 15.12
   ***STREET FLOW SPLITS OVER STREET-CROWN***
   FULL DEPTH(FEET) = 0.55 FLOOD WIDTH(FEET) = 18.00
   FULL HALF-STREET VELOCITY(FEET/SEC.) = 3.49
   SPLIT DEPTH(FEET) = 0.37 SPLIT FLOOD WIDTH(FEET) = 8.67
SPLIT FLOW(CFS) = 3.10 SPLIT VELOCITY(FEET/SEC.) = 2.71
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.55
   HALFSTREET FLOOD WIDTH(FEET) = 18.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.49
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.92
 STREET FLOW TRAVEL TIME(MIN.) = 1.22 Tc(MIN.) = 15.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.849
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                 Аp
                                                       SCS
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
                       B 1.34 0.42 0.850
 PUBLIC PARK
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 1.34 SUBAREA RUNOFF(CFS) = 3.00
```

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```
EFFECTIVE AREA(ACRES) = 6.85 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.65
 TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 15.87
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.55 HALFSTREET FLOOD WIDTH(FEET) = 18.00
 FLOW VELOCITY(FEET/SEC.) = 3.49 DEPTH*VELOCITY(FT*FT/SEC.) = 1.92
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE
                                          7.00 = 1366.00 \text{ FEET}.
**********************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE = 81
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
______
 MAINLINE Tc(MIN.) = 15.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.849
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA FP AP SCS
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 0.49 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 1.14
 EFFECTIVE AREA(ACRES) = 7.34 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.65
 TOTAL AREA(ACRES) = 7.3 PEAK FLOW RATE(CFS) = 17.02
*******************
 FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.86
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.65
 EFFECTIVE STREAM AREA(ACRES) = 7.34
 TOTAL STREAM AREA(ACRES) = 7.34
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 17.02
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER

NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 10.43 18.41 2.586 0.42(0.25) 0.60 5.0 1.00
2 17.02 15.86 2.849 0.42(0.27) 0.65 7.3 4.00
                                                      1.00
          17.02 15.86 2.849 0.42(0.27) 0.65
                                                 7.3
                                                         4.00
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAM Q To Intensity Fp(Fm) Ap Ae HEADWATER
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```

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```
(CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES)
  NUMBER
     1

    27.02
    15.86
    2.849
    0.42( 0.27) 0.63
    11.6
    4.00

    25.71
    18.41
    2.586
    0.42( 0.27) 0.63
    12.3
    1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 27.02 Tc(MIN.) = 15.86
EFFECTIVE AREA(ACRES) = 11.62 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 12.3
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 1527.00 FEET.
*********************
 FLOW PROCESS FROM NODE 7.00 TO NODE 10.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << < <
______
 UPSTREAM ELEVATION(FEET) = 1298.50 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 358.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.66
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.63
   HALFSTREET FLOOD WIDTH(FEET) = 18.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.99
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.87
 STREET FLOW TRAVEL TIME(MIN.) = 2.00 Tc(MIN.) = 17.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.638
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.53 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.53 SUBAREA RUNOFF(CFS) = 3.28
 EFFECTIVE AREA(ACRES) = 13.15 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.63
 TOTAL AREA(ACRES) = 13.8 PEAK FLOW RATE(CFS) = 28.09
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 18.00
 FLOW VELOCITY(FEET/SEC.) = 2.97 DEPTH*VELOCITY(FT*FT/SEC.) = 1.85
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 1885.00 FEET.
```

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```
FLOW PROCESS FROM NODE 10.00 TO NODE
                                  10.00 IS CODE =
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <>>>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.86
 RAINFALL INTENSITY(INCH/HR) = 2.64
 AREA-AVERAGED fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.63
 EFFECTIVE STREAM AREA(ACRES) = 13.15
 TOTAL STREAM AREA(ACRES) = 13.84
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
*********************
 FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 619.00
 ELEVATION DATA: UPSTREAM(FEET) = 1311.70 DOWNSTREAM(FEET) = 1302.50
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.507
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.325
 SUBAREA TC AND LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                           1.39 0.42 0.600 76 12.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.84

TOTAL AREA(ACRES) = 1.39 PEAK FLOW RATE(CFS) = 3.84
*****************
 FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1302.50 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 456.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
```

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```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.15
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.46
   HALFSTREET FLOOD WIDTH(FEET) = 12.19
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.42
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.57
 STREET FLOW TRAVEL TIME(MIN.) = 2.22 Tc(MIN.) = 14.73
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.990
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                             SCS
      LAND USE
                       GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                   2.68 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.68 SUBAREA RUNOFF(CFS) = 6.60 
EFFECTIVE AREA(ACRES) = 4.07 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 4.1 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51 HALFSTREET FLOOD WIDTH(FEET) = 15.46
 FLOW VELOCITY(FEET/SEC.) = 3.57 DEPTH*VELOCITY(FT*FT/SEC.) =
 LONGEST FLOWPATH FROM NODE 8.00 TO NODE 10.00 = 1075.00 FEET.
******************
 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1
-----
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.73
 RAINFALL INTENSITY(INCH/HR) = 2.99
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 4.07
 TOTAL STREAM AREA(ACRES) = 4.07
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.02
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
            28.09 17.86 2.638 0.42( 0.26) 0.63 13.2
     1
                                                               4.00

      26.80
      20.45
      2.416
      0.42( 0.26) 0.62
      13.8

      10.02
      14.73
      2.990
      0.42( 0.25) 0.60
      4.1

     1
                                                                  1.00
                                                        4.1
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
                     Tract No. 20257 - Griffin Residential III
```

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```
      36.63
      14.73
      2.990
      0.42( 0.26) 0.62
      14.9

      36.82
      17.86
      2.638 0.42( 0.26) 0.62
      17.2

      34.72
      20.45
      2.416 0.42( 0.26) 0.62
      17.9

                                                        8.00
    2
                                                        4.00
                                                        1.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 36.82 Tc(MIN.) = 17.86
EFFECTIVE AREA(ACRES) = 17.22 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 17.9
                                        10.00 = 1885.00 FEET.
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
************************
 FLOW PROCESS FROM NODE
                     10.00 TO NODE
                                    14.00 \text{ IS CODE} = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.50 DOWNSTREAM(FEET) = 1292.20
 FLOW LENGTH(FEET) = 21.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.74
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 36.82
 PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 17.89
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                        14.00 = 1906.00 FEET.
*****************
 FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 1
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.89
 RAINFALL INTENSITY(INCH/HR) = 2.63
 AREA-AVERAGED fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 17.22
 TOTAL STREAM AREA(ACRES) = 17.91
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                  36.82
*******************
 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 538.00
 ELEVATION DATA: UPSTREAM(FEET) = 1316.00 DOWNSTREAM(FEET) = 1307.90
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.794
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.455
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                              Ap SCS Tc
                                      Fp
```

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```
GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                             1.45 0.42 0.600 76 11.79
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 4.18
TOTAL AREA(ACRES) = 1.45 PEAK FLOW RATE(CFS) =
******************
 FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) <<<<
______
 UPSTREAM ELEVATION(FEET) = 1307.90 DOWNSTREAM ELEVATION(FEET) = 1296.50
 STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.92
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.45
   HALFSTREET FLOOD WIDTH(FEET) = 11.70
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.57
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.60
 STREET FLOW TRAVEL TIME(MIN.) = 3.50 Tc(MIN.) = 15.29
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.918
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                             Ap SCS
     LAND USE
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 2.28 0.42
                                            0.600
                                                    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 2.28 SUBAREA RUNOFF(CFS) = 5.47
 EFFECTIVE AREA(ACRES) = 3.73 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 3.7 PEAK FLOW RATE(CFS) = 8.94
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 13.57
 FLOW VELOCITY(FEET/SEC.) = 3.73 DEPTH*VELOCITY(FT*FT/SEC.) = 1.81
 LONGEST FLOWPATH FROM NODE 11.00 TO NODE 13.00 = 1288.00 FEET.
*****************
 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 31
______
```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<

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```
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
______
  ELEVATION DATA: UPSTREAM(FEET) = 1292.50 DOWNSTREAM(FEET) = 1292.20
  FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013
  DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) = 6.93
  ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) =
                         8.94
 PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 15.36
  LONGEST FLOWPATH FROM NODE 11.00 TO NODE
                                                   14.00 = 1314.00 FEET.
************************
  FLOW PROCESS FROM NODE
                            14.00 TO NODE
                                                 14.00 IS CODE =
  >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
  TOTAL NUMBER OF STREAMS = 2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
  TIME OF CONCENTRATION(MIN.) = 15.36
 RAINFALL INTENSITY(INCH/HR) = 2.91
  AREA-AVERAGED fm(INCH/HR) = 0.25
  AREA-AVERAGED Fp(INCH/HR) = 0.42
  AREA-AVERAGED Ap = 0.60
  EFFECTIVE STREAM AREA(ACRES) = 3.73
  TOTAL STREAM AREA(ACRES) = 3.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.94
  ** CONFLUENCE DATA **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
            36.63 14.76 2.986 0.42(0.26) 0.62 14.9 8.00

36.82 17.89 2.635 0.42(0.26) 0.62 17.2 4.00

34.72 20.48 2.413 0.42(0.26) 0.62 17.9 1.00

8.94 15.36 2.910 0.42(0.25) 0.60 3.7 11.00
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR 2 STREAMS.
  ** PEAK FLOW RATE TABLE **
   STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

      45.47
      14.76
      2.986
      0.42( 0.26) 0.61
      18.5
      8.00

      45.61
      15.36
      2.910
      0.42( 0.26) 0.62
      19.1
      11.00

      44.84
      17.89
      2.635
      0.42( 0.26) 0.62
      21.0
      4.00

      41.99
      20.48
      2.413
      0.42( 0.26) 0.62
      21.6
      1.00

      1
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 45.61 Tc(MIN.) = 15.36
  EFFECTIVE AREA(ACRES) = 19.08 AREA-AVERAGED Fm(INCH/HR) = 0.26
  AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.62
  TOTAL AREA(ACRES) = 21.6
  LONGEST FLOWPATH FROM NODE 1.00 TO NODE 14.00 = 1906.00 FEET.
******************
  FLOW PROCESS FROM NODE 14.00 TO NODE 19.00 IS CODE = 31
```

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```
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.20 DOWNSTREAM(FEET) = 1288.30
 FLOW LENGTH(FEET) = 250.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.53
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 45.61
 PIPE TRAVEL TIME(MIN.) = 0.36 Tc(MIN.) = 15.72
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                    19.00 = 2156.00 FEET.
*************************
 FLOW PROCESS FROM NODE
                    19.00 TO NODE
                                 19.00 \text{ IS CODE} = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <><>
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.72
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 19.08
 TOTAL STREAM AREA(ACRES) = 21.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 45.61
*************************
 FLOW PROCESS FROM NODE 15.00 TO NODE
                                 16.00 \text{ IS CODE} = 21
______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 571.00
 ELEVATION DATA: UPSTREAM(FEET) = 1307.70 DOWNSTREAM(FEET) = 1301.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.979
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.246
 SUBAREA To AND LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/ SCS SOIL AREA
                                 Fρ
                                          αA
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                        0.600 76 12.98
                           1.25 0.42
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.37
 TOTAL AREA(ACRES) =
                  1.25 PEAK FLOW RATE(CFS) =
***********************
 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
 >>>>(STREET TABLE SECTION # 2 USED) << <<
```

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```
______
 UPSTREAM ELEVATION(FEET) = 1301.70 DOWNSTREAM ELEVATION(FEET) = 1296.00
 STREET LENGTH(FEET) = 606.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 18.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.50
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.026
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.89
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.39
   HALFSTREET FLOOD WIDTH(FEET) = 9.57
   AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.54
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.00
 STREET FLOW TRAVEL TIME(MIN.) = 3.97 Tc(MIN.) = 16.95
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.729
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                     Fp
                                               Аp
                    GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              3.15 0.42
                                              0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 3.15 SUBAREA RUNOFF(CFS) = 7.02
 EFFECTIVE AREA(ACRES) = 4.40 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 4.4 PEAK FLOW RATE(CFS) =
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.43 HALFSTREET FLOOD WIDTH(FEET) = 11.17
 FLOW VELOCITY(FEET/SEC.) = 2.75 DEPTH*VELOCITY(FT*FT/SEC.) = 1.19
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE 17.00 = 1177.00 FEET.
************************
 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 31
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << <<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1292.00 DOWNSTREAM(FEET) = 1288.70
 FLOW LENGTH(FEET) = 328.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 14.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.61
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 9.80
 PIPE TRAVEL TIME(MIN.) = 0.83 Tc(MIN.) = 17.78
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE 18.00 = 1505.00 FEET.
*******************
 FLOW PROCESS FROM NODE 18.00 TO NODE 18.00 IS CODE = 81
```

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```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<>
______
 MAINLINE Tc(MIN.) = 17.78
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.646
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
      LAND USE
                       GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                                  1.63 0.42 0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 6.0
                                  PEAK FLOW RATE(CFS) =
**********************
 FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << <<
______
 ELEVATION DATA: UPSTREAM(FEET) = 1288.70 DOWNSTREAM(FEET) = 1288.30
 FLOW LENGTH(FEET) = 34.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.69
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 12.98
 PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 17.85
 LONGEST FLOWPATH FROM NODE 15.00 TO NODE
                                              19.00 = 1539.00 FEET.
*******************
 FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.85
 RAINFALL INTENSITY(INCH/HR) = 2.64
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 6.03
 TOTAL STREAM AREA(ACRES) = 6.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                       12.98
 ** CONFLUENCE DATA **
  STREAM Q Tc Intensity Fp(Fm)
                                               Ap Ae HEADWATER

        NUMBER
        (CFS)
        (MIN.)
        (INCH/HR)
        (INCH/HR)
        (ACRES)
        NODE

        1
        45.47
        15.12
        2.939
        0.42(0.26)
        0.61
        18.5
        8.00

        1
        45.61
        15.72
        2.866
        0.42(0.26)
        0.62
        19.1
        11.00

        1
        44.84
        18.26
        2.601
        0.42(0.26)
        0.62
        21.0
        4.00

        1
        41.99
        20.85
        2.385
        0.42(0.26)
        0.62
        21.6
        1.00
```

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area C Page **15** of **20** RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS.

```
** PEAK FLOW RATE TABLE **
  STREAM Q TC Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE

1 57.85 15.12 2.939 0.42(0.26) 0.61 23.6 8.00
2 58.13 15.72 2.866 0.42(0.26) 0.61 24.4 11.00
3 57.94 17.85 2.639 0.42(0.26) 0.61 26.7 15.00
4 57.61 18.26 2.601 0.42(0.26) 0.61 27.0 4.00
5 53.59 20.85 2.385 0.42(0.26) 0.61 27.7 1.00
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 58.13 Tc(MIN.) = 15.72
EFFECTIVE AREA(ACRES) = 24.39 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.61
 TOTAL AREA(ACRES) = 27.7
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE
                                           19.00 = 2156.00 FEET.
************************
 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 31
______
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) << < <
______
 ELEVATION DATA: UPSTREAM(FEET) = 1288.30 DOWNSTREAM(FEET) = 1288.00
 FLOW LENGTH(FEET) = 31.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.25
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 58.13
 PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 15.77
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 20.00 = 2187.00 FEET.
*******************
                       20.00 TO NODE 23.00 IS CODE = 91
 FLOW PROCESS FROM NODE
______
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<
______
 UPSTREAM NODE ELEVATION(FEET) = 1293.40
 DOWNSTREAM NODE ELEVATION(FEET) = 1291.70
 CHANNEL LENGTH THRU SUBAREA(FEET) = 170.00
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) = 2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.824
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                       Fр
     LAND USE
                       GROUP (ACRES) (INCH/HR) (DECIMAL) CN
                                 0.59 0.42
 PUBLIC PARK
                        В
                                                0.850
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 58.78
```

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```
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 9.00
 AVERAGE FLOW DEPTH(FEET) = 1.57 FLOOD WIDTH(FEET) = 8.70
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.31 Tc(MIN.) = 16.08
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 1.31 EFFECTIVE AREA(ACRES) = 24.98 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.62
 TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) =
                                                   58.13
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) = 1.56 FLOOD WIDTH(FEET) = 8.63
 FLOW VELOCITY(FEET/SEC.) = 8.98 DEPTH*VELOCITY(FT*FT/SEC) = 14.03
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 23.00 = 2357.00 FEET.
*******************
 FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.08
 RAINFALL INTENSITY(INCH/HR) = 2.82
 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.62
 EFFECTIVE STREAM AREA(ACRES) = 24.98
 TOTAL STREAM AREA(ACRES) = 28.26
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 58.13
*******************
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 21
 ______
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
______
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 648.00
 ELEVATION DATA: UPSTREAM(FEET) = 1313.20 DOWNSTREAM(FEET) = 1302.70
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.520
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.323
 SUBAREA TC AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B 1.26 0.42
                                          0.600 76 12.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA RUNOFF(CFS) = 3.48

TOTAL AREA(ACRES) = 1.26 PEAK FLOW RATE(CFS) = 3.48
******************
 FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 62
______
 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<
```

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```
>>>>(STREET TABLE SECTION # 3 USED) << <<
______
 UPSTREAM ELEVATION(FEET) = 1302.70 DOWNSTREAM ELEVATION(FEET) = 1291.70
 STREET LENGTH(FEET) = 627.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 20.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.015
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.86
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 0.32
   HALFSTREET FLOOD WIDTH(FEET) = 7.95
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.88
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.93
 STREET FLOW TRAVEL TIME(MIN.) = 3.63 Tc(MIN.) = 16.15
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.816
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                    SCS
                                               Αp
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN
     LAND USE
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE" B
                              1.20 0.42
                                             0.600 76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
 SUBAREA AREA(ACRES) = 1.20 SUBAREA RUNOFF(CFS) =
 EFFECTIVE AREA(ACRES) = 2.46 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 2.5 PEAK FLOW RATE(CFS) = 5.67
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34 HALFSTREET FLOOD WIDTH(FEET) = 8.61
 FLOW VELOCITY(FEET/SEC.) = 2.96 DEPTH*VELOCITY(FT*FT/SEC.) = 0.99
 LONGEST FLOWPATH FROM NODE 21.00 TO NODE 23.00 = 1275.00 FEET.
********************
 FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 1
______
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<
______
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.15
 RAINFALL INTENSITY(INCH/HR) =
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.60
 EFFECTIVE STREAM AREA(ACRES) = 2.46
 TOTAL STREAM AREA(ACRES) = 2.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
```

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** CONFLUE	NCE DATA	* *						
			Intensity	Fp(I	Fm)	Ар	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH	/HR)		(ACRES)	NODE
1	57.85	15.49	2.894	0.42(0.26)	0.62	24.2	8.00
1	58.13	16.08	2.824	0.42(0.26)	0.62	25.0	11.00
1	57.94	18.22	2.604	0.42(0.26)	0.62	27.3	15.00
1	57.61	18.62	2.567	0.42(0.26)	0.62	27.6	4.00
1	53.59	21.22	2.358	0.42(0.26)	0.62	28.3	1.00
2	5.67	16.15	2.816	0.42(0.25)	0.60	2.5	21.00
RAINFALL I CONFLUENCE					ION RA	ΓΙΟ		
** PEAK FL	OW RATE	TABLE **						
STREAM	Q	Tc	Intensity	Fp(I	Fm)	Аp	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH)	/HR)		(ACRES)	NODE
1	63.45	15.49	2.894	0.42(0.26)	0.62	26.6	8.00
2	63.79	16.08	2.824	0.42(0.26)	0.62	27.4	11.00
3	63.79	16.15	2.816	0.42(0.26)	0.62	27.5	21.00
4	63.15	18.22	2.604	0.42(0.26)	0.62	29.7	15.00
5	62.74	18.62	2.567	0.42(0.26)	0.62	30.0	4.00
6	58.25	21.22	2.358	0.42(0.26)	0.62	30.7	1.00
	RATE(CFS AREA(ACRI GED Fp(II (ACRES) = OWPATH FI) = ES) = NCH/HR) = ROM NODE	$63.79 \\ 27.52 \\ = 0.42 \\ 30.7 \\ 1.00$	Tc(MII) AREA-AV AREA-AV	N.) = -AVERAGEI VERAGEI	GED Fm O Ap = 23.0	(INCH/HR) 0.62 0 = 23!	= 0.26 57.00 FEET.
FLOW PROCE	SS FROM 1							52
>>>>COMPU			RAVEL TIMI	E THRU	SUBARI			
>>>> (STRE								
								_ 1200 F0
UPSTREAM ELEVATION(FEET) = 1291.70 DOWNSTREAM ELEVATION(FEET) = 1280.50 STREET LENGTH(FEET) = 694.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 20.00								
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 6.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.015 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.021								
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 STREET PARKWAY CROSSFALL(DECIMAL) = 0.021 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0250								
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 81.66 *STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:								
	LOW DEPTI							
			EET) = 2 ET/SEC.) =		.97			
			No 20257				-	

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```
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =
 STREET FLOW TRAVEL TIME(MIN.) = 1.94 Tc(MIN.) = 18.09
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.616
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/ SCS SOIL AREA Fp
                                                              SCS
                                                       Дp
                        GROUP (ACRES) (INCH/HR) (DECIMAL) CN
      LAND USE
 NATURAL POOR COVER
  "BARREN"
                          В
                                  15.81
                                             0.11
                                                     1.000
                                                              97
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA AREA(ACRES) = 15.81 SUBAREA RUNOFF(CFS) = 35.72
 EFFECTIVE AREA(ACRES) = 43.33 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 46.5 PEAK FLOW RATE(CFS) =
                                                            94.06
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 22.56
 FLOW VELOCITY(FEET/SEC.) = 6.29 DEPTH*VELOCITY(FT*FT/SEC.) = 4.53
 ** PEAK FLOW RATE TABLE **
            Q Tc Intensity Fp(Fm) Ap Ae HEADWATER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
  STREAM Q Tc Intensity Fp(Fm)
  NUMBER
           94.49 17.42 2.681 0.27( 0.20) 0.76 42.4 8.00

94.13 18.02 2.623 0.27( 0.20) 0.76 43.2 11.00

94.06 18.09 2.616 0.27( 0.20) 0.76 43.3 21.00

91.43 20.17 2.437 0.28( 0.21) 0.75 45.5 15.00

90.72 20.57 2.406 0.28( 0.21) 0.75 45.8 4.00

84.40 23.23 2.223 0.28( 0.21) 0.75 46.5 1.00
     2
     3
     4
 NEW PEAK FLOW DATA ARE:
PEAK FLOW RATE(CFS) = 94.49 Tc(MIN.) =
                                               17.42
 AREA-AVERAGED Fm(INCH/HR) = 0.20 AREA-AVERAGED Fp(INCH/HR) = 0.27
 AREA-AVERAGED Ap = 0.76 EFFECTIVE AREA(ACRES) = 42.37
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 24.00 = 3051.00 FEET.
______
 END OF STUDY SUMMARY:
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.759
 PEAK FLOW RATE(CFS) = 94.49
 ** PEAK FLOW RATE TABLE **
  STREAM Q Tc Intensity Fp(Fm)
                                                     Ae HEADWATER
          (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
94.49 17.42 2.681 0.27(0.20) 0.76 42.4 8
94.13 18.02 2.623 0.27(0.20) 0.76 43.2 11
94.06 18.09 2.616 0.27(0.20) 0.76 43.3 21
  NUMBER
     1
                                                                   8.00
                                                                   11.00
     3
                                                                  21.00
            91.43 20.17 2.437 0.28( 0.21) 0.75
                                                        45.5
                                                                  15.00
            90.72 20.57 2.406 0.28( 0.21) 0.75 45.8
84.40 23.23 2.223 0.28( 0.21) 0.75 46.5
                                                                   4.00
______
______
```

END OF RATIONAL METHOD ANALYSIS

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

SMALL AREA UNIT HYDROGRAPH CALCULATIONS



Tract 20257 JN 10217

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Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

Problem Descriptions: Tract No. 20257 - Griffin Residential III Small Area Unit Hydrograph Proposed 100-year Hydrology

RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00

TOTAL CATCHMENT AREA(ACRES) = 129.50

SOIL-LOSS RATE, Fm, (INCH/HR) = 0.210

LOW LOSS FRACTION = 0.154

TIME OF CONCENTRATION(MIN.) = 23.05

SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA

USER SPECIFIED RAINFALL VALUES ARE USED

RETURN FREQUENCY(YEARS) = 100

5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.32

30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.83

1-HOUR POINT RAINFALL VALUE(INCHES) = 1.20

3-HOUR POINT RAINFALL VALUE(INCHES) = 1.98

6-HOUR POINT RAINFALL VALUE(INCHES) = 2.72

24-HOUR POINT RAINFALL VALUE(INCHES) = 4.97

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 45.62
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 8.02

****	*****	*****	****	*****	****	*****	******
TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	55.0	110.0	165.0	220.0
0.25	0.1022	9.93	.Q				
0.63	0.4184	9.99	.Q	•	•		
1.02	0.7387	10.18	.Q	•	•	•	
1.40	1.0635	10.28	.Q	•	•	•	•
1.79	1.3932	10.48	.Q	•	•	•	•
2.17	1.7277	10.59	.Q	•	•		•
2.55	2.0675	10.81	.0				

Tract No. 20257 – Griffin Residential III Proposed 100-year Hydrology – Area A Page **1** of **3**

2.94	2.4126	10.93	.Q					
3.32	2.7635	11.17	. Q					
3.71	3.1202	11.30		•		•	•	•
			. Q	•		•	•	•
4.09	3.4831	11.56	. Q	•		•	•	•
4.48	3.8525	11.70	. Q			•		
4.86	4.2288	12.00	. Q			_	_	
5.24	4.6122	12.15	. Q	•		·	•	,
				•		•	•	•
5.63	5.0033	12.48	. Q	•		•		•
6.01	5.4023	12.66	. Q			•		
6.40	5.8100	13.02	. Q					
6.78	6.2265	13.22	. Q					
				•		•	•	•
7.16	6.6528	13.63	. Q	•		•	•	•
7.55	7.0891	13.86	. Q	•		•		
7.93	7.5366	14.33	. Q					
8.32	7.9957	14.59	. Q					
8.70	8.4675	15.14	. Q	•		·	•	•
				•		•	•	•
9.09	8.9529	15.44	. Q	•		•	•	•
9.47	9.4532	16.08	. Q			•		
9.85	9.9695	16.44	. Q					
10.24	10.5037	17.21	. Q					
10.62	11.0571			•		•	•	•
		17.64	. Q	•		•	•	•
11.01	11.6323	18.60	. Q	•		•		
11.39	12.2312	19.13	. Q					
11.77	12.8577	20.34	. Q			_		
12.16	13.5143	21.02	. Q					
				•		•	•	•
12.54	14.2257	23.79	. Q			•	•	•
12.93	14.9958	24.73	. Q			•		
13.31	15.8166	26.97	. Q					
13.70	16.6946	28.34		Q .		_	_	
14.08	17.6490	31.78				•	•	•
			•	Q .		•	•	•
14.46	18.6914	33.88	•	Q.		•		•
14.85	19.8658	40.10		Q.		•		
15.23	21.2127	44.75		Q.				
15.62	23.0098	68.45		~	Q			
16.00	25.5632	92.40	•	•		•	•	•
			•	•	Q	•	•	•
16.38	30.4570	215.88	•	•		•	•	. Q.
16.77	34.6993	51.37	•	Q.		•		
17.15	36.0958	36.60		Q.				
17.54	37.1517	29.92		Q .				
17.92	38.0360	25.78				·	•	•
			. Q			•	•	•
18.31	38.8024	22.50	. Q			•		•
18.69	39.4725	19.71	. Q	•		•		•
19.07	40.0727	18.10	. Q			•		
19.46	40.6269	16.81	. Q					
19.84	41.1439	15.75		•		•	•	•
			. Q	•		•	•	•
20.23	41.6297	14.86	. Q	•		•	•	•
20.61	42.0892	14.09	. Q	•		•		
20.99	42.5259	13.42	. Q					
21.38	42.9427	12.84	. Q					
				•		•	•	•
21.76	43.3420	12.31	. Q	•		•	•	
22.15	43.7256	11.85	. Q	•		•	•	
22.53	44.0951	11.43	. Q	•		•		
22.92	44.4519	11.05	. Q					
23.30	44.7971	10.70	.Q	•				•
23.68				•		•	•	•
	45.1318	10.38	.Q	•		•	•	•
24.07	45.4567	10.09	.Q	•		•	•	•

24.45 45.6169 0.00 Q

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE: (Note: 100% of Peak Flow Rate estimate assumed to have an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=======================================	=======
0%	1452.1
10%	368.8
20%	115.2
30%	69.1
40%	46.1
50%	23.0
60%	23.0
70%	23.0
80%	23.0
90%	23.0

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Analysis prepared by:

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Problem Descriptions: Tract No. 20257 - Griffin Residential III Small Area Unit Hydrograph Proposed 100-year Hydrology

RATIONAL METHOD CALIBRATION COEFFICIENT = 1.05
TOTAL CATCHMENT AREA(ACRES) = 46.50
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.200
LOW LOSS FRACTION = 0.169
TIME OF CONCENTRATION(MIN.) = 17.42

SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA USER SPECIFIED RAINFALL VALUES ARE USED

RETURN FREQUENCY(YEARS) = 100

5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.32 30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.83 1-HOUR POINT RAINFALL VALUE(INCHES) = 1.20 3-HOUR POINT RAINFALL VALUE(INCHES) = 1.98 6-HOUR POINT RAINFALL VALUE(INCHES) = 2.72 24-HOUR POINT RAINFALL VALUE(INCHES) = 4.97

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 16.90
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 2.36

*****	*****	*****	****	*****	*****	*****	* * * * * * * * * *	*
TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	25.0	50.0	75.0	100.0	_
0.03	0.0000	0.00	Q		•	•		
0.32	0.0440	3.66	.Q	•	•	•	•	
0.61	0.1325	3.71	.Q	•	•	•	•	
0.90	0.2218	3.74	.Q	•	•	•		
1.19	0.3122	3.79	.Q	•	•	•	•	
1.48	0.4035	3.82	.Q	•	•	•	•	
1.77	0.4958	3.88	.Q	•	•			

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2.06	0.5892	3.91	.Q					
2.35	0.6837	3.97	.Q					
2.64	0.7793	4.00	.Q	·		•	•	•
2.93	0.8761	4.07	.Q	•		•	•	•
				•		•	•	•
3.23	0.9741	4.10	.Q	•		•	•	•
3.52	1.0733	4.17	.Q	•		•	•	•
3.81	1.1738	4.21	.Q			•	•	
4.10	1.2757	4.28	.Q			•	•	
4.39	1.3789	4.32	.Q			•		
4.68	1.4835	4.40	. Q			•	•	
4.97	1.5897	4.45	.Q					
5.26	1.6974	4.53	.Q	•		•	•	•
				•		•	•	•
5.55	1.8068	4.58	.Q	•		•	•	•
5.84	1.9178	4.68	.Q	•		•	•	•
6.13	2.0306	4.73	.Q	•		•	•	•
6.42	2.1452	4.83	.Q			•	•	
6.71	2.2618	4.89	.Q			•	•	
7.00	2.3804	5.00	. Q			•		
7.29	2.5011	5.06	. Q	_		_	_	
7.58	2.6241	5.19	. Q	·		•	•	•
7.87	2.7494	5.26		•		•	•	•
			. Q	•		•	•	•
8.16	2.8772	5.40	. Q	•		•	•	•
8.45	3.0076	5.47	. Q	•		•	•	•
8.74	3.1408	5.63	. Q	•		•	•	•
9.03	3.2770	5.72	. Q			•		
9.32	3.4163	5.90	. Q			•	•	
9.61	3.5589	5.99	. Q					
9.90	3.7051	6.20	. Q			•	•	
10.19	3.8551	6.31	. Q					
10.48	4.0093	6.55	. Q	•		•	•	•
10.40				•		•	•	•
	4.1680	6.67	. Q	•		•	•	•
11.06	4.3315	6.96	. Q	•		•	•	•
11.35	4.5002	7.11	. Q	•		•	•	•
11.65	4.6748	7.44	. Q	•		•	•	•
11.94	4.8556	7.63	. Q			•		
12.23	5.0470	8.33	. Q			•	•	
12.52	5.2514	8.70	. Q			•		
12.81	5.4665	9.23	. Q			•	•	
13.10	5.6915	9.53	. Q	_		_	_	
13.39	5.9284	10.22	. Q	·		•	•	•
13.68	6.1785	10.62		•		•	•	•
			. Q	•		•	•	•
13.97	6.4450	11.59	. Q	•		•	•	•
14.26	6.7298	12.15	. Q	•		•	•	•
14.55	7.0387	13.59	. Q	•		•	•	•
14.84	7.3764	14.55	. Q	•		•	•	•
15.13	7.7577	17.24	. Q			•		
15.42	8.1953	19.24	. Q			•		
15.71	8.7929	30.58		. Q		•		
16.00	9.6226	38.58	•	. ~	Q	•		
16.29	11.2190	94.49	-	-	~	_	. Q	
16.58	12.6390	23.88	•	^		•	. 2	•
			•	Q.		•	•	•
16.87	13.1143	15.73	. Q	•		•	•	•
17.16	13.4565	12.79	. Q	•		•	•	•
17.45	13.7429	11.08	. Q	•		•	•	•
17.74	13.9940	9.86	. Q	•		•	•	
18.03	14.2197	8.96	. Q			•		

18.32	14.4210	7.83	. Q			•	
18.61	14.6022	7.27	. Q			•	
18.90	14.7711	6.81	. Q	•	•	•	•
19.19	14.9299	6.42	. Q	•	•	•	•
19.48	15.0800	6.09	. Q	•	•	•	•
19.77	15.2228	5.80	. Q	•	•	•	•
20.06	15.3590	5.55	. Q		•		•
20.36	15.4894	5.33	. Q		•		•
20.65	15.6148	5.12	. Q	•	•	•	•
20.94	15.7356	4.94	.Q		•		•
21.23	15.8522	4.78	.Q		•		•
21.52	15.9650	4.63	.Q		•		•
21.81	16.0744	4.49	.Q		•		•
22.10	16.1806	4.36	.Q		•		•
22.39	16.2838	4.24	.Q		•		•
22.68	16.3843	4.13	.Q		•		•
22.97	16.4823	4.03	.Q	•	•	•	•
23.26	16.5779	3.94	.Q	•	•	•	•
23.55	16.6714	3.85	.Q	•	•	•	•
23.84	16.7627	3.76	.Q	•	•	•	•
24.13	16.8521	3.69	.Q	•	•	•	•
24.42	16.8963	0.00	Q	•	•	•	•

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE: (Note: 100% of Peak Flow Rate estimate assumed to have an instantaneous time duration)

Percentile of Estimated	Duration
Peak Flow Rate	(minutes)
=======================================	=======
0%	1445.9
10%	296.1
20%	87.1
30%	52.3
40%	34.8
50%	17.4
60%	17.4
70%	17.4
80%	17.4
90%	17.4

Hydrology & Hydraulics Preliminary Report

City of Redlands County of San Bernardino

SURFACE HYDRAULICS



Tract 20257 JN 10217

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                        Analysis prepared by:
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                        37 EAST OLIVE AVENUE
                      REDLANDS, CALIFORNIA 92373
                           (909) 793-2257
 TIME/DATE OF STUDY: 10:20 1/10/2019
______
************************* DESCRIPTION OF STUDY *******************
* Tract No. 20257 - Griffin Residential III
* Street Flow Depth - Proposed 10-year Hydrology
* Pioneer Avenue - Interim Conditions (node C24)
 *****************
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 1:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
                                .00
                                              101.00
               2
                                .01
                                              100.00
               3
                                .17
                                              100.00
               4
                               10.00
                                               99.80
               5
                               10.17
                                               99.13
                              12.17
                                               99.26
                               44.00
          SUBCHANNEL SLOPE(FEET/FEET) = .014000
          SUBCHANNEL MANNINGS FRICTION FACTOR = .015000
       SUBCHANNEL FLOW(CFS) = 25.1
       SUBCHANNEL FLOW AREA(SQUARE FEET) =
                                            5.63
       SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 4.461
       SUBCHANNEL FROUDE NUMBER = 1.607
       SUBCHANNEL FLOW TOP-WIDTH(FEET) = 23.53
       SUBCHANNEL HYDRAULIC DEPTH(FEET) =
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 2:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
               1
                               54.00
                                                99.70
               2
                               64.00
                                               99.30
               3
                              96.00
                                               99.90
                              120.00
                                              100.35
          SUBCHANNEL SLOPE (FEET/FEET) = .014000
                  Tract No. 20257 – Griffin Residential III
                   Street Flow Depths - Exterior Streets
```

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SUBCHANNEL MANNINGS FRICTION FACTOR = .015000

SUBCHANNEL FLOW(CFS) = 23.5

SUBCHANNEL FLOW AREA(SQUARE FEET) = 5.96

SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 3.941

SUBCHANNEL FROUDE NUMBER = 1.573

SUBCHANNEL FLOW TOP-WIDTH(FEET) = 30.56

SUBCHANNEL HYDRAULIC DEPTH(FEET) = .20

TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED = 45.80

COMPUTED IRREGULAR CHANNEL FLOW(CFS) = 48.61

ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE ELEVATION. 99.69

NOTE: WATER SURFACE IS BELOW EXTREME

LEFT AND RIGHT BANK ELEVATIONS.

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                        37 EAST OLIVE AVENUE
                      REDLANDS, CALIFORNIA 92373
                           (909) 793-2257
 TIME/DATE OF STUDY: 10:20 1/10/2019
______
************************* DESCRIPTION OF STUDY *******************
* Tract No. 20257 - Griffin Residential III
* Street Flow Depth - Proposed 100-year Hydrology
* Pioneer Avenue - Interim Conditions (node C24)
 *****************
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 1:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
                                .00
                                              101.00
               2
                                .01
                                              100.00
               3
                                .17
                                              100.00
               4
                               10.00
                                               99.80
               5
                               10.17
                                               99.13
                              12.17
                                               99.26
                               44.00
          SUBCHANNEL SLOPE(FEET/FEET) = .014000
          SUBCHANNEL MANNINGS FRICTION FACTOR = .015000
       SUBCHANNEL FLOW(CFS) = 46.8
       SUBCHANNEL FLOW AREA(SQUARE FEET) =
                                            9.12
       SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 5.126
       SUBCHANNEL FROUDE NUMBER = 1.666
       SUBCHANNEL FLOW TOP-WIDTH(FEET) = 31.02
       SUBCHANNEL HYDRAULIC DEPTH(FEET) =
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 2:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
               1
                               54.00
                                                99.70
               2
                               64.00
                                               99.30
               3
                              96.00
                                               99.90
                              120.00
                                              100.35
          SUBCHANNEL SLOPE (FEET/FEET) = .014000
                  Tract No. 20257 – Griffin Residential III
                   Street Flow Depths - Exterior Streets
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SUBCHANNEL MANNINGS FRICTION FACTOR = .015000

SUBCHANNEL FLOW(CFS) = 51.7

SUBCHANNEL FLOW AREA(SQUARE FEET) = 10.42

SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 4.968

SUBCHANNEL FROUDE NUMBER = 1.666

SUBCHANNEL FLOW TOP-WIDTH(FEET) = 37.74

SUBCHANNEL HYDRAULIC DEPTH(FEET) = .28

TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED = 94.50

COMPUTED IRREGULAR CHANNEL FLOW(CFS) = 98.50

ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE ELEVATION. 99.82

NOTE: WATER SURFACE IS BELOW EXTREME LEFT AND RIGHT BANK ELEVATIONS.

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SUBCHANNEL SLOPE(FEET/FEET) = .014000

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SUBCHANNEL SLOPE(FEET/FEET) = .014000 SUBCHANNEL MANNINGS FRICTION FACTOR = .015000
SUBCHANNEL FLOW(CFS) = 27.7 SUBCHANNEL FLOW AREA(SQUARE FEET) = 4.65 SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 5.952 SUBCHANNEL FROUDE NUMBER = 1.696 SUBCHANNEL FLOW TOP-WIDTH(FEET) = 12.16 SUBCHANNEL HYDRAULIC DEPTH(FEET) = .38
TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED = 94.50 COMPUTED IRREGULAR CHANNEL FLOW(CFS) = 96.19 ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE ELEVATION
NOTE: WATER SURFACE IS BELOW EXTREME LEFT AND RIGHT BANK ELEVATIONS.

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                        37 EAST OLIVE AVENUE
                      REDLANDS, CALIFORNIA 92373
                           (909) 793-2257
 TIME/DATE OF STUDY: 10:20 1/10/2019
______
******************** DESCRIPTION OF STUDY ******************
* Tract No. 20257 - Griffin Residential III
* Street Flow Depth - Proposed 10-year Hydrology
* San Bernardino Avenue - Interim Conditions (node A29)
 *****************
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 1:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
                                .00
                                              101.00
                                              100.00
               2
                                .01
               3
                              11.00
                                              99.78
               4
                              11.17
                                               99.11
               5
                              13.17
                                               99.24
                              30.00
                                               99.58
          SUBCHANNEL SLOPE (FEET/FEET) = .017000
          SUBCHANNEL MANNINGS FRICTION FACTOR = .015000
       SUBCHANNEL FLOW(CFS) = 83.8
       SUBCHANNEL FLOW AREA(SQUARE FEET) =
                                           11.73
       SUBCHANNEL FLOW VELOCITY (FEET/SEC.) =
       SUBCHANNEL FROUDE NUMBER = 1.944
       SUBCHANNEL FLOW TOP-WIDTH(FEET) =
       SUBCHANNEL HYDRAULIC DEPTH(FEET) =
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 2:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
               1
                              50.63
                                               99.16
               2
                              52.63
                                               99.03
               3
                              53.00
                                               99.70
                              65.99
                                              99.96
                              66.00
                                              100.96
          SUBCHANNEL SLOPE(FEET/FEET) = .017000
                  Tract No. 20257 - Griffin Residential III
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Street Flow Depths - Exterior Streets Page 9 of 16

SUBCHANNEL MANNINGS FRICTION FACTOR = .015000

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                        37 EAST OLIVE AVENUE
                      REDLANDS, CALIFORNIA 92373
                           (909) 793-2257
 TIME/DATE OF STUDY: 10:20 1/10/2019
______
******************** DESCRIPTION OF STUDY ******************
* Tract No. 20257 - Griffin Residential III
* Street Flow Depth - Proposed 100-year Hydrology
* San Bernardino Avenue - Interim Conditions (node A29)
 *****************
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 1:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
                                .00
                                              101.00
                                              100.00
               2
                                .01
               3
                              11.00
                                              99.78
               4
                              11.17
                                               99.11
               5
                              13.17
                                               99.24
                              30.00
                                               99.58
          SUBCHANNEL SLOPE (FEET/FEET) = .017000
          SUBCHANNEL MANNINGS FRICTION FACTOR = .015000
       SUBCHANNEL FLOW(CFS) = 167.2
       SUBCHANNEL FLOW AREA(SQUARE FEET) =
                                           18.29
       SUBCHANNEL FLOW VELOCITY (FEET/SEC.) =
                                          9.145
       SUBCHANNEL FROUDE NUMBER = 2.064
       SUBCHANNEL FLOW TOP-WIDTH(FEET) =
       SUBCHANNEL HYDRAULIC DEPTH(FEET) =
          * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 2:
          NODE NUMBER "X" COORDINATE "Y" COORDINATE
               1
                              50.63
                                               99.16
               2
                              52.63
                                               99.03
               3
                              53.00
                                               99.70
                              65.99
                                              99.96
                              66.00
                                              100.96
          SUBCHANNEL SLOPE(FEET/FEET) = .017000
                  Tract No. 20257 – Griffin Residential III
```

Street Flow Depths – Exterior Streets
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SUBCHANNEL MANNINGS FRICTION FACTOR = .015000

SUBCHANNEL FLOW(CFS) = 52.4

SUBCHANNEL FLOW AREA(SQUARE FEET) = 7.02

SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 7.465

SUBCHANNEL FROUDE NUMBER = 1.946

SUBCHANNEL FLOW TOP-WIDTH(FEET) = 15.36

SUBCHANNEL HYDRAULIC DEPTH(FEET) = .46

TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED = 216.00

COMPUTED IRREGULAR CHANNEL FLOW(CFS) = 219.66

ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE
ELEVATION. 100.18

NOTE: WATER SURFACE IS BELOW EXTREME
LEFT AND RIGHT BANK ELEVATIONS.

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Street Flow Depths – Exterior Streets
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SI	JBCHANNEL FLOW(CFS) = 100.2
Sī	JBCHANNEL FLOW AREA(SQUARE FEET) = 8.94
Sī	JBCHANNEL FLOW VELOCITY(FEET/SEC.) = 11.212
Sī	JBCHANNEL FROUDE NUMBER = 2.049
SI	JBCHANNEL FLOW TOP-WIDTH(FEET) = 9.61
SI	JBCHANNEL HYDRAULIC DEPTH(FEET) = .93
	DTAL IRREGULAR CHANNEL FLOW(CFS) WANTED = 101.00 DMPUTED IRREGULAR CHANNEL FLOW(CFS) = 102.13
	STIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE LEVATION99.85
	NOTE: WATER SURFACE IS BELOW EXTREME LEFT AND RIGHT BANK ELEVATIONS.

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE (C) Copyright 1982-94 Advanced Engineering Software (aes) Ver. 4.2A Release Date: 6/01/94 License ID 1302 Analysis prepared by: HICKS & HARTWICK, INC. 37 EAST OLIVE AVENUE REDLANDS, CALIFORNIA 92373 (909) 793-2257 TIME/DATE OF STUDY: 10:20 1/10/2019 ______ ******************** DESCRIPTION OF STUDY ****************** * Tract No. 20257 - Griffin Residential III * Street Flow Depth - Proposed 100-year Hydrology * San Bernardino Avenue - Proposed Conditions (node A29) *************** * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 1: NODE NUMBER "X" COORDINATE "Y" COORDINATE .00 101.00 2 .01 100.00 3 8.00 99.84 8.17 99.17 4 5 10.17 100.30 SUBCHANNEL SLOPE(FEET/FEET) = .017000 SUBCHANNEL MANNINGS FRICTION FACTOR = .015000 SUBCHANNEL FLOW(CFS) = 29.3SUBCHANNEL FLOW AREA(SQUARE FEET) = SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 6.798 SUBCHANNEL FROUDE NUMBER = 1.840 SUBCHANNEL FLOW TOP-WIDTH(FEET) = 10.16 SUBCHANNEL HYDRAULIC DEPTH(FEET) = * ENTERED INFORMATION FOR SUBCHANNEL NUMBER 2: NODE NUMBER "X" COORDINATE "Y" COORDINATE 109.83 99.30 1 2 111.83 99.17 3 112.00 97.84 4 119.99 100.00 120.00 101.00 SUBCHANNEL SLOPE(FEET/FEET) = .017000 SUBCHANNEL MANNINGS FRICTION FACTOR = .015000 Tract No. 20257 – Griffin Residential III

Street Flow Depths – Exterior Streets
Page **15** of **16**

SUBCHANNEL FLOW(CFS) = 188.7

SUBCHANNEL FLOW AREA(SQUARE FEET) = 13.47

SUBCHANNEL FLOW VELOCITY(FEET/SEC.) = 14.010

SUBCHANNEL FROUDE NUMBER = 2.145

SUBCHANNEL FLOW TOP-WIDTH(FEET) = 10.16

SUBCHANNEL HYDRAULIC DEPTH(FEET) = 1.33

TOTAL IRREGULAR CHANNEL FLOW(CFS) WANTED = 216.00

COMPUTED IRREGULAR CHANNEL FLOW(CFS) = 217.95

ESTIMATED IRREGULAR CHANNEL NORMAL DEPTH WATER SURFACE ELEVATION. 100.30

NOTE: WATER SURFACE IS BELOW EXTREME

LEFT AND RIGHT BANK ELEVATIONS.

City of Redlands County of San Bernardino

CATCH BASIN INLET HYDRAULICS



City of Redlands
County of San Bernardino

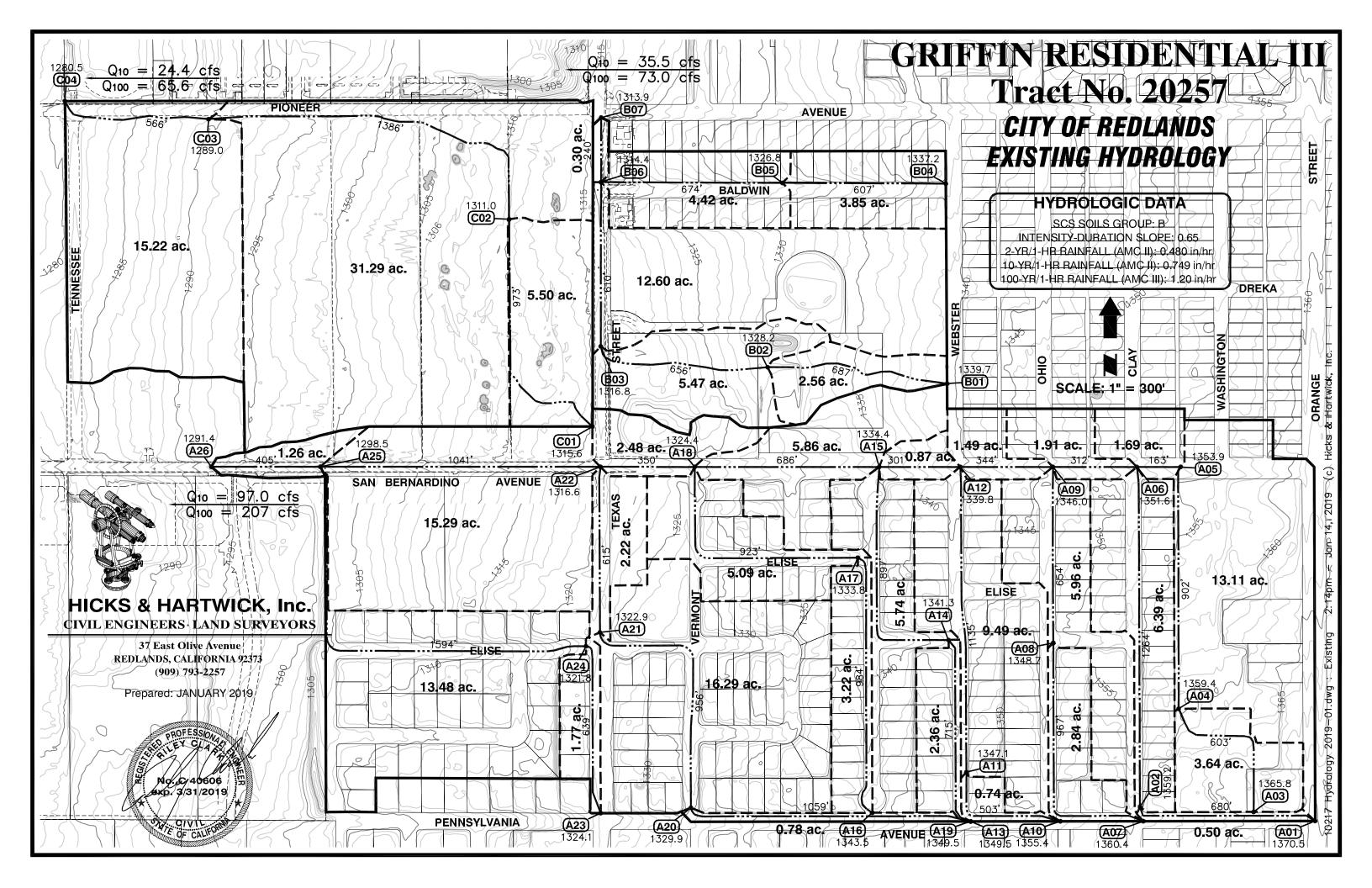
STORM DRAIN HYDRAULICS

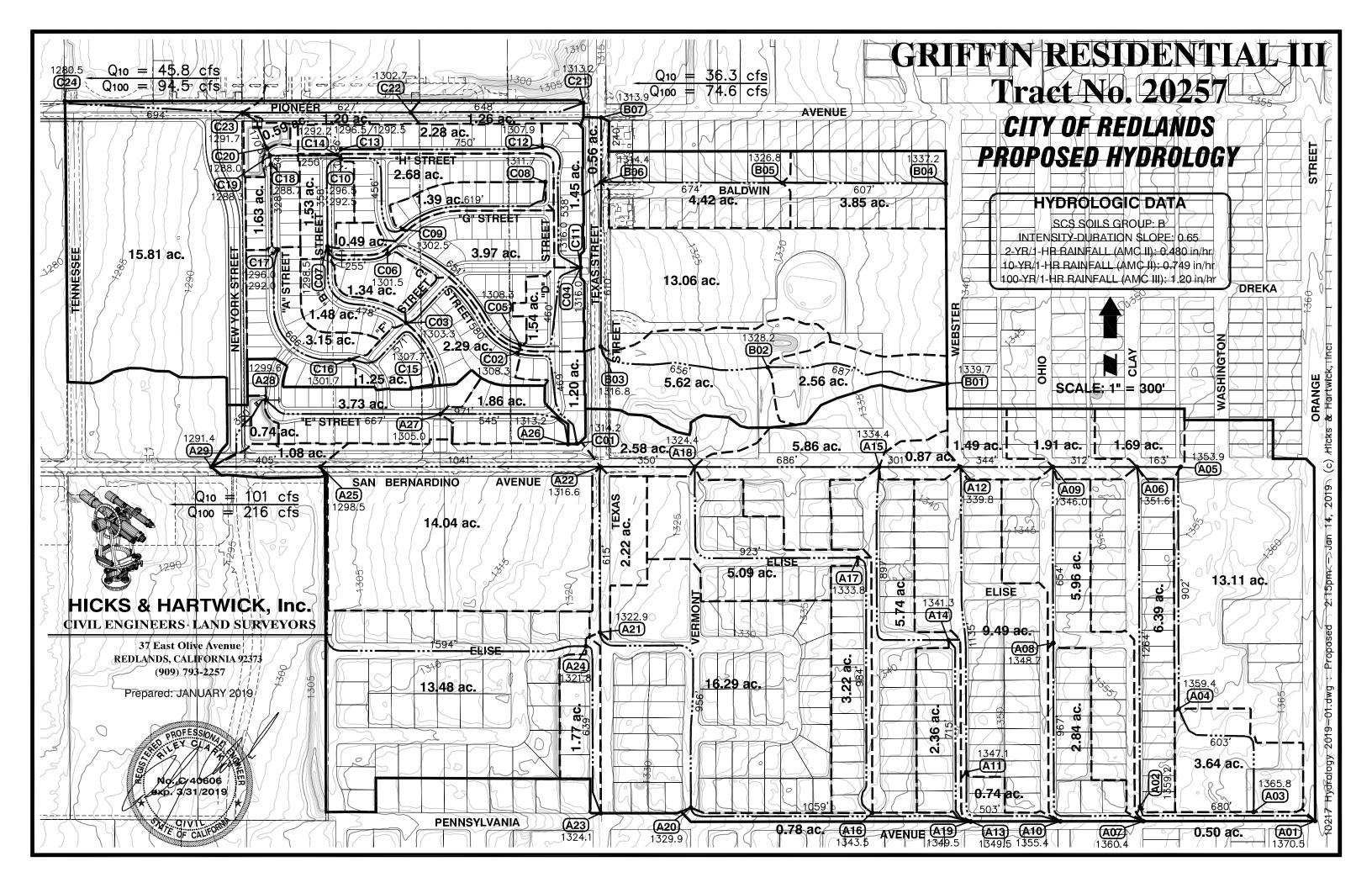


City of Redlands County of San Bernardino

HYDROLOGY MAPS







City of Redlands County of San Bernardino

DIGITAL COPY



City of Redlands County of San Bernardino

STORM DRAIN PLANS



Appendix F2 Preliminary Water Quality Management Plan

HERITAGE SPECIFIC PLAN
INITIAL STUDY

Preliminary Water Quality Management Plan

FOR:

Heritage

Tract 20257 (APN 0167-091-02, -04, -05 and -08)

Prepared For:

Griffin Residential III, LLC

Michael Vairin, Senior Vice President

110 North Lincoln Avenue, Suite 100

Corona, CA 92882

951-547-3517

Prepared by:

Hicks & Hartwick, Inc. 37 E Olive Ave. STE C Redlands, CA 92373 909-793-2257

Job No. 10217

Approval Date: To be Determined



Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for HERITAGE by Hicks & Hartwick, Inc.. The WQMP is intended to comply with the requirements of the City of Redlands and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

.

Project Data								
Permit/Application Number(s):		***		Grading Permit Number(s):	***			
Tract/Parcel Map Number(s):		TR 20257		Building Permit Number(s):	***			
CUP, SUP, and/o	CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):				APN 0167-091-02, -04, -05 & -08			
	Owner's Signature							
Owner Name:	Michael	Vairin						
Title	Title Owner							
Company	Griffin	Residential II	I, LLC					
Address	Address 110 North Lincoln Avenue, Suite 100							
Email	Email <u>mvairin@griffin-residential.com</u>							
Telephone #	ephone # (714) 547-3517							
Signature				D	Date			

Preparer's Certification

Project Data							
Permit/Application Number(s):	****	Grading Permit Number(s):	****				
Tract/Parcel Map Number(s):	TR 20257	Building Permit Number(s):	****				
CUP, SUP, and/or APN (Sp	CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):						

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Mat	tthew C. Hicks	PE Stamp Be low
Title	Principal	
Company	Hicks & Hartwick, Inc.	PROFESS/ON P
Address	37 E Olive Ave STE C Redlands, CA 92372	STER C. THON ENGINEEM C. THEN C.
Email	matt@verycivil.com	No. 63494 No. 63494
Telephone #	909-793-2257	OF CALIFORNIA
Signature	Mark C. Life	OF CALIFORN
Date	12-21-2018	

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Water Quality Management Plan (WQMP)

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Section 1 Discretionary Permit(s)

Form 1-1 Project Information						
Project Na	Project Name Heritage					
Project Ow	vner Contact Name:	Michael Vairin				
Mailing Address:	110 N. Lincoln Avenue, S Corona, CA 92882	uite 100	E-mail Address:	mvairin@griffin- residential.com	Telephone:	(941) 547-3517
Permit/Ap	plication Number(s):	****		Tract/Parcel Map Number(s):	TR 20257	
Additional Comments	Information/ s:					
Description of Project: The project is a 211 lot single family residential subdivision. It will include two infilt basins to manage storm water quality.					wo infiltration	
WQMP co	mmary of Conceptual nditions (if previously and approved). Attach copy.	roject is located within an HCOC exempt area of the City and no HCOC analysis was				

Section 2 Project Description 2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project								
1 Development Catego	ry (Select	all that a	pply):					
Significant re-development involving the addition or replacement of 5,000 ft ² or more of impervious surface on an already developed site			tion of 10,000 ft ² or impervious surface	Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532-7534, 7536-7539 Restaurants (with SI code 5812) where the I area of development is 5,000 ft ² or more			5812) where the land of development is	
5,000 ft ² or more which located on areas with k erosive soil conditions of	Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more Developments of impervious adjacent to discharging environme or waterbo CWA Section		relopments of 2,500 ft ² rvious surface or more t to (within 200 ft) or ging directly into mentally sensitive areas rbodies listed on the ction 303(d) list of d waters.	Parking lots of 5,000 ft ² or more exposed to storm water		that more	Retail gasoline outlets are either 5,000 ft ² or e, or have a projected age daily traffic of 100 ore vehicles per day	
Non-Priority / Non		-	May require source control	LID BMP	s and other LIP red	quiremen	ts. Plea	se consult with local
Project Area (ft2):	1,562,06	1	3 Number of Dwelling L	Jnits:	211	4 SIC C	ode:	1521
Is Project going to be phased? Yes No If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.								
6 Does Project include Appendix A of TGD for WC		es 🔀 No	If yes, ensure that appli	cable red	quirements for tra	nsportatio	on proje	ects are addressed (see

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.



Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

The project will not form a "Property Owners Association" to handle "Water Quality Management Plan" related issues. Water Quality Management Plan related maintenance issues will be addressed as follows:

- 1. The Homeowners will be responsible for maintenance on their individual lots (Lots 1-211)
- 2. A Community Facilities District will be responsible for maintenance of the open space lots A-G.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern							
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments				
Pathogens (Bacterial / Virus)	E 🔀	N 🗌					
Nutrients - Phosphorous	E 🖂	Z					
Nutrients - Nitrogen	E 🖂	N 🗌					
Noxious Aquatic Plants	E 🖂	N 🗌					
Sediment	E 🖂	N 🗌					
Metals	E 🗌	N 🖂					
Oil and Grease	E 🔀	N 🗌					
Trash/Debris	E 🖂	N 🗌					
Pesticides / Herbicides	E 🖂	N 🗌					
Organic Compounds	E 🖂	N 🗌					
Other:	E 🗌	N 🗌					
Other:	E 🗌	N 🗌					
Other:	E 🗌	N 🗌					
Other:	E 🗌	N 🗌					
Other:	E 🗌	N 🗌					

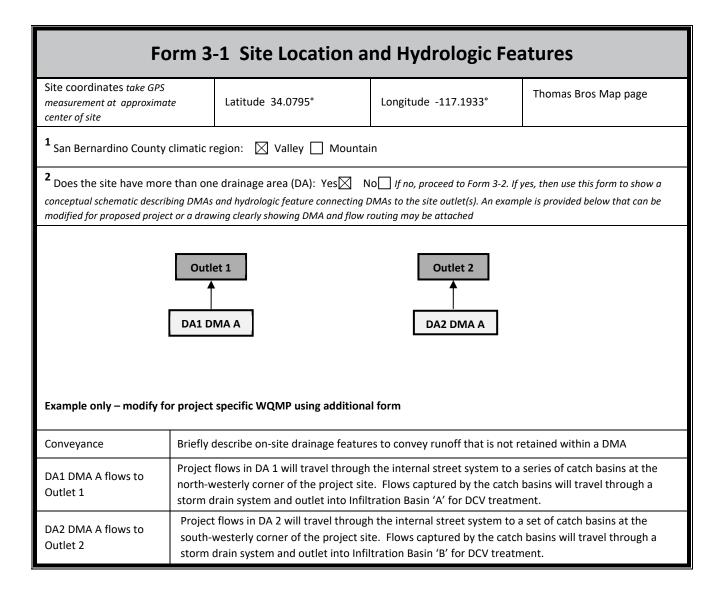
2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits									
1 Project Types that Qualify for Wat	1 Project Types that Qualify for Water Quality Credits: Select all that apply								
Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced] Current= - SF New= - SF Credit=0%	Higher density development projects Vertical density [20%] 7 units/ acre [5%]	Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]						
Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]						
² Total Credit 0% (Total all credit pe	² Total Credit 0% (Total all credit percentages up to a maximum allowable credit of 50 percent)								
Description of Water Quality Credit Eligibility (if applicable)	N/A								

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.



Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1						
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D		
1 DMA drainage area (ft²)	1,267,457					
2 Existing site impervious area (ft²)	0					
Antecedent moisture condition For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412 map.pdf	11					
4 Hydrologic soil group Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	A/B					
5 Longest flowpath length (ft)	1,360					
6 Longest flowpath slope (ft/ft)	.018					
7 Current land cover type(s) <i>Select from Fig C-3</i> of Hydrology Manual	Annual Grass					
8 Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating	Fair					

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 2						
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D		
$^{f 1}$ DMA drainage area (ft 2)	294,604					
2 Existing site impervious area (ft²)	0					
Antecedent moisture condition For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412 map.pdf	II					
4 Hydrologic soil group Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	A/B					
5 Longest flowpath length (ft)	1,300					
6 Longest flowpath slope (ft/ft)	.017					
7 Current land cover type(s) Select from Fig C-3 of Hydrology Manual	Annual Grass					
8 Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating	Fair					

Photo 1: At southwest corner of project site looking east along San Bernardino Ave and south project boundary.

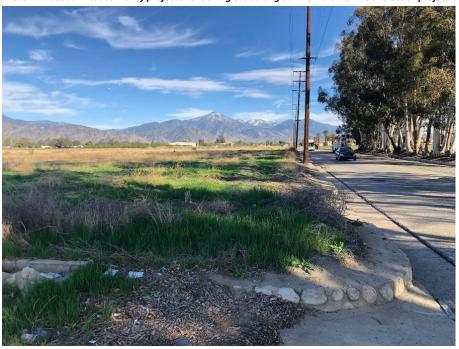




Photo 2: At northwest corner of project site on Pioneer Avenue looking south along west project boundary and future New York Street.

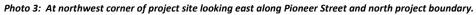




Photo 4: At northeast corner of project site looking south along Texas Street and east project boundary.







Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)						
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H		
¹ DMA drainage area (ft²)						
2 Existing site impervious area (ft²)						
Antecedent moisture condition For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412 map.pdf						
Hydrologic soil group Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP						
5 Longest flowpath length (ft)						
6 Longest flowpath slope (ft/ft)						
7 Current land cover type(s) Select from Fig C-3 of Hydrology Manual						
8 Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating						

Form 3-3 Watershe	Form 3-3 Watershed Description for Drainage Area								
	Santa Ana River Reach 5								
Receiving waters	Santa Ana River Reach 4								
Refer to Watershed Mapping Tool - http://sbcounty.permitrack.com/WAP	Santa Ana River Reach 3								
See 'Drainage Facilities" link at this website	Prado Basin								
Applicable TMDLs Refer to Local Implementation Plan	None								
303(d) listed impairments Refer to Local Implementation Plan and Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water-iss-ues/programs/tmdl/index.shtml	None for immediate receiving waters Santa Ana River Reach 4 – pathogens Santa Ana River Reach 3 – pathogens / metals								
Environmentally Sensitive Areas (ESA) Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	None								
Unlined Downstream Water Bodies Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	Santa Ana River Reach 5, Reach 4, Reach 3								
Hydrologic Conditions of Concern	Yes Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal No								
Watershed–based BMP included in a RWQCB approved WAP	Yes Attach verification of regional BMP evaluation criteria in WAP • More Effective than On-site LID • Remaining Capacity for Project DCV • Upstream of any Water of the US • Operational at Project Completion • Long-Term Maintenance Plan								

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

	Form 4.1-1 Non-Structural Source Control BMPs									
	Name	Che	ck One	Describe BMP Implementation OR,						
Identifier	Name	Included	Not Applicable	if not applicable, state reason						
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs			The project owner will provide educational materials to property owners within the project. The materials will discuss water quality management issues relating to the project and property owners individual and corporate responsibilities. The materials will contain appropriate information from private and government resources. These materials will include information on general good housekeeping practices that contribute to protection of Storm water quality, and BMPs that eliminate or reduce pollution. The materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins, and storm drains. These materials will be made available by the owner and are attached to the WQMP template as Attachment H. The owner will note the availability of stormwater information and educational materials available on the San Bernardino County Website http://www.sbcountystormwater.org/ A copy of these materials and a copy of the WQMP must be given to each property owner with the purchase of a lot within the subdivision at the close of purchase.						
N2	Activity Restrictions			All activities are restricted for which there isn't an appropriate BMP provided for in this WQMP.						
N3	Landscape Management BMPs			The Homeowners shall comply with landscape requirements in accordance with CASQA New Development BMP Handbook SD-10 (attached). All new landscapes shall incorporate the requirements of this BMP to maximize infiltration, provide retention, slow runoff and minimize impervious land coverage.						
N4	BMP Maintenance			 The Homeowners will be responsible for BMP maintenance on their individual lots (Lots 1-211). The City of Redlands will own Lot A-G in Fee Title and will be responsible for BMP Maintenance via a Communities Facilities District. 						

	Form 4	.1-1 No	n-Struc	tural Source Control BMPs
N5	Title 22 CCR Compliance (How development will comply)			The homeowners must comply the County ordinances for Hazardous waste and waste disposal. The City of Redlands through the Fire Department provides for household hazardous waste collection. The homeowners shall comply by using this facility to dispose of all leftover pesticides, fertilizers, herbicides, oil, paints, antifreeze, batteries, corrosives and flammables. Alternate approved sites for disposal are available. See the San Bernardino County stormwater website for additional disposal locations. Additionally, there are educational material covering hazardous waste covered under N1. The current educational materials are attached to this WQMP.
N6	Local Water Quality Ordinances			The Project must comply with any applicable local water quality ordinances. The local jurisdiction (City of Redlands) under local water quality ordinances, has authority to ensure clean stormwater discharges from the site.
N7	Spill Contingency Plan		\boxtimes	Not required for single family residences.
N8	Underground Storage Tank Compliance		\boxtimes	No underground storage tanks on this site.
N9	Hazardous Materials Disclosure Compliance		\boxtimes	Not required for single family residences.
N10	Uniform Fire Code Implementation			The project shall comply with Article 80 of the Uniform Fire Code enforced by the City of Redlands Fire department. All hazardous materials covered by this code are banned from this project.
N11	Litter/Debris Control Program	\boxtimes		 The Homeowners will be responsible for litter and debris on their individual lots (Lots 1-211). The City of Redlands will own Lots A-G in Fee Title and will be responsible for litter and debris control via a CFD.
N12	Employee Training			This does not apply to a single family residential project.

	Form 4.1-1 Non-Structural Source Control BMPs								
- + : f:	Nama	Che	ck One	Describe BMP Implementation OR,					
Identifier	Name	Included	Not Applicable	if not applicable, state reason					
N13	Housekeeping of Loading Docks			There are no onsite loading docks.					
N14	Catch Basin Inspection Program			The single family residences have no catch basins within their single family lots. The proposed catch basins will be within the City of Redlands maintenance areas and will be covered by their own inspection program.					
N15	Vacuum Sweeping of Private Streets and Parking Lots		\boxtimes	This project has no private streets or parking lots.					
N16	Other Non-structural Measures for Public Agency Projects		\boxtimes	This is not a public agency project.					
N17	Comply with all other applicable NPDES permits			None required.					

	Form 4.1	-2 Stru	ctural S	ource Control BMPs
		Chec	ck One	Describe BMP Implementation OR,
Identifier	Name	Included	Not Applicable	If not applicable, state reason
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)			Signage notices regarding discharge prohibitions will be placed at storm drain inlets to eliminate or reduce dumping and littering. The phrase "No Dumping – Drains to Creek," or an equally effective phrase as approved by the City of Redlands, will be stenciled on catch basins (inlets) to alert the public as to the destination of pollutants discharged into storm drains. This signage will be maintained by the owner. This project site will include storm drain signage implemented consistent with BMP SD-13 (Reference SD-13 attached under the BMP section 6.4). The above phrase has been approved by the City of Redlands.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)			There will be no outdoor material storage on this site.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)			There are no trash or waste storage areas on this site
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)			Irrigation methods will be utilized to minimize runoff of excess irrigation water across impervious surfaces and into the storm water conveyance system. Such measures shall include employing rain-triggered shutoff devices to eliminate or reduce irrigation during and immediately after precipitation, using mulches (such as wood chips) to minimize sediment in runoff and to maintain soil infiltration capacity, and coordinating design of the irrigation system and landscape to minimize overspray and runoff. Irrigation systems shall flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or water supply lines. Water conservation devices such as programmable irrigation timers and soil moisture sensors shall be used. This project will be designed for efficient irrigation by implementation of BMP SD-12. Reference SD-12 attached under the BMP section 6.4B.
\$5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	\boxtimes		All parkway strips shall be finish-graded at a minimum of 1-2 inches below top of curb or sidewalk for increased retention/infiltration of stormwater and irrigation water.

\$6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)		Project plans will include Source-Control BMPs to decrease the potential for erosion of slopes, channels, and storm drain outlets. Slope runoff will be conveyed safely from the tops of slopes. 1. All manufactured slopes within the project will be landscaped and protected. 2. Prior to slope landscaping slopes shall be stabilized per the SWPPP. 3. Install energy dissipaters per the Final project plans at the outlet locations shown on the attached BMP exhibit. 4. Onsite conveyance channels (drainage swales) will be lined, where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area.
S 7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	\boxtimes	N/A There are no covered dock areas.
\$8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	\boxtimes	N/A There are no covered maintenance bays.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)		N/A There are no vehicle wash areas.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	\boxtimes	N/A There are no outdoor processing areas.
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	\boxtimes	N/A None on this site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)		N/A None on this site.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)		N/A None on this site.
S14	Wash water control for food preparation areas		N/A None on this site.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	\boxtimes	N/A None on this site.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist
Site Design Practices If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets
Minimize impervious areas: Yes No DEXPIRITED NO DESPIRITED NO DESPIRITED NO DEXPIRITED NO DEXPIRITED NO DESPIRITED
Maximize natural infiltration capacity: Yes No Explanation: The proposed infiltration basins for the project will be flagged or staked off during construction operations to maximize the natural infiltration capacity of those areas.
Preserve existing drainage patterns and time of concentration: Yes \(\subseteq \text{No \(\subseteq \)} \) Explanation: The project proposes to extend the time of concentration with addition of two proposed infiltration basins.
Disconnect impervious areas: Yes No Explanation: The project is proposing to direct runoff to planters and landscaped areas and incorporates permeable areas throughout the site to accept runoff. All roof downspouts will drain to pervious areas.
Protect existing vegetation and sensitive areas: Yes \(\square\) No \(\square\) Explanation: There are no existing vegetative or sensitive areas on this site.
Re-vegetate disturbed areas: Yes 🗵 No 🗌 Explanation: All disturbed areas without impervious construction will be revegetated.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes No Explanation: This WQMP has designated two infiltration basin areas that will be identified as a 'no compaction zone' during site grading and construction.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes No Explanation: Individual lots will be surrounded with a vegetated swale sloping at 1% minimum.
Stake off areas that will be used for landscaping to minimize compaction during construction: Yes No Explanation: The house pads and street areas will not utilize this feature, but the park areas and infiltration basins will use this feature.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. *If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet*.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P₆ method (MS₄ Permit Section XI.D.6a.ii) Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)							
1 Project area DA 1 (ft ²): Imperviousness after applying preventative site design practices (Imp%): 55.18% 3 Runoff Coefficient (Rc): 0.37 $R_c = 0.858(Imp\%)^{^{^{^{3}}}} - 0.78(Imp\%)^{^{^{^{2}}}} + 0.774(Imp\%) + 0.04$							
4 Determine 1-hour rainfa	II depth for a 2-year return period P _{2yr-1hr} (in): 0.4	80 http://hdsc.nws.noaa.gov/hdsc/	'pfds/sa/sca pfds.html				
	Compute P_6 , Mean 6-hr Precipitation (inches): 0.71 $P_6 = Item \ 4 *C_1, where \ C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)$						
6 Drawdown Rate Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.							
DCV = 1/12 * [Item 1* Item 3	7 Compute design capture volume, DCV (ft ³): 55,078 $DCV = 1/12 * [Item 1* Item 3 * Item 5 * C2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2$						

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)							
Project area DA 1 (ft ²): 2 Imperviousness after applying preventative site design practices (Imp%): 52.38% 3 Runoff Coefficient (Rc): 0.35 $R_c = 0.858(Imp\%)^{^3} - 0.78(Imp\%)^{^2} + 0.774(Imp\%) + 0.04$							
4 Determine 1-hour rainfa	Determine 1-hour rainfall depth for a 2-year return period P _{2yr-1hr} (in): 0.480 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html						
	Compute P_6 , Mean 6-hr Precipitation (inches): 0.71 $P_6 = Item \ 4 *C_1, where \ C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)$						
Drawdown Rate Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.							
DCV = 1/12 * [Item 1* Item 3	Compute design capture volume, DCV (ft ³): 12,150 $DCV = 1/12 * [Item 1* Item 3 * Item 5 * C2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2$						

Form 4.2-2 Summary of HCOC Assessment (DA 1) Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes \(\sigma\) No \(\sigma\) Go to: http://sbcounty.permitrack.com/WAP If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below (Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual) If "No," then proceed to Section 4.3 Project Conformance Analysis Condition Runoff Volume (ft³) Time of Concentration (min) Peak Runoff (cfs) Pre-developed Form 4.2-3 Item 12 Form 4.2-4 Item 13 Form 4.2-5 Item 10 6 Post-developed Form 4.2-3 Item 13 Form 4.2-4 Item 14 Form 4.2-5 Item 14 Difference Item 4 – Item 1 Item 2 – Item 5 Item 6 – Item 3 10 % 11 _% 12 _% Difference (as % of pre-developed) Item 7 / Item 1 Item 8 / Item 2 Item 9 / Item 3

Form 4.	Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)										
Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H			
1a Land Cover type											
2a Hydrologic Soil Group (HSG)											
3a DMA Area, ft ² sum of areas of DMA should equal area of DA											
4 a Curve Number (CN) use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP											
Weighted Curve Number Determination for: <u>Post</u> -developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H			
1b Land Cover type											
2b Hydrologic Soil Group (HSG)											
3b DMA Area, ft ² sum of areas of DMA should equal area of DA											
4b Curve Number (CN) use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP											
5 Pre-Developed area-weighted CN	:	7 Pre-develop S = (1000 / It	ped soil storag em 5) - 10	ge capacity, S (in):	9 Initial ab	ostraction, I _a (i Item 7	n):			
6 Post-Developed area-weighted Cl	N:	8 Post-develo S = (1000 / It	oped soil stora em 6) - 10	ge capacity, S	10 Initial abstraction, I _a (in): I _a = 0.2 * Item 8						
11 Precipitation for 2 yr, 24 hr stor		pfds.html				ı					
12 Pre-developed Volume (ft ³): V _{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)											
13 Post-developed Volume (ft ³): V _{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)											
14 Volume Reduction needed to n V _{HCOC} = (Item 13 * 0.95) – Item 12	neet HCOC R	equirement, (f	t³):								

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA (For projects using the Hydrology Manual complete the form below)

Use additi		•	than 4 DMA	Use addit		•	:han 4 DMA
DMA A	DMA B	DMA C	DMA D	DMA A	DMA A	DMA C	DMA D
-				-	-		
-				-	-		
-				-	-		
-				-	-		
-				-	-		
		Use additional forms if the DMA B	DMA A DMA B DMA C	DMA A DMA B DMA C DMA D I DMA G DMA D I DMA G DMA D I DMA G DMA D I DMA	Use additional forms if there are more than 4 DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA B DMA C DMA D DMA A DMA A DMA D DMA A DMA B DMA C DMA D DMA A DMA B DMA C DMA D DMA A DMA D DMA A DMA D DMA A DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D DMA D	Use additional forms if there are more than 4 DMA DMA A DMA B DMA C DMA D DMA A DMA D Use additional forms if there are more than 4 DMA	

Pre-developed time of concentration (min): Minimum of Item 12 pre-developed DMA

¹⁴ Post-developed time of concentration (min): Minimum of Item 12 post-developed DMA

Additional time of concentration needed to meet HCOC requirement (min): $T_{C-HCOC} = (Item \ 13 * 0.95) - Item \ 14$

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)									
Compute peak runoff for pre- and post-develo	ped conditions								
			Outlet (eloped DA Use addition ore than 3 D	nal forms if	Outlet (Post-developed DA to Pr Outlet (Use additional for more than 3 DMA)		
			DMA A	DMA B	DMA C	DMA A Pervious	DMA A Imperv.	DMA C	
1 Rainfall Intensity for storm duration equal to $I_{peak} = 10^{\circ}(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-1)$									
Drainage Area of each DMA (Acres) For DMA with outlet at project site outlet, include up schematic in Form 3-1, DMA A will include drainage f		g example							
Ratio of pervious area to total area For DMA with outlet at project site outlet, include up schematic in Form 3-1, DMA A will include drainage f	g example								
Pervious area infiltration rate (in/hr) Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP									
5 Maximum loss rate (in/hr) F _m = Item 3 * Item 4 Use area-weighted F _m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)									
Peak Flow from DMA (cfs) Qp = Item 2 * 0.9 * (Item 1 - Item 5)									
7 Time of concentration adjustment factor for	other DMA to	DMA A	n/a			n/a			
site discharge point	u diadian	DMA B		n/a			n/a		
Form 4.2-4 Item 12 DMA / Other DMA upstream of si point (If ratio is greater than 1.0, then use maximum	=	DMA C			n/a			n/a	
8 Pre-developed Q _p at T _c for DMA A: Q _p = Item 6 _{DMAA} + [Item 6 _{DMAB} * (Item 1 _{DMAA} - Item 5 _{DMAB})/(Item 1 _{DMAB} - Item 5 _{DMAB})* Item 7 _{DMAA/2}] + [Item 6 _{DMAC} * (Item 1 _{DMAA} - Item 5 _{DMAC})/(Item 1 _{DMAC} - Item 5 _{DMAC})* Item 7 _{DMAA/3}]	Pre-developed Qp = Item 6DMAB + 5DMAA)/(Item 1DMAC [Item 6DMAC * (Item Item 5DMAC) * Item	n 1 _{DMAB} - Ite. em 7 _{DMAB/1}] -	m $Q_p = 5_{DM}$ MAC = [Ite]	Pre-developed Q _p at T _c for DMA C: Q _p = Item 6 _{DMAC} + [Item 6 _{DMAA} * (Item 1 _{DMAC} - Ite 5 _{DMAA})/(Item 1 _{DMAA} - Item 5 _{DMAA})* Item 7 _{DMAC/2}] [Item 6 _{DMAB} * (Item 1 _{DMAC} - Item 5 _{DMAB})/(Item 1 _L - Item 5 _{DMAB})* Item 7 _{DMAC/2}]			_{AC} - Item мас/1] +		
$^{f 10}$ Peak runoff from pre-developed condition $^{f c}$	onfluence analys	sis (cfs): Maxim	num of Item	8, 9, and 10	(including o	additional for	rms as neede	?d)	
Post-developed Q_p at T_c for DMA A: Same as Item 8 for post-developed values	Post-develo Same as Item 9 for	ped Q_p at T_c for			Post-developed Q_p at T_c for DMA C: Same as Item 10 for post-developed values				
Peak runoff from post-developed condition	confluence analy	vsis (cfs): Maxi	mum of Iten	n 11, 12, an	d 13 (includi	ng additiona	l forms as ne	eded)	
15 Peak runoff reduction needed to meet HCO	C Requirement (c	cfs): Q _{p-HCOC} = (I	tem 14 * 0.9	95) – Item 1	0				

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
Would infiltration BMP pose significant risk for groundwater related concerns? Yes No Refer to Section 5.3.2.1 of the TGD for WQMP
If Yes, Provide basis: (attach)
 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes No Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): The location is less than 50 feet away from slopes steeper than 15 percent The location is less than eight feet from building foundations or an alternative setback. A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☐
If Yes, Provide basis: (attach)
4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes No
If Yes, Provide basis: (attach)
Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes \sum No \sum \square
If Yes, Provide basis: (see infiltration testing results in appendix)
Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes No See Section 3.5 of the TGD for WQMP and WAP
If Yes, Provide basis: (attach)
Any answer from Item 1 through Item 3 is "Yes": Yes No life yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below. 8 Any answer from Item 4 through Item 6 is "Yes": Yes No life yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP. If no, then proceed to Item 9, below.
All answers to Item 1 through Item 6 are "No": Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP. Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrol	ogic Source	Control BMF	Ps (DA 1)
¹ Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☑ No ☐ If yes, complete Items 2-5; If no, proceed to Item 6 Note: Map shows proposed routing but no reduction in DCV volume is requested so items 2-5 were not completed.	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Total impervious area draining to pervious area (ft²)			
³ Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft ³) $V = Item2 * Item 3 * (0.5/12)$, assuming retention of 0.5 inches of runoff			
⁵ Sum of retention volume achieved from impervious area dis	persion (ft³): 0 V _{reten}	tion =Sum of Item 4 for all	BMPs
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes No If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
7 Ponding surface area (ft²)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft²)			
Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft ³) V _{retention} = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)			
13 Runoff volume retention from on-lot infiltration (ft ³): 0	V _{retention} =Sum of Item 12	for all BMPs	

Form 4.3-2 cont. Site Design Hydr	ologic Source	ce Control Bi	MPs (DA 1)
14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes No If yes, complete Items 15-20. If no, proceed to Item 21	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
15 Rooftop area planned for ET BMP (ft²)			
Average wet season ET demand (in/day) Use local values, typical ~ 0.1			
Daily ET demand (ft³/day) Item 15 * (Item 16 / 12)			
Drawdown time (hrs) Copy Item 6 in Form 4.2-1			
19 Retention Volume (ft³) V _{retention} = Item 17 * (Item 18 / 24)			
20 Runoff volume retention from evapotranspiration BMPs (ft	³): 0 V _{retention} =Sum (of Item 19 for all BMPs	
21 Implementation of Street Trees: Yes No If yes, complete Items 22-25. If no, proceed to Item 26	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft²)			
Runoff volume retention from street trees (ft ³) $V_{retention} = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches$			
25 Runoff volume retention from street tree BMPs (ft³): 0	V _{retention} = Sum of Item 24	for all BMPs	
26 Implementation of residential rain barrel/cisterns: Yes No If yes, complete Items 27-29; If no, proceed to Item 30	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
Number of rain barrels/cisterns			
Runoff volume retention from rain barrels/cisterns (ft ³) $V_{retention} = Item 27 * 3$			
29 Runoff volume retention from residential rain barrels/Cister	rns (ft3): 0 V _{retention}	n =Sum of Item 28 for all B	3MPs
Total Retention Volume from Site Design Hydrologic Source	: Control BMPs: 17 St	um of Items 5, 13, 20, 25	and 29

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

Form 4.3-3 Infiltration LID BMP - i	ncluding und	derground B	MPs (DA 1)
1 Remaining LID DCV not met by site design HSC BMP (ft³): Vunnet =	53,593 Form 4.2-1 Item	7 - Form 4.3-2 Item 30	
BMP Type Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs	DA 1 DMA A BMP Type (Infiltration Basin)	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Infiltration rate of underlying soils (in/hr) See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods	10.0		
3 Infiltration safety factor See TGD Section 5.4.2 and Appendix D	3.5		
4 Design percolation rate (in/hr) $P_{design} = Item 2 / Item 3$	2.86		
⁵ Ponded water drawdown time (hr) <i>Copy Item 6 in Form 4.2-1</i>	48		
6 Maximum ponding depth (ft) BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details	5.0		
7 Ponding Depth (ft) $d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6$	5.0		
8 Infiltrating surface area, SA_{BMP} (ft ²) the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP	9,542		
Amended soil depth, d_{media} (ft) Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details	2.0		
10 Amended soil porosity	0.3		
Gravel depth, d_{media} (ft) Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details	1.0		
12 Gravel porosity	0.4		
Duration of storm as basin is filling (hrs) Typical ~ 3hrs	3		
14 Above Ground Retention Volume (ft³) V _{retention} = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]	64,068		
15 Underground Retention Volume (ft³) Volume determined using manufacturer's specifications and calculations	n/a		
Total Retention Volume from LID Infiltration BMPs: 64,068 (Sum	n of Items 14 and 15 for a	all infiltration BMP includ	ded in plan)
17 Fraction of DCV achieved with infiltration BMP: 116.32% Retent	ion% = Item 16 / Form 4.	2-1 Item 7	
18 Is full LID DCV retained on-site with combination of hydrologic so If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Far portion of the site area used for retention and infiltration BMPs equals or exceeds applicable category of development and repeat all above calculations.	ctor of Safety to 2.0 and in	crease Item 8, Infiltrating	Surface Area, such that the

Form 4.3-3 Infiltration LID BMP - i	ncluding un	derground B	BMPs (DA 2)
1 Remaining LID DCV not met by site design HSC BMP (ft ³): $V_{unmet} =$	12,150 Form 4.2-1 Item	7 - Form 4.3-2 Item 30	
BMP Type Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs	DA 2 DMA A BMP Type (Infiltration Basin)	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
Infiltration rate of underlying soils (in/hr) See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods	10.0		
3 Infiltration safety factor See TGD Section 5.4.2 and Appendix D	3.5		
4 Design percolation rate (in/hr) P _{design} = Item 2 / Item 3	2.86		
⁵ Ponded water drawdown time (hr) <i>Copy Item 6 in Form 4.2-1</i>	48		
6 Maximum ponding depth (ft) BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details	4.5		
7 Ponding Depth (ft) $d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6$	4.5		
8 Infiltrating surface area, SA_{BMP} (ft ²) the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP	6,333		
Amended soil depth, d_{media} (ft) Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details	n/a		
10 Amended soil porosity	n/a		
11 Gravel depth, d_{media} (ft) Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details	n/a		
12 Gravel porosity	n/a		
Duration of storm as basin is filling (hrs) Typical ~ 3hrs	3		
14 Above Ground Retention Volume (ft ³) V _{retention} = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]	33,022		
15 Underground Retention Volume (ft³) Volume determined using manufacturer's specifications and calculations	n/a		
Total Retention Volume from LID Infiltration BMPs: 33,022 (Sun	n of Items 14 and 15 for a	all infiltration BMP includ	ded in plan)
17 Fraction of DCV achieved with infiltration BMP: 271.79% Retent			
18 Is full LID DCV retained on-site with combination of hydrologic so If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Fa portion of the site area used for retention and infiltration BMPs equals or exceeds applicable category of development and repeat all above calculations.	ctor of Safety to 2.0 and in	crease Item 8, Infiltrating	Surface Area, such that the

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harves	t and Use B	MPs (DA 1)	
1 Remaining LID DCV not met by site design HSC or infiltration V _{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16	BMP (ft³): 0		
BMP Type(s) Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft³) <i>Volume of cistern</i>			
$oldsymbol{4}$ Landscaped area planned for use of harvested stormwater (ft²)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical $^{\sim}$ 0.1 in/day			
6 Daily water demand (ft ³ /day) <i>Item 4 * (Item 5 / 12)</i>			
7 Drawdown time (hrs) Copy Item 6 from Form 4.2-1			
8 Retention Volume (ft³) V _{retention} = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))			
9 Total Retention Volume (ft³) from Harvest and Use BMP 0 <i>Su</i>	m of Item 8 for all harv	vest and use BMP included	d in plan
10 Is the full DCV retained with a combination of LID HSC, rete If yes, demonstrate conformance using Form 4.3-10. If no, then re-eva that the maximum portion of the DCV is retained on-site (using a single after this optimization process, proceed to Section 4.3.4.	luate combinations of	all LID BMP and optimize	their implementation such

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Sele	ctio	n and Ev	aluation of Biot	trea	tment BMP (DA 1)
Remaining LID DCV not met by si infiltration, or harvest and use BMI biotreatment (ft³): 0 Form 4.2-1 Ite 30 – Form 4.3-3 Item 16- Form 4.3-4 Ite	P for po	tential	List pollutants of concern Copy from Form 2.3-1. Pathogens (Bacterial / Virus), Nutrients – Phosphorous and Nitroge Noxious Aquatic Plants, Sediment, Oil and Grease, Trash/Debris, Pesticides / Herbicides, Organic Compounds		trients – Phosphorous and Nitrogen, t, Oil and Grease, Trash/Debris,
2 Biotreatment BMP Selected	Use Foi		ed biotreatment 7 to compute treated volume	Us	Flow-based biotreatment e Form 4.3-8 to compute treated volume
(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)	Pla Co	Bioretention with underdrain Planter box with underdrain Constructed wetlands Wet extended detention Dry extended detention		☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment	
Wolume biotreated in volume base biotreatment BMP (ft ³): Form 4.3-6			remaining LID DCV with tion of volume based biotreatm		5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP:
15 + Form 4.3-7 Item 13	,	•	em 1 – Item 3		% Item 4 / Item 1
Flow-based biotreatment BMP ca					to determine flow capacity required to zone (Form 3-1 Item 1)
7 Metrics for MEP determination:					
• Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the					
TGD for WQMP for the proposed category of development: If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.					

Form 4.3-6 Volume Base Bioretention and Planter		-	
Biotreatment BMP Type (Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
1 Pollutants addressed with BMP List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP			
2 Amended soil infiltration rate <i>Typical</i> ~ 5.0			
3 Amended soil infiltration safety factor <i>Typical</i> ~ 2.0			
4 Amended soil design percolation rate (in/hr) P _{design} = Item 2 / Item 3			
⁵ Ponded water drawdown time (hr) <i>Copy Item 6 from Form 4.2-1</i>			
6 Maximum ponding depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
7 Ponding Depth (ft) d_{BMP} = Minimum of (1/12 * Item 4 * Item 5) or Item 6			
8 Amended soil surface area (ft²)			
Amended soil depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
10 Amended soil porosity, n			
11 Gravel depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
12 Gravel porosity, n			
Duration of storm as basin is filling (hrs) Typical ~ 3hrs			
14 Biotreated Volume (ft ³) V _{biotreated} = Item 8 * [(Item 7/2) + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]			
Total biotreated volume from bioretention and/or planter box Sum of Item 14 for all volume-based BMPs included in this form	with underdrains	ВМР: 0	

Form 4.3-7 Volume Base Constructed Wetlands		·		
Biotreatment BMP Type Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage	DA DMA BMP Type		DA E BMP Typ (Use addition for more	onal forms
and pollutants treated in each module.	Forebay	Basin	Forebay	Basin
Pollutants addressed with BMP forebay and basin List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft²) Abottom = Item 2 * Item 3				
⁵ Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft²) A _{surface} =(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))				
Storage volume (ft³) For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details V = Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]				
9 Drawdown Time (hrs) Copy Item 6 from Form 2.1				
Outflow rate (cfs) $Q_{BMP} = (Item 8_{forebay} + Item 8_{basin}) / (Item 9 * 3600)$				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft ³) V _{biotreated} = (Item 8 _{forebay} + Item 8 _{bosin}) +(Item 10 * Item 11 * 3600)				
Total biotreated volume from constructed wetlands, extended ((Sum of Item 12 for all BMP included in plan)	dry detention, or	extended wet de	tention: 0	

Form 4.3-8 Flow Based Biotreatment (DA 1)			
Biotreatment BMP Type Vegetated swale, vegetated filter strip, or other comparable proprietary BMP	DA DMA BMP Type Vegetated Swales	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
1 Pollutants addressed with BMP List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5	-		
Flow depth for water quality treatment (ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details	-		
Bed slope (ft/ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details	-		
4 Manning's roughness coefficient	-		
5 Bottom width (ft) bw = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)	-		
Gaide Slope (ft/ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details	-		
7 Cross sectional area (ft²) A = (Item 5 * Item 2) + (Item 6 * Item 2^2)	-		
8 Water quality flow velocity (ft/sec) V = Form 4.3-5 Item 6 / Item 7	-		
9 Hydraulic residence time (min) Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details	-		
Length of flow based BMP (ft) L = Item 8 * Item 9 * 60	-		
11 Water surface area at water quality flow depth (ft ²) $SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10$	-		

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)
Total LID DCV for the Project DA-1 (ft³): 55,078 Copy Item 7 in Form 4.2-1
2 On-site retention with site design hydrologic source control LID BMP (ft ³): 0 Copy Item 30 in Form 4.3-2
3 On-site retention with LID infiltration BMP (ft ³): 64,068 Copy Item 16 in Form 4.3-3
On-site retention with LID harvest and use BMP (ft ³): 0 Copy Item 9 in Form 4.3-4
⁵ On-site biotreatment with volume based biotreatment BMP (ft³): 0 Copy Item 3 in Form 4.3-5
⁶ Flow capacity provided by flow based biotreatment BMP (cfs): 0 Copy Item 6 in Form 4.3-5
 IID BMP performance criteria are achieved if answer to any of the following is "Yes": Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes No If yes, sum of Items 2, 3, and 4 is greater than Item 1 Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes No If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.35 Item 6 and Items 2, 3 and 4 are maximized On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes No If yes, Form 4.3-1 Items 7 and 8 were both checked yes
 8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance: Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, Voit = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)% An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative
Compliance Volume Estimate (DA 2)
Total LID DCV for the Project DA-1 (ft ³): 12,150 Copy Item 7 in Form 4.2-1
2 On-site retention with site design hydrologic source control LID BMP (ft³): 0 Copy Item 30 in Form 4.3-2
On-site retention with LID infiltration BMP (ft ³): 33,022 Copy Item 16 in Form 4.3-3
4 On-site retention with LID harvest and use BMP (ft ³): 0 Copy Item 9 in Form 4.3-4
On-site biotreatment with volume based biotreatment BMP (ft³): 0 Copy Item 3 in Form 4.3-5
Flow capacity provided by flow based biotreatment BMP (cfs): 0 Copy Item 6 in Form 4.3-5
 IID BMP performance criteria are achieved if answer to any of the following is "Yes": Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes No If yes, sum of Items 2, 3, and 4 is greater than Item 1 Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes No If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.35 Item 6 and Items 2, 3 and 4 are maximized On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes No If yes, Form 4.3-1 Items 7 and 8 were both checked yes
If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance: • Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, Voit = (Item 1 - Item 2 - Item 3 - Item 4 - Item 5) * (100 - Form 2.4-1 Item 2)% • An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed.

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)					
1 Volume reduction needed for HCOC performance criteria (ft³): (Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1		On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft³): Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction			
Remaining volume for HCOC volume capture (ft³): Item 1 – Item 2	(ft³): 0 Ex	4 Volume capture provided by incorporating additional on-site or off-site retention BMP (ft³): 0 Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)			
If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification Attach in-stream control BMP selection and evaluation to this WQMP					
 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes No Diffuse, HCOC performance criteria is achieved. If no, select one or more mitigation options below: Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP HCOC Infiltrated					
7 Form 4.2-2 Item 12 less than or equal to 5%: Yes No If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:					
site retention BMPs HC BMPs upstream of a waterboa through hydrograph attenuati during a 2-yr storm event) Incorporate appropriate in-	 Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs HCOC Infiltrated BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event) Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California 				

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)				
ВМР	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities	
Education of Property Owners, Tenants and Occupants	Lot Owners	The project owner is responsible for the initial distribution of the WQMP and educational materials to the individual lot owners at the close of escrow on each lot. Individual lot owners are responsible for staying informed regarding current storm water quality requirements by downloading the latest educational material published by the County of San Bernardino and available on the County's website at: http://www.sbcountystormwater.org/ agency.	Yearly	
Activity Restrictions	Lot Owners	Lot owner to review activity restrictions for the community (e.g. – car washing restrictions, hazardous material storage requirements, etc.) on an annual basis for changes in local City ordinance.	Yearly	
BMP Maintenance	Lot Owners and City of Redlands through a CFD	Lot owners to inspect and maintain routine structural BMPs on their lots per the BMP maintenance recommendations provided on BMP reference sheets in Section 6.4B of this manual. The City of Redlands, through a CFD, to inspect and maintain Lots A-G per the BMP maintenance recommendations provided on BMP reference sheets in Section 6.4B of this manual.	Monthly	
Local Water Quality Ordinances	Lot Owners	City regulated compliance. Check with City of Redlands regarding changes in local water quality ordinance on annual basis.	Yearly	
Spill Contingency Plan	-	Not applicable for residential subdivision project where storage of hazardous materials not permitted.	-	
Litter / Debris Control Program	Lot Owners	Maintenance shall consist of litter patrol, emptying of trash receptacles, picking up pet waste and using the proper containers for trash pickup. Containers should be cleaned at least every six months	Daily & 6 Months	

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)				
ВМР	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities	
Storm Drain Signage	Project Owner (prior to City acceptance) then City of Redlands	Owner to inspect and replace storm drain signage as necessary. The City of Redlands will not inspect or maintain any devices until the infrastructure is accepted by the City. Until that time is is the owner's responsibility to inspect and maintain this BMP.	Yearly (prior to City acceptance) then City Determined	
Landscape Finished Grade	Lot Owners	This inspection and maintenance normaly refers to some landscape areas and parkway grade held at a lower grade than the surrounding area. Verfify landscaping is 1-2" below the adjacent finished surface grade to allow for ponding. Remove excessive soil and/or vegetation to restore 1" minimum depth of lanscaping area below adjacent grade. Replant landscaping areas disturbed during soil removal.	Yearly	
Protect Slopes and Channels and provide Energy Dissipation	Lot Owners and City of Redlands through a CFD	Channels (Drainage Swales) – Lot owner's to inspect for debris and/or overgrowth, clean, repair and replace all channel stabilization and vegetation. Slopes - Lot owner's to inspect for erosion and/or overgrowth, clean, repair and replace all slope stabilization and vegetation as necessary. Energy Dissipation – City to determine final inspection and maintenance requirements of energy dissipators located in infiltration basins however minimum inspection to include inspecting for rock displacement or debris, cleaning and replacing any rock or concrete splash pads or pipe outlet rock pads.	Monthly for Lot Owners/City Determined for City maintained items	
Landscape Maintenance	Lot Owners	Landscapes shall be maintained to ensure water efficiency and healthy appearance. A regular maintenance schedule shall include, but not be limited to: 1. Checking, adjusting, and repairing the irrigation equipment; 2. Resetting the automatic controller; 3. Aerating and dethatching turf areas; 4. Replenishing mulch; 5. Fertilizing; 6. Pruning, weeding, removing litter and replacement of plants as required. Verify fertilizer and pesticide usage requirements consistent with the instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation Comply with product labels as new products are purchased and update new regulations by the State Department of Pesticide Regulation (http://www.cdpr.ca.gov/)	Weekly	

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)					
ВМР	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities		
Roof Runoff Controls	Lot Owners	Roof Inlets and Outlets - Inspect and clean as necessary all roof inlets, outlets and drains (CASQA New Development BMP Handbook SD-11)	Yearly		
Efficient Irrigation	Lot Owners	Rain and pressure shutoff devices: inspect and replace as necessary Timers: inspect and replace as necessary Mulch: Add mulch (wood chips) as necessary Overspray: Inspect and adjust system	Monthly		
SD-21 Alternative Building Materials	Lot Owners	Decking & Fencing - inspect, repair and replace. Use no Chromated Copper Arsenate products for repair or replacement. Roofing - inspect, repair and replace. If repair or replacement product is metal, use only appropriately coated products. Paved areas - see pervious pavement maintenance. Building siding - inspect, repair and replace. Pesticide reduction - inspect, repair and replace termite barriers	Yearly		
TC-11 Infiltation Basin	Project Owner (prior to City acceptance) then City of Redlands through a CFD	 Inspect for sediment accumulation and trash/debris. Remove trash and debris. Inspect vegetation health. Prune vegetation, remove weeds and remove/replace dead or diseased vegetation. Inspect basin side slopes for erosion. Revetage eroded side slopes and stabilize with an erosion control mulch or mat until vegetation cover is established. Inspect for standing water (annually at end of rainy season). Remove deposited sediments and use a hand-guided rotarty tiller to scarify top 12" of basin (only as needed when standing water is present at end of rainy season) The City of Redlands will not inspect or maintain basins until the infrastructure is accepted by the City. Until that time is is the owner's responsibility to inspect and maintain this BMP. 	Monthly (prior to City acceptance) then City Determined		
MP-52 Drain Inserts	Project Owner (prior to City acceptance) then City of Redlands through a CFD	Project Owner to inspect and maintain according to manufacturer's recommendations included in Section 6.4B (Flogard+Plus Catch Basin Inlet Filter Inspection and Maintenance Guide). The City of Redlands will not inspect or maintain inserts until the infrastructure is accepted by the City. Until that time is is the owner's responsibility to inspect and maintain this BMP.	Monthly (prior to City acceptance) then City Determined		

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

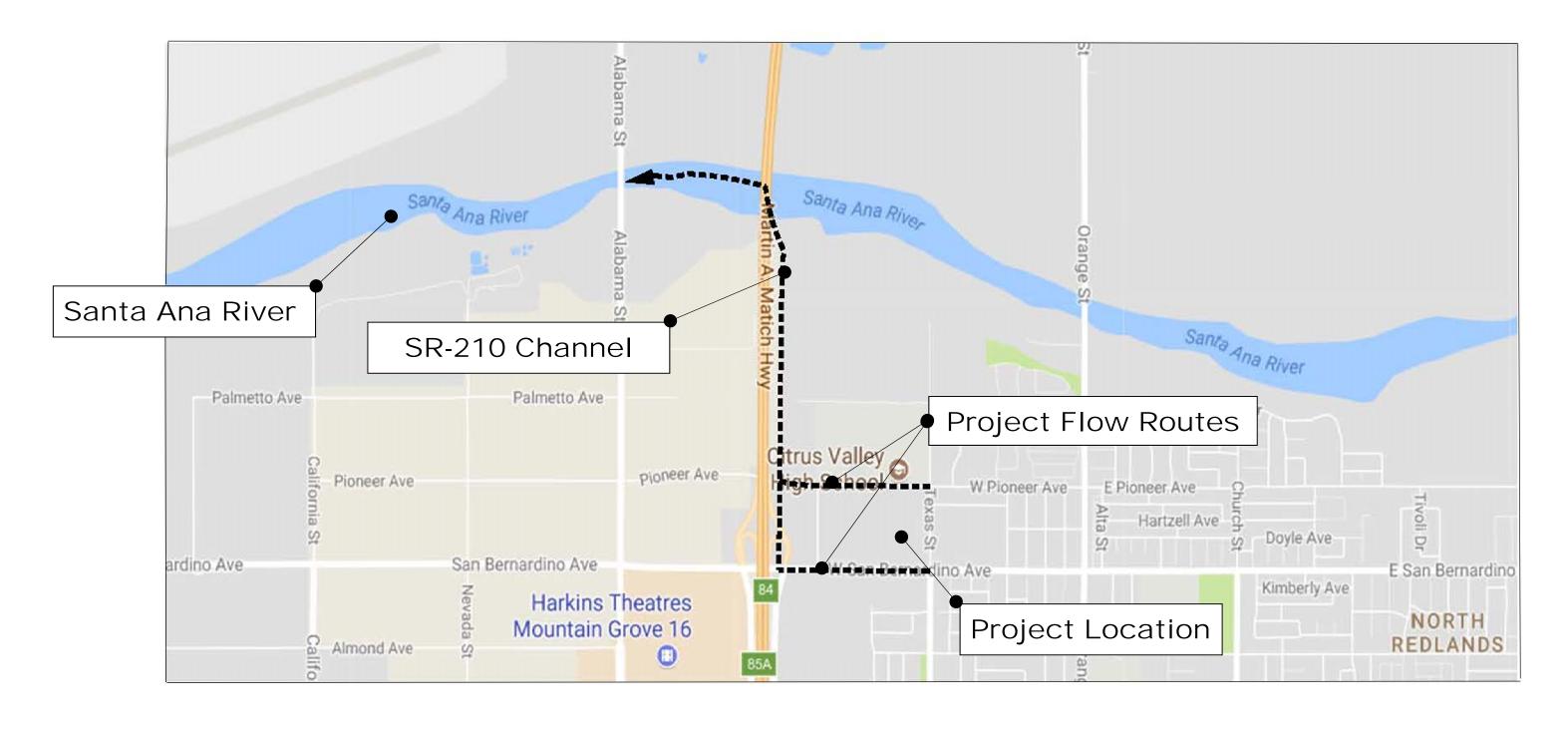
6.4 Other Supporting Documentation

- BMP Exhibits
- BMP Educational Materials

VICINITY MAP

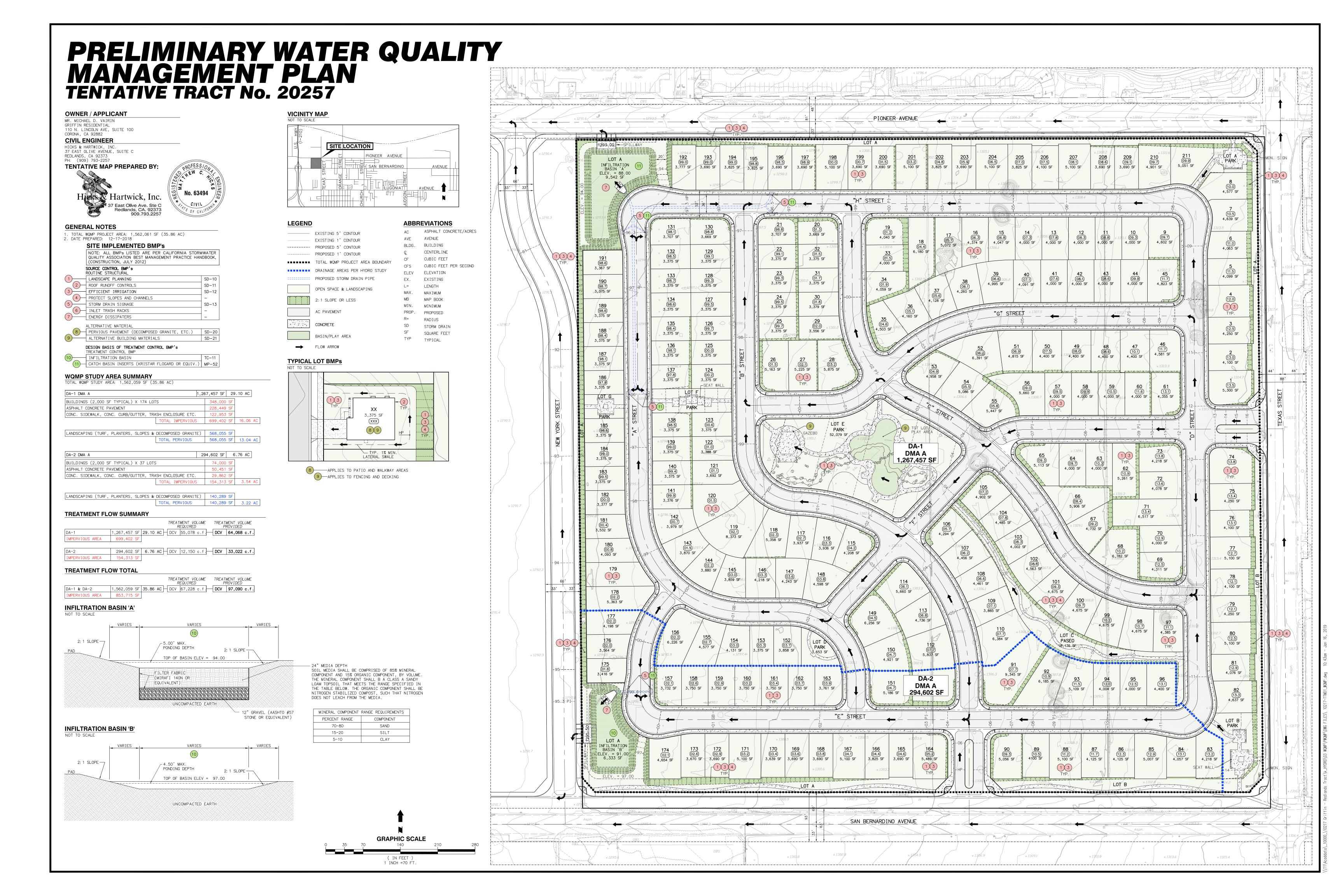
CITY OF REDLANDS, CALIFORNIA SCALE: NTS

Project Drainage Path





Project Drainage Path City of Redlands Tract 20257



RECORDING REQUESTED BY AND WHEN RECORDED MAIL TO:

CITY CLERK CITY OF REDLANDS P.O. BOX 3005 REDLANDS, CA 92373

SPACE ABOVE THIS LINE FOR RECORDER'S USE

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE AGREEMENT Assessor's Parcel Number(s) APN 0167-091-02, -04, -05 & -08

THIS AGREEMENT is made and entered into this _____ day of _____, 20___, by and between Griffin Residential III, LLC, a Delaware limited liability company ("Owner"), and the City of Redlands, a municipal corporation ("City"). The Owner and the City are sometimes each individually referred to herein as a "Party" and, collectively, as the "Parties."

RECITALS

WHEREAS, the Owner owns real property ("Property") in the City specifically described in Exhibits "A" and "B" which are attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of approval of the Owner's development project commonly known as Heritage and filed as Tract 20257 (the "Project"), the City required the Project to employ on-site control measures to minimize pollutants in urban stormwater runoff; and

WHEREAS, the Owner has chosen to install two Infiltration Basins and Catch Basin Drain Inserts (the "Devices") to minimize pollutants in urban stormwater runoff; specifically described in Exhibit "C" and shown in Exhibit "D" both of which are attached hereto and incorporated herein by this reference; and

WHEREAS, the Devices have been installed in accordance with plans and specifications approved by the City; and

WHEREAS, the Devices being installed on private property and draining only private property, are private facilities with all maintenance or replacement therefor being the sole responsibility of the Owner; and

WHEREAS, the Owner is aware that periodic and continuous maintenance including, but not necessarily limited to, filter material replacement and sediment removal is required to assure proper performance of the Devices and that such maintenance activity will require compliance with all Federal, State and local laws and regulations, including those pertaining to confined space and waste disposal methods in effect at the time such maintenance occurs;

NOW, THEREFORE, in consideration of the City's approval of the Project and the mutual promises contained herein, the City of Redlands and Heritage agree as follows:

AGREEMENT

- 1. The Owner hereby provides the City and its designees with full right of access to the Devices and the Owner's Property in the immediate vicinity of the Devices (a) at any time, upon reasonable notice; or (b) in the event of emergency, as determined by the City Engineer with no advance notice; for the purpose of inspecting, sampling and testing of the Devices, and in cases of emergency, to undertake all necessary repairs or other preventative measures at the Owner's expense as provided for in Section 3, below. The City shall make every effort at all times to minimize or avoid interference with the Owner's use of the Property when undertaking such inspections and repairs.
- 2. The Owner shall diligently maintain the Devices in a manner consistent with the manufacturers' recommended maintenance schedule to ensure efficient performance. All reasonable precautions shall be exercised by the Owner and the Owner's representatives in the removal and extraction of materials from the Devices, and the ultimate disposal of the materials in a manner consistent with all applicable laws. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the materials removed, the quantity and the location of disposal destinations, as appropriate.
- 3. In the event the Owner fails to perform the necessary maintenance required by this Agreement within thirty (30) days of being given written notice by the City to do so, setting forth with specificity the action to be taken, the City is authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by law, twenty (20) days after the Owner's receipt of the notice of expense until paid in full.
- 4. This Agreement affects County of San Bernardino Assessor's Parcel No. 0167-091-02, -04, -05 and -08 shall be recorded in the Official Records of the County of San Bernardino at the expense of the Owner and shall constitute notice to all successors and assigns to the title to the Property of the obligations herein set forth. This Agreement shall also constitute a lien against the Property in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.
- 5. In event any action is commenced to enforce or interpret any of the terms or conditions of this Agreement the prevailing Party shall, in addition to any costs and other relief, be entitled to

the recovery of its reasonable attorneys' fees, including fees for the use of in-house counsel by a Party.

- 6. It is the intent of the Parties that the burdens and benefits herein undertaken shall constitute equitable servitudes that run with the Property and shall be binding upon future owners of all or any portion of the Property. Any owner's liability hereunder shall terminate at the time it ceases to be an owner of the encumbered Property, except for obligations which accrue prior to the date of transfer by such owner, which shall remain the personal obligation of such owner.
- 7. Time is of the essence in the performance of this Agreement.
- 8. Any notice to a Party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A Party may change notice address only by providing written notice thereof to the other Party.

CITY
OWNER
Griffin Residential III, LLC, a Delaware
limited liability company
City of Redlands
P.O. Box 3005
Redlands, CA 92373
OWNER
Griffin Residential III, LLC, a Delaware
limited liability company
Michael Vairin, Authorized Representative
110 North Lincoln Avenue, Suite 100
Corona, CA 92373

- 9. This Agreement shall be governed by and construed in accordance with the laws of the State of California.
- 10. Any amendment to this Agreement shall be in writing and approved by the City Council of City and signed by the City and the Owner.

IN WITNESS WHEREOF, the Parties hereto have affixed their signatures as of the date first written above.

CITY OF REDLANDS:	OWNER:
Paul W. Foster, Mayor	Griffin Residential III, LLC, a Delaware limited liability company Michael Vairin, Authorized Representative
Attest:	
Jeanne Donaldson, City Clerk	

Replace this page with a fully executed Notary Acknowledgment page.



Exhibit "A"
Legal Description



Exhibit "B" Plat Exhibit

(replace this sheet with plat map in pdf file)

Exhibit C Stormwater Pollution Control Devices

	Stormwater Pollution Control Devices							
BMP #	BMP or Pollution Control Device	Latitude	Longitude	Maintenance Provided By	Frequency			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Exhibit D BMP Map



Site Design & Landscape Planning SD-10



Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- Minimize Impervious Land Coverage
 Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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SD-10 Site Design & Landscape Planning

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

Site Design & Landscape Planning SD-10

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

SD-10 Site Design & Landscape Planning

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Rain Garden

Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- Slow Runoff
 Minimize Impervious Land
 Coverage
 Prohibit Dumping of Improper
 Materials
- ✓ Contain Pollutants

 Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain



barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition



Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

Association

California Stormwater Quality

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
 - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
 - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
 - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
 - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Design Objectives

Maximize Infiltration

Provide Retention

Slow Runoff

Minimize Impervious Land Coverage

✓ Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

 Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING –



DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

• Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under "designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

■ Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.
- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Slow Runoff
- ✓ Minimize Impervious Land Coverage Prohibit Dumping of Improper Materials Contain Pollutants Collect and Convey

Description

Pervious paving is used for light vehicle loading in parking areas. The term describes a system comprising a load-bearing, durable surface together with an underlying layered structure that temporarily stores water prior to infiltration or drainage to a controlled outlet. The surface can itself be porous such that water infiltrates across the entire surface of the material (e.g., grass and gravel surfaces, porous concrete and porous asphalt), or can be built up of impermeable blocks separated by spaces and joints, through which the water can drain. This latter system is termed 'permeable' paving. Advantages of pervious pavements is that they reduce runoff volume while providing treatment, and are unobtrusive resulting in a high level of acceptability.

Approach

Attenuation of flow is provided by the storage within the underlying structure or sub base, together with appropriate flow controls. An underlying geotextile may permit groundwater recharge, thus contributing to the restoration of the natural water cycle. Alternatively, where infiltration is inappropriate (e.g., if the groundwater vulnerability is high, or the soil type is unsuitable), the surface can be constructed above an impermeable membrane. The system offers a valuable solution for drainage of spatially constrained urban areas.

Significant attenuation and improvement in water quality can be achieved by permeable pavements, whichever method is used. The surface and subsurface infrastructure can remove both the soluble and fine particulate pollutants that occur within urban runoff. Roof water can be piped into the storage area directly, adding areas from which the flow can be attenuated. Also, within lined systems, there is the opportunity for stored runoff to be piped out for reuse.

Suitable Applications

Residential, commercial and industrial applications are possible. The use of permeable pavement may be restricted in cold regions, arid regions or regions with high wind erosion. There are some specific disadvantages associated with permeable pavement, which are as follows:

 Permeable pavement can become clogged if improperly installed or maintained. However, this is countered by the ease with which small areas of paving can be cleaned or replaced when blocked or damaged.

- Their application should be limited to highways with low traffic volumes, axle loads and speeds (less than 30 mph limit), car parking areas and other lightly trafficked or non-trafficked areas. Permeable surfaces are currently not considered suitable for adoptable roads due to the risks associated with failure on high speed roads, the safety implications of ponding, and disruption arising from reconstruction.
- When using un-lined, infiltration systems, there is some risk of contaminating groundwater, depending on soil conditions and aquifer susceptibility. However, this risk is likely to be small because the areas drained tend to have inherently low pollutant loadings.
- The use of permeable pavement is restricted to gentle slopes.
- Porous block paving has a higher risk of abrasion and damage than solid blocks.

Design Considerations

Designing New Installations

If the grades, subsoils, drainage characteristics, and groundwater conditions are suitable, permeable paving may be substituted for conventional pavement on parking areas, cul de sacs and other areas with light traffic. Slopes should be flat or very gentle. Scottish experience has shown that permeable paving systems can be installed in a wide range of ground conditions, and the flow attenuation performance is excellent even when the systems are lined.

The suitability of a pervious system at a particular pavement site will, however, depend on the loading criteria required of the pavement.

Where the system is to be used for infiltrating drainage waters into the ground, the vulnerability of local groundwater sources to pollution from the site should be low, and the seasonal high water table should be at least 4 feet below the surface.

Ideally, the pervious surface should be horizontal in order to intercept local rainfall at source. On sloping sites, pervious surfaces may be terraced to accommodate differences in levels.

Design Guidelines

The design of each layer of the pavement must be determined by the likely traffic loadings and their required operational life. To provide satisfactory performance, the following criteria should be considered:

- The subgrade should be able to sustain traffic loading without excessive deformation.
- The granular capping and sub-base layers should give sufficient load-bearing to provide an adequate construction platform and base for the overlying pavement layers.
- The pavement materials should not crack of suffer excessive rutting under the influence of traffic. This is controlled by the horizontal tensile stress at the base of these layers.

There is no current structural design method specifically for pervious pavements. Allowances should be considered the following factors in the design and specification of materials:

- Pervious pavements use materials with high permeability and void space. All the current UK
 pavement design methods are based on the use of conventional materials that are dense and
 relatively impermeable. The stiffness of the materials must therefore be assessed.
- Water is present within the construction and can soften and weaken materials, and this must be allowed for.
- Existing design methods assume full friction between layers. Any geotextiles or geomembranes must be carefully specified to minimize loss of friction between layers.
- Porous asphalt loses adhesion and becomes brittle as air passes through the voids. Its durability is therefore lower than conventional materials.

The single sized grading of materials used means that care should be taken to ensure that loss of finer particles between unbound layers does not occur.

Positioning a geotextile near the surface of the pervious construction should enable pollutants to be trapped and retained close to the surface of the construction. This has both advantages and disadvantages. The main disadvantage is that the filtering of sediments and their associated pollutants at this level may hamper percolation of waters and can eventually lead to surface ponding. One advantage is that even if eventual maintenance is required to reinstate infiltration, only a limited amount of the construction needs to be disturbed, since the sub-base below the geotextile is protected. In addition, the pollutant concentration at a high level in the structure allows for its release over time. It is slowly transported in the stormwater to lower levels where chemical and biological processes may be operating to retain or degrade pollutants.

The design should ensure that sufficient void space exists for the storage of sediments to limit the period between remedial works.

- Pervious pavements require a single size grading to give open voids. The choice of materials is therefore a compromise between stiffness, permeability and storage capacity.
- Because the sub-base and capping will be in contact with water for a large part of the time, the strength and durability of the aggregate particles when saturated and subjected to wetting and drying should be assessed.
- A uniformly graded single size material cannot be compacted and is liable to move when construction traffic passes over it. This effect can be reduced by the use of angular crushed rock material with a high surface friction.

In pollution control terms, these layers represent the site of long term chemical and biological pollutant retention and degradation processes. The construction materials should be selected, in addition to their structural strength properties, for their ability to sustain such processes. In general, this means that materials should create neutral or slightly alkaline conditions and they should provide favorable sites for colonization by microbial populations.

Construction/Inspection Considerations

- Permeable surfaces can be laid without cross-falls or longitudinal gradients.
- The blocks should be lain level

- They should not be used for storage of site materials, unless the surface is well protected from deposition of silt and other spillages.
- The pavement should be constructed in a single operation, as one of the last items to be built, on a development site. Landscape development should be completed before pavement construction to avoid contamination by silt or soil from this source.
- Surfaces draining to the pavement should be stabilized before construction of the pavement.
- Inappropriate construction equipment should be kept away from the pavement to prevent damage to the surface, sub-base or sub-grade.

Maintenance Requirements

The maintenance requirements of a pervious surface should be reviewed at the time of design and should be clearly specified. Maintenance is required to prevent clogging of the pervious surface. The factors to be considered when defining maintenance requirements must include:

- Type of use
- Ownership
- Level of trafficking
- The local environment and any contributing catchments

Studies in the UK have shown satisfactory operation of porous pavement systems without maintenance for over 10 years and recent work by Imbe et al. at 9th ICUD, Portland, 2002 describes systems operating for over 20 years without maintenance. However, performance under such regimes could not be guaranteed, Table 1 shows typical recommended maintenance regimes:

Ta	ble 1 Typical Recommended Maintenance Regin	nes
	Activity	Schedule
	Minimize use of salt or grit for de-icing	
	Keep landscaped areas well maintained	Ongoing
•	Prevent soil being washed onto pavement	
	Vacuum clean surface using commercially available sweeping machines at the following times:	
	- End of winter (April)	2/3 x per year
	- Mid-summer (July / August)	
	- After Autumn leaf-fall (November)	
•	Inspect outlets	Annual
=	If routine cleaning does not restore infiltration rates, then reconstruction of part of the whole of a pervious surface may be required.	
	The surface area affected by hydraulic failure should be lifted for inspection of the internal materials to identify the location and extent of the blockage.	As needed (infrequent) Maximum 15-20 years
	Surface materials should be lifted and replaced after brush cleaning. Geotextiles may need complete replacement.	g rysm s
	Sub-surface layers may need cleaning and replacing.	
	Removed silts may need to be disposed of as controlled waste.	

Permeable pavements are up to 25 % cheaper (or at least no more expensive than the traditional forms of pavement construction), when all construction and drainage costs are taken into account. (Accepting that the porous asphalt itself is a more expensive surfacing, the extra cost of which is offset by the savings in underground pipework etc.) (Niemczynowicz, et al., 1987)

Table 1 gives US cost estimates for capital and maintenance costs of porous pavements (Landphair et al., 2000)

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Cost Considerations

Permeable pavements are up to 25 % cheaper (or at least no more expensive than the traditional forms of pavement construction), when all construction and drainage costs are taken into account. (Accepting that the porous asphalt itself is a more expensive surfacing, the extra cost of which is offset by the savings in underground pipework etc.) (Niemczynowicz, et al., 1987)

Table 2 gives US cost estimates for capital and maintenance costs of porous pavements (Landphair et al., 2000)

Engineer's Estimate for Porous Pavement Table 2

					ď	Porous Pavement	avemen	_					
Item	Units	Price	Cycles/ Year	Quant. 1 Acre WS	Total	Quant, 2 Acre WS	Total	Quant.3 Acre WS	Total	Quant, 4 Acre WS	Total	Quant.5 Acre WS	Total
Grading	λS	\$2.00		604	\$1,208	1209	\$2,418	1812	\$3,624	2419	\$4,838	3020	\$6,040
Paving	λS	\$19.00		212	\$4,028	424	\$8,056	989	\$12,084	848	\$16,112	1060	\$20,140
Excavation	CY	\$3.60		201	\$724	403	\$1,451	604	\$2,174	908	\$2,902	1008	\$3,629
Filter Fabric	λS	\$1.15		002	\$805	1400	\$1,610	2000	\$2,300	2800	\$3,220	3600	\$4,140
Stone Fill	λO	\$16.00		201	\$3,216	403	\$6,448	604	\$9,664	908	\$12,896	1008	\$16,128
Sand	CA	\$7.00		100	\$700	200	\$1,400	300	\$2,100	400	\$2,800	200	\$3,500
Sight Well	EA	\$300.00		2	\$600	6	\$900	4	\$1,200	7	\$2,100	7	\$2,100
Seeding	LF	\$0.05		644	\$32	1288	\$64	1932	\$97	2576	\$129	3220	\$161
Check Dam	CY	\$35.00		0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Total Construction Costs	tion Co	sts			\$10,105		\$19,929		\$29,619		\$40,158		\$49,798
Construction Costs Amortized for 20 Years	Costs An	nortized			\$505		\$886		\$1,481		\$2,008		\$2,490
					Annual	Annual Maintenance Expense	ance Ex	pense					
Item	Units	Price	Cycles/ Year	Quant. 1 Acre WS	Total	Quant, 2 Acre WS	Total	Quant.3 Acre WS	Total	Quant, 4 Acre WS	Total	Quant.5 Acre WS	Total
Sweeping	OV	\$250.00	9	1	\$1,500	2	\$3,000	8	\$4,500	4	\$6,000	2	\$7,500
Washing	O∀	\$250.00	9	1	\$1,500	2	\$3,000	8	\$4,500	4	\$6,000	2	\$7,500
Inspection	MH	\$20.00	5	2	\$100	5	\$100	2	\$100	5	\$100	2	\$100
Deep Clean	AC	\$450.00	0.5	-	\$225	2	\$450	3	\$675	3.9	\$878	5	\$1,125
Total Annual Maintenance Expense	Aaintena	nce Expens	95		\$3,960		\$7,792		\$11,651		\$15,483		\$19,370

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Supplemental Information

Other Resources

Abbott C.L. and Comino-Mateos L. 2001. In situ performance monitoring of an infiltration drainage system and field testing of current design procedures. Journal CIWEM, 15(3), pp.198-202.

Construction Industry Research and Information Association (CIRIA). 2002. *Source Control using Constructed Pervious Surfaces C*582, London, SW1P 3AU.

Construction Industry Research and Information Association (CIRIA). 2000. Sustainable urban drainage systems - design manual for Scotland and Northern Ireland Report C521, London, SW1P 3AU.

Construction Industry Research and Information Association (CIRIA). 2000 C522 Sustainable urban drainage systems - design manual for England and Wales, London, SW1P 3AU.

Construction Industry Research and Information Association (CIRIA). *RP448 Manual of good practice for the design, construction and maintenance of infiltration drainage systems for stormwater runoff control and disposal*, London, SW1P 3AU.

Dierkes C., Kuhlmann L., Kandasamy J. & Angelis G. Pollution Retention Capability and Maintenance of Permeable Pavements. *Proc* 9th *International Conference on Urban Drainage, Portland Oregon, September* 2002.

Hart P (2002) Permeable Paving as a Stormwater Source Control System. *Paper presented at Scottish Hydraulics Study Group 14th* Annual seminar, SUDS. 22 March 2002, Glasgow.

Kobayashi M., 1999. Stormwater runoff control in Nagoya City. Proc. 8 th Int. Conf. on

Urban Storm Drainage, Sydney, Australia, pp.825-833.

Landphair, H., McFalls, J., Thompson, D., 2000, Design Methods, Selection, and Cost Effectiveness of Stormwater Quality Structures, Texas Transportation Institute Research Report 1837-1, College Station, Texas.

Legret M, Colandini V, Effects of a porous pavement with reservior strucutre on runoff water:water quality and the fate of heavy metals. Laboratoire Central Des Ponts et Chaussesss

Macdonald K. & Jefferies C. Performance Comparison of Porous Paved and Traditional Car Parks. *Proc. First National Conference on Sustainable Drainage Systems, Coventry June 2001.*

Niemczynowicz J, Hogland W, 1987: Test of porous pavements performed in Lund, Sweden, in Topics in Drainage Hydraulics and Hydrology. BC. Yen (Ed.), pub. Int. Assoc. For Hydraulic Research, pp 19-80.

Pratt C.J. SUSTAINABLE URBAN DRAINAGE – A Review of published material on the performance of various SUDS devices prepared for the UK Environment Agency. Coventry University, UK December 2001.

Pratt C.J., 1995. Infiltration drainage – case studies of UK practice. Project Report

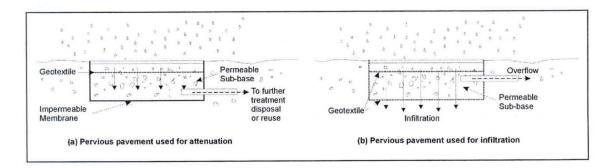
22,Construction Industry Research and Information Association, London, SW1P 3AU; also known as National Rivers Authority R & D Note 485

Pratt. C. J., 1990. Permeable Pavements for Stormwater Quality Enhancement. In: Urban Stormwater Quality Enhancement - Source Control, retrofitting and combined sewer technology, Ed. H.C. Torno, ASCE, ISBN 0872627594, pp. 131-155

Raimbault G., 1997 French Developments in Reservoir Structures Sustainable water resources I the 21st century. Malmo Sweden

Schlüter W. & Jefferies C. Monitoring the outflow from a *Porous Car Park Proc. First National Conference on Sustainable Drainage Systems, Coventry June 2001.*

Wild, T.C., Jefferies, C., and D'Arcy, B.J. SUDS in Scotland – the Scottish SUDS database Report No SR(02)09 *Scotland and Northern Ireland Forum for Environmental Research, Edinburgh.* In preparation August 2002.



Schematics of a Pervious Pavement System



Design Objectives

- ✓ Maximize Infiltration
- ✓ Provide Retention
- ✓ Source Control

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutant

Collect and Convey

Description

Alternative building materials are selected instead of conventional materials for new construction and renovation. These materials reduce potential sources of pollutants in stormwater runoff by eliminating compounds that can leach into runoff, reducing the need for pesticide application, reducing the need for painting and other maintenance, or by reducing the volume of runoff.

Approach

Alternative building materials are available for use as lumber for decking, roofing materials, home siding, and paving for driveways, decks, and sidewalks.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations *Designing New Installations*

Decking

One of the most common materials for construction of decks and other outdoor construction has traditionally been pressure treated wood, which is now being phased out. The standard treatment is called CCA, for chromated copper arsenate. The key ingredients are arsenic (which kills termites, carpenter ants and other insects), copper (which kills the fungi that cause wood to rot) and chromium (which reacts with the other ingredients to bind them to the wood). The amount of arsenic is far from trivial. A deck just 8 feet x 10 feet contains more than 1 1/3 pounds of this highly potent poison. Replacement materials include a new type of pressure treated wood, plastic and composite lumber.

There are currently over 20 products in the market consisting of plastic or plastic-wood composites. Plastic lumber is made from 100% recycled plastic, # 2 HDPE and polyethylene plastic milk jugs

California

Stormwater

Quality

Association

SD-21 Alternative Building Materials

and soap bottles. Plastic-wood composites are a combination of plastic and wood fibers or sawdust. These materials are a long lasting exterior weather, insect, and chemical resistant wood lumber replacement for non structural applications. Use it for decks, docks, raised garden beds and planter boxes, pallets, hand railings, outdoor furniture, animal pens, boat decks, etc.

New pressure treated wood uses a much safer recipe, ACQ, which stands for ammoniacal copper quartenary. It contains no arsenic and no chromium. Yet the American Wood Preservers Association has found it to be just as effective as the standard formula. ACQ is common in Japan and Europe.

Roofing

Several studies have indicated that metal used as roofing material, flashing, or gutters can leach metals into the environment. The leaching occurs because rainfall is slightly acidic and slowly dissolved the exposed metals. Common traditional applications include copper sheathing and galvanized (zinc) gutters.

Coated metal products are available for both roofing and gutter applications. These products eliminate contact of bare metal with rainfall, eliminating one source of metals in runoff. There are also roofing materials made of recycled rubber and plastic that resemble traditional materials.

A less traditional approach is the use of green roofs. These roofs are not just green, they're alive. Planted with grasses and succulents, low- profile green roofs reduce the urban heat island effect, stormwater runoff, and cooling costs, while providing wildlife habitat and a connection to nature for building occupants. These roofs are widely used on industrial facilities in Europe and have been established as experimental installations in several locations in the US, including Portland, Oregon. Their feasibility is questionable in areas of California with prolonged, dry, hot weather.

Paved Areas

Traditionally, concrete is used for construction of patios, sidewalks, and driveways. Although it is non-toxic, these paved areas reduce stormwater infiltration and increase the volume and rate of runoff. This increase in the amount of runoff is the leading cause of stream channel degradation in urban areas.

There are a number of alternative materials that can be used in these applications, including porous concrete and asphalt, modular blocks, and crushed granite. These materials, especially modular paving blocks, are widely available and a well established method to reduce stormwater runoff.

Building Siding

Wood siding is commonly used on the exterior of residential construction. This material weathers fairly rapidly and requires repeated painting to prevent rotting. Alternative "new" products for this application include cement-fiber and vinyl. Cement-fiber siding is a masonry product made from Portland cement, sand, and cellulose and will not burn, cup, swell, or shrink.

Pesticide Reduction

A common use of powerful pesticides is for the control of termites. Chlordane was used for many years for this purpose and is now found in urban streams and lakes nationwide. There are a

number of physical barriers that can be installed during construction to help reduce the use of pesticides.

Sand barriers for subterranean termites are a physical deterrent because the termites cannot tunnel through it. Sand barriers can be applied in crawl spaces under pier and beam foundations, under slab foundations, and between the foundation and concrete porches, terraces, patios and steps. Other possible locations include under fence posts, underground electrical cables, water and gas lines, telephone and electrical poles, inside hollow tile cells and against retaining walls.

Metal termite shields are physical barriers to termites which prevent them from building invisible tunnels. In reality, metal shields function as a helpful termite detection device, forcing them to build tunnels on the outside of the shields which are easily seen. Metal termite shields also help prevent dampness from wicking to adjoining wood members which can result in rot, thus making the material more attractive to termites and other pests. Metal flashing and metal plates can also be used as a barrier between piers and beams of structures such as decks, which are particularly vulnerable to termite attack.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

There are no good, independent, comprehensive sources of information on alternative building materials for use in minimizing the impacts of stormwater runoff. Most websites or other references to "green" or "alternative" building materials focus on indoor applications, such as formaldehyde free plywood and low VOC paints, carpets, and pads. Some supplemental information on alternative materials is available from the manufacturers.

Fires are a source of concern in many areas of California. Information on the flammability of alternative decking materials is available from the University of California Forest Product Laboratory (UCFPL) website at: http://www.ucfpl.ucop.edu/WDDeckIntro.htm



Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff. Infiltration facilities store runoff until it gradually exfiltrates through the soil and eventually into the water table. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems. Infiltration basins can be challenging to apply on many sites, however, because of soils requirements. In addition, some studies have shown relatively high failure rates compared with other management practices.

California Experience

Infiltration basins have a long history of use in California, especially in the Central Valley. Basins located in Fresno were among those initially evaluated in the National Urban Runoff Program and were found to be effective at reducing the volume of runoff, while posing little long-term threat to groundwater quality (EPA, 1983; Schroeder, 1995). Proper siting of these devices is crucial as underscored by the experience of Caltrans in siting two basins in Southern California. The basin with marginal separation from groundwater and soil permeability failed immediately and could never be rehabilitated.

Advantages

- Provides 100% reduction in the load discharged to surface waters.
- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a

Targeted Constituents

- ✓ Sediment
- Nutrients
- Trash
- ✓ Metals
- ✓ Bacteria
- Oil and Grease
- ✓ Organics

Legend (Removal Effectiveness)

- Low
- High
- ▲ Medium



significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.

■ If the water quality volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

Limitations

- May not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration basins once clogged.

Design and Sizing Guidelines

- Water quality volume determined by local requirements or sized so that 85% of the annual runoff volume is captured.
- Basin sized so that the entire water quality volume is infiltrated within 48 hours.
- Vegetation establishment on the basin floor may help reduce the clogging rate.

Construction/Inspection Considerations

- Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabilized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete.
- Place excavated material such that it can not be washed back into the basin if a storm occurs during construction of the facility.
- Build the basin without driving heavy equipment over the infiltration surface. Any
 equipment driven on the surface should have extra-wide ("low pressure") tires. Prior to any
 construction, rope off the infiltration area to stop entrance by unwanted equipment.
- After final grading, till the infiltration surface deeply.
- Use appropriate erosion control seed mix for the specific project and location.

Performance

As water migrates through porous soil and rock, pollutant attenuation mechanisms include precipitation, sorption, physical filtration, and bacterial degradation. If functioning properly, this approach is presumed to have high removal efficiencies for particulate pollutants and moderate removal of soluble pollutants. Actual pollutant removal in the subsurface would be expected to vary depending upon site-specific soil types. This technology eliminates discharge to surface waters except for the very largest storms; consequently, complete removal of all stormwater constituents can be assumed.

There remain some concerns about the potential for groundwater contamination despite the findings of the NURP and Nightingale (1975; 1987a,b,c; 1989). For instance, a report by Pitt et al. (1994) highlighted the potential for groundwater contamination from intentional and unintentional stormwater infiltration. That report recommends that infiltration facilities not be sited in areas where high concentrations are present or where there is a potential for spills of toxic material. Conversely, Schroeder (1995) reported that there was no evidence of groundwater impacts from an infiltration basin serving a large industrial catchment in Fresno, CA.

Siting Criteria

The key element in siting infiltration basins is identifying sites with appropriate soil and hydrogeologic properties, which is critical for long term performance. In one study conducted in Prince George's County, Maryland (Galli, 1992), all of the infiltration basins investigated clogged within 2 years. It is believed that these failures were for the most part due to allowing infiltration at sites with rates of less than 0.5 in/hr, basing siting on soil type rather than field infiltration tests, and poor construction practices that resulted in soil compaction of the basin invert.

A study of 23 infiltration basins in the Pacific Northwest showed better long-term performance in an area with highly permeable soils (Hilding, 1996). In this study, few of the infiltration basins had failed after 10 years. Consequently, the following guidelines for identifying appropriate soil and subsurface conditions should be rigorously adhered to.

- Determine soil type (consider RCS soil type 'A, B or C' only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30% clay or more than 40% of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.
- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.
- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15% should not be considered.
- Ensure that adequate head is available to operate flow splitter structures (to allow the basin
 to be offline) without ponding in the splitter structure or creating backwater upstream of the
 splitter.

Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.
- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.
- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.
- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Additional Design Guidelines

- (1) Basin Sizing The required water quality volume is determined by local regulations or sufficient to capture 85% of the annual runoff.
- (2) Provide pretreatment if sediment loading is a maintenance concern for the basin.
- (3) Include energy dissipation in the inlet design for the basins. Avoid designs that include a permanent pool to reduce opportunity for standing water and associated vector problems.
- (4) Basin invert area should be determined by the equation:

$$A = \frac{WQV}{kt}$$

where A = Basin invert area (m²)

WQV = water quality volume (m³)

k = 0.5 times the lowest field-measured hydraulic conductivity (m/hr)

t = drawdown time (48 hr)

(5) The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).

Maintenance

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Inspections and maintenance to ensure.
- Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time has been obtained.
- Schedule semiannual inspections for beginning and end of the wet season to identify
 potential problems such as erosion of the basin side slopes and invert, standing water, trash
 and debris, and sediment accumulation.
- Remove accumulated trash and debris in the basin at the start and end of the wet season.
- Inspect for standing water at the end of the wet season.
- Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin.
- If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.
- To avoid reversing soil development, scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a very light tractor.

Cost

Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. One study estimated the total construction cost at about \$2 per ft (adjusted for inflation) of storage for a 0.25-acre basin (SWRPC, 1991). As with other BMPs, these published cost estimates may deviate greatly from what might be incurred at a specific site. For instance, Caltrans spent about \$18/ft³ for the two infiltration basins constructed in southern California, each of which had a water quality volume of about 0.34 ac.-ft. Much of the higher cost can be attributed to changes in the storm drain system necessary to route the runoff to the basin locations.

Infiltration basins typically consume about 2 to 3% of the site draining to them, which is relatively small. Additional space may be required for buffer, landscaping, access road, and fencing. Maintenance costs are estimated at 5 to 10% of construction costs.

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly maintained, infiltration basins have a high failure rate. Thus, it may be necessary to replace the basin with a different technology after a relatively short period of time.

References and Sources of Additional Information

Caltrans, 2002, BMP Retrofit Pilot Program Proposed Final Report, Rpt. CTSW-RT-01-050, California Dept. of Transportation, Sacramento, CA.

Galli, J. 1992. *Analysis of Urban BMP Performance and Longevity in Prince George's County, Maryland*. Metropolitan Washington Council of Governments, Washington, DC.

Hilding, K. 1996. Longevity of infiltration basins assessed in Puget Sound. *Watershed Protection Techniques* 1(3):124–125.

Maryland Department of the Environment (MDE). 2000. *Maryland Stormwater Design Manual*. http://www.mde.state.md.us/environment/wma/stormwatermanual. Accessed May 22, 2002.

Nightingale, H.I., 1975, "Lead, Zinc, and Copper in Soils of Urban Storm-Runoff Retention Basins," American Water Works Assoc. Journal. Vol. 67, p. 443-446.

Nightingale, H.I., 1987a, "Water Quality beneath Urban Runoff Water Management Basins," Water Resources Bulletin, Vol. 23, p. 197-205.

Nightingale, H.I., 1987b, "Accumulation of As, Ni, Cu, and Pb in Retention and Recharge Basin Soils from Urban Runoff," Water Resources Bulletin, Vol. 23, p. 663-672.

Nightingale, H.I., 1987c, "Organic Pollutants in Soils of Retention/Recharge Basins Receiving Urban Runoff Water," Soil Science Vol. 148, pp. 39-45.

Nightingale, H.I., Harrison, D., and Salo, J.E., 1985, "An Evaluation Technique for Groundwater Quality Beneath Urban Runoff Retention and Percolation Basins," Ground Water Monitoring Review, Vol. 5, No. 1, pp. 43-50.

Oberts, G. 1994. Performance of Stormwater Ponds and Wetlands in Winter. *Watershed Protection Techniques* 1(2): 64–68.

Pitt, R., et al. 1994, *Potential Groundwater Contamination from Intentional and Nonintentional Stormwater Infiltration*, EPA/600/R-94/051, Risk Reduction Engineering Laboratory, U.S. EPA, Cincinnati, OH.

Schueler, T. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs*. Metropolitan Washington Council of Governments, Washington, DC.

Schroeder, R.A., 1995, Potential For Chemical Transport Beneath a Storm-Runoff Recharge (Retention) Basin for an Industrial Catchment in Fresno, CA, USGS Water-Resource Investigations Report 93-4140.

Southeastern Wisconsin Regional Planning Commission (SWRPC). 1991. *Costs of Urban Nonpoint Source Water Pollution Control Measures*. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI.

U.S. EPA, 1983, *Results of the Nationwide Urban Runoff Program: Volume 1 – Final Report*, WH-554, Water Planning Division, Washington, DC.

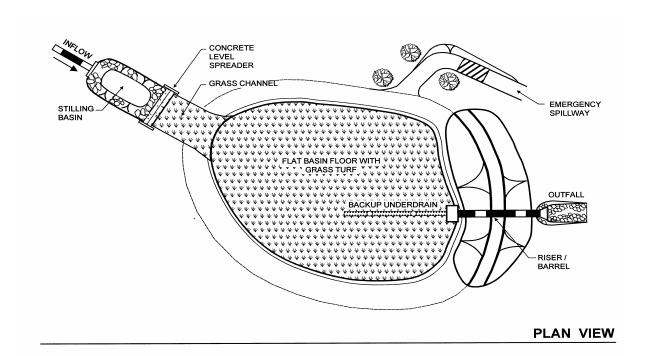
Watershed Management Institute (WMI). 1997. *Operation, Maintenance, and Management of Stormwater Management Systems*. Prepared for U.S. Environmental Protection Agency Office of Water, Washington, DC.

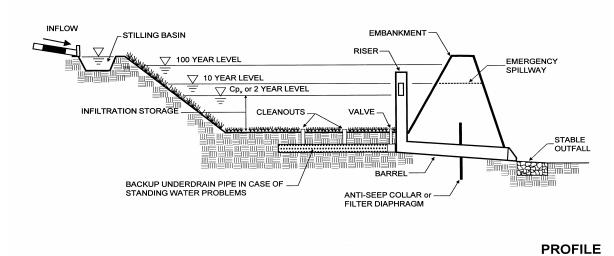
Information Resources

Center for Watershed Protection (CWP). 1997. *Stormwater BMP Design Supplement for Cold Climates*. Prepared for U.S. Environmental Protection Agency Office of Wetlands, Oceans and Watersheds. Washington, DC.

Ferguson, B.K., 1994. Stormwater Infiltration. CRC Press, Ann Arbor, MI.

USEPA. 1993. *Guidance to Specify Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA-840-B-92-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC.





Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer's guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.



one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than \$100 to about \$2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998

Drain Inserts MP-52

Woodward Clyde, June 11, 1996, Parking Lot Monitoring Report, Santa Clara Valley Nonpoint Source Pollution Control Program.





FLOGARD+PLUS® CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide





SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an onsite evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

- 1. For areas with a definite rainy season: Prior to, during and following the rainy season.
- 2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
- 3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
- 4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

- 1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
- 2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts.)
- 3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
- 4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary and the pouch tethers re-attached to the liner's D-ring. See below.
- 5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS® CATCH BASIN INSERT FILTER

OUR MARKETS











WATER





PRESORTED STANDARD U.S. POSTAGE SACRAMENTO, CA PERMIT# 000

PAID

San Bernardino County Stormwater Program

825 East Third Street · Room 127 San Bernardino, CA 94215-0835



Pollution Prevention

CARPET CLEANING ACTIVITIES



Pollution Prevention

Stormwater Management Practices for Carpet Cleaning Activities

These guidelines apply even if the cleaning products are labeled "nontoxic" or "biodegradable". Although these products may be less harmful to the environment, they can still have harmful effects if they enter the storm drain untreated.

Toxic chemicals and discharged waste water from carpet, drapery, furniture and window cleaning often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

Dispose of Wastewater Properly

Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer system within sanitary sewer discharge limits, hauled off and disposed of properly, or may be discharged to a pervious area, for example, a lawn area, as long as it does not overflow into the street, gutter, parking lot or storm drain. Wastewater should never be discharged into a street, gutter, parking lot or storm drain.

Filter Wastewater

Carpet cleaning wastewater should be filtered before discharging it to the sanitary sewer since fibers and other debris in the wastewater can clog pipes. The filtered material can be disposed of in the garbage, provided that the waste is not contaminated with hazardous pollutants.

To report illegal dumping call (877) WASTE18 or visit our website: sbcountystormwater.org





WASH YOUR CAR THE **ECO-FRIENDLY WAY!**

When possible, wash in a professional car wash.

Locate the nearest storm drain and ensure that wash water does not flow into it.



- Wash in a contained area or on grass*, gravel or other permeable surface. Dispose of excess soapy water into the sanitary sewer (ie. sink or toilet) or onto grass.
- Use eco-friendly cleaning products (non-toxic, phosphate free or biodegradable). Use as little soap as possible and wipe brake dust off tires with a rag before washing.
- Conserve water by using a high pressure hose and turn off the water when not in use.

*Some local ordinances may not allow a car to be parked on the front lawn. Check with your City's Building and Code department if you are unsure.

How Does Eco Car Washing Help Local Waterways?

When excess wash water travels through the street it has the potential to pick up oil, grease and other chemicals along the way before it ends up in the curb, gutter and the storm drain system. This contaminated water then travels to our creeks and the Santa Ana River making it unsafe for people and wildlife.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org To find a Hazardous Waste Facility, call (800) OILY CAT

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Cuando sea posible, lávelo en un lavadero profesional de autos.

Ubique el desagüe pluvial más cercano y asegúrese de que nada pueda entrar en él o que pueda descargarse allí.



- Lave su auto sobre el cesped, grava u otras superficies permeables. Elimine el exceso de agua jabonosa en un drenaje sanitario (por ejemplo, lavamanos o inodoro) o en el césped.
- **Use** productos de limpieza ecológicos (no tóxicos, sin fosfato o biodegradables). Use la menor cantidad de jabón posible y limpie el polvo de frenos de los neumáticos con un trapo antes de lavar.
- Conserve agua usando una manguera de alta presión y cierre el agua cuando no la use.

* Es posible que algunas ordenanzas locales no permitan estacionar sobre el césped en el frente de la casa. Consulte con el departamento de Código Urbano y Edificación de su ciudad si no está seguro.

¿De qué Manera el Lavado de Autos Ecológico Ayuda a Proteger los Canales Fluviales Locales?

Cuando el exceso de agua de lavado viaja por la calle, es posible que recoja aceite, grasa y otros elementos guímicos en el camino antes de que llegue en el desagüe pluvial y el sistema de la boca de tormenta. Esa agua contaminada luego viaja hacia nuestros arroyos y al Río Santa Ana, haciendo que sea inseguro para la gente y los animales.



Para reportar actividades ilegales, llame a (877) WASTE18 o visite sbcountystormwater.org. Para encontrar un establecimiento de Desechos Peligrosos, llame al (800) OILY CAT

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Pool Discharge Tips Maintain your pool properly and help protect the environment

DID YOU KNOW?

Routine swimming pool maintenance generates a variety of wastes such as cleaning wastewater, filter back-wash residues, biocides and acid washes that can contribute to stormwater pollution. Chlorine and other pool chemicals can harm our waterways when they are discharged improperly.



Share these good housekeeping practices with your pool service personnel to keep pollutants out of our waterways:

HOLD IT BEFORE YOU DRAIN IT.

- De-chlorinate the water before draining the pool to the storm drain.
- Consult with your pool contractor before de-chlorinating the pool to learn about your options.

IMPORTANT:

- Dispose of filter backwash solids in the trash or landscape area.
- Neutralize acid washes before discharging to the sewer. Do not discharge to the storm drain.

SHUT:

Shut off the chlorination system or stop adding chlorine.

HOLD:

Hold the water in the pool for at least 5 days or add a de-chlorinating agent.

TEST:

Use a pool testing kit to ensure the level of chlorine is at 0.1ppm before discharging the water.

- Make sure all debris is removed and chemicals are dissipated.
- pH of pool water should be between 6.5 and 8.5 before discharging.
- Make sure the water is free of any discoloration, mosquitoes, dirt or algae.

DRAIN:

Check with your city for local requirements before discharging your pool to the storm drain or sewer.

- **Alternative 1:** Sanitary Sewer Some cities allow pools to be drained to the sanitary sewer during non-peak hours.
- Alternative 2: Lawn or Garden Discharge the pool water through the lawn or garden. The flow should be controlled to prevent erosion problems or the water entering a neighbor's property.
- For Saltwater Pools: Saltwater pools should only be drained to the sewer or hauled away.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org facebook.com/sbcountystormwater

Consejos para Vaciar su Piscina

Conserve su piscina en

buen estado y ayude a proteger el medio ambiente

Sabía que...?

El mantenimiento de la piscina genera desechos, como las aguas residuales de limpieza, los residuos del agua estancada de los filtros y los lavados al ácido y otros químicos, que pueden contribuir a la contaminación de las aguas en las alcantarillas. El cloro y otros productos químicos para piscinas pueden dañar el medio ambiente cuando se desechan de manera inadecuada.



Comparta estas buenas prácticas de limpieza con su personal de servicio de piscinas para mantener las alcantarillas libres de contaminantes:

ESPERE ANTES DE VACIAR

- Debe eliminar el cloro del agua antes de vaciar la piscina en las alcantarillas.
- Consulte con su contratista de piscina para obtener más información sobre sus opciones.

CORTAR:

Corte el sistema de cloración o deje de agregar cloro.

CONSERVAR:

Conserve el agua en la piscina 5 días o agregue un agente de descloración.

PROBAR:

Utilice un equipo de pruebas para piscinas con el fin de asegurar que el nivel de cloro esté en 0.1ppm antes de vaciar el agua.

- Asegúrese de retirar todos los desechos y disipar los químicos.
- El pH del agua de la piscina debe estar entre 6.5 y 8.5 antes del vaciado.
- Asegúrese de que el agua no contenga contaminacion, zancudos, suciedad o algas.

IMPORTANTE:

- Deseche los sólidos del agua estancada de los filtros en la basura o en el jardín.
- Neutralice los lavados al ácido antes de vaciarlos en la alcantarilla. No deseche nada contaminante en las alcantarillas.

VACIAR:

Verifique los requisitos locales de su ciudad antes de vaciar su piscina en el desagüe de las alcantarillas.

- **Alternativa 1:** Drenaje Sanitario Algunas ciudades permiten que las piscinas se vacíen en el drenaje sanitario.
- Alternativa 2: Césped o Jardín Vacíe el agua de la piscina en el césped o
 jardín. Se debe controlar la corriente de agua para evitar problemas de erosión
 o que el agua entre en la propiedad del vecino.
- Para las Piscinas de Agua Salada: Estas piscinas solo se deben ser vaciados en la alcantarilla o se debe transportar el agua y los residuos a algún lugar adecuado.



Para reportar desechos ilegales, comuníquese al (877) WASTE18 o visite sbcountystormwater.org facebook.com/sbcountystormwater

WISHFUL THINKING...



UNTIL THIS IS A REALITY, PLEASE PICK UP AFTER YOUR PET.



sbcountystormwater.org or (877) WASTE18

MOBILE VEHICLE CLEANING & MAINTENANCE

DISCHARGE INTO THE STORM DRAIN, **ACCIDENTAL OR NOT,**CAN LEAD TO ENFORCEMENT ACTIONS, WHICH CAN INCLUDE FINES.

These best management practices will help you prevent polluted water and other materials from flowing into the street, gutter and storm drain.

WASH WATER DISPOSAL



HAZARDOUS WASTE SPILL CLEAN-UP & DISPOSAL





- When washing items contaminated by hazardous materials, wash water should be collected and hauled off-site for proper disposal.
- Wash in customers wash bay or pump wastewater to the wash bays' pretreatment system.
- Engine cleaning must be performed at a facility that has the equipment to properly process the contaminated wash water runoff.

- If a spill occurs, use an absorbent material such as kitty litter or absorbent pads.
- Clean up the excess. Properly dispose of absorbent material used to clean up spills contact an approved hauler for assistance/disposal. Sweep work area thoroughly after cleaning.
- Keep toxics out of the trash by disposing of them properly, this includes absorbent materials used to clean up toxic waste spills. Toxic materials may include used motor oil and oil filters, antifreeze, batteries and gasoline. Make sure to maintain hauling records for all hazardous waste.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org To report toxic spills call (800) 33 TOXIC To dispose of hazardous waste, call the CUPA Program (909) 386-8401

sbcountystormwater.org

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■ Regulatory information

The Federal Water Pollution Control Act prohibits the discharge of any pollutant to navigable waters from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 passage of the Water Quality Act established NPDES permit requirements for discharges of storm water. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

Industrial facilities and construction sites are regulated by the Regional Water Quality Control Board and State Water Resources Control Board, through general storm water permits. Most industrial, manufacturing or transportation businesses that store materials, products or equipment outdoors, or conduct vehicle washing or process operations outdoors are required to obtain coverage under the State Water Resources Control Board's General Industrial Activities Stormwater Permit. For more information about this permit, visit www.swrcb.ca.gov/stormwtr/industrial.html or contact your local storm water coordinator.

If your business conducts construction activities, including clearing, grading, stockpiling or excavation that results in soil disturbances of at least one acre, you are subject to the State Water Resources Control Board's General Construction Activities Stormwater Permit. To find out more about this storm water permit for construction, visit: www.swrcb.ca.gov/stormwtr/construction.html.

Cities and counties are regulated through permits issued by the Regional Boards. Since 1990, operators of large storm drain systems such as San Bernardino County's have been required to:

- Develop a storm water management program designed to prevent harmful pollutants from being dumped or washed by storm water runoff, into the storm water system, then discharged into local water bodies; and
- Obtain a National Pollutant Discharge Elimination System (NPDES) permit.

The NPDES permit programs in California are administered by the State Water Resources Control Board and by nine regional boards that issue NPDES permits and enforce regulations within their respective region.

San Bernardino County lies within the jurisdiction of the Santa Ana Region. This regional board issues a permit to the San Bernardino County Permittees, which includes the County of San Bernardino, San Bernardino County Flood Control District and incorporated cities of San Bernardino County. Since the program's inception, the County of San Bernardino has served as the principal permittee.

Documents & reports:

The following documents describe the regulations and programs for water quality in San Bernardino County. You can review the latest Basin Plan, National Pollutant Discharge Elimination System (NPDES) Permit and Drainage Area Management Plan (DAMP).

Basin Plans: The document for each region of the State Water Quality
Board's jurisdiction, including Santa Ana, is the Water Quality Control
Plan, commonly referred to as the Basin Plan. It is the foundation for the
regulatory programs of each regional board. The Basin Plan documents
the beneficial uses of the region's ground and surface waters, existing
water quality conditions, problems, and goals, and actions by the
regional board and others that are necessary to achieve and maintain
water quality standards.

▶Water Control Plan for the Santa Ana River Basin

- Municipal National Pollutant Discharge Elimination System (NPDES) Permits: The
 permits of each region outline additional steps for a storm water
 management program and specify requirements to help protect the
 beneficial uses of the receiving waters. They require permittees to
 develop and implement Best Management Practices (BMPs) to
 control/reduce the discharge of pollutants to waters of the United
 States to the maximum extent practicable (MEP).
 - Santa Ana Regional Water Quality Control Board Municipal NPDES Permit Order No. R8-2002-0012
- Report of Waste Discharge: The Report of Waste Discharge (ROWD)
 describes the San Bernardino Stormwater Program, implemented by the
 County and cities to comply with their jointly held stormwater permit. It
 is the principle policy and guidance document for the NPDES Stormwater
 Program.
 - ▶ Report of Waste Discharge 2000
- San Bernardino County Storm Water Program Annual Status Report: The Annual Status Report is a requirement of the NPDES permit for submittal to the Regional Boards and United States Environmental Protection Agency. The report presents an analysis and assessment of permit compliance activities.
- ►Annual report will be posted soon

For more information about how you can prevent stormwater pollution: www.sbcountystormwater.org

IT'S A WIN WIN FOR A FREE RAIN BARREL

Be part of the solution and join the great give away!

Sign up for San Bernardino County Stormwater's e-newsletter for a chance to win this FREE rain barrel (estimated value: \$125 dollars).

Note: we will not share, sell or otherwise distribute email addresses to other organizations or companies.

EVERY DROP COUNTS!

Safely capture rainwater on your property and then reuse it for your home's irrigation. Join others in saving on water expenses and preserving our local waterways.



For more information about current campaigns visit sbcountystormwater.org/dog

🚮 facebook.com/sbcountystormwater

PICK UP After Your Pet! Protect the health of your pet and the environment

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San Bernardino County Stormwater Program



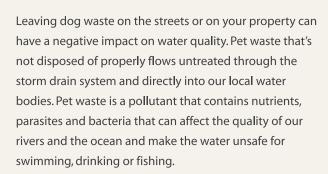
WHY IT MATTERS



PROTECT YOUR FAMILY AND YOUR PET

- Dog waste can infect children and adults with disease-causing bacteria and parasites.
- Your dog can get infected from the waste of other dogs.

PROTECT OUR ENVIRONMENT



BAG IT AND TRASH IT

It's that simple to protect our health and the environment!



- Keep a supply of bags near your dog leash or tie them to the leash
- Use a poop scooper
- Bring several plastic bags with you
- Reuse plastic grocery bags or purchase special doggie waste bags at pet supplies stores
- » Make sure your pet's waste gets into a trash can

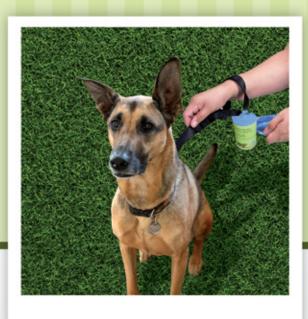
Encourage your neighbors and other pet owners to do the right thing and pick up after their pets.











¡RECOJA los desechos de sus mascotas!

Proteja la salud de su mascota y el medio ambiente

Si desea más información, visite sbcountystormwater.org/dog

facebook.com/sbcountystormwater

San Bernardino County Stormwater Program



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POR QUÉ ES IMPORTANTE



PROTEJA A SU FAMILIA Y A SU MASCOTA

- Los desechos de los perros pueden infectar a niños y adultos con enfermedades causadas por bacterias y parásitos.
- Su perro puede contraer una infección de los desechos de otros perros.

PROTEJA EL MEDIO AMBIENTE



Dejar desechos de perros en la calle o en su propiedad puede tener un impacto negativo en la calidad del agua. Los desechos de mascotas que no se eliminan de la propiedad fluyen sin tratamiento por el sistema de drenaje de tormentas y llegan directamente a las masas de agua locales. Los desechos de mascotas son agentes contaminantes que contienen nutrientes, parásitos y bacterias que pueden afectar la calidad de nuestros ríos y océanos, y hacer que el agua no sea segura para nadar, beber o pescar.

COLÓQUELA EN UNA BOLSA Y TÍRELA EN LA BASURA

Así de simple es proteger nuestra salud y el medio ambiente.



- Guarde algunas bolsas cerca de la correa de su perro o átelas a la correa;
- Use una cuchara para recojer el desecho;
- » Lleve varias bolsas plásticas;
- Reutilice bolsas plásticas de comestibles o compre bolsas especiales para desechos de perros en las tiendas para mascotas;
- Asegúrese de tirar los desechos de su perro en un cesto de basura.

Aliente a sus vecinos y otros dueños de mascotas a hacer lo correcto y levantar los desechos de sus mascotas.









WE DID IT OURSELVES AND WE DID IT RIGHT

When painting your home, protect your family and community.

- PAINTS that are water-based are less toxic and should be used whenever possible.
- BRUSHES with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- SAFELY dispose of unwanted paint. The County of San Bernardino offers 9 HHW Centers that accept paint and other toxic waste FREE of charge.

To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org





Cuando pinte su casa, proteja a su familia y a su comunidad.

- PINTURAS a base de agua son menos tóxicas y debe de utilizarlas cuando sea posible.
- BROCHAS a base de agua deben ser lavadas en el lavabo. Esas con pintura a base de aceite deben ser limpiadas con disolvente.
- SANAMENTE deshágase de la pintura que no necesita. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pintura y otros desechos tóxicos GRATUITAMENTE.

Para reportar actividades ilegales llamar al (877) WASTE18 o visite sbcountystormwater.org



WE DID IT OURSELVES AND WE DID IT RIGHT



When painting your home, protect your family and community.

- ▶ PAINTS that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
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LO HICIMOS NOSOTROS MISMOS Y LO HICIMOS BIEN



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WE DID IT OURSELVES
AND WE DID IT RIGHT



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Pinte De Manera



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LO HICIMOS NOSOTROS MISMOS
Y LO HICIMOS BIEN



Para reportar actividades ilegales llamar al (877) WASTE18 o visite sbcountystormwater.org



■ Mobile vehicle maintenance

Wash in a designated area that has been bermed up to contain the wash water.

Common water control devices are: recycling systems; pretreatment or sewer discharge systems; limited recycling systems; wash pits(portable vinyl wash pads), vacuum sludge filtering systems; wet-dry vacuums, sump pumps; drain covers; portable dams; vacubrooms; oil absorbent pads, booms, pillows, and tubes; plastic sheeting; filter tubs; buckets; pans; and squeegees.

When cleaning engines using chemical additives like soaps, solvents or degreasers, the cleaning must be performed at a facility that has the equipment to properly process the contaminated wastewater runoff, or using a leak-proof ground cover device that will catch and contain all contaminated wastewater runoff for later disposal in a manner that complies with city, county, state and federal codes.

Wastewater from cleaning equipment must be discharged into a sink, toilet, or other drain connected to the sanitary sewer

LANDSCAPE MAINTENANCE

DISCHARGE TO THE STORM DRAIN, **ACCIDENTAL OR NOT**, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to prevent water pollution from landscaping activities.

RECYCLE YARD WASTE



- Recycle leaves, grass clippings and other yard waste.
- Do not blow, sweep, rake or hose yard waste into the street or catch basin.
- Try grasscycling: the natural recycling of grass by leaving clippings on the lawn when mowing.

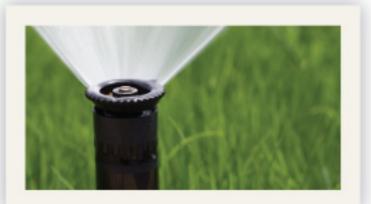
For more information, please visit: www.calrecycle.ca.gov/organics /grasscycling

USE FERTILIZERS, HERBICIDES AND PESTICIDES SAFELY



- Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural and non-toxic alternatives as often as possible.
- If you must use chemical fertilizers, herbicides or pesticides:
 - Spot apply, rather than blanketing entire areas.
 - Avoid applying near curbs and driveways, and never before a rain.
 - Apply fertilizers as needed: when plants could best use it and when the potential runoff would be low.
 - Follow the manufacturer's instructions carefully—this will not only give the best results, but will save money.

USE WATER WISELY



- Control the amount of water and direction of sprinklers. Sprinklers should only be on long enough to allow water to soak into the ground, but not so long as to cause runoff.
- Periodically inspect, fix leaks and realign sprinkler heads.
- Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.



HOMEOWNERS

KEEP THESE TIPS IN MIND WHEN HIRING PROFESSIONAL LANDSCAPERS AND REMIND AS NECESSARY.



Leftover pesticides, fertilizers, and herbicides contaminate landfills and should be disposed of through a Hazardous Waste Facility. For more information on proper disposal call,

(909) 382-5401 or 1-800-0ILY CAT.

*FREE for San Bernardino County residents only. Businesses can call for cost inquiries and to schedule an appointment.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org To report toxic spills, call 1(800) 33 TOXIC
To dispose of hazardous waste, call 1(800) OILY CAT

sbcountystormwater.org

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MANTENIMIENTO DE JARDINERÍA

LAS DESCARGAS A LOS DESAGUES PLUVIALES, DE MANERA ACCIDENTAL O NO, PUEDEN INDUCIR A LA APLICACIÓN DE MULTAS Y OTRAS MEDIDAS.

Siga las mejores prácticas descritas debajo para evitar la contaminación del agua por actividades de jardinería.

RECICLAJE DE LOS DESECHOS DE JARDÍN



- Reciclar las hojas, recortes de césped y otros desechos de jardín.
- No soplar, barrer, o usar la manguera para empujar los desechos de jardín a la calle.
- Poner a prueba el reciclaje de césped (grasscycling): la manera natural de reciclar el césped dejando los recortes sobre el césped cuando son cortados. Para más información, visite la página web:

www.calrecycle.ca.gov/organics/grasscy cling

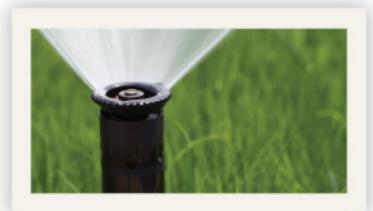
USAR FERTILIZANTES, HERBICIDAS Y PESTICIDAS DE MANERA SEGURA



- Los fertilizantes, herbicidas y pesticidas son arrastrados con frecuencia hacia el sistema de desagüe pluvial mediante el escurrimiento de los rociadores. Use alternativas naturales no tóxicas siempre que sea posible.
- Si tiene que usar fertilizantes, herbicidas o pesticidas químicos:
 Aplicar solo en el sitio necesario, en lugar de cubrir todas las áreas.
 Evitar aplicar cerca de los bordillos y las calzadas, y nunca antes de que llueva.
 Aplicar los fertilizantes cuando sea necesario: esto es, cuando las plantas mejor podrían usarlo y el posible escurrimiento sea bajo.
 Seguir las instrucciones del fabricante cuidadosamente esto no solo le proporcionará los mejores resultados, pero le

permitirá ahorrar dinero.

USAR EL AGUA DE MANERA PRUDENTE



- Controlar la cantidad de agua y la orientación de los rociadores. Los rociadores deben ser solo lo suficientemente largos como para permitir que el agua remoje el suelo, pero no tan largos que causen un escurrimiento.
- Inspeccione, repare los escapes y alinee los aspersores periódicamente.
- Siembre plantas nativas para reducir el uso de agua, fertilizantes, herbicidas y pesticidas.

PROPIETARIOS DE HOGARES

Tengan en cuenta estos consejos cuando contraten a paisajistas profesionales y recuérdenselos según sea necesario.



Los sobrantes de pesticidas, fertilizantes y herbicidas contaminan los vertederos y deben ser desechados a través de Plantas de Tratamiento para Residuos Peligrosos. Para más información sobre el manejo adecuado de residuos peligrosos, llame a (909) 382-5401 o 1-800-0ILY CAT.

GRATIS únicamente para los residentes del Condado de San Bernardino. Las empresas pueden llamar para indagar sobre los costos y concertar una cita



Para denunciar el vertido ilegal de basura, llame al (877) WASTE18 o visite sbcountystormwater.org Para denunciar derrames tóxicos, llame al 1(800) 33 TOXIC Para desechar residuos peligrosos, llame al 1(800) OILY CAT

sbcountystormwater.org

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FOR MORE INFORMATION ON PREVENTING STORMWATER POLLUTION CALL 1(800) CLEANUP OR VISIT WWW.SBCOUNTY.GOV/STORMWATER

Stormwater Pollution Prevention

Best Management Practices for Homeowner's Associations, Property Managers and Property Owners





Your Guide To Maintaining Water Friendly Standards In Your Community

sbcountystormwater.org

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COMMERCIAL TRASH ENCLOSURES

FOLLOW THESE **REQUIREMENTS**TO **KEEP OUR WATERWAYS CLEAN**

Trash enclosures, such as those found in commercial and apartment complexes, typically contain materials that are intended to find their way to a landfill or a recycling facility.

These materials are NOT meant to go into our local lakes and rivers.

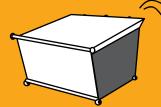
PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

PUT TRASH INSIDE



Place trash inside the bin (preferably in sealed bags)

CLOSE THE LID



Prevent rain from entering the bin in order to avoid leakage of polluted water runoff

KEEP TOXICS OUT



- Paint
- Grease, fats and used oils
- Batteries, electronics and fluorescent lights

SOME ADDITIONAL GUIDELINES, INCLUDE

✓ SWEEP FREQUENTLY

Sweep trash enclosure areas frequently, instead of hosing them down, to prevent polluted water from flowing into the streets and storm drains.

✓ FIX LEAKS

Address trash bin leaks immediately by using dry clean up methods and report to your waste hauler to receive a replacement.

✓ CONSTRUCT ROOF

Construct a solid cover roof over the existing trash enclosure structure to prevent rainwater from coming into contact with trash and garbage. Check with your local City/County for Building Codes.

In San Bernardino County, stormwater pollution is caused by food waste, landscape waste, chemicals and other debris that are washed into storm drains and end up in our waterways - untreated! You can be part of the solution by maintaining a water-friendly trash enclosure.

THANK YOU FOR HELPING TO KEEP SAN BERNARDINO COUNTY CLEAN AND HEALTHY!



In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

HAZARDOUS WASTE

CESQG PROGRAM

Conditionally Exempt Small Quantity Generator

WHAT IS A CESQG?

Businesses that generate 27 gallons or 220 lbs. of hazardous waste, or 2.2 lbs. of extremely hazardous waste per month are called "Conditionally Exempt Small Quantity Generators," or CESQGs. San Bernardino County Household Hazardous Program provides waste management services to CESQG businesses. The most common CESQGs in San Bernardino County are painters, print shops, auto shops, builders, agricultural operators and property managers, but there are many others. When you call, be ready to describe the types and amounts of waste your business generates in a typical month. If you generate hazardous waste on a regular basis, you must:

- Register with San Bernardino County Fire Department (909) 386-8401 as a hazardous waste generator.
- To obtain an EPA ID# and application form from the State visit www.dtsc.ca.gov.
- Manage hazardous waste in accordance with all applicable local, state and federal laws and regulations.

HOW DO I GET SERVICE?

To arrange an appointment for the CESQG Program, call 1-800-OILY CAT or 909-382-5401. Be ready to describe the type and amount of hazardous waste your business is ready to dispose of, and the types and size(s) of containers that the waste is in.

Waste Type and Cost

There is a small handling fee involved in the collection of hazardous waste from your business. Disposal costs depend on the type of waste.

Aerosols	\$1.29/lb.
Automobile motor oil	\$.73/gal.
Anti-freeze	\$1.57/gal.
Contaminated oil	\$4.48/gal.
Car batteries	\$.62/ea.
Corrosive liquids, solids	\$2.80/lb.
Flammable solids, liquids	\$1.57/lb.
Latex Paint	\$.73/lb.
Mercury	\$10.08/lb.
NiCad/Alkaline Batteries	\$2.13/lb.
Oil Base Paints	\$1.00/lb.
Oil Filters	\$.56/ea.
Oxidizers	\$9.63/lb.
PCB Ballasts	\$5.94/lb.
Pesticides (most)	\$2.91/lb.
Photofixer, developer	\$4.31/gal.
Television & Monitors	\$11.20/ea.
Additional Handling	\$138.00/hr.

^{*}Rates subject to change without notice*

WE CANNOT ACCEPT

- * Radioactives
- ★ Water reactives
- * Explosives
- * Compressed gas cylinders
- * Medical or biohazardous waste
- * Asbestos
- * Remediation wastes



HAZARDOUS WASTE

WHY IS THE FIRE DEPARTMENT COLLECTING HAZARDOUS WASTE?

Small Quantity Generators often have difficulty disposing of small quantities of hazardous waste. Hazardous waste companies usually have a minimum amount of waste that they will pick up, or charge a minimum fee for service. Typically, the minimum fee exceeds the cost of disposal for the hazardous waste. This leaves the small quantity generator in a difficult situation. Some respond by storing hazardous waste until it becomes economical for the hazardous waste transporter to pick it up, putting the business out of compliance by exceeding regulatory accumulation time limits. Other businesses simply store their hazardous wastes indefinitely, creating an unsafe work environment and exceeding accumulation time limits. Yet other businesses attempt to illegally dispose of their waste at household hazardous waste collection facilities. These facilities are not legally permitted to accept commercial wastes, nor are prepared to provide legal documentation for commercial hazardous waste disposal. In answer to the problems identified above, the San Bernardino County Fire Department Household Hazardous Program instituted the Conditionally Exempt Small Quantity Generator Program.

PAYMENT FOR SERVICES

The CESQG Program will prepare an invoice for your business at the time of service. You can pay at the time of service with cash or a check, or you can mail your payment to the Fire Department within 30 days. Please note that we do not accept credit card payments. The preferred method of payment is to handle payment at time of service. Additional charges may apply for accounts not paid within 30 days.

ARE THERE ANY OTHER WAYS THAT I CAN SAVE MONEY ON HAZARDOUS WASTE DISPOSAL?

Yes! First, start by reducing the amount of waste that you produce by changing processes or process chemicals, at your business. Next, examine if there is a way that you can recycle your waste back into your processes. Network with similar businesses or trade associations for waste minimization and pollution prevention solutions.

WHAT IF YOUR BUSINESS DOES NOT OUALIFY?

Call the San Bernardino County Fire Department Field Services Division for assistance with hazardous waste management at 909-386-8401. If you reduce the amount of waste you generate each month to 27 gallons or less, you may qualify in the future.

WHAT HAPPENS TO YOUR HAZARDOUS WASTE?

Hazardous waste collected by the CESQG Program is transported to a state permitted processing facility in San Bernardino. The waste is further processed at this point and packaged for off-site recycling (oil filters, oil, latex paint, antifreeze, and batteries) or destructive incineration (pesticides, corrosives, flammables, oil based paint).

San Bernardino County Fire Department
CESQG Program
2824 East "W" Street
San Bernardino, CA 92415-0799
Phone: 909-382-5401
Fax: 909-382-5413
www.sbcfire.org/hazmat/hhw.asp
Email: jschwab@sbcfire.org



WORKING OUTDOORS & HANDLING SPILLS

WHEN WORKING OUTDOORS USE THE 3 Cs

CUANDO TRABAJE AL AIRE LIBRE UTILICE LAS 3Cs

CONTROL | CONTROL



Locate the nearest storm drain and ensure nothing can enter or be discharged into it.

Ubique el desagüe de aguas pluviales más cercano y asegúrese de que nada pueda ingresar a éste ni descargarse en él.

CONTAIN | CONTENER



Isolate your area to prevent material from potentially flowing or being blown away.

Aísle su área para evitar que el material pueda discurrirse o ser llevado por el viento.

CAPTURE | CAPTURAR



Sweep up debris and place it in the trash. Clean up spills with an absorbent material (e.g. kitty litter) or vacuum with a Wet-Vac and dispose of properly. Recoja los restos y colóquelos en la basura. Limpie los derrames con un material absorbente (como la arena para gatos) o aspírelos con una Wet-Vac (aspiradora de humedad) y deséchelos correctamente.



COMMERCIAL LANDSCAPE

DISCHARGE TO THE STORM DRAIN, **ACCIDENTAL OR NOT**, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to prevent water pollution from landscaping activities.

RECYCLE YARD WASTE



- Recycle leaves, grass clippings and other yard waste.
- Do not blow, sweep, rake or hose yard waste into the street or catch basin.
- Try grasscycling: the natural recycling of grass by leaving clippings on the lawn when mowing.

For more information, please visit: www.calrecycle.ca.gov/organics/grasscycling

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 - Spot apply, rather than blanketing entire areas.
 - Avoid applying near curbs and driveways, and **never** before a rain.
 - Apply fertilizers as needed: when plants could best use it and when the potential runoff would be low.
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USE WATER WISELY



- Control the amount of water and direction of sprinklers. Sprinklers should only be on long enough to allow water to soak into the ground, but not so long as to cause runoff.
- Periodically inspect, fix leaks and realign sprinkler heads.
- Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.



HOMEOWNERS

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sbcountystormwater.org

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. Fountain water containing chlorine and copperbased algaecides is toxic to aquatic life. Proper inspection, cleaning, and repair of pedestrian areas and HOA owned surfaces and structures can reduce pollutant runoff from these areas. Maintaining these areas may involve one or more of the following activities:

- 1. Surface Cleaning
- 2. Graffiti Cleaning
- 3. Sidewalk Repair
- 4. Controlling Litter
- 5. Fountain Maintenance

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for sidewalk, plaza, and fountain maintenance and cleaning include:

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).
- Once per year, educate HOA staff and tenants on pollution prevention measures.

MODEL PROCEDURES:

1. Surface Cleaning

Discharges of wash water to the storm water drainage system from cleaning or hosing of impervious surfaces is prohibited.
Sidewalks, Plazas

- ✓ Use dry methods (e.g. sweeping, backpack blowers, vacuuming) whenever practical to clean sidewalks and plazas rather than hosing, pressure washing, or steam cleaning. DO NOT sweep or blow material into curb; use devices that contain the materials.
- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.



Parking Areas, Driveways, Drive-thru

- ✓ Parking facilities should be swept/vacuumed on a regular basis. Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.
- ✓ Sweep all parking lots at least once before the onset of the wet season.
- ✓ Use absorbents to pick up oil; then dry sweep.
- ✓ Appropriately dispose of spilled materials and absorbents.

OPTIONAL:

 Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

Building Surfaces, Decks, etc., without loose paint

- ✓ Use high-pressure water, no soap.
- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

Unpainted Building Surfaces, Wood Decks, etc.

- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.
- ✓ Use biodegradable cleaning agents to remove deposits.
- ✓ Make sure pH is between 6.5 and 8.5 THEN discharge to landscaping (if cold water without a cleaning agent) otherwise dispose of properly.

2. Graffiti Cleaning

Graffiti Removal

- ✓ Avoid graffiti abatement activities during rain events.
- ✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal in the Roads, Streets, and Highway Operation and Maintenance procedure sheet.
- ✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.



✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.

OPTIONAL:

• Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

3. Sidewalk Repair

Surface Removal and Repair

- ✓ Schedule surface removal activities for dry weather if possible.
- ✓ Avoid creating excess dust when breaking asphalt or concrete.
- √ Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up material.
- ✓ Designate an area for clean up and proper disposal of excess materials.
- ✓ Remove and recycle as much of the broken pavement as possible.
- ✓ When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains shovel or vacuum the slurry, remove from site and dispose of properly.
- ✓ Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Discharge wash water to landscaping, pump to the sanitary sewer if permitted to do so or contain and dispose of properly.

Concrete Installation and Repair

- ✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.
- ✓ Wash concrete trucks off-site or in designated areas on-site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other storm water conveyance structures. (See Concrete Waste Management BMP WM 8)



- ✓ Store dry and wet concrete materials under cover, protected from rainfall and runoff and away from drainage areas. After job is complete remove temporary stockpiles (asphalt materials, sand, etc.) and other materials as soon as possible.
- ✓ Return leftover materials to the transit mixer. Dispose of small amounts of excess concrete, grout, and mortar in the trash.
- ✓ When washing concrete to remove fine particles and expose the aggregate, contain the wash water for proper disposal.
- ✓ Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.
- ✓ Protect applications of fresh concrete from rainfall and runoff until the material has hardened.

4. Litter Control

- ✓ Enforce anti-litter laws.
- ✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- ✓ Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.

OPTIONAL:

• Post "No Littering" signs.

5. Fountain Maintenance

- ✓ Do not use copper-based algaecides. Control algae with chlorine or other alternatives, such as sodium bromide.
- ✓ Allow chlorine to dissipate for a few days and then recycle/reuse water by draining it gradually onto a landscaped area. Water must be tested prior to discharge to ensure that chlorine is not present (concentration must be less than 0.1 ppm).
- ✓ Contact local agency for approval to drain into sewer or storm drain.
- ✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.



Vehicle or equipment maintenance has the potential to be a significant source of stormwater pollution. Engine repair and service (parts cleaning, spilled fuel, oil, etc.), replacement of fluids, and outdoor equipment storage and parking (dripping engines) can all contaminate stormwater. Conducting the following activities in a controlled manner will reduce the potential for stormwater contamination:

- 1. General Maintenance and Repair
- 2. Vehicle and Machine Repair
- 3. Waste Handling/Disposal

Related vehicle maintenance activities are covered under the following program headings in this manual: "Vehicle and Equipment Cleaning", "Vehicle and Equipment Storage", and "Vehicle Fueling".

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for equipment maintenance and repair include:

- Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Minimize use of solvents. Clean parts without using solvents whenever possible. Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- Once per year, educate HOA staff and tenants on pollution prevention measures.



MODEL PROCEDURES:

1. General Maintenance and Repair

General Guidelines

→ Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.

- ✓ Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- ✓ Regularly inspect vehicles and equipment for leaks.
- ✓ Move activity indoors or cover repair area with a permanent roof if feasible.
- ✓ Minimize contact of stormwater with outside operations through berming the local sewering and drainage routing.
- ✓ Place curbs around the immediate boundaries of the process equipment.
- ✓ Clean yard storm drain inlets regularly and stencil them.

Good Housekeeping

- ✓ Avoid hosing down work areas. If work areas are washed and if discharge to the sanitary sewer is allowed, treat water with an appropriate treatment device (e.g. clarifier) before discharging. If discharge to the sanitary sewer is not permitted, pump water to a tank and dispose of properly.
- ✓ Collect leaking or dripping fluids in drip pans or container. Fluids are easier to recycle or dispose of properly if kept separate.
- ✓ Keep a drip pan under the vehicle while you unclip hoses, unscrew filters, any discharge of or remove other parts. Place a drip pan under any vehicle that might leak while you work on it to keep splatters or drips off the shop floor.
- ✓ Educate employees on proper handling and disposal of engine fluids.
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Do not pour liquid waste to floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- ✓ Post signs at sinks and stencil outdoor storm drain inlets.

2. Vehicle Repair

General Guidelines

- ✓ Perform vehicle fluid removal or changing inside of a building or in a contained covered area, where feasible, to prevent the run-on of stormwater and the runoff of spills.
- ✓ Regularly inspect vehicles and equipment for leaks, and repair as needed.



- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Immediately drain all fluids from wrecked vehicles. Ensure that the drain pan or drip pan is large enough to contain drained fluids (e.g. larger pans are needed to contain antifreeze, which may gush from some vehicles).
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- ✓ Oil filters disposed of in trash cans or dumpsters can leak oil. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- ✓ Store cracked batteries in a non-leaking secondary container and dispose of properly at recycling facilities or at County hazardous waste disposal site.

Vehicle Leak and Spill Control

- ✓ Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- ✓ Place a stockpile of spill cleanup materials where it will be readily accessible.
- ✓ Sweep floor using dry absorbent material.

3. Machine Repair

- ✓ Keep equipment clean; don't allow excessive build-up of oil or grease.
- ✓ Minimize use of solvents.
- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Perform major equipment repairs at the corporation yard, when practical.
- ✓ Following good housekeeping measures in Vehicle Repair section.

4. Waste Handling/Disposal

Waste Reduction

- ✓ Prevent spills and drips of solvents and cleansers to the shop floor.
- ✓ Do liquid cleaning at a centralized station so the solvents and residues stay in one area. Recycle liquid cleaners when feasible.



✓ Locate drip pans, drain boards, and drying racks to direct drips back into a solvent sink or fluid holding tank for reuse.

OPTIONAL:

- If possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous material:
 - -Use non-caustic detergents instead of caustic cleaning for parts cleaning.
 - -Use a water-based cleaning service and have tank cleaned. Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.
 - -Replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents.
 - -Choose cleaning agents that can be recycled.

Recycling

OPTIONAL:

- Separate wastes for easier recycling. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents separate from non-chlorinated solvents.
- Label and track the recycling of waste material (e.g. used oil, spent solvents, batteries).
- Purchase recycled products to support the market for recycled materials.

LIMITATIONS:

Space and time limitations may preclude all work being conducted indoors. It may not be possible to contain and clean up spills from vehicles/equipment brought on-site after working hours. Dry floor cleaning methods may not be sufficient for some spills – see spill prevention and control procedures sheet. Identification of engine leaks may require some use of solvents.



POOL MAINTENANCE

Pool chemicals and filter solids, when discharged to the City streets, gutters or storm drans, DO NOT GET TREATED before reaching the Santa Ana River. Chlorine, acid cleaning chemicals and metal-based algaecides used in pools can kill beneficial organisms in the food chain and pollute our drinking water.

When emptying your swimming pool, spa or fountain, please use one of the following best management practices to prevent water pollution:

- Reuse the water as landscape irrigation
- Empty the water into the sewer between midnight and 6:00 am
- Remove solids and floating debris and dispose of in the trash, de-chlorinate the water to a chlorine residual = 0, wait 24 hours, then discharge the water to the street or storm drain
- Try not to use metal-based algaecides (i.e. copper sulfate) in your pool or spa. If you have, empty your pool or spa into the sewer. *Prior to discharging pool water into the sanitary sewer system, contact your local agency.*
- If the pool contains algae and mosquito larvae, discharge the water to the sewer

When acid cleaning or other chemical cleaning:

• Neutralize the pool water to pH of 6.5 to 8.5, then discharge to the sewer

For swimming pool and spa filter backwash:

- Dispose of solids into trash bag, then wash filter into a landscape area
- Settle, dispose of solids in trash and discharge water to the sewer, never to the storm drain



For Residents

The following is a preview of the information we have available to residents. For more fact sheets, visit **sbcountystormwater.org**

Household Hazardous Waste Center Locations

TOO TOXIC TO TRASH

Dispose of your **HOUSEHOLD HAZARDOUS WASTE** (HHW) at a **FREE** HHW Center near you. Examples of items collected: pesticides, fertilizers, paints, cleaners, antifreeze, batteries, motor oil, oil filters, and electronic waste.

SERVICE AREA	ERVICE AREA LOCATION		HOURS
Big Bear Lake (does not accept E-waste)	Big Bear Lake accept E 42040 Garstin Dr. (cross: Big Bear Blvd.)		9 a.m 2 p.m.
Chino	Chino 5050 Schaefer Ave. (cross: 4th St.)		8 a.m 1 p.m.
Fontana (Fontana residents only)	16454 Orange Way (cross: Cypress Ave.) Note: Provide a trash bill and a driver's license as proof of residency.	Saturdays	8 a.m 12 p.m.
Ontario	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m 2 p.m.
Rancho Cucamonga	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m 12 p.m.
Redlands	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m 12:30 p.m.
Rialto (does not accept E-waste) 246 Willow Ave. (cross: Rialto Ave.)		2 nd & 4 th Fri. & Sat.	8 a.m 12 p.m.
San Bernardino	San Bernardino 2824 East 'W' St., 302 (cross: Victoria Ave.)		9 a.m 4 p.m.
Upland	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m 2 p.m.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org

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TAKE ONE



When painting your home, protect your family and community.

- PAINTS that are water-based are less toxic and should be used whenever possible.
- BRUSHES with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- SAFELY dispose of unwanted paint and paint thinner.
 The County of San Bernardino offers 9 HHW Centers that accept paint and other household hazardous waste from residents FREE of charge. For a list of acceptable materials, location information, and hours of operation call 1-800-OILY CAT.



VEHICLE MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Cleaning Auto Parts

Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a sink, parking lot, driveway or street.

Storing Hazardous Waste

Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Preventing Leaks and Spills

Conduct all vehicle maintenance inside of a garage. Place drip pans underneath vehicle to capture fluids. Use absorbent materials instead of water to clean work areas.

Cleaning Spills

Use dry methods for spill cleanup (sweeping, absorbent materials). To report accidental spills into the street or storm drain call (877) WASTE18 or 911.

Proper Disposal of Hazardous Waste

Dispose of household hazardous waste by taking it to your nearest household hazardous waste center. For more information, call 1-800-OILY CAT or check out sbcountystormwater.org/Disposal.html



PET WASTE DISPOSAL



Remember to pick up after your pet every time to keep San Bernardino County clean and healthy!





In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

Set In Touch With Us Online!



» Website sbcountystormwater.org



» **eUpdates** sbcountystormwater.org/newsletter



» Facebook
facebook.com/sbcountystormwater



» YouTube *youtube.com/sbcountystormwater*



» Report Pollution Violations sbcountystormwater.org/report



» Email *info@sbcountystormwater.org*

TOO TOXIC TO TRASH

Dispose of your **HOUSEHOLD HAZARDOUS WASTE** (HHW) at a **FREE** HHW Center near you. Examples of items collected: pesticides, fertilizers, paints, cleaners, antifreeze, batteries, motor oil, oil filters, and electronic waste.

SERVICE AREA	LOCATION	DAYS OPEN	HOURS
Big Bear Lake (does not accept E-waste)	42040 Garstin Dr. (cross: Big Bear Blvd.)	Saturdays	9 a.m 2 p.m.
Chino	5050 Schaefer Ave. (cross: 4th St.)	2 nd & 4 th Sat.	8 a.m 1 p.m.
Fontana (Fontana residents only)	16454 Orange Way (cross: Cypress Ave.) Note: Provide a trash bill and a driver's license as proof of residency.	Saturdays	8 a.m 12 p.m.
Ontario	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m 2 p.m.
Rancho Cucamonga	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m 12 p.m.
Redlands	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m 12:30 p.m.
Rialto (does not accept E-waste)	246 Willow Ave. (cross: Rialto Ave.)	2 nd & 4 th Fri. & Sat.	8 a.m 12 p.m.
San Bernardino	2824 East 'W' St., 302 (cross: Victoria Ave.)	Mon. – Fri.	9 a.m 4 p.m.
Upland	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m 2 p.m.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

TAKE ONE

MUY TÓXICO PARA LA BASURA

Deshágase de sus **DESECHOS PELIGROSOS** gratuitamente en un centro de recolección cerca de usted. Ejemplos de artículos que se aceptan: pesticidas, fertilizantes, pinturas, limpiadores, anticongelante, baterías, aceite de motores y filtros, y aparatos electrónicos.

ÁREA DE SERVICIO	UBICACIÓN	ABIERTO	HORARIO
Big Bear Lake (no se acepta materiales electronicas)	42040 Garstin Dr. (Big Bear Blvd.)	Sábado	9 a.m 2 p.m.
Chino	5050 Schaefer Ave. (4th St.)	2 nd & 4 th Sábado	8 a.m 1 p.m.
Fontana (residentes de Fontana solamente)	Nota: Presentar un recibo de basura y licencia de conducir como prueba de residencia.	Sábado	8 a.m 12 p.m.
Ontario	1430 S. Cucamonga Ave. (Belmont St.)	Viernes & Sábado	9 a.m 2 p.m.
Rancho Cucamonga	8794 Lion Street (Off 9th St, between Vineyard & Hellman)	Sábado	8 a.m 12 p.m.
Redlands	500 Kansas St. (Park Ave.)	Sábado	9:30 a.m 12:30 p.m.
Rialto (no se acepta materiales electronicas)	246 Willow Ave. (Rialto Ave.)	2 nd & 4 th Virnes & Sábado	8 a.m 12 p.m.
San Bernardino	2824 East 'W' St., 302 (Victoria Ave.)	Lunes - Viernes	9 a.m 4 p.m.
Upland	1370 N. Benson Ave. (14th St.)	Sábado	9 a.m 2 p.m.

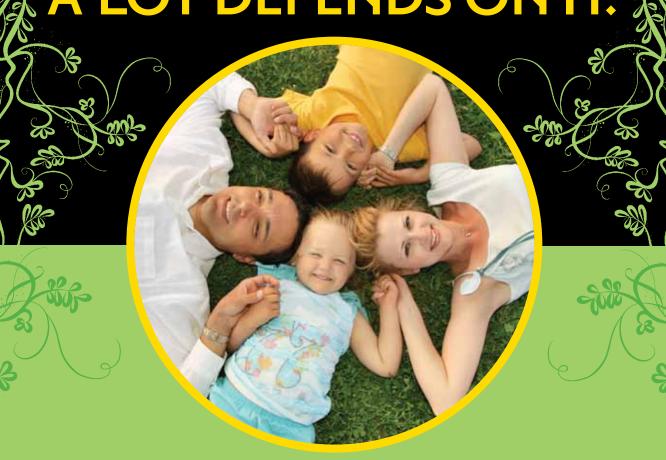


Para reportar actividades ilegales llamar al (877) WASTE18 o visite Sbcountystormwater.org

Arte Cortesía del Programa de Agua Pluvial de la Ciudad de Los Angeles. Impreso en papel reciclado.

TOME UNO

A SAFE GARDEN: A LOT DEPENDS ON IT.



Protect your family and community when using pesticides and fertilizers.

- ** STRATEGICALLY apply products on your lawn when rain is not expected. Rain can wash toxic chemicals from your lawn into local waterways.
- SPOT-APPLY products directly on the problem instead of the whole area. Use less chemicals, and conserve the supply of your product.
- SAFELY dispose of unwanted products. The County of San Bernardino offers 9 HHW Centers that accept pesticides, fertilizers and other toxic waste FREE of charge.

To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org





UN JARDÍN SANO: MUCHO DEPENDE DE ÉL.





- **ESTRATÉGICAMENTE** aplique productos en su césped solamente cuando no se espera lluvia. La lluvia puede llevarse químicos tóxicos de su césped hacia los canales pluviales en su área.
- **ESCASAMENTE** aplique los productos directamente en el área en donde exista el problema en lugar de distribuirlo en todo el jardín. Así, utilizará menos productos químicos y le rendirá más.
- **ELIMINE** productos tóxicos sanamente. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pesticidas, fertilizantes y otros desechos tóxicos GRATUITAMENTE.

Para reportar actividades ilegales llamar al (877) WASTE18 o visite sbcountystormwater.org



A SAFE GARDEN: A LOT DEPENDS ON IT.

Protect your family and community when using pesticides and fertilizers.

- STRATEGICALLY apply products on your lawn only when rain is not expected.
- **SPOT-APPLY** directly on the problem instead of the whole area.
- SAFELY dispose of unwanted products.
 The County of San Bernardino offers 9 HHW
 Centers that accept pesticides, fertilizers and other toxic waste FREE of charge.

To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org





Proteja a su familia y a su comunidad cuando utilice pesticidas y fertilizantes.

- ESTRATÉGICAMENTE aplique productos en su césped solamente cuando no se espera lluvia.
- ESCASAMENTE aplique los productos directamente en el área en donde exista el problema en lugar de distribuirlo en todo el jardín.
- ELIMINE productos tóxicos sanamente. El Condado de San Bernardino ofrece 9 centros de recolección que aceptan pesticidas, fertilizantes y otros desechos tóxicos GRATUITAMENTE.

Para reportar actividades ilegales llamar al (877) WASTE18 o visite sbcountystormwater.org



SPOT-APPLY

pesticides directly on the problem rather than blanketing the whole area.



sbcountystormwater.org

A SAFE GARDEN: A LOT DEPENDS ON IT.



ESCASAMENTE

aplique pesticidas directamente en el problema en lugar de distribuirlo en todo el jardín.



sbcountystormwater.org

UN J ARDÍN SANO: MUCHO DEPENDE DE EL.



GARDEN SMART: Use Pesticides and Fertilizers Sparingly





sbcounty.gov/stormwater





Managing FATS, OIL and GREASE "It's Easier than YOU Think!"

WRONG WAY

La Forma Incorrecta





1

Do not pour cooking residue directly into the drain.

No vierta residuos de cocinar directamente en el desague.



2

Do not dispose of food waste into the garbage disposal.

No ponga desperdicios de comida en el triturador de comida.



3

Do not pour waste oil directly into the drain.

No ponga desperdicio de aceite directamente en el desague.



1

Do not wash floor mats where water will run off directly into the storm drain.

No lave tapetes de piso en un lugar donde el agua corra hacia el desague.



1

Wipe pots, pans, and work areas prior to washing.

Limpie con una toallita las ollas, cazuelas, y areas de trabajo antes de lavarlos.



Z

Dispose of food waste directly into the trash.

Deseche los desperdicios de comida en el bote de basura.



3

Collect waste oil and store for recycling.

Junte el desperdicio de aceite y guardelo para que sea reciclado.



4

Clean mats inside over a utility sink.

Limpie los tapetes de piso detro de un lavabo o fregador.



ROADWORK AND PAVING

Asphalt, saw-cut slurry and excavated materials from road paving, surfacing and pavement removal often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



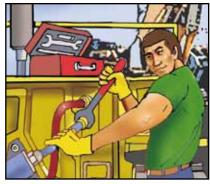
Preventing Erosion

Schedule excavation and grading work during dry weather. Develop and implement erosion and sediment control plans for excavated embankments. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



During Construction

Cover catch basins and maintenance holes when applying seal coat, slurry seal or fog seal. Use check dams, ditches or berms around excavations, and avoid over applying water for dust control. Never wash excess materials from exposed aggregate or concrete into the street, gutter or a storm drain.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.



Barricade storm drain openings during saw-cutting, and recycle broken up pavement at a crushing company. For recycling information, call [909] 386-8401.



Cleaning & Preventing Spills

Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Sweep up dry spills, instead of hosing. Prevent spills from paver machines by using drip pans, or by placing absorbent materials like cloths or rags under the machines when not in use. To report serious spills, call 911.

To report illegal dumping call

(877) WASTE18 sbcountystormwater.org



Prevención de Contaminación del Desagüe TRABAJO DE CARRETERAS & PAVIMENTO Asfalto, mezcla y materiales de excavaciones del pavimento acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana Esto contamina el agua que tamamas haciando la sur

San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el aqua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



Previniendo Erosiones

Planea las excavaciones trabajo de jardineria durante el clima seco. Desarrolla e implementa planes de embancamientos de control de sedimento y excavaciones. Cubre montones de tierra, grava y otros materiales con un plastico para protejerlos de la Ilvia, aire y desagüe.



Durante Construcción

Cubre los lavados y da mantenimiento a los hoyos al aplicar selladura o mezcla. Revisa las areas de excavaciones, y evita pasarte de agua para preveenir polvadura. Nunca laves los materiales llenos de concreto en la calle, drenajes o en el desagüe.



Mantenimiento de Vehiculos & Herramientas

Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura y evita goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador.



Bloquea alrededor de los drenaies cuando estes usando las maguinas de sierra, tambien recicla todo el pavimento roto en la compañia demolidora. Para más información llama al (909) 386-8401.



Limpiando & Previniendo Derrames

Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin Barre los derrames en ves de lavarlos con la manguera. Previene los derrames de las maquinas usando enbudos o colocanto garras para absorver cualquier liquido. Para reportar derrames llama al 911.

> Para reportar actividades ilegales llamar al:

(877) WASTE18 sbcountystormwater.org



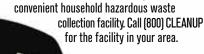
HOME & GARDEN

Yard waste and household toxics like paints and pesticides often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.



Recycle Household Hazardous Waste

Household products like paint, pesticides, solvents and cleaners are too dangerous to dump and too toxic to trash. Take them to be recycled at a convenient household hazardous waste





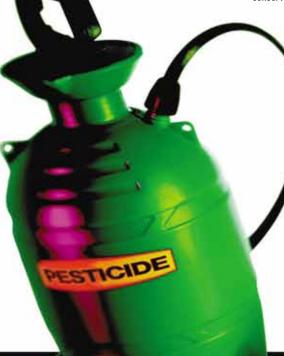
Disposing of Yard Waste

Recycle leaves, grass clippings and other yard waste, instead of blowing, sweeping or hosing into the street. Try grasscycling, leaving grass clippings on your lawn instead of using a grass catcher. The clippings act as a natural fertilizer, and because grass is mostly water, it also irrigates your lawn, conserving water.



Use Fertilizers & Pesticides Safely

Fertilizers and pesticides are often carried into the storm drain system by sprinkler runoff. Try using organic or non-toxic alternatives. If you use chemical fertilizers or pesticides, avoid applying near curbs and driveways and never apply before a rain.



Planting in the Yard

Produce less yard waste and save water by planting low maintenance, drought-tolerant trees and shrubs. Using drip irrigation, soaker hoses or micro-spray systems for flower beds and vegetation can also help reduce your water bill and prevent runoff.



Use Water Wisely

Cut your water costs and prevent runoff by controlling the amount of water and direction of sprinklers. The average lawn needs about an inch of water a week, including rainfall, or 10 to 20 minutes of watering. A half-inch per week is enough for fall and spring. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff.

To report illegal dumping call

(877) WASTE18 sbcountystormwater.org



Prevención de Contaminación

Basura del jardín y otros toxicos caseros como pintura, pesticidas y otros mas acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la

contaminación y protejer la salud publica.



Disponiendo Desechos del Jardin

Recicla hojas, pasto y otras basuras del jardín en ves de soplarlas, barrerlas hacia la calle. El pasto sirve como fertilizante, y como el pasta es la mayoria agua tambien riega tu jardín, ahorrandote agua.



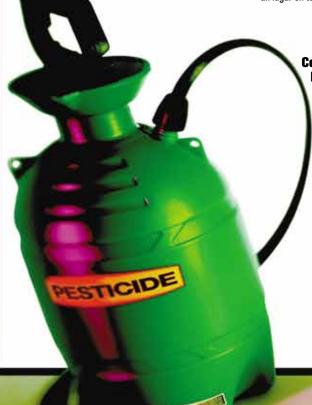
Reciclando Materiales del Hogar **Peliarosos**

Limpiadores del hogar como pintura, pesticidas, solventes y limpiadores son demasiado toxicos para tirarlos en la basura. Desechalos en unlugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.



Usando Fertilizantes & Pesticidas Adecuadamente

Fertilizantes y pesticidas muchas veces terminan en los drenajes. Usa alternativas que no sean toxicas. Si tu usas fertilizantes y pesticidas con quimicos, no los uses cerca de las banquetas y cocheras y nunca los uses en tiempos de lluvia.



Cembrando en el Jardin

Reduce la basura del jardín y ahorra agua plantando arboles y plantas de bajo mantenimiento. Riega moderadamente con mangueras u otros metodos para las flores o vegetacion asi reduciras tu pago del mes y previenes el desagüe.



Usando el Agua Adecuadamente

Reduce el pago del agua y previene el desagüe controlando la cantidad y direccion de tus regaderas para el jardin. Solo necesitas regar de 10 a 20 minutos a la semana. Durante la primavera y otoño es la mitad. Las regaderas del jardin deverian estar ajustadas a que rieguen lo suficinete y evitar el desagüe.

Para reportar actividades ilegales llamar al:

(877) WASTE18 sbcountystormwater.org



EXCAVATION AND GRADING

Sediment, cement wash, asphalt and vehicle fluids from soil excavation and grading often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Recycling Waste

Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutters and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks. Use gravel approaches where truck traffic is heavy to reduce soil compaction and limit the tracking of sediment into the street.



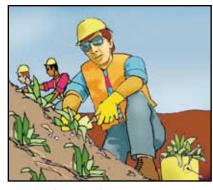
Cleaning & Preventing Spills

Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids. To report serious spills, call 911.



Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Preventing Erosion

Avoid excavation or grading during wet weather. Plant temporary vegetation on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff. Channels can be lined with grass or roughened pavement to reduce runoff velocity.

To report illegal dumping call

(877) WASTE18 sbcountystormwater.org



Prevención de Contaminación

del Desagüe Excavaciones en el Rio de Santa Ana. Esto contamina el ag

Sedimento, cemento, asfalto y liquidos de auto, tierra y residuos peligrosos de lugares de construcción acaban por llegar a los drenajes del Condado de San Bernardino y terminando

en el Rio de Santa Ana. Esto contamina el aqua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



Reciclando Desechos

Recicla el aspfalto, concreto, madera y la vegetacion cuando sea posible. Materiales no reciclados se deverian llevar a lugares de desechos peligrosos. Para màs informacion llama al (909) 386-8401.



Manteniendo Vehiculos & **Herramientas**

Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura. Usa grava donde mayormente se consentra el trafico de camiones para y reducir el sedimento en las calles.

plastico para protejerlos de

la lluvia, el aire y el desagüe.



Limpiando & Previniendo Derrames

Usa siempre un enbudo al vaciar liquidos. Barre los derrames en ves de lavarlos con la manguera. Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Preveen goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador. Para reportar derrames llama al 911.



Previniendo Erosiones

Evita las excavaciones durante Iluvia, Planta vegetacion temporal en colinas donde aun no hay planes de construcción y planta vegetacion permanente al terminar las excavaciones. Construye algunos canales para el desagüe. Estos pueden ser creados con pasto y cemento para reducir la velocidad del desagüe.

Para reportar actividades ilegales llamar al:

(877) WASTE18 sbcountystormwater.org



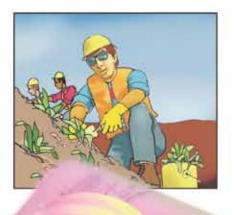
CONSTRUCTION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Store Materials Safely

Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call [909] 386-8401.

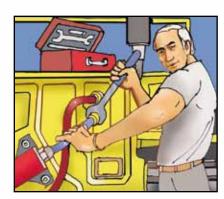


Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydromulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Channels can be lined with grass or roughened pavement to reduce runoff velocity.



Cleaning & Preventing Spills

Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

To report illegal dumping call

(877) WASTE18 sbcountystormwater.org



Prevención de Contaminación

del Desague construcción Esto contamina el agua que tomamos, ha

Cemento, sedimentos, liquidos de auto, polvos y residuos peligrosos acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana.

Esto contamina el aqua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



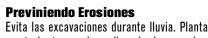
Almacenando Materiales Cuidadosamente

Manten materiales de construcción y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y herramientas para excavar cuviertos con algun plastico para protejerlos de la lluvia, el aire y el desagüe.



Ordenando Materiales & Reciclando Desechos

Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales que se puedan reciclar cuando sea posible. Se puede reciclar el aspfalto. concreto, madera y la vegetacion. Materiales no reciclados se deven llevar a lugares de desechos peligrosos. Para mas información llama al (909) 386-8401.

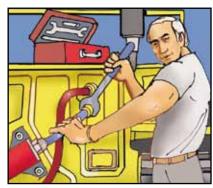


vegetacion temporal en colinas donde aun no hay planes de construccion y planta vegetacion permanente al terminar las excavaciones. Construye algunos canales para el desagüe. Estos pueden ser creados con pasto y cemento para reducir la velocidad del desagüe.



Limpiando & Previniendo Derrames

Usa siempre un enbudo al vaciar liquidos. Barre los derrames en ves de lavarlos con la manguera. Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Para reportar derrames llama al 911.



Mantenimiento de Vehiculos & **Herramientas**

Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura y preveen goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador.

Para reportar actividades ilegales llamar al:

(877) WASTE18 sbcountystormwater.org



FRESH CONCRETE & MORTAR APPLICATION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Secure open bags of cement and cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. Call (909) 386-8401 for recycling and disposal information.



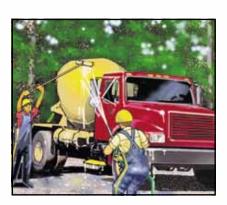
During Construction

Schedule excavation and grading during dry weather. Prevent mortar and cement from entering the street and storm drains by placing erosion controls. Setup small mixers on tarps or drop cloths, for easy cleanup of debris. Never bury waste material. Recycle or dispose of it as hazardous waste.



Cleaning Up

Wash concrete dust onto designated dirt areas, not down driveways or into the street or storm drains. Wash out concrete mixers and equipment in specified washout areas, where water can flow into a containment pond. Cement washwater can be recycled by pumping it back into cement mixers for reuse. Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.



To report illegal dumping call

(877) WASTE18 sbcountystormwater.org



Prevención de Contaminación

del Desague APLICANDO CONCRETO FRESCO lugares de concreto fresco por llegar a los drenajes del Condado de San Bernar de Santo Ana Esta contemina el como que tempora a haciandella religiora a por

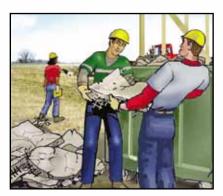
liquidos de auto, tierra y residuos peligrosos de

lugares de concreto fresco por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



Almacenando Materiales

Manten materiales de construcción y residuos leios de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y herramientas para excavar cuviertos con algun plastico para protejerlos de la lluvia, el aire y el desagüe.



Ordenando Materiales & Reciclando

Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales recicables cuando sea posible. Cuando estes rompiendo el pavimento, recicla los pedasos en la compañia demolidora. Se puede reciclar el aspfalto, concreto, madera y la vegetacion. Materiales no reciclados se deverian llevar a lugares de desechos peligrosos. Ilama al (909) 386-8401 para más información.



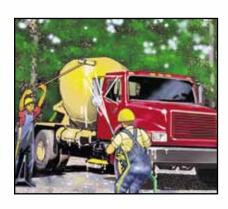
Durante Construcción

Planea las excavaciones durante clima seco. No deies que el cemento o la cal lleguen hasta las calles o drenajes, evita esto con plantas temporales para detener el desagüe. Cubre las maquinas de mesclar con alguna garra para que se facilite la limpieza de residuos. Nunca entierres los desechos. Recicla todos los desechos peliarosos.



Limpiando

Lava la cal en un area designada, no la eches hacia la cochera o en la calle. Lava las mescladoras y las herramientas en un lugar especifico, donde el agua lleque a un contenedor. El aqua de cemento se puede reciclar volviendola a usar en las mescladoras. Nunca dejes el agua de cemento que corra hacia las calles, alcantarillas o drenaies.



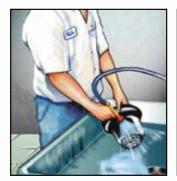
Para reportar actividades ilegales llamar al:

(877) WASTE18 sbcountystormwater.org



AUTO MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Cleaning Auto Parts

Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a shop sink, parking lot, driveway or street.



Storing Hazardous Waste

Keep your liquid waste segregated.
Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.



Metal Grinding and Polishing

Keep a bin under your lathe or grinder to capture metal filings. Send uncontaminated filings to a scrap metal recycler for reclamation. Store metal filings in a covered container or indoors.



Preventing Leaks and Spills

Place drip pans underneath to capture fluids. Use absorbent cleaning agents instead of water to clean work areas.



Cleaning Spills

Use dry methods for spill cleanup (sweeping, absorbent materials). Follow your hazardous materials response plan, as filed with your local fire department or other hazardous materials authority. Be sure that all employees are aware of the plan and are capable of implementing each phase. To report serious toxic spills, call 911.



Proper Disposal of Hazardous Waste

Recycle used motor oil and oil filters, anti-freeze and other hazardous automotive fluids, batteries, tires and metal filings collected from grinding or polishing auto parts. Contact a licensed hazardous waste hauler. For more recycling information, call [909] 386-8401.



To report illegal dumping call

(877) WASTE18 sbcountystormwater.org

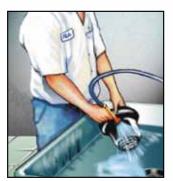


Prevención de Contaminación

del Desague Mantenimiento de Auto
Bernardino y terminando en el Rio de Santa Ana. Esto contamina el

Aceite, grasa, anti-congelantes y otros liquidos toxicos para el auto acaban por llegar a los drenajes del Condado de San

Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



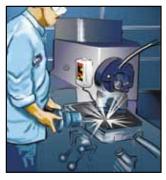
Limpiar Partes De Autos

Limpia las partes de auto con un cepillo de alambres o usa un limpiador de hornos en vez de usar limpiadores líquidos. Arregla las graseras, perchas para secar y tablas de escurrir para que los líquidos sean dirigidos al lavadero o recipientes para guardar líquidos. No laves las partes de auto o herramientas en el estacionamiento, la cochera o la calle.



Almacenando Desechos Peligrosos

Manten los desechos líquidos separados. Varios líquidos pueden ser reciclados por compañías que se especializan en desechos tóxicos si aun no estan mezclados. Guarda y cubre todos los materiales dentro de un lugar para prevenir la contaminación del desagüe.



Desechos de Metal & Pulidos

Manten un recipiente debajo de las maquinas de tornos o amoladoras para colectar desechos de metal. Manda los desechos de metal a un centro de reciclaje de metales. Guarda los desechos de metal en un recipiente cuvierto o dentro del local.



Prevenir Goteaduras & Derrames

Utilisa caserolas para el goteo de líquidos. Use limpiadores absorbentes en lugar de agua para limpiar el área de trabajo.



Limpiando Derrames

Sique tu plan de como actuar sobre los materiales tóxicos, como esta indicado en el departamento de bomberos local u otras autoridades de materiales tóxicos. Asegurate que todos los empleados estén informados y capaz de aplicar cada fase del plan. Usa métodos secos para limpiar derramamientos (barriendo, materiales absorbentes, etc.).



Manera Correcta de **Depositar los Desechos Peligrosos**

Recicla el aceite de motor y filtros de aceite usados, anti-congelante, baterias, lubricantes, y desechos de metal y partes de auto pulidas. Llama a un colector de desechos tóxicos para disponer de absorbentes saturados. Mas iformación sobre reciclaje, llama al (909) 386-8401.



Para reportar actividades ilegales llamar al:

(877) WASTE18 sbcountystormwater.org



■ Construction & development:

Soil, cement wash, asphalt, oil and other hazardous debris from construction sites often make their way into the San Bernardino County storm drain system, and flow untreated into local waterways. Follow these best management practices to prevent pollution, protect public health and avoid fines or legal action.

- Store Materials Safely: Keep construction materials and debris away
 from the street, gutter and storm drains. Cover exposed stockpiles of
 soil, sand or gravel and excavated material with plastic sheeting,
 protected from rain, wind and runoff.
- Preventing Erosion: Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydro mulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Use gravel approaches where truck traffic is frequent to reduce soil compaction and limit the tracking of sediment into the streets. For more information on erosion control, call (909) 799-7407.
- Cleaning & Preventing Spills: Use a drip pan and funnel when draining
 or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for
 spills by preparing and using spill containment and cleanup kits that
 include safety equipment and dry cleanup materials such as kitty litter
 or sawdust. To report serious spills, call 911.
- Maintaining Vehicles & Equipment: Maintain and refuel vehicles and equipment at
 a single location on-site, away from the street, gutter and storm drains. Perform
 major equipment repairs and washings off-site. Inspect vehicles and equipment
 frequently for leaks, and prevent leaks from stored vehicles by draining gas,
 hydraulic oil, transmission, and brake and radiator fluids.
- Ordering Materials & Recycling Waste: Reduce waste by ordering only the
 amounts of materials needed for the job. Use recycled or recyclable materials
 whenever possible. You can recycle broken asphalt, concrete, wood, and cleared
 vegetation. Dispose of hazardous materials through a hazardous waste hauler or
 other means in accordance with the construction permit. Non-recyclable materials
 should be taken to a landfill or disposed of as hazardous waste. For recycling and
 disposal information, call (909) 386-8401.
- Concrete and mortar application: Never dispose of cement washout into driveways, streets, gutters or drainage ditches. Wash concrete mixers and equipment only in specified washout areas, where the water flows into lined containment ponds. Cement wash water can be recycled by pumping it back into cement mixers for reuse.

For more information about how you can prevent stormwater pollution: www.sbcountystormwater.org



DISCHARGE INTO OUR WATERWAYS, <u>ACCIDENTAL</u> OR <u>NOT</u>, CAN LEAD TO ENFORCEMENT ACTIONS, WHICH CAN INCLUDE FINES.

WHEN WORKING WITH CONCRETE

CONTROL CONTAIN | CAPTURE



Locate the nearest storm drain and ensure nothing can enter or be discharged into it. Use plastic covers and sandbags when working within 50' of a storm drain or catch basin.



Isolate area and secure bags of cement after they are open. Keep cement, sand and aggregate (wet/dry) and slurries from saw cutting, from flowing into the streets, gutter and storm drains or being blown away. Cover bags of cement in case of rain.





Sweep dry residue or vacuum wet concrete residue and dispose of **properly.** Create a designated washout area for equipment and tools and place away from driveways and storm drains. Dispose of concrete/plaster waste and rinsewater by hauling off to an approved disposal site.



To report illegal dumping, call (877) WASTE18 or visit sbcountystormwater.org



LA DESCARGA EN NUESTRAS VÍAS FLUVIALES, DE <u>FORMA ACCIDENTAL</u> O NO, PUEDE LLEVAR A TOMAR MEDIDAS PARA CUMPLIR CON LA LEY QUE PUEDEN INCLUIR MULTAS.

CUANDO TRABAJE CON CONCRETO APLIQUE LAS 5 L



Ubique el desagüe pluvial más cercano y asegúrese de que nada pueda entrar en él o que pueda descargarse allí. Use cubiertas de plástico y bolsas de arena cuando trabaje a una distancia de 50' de un desagüe pluvial o sumidero.

CONTROL CONTENCIÓN



Aísle el área y asegure las bolsas de cemento una vez que las haya abierto. Impida que el cemento, la arena y los componentes del concreto (secos y

húmedos) y los residuos acuosos resultantes después de cortar con sierra, fluyan hacia la calle, la alcantarilla y los desagües o que se vuelen con el viento. Cubra las bolsas de cemento en caso de lluvia.

CAPTURA



Barra los residuos secos o limpie con una aspiradora los residuos de concreto húmedo y elimínelos en forma apropia-

da. Cree un área específica para enjuagar equipos y herramientas, y colóquela lejos de las entradas de automóviles y de los desagües pluviales.

Desheche los residuos de concreto o yeso y el agua de enjuague, llevándolos a un sitio aprobado para su eliminación.



Para informar sobre el vaciado ilegal de residuos, llame al (877) WASTE18 o visite el sitio: sbcountystormwater.org

PREVENCIÓN DE CONTAMINACIÓN DE AGUAS PLUVIALES EN EL CONDADO DE SAN BERNARDINO

■ Commercial landscape maintenance:

Yard waste, sediments and toxic lawn and garden chemicals used in commercial landscape maintenance often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution, protect public health and avoid fines or legal action.

- Recycle Yard Waste: Recycle leaves, grass clippings and other yard waste. Do not
 blow, sweep, rake or hose yard waste into the street. Let your customers know
 about grass cycling --the natural recycling of grass by leaving clippings on the
 lawn when mowing instead of using a grass catcher. Grass clippings will quickly
 decompose, returning valuable nutrients to the soil. You can get more information
 at www.ciwmb.ca.gov/Organics.
- Use Fertilizers, Herbicides & Pesticides Safely: Fertilizers, herbicides and
 pesticides are often carried into the storm drain system by sprinkler runoff. Use
 natural, non-toxic alternatives to traditional garden chemicals. If you must use
 chemical fertilizers, herbicides, or pesticides spot apply rather than blanketing
 entire areas, avoid applying near curbs and driveways and never apply before a
 rain.
- Recycle Hazardous Waste: Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility. For information on proper disposal, call (909) 386-8401.
- Use Water Wisely: Conserve water and prevent runoff by controlling the amount
 of water and direction of sprinklers. Sprinklers should be on long enough to allow
 water to soak into the ground but not so long as to cause runoff. Periodically
 inspect, fix leaks and realign sprinkler heads.
- **Planting:** Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.
- Prevent Erosion: Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways. Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff. Avoid excavation or grading during wet weather.
- Store Materials Safely: Keep landscaping materials and debris away from the street, gutter and storm drains. Onsite stockpiles of materials should be covered with plastic sheeting to protect from rain, wind and runoff.



For more information about how you can prevent stormwater pollution: www.sbcountystormwater.org

Carpet cleaning:

Toxic chemicals and discharged waste water from carpet, drapery, furniture and window cleaning often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

These guidelines apply even if the cleaning products are labeled "nontoxic" or "biodegradable". Although these products may be less harmful to the environment, they can still have harmful effects if they enter the storm drain untreated.

- Dispose of wastewater properly: Wastewater from cleaning equipment must be
 discharged into a sink, toilet, or other drain connected to the sanitary sewer
 system within sanitary sewer discharge limits, or hauled off and disposed of
 properly. Wastewater should never be discharged into a street, gutter, parking lot
 or storm drain.
- Filter wastewater: Carpet cleaning wastewater should be filtered before discharging it to the sanitary sewer since fibers and other debris in the wastewater can clog pipes. The filtered material can be disposed of in the garbage, as long as the waste is not contaminated with hazardous pollutants.

PRESORTED STANDARD U.S. POSTAGE SACRAMENTO, CA PERMIT# 000

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San Bernardino County Stormwater Program





Pollution Prevention

LANDSCAPE MAINTENANCE



Stormwater Management Practices for Commercial Landscape Maintenance

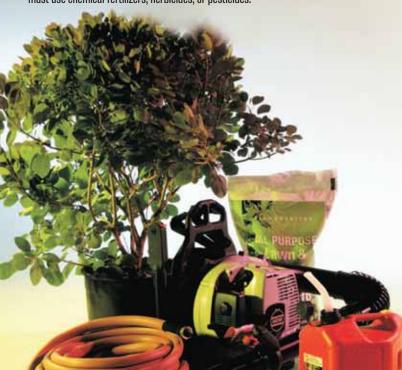
Yard waste, sediments, and toxic lawn/garden chemicals used in commercial landscape maintenance often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

Recycle Yard Waste

Recycle leaves, grass clippings and other yard waste. Do not blow, sweep, rake or hose yard waste into the street. Try grasscycling - the natural recycling of grass by leaving clippings on the lawn when mowing. Grass clippings will quickly decompose, returning valuable nutrients to the soil. Further information can be obtained at www.ciwmb.ca.gov/Organics.

Use Fertilizers, Herbicides and Pesticides Safely

Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use of natural, non-toxic alternatives to the traditional fertilizers, herbicides and pesticides is highly recommended. If you must use chemical fertilizers, herbicides, or pesticides:



- Spot apply pesticides and herbicides, rather than blanketing entire areas.
- Avoid applying near curbs and driveways, and never apply before a rain.
- Apply fertilizers as needed, when plants can best use it, and when the potential for it being carried away by runoff is low.

Recycle Hazardous Waste

Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility, which accepts these types of materials. For information on proper disposal call, (909) 386-8401.

Use Water Wisely

Conserve water and prevent runoff by controlling the amount of water and direction of sprinklers. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff. Periodically inspect, fix leaks and realign sprinkler heads. Plant native vegetation to reduce the need of water, fertilizers, herbicides, and pesticides.

Prevent Erosion

Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways.

- Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff.
- Avoid excavation or grading during wet weather.

Store Materials Safely

Keep landscaping materials and debris away from the street, gutter and storm drains. On-site stockpiles of materials must be covered with plastic sheeting to protect from rain, wind and runoff.

To report illegal dumping call (877) WASTE18

or visit our website:

sbcountystormwater.org

DCV Analysis - DA-1 HERITAGE Tract 20257

Design Capture Volume Calculation	Template Item	Value	Comment
Project Area (ft²)	1	1,267,457	
Impervious Area (ft²)		699,402	
Imperviousness (Imp %)	2	55.18%	Imperviousness after applying preventative site design practices
Runoff Coefficient (Rc)	3	0.37	Rc=0.858(Imp%) ³ -0.78(Imp%) ² +0.774(Imp%)+0.04
P _{2yr-1hr} (in)	4	0.480	Determine 1-hour rainfall depth for a 2-year return period from NOAA
C ₁		1.4807	Climatic region Valley=1.4807, Mountain=1.909, Desert=1.2371
P ₆ (in)	5	0.71	Mean 6-hr precipitation = P _{2yr-1hr} (in)*C ₁
C ₂	6	1.963	24 hrs = 1.582, 48 hrs = 1.963 Drawdown Rate
DCV (ft ³)	7	55,078	Design Capture Volume
Water Quality Credits Volume Reduction (ft ³)			10% reduction for redevelopment project in core city center 10% reduction for in-fill project
Remaining DCV (ft ³)		55,078	Remaining Design Capture Volume after Water Qaulity Credits applied
Flow Based BMP Calculation (Qbmp)			
Regression Coefficeint for Intensity (I R _{C)}		0.2787	Valley=0.2787 Mountain=0.3614 Desert=0.3250
Qbmp(ft ³ /sec)			Q=(Rc)(PxIRc)(Area(ac))

DCV Analysis - DA-2 HERITAGE Tract 20257

Design Capture Volume Calculation	Template Item	Value	Comment
Project Area (ft²)	1	294,604	
Impervious Area (ft²)		154,313	
Imperviousness (Imp %)	2	52.38%	Imperviousness after applying preventative site design practices
Runoff Coefficient (Rc)	3	0.35	Rc=0.858(Imp%) ³ -0.78(Imp%) ² +0.774(Imp%)+0.04
P _{2yr-1hr} (in)	4	0.480	Determine 1-hour rainfall depth for a 2-year return period from NOAA
C ₁		1.4807	Climatic region Valley=1.4807, Mountain=1.909, Desert=1.2371
P ₆ (in)	5	0.71	Mean 6-hr precipitation = $P_{2yr-1hr}(in)*C_1$
C ₂	6	1.963	24 hrs = 1.582, 48 hrs = 1.963 Drawdown Rate
DCV (ft ³)	7	12,150	Design Capture Volume
Water Quality Credits Volume Reduction (ft ³)			10% reduction for redevelopment project in core city center 10% reduction for in-fill project
Remaining DCV (ft³)		12,150	Remaining Design Capture Volume after Water Qaulity Credits applied
Flow Based BMP Calculation (Qbmp)			
Regression Coefficeint for Intensity (I R _{C)}		0 2787	Valley=0.2787 Mountain=0.3614 Desert=0.3250
Qbmp(ft ³ /sec)			Q=(Rc)(PxIRc)(Area(ac))

PWQMP Infiltration Basin 'A' Sizing (DA 1) HERITAGE Tr.20257

Infiltration			
	4	FF 070	cr 3
Remaining DCV	1	55,078	
Infiltration Rate	2		in/hr
Safety Factor	3	3.5	
P _{design}	4	2.86	in/hr
Max Drawdown Time	5	48	hrs
Max Pond Depth to Drain in 48 hrs	6	11.43	ft
Max Pond Depth (Basin Max. Depth)	6	5.00	ft
Pond Depth	7	5.00	ft
Infiltrating Surface Area	8	9,542	ft ²
Amended Soil Depth d _{media}	9	2	ft
Amended Soil Porosity	10	0.3	
Gravel Depth d _{media}	11	1	ft
Gravel Porosity	12	0.4	
Storm Duration	13	3	hrs
V _{ret} =	14	64,068	ft ³
Manufacturer's Retention	15	0	ft ³
Total Retention Volume	16	64,068	ft ³
Fraction of DCV Achieved	17	116.32%	
Full DCV Achieved	18	Yes	
Actual		25.20	hrs

PWQMP Infiltration Basin 'B' Sizing (DA 2) HERITAGE Tr.20257

Infiltration			
Remaining DCV	1	12,150	ft ³
Infiltration Rate	2		in/hr
Safety Factor	3	3.5	
P _{design}	4	2.86	in/hr
Max Drawdown Time	5	48	hrs
Max Pond Depth to Drain in 48 hrs	6	11.43	ft
Max Pond Depth (Basin Max. Depth)	6	4.50	ft
Pond Depth	7	4.50	ft
Infiltrating Surface Area	8	6,333	ft ²
Amended Soil Depth d _{media}	9	0	ft
Amended Soil Porosity	10	0	
Gravel Depth d _{media}	11	0	ft
Gravel Porosity	12	0.4	
Storm Duration	13	3	hrs
V _{ret} =	14	33,022	ft ³
Manufacturer's Retention	15	0	ft ³
Total Retention Volume	16	33,022	ft ³
Fraction of DCV Achieved	17	271.79%	
Full DCV Achieved	18	Yes	
Actual		18.90	hrs



WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Thursday, April 05, 2018

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s): 016709105, 016709104, 016709102, 016709108

Project Site Acreage: 37.237

HCOC Exempt Area: Yes. Verify that the project is completely with the HCOC exemption area.

Closest Receiving Waters: System Number - 101

Applicant to verify based on local drainage facilities and topography.)

Facility Name - Santa Ana River

Owner - SBCFCD

Closest channel segment's susceptibility to Hydromodification: EHM Highest downstream hydromodification susceptibility: High Is this drainage segment subject to TMDLs? No Are there downstream drainage segments subject to TMDLs? No Is this drainage segment a 303d listed stream? No Are there 303d listed streams downstream? Yes Are there unlined downstream waterbodies? No Project Site Onsite Soil Group(s): A, B **Environmentally Sensitive Areas within 200':** None Groundwater Depth (FT): -200 Parcels with potential septic tanks within 1000': No Known Groundwater Contamination Plumes within 1000': Yes

Studies and Reports Related to Project Site: CSDP 4 CALC SHEET FOR HYDRO

CSDP 4 Hydrological Design Criteria

SBVMWD High Groundwater / Pressure Zone Area



NOAA Atlas 14, Volume 6, Version 2 Location name: Redlands, California, USA* Latitude: 34.0795°, Longitude: -117.1933° Elevation: 1306.38 ft**

* source: ESRI Maps ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF tabular | PF graphical | Maps & aerials

PF tabular

F D	S-based p	Joint prec	ipitation i					Ce ilitei va	113 (111 11101	163)
Duration	Average recurrence interval (years) 1 2 5 10 25 50 100 200 500 10								1000	
5-min	0.099 (0.082-0.120)	0.128	0.168 (0.139-0.205)	0.201	0.246	0.283	0.320	0.360	0.416	0.460
10-min	0.142 (0.118-0.172)	0.184 (0.153-0.224)	0.241 (0.199-0.293)	0.288 (0.236-0.354)	0.353 (0.280-0.449)	0.405 (0.315-0.526)	0.459 (0.348-0.612)	0.516 (0.380-0.708)	0.596 (0.420-0.852)	0.659 (0.449-0.977
15-min	0.172 (0.143-0.209)	0.223 (0.185-0.271)	0.291 (0.241-0.355)	0.348 (0.286-0.428)	0.427 (0.339-0.543)	0.490 (0.381-0.637)	0.555 (0.421-0.740)	0.624 (0.460-0.856)	0.720 (0.508-1.03)	0.797 (0.543-1.18
30-min	0.256 (0.213-0.310)	0.331 (0.275-0.403)	0.433 (0.359-0.528)	0.517 (0.425-0.636)	0.635 (0.504-0.808)	0.729 (0.566-0.947)	0.826 (0.626-1.10)	0.928 (0.684-1.27)	1.07 (0.756-1.53)	1.19 (0.808-1.76
60-min	0.370 (0.308-0.449)	0.480 (0.399-0.583)	0.627 (0.519-0.764)	0.749 (0.616-0.921)	0.920 (0.730-1.17)	1.06 (0.820-1.37)	1.20 (0.906-1.59)	1.34 (0.990-1.84)	1.55 (1.10-2.22)	1.72 (1.17-2.55)
2-hr	0.528 (0.439-0.641)	0.678 (0.563-0.824)	0.877 (0.727-1.07)	1.04 (0.857-1.28)	1.27 (1.01-1.62)	1.45 (1.13-1.88)	1.63 (1.24-2.18)	1.83 (1.35-2.51)	2.09 (1.48-3.00)	2.30 (1.57-3.41)
3-hr	0.649 (0.540-0.788)	0.830 (0.690-1.01)	1.07 (0.888-1.31)	1.27 (1.04-1.56)	1.54 (1.23-1.96)	1.76 (1.37-2.28)	1.98 (1.50-2.63)	2.20 (1.62-3.02)	2.52 (1.78-3.60)	2.76 (1.88-4.09)
6-hr	0.908 (0.756-1.10)	1.16 (0.964-1.41)	1.49 (1.24-1.82)	1.77 (1.45-2.17)	2.14 (1.70-2.72)	2.42 (1.89-3.15)	2.72 (2.06-3.62)	3.03 (2.23-4.15)	3.44 (2.43-4.92)	3.77 (2.57-5.58)
12-hr	1.21 (1.01-1.47)	1.56 (1.29-1.89)	2.01 (1.66-2.44)	2.37 (1.95-2.91)	2.87 (2.28-3.65)	3.25 (2.53-4.22)	3.64 (2.76-4.85)	4.04 (2.97-5.53)	4.58 (3.23-6.55)	5.00 (3.40-7.40)
24-hr	1.63 (1.44-1.88)	2.11 (1.86-2.43)	2.73 (2.41-3.16)	3.24 (2.83-3.77)	3.92 (3.32-4.72)	4.44 (3.69-5.46)	4.97 (4.03-6.26)	5.51 (4.34-7.13)	6.24 (4.72-8.42)	6.81 (4.98-9.49)
2-day	2.01 (1.78-2.32)	2.64 (2.33-3.04)	3.46 (3.05-4.01)	4.14 (3.62-4.82)	5.05 (4.28-6.09)	5.76 (4.78-7.09)	6.48 (5.25-8.16)	7.23 (5.70-9.36)	8.24 (6.24-11.1)	9.03 (6.61-12.6)
3-day	2.18 (1.93-2.51)	2.89 (2.56-3.34)	3.85 (3.39-4.45)	4.63 (4.05-5.40)	5.72 (4.85-6.89)	6.57 (5.45-8.08)	7.45 (6.03-9.38)	8.36 (6.59-10.8)	9.62 (7.28-13.0)	10.6 (7.76-14.8)
4-day	2.35 (2.08-2.71)	3.15 (2.78-3.63)	4.21 (3.72-4.87)	5.10 (4.46-5.95)	6.34 (5.37-7.63)	7.31 (6.07-8.99)	8.32 (6.74-10.5)	9.37 (7.39-12.1)	10.8 (8.20-14.6)	12.0 (8.78-16.7)
7-day	2.71 (2.40-3.13)	3.67 (3.24-4.23)	4.95 (4.36-5.72)	6.01 (5.26-7.01)	7.50 (6.35-9.03)	8.66 (7.19-10.7)	9.88 (8.00-12.4)	11.2 (8.79-14.4)	12.9 (9.78-17.4)	14.3 (10.5-20.0)
10-day	2.94 (2.60-3.38)	3.99 (3.53-4.60)	5.41 (4.77-6.25)	6.59 (5.77-7.68)	8.24 (6.98-9.92)	9.54 (7.92-11.7)	10.9 (8.82-13.7)	12.3 (9.71-15.9)	14.3 (10.8-19.3)	15.9 (11.6-22.1)
20-day	3.63 (3.21-4.18)	4.97 (4.40-5.74)	6.79 (5.99-7.86)	8.31 (7.27-9.69)	10.4 (8.85-12.6)	12.1 (10.1-14.9)	13.9 (11.3-17.5)	15.8 (12.4-20.4)	18.4 (13.9-24.7)	20.4 (14.9-28.5)
30-day	4.27 (3.78-4.92)	5.87 (5.19-6.77)	8.03 (7.08-9.29)	9.84 (8.61-11.5)	12.4 (10.5-14.9)	14.4 (12.0-17.7)	16.5 (13.4-20.8)	18.8 (14.8-24.3)	21.9 (16.6-29.6)	24.4 (17.9-34.1)
45-day	5.11 (4.53-5.89)	7.00 (6.19-8.07)	9.56 (8.44-11.1)	11.7 (10.3-13.7)	14.8 (12.5-17.8)	17.2 (14.3-21.1)	19.7 (16.0-24.8)	22.4 (17.7-29.0)	26.2 (19.8-35.3)	29.2 (21.4-40.8)
60-day	5.99 (5.30-6.90)	8.15 (7.21-9.40)	11.1 (9.78-12.8)	13.6 (11.9-15.8)	17.1 (14.5-20.6)	19.9 (16.5-24.4)	22.8 (18.5-28.7)	25.9 (20.4-33.5)	30.3 (22.9-40.8)	33.8 (24.7-47.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

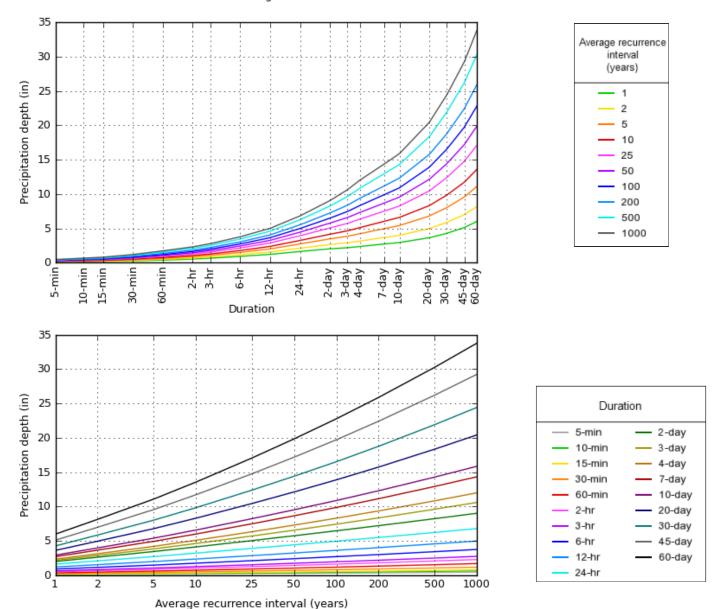
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves Latitude: 34.0795°, Longitude: -117.1933°



NOAA Atlas 14, Volume 6, Version 2

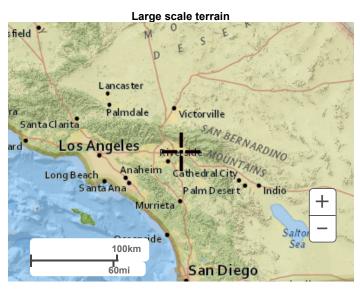
Created (GMT): Wed Dec 19 23:42:03 2018

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Maps & aerials

Small scale terrain







Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
Α	Suitability Assessment	Soil assessment methods	0.25	2	.50
		Predominant soil texture	0.25	1	.25
		Site soil variability	0.25	1	.25
		Depth to groundwater / impervious layer	0.25	1	.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.25
	Design	Tributary area size	0.25	3	.75
В		Level of pretreatment/ expected sediment loads	0.25	1	.25
		Redundancy	0.25	3	.75
		Compaction during construction	0.25	2	.50
		Design Safety Factor, $S_B = \Sigma p$			2.25
Combined Safety Factor, S _{TOT} = S _A x S _B					3.50
Measured Infiltration Rate, inch/hr, K _M (corrected for test-specific bias)				10.0	
Design Infiltration Rate, in/hr, K _{DESIGN} = S _{TOT} / K _M				2.86	

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

PLEASE SEE ATTACHED INFILTRATION TESTING UNDER TAB 6.4E MISC. DATA.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

VII-35 May 19, 2011

UPDATED GEOTECHNICAL AND INFILTRATION EVALUATION FOR

PROPOSED RESIDENTIAL DEVELOPMENT CITRUS VALLEY PROJECT NORTH OF SAN BERNARDINO AVENUE AND WEST OF TEXAS STREET CITY OF REDLANDS, SAN BERNARDINO COUNTY, CALIFORNIA

PREPARED FOR

RSI COMMUNITIES
620 NEWPORT CENTER DRIVE, 12TH FLOOR
NEWPORT BEACH, CALIFORNIA 92660

PREPARED BY

GEOTEK, INC. 1548 NORTH MAPLE STREET CORONA, CALIFORNIA 92880



OCTOBER 24, 2017





October 24, 2017 Project No. 1776-CR

RSI Communities

620 Newport Center Drive, 12th Floor Newport Beach, California 92660

Attention: Mr. Jim Holas

Subject: Updated Geotechnical and Infiltration Evaluation

Proposed Residential Development

North of San Bernardino Avenue and West of Texas Street

City of Redlands, San Bernardino County, California

Dear Mr. Holas:

We are pleased to provide the results of our updated geotechnical and infiltration evaluation for the subject site located in the city of Redlands, County of San Bernardino, California. This report presents a discussion of our evaluation and provides preliminary geotechnical recommendations for earthwork, foundation design, and construction. In our opinion, the site development appears feasible from a geotechnical viewpoint provided that the recommendations presented in this report are incorporated into the design and construction.

GeoTek, Inc. (GeoTek) has reviewed the referenced report by Leighton and Associates, Inc, (L&A, 2006). GeoTek has reviewed the boring logs and results of the laboratory testing in the referenced report and now assumes responsibility as geotechnical consultant of record henceforth for the subject project.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted, **GeoTek, Inc.**



Edward H. LaMont CEG 1892, Exp. 7/31/18 Principal Geologist Gaby M. Bogdanoff CE 66619, Exp. 06/30/18 Project Engineer

Distribution: (I) Addressee via email (one PDF file)

G:\Projects\1751 to 1800\1776CR RSI Communities Citrus Valley Redlands\Geo Investigation\1776-CR Updated Geotechnical Evaluation Citrus Valley Project Redlands.doc



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City of Redlands, Sand Bernardino County, California

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5.4.2 Concrete Mix Design
5.4.2 Concrete Mix Design
5.4.2 Concrete Mix Design

ENCLOSURES

- Figure I Site Location Map
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- Appendix A Boring Logs and Laboratory Test Results by L&A (2006)
- Appendix B Trench Logs by GeoTek
- Appendix C Laboratory Test Results
- Appendix D Infiltration Test Results
- Appendix E General Grading Guidelines



I. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the geotechnical conditions in the area of proposed construction. Services provided for this study included the following:

- Research and review of available geologic data and general information pertinent to the site,
- Site exploration consisting of the excavation, logging, and sampling of 12 exploratory trenches,
- Evaluation of water infiltration potential by performing four infiltration tests,
- Laboratory testing of soil samples obtained during the field investigation,
- Review and evaluation of site seismicity, and
- Compilation of this geotechnical report which presents our findings, conclusions, and recommendations for the proposed development.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The square-shaped project site consists of approximately 37.3 acres and is located north of West San Bernardino Avenue, south of West Pioneer Avenue, west of Texas Street, and approximately 1/3-mile east of the 210 Freeway in the city of Redlands, San Bernardino County, California. Based on our recent site reconnaissance, the site is occupied by a citrus grove which has mostly been abandoned. The property is relatively planar with a topographic relief of 25 feet to the west-northwest. Surface drainage is directed to the west and northwest. Surrounding properties include vacant land to the west, West Pioneer Avenue followed by a school site to the north, and scattered residential and agricultural properties to the east and south.

The general location of the site is shown on Figure 1.



Project No. 1776-CR October 24, 2017

Page 2

2.2 PROPOSED DEVELOPMENT

Based on the *Conceptual Plan 3* prepared for the site, it is our understanding that the construction of the project will include the razing of all the existing citrus trees and related improvements to build approximately 138 residential units, with associated underground utilities, paved streets, and landscape areas. We also anticipate that the residences will consist of one- to two-story wood-frame houses with concrete slab-on-grade floors and conventional shallow foundations. Cuts and fills of less than 5 feet, and cut and fill slopes up to 5 feet in height are also expected.

If the site development differs from that described above, the recommendations should be subject to further review and evaluation. Final site development plans should be reviewed by GeoTek, Inc.

3. REVIEW OF PREVIOUS REPORTS, FIELD EXPLORATION, LABORATORY TESTING, AND INFILTRATION TESTING

3.1 REVIEW OF PREVIOUS REPORTS

On June 21, 2006, Leighton and Associates (L&A) completed a Geotechnical Study to Support the Environmental Impact Report, Redlands Commons and Trojan Groves Project, West of Texas Street, North of San Bernardino Avenue, City of Redlands, California. This study placed four exploratory borings to a maximum depth of 51.5 feet below the ground surface (bgs) within the subject project site. L&A described that the upper one to two feet of the onsite soil had being disturbed due to the agricultural activities on site. Native materials, below the disturbed upper soil, consisted of loose to medium dense sand with varying amounts of silt, gravel, and scarce cobbles. Groundwater was not encountered by L&A up to 51.5 feet bgs. L&A stated that groundwater was at 150 to 200 feet bgs below the site and that the risk of soil liquefaction at the site was very low. Surficial soils were also reported to have "negligible" soluble sulfate concentrations; "very low" expansion potential; and being "mildly to moderately" corrosive to ferrous metals. Potential cut slopes exposing unconsolidated alluvial materials and fill slopes were noted to likely be moderately to highly susceptible to erosion. Also, to mitigate loose surficial site soils, L&A recommended that residential pad areas be over-excavated and recompacted to a minimum depth of 2 feet below the bottom of footings or 4 feet below existing grade, whichever was greater.



The logs of the exploratory borings and laboratory test results by L&A are included in Appendix A. The approximate exploratory boring locations by L&A are shown on the Exploration Location Map in Figure 2.

3.2 FIELD EXPLORATION

GeoTek conducted a field exploration at the site on October 9, 2017 which consisted of excavating 12 exploratory trenches to depths ranging from approximately 3 to 12 feet bgs. The approximate locations of the recent exploratory trenches and the previous borings by L&A are shown on the Exploration Location Map, presented as Figure 2. Logs of the exploratory trenches performed by GeoTek are included in Appendix B.

3.3 LABORATORY TESTING

Laboratory testing was performed on selected bulk and relatively undisturbed soil samples collected during our field exploration. The purpose of the laboratory testing was to confirm the field classification of the soils encountered and to evaluate their physical properties for use in the engineering design and analysis. Results of the laboratory testing program along with a brief description and relevant information regarding testing procedures are included in Appendix C and on the trench logs included in Appendix B.

3.4 INFILTRATION TESTING

Four shallow trenches were excavated at the site for infiltration testing purposes. The trenches were excavated to 3 feet bgs and were placed in each of the four quadrants of the site so that representative testing of the site soils was more likely to occur. The approximate locations of the infiltration trenches are shown on the Exploratory Location Map (Figure 2).

An 8-inch diameter, 12-inch deep hole was excavated at the bottom of each trench to perform percolation testing in general accordance with the *Orange County Technical Guidance Document Appendix VII*, which is also the guideline adopted by San Bernardino County. The percolation rates obtained were then converted to field infiltration rates using the Porchet Method outlined in the referenced *Guidance Document*.

The field infiltration rates are presented in the following table for each of the trenches after the rates had stabilized.



SUMMARY OF FIELD INFILTRATION RATES			
Trench No.	Approximate Depth of Testing (feet)	Field Infiltration Rate (inches per hour)	
I- I	3	17.3	
I-2	3	20.5	
I-3	3	16.7	
I-4	3	10.0	

Copies of the data conversion sheets (Porchet Method) are included in Appendix D. Given the nature of the materials encountered and infiltration rates attained in the trenches excavations tested, the number of test performed should be considered adequate for preliminary design purposes.

Over the lifetime of the storm water disposal areas, the infiltration rates may be affected by silt build up and biological activities, as well as local variations in near surface soil conditions. A suitable factor of safety should be applied to the field rates to design the infiltration system.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is situated in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. Basically, it extends from the point of contact with the Transverse Ranges geomorphic province, southerly to the tip of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zone trend northwest-southeast and are found near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province, and the San Jacinto fault borders the province adjacent the Colorado Desert province.



More specific to the subject property, the site is located in an area geologically mapped to be underlain by younger alluvium deposits (Morton, D.M. and Miller F.K., 2006). The San Andres Fault zone, San Bernardino Mountains section, located approximately 3.5 miles northeast of the site, is the closest known active fault to the subject site.

4.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the earth materials underlying the site is presented in the following section. Based on our recent subsurface exploration and review of readily available regional geologic maps for the project site area (Morton, D.M. and Miller F.K., 2006), Quaternary age younger alluvial fan deposits underlie the site.

4.2.1 Younger Alluvial Fan Deposits

The alluvial deposits encountered in our trenches generally consist of grayish brown to gray, dry to slightly moist, silty fine to coarse sands along with poorly sorted fine to coarse sands with gravel. Based on our field observations and in-place density tests, the upper 5 to 7 feet of the site soils are loose to medium dense, becoming denser with depth.

A "very low" (0≤El≤20) expansion potential for the surficial soils was found when tested in accordance with ASTM Test Method D 4829. In addition, results of direct shear testing confirmed our observations that the site soils are mostly granular with no to little cohesion. These soils are relatively more susceptible to erosion.

Detailed trench logs are provided in Appendix B.

4.3 SURFACE AND GROUNDWATER

4.3.1 Surface Water

If encountered during the earthwork construction, surface water on this site is the result of precipitation or surface run-off from surrounding sites. Overall area drainage is towards the west-northwest. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

Groundwater was not encountered within the trenches at the time of our investigation. L&A noted the absence of groundwater in their borings drilled up to 51.5 feet bgs at the site (L&A, 2006). As noted within the Seismic Hazard Zone Report for the Redlands Quadrangle, historic high groundwater is mapped at approximately 150 feet bgs (California Department of



Conservation, 1997). The California Water Data Library (http://www.water.ca.gov/) indicates groundwater at a depth of 227 to 233 feet bgs from 2015 to 2017, based on a well approximately 0.5 miles south of the project site.

It is possible that seasonal variations (temperature, rainfall, etc.) will cause fluctuations in the groundwater level. The groundwater levels presented in this report are the levels that were measured at the time of our field activities or as stated in the referenced source. It is recommended that the contractor determine the actual groundwater levels at the site at the time of the construction activities to determine the impact, if any, on the construction procedures.

Based on the above data, groundwater is not anticipated to adversely affect the proposed improvements.

4.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an "Alquist-Priolo" Earthquake Fault Zone or a Special Studies Zone (Bryant and Hart, 2007; CGS, 1980). The nearest zoned fault to the subject site is the San Andres Fault zone, San Bernardino Mountains section, located approximately 3.5 miles northeast of the site.

4.4.1 Seismic Design Parameters

The site is located at approximately 34.079067 Latitude and -117.193333 Longitude. Site spectral accelerations (Ss and S1), for 0.2 and 1.0 second periods for a Class "D" site, were determined from the USGS Website, Earthquake Hazards Program, Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude/Longitude. The results are presented in the following table:



2016 CBC SITE SEISMIC P	ARAMETERS
Mapped 0.2 sec Period Spectral Acceleration, S_s	1.821g
Mapped 1.0 sec Period Spectral Acceleration, S1	0.870g
Site Coefficient for Site Class "D", Fa	1.0
Site Coefficient for Site Class "D", Fv	1.5
Maximum Considered Earthquake (MCE Spectral Response Acceleration for 0.2 Second, Sms	1.821g
Maximum Considered Earthquake (MCE Spectral Response Acceleration for 1.0 Second, Sм1	1.305g
Design Spectral Response Acceleration for Parameter at 0.2 Second, SDS	1.214g
Design Spectral Response Acceleration for Parameter at 1.0 second, SDI	0.870g
Peak Ground Acceleration (PGA _M)	0.724g

4.4.2 Liquefaction and Seismically-Induced Settlement

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction occurs, the liquefied soil/water matrix can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures and some low-plastic silts and clays.

The subject site is not mapped within a zone of potentially liquefiable soils by the Department of Conservation (CGS) or by the County of San Bernardino. Liquefaction is not considered a hazard at the site due to the lack of shallow groundwater.

Total and differential seismically-induced settlement is anticipated to be less than 2-inches and I inch, respectively (L&A, 2006).



4.4.3 Other Seismic Hazards

Evidence of ancient landslides or slope instabilities at this site was not observed during our investigation. The site vicinity is located in an area that has relatively flat to gently sloping terrain. Thus, the potential for landslides is considered negligible. Additionally, the project site is not located in an area identified by the State of California as an earthquake-induced landslide hazard zone (CGS, 2000).

The potential for secondary seismic hazards such as a seiche or tsunami are considered to be negligible due to site elevation and distance from an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5. I **GENERAL**

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations are incorporated into the design and construction phases of development.

5.2 EARTHWORK CONSIDERATIONS

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Redlands, the 2016 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix E outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix E.

5.2.1 Site Clearing and Demolition

In areas of planned grading or improvements, the site should be cleared of existing improvements, vegetation, trash and debris, and properly disposed of off-site. Voids resulting from the removal of trees and demolition of the existing structures and improvements should be backfilled with engineered fill materials with expansion characteristics similar to the on-site soils.



5.2.2 Removals/Overexcavations

It is recommended that the upper loose portions of the native alluvial soils below the planned structural areas and structural fill areas be removed until competent native soils are encountered. Competent native soil should have a relative compaction of at least 85 percent (ASTM D 1557) and little to no visible porosity. Loose alluvium was noted in all our trenches to depths of approximately 5 feet bgs. A representative of this firm should observe and approve the bottom of all excavations.

Cut lots should be over-excavated to a minimum of 5 feet below the existing grade or 2 feet below the deepest planned footing, whichever is greater. In addition, the cut portions of transition lots should be excavated to at least 5 feet below the existing ground surface, at least 2 feet below the deepest footing, or to a minimum of one-third of the maximum fill thickness, whichever is greater.

As a minimum, removals/over-excavations should laterally 5 feet away from foundation elements or at a 1:1 (h:v) projection to the recommended removal depth, whichever is greater.

Development plans should be reviewed by this firm when available. Depending on actual field conditions encountered during grading, locally deeper areas of removal may be recommended.

All footings should rest on at least 2 feet of engineered compacted fill.

Street and flatwork areas and areas to receive fills located beyond the limits of the remedial grading of the building pads should be excavated a minimum depth of 3 feet from the original ground surface or a minimum of 2 feet below the proposed finish grade, whichever is greater. Removals/over-excavations for street and flatwork improvements should extend laterally a minimum of 2 feet from the edges of the improvements.

5.2.3 Preparation of Areas to Receive Engineered Fill

A representative of this firm should observe the bottom of all excavations. Upon approval, the exposed soils and all soils in areas to receive engineered fill should be scarified to a depth of approximately 8 inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

5.2.4 Engineered Fills

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. Rock fragments greater than six inches in maximum dimension should not be incorporated into the fill. The organic content of



the existing surficial soils across the site should be verified prior their use as compacted fill. Organic content of engineered fill shall be less than I percent by weight, per local industry standards.

Engineered fill should be placed in horizontal lifts not exceeding eight inches in loose thickness, moisture conditioned to at least the optimum moisture content and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

5.2.5 Slope Construction

Fill and cut slopes constructed at gradients of 2:1 (h:v), in accordance to industry standards, are anticipated to be globally stable. However, granular soils with no to little cohesion were noted to be predominant at the site. Surficially, proposed 2:1 cut slopes and 2:1 fill slopes built with the on-site materials may be unstable. To reduce this potential, slopes should be properly planted with light-weight, deep-rooted plants approved by the City. Slopes should not be over-irrigated. Drainage should not be allowed to flow uncontrolled over the slopes. Additionally, slopes on this site are recommended to be reinforced with a geotextile along the surface to increase the surficial stability. This reinforcement should be Miramesh® Biaxial Geosynthetics or equivalent. See sections 5.5.1 and 5.5.2 of this report for additional recommendations.

Where fill is to be placed against sloping terrain with gradients 5:1 (h:v) or steeper, the sloping ground surface should be benched to remove loose and disturbed surface soil to assure that the new fill is placed in direct contact with competent native soils and to provide horizontal surfaces for fill placement. Keyways and benches should be constructed per instructions of GeoTek's representative.

The base of the keyways and benches should be sloped back into the hillside at a gradient of at least 2 percent. The base of the benches should be evaluated by a representative of GeoTek prior to processing. Upon approval, the exposed soils should be moistened to at least the optimum moisture content, and densified to a relative compaction of at least 90 percent (ASTM D 1557). Details showing slope construction are presented in Appendix E.

An engineering geologist should observe all cut slopes. Cut slopes should expose competent native soils. If adverse structure or incompetent materials are exposed and identified in the cut slopes, stabilization fills may be recommended.

5.2.6 Excavation Characteristics

Excavation in the on-site soils is expected to be feasible using heavy-duty grading equipment in good operating condition. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines.



Temporary excavations within the on-site materials should be stable at 1:1 (h:v) inclinations for cuts less than 5 feet in height.

5.2.7 Trench Excavations and Backfill

Temporary excavations within the onsite materials should be stable at 1:1 inclinations for short durations during construction, and where cuts do not exceed 5 feet in height. Temporary cuts to a maximum height of 4 feet can be excavated vertically, but local sloughing and/or failure could occur due to the granular nature of some of the soils at this site. If excavations deeper than 5 feet are required, these should be sloped to at least 1.5:1 (h:v). Increased caution should be applied when working near or within any excavations at this site.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90 percent relative compaction (as determined per ASTM D 1557). Under-slab trenches should also be compacted to project specifications. Where applicable, based on jurisdictional requirements, the top 12 inches of backfill below subgrade for road pavements should be compacted to at least 95 percent relative compaction. Onsite materials should be suitable as backfill provided particles larger than 6± inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.2.8 Shrinkage and Subsidence

Several factors will impact earthwork balancing on the site, including shrinkage, bulking, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage, bulking and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 5 to 15 percent may be considered for the materials requiring removal and/or recompaction. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of site earthwork construction. Bulking is not considered to be a significant factor with the underlying materials within the vicinity of the anticipated construction. Subsidence on the order of up to 0.1 foot could occur.



5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

The soils encountered in our exploratory trenches and in the exploratory borings by L&A (2006) are mostly granular soils and possess "very low" (0≤El≤20) expansion potential in accordance with ASTM D 4829. Foundation design criteria, in general conformance with the 2016 CBC, are presented below. These are minimal recommendations and are not intended to supersede the design by the project structural engineer.

The foundation elements for the proposed structures should bear entirely in engineered fill soils. Foundations should be designed in accordance with the 2016 California Building Code (CBC).

A summary of our foundation design recommendations is presented in the following table:

GEOTECHNICAL RECOMMENDATIONS FOR FOUNDATION DESIGN			
Design Parameter	"Very Low" Expansion Potential 0≤El≤20		
Foundation Depth or Minimum Perimeter Beam Depth (inches below the lowest adjacent grade)	One-Story – 12 Two-Stories – 12		
Minimum Foundation Width (inches)*	One- to Two-Stories – 12		
Minimum Slab Thickness (inches)	4 - Actual		
Sand Blanket and Moisture Retardant membrane below On-Grade Building Slabs	2 inches of sand** overlying moisture vapor retardant membrane overlying 2 inches of sand**		
Minimum Slab Reinforcing	$6" \times 6" - WI.4/WI.4$ welded wire fabric placed in the middle of slab		
Minimum Footing Reinforcement for Continuous Footings, Grade Beams and Retaining Wall Footings	Two No. 4 reinforcing bars, one placed near the top and one near the bottom		
Effective Plasticity Index***	NA		
Presaturation of Subgrade Soil (Percent of Optimum/Depth in Inches)	Minimum of 100% of the optimum moisture content to a depth of at least 12 inches prior to placing concrete		

^{*} Code minimums per Table 1809.7 of the 2016 CBC

An allowable bearing capacity of 1800 pounds per square foot (psf) may be used for design of building and retaining wall footings. This value may be increased by 400 psf for each additional 12 inches of embedment depth and by 200 psf for each additional 12 inches in width to a maximum of 3000 psf. The allowable bearing capacity may be increased by one-third when considering short-term wind and/or seismic loads.



^{**} Sand should have a sand equivalent of at least 30

For footings designed in accordance with the recommendations presented in this report, we would anticipate a maximum static settlement of less than one inch and a maximum differential static settlement of less than ½-inch in a 40-foot span. Differential seismic settlement is anticipated to be less than I-inch in a 40-foot span (L&A, 2006).

The passive earth pressure may be computed as an equivalent fluid having a density of 300 psf per foot of depth, to a maximum earth pressure of 3000 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. When combining passive and frictional resistance, the passive pressure component should be reduced by one-third.

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2016 *California Green Building Standards Code* (CALGreen) Section 4.505.2 and the 2016 *CBC* Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a six-mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeability) to achieve the desired performance level. Consideration should be given to consulting with an individual possessing specific expertise in this area for additional evaluation.



Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarders should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, and/or architect be consulted to evaluate the general and specific moisture vapor transmission paths and associated potential impact.

In addition, the recommendations in this report and our services in general are not intended to address mold prevention, since we along with geotechnical consultants in general, do not practice in areas of mold prevention. If specific recommendations are desired, a professional mold prevention consultant should be contacted.

5.3.2 Miscellaneous Foundation Recommendations

- To reduce moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.
- Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.
- Under-slab utility trenches should be compacted to project specifications. Compaction should be achieved with a mechanical compaction device. If soils to be used as backfill have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3.3 Foundation Set Backs

Minimum setbacks to all foundations should comply with the 2016 CBC or City of Redlands requirements, whichever is greater. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movements and/or differential settlements. If large enough, these movements can compromise the integrity of the improvements. The bottom of any proposed foundations should be deepened so as to extend below a 1:1 (h:v) upward projection from the bottom edge of the closest footing.



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5.3.4 Retaining Wall Design and Construction

5.3.4.1 General Design Criteria

Recommendations presented in this report apply to typical masonry or concrete retaining walls to a maximum height of up to about 6 feet. Additional review and recommendations should be requested for higher walls. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Retaining wall foundations should be embedded a minimum of 12 inches into engineered fill and/or competent native materials and should be designed in accordance with Section 5.3.1 of this report. Structural needs may govern and should be evaluated by the project structural engineer.

Earthwork considerations, site clearing and remedial earthwork for all earth retention structures should meet the requirements of this report, unless specifically provided otherwise, or more stringent requirements or recommendations are made by the designer. The backfill material placement for all earth retention structures should meet the requirement of Section 5.3.4.3 in this report.

In general, cantilever earth retention structures, which are designed to yield at least 0.001H, where H is equal to the height of the earth retention structure to the base of its footing, may be designed using the active condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at top, such as typical basement walls) should be designed using the at-rest condition.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent building or traffic loading, should be considered in the design of the earth retention structures. Loads applied within a 1:1 (h:v) projection from the surcharge on the stem and footing of the earth retention structure should be considered in the design.

Final selection of the appropriate design parameters should be made by the designer of the earth retention structures.

5.3.4.2 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 6 feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given



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below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, or adverse geologic conditions.

ACTIVE EARTH PRESSURES		
Surface Slope of Retained	Equivalent Fluid Pressure	
Materials	(pcf)	
(h:v)	(Native Backfill)*	
Level	37	
2:1	58	

^{*} The design pressures assume the backfill material has an expansion index less than or equal to 20. Backfill zone includes area between back of the wall to a plane (I:I h:v) up from bottom of the wall foundation (on the backside of the wall) to the (sloped) ground surface.

5.3.4.3 Restrained Retaining Walls

Retaining walls that will be restrained at the top that support level backfill or that have reentrant or male corners, should be designed for an equivalent at-rest fluid pressure of 58 pcf, plus any applicable surcharge loading for level backfill conditions. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

5.3.4.4 Retaining Wall Backfill and Drainage

Retaining walls should be provided with an adequate pipe and gravel back drain system to help prevent buildup of hydrostatic pressures. Backdrains should consist of a 4-inch diameter perforated collector pipe (Schedule 40, SDR 35, or approved equivalent) embedded in a minimum of one-cubic foot per linear foot of $\frac{3}{4}$ - to 1-inch clean crushed rock or an approved equivalent, wrapped in filter fabric (Mirafi 140N or an approved equivalent). The drain system should be connected to a suitable outlet. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Retaining wall backfill should be placed in lifts no greater than 8 inches in thickness and compacted to a minimum of 90 percent relative compaction in accordance with ASTM Test Method D 1557. The wall backfill should also include a minimum one-foot wide section of ³/₄-to 1-inch clean crushed rock (or an approved equivalent). The rock should be placed immediately adjacent to the back of the wall and extend up from a back drain to within approximately 24 inches of the finish grade. The rock should be separated from the earth with filter fabric. The upper 24 inches should consist of compacted on-site soil.



As an alternative to the drain rock and fabric, Miradrain 2000, or approved equivalent, may be used behind the retaining wall. The Miradrain 2000 should extend from the base of the wall to within 2 feet of the ground surface. The subdrain should be placed at the base of the wall in direct contact with the Miradrain 2000.

The presence of other materials might necessitate revision to the parameters provided and modification of the wall designs. Proper surface drainage needs to be provided and maintained.

5.3.4.5 Other Design Considerations

- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.
- No backfill should be placed against concrete until minimum design strengths are evident by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should be approved the project geotechnical engineer or their authorized representative.

5.3.5 Pavement Design Considerations

Pavement design for proposed street improvements was conducted per Caltrans *Highway Design Manual* guidelines for flexible pavements. Based on an assumed R-value of 35 typically associated with silty sandy soils and for Traffic Indices (TIs) ranging from 4.5 to 5.5 generally linked to roads with light vehicular traffic with occasional heavy truck traffic, the following sections were calculated:

PRELIMINARY STRUCTURAL SECTIONS FOR SITE PAVEMENTS			
Traffic Index	Thickness of AC (feet)	Thickness of AB (feet)	
4.5	0.25*	0.33*	
5.0	0.25	0.40	
5.5	0.25	0.50	

^{*}Minimum thickness required by the City of Redlands

Traffic Indices (TIs) used in our pavement design are considered reasonable values for the proposed residential street areas, and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from the paving will result in premature pavement failure. Traffic parameters used for design were selected based upon engineering judgment and not upon information furnished to us such as an equivalent wheel load analysis or a traffic study.



The recommended pavement sections provided are intended as a minimum guideline and final selection of pavement cross section parameters should be made by the project civil engineer, based upon the local laws and ordinates, expected subgrade and pavement response, and desired level of conservatism. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. Final pavement design should be checked by testing of soils exposed at subgrade (the upper 5 feet) after final grading has been completed.

Asphalt concrete and aggregate base should conform to current Caltrans Standard Specifications Section 39 and 26-1.02, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the current Standard Specifications for Public Work (Green Book). Crushed aggregate base or crushed miscellaneous base can conform to Section 200-2.2 and 200-2.4 of the Green Book, respectively. Pavement base should be compacted to at least 95 percent of the ASTM D1557 laboratory maximum dry density.

All pavement installation, including preparation and compaction of subgrade, compaction of base material, placement and rolling of asphaltic concrete, should be done in accordance with the City of Redlands specifications, and under the observation and testing of GeoTek and a City Inspector where required. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern.

Deleterious material, excessive wet or dry pockets, oversized rock fragments, and other unsuitable yielding materials encountered during grading should be removed. Once existing compacted fill are brought to the proposed pavement subgrade elevations, the subgrade should be proof-rolled in order to check for a uniform and unyielding surface. The upper 12 inches of pavement subgrade soils should be scarified, moisture conditioned at or near optimum moisture content, and recompacted to at least 95 percent of the laboratory maximum dry density (ASTM D1557). Rock fragment over 6 inches in one dimensions should not be placed within the upper 12 inches of the subgrade. If loose or yielding materials are encountered during construction, additional evaluation of these areas should be carried out by GeoTek. All pavement section changes should be properly transitioned.

5.3.6 Soil Corrosivity

The soil resistivity at this site was tested in the laboratory on two samples collected during the field exploration. The results of the testing indicate that the soil samples are "mildly corrosive" to buried ferrous metals in accordance with current standards commonly used by corrosion engineers. These characteristics are considered typical of soils commonly found in Southern California. Consideration should be given to consulting with a corrosion engineer.



5.3.7 Soil Sulfate Content

The sulfate content was determined in the laboratory on two samples of the on-site soils. The results indicate that the water-soluble sulfate range is less than 0.1 percent by weight, which is considered "not applicable" (i.e. negligible) as per Table 4.2.1 of ACI 318. Based upon the test results, no special concrete mix design is required for sulfate attack resistance.

5.3.8 Import Soils

Import soils should have expansion characteristics similar to the on-site soils. GeoTek also recommends that, as a minimum, proposed import soils be tested for corrosivity and soluble sulfate content. GeoTek should be notified a minimum of 72 hours prior to importing so that appropriate sampling and laboratory testing can be performed.

5.4 CONCRETE CONSTRUCTION

5.4.1 General

Concrete construction should follow the 2016 CBC and ACI guidelines regarding design, mix placement and curing of the concrete. If desired, we could provide quality control testing of the concrete during construction.

5.4.2 Concrete Mix Design

As indicated in Section 5.3.7, no special concrete mix design is required by Code to resist sulfate attack based on the existing test results. However, additional testing should be performed during grading so that specific recommendations can be formulated based on the asgraded conditions.

5.4.3 Concrete Flatwork

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. No specific reinforcement is required from a geotechnical perspective. However, some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices commonly utilized in residential construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented in this report.

Subgrade soils (typically "very low" expansion potential) should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. at the



subject site should be pre-saturated to a minimum of 100 percent of optimum moisture content to a depth of at least 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with City of Redlands specifications, and under the observation and testing of GeoTek and a City/County inspector, if necessary.

5.4.4 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than I/8 inch in width. Most cracks in concrete while unsightly do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

5.5 POST CONSTRUCTION CONSIDERATIONS

5.5.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not



recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided.

5.5.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings. Soil areas within 10 feet of the proposed structure should slope at a minimum of 5 percent away from the building, if possible unless the area is paved. Paved areas are to be sloped at 2 percent away from the structure. Roof gutters and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street gutter pan or directly to the storm drain system. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.6 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that grading and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. We also recommend that GeoTek, Inc. representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should have the representative from GeoTek, Inc. perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of all unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement, and collect soil samples for laboratory testing where necessary.



- Project No. 1776-CR October 24, 2017 Page 22
- Observe the fill for uniformity during placement, including utility trenches.
- Perform field density testing of the fill materials.
- Observe and probe foundation soils to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, Inc. which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6. INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of our evaluation is limited to the boundaries of the subject property. This review does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and the client's needs, our fee estimate (Proposal No. P-0906217r) dated September 22, 2017 and geotechnical engineering standards normally used on similar projects in this locality at the present.



7. LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil materials vary in character between excavations formed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

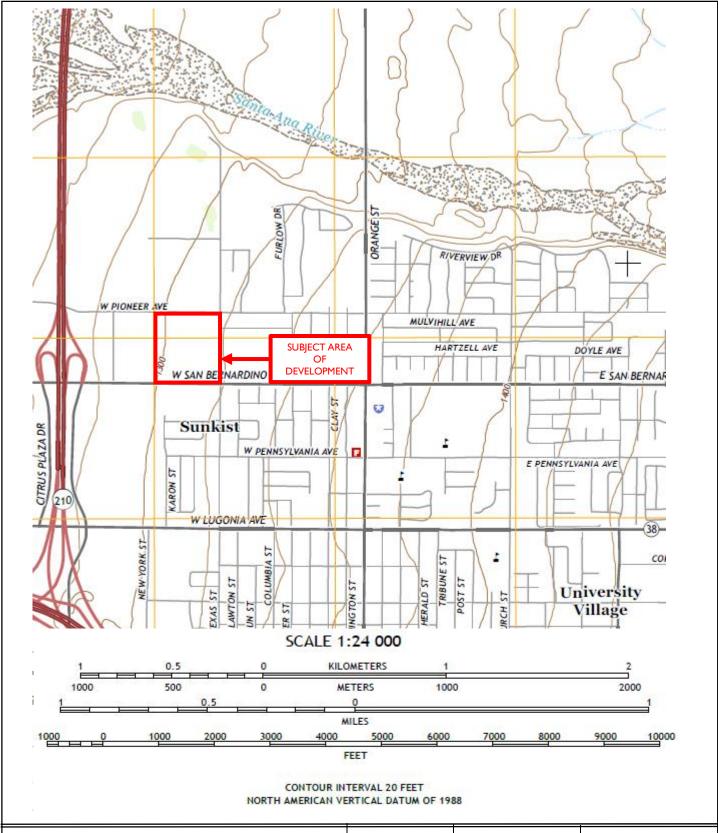
Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.



8. SELECTED REFERENCES

- American Concrete Institute (ACI), 2006, Publication 302.2R-06, Guide for Concrete Slabs That Receive Moisture Sensitive Flooring Materials.
- ASTM, 2011, "Soil and Rock: American Society for Testing and Materials," vol. 4.08 and 4.09.
- Morton, D.M. and Miller, F.K., 2006, "Preliminary Geologic Map of the San Bernardino and Santa Ana 30'X60' Quadrangle," U.S. Geological Survey open-file Report 2006-1217.
- Bryant, W.A., and Hart, E.W., 2007, "Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps," California Geological Survey: Special Publication 42.
- California Code of Regulations, Title 24, 2016 "California Building Code," 3 volumes.
- California Department of Water Resources groundwater well data (http://www.water.ca.gov/).
- Leighton and Associates, Inc, 2006, "Geotechnical Study to Support the Environmental Impact Report, Redlands Commons and Trojan Grover Project, West pf Texas Street, North of San Bernardino Avenue, City of Redlands, California", June 21.
- National Association of Corrosion Engineers, 1984, "Corrosion Basics An Introduction."
- Seismic Design Values for Buildings (http://geohazards.usgs.gov/designmaps/us/application.php).
- State of California, 1997, "Seismic Hazard Zone Report, Redlands Quadrangle."
- Terzaghi, K. and Peck, R. B., 1967, "Soil Mechanics in Engineering Practice", Second Edition.





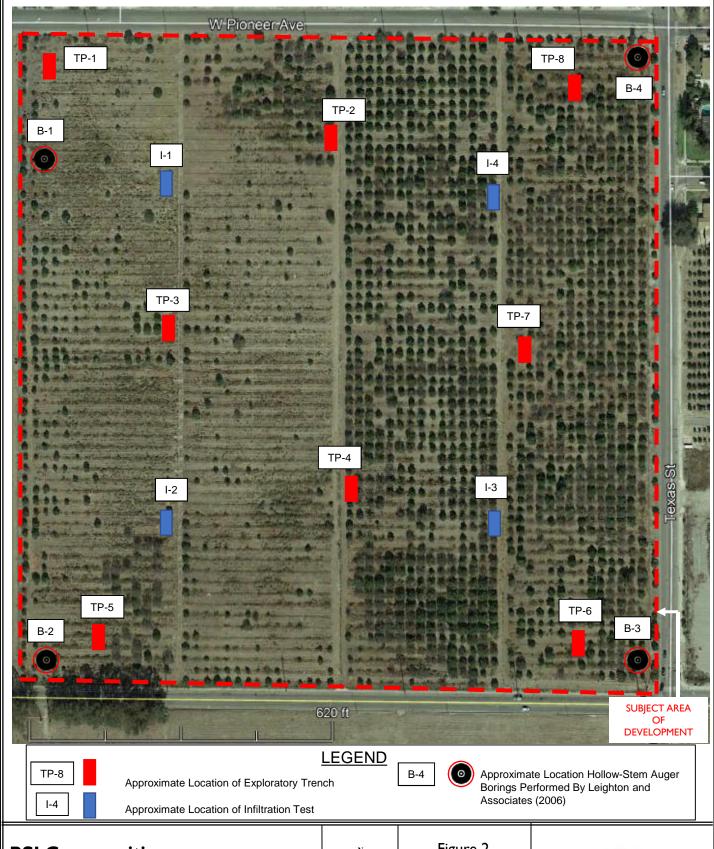
RSI Communities

Citrus Valley Project Redlands, San Bernardino County, California GeoTek Project No. 1776-CR



Modified from USGS 7.5-minute Redlands Topographic Map Figure I
Site Location
Map





RSI Communities

Citrus Valley Project Redlands, San Bernardino County, California GeoTek Project No. 1776-CR



Figure 2 Exploration Location Map



APPENDIX A

BORING LOGS AND LABORATORY TEST RESULTS BY L&A (2006)

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



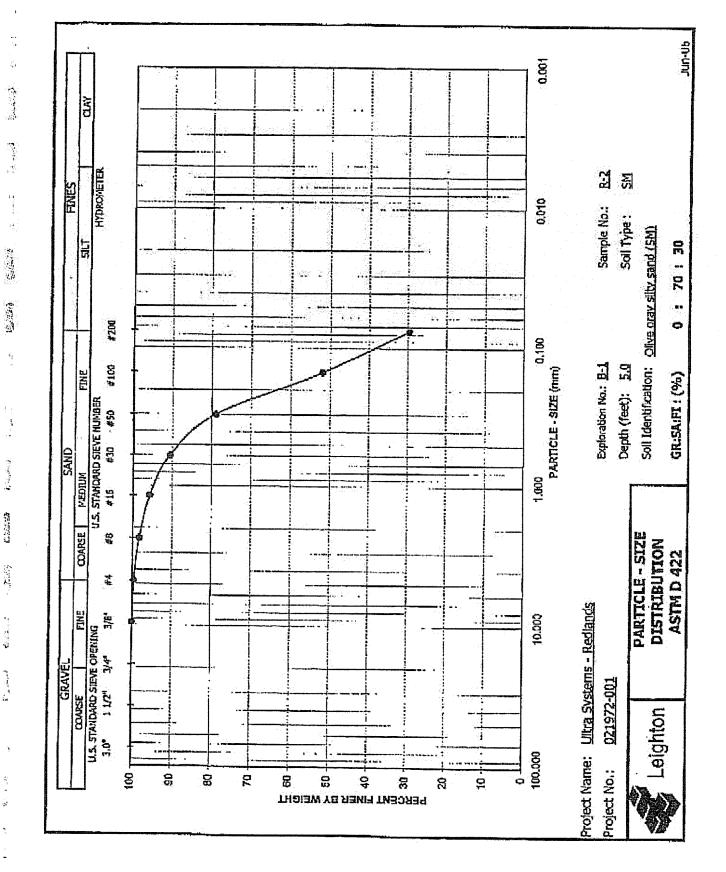
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Ele	vatio	n Top of	Hole	1		Locatio	the straining that		See Geotechnical Map	Jrop <u>30"</u>	
Elevation Fast	Dapth Feat	Graphic Log	Attitudes	Sample No.	Blows Per Six Inches	Dry Dansily per	Moisture Content, %	\$9 Class. (0.8.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests	
			The Manager	B-8-1 R-1	4 5 6	J07.0	3.0	SM	O'ARTECIAL FILL (An Silty SAND, line-to medium-grained, some cearse grains, grayish brown, moist, non-plastic, some sub-angular grayel to 1 linch, some sub-munded colibbes O Z'Silty SAND, fine-to medium-grained, some cearse grains, brown, locate, moist, non-plastic O 4' Drill granumered 10" Irrigation Line		
	-			R-2	668	, i.e.		SM	(ā) S' ALLUVIUM (Ont)Silty SAND, fine- to medium-grained, some coarsu grains, grayish brawn, losse, wet due to damaged irrigation line; sand with silt interbuilded (30% -200)	S/	
	-01			R-3	8 9 15	105.0	16.0	SM	@ 10' Sifty SAND as above, grayith brown, moist, merform dense, trace sub-angular gravel to 1 inch		
	15			R-4	16 16 17			SP	@ 15' Poorly graded SAND, fine-to medium-grained, some coacse grains, olive brown, moist, medium dense, increasing gravel		
	20-1			K-5	10 16 17	109.0	3.0	Si*	@ 20' Poorly graded SAND as above		
	15 —			s.ı	7			SM	(ii) 25' Silly SAND, fire-to course-grained, brown/gray/reddish brown (layered), moist, medium dense, mace sub-angular gravel to 1 inch (14%-200)	S,A	
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ш	Feet	Graphic Log	Affiludes	Sample No.	Blows Per Six Inches	Dry Depally pol	Moisture Content, %	Soil Class. (US.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
.3	10 — - - - -			R-6	14 15 18	105.0	4.0	SP	(i) 30' Poorly graded SAND, maint, medium demet, trace subangular gravel to 1 inch; thin afternating hown/gray layers, decreasing course sand	
/3	5 			S-2	16 18			SP	@35' Poorly graded SAND as above, gray, moist, trace sub-ungular gravet to 1 inch	
A	0-1			R-7	29 34 50/6"			SP	@ 40° Poorly graded SAND as above, very dense	
4	5			S-3	8 11 9			SP-SM	(a) 45° Poorly graded SAND with silt lenser, gray brown, medium dense, moist	
51	0-			R-8	14 16 26			SP-SM	@ 50° Propriy gruded SAND with silt londes as above	-
33									Total depth S1.3 feet No ground water encountered Backfilled with soil cuttings	
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Ek	evatio	ration Top of Hole Location				See Geotechnical Map				
Feet	Depth Feet	Graphic Jog	Attitudes	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soll Class. (U.S.C.S.)		Type of Tests
				Hug-I R-I	4 6 7	110.0	5.0	SP	O' ALLUVIUM (Qal) Poundy graded SAND with Silt, line-to medium-grained, some course grains, brown, slightly moist to moid, silt lenses (2 2' Poorly graded SAND with Silt as above	МІ
	-			R-2	5 8 9	110.0	20	SP	F Poorty gradul SAND, fine-to course-grained, gray, moid, medium dense, trace sub-angular gravel to 1 inch	a
	10			17-3	457	92.0	13.0	SP	@ 10' Pworty graded SAND, fine-to medium-grained, some coarse grains, gray, muist, loose, silty clay lens in tip of sampler.	C
	15			3-1	5 7 X		3.0	sr	(a) 15' Poorly graded SAND, gray/brown, fine to medium grained, moist, medium dense	
	20-			R-4	10 14 20	109.0	3.0	SP	@ 20 Poorly graded SAND, fine-to medium-grained, some course grains, gray, moist, dense.	
THE PROPERTY OF THE PROPERTY O	25-								Total depth 21.5 feet No ground water encountered Backfilled with soil cautings	
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		meter n Top ol		inch		ocatic	Veight		140 lb. Automatic Hammer Drop 30"
Elevation Feet	Depth Feat	Graphic Log	Attlfudes	Sample No.	Blows Per Six Inches	Dry Denaity poi	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC
	3			R-1	6 5 7 6 10 10 10	112.0	5.0	Str	O' ALLUYIUM (Onl) Poorly graded SAND with Silt, fine-to mechani-gramed, some course grains, brown, trace sub-angular gravel to I inch © Z Poorly graded SAND with Silt, brown, moist, lorse, fine to mechani grained © S' Poorly graded SAND, fine-to medium-grained, some course grains, grayish brown, moist, medium dense, some sub-angular gravel to 1½ inches
	10			R-J	9 11 13	104.0	3,0	SP	@ 10' Poorty graded SAND as alrove
- Constitution of the Cons	15—			R-4	7 8 9	98.0	6.0	SP	@ 15 Pourly graded SAND as above, dark grayish brown, moist, loose to mexicum dense, decreasing coarse sand, trace gravel to 1 inch
	20-			S-1	13 16 12			Sr	@ 20 Poorly graded SAND as above, medium dense, increasing gravel, poor recovery due to 1% inch gravel in tip of sampler
	25—								Total depth 21.5 feet No ground water encountered Backfilled with sold curriage
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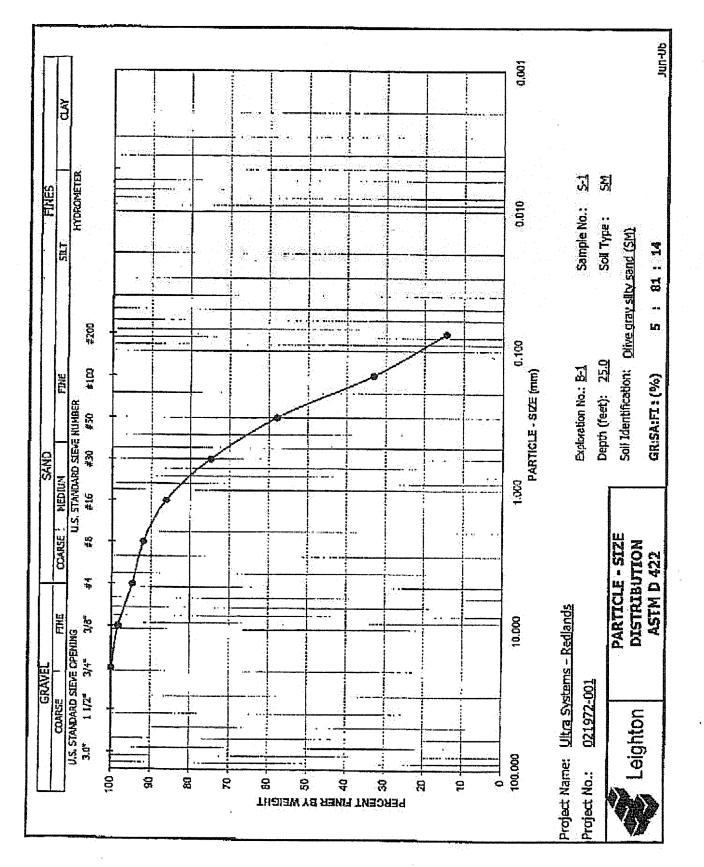
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Hc	le Dia	meter	-	inch		rive V	/elght			-/5 p <u>30"</u>
Eli	olisve	n Top of	Hole	,		ocatio	in:	See Geotechnical Map		
Elevation Feet	Depth	Graphic Log	Attltudas	Sample No.	Blows Per Six Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION Logged By CBC Sampled By CBC	Type of Tests
	- 0 -		· .						@C ALLUVIUM (Oal) Silty SAND, fine to medium-grahed, graysh brown, slightly moist, some sub-rounded grayel to 1 inch	-
j J				R-I	51516			SM	@ 2° Sitty SAND, fine-to medium-grained, some coarse grains, brown, kesse, meist, rem-plastic (31% -200)	SA
	5			R-2 Bag-1	7 8 7	117.0	3.0 >>>	SM	@ 5' Siky SAND with Oravel, fine-to-medium grained, some coarse grains, grayish brown, loose, moist, sub-angular gravel in 1 inch, non-plastic	Cal El CR
e e militari de la manda d	10			R-3	155	107_0	3.0	SP	(ন) IU Poorly graded SAND with ecased, fine-to course-grained, gray, moist, medium dense, sub-angular gravel to 1 inch	
	I5]S-1	5 6 7			Zr	@ 15' Poorty graded SAND with gravel as above, some brown silty leases	
	20-			R.4	19 24 28	በሌዕ	5.0	SP	@ 20' Poorly garded SAND with gravel as above, dense, 2 inch gravel in tip of sampler.	
	25—								Total depth drilled 21.5 feet No ground water encountered Backfilled with soil cuttings	
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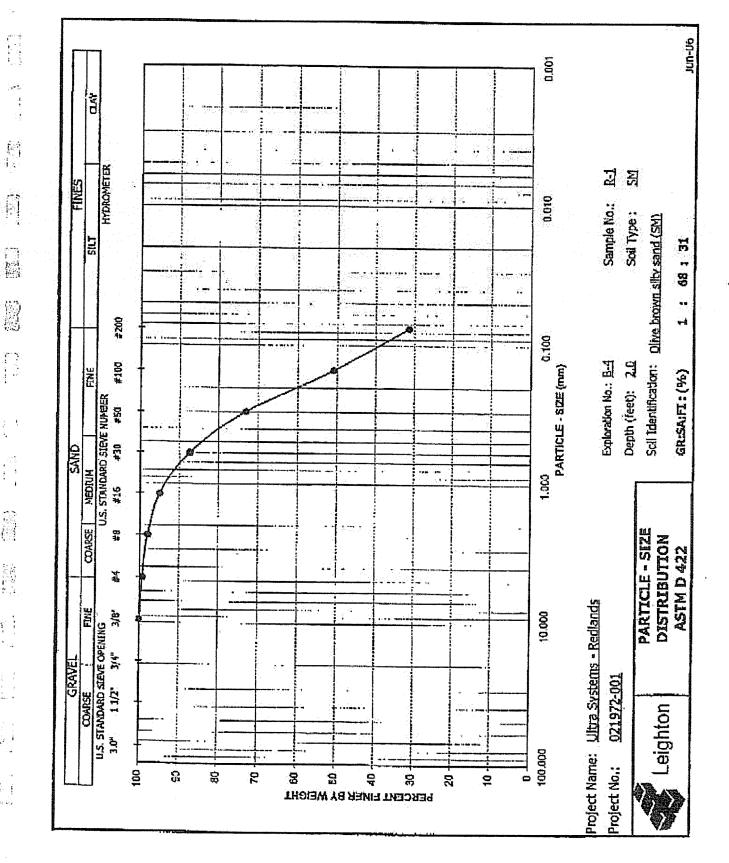


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MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project No.; Boring No.:	Ultra Systems - 021972-001 B-2 Bag-1 Olive poorly gra	•	ith silt (SP-SN	Input By : Depth (ft.)		Date: Date:	06/05/06 06/12/06
Preparation Method;	Mala Valu	Moist Dry me (ft ^a)	0,03307]. Ram l	X Weight = 10 II	Mechanica Manual Ra 1.; Drop =	m
TEST N	The second secon		2	3		, , 5	. 6
Wt. Compacted 50		3738.0	3817.0	3857.0	3804.0		
Weight of Mold	(9)	1810.0	1810.0	1810.0	1810.0]
Net Weight of Soil	(g)	1928.0	2007.0	2047.0	1994.0	eliteri (j. 1 	
Wet Weight of Soil	+ Cont. (g)	449,80	497.10	458.10	540.10	TO THE THE PERSON NAMED IN A PARTY OF THE PA	era Paris Constitutiva de la casa
Dry Welght of Soil	+ Cont. (g)	432.00	466.50	431,40	486.70		
Weight of Contains	er (g)	54.40	52.30	54.20	51.60		† * * *
Moisture Content	(%)	4.71	7.39	9.73	12.27	And NOTE A REPORT PROPERTY AND A STATE OF THE STATE OF TH	and the second second second
Wet Density	(pcf)	128.5	133.8	136.5	132.9		
Dry Density	(p cf)	122.7	124.6	124.4	118.4		
PROCEDURE USI Procedure A Soil Passing No. 4 (4.75 m Mold: 4 in. (101.6 mm) Layers: 5 (Five) Blows per layer: 25 (twe May be used if +#4 is 20% Procedure B Soil Passing 3/8 in. (9.5 mm) Mold: 4 in. (101.6 mm) Layers: 5 (Five) Slows per layer: 25 (twe Lise if +#4 is >20% and + 20% or less Procedure C Soil Passing 3/4 in. (19.0 m Addid: 6 in. (15.4 mm) Layers: 5 (Five) Rows per layer: 56 (five)	m) Sieve diameter nty-five) 125 m) Sieve diameter 20 nty-five) 3/8 in. is 20 August 120 august 12	3.0				SP, GR	= 2.70
GR:SA:FI	110.	, Hit		-	+		
Itterberg Limits:		0.0	5.0	- - - 	11	15.0	20.0
LLPLPI					Content (%)	, s weld,	*0.0

Leighton

EXPANSION INDEX of SOILS ASTM D 4829

Project Name:

Ultra Systems - Redlands

Tested By: GEB

Date:

06/08/06

Project No. :

021972-001

Checked By: LF
Depth (ft.) 5-10

Date:

06/12/06

Boring No.: Sample No.:

B-4

Bag-1

Soil Identification:

Olive silty sand (SM)

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry WL of Soil	(g)	1000.00
Weight Soll Retained on #	4 Sieve	0.00
Percent Passing # 4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100.00

MOLDED SPEC	MEN	Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(រោ.)	1.0000	0.9990
Wt. Comp. Soil + Mold	(g)	593.40	430.20
Wt. of Mold	(9)	190.50	0.00
Specific Gravity (Assum	ed)	2.70	2.70
Container No.		o	Ō
Wet Wt. of Soil + Cont.	(g)	841.90	620.70
Dry Wt. of Soil + Cont.	(g)	779.30	563.60
Wt. of Container	(g)	0.00	190.50
Moisture Content	(%)	8.03	15.30
Wet Density	(pcf)	121,5	129.9
Dry Density	(pcf)	112.5	112.7
Void Ratio		0.499	0.496
Total Porosity		0.333	0.332
Pere Volume	(cc)	68,9	68.6
Degree of Saturation (%) [S meas]	43.5	83.2

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
06/08/06	10:31	1,0	0	0.4810
06/08/06	10:41	1.0	10	0.4810
		dd Distilled Water to the	Specimen	<u> </u>
06/08/06	16:54	1.0	373	0.4800
06/09/06	8:51	1.0	A STATE OF THE STA	0.4800
06/09/06	9:55	1.0	1330 1394	
er ja				

Expansion Index (EI meas)	3	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-1.0
Expansion Index (EI) 30	=	El meas - (50 -\$ meas)x((65+El meas) / (220-\$ meas))	Ò



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546)

Project Name: Ultra Systems - Redlands

Tested By: Checked By: FT, ESS Date:

Date:

06/08/06 06/12/06

Project No.: Boring No.:

B-2

Sample Type:

Drive

Sample No.:

Sample Description:

R-3

Grayish brown silty sand (SM)

Depth (ft.)

10.0

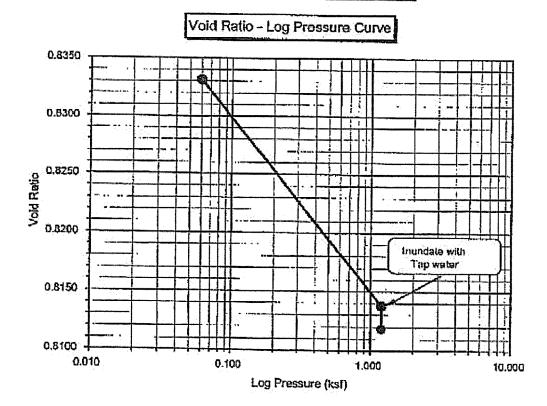
Initial Dry Density (pcf):	91.9
Initial Moisture (%):	13.42
Initial Length (in.):	1,0000
Initial Dial Reading:	0.1080
Diameter(In);	2.416

021972-001

Final Dry Density (pcf):	88.9
Final Moisture (%):	32.7
Initial Void ratio:	0.8335
Specific Gravity(assumed):	2.70
Initial Saturation (%)	43.5

Pressure (p) (ksf)	Final Reading (In)	Apparent Thickness (In)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Vold Ratio	Corrected Deformation (%)
0.060	0.1082	0.9998	0.00	-0.02	0.8331	-0.02
1,200	0.1188	0.9893	0.00	-1,08	0.8138	-1.08
H2O	0.1198	0.9882	0.00	-1.18	0.8118	-1.18

Percent Swell (+) / Settlement (-) After inundation = -0.11





One-Dimensional Swell or Settlement Potential of Cobesive Soils (ASTM D 4546)

Project Name: Ultra Systems - Redlands

Project No.: 021972-001

Baring No.:

B-3

Sample No.:

R-2

Sample Description:

Brown silty sand (SM)

Tested By:

FT, ESS Date:

06/08/06

Date:

Checked By:

06/12/06

Sample Type:

Drive

Depth (it.) 5.0

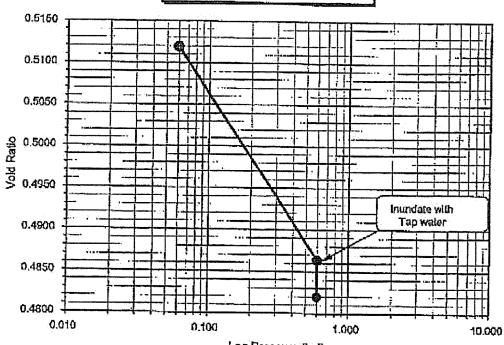
Initial Dry Density (pcf):	111.5
Initial Moisture (%):	1.35
Initial Length (in.);	1.0000
Initial Dial Reading:	0.1346
Diameter(in);	2.416

Final Dry Density (pcf):	111.5
Final Moisture (%):	17.2
Initial Vold ratio:	0.5120
Specific Gravity(assumed):	2.70
tnitial Saturation (%)	7.1

Pressure (p) (kal)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1347	0.9999	0.00	-0.01	0.5119	-0.01
0.600	0.1516	0.9830	0.00	-1.70	0.4863	-1.70
H2O	0.1545	0.9801	0.00	-1.99	0,4820	-1.99

Percent Swell (+) / Settlement (-) After inundation =

Void Ralio - Log Pressure Curve





One-Dimensional Swell or Settlement Potential of Collesive Soils

(ASTM D 4546)

Project Name: Project No.:

Boring No.:

Sample No.:

Ultra Systems - Redlands

021972-001

B-4 R-2

Tested By: Checked By: FT, ESS Date:

5.0

06/08/06

Sample Type:

Drive Depth (R.)

Date:

06/12/06

Sample Description:

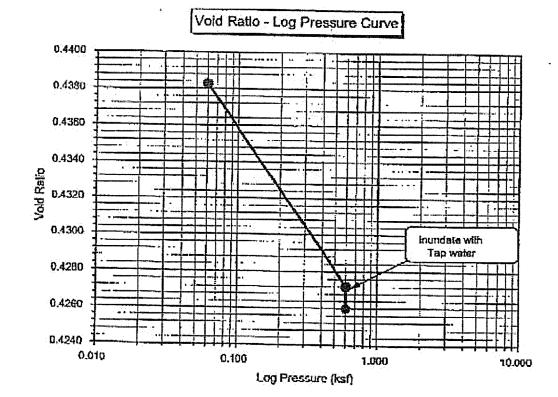
Olive brown silly sand with gravel (SM)g

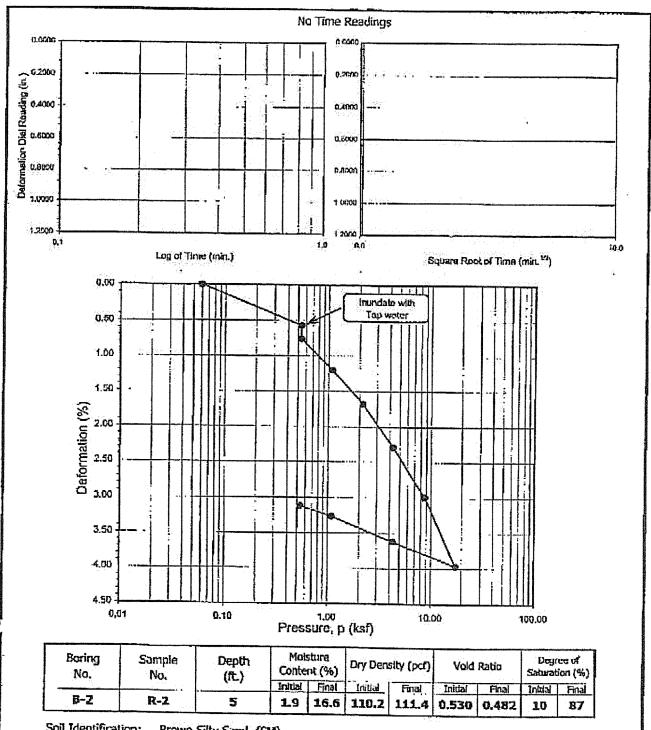
Initial Dry Density (pcf);	117.1
Initial Moisture (%):	12.54
Initial Length (in.):	1,0000
· Initial Dial Reading:	0.1523
Diameter(in):	2.416

Final Dry Density (pcf):	117.0
Final Moisture (%):	14.2
Initial Void ratio:	0.4389
Specific Gravity(assumed):	2.70
Initial Saturation (%)	77.2

Pressure (p) (kel)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.060	0.1527	0,9996	0.00	-0.04	0.4383	-0,04
0.600	0.1604	0.9919	0.00	-0.81	0.4272	-0.81
1120	0.1613	0.9911	0.00	-0.90	0.4260	-0.90

Percent Swell (+) / Settlement (-) After inundation = -0.09





Soil Identification: Brown Silty Sand (SM)



ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS (ASTM D 2435)

Project No.:

021972-001

Ultra Systems - Redlands

06-06

APPENDIX B

TRENCH LOGS BY GEOTEK

Citrus Valley Project

Redlands, San Bernardino County, California

Project No. 1776-CR



B-FIELD TESTING AND SAMPLING PROCEDURES

Bulk Samples (Large)

These samples are normally large bags of representative earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)

These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of representative earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B-TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of trenches:

SOILS

USCS Unified Soil Classification System

f-c Fine to coarse f-m Fine to medium

GEOLOGIC

B: Attitudes Bedding: strike/dip
J: Attitudes Joint: strike/dip
C: Contact line

Dashed line denotes USCS material change
 Solid Line denotes unit / formational change
 Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the logs of trenches)



CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
LOCATION:	See Exploration Location Map	_	

LOC	CATION: See Exploration Location Map							
	SA	MPLES				Labora	tory Testing	
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-I	Water Content (%)	Dry Density (pcf)	Others	
	San	ĕ	\supset	MATERIAL DESCRIPTION AND COMMENTS	Wat	Ωr	ŏ	
_			SM	YOUNGER ALLUVIUM Silty f-m SAND, brown, dry, loose to medium dense				
- -				Becomes slightly moist			·	
- -		7	SP	Silty f-c SAND, brown, slightly moist, medium dense	2.3	108.2		
5 -] 		SP	F-c SAND, gray, slightly moist, trace gravel				
- -				Same as above.			SA	
- 10 -				Starts caving TRENCH TERMINATED AT 10 FEET				
-	-			No groundwater encountered				
- - -	- - - - -			Trench backfilled with soil cuttings				
15 - - -	† • • •							
<u>9</u>	Sam	nple typ	oe:	RingSmall Bulk	∇	Water	Table	
LEGEND		testing		AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidation	ysis	RV =	R-Value Test = Maximum Density	

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
LOCATION:	See Exploration Location Map	_	

LOC	ATIO	N:		See Exploration Location Map				
	SA	MPLES				Laboratory Testing		
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-2	Water Content (%)	Dry Density (pcf)	Others	
	San	Bic	n	MATERIAL DESCRIPTION AND COMMENTS	Wat	٦	Ŭ	
				YOUNGER ALLUVIUM				
- -		6	SM 	Silty f-m SAND, brown, dry, loose	1.4	96.2	HC 	
5 -	X			Same as above, becomes medium dense	3.9	104.8	SH, EI, MD HC	
- - - - -		10		Same as above, becomes medium dense	3.7	104.8	HC	
10 -			ML	F sandy SILT, Dark gray, moist, stiff				
			SP	F-c SAND, light gray, slightly moist, medium dense				
- - -				TRENCH TERMINATED AT 12 FEET No groundwater encountered Trench backfilled with soil cuttings				
15 - - - -								
END	Sample typ Lab testing:			RingSmall BulkSmall Bulk	<u></u> ∨			
LEG				AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidate			R-Value Test = Maximum Density	

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
LOCATION:	See Exploration Location Map	_	

LOC	LOCATION: See Exploration Location Map							
	SAMPLES					Laboratory Testing		
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-3	Water Content (%)	Dry Density (pcf)	Others	
	San	Blo)	MATERIAL DESCRIPTION AND COMMENTS	Wat	ū	Ŭ	
_				YOUNGER ALLUVIUM				
-	-		SM	Silty f-m SAND, light brown, dry, loose				
- -			SM	Silty f-c SAND, brown, slightly moist, loose, trace well-rounded gravel				
5-	-		SP	F-c SAND, gray, slightly moist, medium dense, trace gravel and cobble, rare boulders				
-	-			Same as above, no boulders				
_				TRENCH TERMINATED AT 10 FEET				
- -	<u> </u>			No groundwater encountered				
-	 			Trench backfilled with soil cuttings				
-	 							
-	- -							
15 -								
- -	 							
Ω	Sam	ple typ	oe:	RingSmall Bulk	<u></u> ∨	Vater Tab	le	
LEGEND	Lab	testing	<u>:</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolida			R-Value Test = Maximum Density	

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
I OCATION:	See Exploration Location Man		

LOC	LOCATION: See Exploration Location Map								
	SAMPLES						Laboratory Testing		
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-4	Water Content (%)	Dry Density (pcf)	Others		
	Sa	B	_	MATERIAL DESCRIPTION AND COMMENTS	Wa	۵			
-	-		SM	YOUNGER ALLUVIUM Silty f-m SAND, light brown, dry, loose					
5 -			SP	F-c SAND, brown, dry to slightly moist, loose to medium dense, trace gravel					
- - - - -			SM	Silty f-c SAND, gray, slightly moist, medium dense					
-			SP	F-c SAND, gray, slightly moist, medium dense, trace fine gravel					
- - - - 15 - - -				TRENCH TERMINATED AT 12 FEET No groundwater encountered Trench backfilled with soil cuttings					
LEGEND		nple typ		RingSmall BulkSmall Bulk		Vater Tab	le R-Value Test		
LE	∟ab	testing	<u>;</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidate			R-Value Test = Maximum Density		

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
LOCATION:	San Exploration Location Man	·	

LOCA	TIO	N:		See Exploration Location Map			
	SA	MPLES				Labora	atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-5	Water Content (%)	Dry Density (pcf)	Others
	San	Blo	n	MATERIAL DESCRIPTION AND COMMENTS	Wate	ρŗ	O
				YOUNGER ALLUVIUM			
-			SM	Silty f-c SAND, light brown, dry, loose			
-			SP	F-c SAND, brown, slightly moist, loose to medium dense			
5 -							SA
-	"		SP	F-c SAND, gray, slightly moist, medium dense, some fine gravel			
-				Starts caving			
10 -				TRENCH TERMINATED AT 10 FEET			
-							
				No groundwater encountered			
				Trench backfilled with soil cuttings			
_	•						
_							
_	•						
_							
15 -							
_							
_							
Ω	Sam	ple typ	<u>oe</u> :	RingSmall Bulk	<u></u> ∨	Vater Tab	le
LEGEND	Lab	testing	<u>.</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal	ysis	RV =	R-Value Test
ij			•	SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolida		MD :	= Maximum Density

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
I OCATION:	See Exploration Location Man	-	

LOCA	OITA	N:		See Exploration Location Map			
	SA	MPLES				Labora	atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-6	Water Content (%)	Dry Density (pcf)	Others
	San	Blo	n	MATERIAL DESCRIPTION AND COMMENTS	Wate	Dr	O
				YOUNGER ALLUVIUM			
- - -			SM	Silty f-m SAND, light brown, dry, loose			
<u>-</u>			SP	F-c SAND, brown, slightly moist, loose to medium dense			
5 -			SP	F-c SAND, gray, slightly moist, trace gravel			
- - -	X			Same as above, some fine gravel, becomes medium dense Starts caving			El
10 -				TRENCH TERMINATED AT 10 FEET			
- - -				No groundwater encountered Trench backfilled with soil cuttings			
- - 15 -							
- -	<u> </u> 						
9	Sam	ple typ	<u>oe</u> :	RingSmall Bulk	<u></u>	Vater Tab	ile
LEGEND	Lab	testing	<u>;</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidate	lysis	RV =	R-Value Test = Maximum Density

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
I OCATION:	See Exploration Location Man		

LOC	OCATION: See Exploration Location Map						
	SA	MPLES	_			Labora	atory Testing
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-7	Water Content (%)	Dry Density (pcf)	Others
	ß	В		MATERIAL DESCRIPTION AND COMMENTS	Š	Δ	
- •			SM	YOUNGER ALLUVIUM Silty f-m SAND, brown, dry, loose			
- - - - 5-			SP	F-c SAND, brownish gray, slightly moist, few fine gravel, loose to medium dense		 	
-			SP	F-c SAND, gray, slightly moist, medium dense, trace gravel Starts caving			
10							
-				TRENCH TERMINATED AT 10 FEET			
_	.↓						
-	4			No groundwater encountered			
-	4			Trench backfilled with soil cuttings			
-	4						
_	4						
-	4						
-	4						
-	+						
15 -	+						
-	1						
-	1						
-	†						
-	†						
-	1						
LEGEND	San	nple typ	oe:	RingSmall Bulk	<u></u>	Water Tab	le
EG	Lab	testing	<u>;</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Ana			R-Value Test
\Box				SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolid	lation	MD :	= Maximum Density

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
I OCATION:	See Exploration Location Man	-	

LOC	OITA	N:		See Exploration Location Map				
	SAMPLES		_			Laboratory Testing		
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: TP-8	Water Content (%)	Dry Density (pcf)	Others	
	San	Blo)	MATERIAL DESCRIPTION AND COMMENTS	Wat	٦	Ü	
				YOUNGER ALLUVIUM				
- - -			SM	Silty f-m SAND, brownish gray, dry, loose				
5 -			SP	F-c SAND, brownish gray, slightly moist, medium dense, few fine gravel				
-	<u> </u>		SP	F-c SAND, gray, slightly moist, trace gravel				
-	<u> </u>			Starts caving				
- - 10 -	- - - -							
				TRENCH TERMINATED AT 10 FEET				
- - - -	- - - - - - -			No groundwater encountered Trench backfilled with soil cuttings				
- 15 - - - -								
	Sam	nple typ		RingLarge BulkSmall Bulk	<u></u>	Vator Tab	ulo.	
LEGEND		testing		AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolidate	ysis	RV =	R-Value Test Maximum Density	

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
LOCATION:	See Exploration Location Man		

LOCA	OITA	N:		See Exploration Location Map				
SAMPLES					Laboratory Testing			
Depth (ft)	Sample Type	Blow Count	TRENCH NO.: I-I		Water Content (%)	Dry Density (pcf)	Others	
	San	Blo	n	MATERIAL DESCRIPTION AND COMMENTS	Wate	Dr	O	
				YOUNGER ALLUVIUM				
-			SM	Silty f-c SAND, brownish gray, dry, loose				
-				TRENCH TERMINATED AT 3 FEET				
_	1							
				No groundwater encountered				
5 —	_			Trench backfilled with soil cuttings				
_	-							
_	1							
_	1							
_	4							
_	<u> </u>							
_	1							
_	1							
10 -								
_	-							
-	-							
_	_							
_								
_	-							
_	1							
15 -	-							
	Ī							
[-	-							
-	1							
ΩN	Sam	nple typ	<u>oe</u> :	RingSmall Bulk	<u></u> ∨	Vater Tab	ile	
LEGEND	Lab	testing	<u>;</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Ana		RV =	R-Value Test	
				SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolid	ation	MD :	= Maximum Density	

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
LOCATION:	San Exploration Location Man	·	

LOC	ATIO	N:		See Exploration Location Map				
SAMPLES					Laboratory Testing			
Depth (ft)	Depth (ft) Sample Type Blow Count		USCS Symbol	TRENCH NO.: I-2	Water Content (%)	Dry Density (pcf)	Others	
	Sar	Blc	ر	MATERIAL DESCRIPTION AND COMMENTS	Wat	٥	ŭ	
				YOUNGER ALLUVIUM				
- - -			SM	Silty f-c SAND, brownish gray, dry, loose				
_				TRENCH TERMINATED AT 3 FEET				
_	-			TRENCH TERMINATED AT 3 FEET				
<u>-</u>	-			No groundwater encountered Trench backfilled with soil cuttings				
5 -	1							
_	1							
_	1							
_	1							
_	1							
_	-							
10 -	<u> </u>							
-	<u> </u>							
_	<u> </u>							
_								
_	1							
_]							
_	1							
15 -	1							
_	1							
_	1							
-	1							
S.	Sam	nple typ	<u>oe</u> :	RingSmall Bulk	<u></u>	Vater Tab	le	
LEGEND	Lab	testing	<u>;</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolida			R-Value Test = Maximum Density	
$ldsymbol{ldsymbol{\sqcup}}$				Six - Sunace/resistavity rest Six - Siteal rest MC- Collsolide	LUUII	י טויו	i iaxiiiiuiii Delisity	

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
	C F I I M		

LOC	ATIO	N:		See Exploration Location Map			
SAMPLES				Laboratory Testing			
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: I-3	Water Content (%)	Dry Density (pcf)	Others
	Sal	ă		MATERIAL DESCRIPTION AND COMMENTS	Wai	۵	
				YOUNGER ALLUVIUM			
-			SM	Silty f-c SAND, brownish gray, dry, loose			
-				TRENCH TERMINATED AT 3 FEET			
-	+			TRENCH TERMINATED AT 3 FEET			
-	+			No groundwater encountered			
-	1			Trench backfilled with soil cuttings			
5-	1			Ĭ			
-							
_	1						
_	4						
-	+						
-	+						
-	+						
10 -	1						
-	†						
_							
]						
]						
_	4						
-	-						
_	4						
-	+						
15 -	1						
-	1						
-	1						
_]						
₽	San	nple typ	<u>oe</u> :	RingSmall Bulk	<u></u> ∨	Vater Tab	le
LEGEND		testing		AL = Atterberg Limits EI = Expansion Index SA = Sieve Anal			R-Value Test
Ë	<u>∟au</u>	LESUITE	<u>}•</u>	SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolida			= Maximum Density
							-

CLIENT:	RSI Communities	LOGGED BY:	DRW
PROJECT NAME:	Citrus Valley	EQUIPMENT	Backhoe
PROJECT NO.:	1776-CR	DATE:	10/9/2017
I OCATION:	See Exploration Location Man	-	

LOCA	OITA	N:		See Exploration Location Map				
SAMPLES			_		Laboratory Testing			
Depth (ft)	Sample Type	Blow Count	USCS Symbol	TRENCH NO.: I-4	Water Content (%)	Dry Density (pcf)	Others	
	San	Bio	n	MATERIAL DESCRIPTION AND COMMENTS	Wat	٦	Ŭ	
				YOUNGER ALLUVIUM				
- - -			SM	Silty f-c SAND, brownish gray, dry, loose				
_				TRENCH TERMINATED AT 3 FEET				
_				TRENCH TERMINATED AT STEET				
_	<u> </u>			No groundwater encountered				
5 –				Trench backfilled with soil cuttings				
_	•							
_	1							
_								
_								
10 -								
_								
_								
_								
_								
_								
15 –	•							
_	,							
_								
_								
Ω	Sam	ple typ	<u>oe</u> :	RingSmall Bulk	<u></u> ∨	Vater Tab	le	
LEGEND	Lab	testing	<u>;</u>	AL = Atterberg Limits EI = Expansion Index SA = Sieve Analy	ysis	RV =	R-Value Test	
				SR = Sulfate/Resisitivity Test SH = Shear Test HC= Consolida	ation	MD =	Maximum Density	

APPENDIX C

LABORATORY TEST RESULTS

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



SUMMARY OF LABORATORY TESTING

In Situ Moisture Content and Unit Weight

The field moisture content was measured in the laboratory on selected samples collected during the field investigation. The field moisture content is determined as a percentage of the dry unit weight. The dry density was measured in the laboratory on selected ring samples. The results are shown on the logs of exploratory trenches in Appendix B.

Moisture-Density Relations

Laboratory testing was performed on a site sample collected during the recent subsurface exploration. The laboratory maximum dry density and optimum moisture content for the sample tested was determined in general accordance with test method ASTM Test Procedure D 1557. The results are shown on Enclosure C-I.

Direct Shear

Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080. The rate of deformation was approximately 0.035 inch per minute. The sample was sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The test was performed on a sample remolded to 90% of the maximum dry density per ASTM D 1557. The shear test results are presented on Enclosure C-2.

Expansion Index

Expansion Index (EI) testing was performed on two soil samples collected from the trenches. Testing was performed in general accordance with ASTM Test Method D 4829. The results are shown on Enclosures C-3 and C-4.

Materials Finer Than the No. 200 Sieve

A #200 sieve wash was performed on selected samples of the soils according to ASTM Test Method D 1140. The results of this testing are presented on the trench logs in Appendix B.

Consolidation

Consolidation/collapse testing was performed on two selected samples of the site soils according to ASTM Test Method D 2435. The results of these tests are presented graphically on Enclosures C-5 and C-6.



Corrosion

Corrosion testing (resistivity per ASTM G187, sulfates per ASTM D516, chlorides per ASTM D512B, pH per ASTM G51) was conducted on representative samples obtained during the field investigation. The test results are included on Enclosure C-7.





MOISTURE/DENSITY RELATIONSHIP

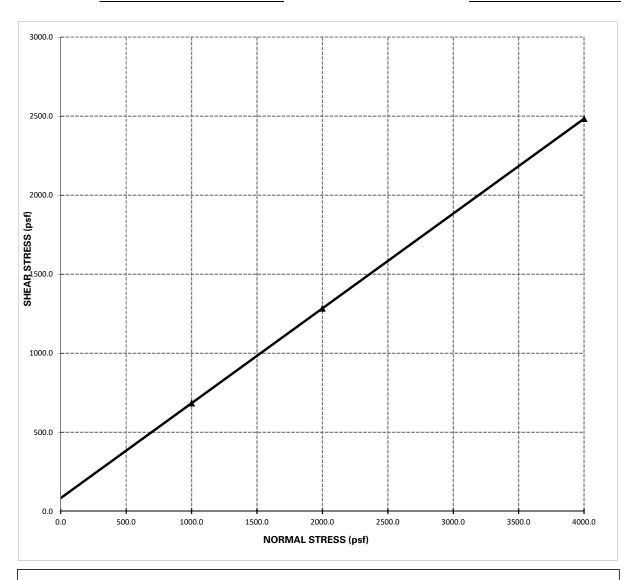
		RSI Communities			Job No.:		
	Project:	Citrus Valley			Lab No.:	Corona	
	Location:						
	Material Type:	Gray Brown Fine San	d w/ Silt				
	Material Supplier:						
	Material Source:						
	Sample Location:	TP-2 @ 3 - 5					
	•						
	Sampled By:	DRW		Date	Sampled:	13-Oct-17	
	Received By:				Received:		
	Tested By:			Da	te Tested:		
	Reviewed By:			Date	Reviewed:		
	,						
	Test Procedure:	ASTM 1557	Method:	Α			
Ove	ersized Material (%):		Correction		/es	x no	
	,			-			
	MOISTURE/D	ENSITY RELATIONS	HIP CURVE	•	DRY DENS	SITY (pcf):	
				_	CORRECT	ED DRY DENSITY (pc	·f\·
	1.10	.		_	CORRECT	ED DICT DENOTET (po	').
	140				ZERO AIR	VOIDS DRY DENSITY	,
	135				(pcf)		
	100			×	S.G. 2.7		
	130						
ш	1			*	S.G. 2.8		
ည	125				S.G. 2.6		
,					5.G. 2.6		
DRY DENSITY, PCF	120	<u> </u>	*		Poly. (DRY	DENSITY (pcf):)	
Ë	115				- , (- u - / /	
≿	113				- OVERSIZE	CORRECTED	
	110						
					ZERO AIR	VOIDS	
	105				— Poly. (S.G.	2.7\	
					Foly. (3.G.	2.1)	
	100	6 7 8 9 10 11 12 13 1	/ 15 16 17 18 1	9 20	— Poly. (S.G.	2.8)	
	0 1 2 3 4 3			3 20		•	
		MOISTURE CONTENT, %	b		Poly. (S.G.	2.6)	
		MOISTURE DEN	SITY RELATI	ONSHIP V	ALUES		
	Maxi	mum Dry Density, pc	f 117.0	@	Optimum	Moisture, %	10.0
		mum Dry Density, pc				Moisture, %	
					-		
		MATE	RIAL DESCR	IPTION			
Grair	n Size Distribution:				Atterberg I	Limits:	
	% Gravel (retained on No. 4)				Liquid Limit, %	
		assing No. 4, Retained	d on No. 200)			Plastic Limit, %	
		Clay (Passing No. 200				Plasticity Index,	%
	Classifica		,	l		1	
		Unified Soils Classific	ation:				
		AASHTO Soils Classi	_				
		20.00 0.000					



DIRECT SHEAR TEST

 Project Name:
 Citrus Valley
 Sample Location:
 TP-2 @ 3 - 5 ft

 Project Number:
 1776-CR
 Date Tested:
 10/18/2017



Shear Strength: $\Phi = 31.0^{\circ}$ C = 84.00 psf

Notes:

- I The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.
- 2 The above reflect direct shear strength at saturated conditions.
- 3 The tests were run at a shear rate of 0.035 in/min.



EXPANSION INDEX TEST

(ASTM D4829)

	Client:	RSI Communities				Tested/	Checked By	<i>r:</i> DI	Lab No	Corona
	Project Number:	1776-CR				Date Tes	sted:	10/16/2017		
	Project Location:	Citrus Valley				Sample	Source:	TP-2 @ 3 - 5	ft	
				<u>_</u>		Sample	Description	:		
	Ring #:Ring D	ia. : 4.01" Ring Ht.:1"								
		DENSITY DETERMINAT	ION							
4	Weight of compacted s	sample & ring (gm)	766.5		RI	EADING	S			
3	Weight of ring (gm)		363.1		DATE	TIME	READING			
C	Net weight of sample (gm)	403.4		10/16/2017	5:10	0.2320	Initial		
ס	Wet Density, lb / ft3 (0	C*0.3016)	121.7			5:20	0.2320	10 min/Dry		
Ε	Dry Density, lb / ft3 (D.	/1.F)	111.1							
	S	ATURATION DETERMINA	ATION							
F	Moisture Content, %		9.5							
3	Specific Gravity, assur	med	2.70		10/17/2017	5:30	0.2320	Final		
Н	Unit Wt. of Water @ 20	0 °C, (pcf)	62.4					_		
I	% Saturation		49.7		FINAL MO	DISTURE		_		
					Veight of wet ple & tare	% N	Moisture			
					793.1		16.1			

EXPANSION INDEX =

0



Client:

RSI Communities

EXPANSION INDEX TEST

(ASTM D4829)

Tested/ Checked By:

0

DI

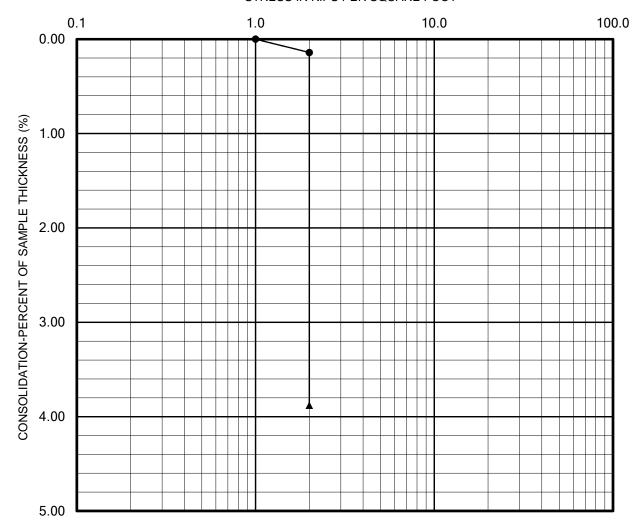
Lab No

Corona

Project Number:	1776-CR			Date Te	sted:	10/16/2017
Project Location:	Citrus Valley			Sample	Source:	TP-6 @ 6-8 ft
				Sample	Description	<i>:</i>
Ring #:Ring D	Dia. : 4.01" Ring Ht1"					
	DENSITY DETERMINAT	ION				
Weight of compacted	sample & ring (gm)	769.1	RI	EADING	S	
B Weight of ring (gm)		366.2	DATE	TIME	READING	
Net weight of sample	(gm)	402.9	10/16/2017	4:42	0.3850	Initial
Wet Density, lb / ft3 (C*0.3016)	121.5		4:52	0.3850	10 min/Dry
Dry Density, lb / ft3 (D)/1.F)	110.5				
	SATURATION DETERMIN	ATION				
Moisture Content, %		10.0				
Specific Gravity, assu	med	2.70	10/17/2017	5:30	0.3850	Final
Unit Wt. of Water @ 2	20 °C, (pcf)	62.4				_
I % Saturation		51.4	FINAL MO	OISTURI	=	
			eight of wet ple & tare	% I	Moisture	
			798.2		17.2	7
						 -

EXPANSION INDEX =

STRESS IN KIPS PER SQUARE FOOT



--◆--- Seating Cycle

Loading Prior to Inundation
Loading After Inundation

--★--- Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435



 CHECKED BY:
 Lab: DI

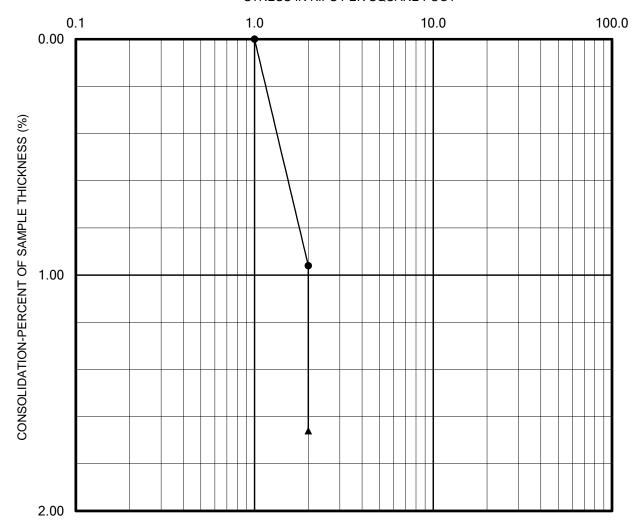
 PROJECT NO.: 1776-CR
 Date: 10/16/17

CONSOLIDATION REPORT

Sample: TP-2 @ 2 ft

Plate C-5





--◆--- Seating Cycle

Loading Prior to Inundation
Loading After Inundation

--★--- Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435



 CHECKED BY:
 Lab: DI

 PROJECT NO.: 1776-CR
 Date: 10/16/17

CONSOLIDATION REPORT

Sample: TP-2 @ 6 ft

Plate C-6



Soil Analysis Lab Results

Client: Geotek Inc Job Name: Citrus Valley Client Job Number: 1776-CR Project X Job Number: S171017B October 18, 2017

	Method	ASTN	I G187	ASTN	1 D516	ASTM	D512B	SM 4500-E	SM 4500-C	SM 4500-D	ASTM G200	ASTM G51
Bore# /	Depth	Resis	tivity	Sulf	fates	Chlo	rides	Nitrate	Ammonia	Sulfide	Redox	pН
Description		As Rec'd	Minimum									
	(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(mg/kg)	(mg/kg)	(mg/kg)	(mV)	
TP-2	3.0-5.0	134,000	15,410	6	0.0006	18	0.0018	ND	5.8	0.36	201	8.36
		321,600	18,760		0.0003		0.0015	ND		0.27	205	7.91

Unk = Unknown

ND = 0 = Not Detected

NT = Not Tested

mg/kg = milligrams per kilogram (parts per million) of dry soil weight

Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Ernesto Padilla, BSME

Field Engineer

Respectfully Submitted,

Ed Hernandez, M.Sc., P.E.

Sr. Corrosion Consultant

NACE Corrosion Technologist #16592

Professional Engineer California No. M37102

ehernandez@projectxcorrosion.com



Enclosure C-7

APPENDIX D

INFILTRATION RATE RESULTS

Citrus Valley Project

Redlands, San Bernardino County, California

Project No. 1776-CR



Project: Citrus Valley Project

Project No: 1776-CR

Date: 10/11/2017

Test No. I-I @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	10	min
Final Depth to Water, $D_F =$	11.750	in
Test Hole Radius, r =	4	in
Initial Depth to Water, $D_O =$	0	in
Total Test Hole Depth, $D_T =$	12	in

Equation -
$$I_t = \Delta H (60r)$$

$$\Delta t (r+2H_{avg})$$

$$H_{O} = D_{T} - D_{O} =$$
 12 in $H_{F} = D_{T} - D_{F} =$ 0.25 in $\Delta H = \Delta D = H_{O} - H_{F} =$ 11.75 in Havg = $(H_{O} + H_{F})/2 =$ 6.125 in

 I_t = 17.354 Inches per Hour



Project: Citrus Valley Project

Project No: 1776-CR

Date: 10/11/2017

Test No. I-2 @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	8.75	min
Final Depth to Water, $D_F =$	12.000	in
Test Hole Radius, r =	4	in
Initial Depth to Water, $D_O =$	0	in
Total Test Hole Depth, $D_T =$	12	in

Equation -
$$I_t = \Delta H (60r)$$

$$\Delta t (r+2H_{avg})$$

$$H_{O} = D_{T} - D_{O} =$$
 12 in $H_{F} = D_{T} - D_{F} =$ 0 in $\Delta H = \Delta D = H_{O} - H_{F} =$ 12 in Havg = $(H_{O} + H_{F})/2 =$ 6 in

$$I_t = 20.571$$
 Inches per Hour



Project: Citrus Valley Project

Project No: 1776-CR

Date: 10/11/2017

Test No. I-3 @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	10	min
Final Depth to Water, $D_F =$	11.500	in
Test Hole Radius, r =	4	in
Initial Depth to Water, D_0 =	0	in
Total Test Hole Depth, $D_T =$	12	

Equation -
$$I_t = \Delta H (60r)$$

$$\Delta t (r+2H_{avg})$$

$$H_{O} = D_{T} - D_{O} =$$
 12 in $H_{F} = D_{T} - D_{F} =$ 0.5 in $\Delta H = \Delta D = H_{O} - H_{F} =$ 11.5 in Havg = $(H_{O} + H_{F})/2 =$ 6.25 in

$$I_t$$
 = 16.727 Inches per Hour



Project: Citrus Valley Project

Project No: 1776-CR

Date: 10/11/2017

Test No. I-4 @ 3 to 4 ft bgs

Porchet Method Application to Calculate Infiltration Rate

Time Interval, $\Delta t =$	10	min
Final Depth to Water, $D_F =$	8.250	in
Test Hole Radius, r =	4	in
Initial Depth to Water, $D_O =$	0	in
Total Test Hole Depth, $D_T =$	12	in

Equation -
$$I_t = \Delta H (60r)$$

$$\Delta t (r+2H_{avg})$$

$$H_{O} = D_{T} - D_{O} =$$
 12 in $H_{F} = D_{T} - D_{F} =$ 3.75 in $\Delta H = \Delta D = H_{O} - H_{F} =$ 8.25 in Havg = $(H_{O} + H_{F})/2 =$ 7.875 in

 $I_t = 10.025$ Inches per Hour



APPENDIX E

GENERAL GRADING GUIDELINES

Citrus Valley Project
Redlands, San Bernardino County, California
Project No. 1776-CR



GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the California Building Code, CBC (2016) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

- Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
- 2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
- 3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
- 4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.



- 5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
- 6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
- 7. Procedures for testing of fill slopes are as follows:
 - a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
 - b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
- 8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

- I. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
- 2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
- 3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

Treatment of Existing Ground

 Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed unless otherwise specifically indicated in the text of this report.



- 2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
- 3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
- 4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
- 5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Fill Placement

- I. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
- 2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
- 3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
 - a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
 - b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
- 4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
 - a) They are not placed in concentrated pockets;
 - b) There is a sufficient percentage of fine-grained material to surround the rocks;
 - c) The distribution of the rocks is observed by, and acceptable to, our representative.
- 5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
- 6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable



methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

- I. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
- 2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
- 3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
- 4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
- 5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

I. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.



- 2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
 - a) shallow (12 + inches) under slab interior trenches and,
 - b) as bedding in pipe zone.

The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.

- 3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
- 4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
- 5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

- I. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
- 2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
- 3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.



In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

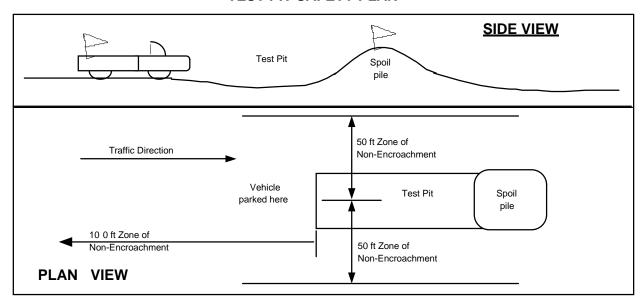
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN





Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

- 1. is 5 feet or deeper unless shored or laid back,
- 2. exit points or ladders are not provided,
- 3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
- 4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractors representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project



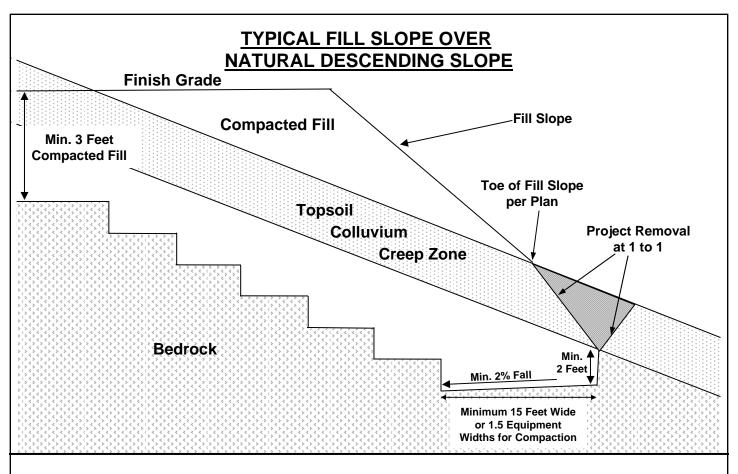
RSI Communities

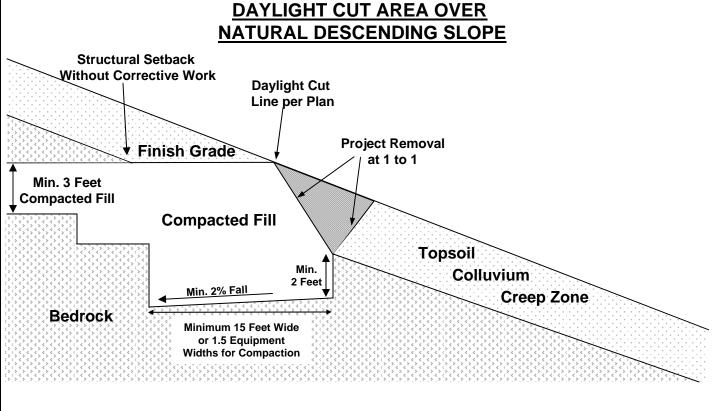
manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.







TREATMENT ABOVE

NATURAL SLOPES

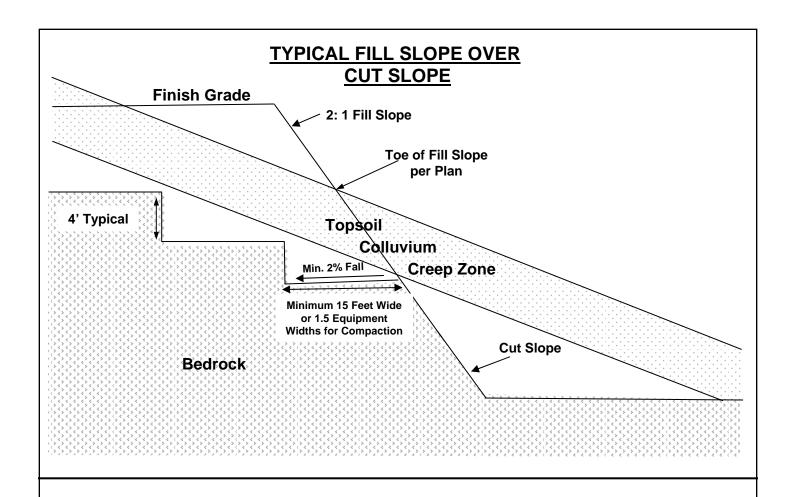
1548 North Maple Street

Corona, California 92880

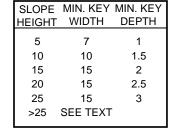
GEOTEK

STANDARD GRADING

GUIDELINES







CONTRACTOR TO VERIFY WITH SOIL ENGINEER PRIOR TO CONSTRUCTION

Bedrock or Suitable Dense Material Minimum compacted fill required to provide lateral support.

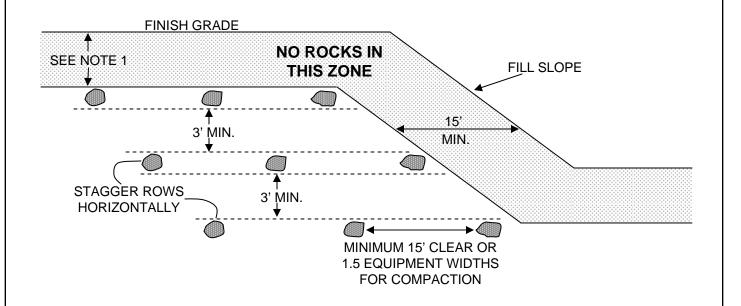
Excavate key if width or depth less than indicated in table above



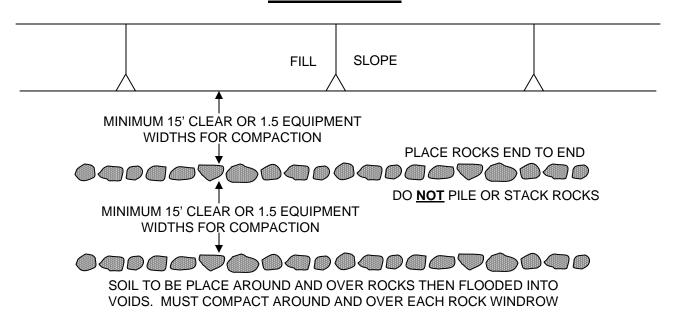
1548 North Maple Street Corona, California 92880 COMMON FILL SLOPE KEYS

STANDARD GRADING GUIDELINES

CROSS SECTIONAL VIEW



PLAN VIEW



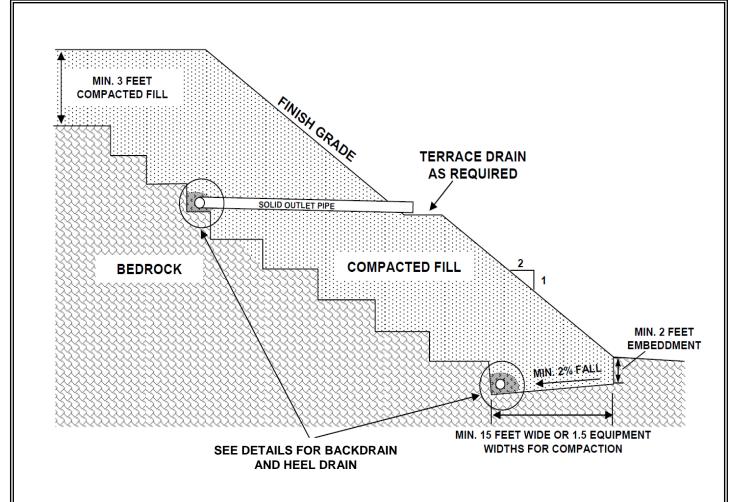
NOTES:

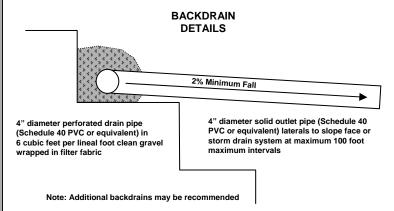
- 1) SOIL FILL OVER WINDROW SHOULE BE 7 FEET OR PER JURISDUICTIONAL STANDARDS AND SUFFICIENT FOR FUTURE EXCAVATIONS TO AVOID ROCKS
- 2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER
- SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO SOIL ENGINEER ACCEPTANCE
- 4) SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION
- 5) INDIVDUAL LARGE ROCKS MAY BE BURIED IN PITS.



ROCK BURIAL DETAILS

STANDARD GRADING GUIDELINES







6" diameter perforated drain pipe in 6 cubic feet per lineal foot clean gravel wrapped in filter fabric, outlet pipe to gravity flow with 2% minimum fall



1548 North Maple Street Corona, California 92880 TYPICAL BUTTRESS AND STABILIZATION FILL

STANDARD GRADING GUIDELINES

Appendix G Noise Technical Memorandum

HERITAGE SPECIFIC PLAN
INITIAL STUDY



MEMORANDUM

To: Emily Elliot, Michael Baker International

From: Pierre Glaize, Michael Baker International

Eddie Torres, Michael Baker International

Date: September 23, 2019

Subject: Heritage Specific Plan Project – Noise Technical Memorandum

PURPOSE

The purpose of this technical memorandum is to evaluate potential short- and long-term noise and ground-borne vibration impacts as a result of the proposed Heritage Specific Plan Project (project), located in the City of Redlands, California.

PROJECT LOCATION

The City of Redlands (City) is located in the southwestern portion of San Bernardino County. The City is bisected by Interstate 10 (I-10) and State Route 210 (SR-210) and is primarily surrounded by the cities of Loma Linda, San Bernardino, and Highland.

Regional access to the project site (site) provided via I-10 at the Alabama Street exit, approximately 1.2 miles to the southwest of the site, and via SR-210 at the San Bernardino Avenue exit, approximately 0.25 miles to the west of the site. Local access to the site is provided via West San Bernardino Avenue and Texas Street.

The site includes four parcels (Assessor's Parcel Number [APNs]: 0167-091-02-0000, 0167-091-04-0000, 0167-091-05-0000, and 0167-091-08-0000) totaling approximately 37.2 acres. The planned development encompasses property located within the East Valley Corridor Specific Plan, which will be amended to remove the site from the East Valley Corridor Specific Plan to establish the proposed Heritage Specific Plan.

EXISTING SITE CONDITIONS

The site consists of a former citrus orchard, most of which has been graded. The site's natural vegetation has been largely removed by past cultivation and weed abatement disking; however, the western parcel supports some non-native grassland. There is an existing water conveyance system on-site previously used for citrus irrigation that consists of a combination of rock-and-mortar flumes, brick flow control weirs, and concrete distribution standpipes. The site is otherwise unimproved and there are no other existing structures on-site.

The topography of the site is relatively flat; however, each parcel is separated by a small retaining wall step with a grade difference of approximately one to two feet, sloping down westerly. The elevation of the site is approximately 1,300 feet. The site generally drains to the west; however, there are north-south channels associated with citrus groves in the project area that intercept and divert the runoff north.

The site is bounded by public institutional uses (Citrus Valley High School) to the north, vacant land to the west, residential development to the south and east, and agricultural uses to the east. According to the City of Redlands General Plan 2035, there are City-owned citrus groves located within the agricultural uses immediately to the east of the site along Texas Street.

PROJECT DESCRIPTION

The proposed development is comprised of a new planned residential community that would include approximately 207 one- and two-story, single-family detached wood-framed residences with concrete slab-on-grade floors and associated underground utilities. The overall gross density of the development would be approximately 5.7 dwelling units per acres [du/ac] (maximum of 6 du/ac based on the City's Heritage Specific Plan zoning district). The proposed project would provide the following site access:

- West San Bernardino Avenue: Vehicular access to the site via West San Bernardino Avenue would be provided through a two-way access road located midway between future New York Street and Texas Street that connects to the internal roadway system of the project. Traffic exiting the site at this location would be restricted to right-turn only by a proposed raised median on West San Bernardino Avenue. A seven-foot-wide pedestrian sidewalk is proposed along the north side of West San Bernardino Avenue that would meander between the public right-of-way and adjacent landscape lot to be dedicated to the City.
- <u>Texas Street</u>: Vehicular access to the site via Texas Street would be provided through a two-way access road located midway between Pioneer Avenue and West San Bernardino Avenue that would connect to the internal roadway system of the project.
- <u>Pioneer Avenue</u>: No vehicular access to the site is proposed along Pioneer Avenue except for a restricted emergency vehicle access driveway at the northwest corner of the site.
- New York Street (Future): No vehicular access to the site is proposed along New York Street.
- Internal Circulation: Access to the site would be provided by two ingress/egress points on West
 San Bernardino Avenue and Texas Street. Internal roadways would provide access to the
 residential units and parks. The street design section would be a modified City standard for local

residential streets with a 52-foot right-of-way, 36-foot curb-to-curb separation, and five-foot wide curb adjacent sidewalks.

A comprehensive sidewalk and trail system with connections to the public realm are planned throughout the project. This system includes landscaped nodes that connect the corners of the site to the public street network to create a walkable community, particularly for students to walk to Citrus Valley High School. The site's street network leads to an open space area at the center of the community. This publicly accessible space would include a mix of passive uses including, but not limited to; picnicking areas, shade structure(s), playgrounds, gardens, seating areas, informal play areas, and landscaping.

FUNDAMENTALS OF SOUND AND ENVIRONMENTAL NOISE

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air and is characterized by both its amplitude and frequency (or pitch). The human ear does not hear all frequencies equally. In particular, the ear de-emphasizes low and very high frequencies. To better approximate the sensitivity of human hearing, the A-weighted decibel scale (dBA) has been developed. Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is perceived to be twice as loud and 20 dBA higher is perceived to be four times as loud, and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). On this scale, the human range of hearing extends from approximately 3 dBA to around 140 dBA.

Noise is generally defined as unwanted or excessive sound, which can vary in intensity by over one million times within the range of human hearing; therefore, a logarithmic scale, known as the decibel scale (dB), is used to quantify sound intensity. Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks, and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates (is reduced) at a rate between 3 dBA and 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between the noise source and the receiver. Hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance. Noise generated by stationary sources typically attenuates at a rate between 6 dBA and about 7.5 dBA per doubling of distance.

There are several metrics used to characterize community noise exposure, which fluctuate constantly over time. One such metric, the equivalent sound level (L_{eq}), represents a constant sound that, over the specified period, has the same sound energy as the time-varying sound. Noise exposure over a longer period is often evaluated based on the Day-Night Sound Level (L_{dn}). This is a measure of 24-hour noise levels that incorporates a 10-dBA penalty for sounds occurring between 10:00 p.m. and 7:00 a.m. The penalty is intended to reflect the increased human sensitivity to noises occurring during nighttime hours, particularly at times when people are sleeping and there are lower ambient noise conditions. Typical L_{dn} noise levels for light and medium density residential areas range from 55 dBA to 65 dBA.

FUNDAMENTALS OF ENVIRONMENTAL GROUNDBORNE VIBRATION

Sources of earth-borne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions). Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. Common sources for groundborne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment. For the purposes of this analysis, a PPV descriptor with units of inches per second is used to evaluate construction-generated vibration for building damage and human complaints.

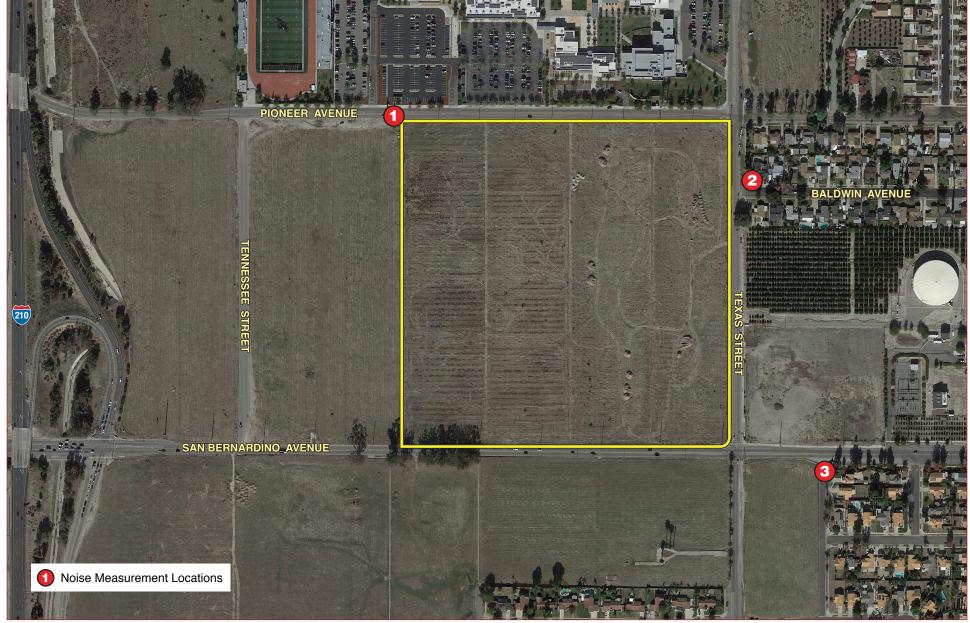
EXISTING NOISE SETTING

Existing Ambient Noise Levels

In order to quantify existing ambient noise levels in the project area, Michael Baker International conducted three noise measurements in the site vicinity on July 9, 2019; refer to <u>Appendix A</u>, <u>Noise Data</u>, and <u>Exhibit 1</u>, <u>Noise Measurement Locations</u>. The noise measurement locations are representative of typical existing noise exposure at and immediately adjacent to the site. Ten-minute measurements were taken between 11:00 a.m. and 12:00 p.m. at each location during the day. Short-term (L_{eq}) measurements are considered representative of the noise levels throughout the day. Noise measurements were taken during "off-peak" (9:00 a.m. through 3:00 p.m.) traffic noise hours as this provides a more conservative baseline. During rush hour traffic, vehicle speeds and heavy truck volumes are often low. Free-flowing traffic conditions just before or after rush hour often yield higher noise levels.¹ The average noise levels and sources of noise measured at each location are identified in Table 1, *Noise Measurements*.

Heritage Specific Plan Project Noise Technical Memorandum

¹ California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.



Source: Google Earth, September 2019.

NOISE TECHNICAL MEMORANDUM HERITAGE SPECIFIC PLAN PROJECT





Noise Measurement Locations

Table 1
Noise Measurements

Site No.	Location	L _{eq} (dBA)	L _{min} (dBA)	L _{max} (dBA)	Peak (dBA)	Time
1	Across from Citrus Valley High School on West Pioneer Avenue	65.7	45.6	85.1	101.2	11:06 a.m.
2	Corner of Baldwin Avenue and Texas Street	60.8	43.0	77.0	94.2	11:21 a.m.
3	End of Vermont Street, perpendicular to West San Bernardino Avenue	60.4	44.6	72.2	101.9	11:38 a.m.
Note: dRA =	A-weighted decibels: Log = Equivalent Sound Level: Log = Minimum S	ound Leve	l· I = M	aximum S	ound Leve	

Note: dBA = A-weighted decibels; L_{eq} = Equivalent Sound Level; L_{min} = Minimum Sound Level; L_{max} = Maximum Sound Level Refer to Exhibit 1, Noise Measurement Locations for a map of the noise measurement locations.

Source: Michael Baker International, July 9, 2019.

Meteorological conditions were clear skies, warm temperatures, with light wind speeds (five miles per hour), and low humidity. Noise monitoring equipment used for the ambient noise survey consisted of a Brüel & Kjær Hand-held Analyzer Type 2250 equipped with a Type 4189 pre-polarized microphone. The monitoring equipment complies with applicable requirements of the American National Standards Institute for Type I (precision) sound level meters. Measured noise levels during the daytime measurements ranged from 60.4 to 65.7 dBA L_{eq}.

Existing Stationary Noise Levels

The project area consists of residential, public institutional (Citrus Valley High School), and agricultural uses, as well as vacant land. The primary sources of stationary noise in the project vicinity are public institutional, agricultural, and suburban-related activities. These noise sources include operations of heavy-duty agricultural equipment, Citrus Valley High School stadium events, and parking areas, as well as heating, ventilation, and air conditioning [HVAC] units. The noise associated with these sources may represent a single-event noise occurrence, short-term, or long-term/continuous noise.

Existing Mobile Noise Levels

In order to assess the potential for mobile source noise impacts, it is necessary to determine existing noise levels generated by vehicles traveling through the project area. Vehicle traffic along Tennessee Street, West San Bernardino Avenue, Texas Street, and Pioneer Street currently generate the majority of existing noise in the immediate project vicinity. As shown in <u>Table 2 Existing Traffic Noise Levels</u>, existing mobile noise sources in the vicinity of the site range from 53.6 to 65.4 dBA CNEL.

Mobile source noise was modeled using the Federal Highway Administration's Highway Noise Prediction Model (FHWA RD-77-108). The model calculates the average noise level at specific locations based on traffic volumes, average speeds represented by the posted speed limit, roadway geometry, and site environmental conditions. The model does not account for ambient noise levels. Noise projections are based on modeled vehicular traffic as derived from the *Pioneer & Texas Residential Traffic Impact Analysis* (Traffic Impact Analysis); refer to <u>Appendix A</u> for modeling assumptions and vehicle speeds along the roadway segments. Existing modeled traffic noise levels are shown in Table 2.

Table 2 **Existing Traffic Noise Levels**

			Existing Condition	ons		
Da adama Camana 4		dBA @ 100	Distance from Roadway Centerline to: (Feet)			
Roadway Segment	ADT	Feet from Roadway Centerline	60 CNEL Noise Contour	65 CNEL Noise Contour	70 CNEL Noise Contour	
Citrus Plaza Drive						
South of West San Bernardino Avenue	14,300	63.1	161	75	•	
West San Bernardino Avenue						
West of Citrus Plaza Drive	17,300	65.2	222	103	•	
Citrus Plaza Drive to Tennessee Street	25,000	65.4	229	106	49	
South Tennessee Street to North Tennessee Street	19,400	64.2	192	89	41	
Tennessee Street to Driveway1	16,600	63.6	173	80	37	
Driveway 1 to Texas Street	17,100	63.7	176	82	38	
East of Texas Street	14,900	63.1	161	75	35	
Tennessee Street	,		191	<u> </u>		
South of West San Bernardino Avenue	10,000	58.9	84	39	-	
North of West San Bernardino Avenue	3,000	53.6	38	-	-	
Pioneer Avenue						
West of Texas Street	8,200	58.0	74	34	-	
East of Texas Street	8,000	57.9	72	34	-	
Texas Street						
North of Pioneer Avenue	4,100	55.0	47	-	-	
Pioneer Avenue to Driveway 2	4,200	55.1	47	-	-	
Driveway 2 to West San Bernardino Avenue	4,100	55.0	46	-	-	
West San Bernardino Avenue to West Pennsylvania Avenue	7,000	59.8	97	45	-	
West Pennsylvania Avenue to Lugonia Avenue	7,300	60.0	100	46	_	
South of Lugonia Avenue	9,400	61.1	118	55	_	
Lugonia Avenue	5,700	1 2711			1	
West of Texas Street	9,300	58.5	80	37	-	
East of Texas Street	10,600	61.7	130	60	-	
Interstate 210	, , , , , , , , ,	1		-		
West of Texas Street	16,400	63.5	171	80	37	
East of Texas Street	13,100	62.5	147	68	32	

Notes: ADT = average daily traffic; dBA = A-weighted decibels; CNEL = Community Noise Equivalent Level

Source: Noise modeling is based on traffic data within Urban Crossroads' *Pioneer & Texas Residential Traffic Impact Analysis*, dated April 6, 2019.

REGULATORY SETTING

State of California

California Noise Control Act of 1973

Sections 46000 through 46080 of the California Health and Safety Code, known as the California Noise Control Act, find that excessive noise is a serious hazard to public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. The act also finds that there is a continuous and increasing bombardment of noise in urban, suburban, and rural areas. The California Noise Control Act declares that the State has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the State to provide an environment for all Californians that is free from noise that jeopardizes their health or welfare.

California Noise Insulation Standards (CCR Title 24, Part 2, Chapter 2-35)

In 1974, the California Commission on Housing and Community Development adopted noise insulation standards for multi-family residential buildings (Title 24, Part 2, California Code of Regulations). Title 24 establishes standards for interior room noise (attributable to outside noise sources). The regulations also specify that acoustical studies must be prepared whenever a multi-family residential building or structure is proposed to be located near an existing or adopted freeway route, expressway, parkway, major street, thoroughfare, rail line, rapid transit line, or industrial noise source, and where such noise source or sources create an exterior CNEL (or L_{dn}) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or L_{dn}) of at least 45 dBA.

State Office of Planning and Research

The State Office of Planning and Research's *Noise Element Guidelines* include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The *Noise Element Guidelines* contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL. <u>Table 3</u>, <u>Land Use Compatibility for Community Noise Environments</u>, presents guidelines for determining acceptable and unacceptable community noise exposure limits for various land use categories. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Table 3
Land Use Compatibility for Community Noise Environments

Leadille O to co	Community Noise Exposure (Ldn or CNEL dBA)				
Land Use Category	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable	
Residential - Low Density, Single-Family, Duplex, Mobile Homes	50 - 60	55 - 70	70 - 75	75 - 85	
Residential - Multiple Family	50 - 65	60 - 70	70 - 75	70 - 85	
Transient Lodging - Motel, Hotels	50 - 65	60 - 70	70 - 80	80 - 85	
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 - 70	60 - 70	70 - 80	80 - 85	
Auditoriums, Concert Halls, Amphitheaters	NA	50 - 70	NA	65 - 85	
Sports Arenas, Outdoor Spectator Sports	NA	50 - 75	NA	70 - 85	
Playgrounds, Neighborhood Parks	50 - 70	NA	67.5 - 75	72.5 - 85	
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 - 70	NA	70 - 80	80 - 85	
Office Buildings, Business Commercial and Professional	50 - 70	67.5 - 77.5	75 - 85	NA	
Industrial, Manufacturing, Utilities, Agriculture	50 - 75	70 - 80	75 - 85	NA	

Notes: NA: Not Applicable; Ldn: average day/night sound level; CNEL: Community Noise Equivalent Level, dBA = A-weighted decibels

<u>Normally Acceptable</u> - Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

<u>Conditionally Acceptable</u> - New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable - New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

<u>Clearly Unacceptable</u> – New construction or development should generally not be undertaken.

Source: Office of Planning and Research, State of California General Plan Guidelines, October 2017.

City of Redlands

City of Redlands General Plan 2035

The City of Redlands General Plan 2035 (General Plan) Health Community Element identifies noise-sensitive land uses and noise sources, defines areas of noise impact, and establishes policies to ensure that City residents are protected from excessive noise. The Noise Chapter contains two land use compatibility tables that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL. Table 3 presents guidelines for determining acceptable and unacceptable community noise exposure limits for various land use categories. Additionally, Table 4, Interior and Exterior Noise Standards, presents guidelines for maximum allowable interior and exterior noise levels for various land use categories. The following lists applicable noise policies obtained from the General Plan:

Table 4
Interior and Exterior Noise Standards

	Land Use	CNE	L¹
Categories	Uses	Interior ²	Exterior ³
Residential	Single family, Duplex, Multiple Family	45 ⁴	60
Residential	Mobile Home	NA	60⁵
	Hotel, Motel, Transient Lodging	45	65 ⁶
	Commercial Retail, Bank Restaurant	55	NA
	Office Building, Research & Development, Professional Offices, City Office Building	50	NA
Commercial, Industrial, Institutional	Amphitheater, Concert Hall, Auditorium, Meeting Hall	45	NA
	Gymnasium (Multipurpose)	50	NA
	Sports Club	55	NA
	Manufacturing, Warehousing, Wholesale, Utilities	60	NA
	Movie Theaters	45	NA
Institutional	Hospital, School Classrooms	45	60
Open Space	Parks	NA	60

Notes: CNEL = Community Noise Equivalent Level

- 1. The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.
- 2. Indoor environment, excluding bathrooms, toilets, closets, corridors.
- Outdoor environment limited to private yard of single-family residences as measured at the property line; multi-family private patio
 or balcony served by a means of exit from inside; mobile park home; hospital patio; park picnic area; school playground; hotel;
 and recreational area.
- 4. Noise level requirement with open windows, if they are used to meet natural ventilation requirements.
- 5. Exterior noise level should be such that interior level do not exceed 45 CNEL.
- 6. Except those areas affected by aircraft noise.

Source: City of Redlands, City of Redlands General Plan 2035, December 2017.

Policy 9.0e.

Use the criteria specified in General Plan Table 9.1 (<u>Table 3</u>) to assess the compatibility of proposed land uses with the projected noise environment, and apply the noise standards in General Plan Table 9.2 (<u>Table 4</u>), which prescribe interior and exterior noise standards in relation to specific land uses. Do not approve projects that would not comply with the standards in General Plan Table 9.2 (<u>Table 4</u>).

These tables are the primary tools which allow the City to ensure noise-integrated planning for compatibility between land uses and outdoor noise.

Policy 9.0f.

Require a noise impact evaluation based on noise measurements at the site for all projects in Noise Referral Zones (B,C,D) as shown on General Plan Table 9.1 (<u>Table 3</u>) and on General Plan Figure 9.1 (<u>Table 3</u>) or as determined for the tables in the Appendix, as part of the project review process. Should measurements indicate that unacceptable noise levels will be created or experienced, require mitigation measures based on a detailed technical study prepared by a qualified acoustical engineer.

Policy 9.0h. Minimize potential transportation noise through proper design of street circulation, coordination of routing, and other traffic control measures.

Policy 9.0i. Require construction barriers to mitigate sound emissions where necessary or where feasible, and encourage use of walls and berms to protect residential or other noise sensitive land uses that are adjacent to major roads, commercial, or industrial areas.

Policy 9.0j. Require the inclusion of noise mitigation measures in the design of new roadway projects.

Policy 9.0k. Ensure the effective enforcement of City, State, and Federal noise levels by all appropriate City departments.

Policy 9.0l. Adopt and enforce a new Community Noise Ordinance to mitigate noise conflicts between adjacent land uses, to ensure that City residents are not exposed to excessive noise levels from existing and new stationary noise sources, and to educate the public regarding noise issues.

A Community Noise Ordinance establishes noise limits, typical of a quiet residential area, that cannot be exceeded at the property line of the noise-creating use. The types of noise to be controlled include sources such as amplified sound, street sales, animals, construction and demolition, emergency signaling devices, power tools, air conditioning, and vehicles on private property.

Policy 9.0s. Require mitigation to ensure that indoor noise level for residential living spaces not exceed 45 dB LDN/CNEL due to the combined effect of all exterior noise sources.

The Uniform Building Code (specifically, the California Administrative Code, Title 24, Part 6, Division T25) require that "Interior community noise levels (CNEL/LDN) with the windows closed, attributable to exterior sources shall not exceed an annual CNEL or LDN of 45 dB in any habitable room." The code requires that this standard be applied to all new hotels, motels, apartment houses and dwelling units other than detached single family dwellings.

Policy 9-s sets the maximum acceptably interior noise level at 45 CNEL The Noise Referral Zones (65 CNEL) delineates areas within which tests to ensure compliance are to be required for new structures.

Policy 9.0u. Require all new residential projects or replacement dwellings to be constructed near existing sources of non-transportation noise (including but limited to commercial facilities or public parks with sports activities) to demonstrate via an acoustical study conducted by a Registered

Engineer that the indoor noise levels will be consistent with the limits contained in the Community Noise Ordinance.

Policy 9.0v. Consider the following impacts as possibly "significant":

- An increase in exposure of four or more dB if the resulting noise level would exceed that described as clearly compatible for the affected land use, as established in General Plan Table 9.1 (<u>Table</u> 3) and General Plan Table 9.2 (<u>Table 4</u>).
- Any increase of six dB or more, due to the potential for adverse community response.
- Policy 9.0w. Limit hours for all construction or demolition work where site-related noise is audible beyond the boundary line.
- Policy 9.0y. Minimize impacts of loud trucks by requiring that maximum noise levels due to levels due to single events be controlled to 50 dB in bedrooms and 55 dB in other habitable spaces.

City Code of the City of Redlands

Title 8, Health and Safety, Chapter 8.06, Community Noise Control, of the City Code of the City of Redlands (City Code) establishes standards concerning acceptable noise levels for both noise-sensitive land uses and noise-generating land uses. The following sections of the City Code are applicable to the proposed project.

§ 8.06.070 - Exterior Noise Limits.

(A) The noise standards for the categories of land uses identified in table 1 (<u>Table 5</u>, <u>Maximum Permissible Sound Levels by Receiving Land Use</u>) of this section shall, unless otherwise specifically indicated, apply to all such property within a designated zone.

Table 5
Maximum Permissible Sound Levels by Receiving Land Use

Receiving Land Use Category	Time Period	Noise Level (dBA)
Single-family residential districts	10:00 p.m. – 7 :00 a.m.	50
Single-lamily residential districts	7:00 a.m. – 10:00 p.m.	60
Multi-family residential districts;	10:00 p.m. – 7 :00 a.m.	50
institutional; hotels	7:00 a.m. – 10:00 p.m.	60
Commercial	10:00 p.m. – 7 :00 a.m.	60
Commercial	7:00 a.m. – 10:00 p.m.	65
Industrial	Anytime	75
N (10A A : 1 (10 10 1		

Notes: dBA = A-weighted Sound Pressure Level

The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear.

Source: City of Redlands, City Code of the City of Redlands Section 8.06.070, Table 1, Maximum Permissible Sound Levels by Receiving Land Use.

- (B) No person shall operate, or cause to be operated, any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person which causes the noise level when measured on any other property to exceed:
 - 1. The noise standard for that land use specified in table 1 of this section for a cumulative period of more than thirty (30) minutes in any hour; or
 - 2. The noise standard specified in table 1 of this section plus five (5) dB for a cumulative period of more than fifteen (15) minutes in any hour; or
 - 3. The noise standard specified in table 1 of this section plus ten (10) dB for a cumulative period of more than five (5) minutes in any hour; or
 - 4. The noise standard specified in table 1 of this section plus fifteen (15) dB for a cumulative period of more than one minute in any hour; or
 - 5. The noise standard specified in table 1 of this section plus twenty (20) dB or the maximum measured ambient level, for any period of time.
- (C) If the measured ambient level exceeds the allowable noise exposure standard within any of the first four (4) noise limit categories above, the allowable noise exposure standard shall be adjusted in five (5) dB increments in each category as appropriate to encompass or reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.
- (D) The ambient noise shall be measured at the same location along the property line utilized in subsection 8.06.060B of this chapter, with the alleged offending noise source inoperative. If the alleged offending noise source cannot be shut down, the ambient noise shall be estimated by performing a measurement in the same general area of the source but at a sufficient distance that the noise from the source is at least ten (10) dB below the ambient in order that only the ambient level be measured. If the difference between the ambient and the noise source is five (5) to ten (10) dB, then the level of the ambient itself can be reasonably determined by subtracting a one decibel correction to account for the contribution of the source.
- (E) In the event the alleged offensive noise contains a steady, audible tone such as a whine, screech, hum, or is a repetitive noise such as hammering or riveting, or contains music or speech conveying informational content, the standard limits set forth in table 1 of this section shall be reduced by five (5) dB. (Ord. 2579 § 1, 2004)

§ 8.06.080 – Interior Noise Standards.

- (A) No person shall operate or cause to be operated any source of sound, or allow the creation of any noise, which causes the noise level when measured inside a neighboring receiving occupied building to exceed the following standards:
 - 1. The noise standard for that land use specified in table 2 of this section for a cumulative period of more than five (5) minutes in any hour.

- 2. The noise standard for that land use specified in table 2 of this section plus five (5) dB for a cumulative period of more than one minute in any hour.
- 3. The noise standard for that land use specified in table 2 of this section plus ten (10) dB for the maximum measured ambient noise level for any period of time.
- (B) If the measured ambient level exceeds the allowable exterior noise exposure standard in table 1 of this chapter, the allowable interior noise exposure level shall be adjusted in five (5) dB increments as appropriate to reflect the ambient noise level.

Table 6
Maximum Permissible Interior Sound Levels by Receiving Land Use

Receiving Land Use Category	Time Period	Noise Level - dBA
Single-family residential districts	Any time	45
Multi-family residential districts; institutional; hotels	Any time	45
Commercial	Any time	50
Industrial	Any time	60

Notes:

dB(A) = (A-weighted Sound Pressure Level). The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear.

Source: Redlands, California, City Code, Section 8.06.080, Table 2.

§ 8.06.090 – Noise Disturbances prohibited.

- (F) Construction And/Or Demolition: Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekday hours of six o'clock (6:00) P.M. and seven o'clock (7:00) A.M., including Saturdays, or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work by public service utilities, the city or another governmental entity. All mobile or stationary internal combustion engine powered equipment or machinery shall be equipped with exhaust and air intake silencers in proper working order, or suitable to meet the standards set forth herein.
- (G) Vibration: Operating or permitting the operation of any device that creates a vibration which is above the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at one hundred fifty feet (150') from the source if on a public space or public right of way.

§ 8.06.120 – Exemptions.

(G) Construction Activity: This chapter shall not apply to noise sources associated with new construction, remodeling, rehabilitation or grading of any property provided such activities take place between the hours of seven o'clock (7:00) A.M. and six o'clock (6:00) P.M. on weekdays, including Saturdays, with no activities taking place at any time on Sundays or federal holidays. All motorized equipment used in such activity shall be equipped with functioning mufflers.

NOISE SENSITIVE RECEPTORS

Noise-sensitive land uses are generally considered uses where noise exposure could result in health-related risks to individuals, as well as places where a quiet environment is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. The closest sensitive receptors are residential uses located approximately 67 feet to the east of the site and the Citrus Valley High School located approximately 70 feet north of the site.

CEQA THRESHOLDS

The environmental analysis in this memorandum is based on the CEQA Guidelines Appendix G Initial Study Checklist. The issues presented in the Initial Study Checklist have been utilized as thresholds of significance in this section. Accordingly, a project may have a significant adverse impact related to noise and vibration if it would do any of the following:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (refer to Impact Statement NOI-1);
- Generation of excessive groundborne vibration or groundborne noise levels (refer to Impact Statement NOI-2); and/or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels (refer to Impact Statement NOI-3).

SIGNIFICANCE OF CHANGES IN TRAFFIC NOISE LEVELS

An off-site traffic noise impact typically occurs when there is a discernable increase in traffic and the resulting noise level exceeds an established noise standard. In community noise considerations, changes in noise levels greater than 3 dBA are often identified as substantial, while changes less than 1 dBA will not be discernible to local residents. In the range of 1 to 3 dBA, residents who are very sensitive to noise may perceive a slight change. In laboratory testing situations, humans are able to detect noise level changes of slightly less than 1 dBA. However, this is based on a direct, immediate comparison of two sound levels. Community noise exposures occur over a long period of time and changes in noise levels

occur over years (rather than the immediate comparison made in a laboratory situation). Therefore, the level at which changes in community noise levels become discernible is likely to be some value greater than 1 dB, and 3 dB is the most commonly accepted discernable difference. A 5 dBA change is generally recognized as a clearly discernable difference.

As traffic noise levels at sensitive uses likely approach or exceed the applicable land use compatibility standard (refer to <u>Table 3</u>), a 3 dBA increase as a result of the project is used as the increase threshold for the project. Thus, a project would result in a significant noise impact when a permanent increase in ambient noise levels of 3 dBA occur upon project implementation and the resulting noise level exceeds the applicable exterior standard at a noise sensitive use.

IMPACT ANALYSIS

NOI-1 Would the project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Less Than Significant Impact with Mitigation Incorporated.

Construction Noise Impacts

Temporary increases in ambient noise levels as a result of the project would predominantly be associated with construction activities. Construction activities would occur over approximately 42 months and would include the following phases: grading, building construction, paving, and architectural coating. Project construction would require excavators, graders, rubber-tired dozers, scrapers, tractors/loaders/backhoes during grading; cranes, forklifts, generator sets, tractors/loaders/backhoes, welders, during building construction; pavers, paving equipment, rollers, during paving; and lastly air compressors during architectural coatings. Typical noise levels generated by construction equipment are shown in <u>Table 7</u>, *Maximum Noise Levels Generated by Construction Equipment*.

The property line of the nearest sensitive receptors (i.e., residential uses) are located approximately 67 feet east of the proposed construction area. As shown in Table 7, project-related construction noise levels would range between 74 dBA and 87 dBA at a distance of 67 feet. Although these receptors would experience increased noise levels during project construction activities, the City does not have construction noise standards. Rather, Section 8.06.120 of the City Code exempts construction activities from the noise standards provided that such activities take place between 7:00 a.m. to 6:00 p.m. on weekdays, including Saturdays, with no construction activities occurring on Sundays or Federal holidays. These permitted hours of construction are included in the City Code in recognition that construction activities undertaken during daytime hours are a typical part of living in an urban environment and do not cause a significant disruption. Construction would occur throughout the site and would not be concentrated or confined in an area directly adjacent to sensitive receptors. Therefore, construction noise would be acoustically dispersed throughout the site and not concentrated in one area near adjacent sensitive uses. Although project-related construction activities would not exceed applicable noise standards at off-site uses (the City does not have construction noise limits), Noise Reduction Measure NOI-1 would reduce construction noise levels and minimize noise disturbances at off-site uses through implementation of several construction noise best management practices.

Table 7
Maximum Noise Levels Generated by Construction Equipment

Type of Equipment	Acoustical Use Factor ¹	L _{max} at 50 Feet (dBA)	L _{max} at 67 Feet (dBA)
Concrete Saw	20	90	87
Crane	16	81	76
Concrete Mixer Truck	40	79	76
Backhoe	40	78	75
Dozer	40	82	79
Excavator	40	81	78
Forklift	40	78	75
Paver	50	77	74
Roller	20	80	77
Tractor	40	84	81
Water Truck	40	80	77
Grader	40	85	82
General Industrial Equipment	50	85	82

Notes: dBA = dBA = A-weighted decibels; L_{max} = Maximum Sound Level

Source: Federal Highway Administration, Roadway Construction Noise Model (FHWA-HEP-05-054), January 2006.

Long-Term Operational Noise Impacts

As previously described, the project would allow construction of approximately 207 one- and two-story, single-family detached residences and associated infrastructure. As such, project operations include daily activities that would increase mobile traffic noise levels in the project vicinity. The project would also introduce new sources of stationary noise sources that are discussed below.

Off-Site Mobile Noise

The proposed project would result in additional traffic on adjacent roadways from daily activities, thereby increasing vehicular noise in the vicinity of existing and proposed land uses.

Daily Activities

Based on the Traffic Impact Analysis, typical daily activities are forecast to generate 1,956 average daily trips, including 153 trips during the a.m. peak hour and 205 trips during the p.m. peak hour. The "Horizon Year Without Project" and "Horizon Year With Project" scenarios are compared in <u>Table 8</u>, <u>Future Traffic Noise Levels</u>. As depicted in <u>Table 8</u>, under the "Horizon Year Without Project" scenario, noise levels would range from approximately 57.6 dBA to 67.3 dBA, with the highest noise levels occurring along the West San Bernardino Avenue roadway segment from Citrus Plaza Drive to Tennessee Street. The "Horizon Year With Project" scenario noise levels would range from approximately 57.6 dBA to 67.4 dBA, with the highest noise levels occurring along the West San Bernardino Avenue roadway segment from Citrus Plaza Drive to Tennessee Street.

^{1.} Acoustical Use Factor (percent): Estimates the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during construction operation.

Table 8
Future Traffic Noise Levels

Horizon Year Without Project					Horizon Year With Project					
	dBA @ 100	Distance f	rom Roadwa to: (Feet)	ay Centerline		dBA @ 100				Difference In dBA @ 100 Feet
ADT	Roadway Centerline	60 CNEL Noise Contour	65 CNEL Noise Contour	70 CNEL Noise Contour	ADT	Roadway Centerline	60 CNEL Noise Contour	65 CNEL Noise Contour	70 CNEL Noise Contour	from Roadway
18,000	64.1	188	87	-	18,100	64.1	188	87		0.0
_										
27,100	67.1	299	139	65	27,200	67.2	300	139	65	0.0
38,700	67.3	306	142	66	39,400	67.4	310	144	67	0.1
34,000	66.7	279	130	60	35,100	66.8	285	132	61	0.1
28,100	65.9	246	114	53	29,200	66.0	252	117	54	0.2
28,100	65.9	246	114	53		65.9	248	115	53	0.1
19,600	64.3	193	90	42	19,900	64.4	195	91	42	0.1
East of Texas Street 19,600 64.3 193 90 42 19,900 64.4 195 91 42 0.1 Tennessee Street										
17,700	61.3	123	57	-	17,800	61.4	123	57	-	0.0
8,600	58.2	76	35	-	8,600	58.2	76	35	-	0.0
8,100	57.9	73	34	-	8,100	57.9	73	34	-	0.0
10,400	59.0	86	40	-	10,400	59.0	86	40		0.0
10,300	59.0	86	40	-	10,400	59.0	86	40	•	0.0
7,400	57.6	69	-	-	7,400	57.6	69			0.0
7,800	57.8	71	33	-	7,900	57.8	72	33		0.1
7,700	57.7	70	33	-	8,700	58.3	76	35	-	0.5
9,800	61.3	122	57	-	10,300	61.5	126	58		0.2
10,200	61.5	125	58	-	10,700	61.7	129	60	-	0.2
13,200	62.6	149	69	-	13,400	62.6	150	70	32	0.1
22,500	62.4	144	67	-	22,700	62.4	145	67	-	0.0
22,000	64.9	212	98	46	22,100	64.9	212	99	46	0.0
27,000	65.7	239	111	51	27,400	65.7	241	112	52	0.1
21,800	64.7	207	96	45	22,200	64.8	210	97	45	0.1
	18,000 27,100 38,700 34,000 28,100 19,600 17,700 8,600 10,400 10,300 7,400 7,800 7,700 9,800 10,200 13,200 22,500 22,000	ADT dBA @ 100 Feet from Roadway Centerline	ADT dBA @ 100 Feet from Roadway Centerline Distance for GO CNEL Noise Contour 18,000 64.1 188 27,100 67.1 299 38,700 67.3 306 34,000 66.7 279 28,100 65.9 246 28,100 65.9 246 19,600 64.3 193 17,700 61.3 123 8,600 58.2 76 8,100 57.9 73 10,400 59.0 86 10,300 59.0 86 7,800 57.8 71 7,700 57.7 70 9,800 61.3 122 10,200 61.5 125 13,200 62.6 149 22,500 62.4 144 22,000 64.9 212	ADT	ADT	ADT Centerline Bistance From Roadway Centerline Contour Contour	ADT	ADT Color Colo	ADT Feet from Roadway Centerline Feet from Roadway Cent	Name

Notes: ADT = average daily traffic; dBA = A-weighted decibels; CNEL = community noise equivalent level

<u>Table 8</u> also shows the difference between the "Horizon Year Without Project" scenario and the "Horizon Year With Project" scenario. As depicted in <u>Table 8</u>, traffic associated with the proposed project would result in a maximum increase of 0.5 dBA along Texas Street from Driveway 2 to West San Bernardino Avenue. A significant impact would result only if both of the following occur: an exceedance of the City's residential exterior noise standards (i.e., 60 dBA CNEL) and a perceptible increase in traffic noise levels (i.e., noise increase would be greater than 3.0 dBA).

^{1.} The "Future With Project" scenario is the worst-case scenario as it is based on the maximum special event trips (i.e. factored major retreat trips)

Source: Noise modeling is based on traffic data within Urban Crossroads' Pioneer & Texas Residential Traffic Impact Analysis, dated April 6, 2019.

As shown in <u>Table 8</u>, daily traffic levels with the project would not cause a perceptible increase in traffic noise levels (i.e., noise increase would be greater than 3.0 dBA) along any of the surrounding roads. "Horizon Year With Project" traffic noise levels along segments of Tennessee Street, Texas Street and Pioneer Street would not exceed the City's residential exterior noise standards (i.e., 60 dBA CNEL); refer to <u>Table 8</u>. All segments along West San Bernardino Avenue, Citrus Plaza Drive, I-210, and Lugonia Avenue, and some segments of Texas Street and Tennessee Street would exceed the City's residential exterior noise standard of 60 dBA CNEL under the "Horizon Year With Project" scenario; refer to <u>Table 8</u>. However, these segments would also exceed the City's residential exterior noise standards under the "Horizon Year Without Project" scenario and/or result in an imperceptible increase in traffic noise (i.e., less than 3.0 dBA). As the project would not cause an exceedance of the City's residential exterior noise standards in combination with a perceptible increase in traffic noise levels, the proposed project would not significantly increase noise levels along the roadway segments analyzed. Therefore, a less than significant impact would occur in this regard.

Cumulative Mobile Source Impacts

A project's contribution to a cumulative traffic noise increase would be considered significant when the combined effect exceeds the perception level (i.e., auditory level increase) threshold. The combined effect compares the "cumulative with project" condition to "existing" conditions. This comparison accounts for the traffic noise increase generated by a project combined with the traffic noise increase generated by cumulative projects. The following criteria have been utilized to evaluate the combined effect of cumulative noise increase.

- Combined Effect. The cumulative with project noise level ("Cumulative (2024) With Project") would cause a significant cumulative impact if a 3.0 dBA increase over existing conditions occurs and the resulting noise level exceeds the applicable exterior standard at a sensitive use. Although there may be a significant noise increase due to the proposed project in combination with other related projects, it must also be demonstrated that the project has an incremental effect. In other words, a significant portion of the noise increase must be due to the proposed project. The following criteria have been utilized to evaluate the incremental effect of the cumulative noise increase.
- *Incremental Effects*. The "Cumulative (2024) With Project" causes a 1.0 dBA increase in noise above the "Cumulative (2024) Without Project" noise level.

A significant impact would result only if both the combined (including an exceedance of the applicable exterior standard at a sensitive use) and incremental effects criteria have been exceeded. Noise, by definition, is a localized phenomenon and reduces as distance from the source increases. Consequently, only the proposed project and growth due to occur in the site vicinity would contribute to cumulative noise impacts. Table 9, *Cumulative Noise Scenario*, lists the traffic noise effects along roadway segments in the project vicinity for "Existing," "Cumulative (2024) Without Project," and "Cumulative (2024) With Project" conditions, including incremental and net cumulative impacts.

As indicated in <u>Table 9</u>, the "Combined Effects" criterion of 3.0 dBA and "Incremental Effects" criterion of 1.0 dBA is not exceeded along any of the study area roadways. Therefore, the proposed project, would result in less than significant impacts in this regard.

Table 9
Cumulative Noise Scenario

	dBA @ 100 F	eet from Roadw	ay Centerline	Combined Effects	Incremental Effects	Cumulative (2024) with Project	
Roadway Segment	Existing	Cumulative (2024) without Project	Cumulative (2024) with Project	Difference in dBA Between Cumulative With Project and Existing	Difference in dBA Between Cumulative With Project and Cumulative Without Project	Noise Level Exceeds City's 60 dBA CNEL Residential Noise Standard?	Cumulatively Significant Impact? ¹
Citrus Plaza Drive							
South of West San Bernardino Avenue	63.1	63.7	63.7	0.6	0.0	Yes	No
West San Bernardino Avenue							
West of Citrus Plaza Drive	65.2	66.7	66.7	1.5	0.0	Yes	No
Citrus Plaza Drive to Tennessee Street	65.4	66.9	66.9	1.5	0.0	Yes	No
South Tennessee Street to North Tennessee						Yes	No
Street	64.2	66.2	66.3	2.1	0.1		
Tennessee Street to Driveway 1	63.6	64.9	65.1	1.5	0.2	Yes	No
Driveway 1 to Texas Street	63.7	65.0	65.1	1.4	0.1	Yes	No
East of Texas Street	63.1	64.1	65.1	2.0	1.0	Yes	No
Tennessee Street		•			•	•	•
South of West San Bernardino Avenue (I-210)	58.9	60.9	61.0	2.1	0.1	Yes	No
North of West San Bernardino Avenue	53.6	54.3	54.3	0.7	0.0	No	No
South of West San Bernardino Avenue ²	-	57.4	57.4	-	0.0	No	No
Pioneer Avenue							
West of Texas Street	58.0	58.6	58.6	0.6	0.0	No	No
East of Texas Street	57.9	58.6	58.6	0.7	0.0	No	No
Texas Street		•			•	•	•
North of Pioneer Avenue	55.0	57.2	57.2	2.2	0.0	No	No
Pioneer Avenue to Driveway 2	55.1	57.4	57.4	2.3	0.0	No	No
Driveway 2 to West San Bernardino Avenue	55.0	57.3	57.9	2.9	0.6	No	No
West San Bernardino Avenue to West							No
Pennsylvania Avenue	59.8	60.9	61.1	1.3	0.2	Yes	
West Pennsylvania Avenue to Lugonia							No
Avenue	60.0	61.1	61.3	1.3	0.2	Yes	
South of Lugonia Avenue	61.1	62.2	62.2	1.1	0.0	Yes	No
Lugonia Avenue							
West of Texas Street	58.5	60.0	60.0	1.5	0.0	No	No
East of Texas Street	61.7	62.7	62.7	1.0	0.0	Yes	No
Interstate 210							
I-210 northbound on-ramp	63.5	65.3	65.3	1.8	0.0	Yes	No
I-210 southbound off-ramp	62.5	64.3	64.4	1.9	0.1	Yes	No

ADT = average daily trips; dBA = A-weighted decibels; CNEL = community noise equivalent level

Stationary Noise

The project would allow construction of approximately 207 one- and two-story, single-family detached residences and associated infrastructure. Sources of noise that are typical of residential uses include garbage trucks, parking areas, and HVAC units.

Notes:

^{1.} A cumulative impact would occur if the "Combined Effects" and "Incremental Effects" criterion are exceeded and the modeled noise level exceeds the City's exterior noise standard shown in Table 5.

^{2.} Tennessee Street south of San Bernardino Avenue is planned for future development; therefore, the roadway does not generate any trips under existing conditions.

Source: Noise modeling is based on traffic data within the Urban Crossroads' Pioneer & Texas Residential Traffic Impact Analysis, dated April 6, 2019.

Garbage Trucks

The proposed project would involve occasional trash/recycling pickups from slow-moving garbage trucks. Trash/recycling pickup would occur throughout the site. Low-speed truck noise results from a combination of engine, exhaust, and tire noise as well as the intermittent sounds of back-up alarms and releases of compressed air associated with truck air-brakes. However, trash/recycling truck operations would be short-term and irregular and are considered part of standard operations in the area (i.e. existing trash/recycling collection activities at adjacent uses). Therefore, trash/recycling pickups would not introduce a new intrusive noise source compared to existing conditions. As such, a less than significant impact would occur in this regard.

Mechanical Equipment Noise

HVAC units would be installed as part of the proposed project. HVAC systems can result in noise levels of approximately 52 dBA L_{eq} at 50 feet from the source.² At the time of this analysis, the exact location of future HVAC units on-site is unknown. However, the closest potential location of HVAC units on the site to the nearest sensitive receptor (i.e. residents to the east) would be approximately 80 feet. At this distance, HVAC noise levels would be approximately 48 dBA. Additionally, a six-foot stone wall would be constructed between the nearest HVAC unit and the closest sensitive receptor. This six-foot wall would break the line of sight between the HVAC unit and the sensitive receptor and would attenuate the HVAC noise levels by approximately 8 dBA.³ Thus, noise levels produced by the nearest HVAC unit would be closer to 40 dBA. As such, HVAC noise levels would not exceed City Code Section 8.06.070 exterior noise standards of 60 dBA (daytime) and 50 dBA (nighttime). Impacts would be less than significant in this regard.

Parking Lot Noise

The project proposes residential parking spaces with a minimum of two enclosed garage spaces per unit for a total of approximately 414 spaces. There would also be two additional driveway parking spaces per unit. In total, the site would provide approximately 828 parking spaces.

Traffic associated with residential parking areas is typically not of sufficient volume to exceed community noise standards, which are based on a time-averaged scale such as the day-night average sound level (DNL) (or L_{dn}) scale. However, the instantaneous maximum sound levels generated by a car door slamming, engine starting up, and car pass-bys may be an annoyance to adjacent noise-sensitive receptors. Estimates of the maximum noise levels associated with some parking activities are presented in Table 10, *Maximum Noise Levels Generated by Parking Lots*.

² Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over* 1700 Measurement Values, July 6, 2010.

³ Federal Highway Administration, Roadway Construction Noise Model User's Guide, January 2016.

Table 10
Maximum Noise Levels Generated by Parking Lots

Noise Source	Maximum Noise Levels at 50 Feet from Source				
Car door slamming	61 dBA L _{eq}				
Car starting	60 dBA L _{eq}				
Car idling	53 dBA L _{eq}				
Notes: dBA = A-weighted Decibels; Leq = Equivalent Sound Level Source: Kariel, H. G., <i>Noise in Rural Recreational Environments</i> , Canadian Acoustics 19(5), 3-10, 1991.					

As shown in <u>Table 10</u>, parking noise levels range between 53 dBA and 61 dBA at a distance of 50 feet. The 414 outdoor driveway parking spaces would be spread throughout the site. The property line of the nearest sensitive receptors (residences to the east) is located approximately 100 feet west of the closest driveway parking spaces. At this distance, parking noise levels would range between 47 dBA and 55 dBA. Based on City Code Section 8.06.070, exterior noise which exceeds 70 dBA (daytime) or 60 dBA (nighttime) for a cumulative period of more than five minutes in any hour would exceed the City's noise standard. As parking noise is temporary and short in duration, it is not anticipated that parking lot activities depicted in <u>Table 10</u> would exceed five minutes in duration. Therefore, parking lot noise would not exceed the City's 70 dBA (daytime) and 60 dBA (nighttime) noise standard for stationary sources. A less than significant impact would occur this regard.

Noise Reduction Measures:

- NOI-1 Prior to Grading Permit issuance, the project Applicant shall demonstrate, to the satisfaction of the City of Redlands Land Use Services Department Planning Division, that the project complies with the following:
 - Construction contracts specify that all construction equipment, fixed or mobile, shall be
 equipped with properly operating and maintained mufflers and other state required noise
 attenuation devices.
 - Property owners and occupants located within 200 feet of the project boundary shall be sent a notice, at least 15 days prior to commencement of construction of each phase, regarding the construction schedule of the proposed project. A sign, legible at a distance of 50 feet, shall also be posted at the project construction site. All notices and signs shall be reviewed and approved by the City of Redlands Community Development Director (or designee), prior to mailing or posting and shall indicate the dates and duration of construction activities, as well as provide a contact name and a telephone number where residents can inquire about the construction process and register complaints.
 - The Contractor shall provide evidence that a construction staff member will be designated as
 a Noise Disturbance Coordinator and will be present on-site during construction activities.
 The Noise Disturbance Coordinator shall be responsible for responding to any local complaints
 about construction noise. When a complaint is received, the Noise Disturbance Coordinator

shall notify the City within 24 hours of the complaint, determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.), and implement reasonable measures to resolve the complaint, as deemed acceptable by the City of Redlands Community Development Director (or designee). All notices that are sent to residential units immediately surrounding the construction site and all signs posted at the construction site shall include the contact name and the telephone number of the Noise Disturbance Coordinator.

- Construction haul routes shall be designed to avoid noise sensitive uses (e.g., residences, convalescent homes, etc.), to the extent feasible.
- During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receivers.
- Construction activities shall only take place during the allowable hours specified by the City Code of City of Redlands Section 8.06.120 (from 7:00 a.m. to 6:00 p.m. on weekdays, with no construction activities permitted on Sundays or Federal holidays).

Mitigation Measures: No mitigation required.

NOI-2 Would the project result in the exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Less Than Significant Impact. Project construction can generate varying degrees of groundborne vibration, depending on the construction procedure and construction equipment. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings located in the vicinity of the construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, to slight damage at the highest levels. Groundborne vibrations from construction activities rarely reach levels that damage structures.

Construction vibration impacts include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience any cosmetic damage (e.g., plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. For example, buildings that are constructed with typical timber frames and masonry show that a vibration level of up to 0.2 inch-per-second PPV is considered safe and would not result in any construction vibration damage.⁴ This evaluation uses the Federal Transit Administration (FTA) architectural damage criterion for continuous vibrations at non-engineered timber and masonry buildings of 0.2 inch-per-second peak particle velocity (PPV) and human annoyance criterion of 0.1 inch-per-second PPV in accordance with California Department of Transportation guidance.⁵ The

⁴ Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

⁵ California Department of Transportation, *Transportation and Construction Vibration Guidance Manual, Table 20*, September 2013.

FTA has published standard vibration velocities for construction equipment operations. Typical vibration produced by construction equipment is detailed in <u>Table 11</u>, <u>Typical Vibration Levels for Construction</u> Equipment.

Groundborne vibration decreases rapidly with distance. The nearest structure is located approximately 110 feet east of the of the proposed construction area (eastern portion of the site). As indicated in <u>Table 11</u>, vibration velocities from typical heavy construction equipment used during project construction would range from 0.0003 (a small bulldozer) to 0.0228 (vibratory roller) inch-per-second PPV at 110 feet from the source of activity, which would not exceed the FTA's 0.2 inch-per-second PPV threshold. Further, construction vibration would not cause excessive human annoyance as the highest groundborne vibration nearest sensitive receptors (i.e., 0.0228 inch-per-second PPV) would not exceed the 0.1 inch-per-second PPV human annoyance criteria. Therefore, proposed construction activities associated with the project would not expose sensitive receptors to excessive groundborne vibration levels. Vibration impacts associated with construction would be less than significant and no mitigation measures are required.

Table 11
Typical Vibration Levels for Construction Equipment

Equipment	Approximate peak particle velocity at 25 feet (inches/second) ¹	Approximate peak particle velocity at 110 feet (inches/second) ¹
Large bulldozer	0.0890	0.0096
Loaded trucks	0.0760	0.0082
Small bulldozer	0.0030	0.0003
Vibratory roller	0.2100	0.0228

Notes:

1. Calculated using the following formula:

PPV $_{equip}$ = PPV $_{ref}$ x (25/D)^{1.5}

where: PPV (equip) = the peak particle velocity in in/sec of the equipment adjusted for the distance

PPV (ref) = the reference vibration level in in/sec from Table 7-4 of the FTA *Transit*Noise and Vibration Impact Assessment Manual

D = the distance from the equipment to the receiver

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

Mitigation Measures: No mitigation measures are required.

NOI-3 For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The closest airport is the Redlands Municipal Airport, located approximately 2.5 miles to the northeast of the site. The site is not within the Redlands Municipal Airport influence area where aircraft

the area to excessive noise levels. No impacts would occur in this regard. **Mitigation Measures:** No mitigation is required. ⁶ City of Redlands, Redlands Municipal Airport Land Use Compatibility Plan, Figure 2A (Aircraft Noise Concerns), Revised May 6, 2003.

noise levels are a concern.⁶ Thus, the proposed project would not expose people residing or working in

REFERENCES

Documents

- 1. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.
- 2. City of Redlands, City of Redlands General Plan 2035, December 2017.
- 3. City of Redlands, *Redlands Municipal Airport Land Use Compatibility Plan*, Figure 2A (Aircraft Noise Concerns), Revised May 6, 2003.
- 4. City of Redlands, City Code of the City of Redlands, July 2, 2019.
- 5. Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.
- 6. Federal Highway Administration, *Roadway Construction Noise Model User's Guide*, January 2006.
- 7. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.
- 8. Urban Crossroads, Pioneer & Texas Residential Traffic Impact Analysis, April 6, 2019.
- 9. Harris, Cyril, Handbook of Noise Control, 1979.
- 10. Kariel, H. G., *Noise in Rural Recreational Environments*, Canadian Acoustics 19(5), March 10, 1991.
- 11. National Institute on Deafness and Other Communication Disorders, *Noise-Induced Hearing Loss*, https://www.nidcd.nih.gov/sites/default/files/Documents/health/hearing/NoiseInducedHearingLoss.pdf, accessed August 12, 2019.
- 12. State Office of Planning and Research, *State of California General Plan Guidelines*, October 2017.
- 13. U.S. Department of Transportation, *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm, accessed August 20, 2019.
- 14. U.S. Environmental Protection Agency, *Noise Effects Handbook A Desk Reference to Health and Welfare Effects of Noise*, October 1979 (revised July 1981).

Websites / Programs

Federal Highway Administration, *Roadway Construction Noise Model (FHWA-HEP-05-054)*, January 2006.
Federal Highway Administration, *Highway Traffic Nosie Prediction Model (RD-77-108)*, 1978.
Google Earth, 2019.

Appendix ANoise Data

Site Number: Redlands Site #1 Recorded By: Pierre Glaize & Clara Eddy **Job Number:** 173796 **Date:** 07/09/2019 **Time:** 11:06 a.m. Location: Across from Citrus Valley High School. Source of Peak Noise: Traffic on West Pioneer Avenue. Noise Data Leq (dB) Lmin (dB) Lmax (dB) Peak (dB) 65.7 45.6 85.1 101.2

	Equipment								
Category	Type	Vendor		Model	Serial No.	Cert. Date	Note		
	Sound Level Meter	Brüel & Kj	ær	2250	3011133	04/08/2019			
Cound	Microphone	Brüel & Kj	ær	4189	3086765	04/08/2019			
Sound	Preamp	Brüel & Kj	ær	ZC 0032	25380	04/08/2019			
	Calibrator	Brüel & Kj	ær	4231	2545667	04/08/2019			
	Weather Data								
	Duration: 10 min	utes			Sky: Sunny				
	Note: dBA Offset	= 0.00			Sensor Height (ft): 5 ft				
Est.	Wind Ave Speed	Wind Ave Speed (mph / m/s) T			rees Fahrenheit)	Barometer Pressure (inches)			
	5 mpl	5 mph				29.97			

Photo of Measurement Location





2250

Instrument:	2250
Application:	BZ7225 Version 4.7.4
Start Time:	07/09/2019 11:06:29
End Time:	07/09/2019 11:16:29
Elapsed Time:	00:10:00
Bandwidth:	1/3-octave
Max Input Level:	142.09

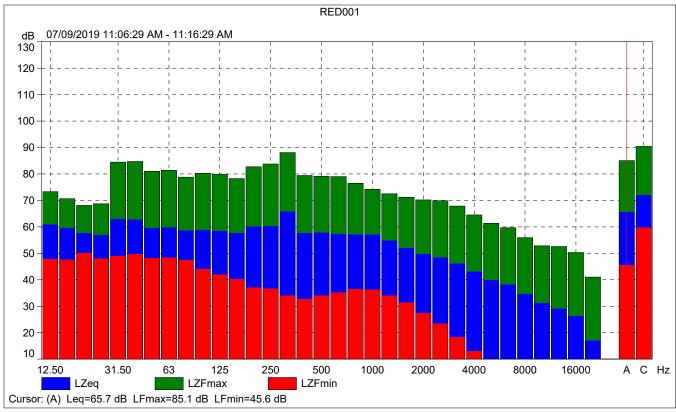
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		С
Spectrum:	FS	Z

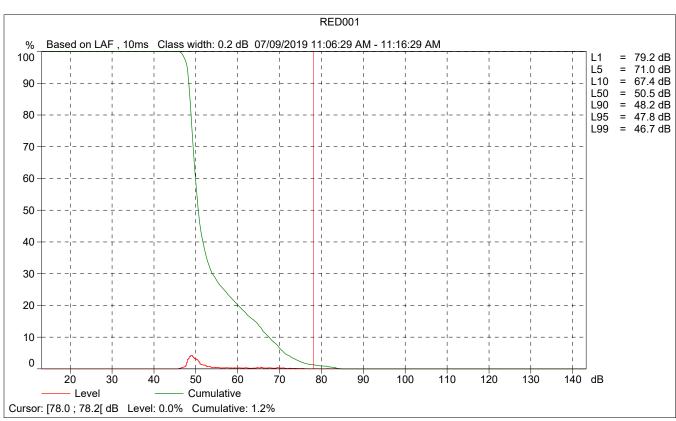
Instrument Serial Number:	3011133
Microphone Serial Number:	3086765
Input:	Top Socket
Windscreen Correction:	UA-1650
Sound Field Correction:	Free-field

Calibration Time:	07/09/2019 07	:16:01
Calibration Type:	External refe	erence
Sensitivity:	43.7627919018269	nV/Pa

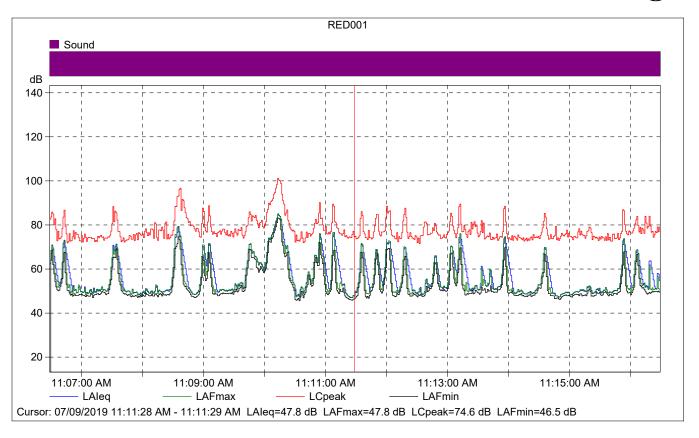
	Start	End	Elapsed	Overload	LAeq	LAFmax	LAFmin
	time	time	time	[%]	[dB]	[dB]	[dB]
Value				0.00	65.7	85.1	45.6
Time	11:06:29 AM	11:16:29 AM	0:10:00				
Date	07/09/2019	07/09/2019					





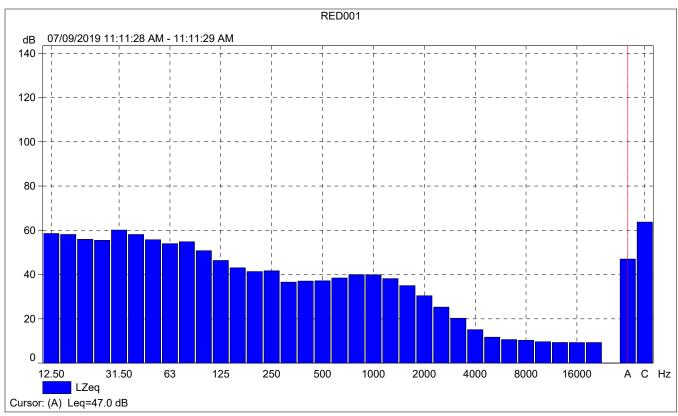


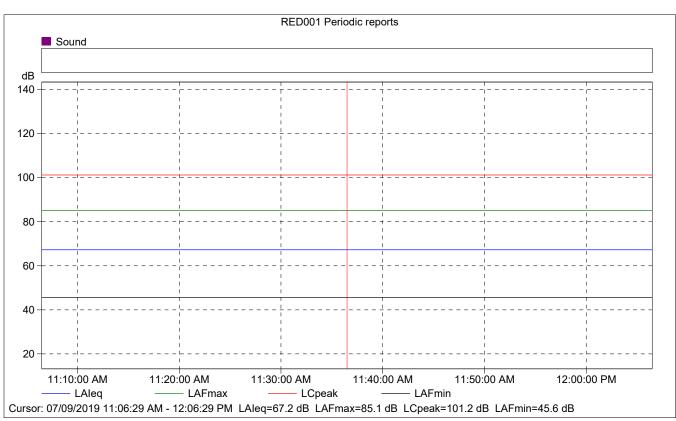




	Start	Elapsed	LAleq	LAFmax	LAFmin
	time	time	[dB]	[dB]	[dB]
Value			47.8	47.8	46.5
Time	11:11:28 AM	0:00:01			
Date	07/09/2019				



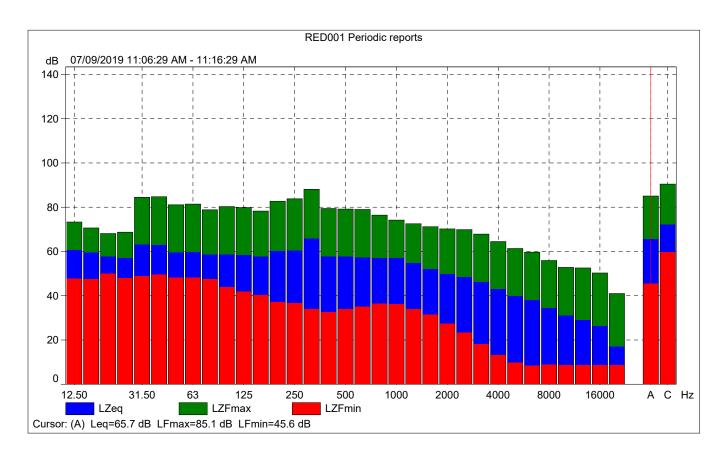




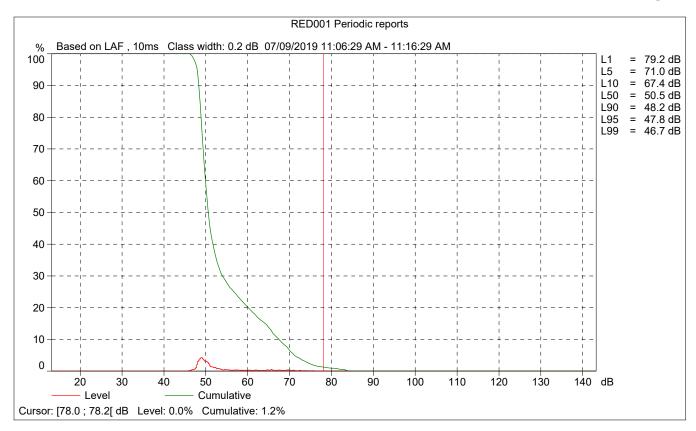


RED001 Periodic reports

	Start	Elapsed	Overload	LAleq	LAFmax	LAFmin
	time	time	[%]	[dB]	[dB]	[dB]
Value			0.00	67.2	85.1	45.6
Time	11:06:29 AM	0:10:00				
Date	07/09/2019					







Site Number: Redlands Site #2 Recorded By: Pierre Glaize & Clara Eddy **Job Number:** 173796 **Date**: 07/09/2019 **Time:** 11:21 a.m. Location: Corner of Baldwin Avenue and Texas Street. Source of Peak Noise: Traffic on Baldwin Avenue Noise Data Leq (dB) Peak (dB) Lmin (dB) Lmax (dB) 60.8 43.0 77.0 94.2

Equipment							
Category	Type	Vendor	· Model	Serial No.	Cert. Date	Note	
	Sound Level Meter	Brüel & Kj	jær 2250	3011133	04/08/2019		
Sound	Microphone	Brüel & Kj	jær 4189	3086765	04/08/2019		
Souria	Preamp	Brüel & Kj	jær ZC 0032	25380	04/08/2019		
	Calibrator	Brüel & Kj	jær 4231	2545667	04/08/2019		
			Weather Data				
	Duration: 10 minutes			Sky: Sunny			
	Note: dBA Offset = 0.00			Sensor Height (ft): 5 ft			
Est.	Wind Ave Speed (mph / m/s)		Temperature (de	Temperature (degrees Fahrenheit)		Barometer Pressure (inches)	
7 mph		า	78°		29.97		





2250

Instrument:	2250
Application:	BZ7225 Version 4.7.4
Start Time:	07/09/2019 11:21:17
End Time:	07/09/2019 11:31:17
Elapsed Time:	00:10:00
Bandwidth:	1/3-octave
Max Input Level:	142.09

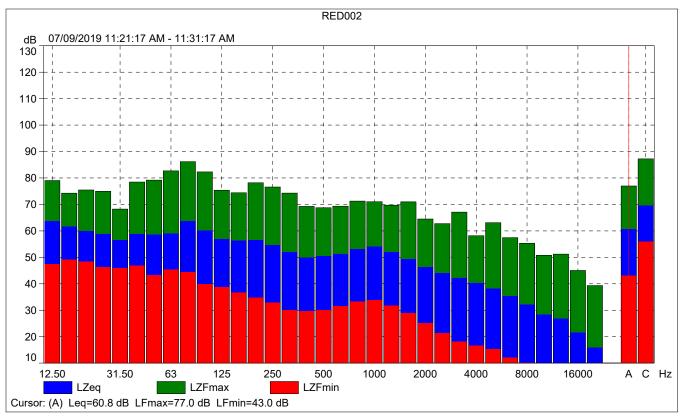
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		С
Spectrum:	FS	Z

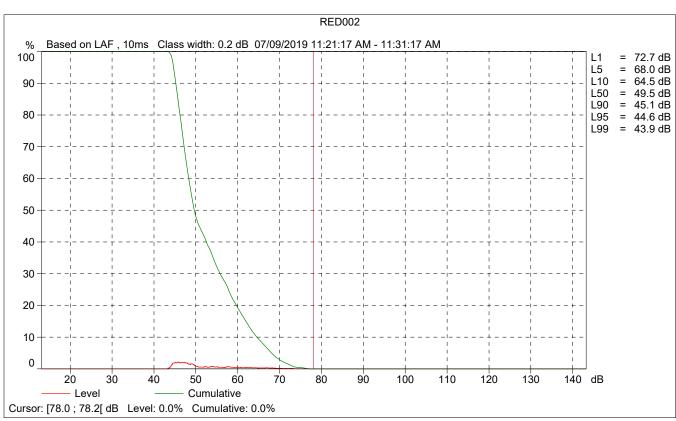
Instrument Serial Number:	3011133
Microphone Serial Number:	3086765
Input:	Top Socket
Windscreen Correction:	UA-1650
Sound Field Correction:	Free-field

Calibration Time:	07/09/2019 07:16:01
Calibration Type:	External reference
Sensitivity:	43.7627919018269 mV/Pa

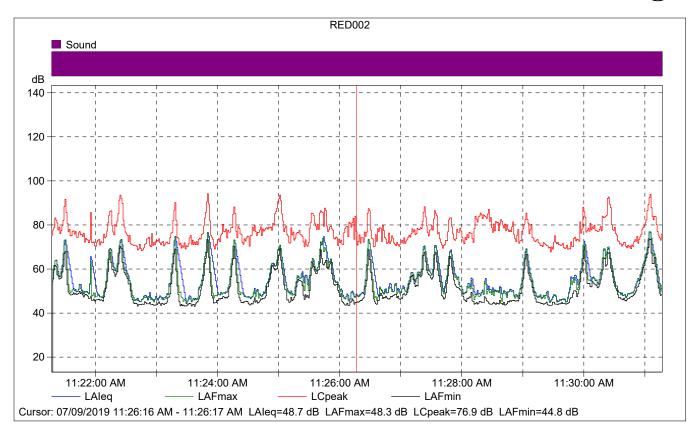
	Start	End	Elapsed	Overload	LAeq	LAFmax	LAFmin
	time	time	time	[%]	[dB]	[dB]	[dB]
Value				0.00	60.8	77.0	43.0
Time	11:21:17 AM	11:31:17 AM	0:10:00				
Date	07/09/2019	07/09/2019					





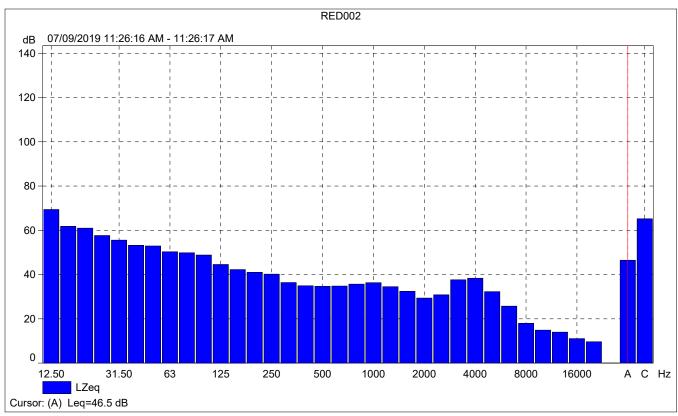


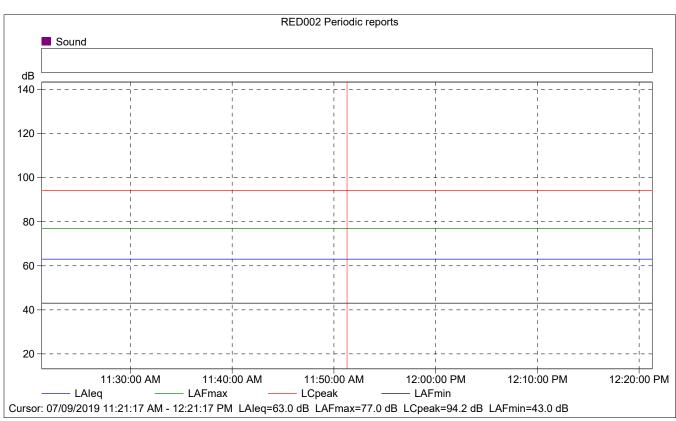




	Start	Elapsed	LAleq	LAFmax	LAFmin
	time	time	[dB]	[dB]	[dB]
Value			48.7	48.3	44.8
Time	11:26:16 AM	0:00:01			
Date	07/09/2019				



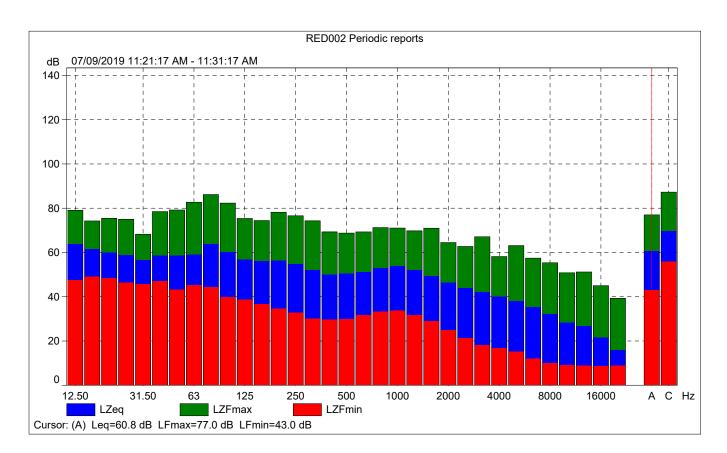




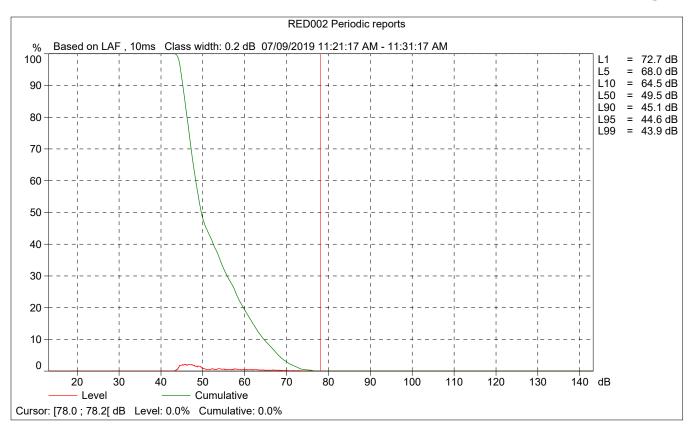


RED002 Periodic reports

	Start	Elapsed	Overload	LAleq	LAFmax	LAFmin
	time	time	[%]	[dB]	[dB]	[dB]
Value			0.00	63.0	77.0	43.0
Time	11:21:17 AM	0:10:00				
Date	07/09/2019					







Site Number: Redlands Site #3

Recorded By: Pierre Glaize & Clara Eddy

Job Number: 173796

Date: 07/09/2019

Time: 11:38 a.m.

Location: End of Vermont Street, perpendicular to San Bernardino Avenue.

Source of Peak Noise: Traffic on San Bernardino Avenue.

Noise Data				
Leq (dB)	Lmin (dB)	Lmax (dB)	Peak (dB)	
60.4	44.6	72.2	101.9	

	Equipment						
Category	Type	Vendor		Model	Serial No.	Cert. Date	Note
	Sound Level Meter	Brüel & Kj	ær	2250	3011133	04/08/2019	
Sound	Microphone	Brüel & Kj	ær	4189	3086765	04/08/2019	
Souria	Preamp	Brüel & Kj	ær	ZC 0032	25380	04/08/2019	
	Calibrator	Brüel & Kj	ær	4231	2545667	04/08/2019	
			W	leather Data			
	Duration: 10 minutes			Sky: Sunny			
	Note: dBA Offset =			Sensor Height (ft): 5 ft			
Est.	Est. Wind Ave Speed (mph / m/s)		Tem	Temperature (degrees Fahrenheit)		Barometer Pressure (inches)	
	7 mpł	7 mph			78°		





2250

Instrument:	2250
Application:	BZ7225 Version 4.7.4
Start Time:	07/09/2019 11:38:05
End Time:	07/09/2019 11:48:05
Elapsed Time:	00:10:00
Bandwidth:	1/3-octave
Max Input Level:	142.09

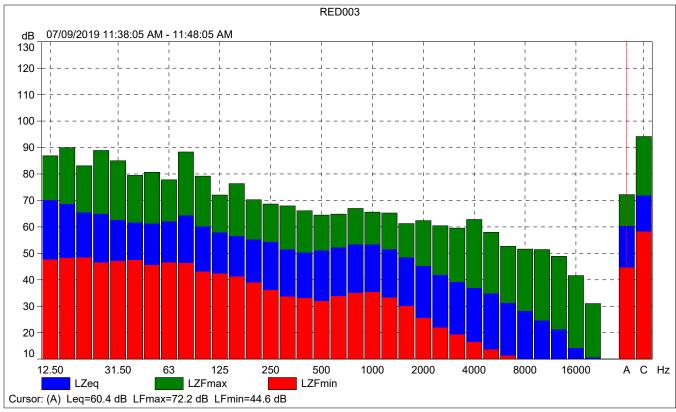
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		С
Spectrum:	FS	Ζ

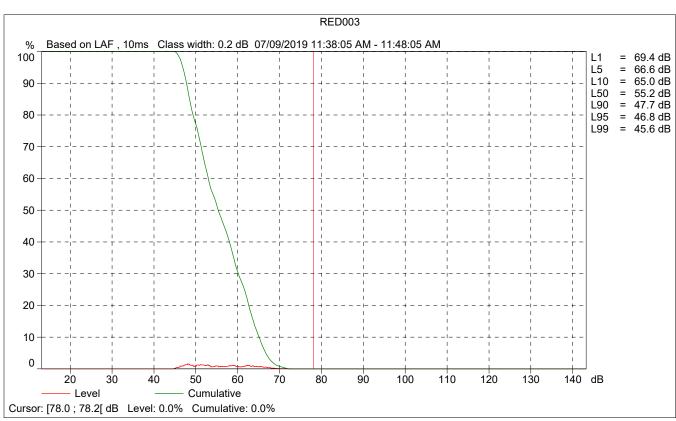
Instrument Serial Number:	3011133
Microphone Serial Number:	3086765
Input:	Top Socket
Windscreen Correction:	UA-1650
Sound Field Correction:	Free-field

Calibration Time:	07/09/2019 07:10	3:01
Calibration Type:	External refere	nce
Sensitivity:	43.7627919018269 m\	//Pa

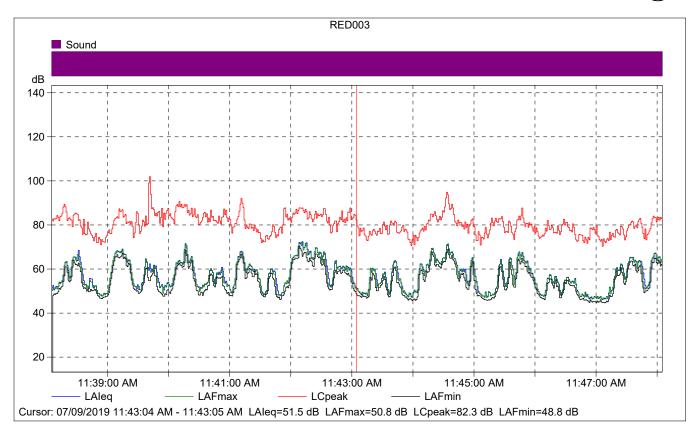
	Start	End	Elapsed	Overload	LAeq	LAFmax	LAFmin
	time	time	time	[%]	[dB]	[dB]	[dB]
Value				0.00	60.4	72.2	44.6
Time	11:38:05 AM	11:48:05 AM	0:10:00				
Date	07/09/2019	07/09/2019					





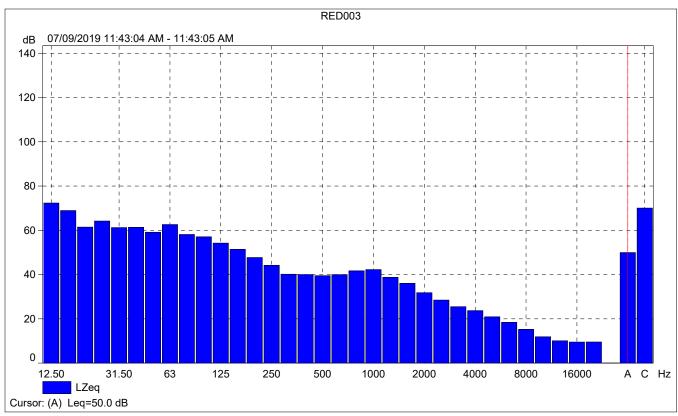


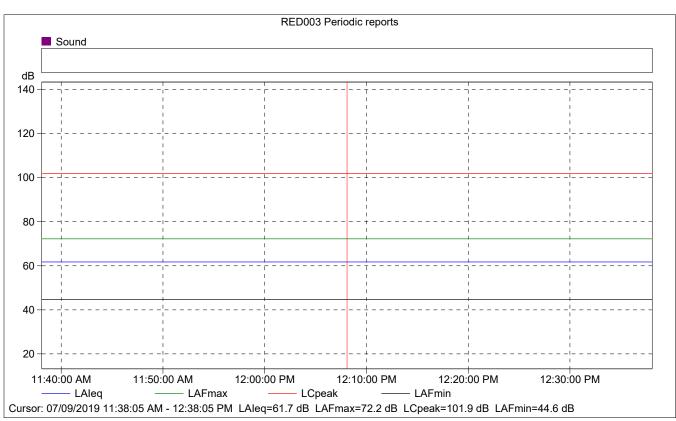




	Start	Elapsed	LAleq	LAFmax	LAFmin
	time	time	[dB]	[dB]	[dB]
Value			51.5	50.8	48.8
Time	11:43:04 AM	0:00:01			
Date	07/09/2019				



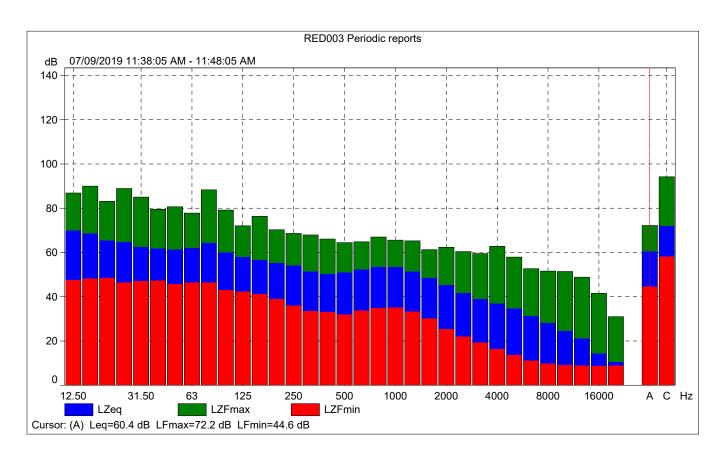




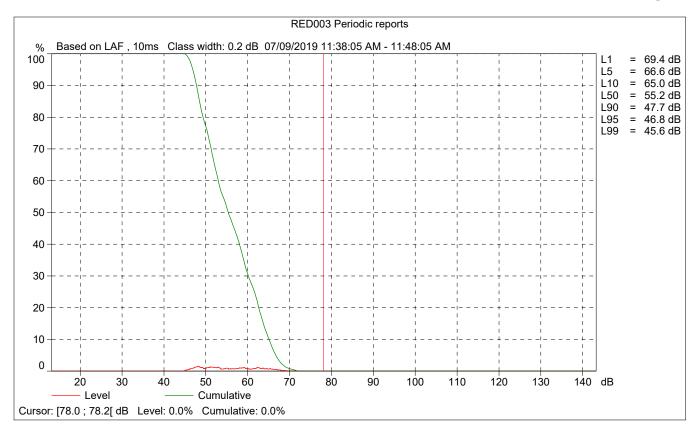


RED003 Periodic reports

	Start	Elapsed	Overload	LAleq	LAFmax	LAFmin
	time	time	[%]	[dB]	[dB]	[dB]
Value			0.00	61.7	72.2	44.6
Time	11:38:05 AM	0:10:00				
Date	07/09/2019					







TRAFFIC NOISE LEVELS AND NOISE CONTOURS

Project Number: 173796

Project Name: Readlands Griffin Homes

Scenario: Existing

Background Information

Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels.

Source of Traffic Volumes: Ganddini (2018)

Community Noise Descriptor: L_{dn}: CNEL: x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.50%	12.90%	9.60%
Medium-Duty Trucks	84.80%	4.90%	10.30%
Heavy-Duty Trucks	86.50%	2.70%	10.80%

			Design		Vehic	Vehicle Mix Distance from Centerline of Roadway				/ay	y		
Analysis Condition		Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at		Distance t	to Contour		Calc
Roadway, Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL	Dist
Ctirus Plaza Drive													
South of San Bernardino Avenue	4	12	14,300	45	0.5	1.8%	0.7%	63.1	-	75	161	347	100
San Bernardino Avenue													
West of Citrus Plaza Drive	5	16	17,300	50	0.5	1.8%	0.7%	65.2	-	103	222	478	100
Citrus Plaza Drive to Tennessee Street	3	0	25,000	45	0.5	1.8%	0.7%	65.4	49	106	229	492	100
South Tennessee Street to North Tennessee Street	2	0	19,400	45	0.5	1.8%	0.7%	64.2	41	89	192	414	100
Tennessee Street to Dwy.1	2	0	16,600	45	0.5	1.8%	0.7%	63.6	37	80	173	373	100
Dwy. 1 to Texas Street	2	0	17,100	45	0.5	1.8%	0.7%	63.7	38	82	176	380	100
East of Texas Street	2	0	14,900	45	0.5	1.8%	0.7%	63.1	35	75	161	347	100
Tennessee Street													
South of San Bernardino Avenue	2	0	10,000	35	0.5	1.8%	0.7%	58.9	-	39	84	181	100
North of San Bernardino Avenue	2	0	3,000	35	0.5	1.8%	0.7%	53.6	-	-	38	81	100
Pioneer Avenue													
West of Texas Street	2	0	8,200	35	0.5	1.8%	0.7%	58.0	-	34	74	158	100
East of Texas Street	2	0	8,000	35	0.5	1.8%	0.7%	57.9	-	34	72	156	100
Texas Street													
North of Pioneer Avenue	2	12	4,100	35	0.5	1.8%	0.7%	55.0	-	-	47	100	100
Pioneer Avenue to Dwy. 2	2	0	4,200	35	0.5	1.8%	0.7%	55.1	-	-	47	101	100
Dwy. 2 to San Bernardino Avenue	2	0	4,100	35	0.5	1.8%	0.7%	55.0	-	-	46	100	100
San Bernardino Avenue to West Pennsylvania Avenu	2	0	7,000	45	0.5	1.8%	0.7%	59.8	_	45	97	210	100
West Pennsylvania Avenue to Lugonia Avenue	2	0	7,300	45	0.5	1.8%	0.7%	60.0	_	46	100	216	100
South of Lugonia Avenue	2	0	9,400	45	0.5	1.8%	0.7%	61.1	_	55	118	255	100
Lugonia Avenue			,										
West of Texas Street	2	0	9,300	35	0.5	1.8%	0.7%	58.5	_	37	80	172	100
East of Texas Street	4	0	10,600	45	0.5	1.8%	0.7%	61.7	_	60	130	281	100
Interstate 210	•	· ·	10,000	.0	0.0	1.070	0 /0	01		00	.00	20.	.00
I-210 northbound on-ramp	1	0	16,400	45	0.5	1.8%	0.7%	63.5	37	80	171	369	100
I-210 southbound off-ramp	1	0	13,100	45	0.5	1.8%	0.7%	62.5	32	68	147	318	100
1-2 to southbound on-rainp	1	U	13,100	40	0.5	1.0 /0	0.7 /0	02.0	JZ	00	147	310	100

¹ Distance is from the centerline of the roadway segment to the receptor location.

Michael Baker International Page 1

[&]quot;-" = contour is located within the roadway right-of-way.

Project Number: 173796

Project Name: Readlands Griffin Homes **Scenario:** Existing plus Project

Background Information

Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels.

Source of Traffic Volumes: Ganddini (2018)

Community Noise Descriptor: L_{dn}: CNEL: x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.50%	12.90%	9.60%
Medium-Duty Trucks	84.80%	4.90%	10.30%
Heavy-Duty Trucks	86.50%	2.70%	10.80%

				Design		Vehic	le Mix	Di	stance fron	n Centerlin	e of Roadw	<i>ı</i> ay	
Analysis Condition		Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at		Distance	to Contour		Calc
Roadway, Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL	Dist
Ctirus Plaza Drive													
South of San Bernardino Avenue	4	12	14,400	45	0.5	1.8%	0.7%	63.1	-	75	162	349	100
San Bernardino Avenue													
West of Citrus Plaza Drive	5	16	17,400	50	0.5	1.8%	0.7%	65.2	-	103	223	480	100
Citrus Plaza Drive to Tennessee Street	3	0	24,600	45	0.5	1.8%	0.7%	65.3	49	105	226	487	100
South Tennesse Street to North Tennessee Street	2	0	20,500	45	0.5	1.8%	0.7%	64.5	43	92	199	429	100
Tennessee Street to Dwy.1	2	0	17,700	45	0.5	1.8%	0.7%	63.9	39	84	181	389	100
Dwy. 1 to Texas Strreet	2	0	17,500	45	0.5	1.8%	0.7%	63.8	39	83	179	386	100
East of Texas Street	2	0	15,200	45	0.5	1.8%	0.7%	63.2	35	76	163	352	100
Tennessee Street													
South of San Bernardino Avenue	2	0	10,000	35	0.5	1.8%	0.7%	58.9	-	39	84	181	100
North of San Bernardino Avenue	2	0	30,000	35	0.5	1.8%	0.7%	63.6	38	81	175	376	100
Pioneer Avenue													
West of Texas Street	2	0	8,200	35	0.5	1.8%	0.7%	58.0	-	34	74	158	100
East of Texas Street	2	0	8,100	35	0.5	1.8%	0.7%	57.9	-	34	73	157	100
Texas Street													
North of Pioneer Avenue	2	12	4,100	35	0.5	1.8%	0.7%	55.0	-	-	47	100	100
Pioneer Avenue to Dwy. 2	2	0	4,300	35	0.5	1.8%	0.7%	55.2	-	-	48	103	100
Dwy. 2 to San Bernardino Avenue	2	0	5,000	35	0.5	1.8%	0.7%	55.8	-	-	53	114	100
San Bernardino Avenue to West Pennsylvania Avenu	2	0	7,500	45	0.5	1.8%	0.7%	60.1	-	47	102	219	100
West Pennsylvania Avenue to Lugonia Avenue	2	0	7,800	45	0.5	1.8%	0.7%	60.3	-	49	105	225	100
South of Lugonia Avenue	2	0	9,600	45	0.5	1.8%	0.7%	61.2	-	56	120	259	100
Lugonia Avenue													
West of Texas Street	2	0	9,500	35	0.5	1.8%	0.7%	58.6	-	38	81	175	100
East of Texas Street	4	0	10,700	45	0.5	1.8%	0.7%	61.8	-	61	131	282	100
Interstate 210			,										
I-210 northbound on-ramp	1	0	16,800	45	0.5	1.8%	0.7%	63.6	38	81	174	375	100
I-210 southbound off-ramp	1	0	13,500	45	0.5	1.8%	0.7%	62.7	32	70	150	324	100
	•	•	,	. •			JJ	~- ··	~-	. •		~— ·	

¹ Distance is from the centerline of the roadway segment to the receptor location.

[&]quot;-" = contour is located within the roadway right-of-way.

Project Number: 173796

Project Name: Readlands Griffin Homes

Scenario: Opening Year Cumulative (2024) Without Project

Background Information

Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels.

Source of Traffic Volumes: Ganddini (2018)

Community Noise Descriptor: L_{dn}: CNEL: x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.50%	12.90%	9.60%
Medium-Duty Trucks	84.80%	4.90%	10.30%
Heavy-Duty Trucks	86.50%	2.70%	10.80%

				Design		Vehic	le Mix	Di	stance fror	n Centerlin	e of Roadw	⁄ay	
Analysis Condition		Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at		Distance	to Contour		Calc
Roadway, Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL	Dist
Ctirus Plaza Drive													•
South of San Bernardino Avenue	4	12	16,300	45	0.5	1.8%	0.7%	63.7	-	82	176	379	100
San Bernardino Avenue													
West of Citrus Plaza Drive	5	16	24,600	50	0.5	1.8%	0.7%	66.7	60	130	281	605	100
Citrus Plaza Drive to Tennessee Street	3	0	35,200	45	0.5	1.8%	0.7%	66.9	62	133	287	619	100
South Tennesse Street to North Tennessee Street	2	0	30,200	45	0.5	1.8%	0.7%	66.2	56	120	258	556	100
Tennessee Street to Dwy.1	2	0	22,300	45	0.5	1.8%	0.7%	64.9	45	98	211	454	100
Dwy. 1 to Texas Strreet	2	0	23,300	45	0.5	1.8%	0.7%	65.0	47	101	217	467	100
East of Texas Street	2	0	18,800	45	0.5	1.8%	0.7%	64.1	41	87	188	405	100
Tennessee Street													
South of San Bernardino Avenue (I-210)	2	0	16,100	35	0.5	1.8%	0.7%	60.9	-	54	115	248	100
North of San Bernardino Avenue	2	0	3,500	35	0.5	1.8%	0.7%	54.3	-	-	42	90	100
South of San Bernardino Avenue	2	0	7,300	35	0.5	1.8%	0.7%	57.4	-	-	68	147	101
Pioneer Avenue													
West of Texas Street	2	0	9,400	35	0.5	1.8%	0.7%	58.6	-	37	81	173	100
East of Texas Street	2	0	9,400	35	0.5	1.8%	0.7%	58.6	-	37	81	173	100
Texas Street													
North of Pioneer Avenue	2	12	6,800	35	0.5	1.8%	0.7%	57.2	_	-	65	141	100
Pioneer Avenue to Dwy. 2	2	0	7,100	35	0.5	1.8%	0.7%	57.4	_	_	67	144	100
Dwy. 2 to San Bernardino Avenue	2	0	7,000	35	0.5	1.8%	0.7%	57.3	_	_	66	143	100
San Bernardino Avenue to West Pennsylvania Avenu	2	0	8,900	45	0.5	1.8%	0.7%	60.9	_	53	114	246	100
West Pennsylvania Avenue to Lugonia Avenue	2	0	9,300	45	0.5	1.8%	0.7%	61.1	_	55	118	253	100
South of Lugonia Avenue	2	0	12,000	45	0.5	1.8%	0.7%	62.2	_	65	139	300	100
Lugonia Avenue	_	Ū	.2,000	.0	0.0	1.070	0.1 70	02.2		00	100	000	.00
West of Texas Street	2	0	12,900	35	0.5	1.8%	0.7%	60.0	_	46	99	214	100
East of Texas Street	4	0	13,300	45	0.5	1.8%	0.7%	62.7	- -	70	151	326	100
Interstate 210	4	U	13,300	43	0.5	1.070	0.7 70	02.7	-	70	131	320	100
	4	0	24 600	<i>1</i> E	0.5	1 00/	0.70/	GE 2	40	104	225	101	100
I-210 northbound on-ramp	1	0	24,600	45 45	0.5	1.8%	0.7%	65.3	48	104	225	484	100
I-210 southbound off-ramp	1	0	19,800	45	0.5	1.8%	0.7%	64.3	42	90	194	419	100

¹ Distance is from the centerline of the roadway segment to the receptor location.

[&]quot;-" = contour is located within the roadway right-of-way.

Project Number: 173796

Project Name: Readlands Griffin Homes

Scenario: One Year Cumulative (2024) With Project

Background Information

Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels.

Source of Traffic Volumes: Ganddini (2018)

Community Noise Descriptor: L_{dn}: CNEL: x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.50%	12.90%	9.60%
Medium-Duty Trucks	84.80%	4.90%	10.30%
Heavy-Duty Trucks	86.50%	2.70%	10.80%

				Design		Vehic	le Mix	Di	stance fror	n Centerlin	e of Roadw	/ay	
Analysis Condition		Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at		Distance	to Contour		Calc
Roadway, Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL	Dist
Ctirus Plaza Drive													
South of San Bernardino Avenue	4	12	16,400	45	0.5	1.8%	0.7%	63.7	_	82	176	380	100
San Bernardino Avenue													
West of Citrus Plaza Drive	5	16	24,700	50	0.5	1.8%	0.7%	66.7	61	131	282	607	100
Citrus Plaza Drive to Tennessee Street	3	0	35,800	45	0.5	1.8%	0.7%	66.9	63	135	290	626	100
South Tennesse Street to North Tennessee Street	2	0	31,300	45	0.5	1.8%	0.7%	66.3	57	123	264	569	100
Tennessee Street to Dwy.1	2	0	23,400	45	0.5	1.8%	0.7%	65.1	47	101	218	469	100
Dwy. 1 to Texas Strreet	2	0	23,800	45	0.5	1.8%	0.7%	65.1	47	102	220	474	100
East of Texas Street	2	0	23,800	45	0.5	1.8%	0.7%	65.1	47	102	220	474	100
Tennessee Street													
South of San Bernardino Avenue (I-210)	2	0	16,200	35	0.5	1.8%	0.7%	61.0	-	54	116	249	100
North of San Bernardino Avenue	2	0	3,500	35	0.5	1.8%	0.7%	54.3	-	-	42	90	100
South of San Bernardino Avenue	2	0	7,300	35	0.5	1.8%	0.7%	57.4	_	-	68	147	101
Pioneer Avenue			,										
West of Texas Street	2	0	9,400	35	0.5	1.8%	0.7%	58.6	_	37	81	173	100
East of Texas Street	2	0	9,500	35	0.5	1.8%	0.7%	58.6	_	38	81	175	100
Texas Street	_	-	-,										
North of Pioneer Avenue	2	12	6,800	35	0.5	1.8%	0.7%	57.2	-	-	65	141	100
Pioneer Avenue to Dwy. 2	2	0	7,200	35	0.5	1.8%	0.7%	57.4	_	_	67	145	100
Dwy. 2 to San Bernardino Avenue	2	0	8,000	35	0.5	1.8%	0.7%	57.9	_	34	72	156	100
San Bernardino Avenue to West Pennsylvania Avenu	2	0	9,400	45	0.5	1.8%	0.7%	61.1	_	55	118	255	100
West Pennsylvania Avenue to Lugonia Avenue	2	0	9,800	45	0.5	1.8%	0.7%	61.3	_	57	122	262	100
South of Lugonia Avenue	2	0	12,200	45	0.5	1.8%	0.7%	62.2	_	65	141	304	100
Lugonia Avenue	2	O	12,200	40	0.0	1.070	0.7 70	02.2		00	171	JU4	100
West of Texas Street	2	0	13,100	35	0.5	1.8%	0.7%	60.0	_	47	100	216	100
	4		•	35 45				62.7		47 71	152		100
East of Texas Street	4	0	13,400	45	0.5	1.8%	0.7%	02.7	-	<i>1</i> 1	152	328	100
Interstate 210	4	0	05.000	4.5	0.5	4.00/	0.70/	05.0	40	405	007	400	400
I-210 northbound on-ramp	1	0	25,000	45	0.5	1.8%	0.7%	65.3	49	105	227	489	100
I-210 southbound off-ramp	1	0	20,200	45	0.5	1.8%	0.7%	64.4	42	91	197	424	100

¹ Distance is from the centerline of the roadway segment to the receptor location.

[&]quot;-" = contour is located within the roadway right-of-way.

Project Number: 173796

Project Name: Readlands Griffin Homes

Scenario: Horizon Year (2040) Without Project

Background Information

Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels.

Source of Traffic Volumes: Ganddini (2018)

Community Noise Descriptor: L_{dn}: _____ CNEL: ___ x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.50%	12.90%	9.60%
Medium-Duty Trucks	84.80%	4.90%	10.30%
Heavy-Duty Trucks	86.50%	2.70%	10.80%

				Design		Vehic	le Mix	Di	stance fror	n Centerlin	e of Roadw	<i>v</i> ay	
Analysis Condition		Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at		Distance	to Contour		Calc
Roadway, Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL	Dist
Ctirus Plaza Drive													
South of San Bernardino Avenue	4	12	18,000	45	0.5	1.8%	0.7%	64.1	-	87	188	405	100
San Bernardino Avenue													
West of Citrus Plaza Drive	5	16	27,100	50	0.5	1.8%	0.7%	67.1	65	139	299	645	100
Citrus Plaza Drive to Tennessee Street	3	0	38,700	45	0.5	1.8%	0.7%	67.3	66	142	306	659	100
South Tennesse Street to North Tennessee Street	2	0	34,000	45	0.5	1.8%	0.7%	66.7	60	130	279	601	100
Tennessee Street to Dwy.1	2	0	28,100	45	0.5	1.8%	0.7%	65.9	53	114	246	529	100
Dwy. 1 to Texas Strreet	2	0	28,100	45	0.5	1.8%	0.7%	65.9	53	114	246	529	100
East of Texas Street	2	0	19,600	45	0.5	1.8%	0.7%	64.3	42	90	193	416	100
Tennessee Street													
South of San Bernardino Avenue (I-210)	2	0	17,700	35	0.5	1.8%	0.7%	61.3	-	57	123	265	100
North of San Bernardino Avenue	2	0	8,600	35	0.5	1.8%	0.7%	58.2	-	35	76	163	100
South of San Bernardino Avenue	2	0	8,100	35	0.5	1.8%	0.7%	57.9	-	34	73	157	101
Pioneer Avenue													
West of Texas Street	2	0	10,400	35	0.5	1.8%	0.7%	59.0	-	40	86	186	100
East of Texas Street	2	0	10,300	35	0.5	1.8%	0.7%	59.0	-	40	86	184	100
Texas Street													
North of Pioneer Avenue	2	12	7,400	35	0.5	1.8%	0.7%	57.6	-	-	69	149	100
Pioneer Avenue to Dwy. 2	2	0	7,800	35	0.5	1.8%	0.7%	57.8	-	33	71	153	100
Dwy. 2 to San Bernardino Avenue	2	0	7,700	35	0.5	1.8%	0.7%	57.7	-	33	70	152	100
San Bernardino Avenue to West Pennsylvania Avenu	2	0	9,800	45	0.5	1.8%	0.7%	61.3	-	57	122	262	100
West Pennsylvania Avenue to Lugonia Avenue	2	0	10,200	45	0.5	1.8%	0.7%	61.5	-	58	125	269	100
South of Lugonia Avenue	2	0	13,200	45	0.5	1.8%	0.7%	62.6	-	69	149	320	100
Lugonia Avenue													
West of Texas Street	2	0	22,500	35	0.5	1.8%	0.7%	62.4	-	67	144	310	100
East of Texas Street	4	0	22,000	45	0.5	1.8%	0.7%	64.9	46	98	212	456	100
Interstate 210			•										
I-210 northbound on-ramp	1	0	27,000	45	0.5	1.8%	0.7%	65.7	51	111	239	515	100
I-210 southbound off-ramp	1	0	21,800	45	0.5	1.8%	0.7%	64.7	45	96	207	446	100

¹ Distance is from the centerline of the roadway segment to the receptor location.

[&]quot;-" = contour is located within the roadway right-of-way.

Project Number: 173796

Project Name: Readlands Griffin Homes **Scenario:** Horizon Year (2040) With Project

Background Information

Model Description: FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels.

Source of Traffic Volumes: Ganddini (2018

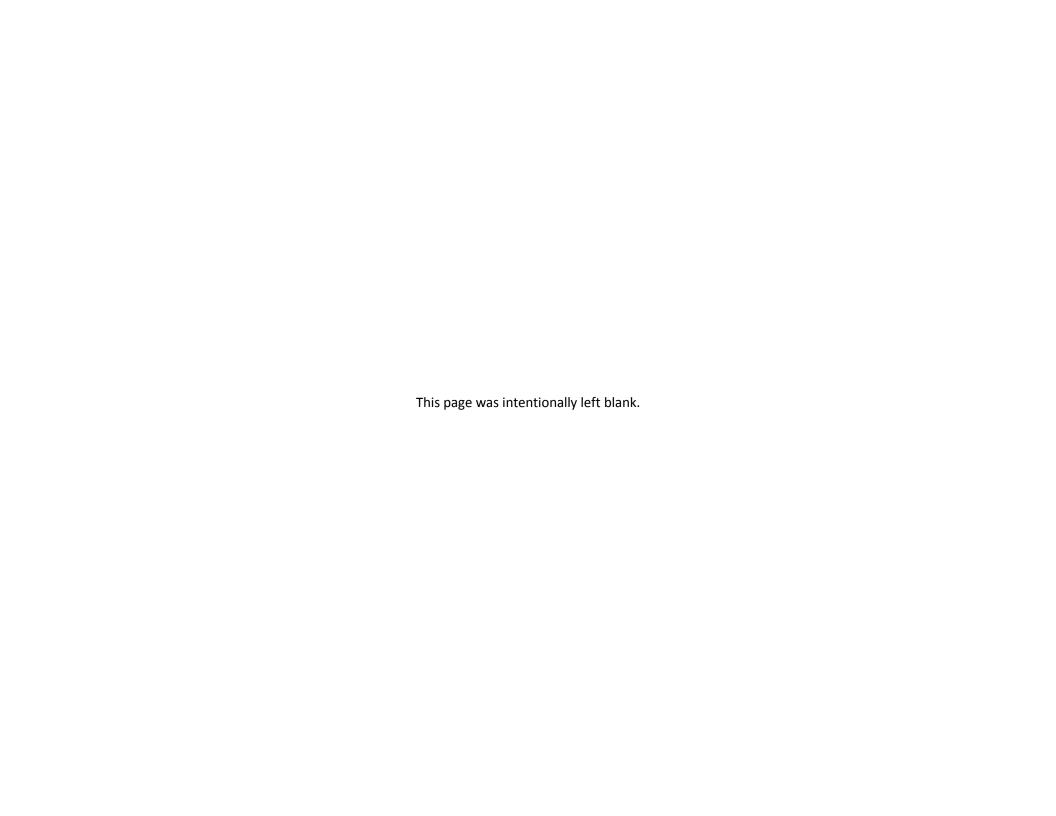
Community Noise Descriptor: L_{dn}: CNEL: x

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.50%	12.90%	9.60%
Medium-Duty Trucks	84.80%	4.90%	10.30%
Heavy-Duty Trucks	86.50%	2.70%	10.80%

				Design		Vehic	le Mix	Di	stance fron	n Centerlin	e of Roadw	ay	
Analysis Condition		Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at		Distance	to Contour		Calc
Roadway, Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL	Dist
Ctirus Plaza Drive													
South of San Bernardino Avenue	4	12	18,100	45	0.5	1.8%	0.7%	64.1	-	87	188	406	100
San Bernardino Avenue													
West of Citrus Plaza Drive	5	16	27,200	50	0.5	1.8%	0.7%	67.2	65	139	300	647	100
Citrus Plaza Drive to Tennessee Street	3	0	39,400	45	0.5	1.8%	0.7%	67.4	67	144	310	667	100
South Tennesse Street to North Tennessee Street	2	0	35,100	45	0.5	1.8%	0.7%	66.8	61	132	285	614	100
Tennessee Street to Dwy.1	2	0	29,200	45	0.5	1.8%	0.7%	66.0	54	117	252	543	100
Dwy. 1 to Texas Strreet	2	0	28,500	45	0.5	1.8%	0.7%	65.9	53	115	248	535	100
East of Texas Street	2	0	19,900	45	0.5	1.8%	0.7%	64.4	42	91	195	421	100
Tennessee Street													
South of San Bernardino Avenue (I-210)	2	0	17,800	35	0.5	1.8%	0.7%	61.4	-	57	123	266	100
North of San Bernardino Avenue	2	0	8,600	35	0.5	1.8%	0.7%	58.2	-	35	76	163	100
South of San Bernardino Avenue	2	0	8,100	35	0.5	1.8%	0.7%	57.9	-	34	73	157	101
Pioneer Avenue													
West of Texas Street	2	0	10,400	35	0.5	1.8%	0.7%	59.0	-	40	86	186	100
East of Texas Street	2	0	10,400	35	0.5	1.8%	0.7%	59.0	-	40	86	186	100
Texas Street													
North of Pioneer Avenue	2	12	7,400	35	0.5	1.8%	0.7%	57.6	-	-	69	149	100
Pioneer Avenue to Dwy. 2	2	0	7,900	35	0.5	1.8%	0.7%	57.8	-	33	72	154	100
Dwy. 2 to San Bernardino Avenue	2	0	8,700	35	0.5	1.8%	0.7%	58.3	-	35	76	165	100
San Bernardino Avenue to West Pennsylvania Avenu	2	0	10,300	45	0.5	1.8%	0.7%	61.5	-	58	126	271	100
West Pennsylvania Avenue to Lugonia Avenue	2	0	10,700	45	0.5	1.8%	0.7%	61.7	-	60	129	278	100
South of Lugonia Avenue	2	0	13,400	45	0.5	1.8%	0.7%	62.6	32	70	150	323	100
Lugonia Avenue													
West of Texas Street	2	0	22,700	35	0.5	1.8%	0.7%	62.4	-	67	145	312	100
East of Texas Street	4	0	22,100	45	0.5	1.8%	0.7%	64.9	46	99	212	458	100
Interstate 210													
I-210 northbound on-ramp	1	0	27,400	45	0.5	1.8%	0.7%	65.7	52	112	241	520	100
I-210 southbound off-ramp	1	0	22,200	45	0.5	1.8%	0.7%	64.8	45	97	210	452	100

¹ Distance is from the centerline of the roadway segment to the receptor location.

[&]quot;-" = contour is located within the roadway right-of-way.



Appendix H1 Traffic Impact Analysis

HERITAGE SPECIFIC PLAN
INITIAL STUDY



Pioneer & Texas Residential

TRAFFIC IMPACT ANALYSIS CITY OF REDLANDS

PREPARED BY:

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FEBRUARY 20, 2020 (REVISED)

11930-12 Report

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LIST OF ABBREVIATED TERMS

(1) Reference

ADT Average Daily Traffic

Caltrans California Department of Transportation
CEQA California Environmental Quality Act
CMP Congestion Management Program

DIF Development Impact Fee

E+P Existing Plus Project

HCM Highway Capacity Manual

ITE Institute of Transportation Engineers

LOS Level of Service

MUTCD Manual on Uniform Traffic Control Devices

PCE Passenger Car Equivalents

PHF Peak Hour Factor

Project Pioneer & Texas Residential

SBCTA San Bernardino County Transportation Authority

sf Square Feet

TIA Traffic Impact Analysis tsf Thousand Square Feet



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1 INTRODUCTION

This report presents the results of the traffic impact analysis (TIA) for the proposed Pioneer & Texas Residential (Project) which is located south of Pioneer Avenue and west of Texas Street in the City of Redlands. A preliminary site plan is shown on Exhibit 1-1. The study area and Project location are illustrated on Exhibit 1-2.

The purpose of this traffic impact analysis is to evaluate the potential impacts to traffic and circulation associated with the development of the proposed Project, and to recommend improvements to mitigate impacts considered significant in comparison to established regulatory thresholds. The scope of this study has been developed through consultation with the City of Redlands, and follows the City's traffic study requirements. The Project Traffic Study Scoping agreement with the City of Redlands is provided in Appendix 1.1 of this TIA.

1.1 PROJECT OVERVIEW

The Project is proposed to consist of 207 single family residential dwelling units. It is assumed that the Project will be constructed and at full occupancy by 2024. Trips generated by the Project's proposed land use has been estimated based on trip generation rates collected by the Institute of Transportation Engineers (ITE) and published in their most current edition of the Trip Generation manual, 10th Edition, 2017. (1) The Project is anticipated to generate a net total of approximately 1,956 trip-ends per day with 153 AM peak hour trips and 205 PM peak hour trips. The assumptions and methods used to estimate the Project's trip generation characteristics are discussed in detail in Section 4.1 Project Trip Generation of this report.

1.2 ANALYSIS SCENARIOS

For the purposes of this traffic study, potential impacts to traffic and circulation have been assessed for each of the following conditions:

- Existing (1 scenario)
- Existing plus Project (1 scenario)
- Opening Year Cumulative (2024), Without and With Project (2 scenarios)
- Horizon Year (2040), Without and With Project (2 scenarios)



PIONEER AV. 762 579' SAN BERNARDINO AV.

EXHIBIT 1-1: PRELIMINARY SITE PLAN

LEGEND:

RIRO = RIGHT-IN/RIGHT-OUT ONLY ACCESS

LI - LEFT IN





PIONEER AV DWY. 2 6 SAN BERNARDINO AV. **TENNESSEE ST** 210 LUGONIA AV.

EXHIBIT 1-2: LOCATION MAP

LEGEND:



= EXISTING INTERSECTION ANALYSIS LOCATION



- FUTURE INTERSECTION ANALYSIS LOCATION





1.2.1 EXISTING CONDITIONS

Information for Existing conditions is disclosed to represent the baseline traffic conditions as they existed at the time this report was prepared. After the traffic counts for this TIA were performed, a traffic signal was installed at the intersection of Texas Street and Pioneer Avenue. The addition of the traffic signal is not likely to significantly increase the traffic volumes, so the analysis within this report is still valid. The intersection of Texas Street & Pioneer Avenue was evaluated with a traffic signal, and found to operate at acceptable LOS during AM, mid-day and PM peak hours.

1.2.2 EXISTING PLUS PROJECT CONDITIONS

The Existing Plus Project (E+P) analysis determines significant traffic impacts that would occur on the existing roadway system with the addition of Project traffic. The E+P analysis has been utilized to identify the project-specific impacts associated solely with the development of the proposed Project based on a comparison of the E+P traffic conditions to Existing conditions.

1.2.3 OPENING YEAR CUMULATIVE (2024) CONDITIONS

The Opening Year Cumulative (2024) conditions analysis will be utilized to determine if improvements funded through local and regional transportation mitigation fee programs, such as City of Redlands Development Impact Fee (DIF) program, can mitigate any forecasted cumulatively significant traffic impacts as identified by the City of Redlands. If the planned and funded improvements can provide the necessary improvements in delay, then the Project's payment into these established fee programs will be considered as nearterm cumulative mitigation. Other improvements needed beyond the "funded" improvements (such as localized improvements to non-funded facilities) are identified as such. To account for background traffic, a list of other known cumulative development projects within the study area were included in addition to a 12.62% ambient growth factor. The ambient growth factor of 12.62% approximately equates to a growth rate of 2% compounded annually for six years as identified in the Scoping Agreement with the City of Redlands.

1.2.4 HORIZON YEAR (2040) CONDITIONS

The Horizon Year (2040) conditions analysis will be utilized to determine if improvements funded through local and regional transportation mitigation fee programs, such as the City of Redlands Development Impact Fee (DIF) program, or other approved funding mechanism can accommodate the cumulative traffic at the target LOS identified by the City of Redlands. If the planned and funded improvements can provide the necessary improvements in delay, then the Project's payment into these established fee programs will be considered as long-range cumulative mitigation. Other improvements needed beyond the "funded" improvements (such as localized improvements to non-funded facilities) are identified as such. Traffic projections for Horizon Year (2040) Without Project conditions were derived from Bernardino Transportation **Analysis** Model (SBTAM) using accepted procedures for model forecast refinement and smoothing.



1.3 STUDY AREA

To ensure that this TIA satisfies the City of Redlands' traffic study requirements, Urban Crossroads, Inc. prepared a project traffic study scoping package for review by City staff prior to the preparation of this report. The Agreement provides an outline of the Project study area, trip generation, trip distribution, and analysis methodology. The Agreement approved by the City is included in Appendix 1.1.

1.3.1 Intersections

The following 8 study area intersections shown on Exhibit 1-2 and listed in Table 1-1 were selected for this TIA based on consultation with City of Redlands staff. The "50 peak hour trip" criterion utilized by the City of Redlands is consistent with the methodology employed by the County of San Bernardino, and generally represents a minimum number of trips at which a typical intersection would have the potential to be substantively impacted by a given development proposal. Although each intersection may have unique operating characteristics, this traffic engineering rule of thumb is a widely utilized tool for estimating a potential area of impact (i.e., study area).

TABLE 1-1: INTERSECTION ANALYSIS LOCATIONS

ID	Intersection Location Jurisdiction				
1	SR-210 SB Ramps / Citrus Plaza Drive & San Bernardino Avenue	Caltrans			
2	SR-210 NB Ramps / Tennessee Street & San Bernardino Avenue	Caltrans			
3	Tennessee Street & San Bernardino Avenue	Redlands			
4	Driveway 1 & San Bernardino Avenue – Future Intersection	Redlands Redlands			
5	Texas Street & Pioneer Avenue				
6	Texas Street & San Bernardino Avenue	Redlands			
7	Texas Street & Driveway 2 – Future Intersection	Redlands			
8	Texas Street & San Bernardino Avenue	Redlands			

The Project is located in the vicinity of Citrus Valley High School. As such, in order to account for unique traffic patterns adjacent to the schools, additional intersections were included in the study area based on discussions with City staff although the Project is anticipated to contribute less than 50 peak hour trips to the intersections.

1.4 SUMMARY OF FINDINGS

This section provides a summary of the analysis results for Existing (2018), E+P, Opening Year Cumulative (2024), and Horizon Year (2040) traffic conditions.



1.4.1 Existing (2018) Conditions

Intersection Operations

A summary of LOS results for Existing traffic conditions are presented in Exhibit 1-3. As shown, there is one study area intersection currently operating at an unacceptable LOS (LOS D or worse) during the peak hours.

Since the preparation of the TIA, a traffic signal has been installed at the intersection of Texas Street and Pioneer Avenue. The addition of a traffic signal is not likely to significantly increase the traffic volumes. The intersection of Texas Street & Pioneer Avenue was evaluated with a traffic signal, and found to operate at acceptable LOS during AM, mid-day and PM peak hours. *Traffic Signal Warrant Analysis*

The following intersections currently warrant a traffic signal based on peak hour traffic volumes:

• Tennessee St. & San Bernardino Av. (#3)

1.4.2 E+P CONDITIONS

Intersection Operations

As shown on Exhibit 1-3, there are no additional study area intersections anticipated to operate at an unacceptable LOS with the addition of Project traffic, from the location previously identified under Existing (2018) traffic conditions.

Traffic Signal Warrant Analysis

No additional study area intersections are anticipated to meet either peak hour or planning level (daily volume based) traffic signal warrants for E+P traffic conditions.

Deficiencies and Recommended Improvements

The addition of Project traffic is not anticipated to result in any direct traffic impacts at the study area intersections. Cumulative traffic impacts are deficiencies that are not directly caused by the Project, but occur as a result of regional growth combined with that or other nearby cumulative development projects or if the project is anticipated to contribute traffic to a deficient intersection under pre-project conditions (i.e., 50 or more peak hour trips). The Project's contribution to a particular cumulative transportation deficiency is deemed cumulatively considerable if the Project adds significant traffic to the forecasted deficiency.

The following study area intersections are anticipated to operate at a deficient LOS for Existing (2018) traffic conditions and would continue to operate at an unacceptable LOS with the addition of Project traffic:

• Tennessee St. & San Bernardino Av. (#3) – LOS F AM and mid-day peak hours



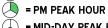
EXHIBIT 1-3: SUMMARY OF DEFICIENT INTERSECTIONS BY ANALYSIS SCENARIO

#	Intersection	Existing (2018)	E+P	Opening Year (2024) Without Project	Opening Year (2024) With Project	Horizon Year (2040) Without Project	Horizon Year (2040) With Project
1	SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.*	\bigcirc				<u> </u>	
2	SR-210 NB Ramps/Tennessee St. & San Bernardino Av. *	\bigcirc					
3	Tennessee St. & San Bernardino Av.						
4	Dwy. 1 & San Bernardino Av.	NA		NA		NA	
5	Texas St. & Pioneer Av.	\bigcirc	\bigcirc	<u> </u>	\bigotimes		
6	Texas St. & Dwy. 2	NA		NA	\odot	NA	
7	Texas St. & San Bernardino Av.	\bigcirc	\bigcirc	\bigcirc	O		
8	Texas St. & Lugonia Av.	\bigcirc		\bigcirc	<u> </u>		

LEGEND:



AM PEAK HOUR



= MID-DAY PEAK HOUR

LOS A-C

LOS D-E LOS F

NA = NOT AN ANALYSIS LOCATION FOR THIS SCENARIO

* = LOS D ACCEPTABLE FOR CALTRANS RAMP INTERSECTIONS



The Project will contribute fair share/payment of fees towards other improvements listed that are not being constructed by the Project. The locations where only a fair share contribution/payment of fees has been identified would remain a significant impact until such time the recommended improvement is implemented.

Impact 1.1 – Tennessee Street & San Bernardino Avenue (#3) – Although this intersection was found to operate at an unacceptable LOS (LOS E or worse) during the AM and mid-day peak hours under Existing traffic conditions, the intersection is anticipated to continue to operate at unacceptable levels during both peak hours with the addition of Project traffic. As such, the impact is considered significant (Project Impact 1.1).

Mitigation Measure 1.1 – Tennessee Street & San Bernardino Avenue (#3) – The intersection of Tennessee Street & San Bernardino Avenue is currently operating at an unacceptable LOS and is anticipated to continue to operate at an unacceptable LOS under future scenarios. It is recommended that the Project stripe a southbound right turn lane in order to improve the traffic conditions to pre-project conditions or better.

1.4.3 OPENING YEAR CUMULATIVE (2024) WITHOUT PROJECT CONDITIONS

Intersection Operations

As shown on Exhibit 1-3, there are 5 additional study area intersections that are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2024) Without Project traffic conditions during one or both peak hours, in addition to the one deficient intersection previously identified for Existing and E+P traffic conditions.

Traffic Signal Warrant Analysis

No additional study area intersections are anticipated to meet peak hour volume-based traffic signal warrants for Opening Year Cumulative (2024) traffic conditions.

1.4.4 OPENING YEAR CUMULATIVE (2024) WITH PROJECT CONDITIONS

Intersection Operations

As shown on Exhibit 1-3, there are no additional study area intersections that are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2024) With Project traffic conditions during one or both peak hours, in addition to the deficient intersections previously identified for Opening Year Cumulative (2024) Without Project traffic conditions.

Traffic Signal Warrant Analysis

No additional study area intersections are anticipated to meet peak hour volume-based traffic signal warrants for Opening Year Cumulative (2024) traffic conditions.

Deficiencies and Recommended Improvements

Cumulative traffic impacts are deficiencies that are not directly caused by the Project, but occur as a result of regional growth combined with that or other nearby cumulative development projects or if the project is anticipated to contribute traffic to a deficient intersection under pre-



project conditions (i.e., 50 or more peak hour trips). The Project's contribution to a particular cumulative transportation deficiency is deemed cumulatively considerable if the Project adds significant traffic to the forecasted deficiency.

The following study area intersections are anticipated to operate at a deficient LOS for Opening Year Cumulative (2024) With Project traffic conditions:

- SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av. (#1) LOS E mid-day peak hour only
- SR-210 NB Ramps/Tennessee St. & San Bernardino Av. (#2) LOS F mid-day and PM peak hours
- Tennessee St. & San Bernardino Av. (#3) LOS F AM, mid-day, and PM peak hours
- Texas St. & San Bernardino Av. (#7) LOS E mid-day peak hour; LOS F PM peak hour
- Texas St. & Lugonia Av. (#8) LOS D AM and mid-day peak hour; LOS F PM peak hour

The Project will contribute fair share/payment of fees towards other improvements listed that are not being constructed by the Project. The locations where only a fair share contribution/payment of fees has been identified would remain a significant impact until such time the recommended improvement is implemented.

1.4.5 HORIZON YEAR (2040) WITHOUT PROJECT CONDITIONS

Intersection Operations

As shown on Exhibit 1-3, there are no additional study area intersections that are anticipated to operate at an unacceptable LOS under Horizon Year (2040) Without Project traffic conditions during one or both peak hours, in addition to the 6 intersections identified previously for Opening Year Cumulative (2024) traffic conditions.

Traffic Signal Warrant Analysis

No additional study area intersections are anticipated to meet peak hour volume-based traffic signal warrants for Horizon Year (2040) Without Project traffic conditions.

1.4.6 Horizon Year (2040) With Project Conditions

Intersection Operations

As shown on Exhibit 1-3, there are no additional study area intersections that are anticipated to operate at an unacceptable LOS under Horizon Year (2040) With Project traffic conditions during one or both peak hours, in addition to the 6 intersections identified previously for Opening Year Cumulative (2024) traffic conditions.

Traffic Signal Warrant Analysis

No additional study area intersections are anticipated to meet peak hour volume-based traffic signal warrants for Horizon Year (2040) With Project traffic conditions.



Deficiencies and Recommended Improvements

Cumulative traffic impacts are deficiencies that are not directly caused by the Project, but occur as a result of regional growth combined with that or other nearby cumulative development projects or if the project is anticipated to contribute traffic to a deficient intersection under preproject conditions (i.e., 50 or more peak hour trips). The Project's contribution to a particular cumulative transportation deficiency is deemed cumulatively considerable if the Project adds significant traffic to the forecasted deficiency.

The following study area intersections are anticipated to operate at a deficient LOS for Horizon Year (2040) With Project traffic conditions:

- SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av. (#1) LOS E AM peak hour; LOS F midday and PM peak hours
- SR-210 NB Ramps/Tennessee St. & San Bernardino Av. (#2) LOS F AM, mid-day, and PM peak hours
- Tennessee St. & San Bernardino Av. (#3) LOS F AM, mid-day, and PM peak hours
- Texas St. & Pioneer Av. (#5) LOS F mid-day peak hour; LOS D PM peak hour
- Texas St. & San Bernardino Av. (#7) LOS F AM, mid-day, and PM peak hours
- Texas St. & Lugonia Av. (#8) LOS E AM peak hour; LOS F mid-day and PM peak hours

The Project will contribute fair share/payment of fees towards other improvements listed that are not being constructed by the Project. The locations where only a fair share contribution/payment of fees has been identified would remain a significant impact until such time the recommended improvement is implemented.

1.5 LOCAL AND REGIONAL FUNDING MECHANISMS

Transportation improvements within the City of Redlands are funded through a combination of direct project mitigation, development impact fee programs or fair share contributions, such as the City of Redlands Development Impact Fee (DIF) program. Identification and timing of needed improvements is generally determined through local jurisdictions based upon a variety of factors.

Table 1-2 lists the incremental intersection improvements that are required for each analysis scenario from Existing and Horizon Year (2040) traffic conditions to alleviate circulation system deficiencies. The regional and local transportation impact fee programs have each been reviewed and compared to the recommended improvements for each impacted facility. Recommended improvements already identified and included in the City of Redlands DIF are clearly denoted. If an impacted facility was found to require improvements beyond those already identified within the fee program, the Project would be required to contribute the associated intersection or roadway fair-share percentage toward the costs of the recommended improvements. The fair-share calculations, presented on Table 1-2, indicate that the Project contributes 0.8% to 9.2% of new vehicle trips to these intersections. The construction of facilities by the Project Applicant would be eligible for DIF credit and reimbursement if the construction exceeds the Project's fair share, as identified in Table 1-2.



The improvements listed in Table 1-2 comprise lane additions/modifications, installation of signals and signal modifications. As noted, the identified improvements are covered either by the City of Redlands DIF Program or as a fair-share contribution, if not covered by a fee program. Depending on the width of the existing pavement and right-of-way, these improvements may involve only striping modifications or they may involve construction of additional pavement width. Additional discussion of the relevant pre-existing transportation impact fee programs is provided below.

1.5.1 CITY OF REDLANDS DEVELOPMENT IMPACT FEE PROGRAM

The City of Redlands adopted the latest update to their Development Impact Fee (DIF) program in 2017. Fees from new residential, commercial and industrial development are collected to fund Measure "I" compliant regional facilities as well as local facilities. Under the City's DIF program, the City may grant to developers a credit against specific components of fees when those developers construct certain facilities and landscaped medians identified in the list of improvements funded by the DIF program.

After the City's DIF fees are collected, they are placed in a separate restricted use account pursuant to the requirements of Government Code sections 66000 *et seq*. The timing to use the DIF fees is established through periodic capital improvement programs which are overseen by the City's Municipal Utilities and Engineering Department. Periodic traffic counts, review of traffic accidents, and a review of traffic trends throughout the City are also periodically performed by City staff and consultants. The City uses this data to determine the timing of the improvements listed in its facilities list. The City also uses this data to ensure that the improvements listed on the facilities list are constructed before the LOS falls below the LOS performance standards adopted by the City. In this way, the improvements are constructed before the LOS falls below the City's LOS performance thresholds. The City's DIF program establishes a timeline to fund, design, and build the improvements.

A summary of off-site improvements needed to address cumulative traffic impacts for E+P, Opening Year Cumulative (2024) and Horizon Year (2040) traffic conditions is included in Table 1-2. Improvements found to be included in City of Redlands Impact Fee (DIF) program have been identified as such. Payment of fees to this program may be considered as mitigation for these improvements. These fees are collected as part of a funding mechanism aimed at ensuring that regional highways and arterial expansions keep pace with the projected vehicle trip increases.





Table 1-2 Page 1 of 2

Summary of Improvements and Rough Order of Magnitude Costs for Intersections

#	Intersection Location	Jurisdiction	E+P (Project Buildout) 2024 With Project	2024 With Project	2040 With Project	Improvements	Total Cost ^{2,3,4}	Fair	Fair Share
	-					in City DIF?⁴		Share % [*]	Cost
Н	SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.	Caltrans	None	2nd WB through lane	Same	Yes	\$267,120	4.3%	\$0
				2nd WB through lane	3rd EB through lane	Yes	\$267,120		\$0
					3rd WB through lane	Yes	\$267,120		\$0
							Total \$534,240		\$0
2	SR-210 NB Ramps/Tennessee St. & San Bernardino Av.	Caltrans	None	2nd and 3rd EB through lanes	Same	N 0	\$534,240	2.6%	\$0
				2nd WB through lane	Same	Yes	\$267,120		\$0
					2nd SB left turn lane	Yes	\$74,200		\$4,155
					3rd WB through lane	Yes	\$267,120		\$0
							Total \$1,142,680		\$4,155
3	Tennessee St. & San Bernardino Av.	Redlands	SB right turn lane	Same	Same	No^{11}	\$74,200	6.4%	\$0
					Install a traffic signal	No	\$250,000		\$15,930
					EB left turn lane	No	\$74,200		\$4,728
					2nd and 3rd EB through	Yes	\$534,240		\$0
					anes 2nd and 3rd WB through lanes	Yes	\$534,240		\$0
							Total \$1,466,880		\$20,657
2	Texas St. & Pioneer Av.	Redlands	None	EB left turn lane	Same	No ¹¹	\$74,200	1.3%	\$0
				EB right turn lane	Same	No^{11}	\$74,200		\$0
					2nd NB through lane	No	\$267,120		\$3,416
					2nd EB through lane	No^{11}	\$267,120		\$0
					WB left turn lane	No	\$74,200		\$949
					2nd WB through lane	Yes	\$267,120		\$0
							Total \$1,023,960		\$4,365

Table 1-2

Page 2 of 2

Summary of Improvements and Rough Order of Magnitude Costs for Intersections

#	Intersection Location	Jurisdiction	E+P (Project Buildout) 2024 With Project	2024 With Project	2040 With Project	Improvements	Total Cost ^{2,3,4}	Fair	Fair Share
						IN CITY DIF?		snare %	Cost
7	Texas St. & San Bernardino Av.	Redlands	None	NB left turn lane	Same	No	\$74,200	6.5%	\$4,789
				SB left turn lane	Same	No ¹¹	\$74,200		\$0
				SB right turn lane	Same	No ¹¹	\$74,200		\$0
				2nd EB through lane	Same	Yes	\$267,120		\$0
				2nd WB through lane	Same	No ¹¹	\$267,120		\$0
					2nd NB through lane	No	\$267,120		\$17,239
					3rd EB through lane	Yes	\$267,120		\$0
					3rd WB through lane	No ¹¹	\$267,120		\$0
					2nd EB left turn lane	No	\$74,200		\$4,789
					Modify traffic signal to				
					implement overlap	No 11	\$111,300		\$0
					phasing on the SB right				
					turn lane				
							Total \$1,632,400		\$26,816
∞	Texas St. & Lugonia Av.	Redlands	None	NB left turn lane	Same	No	\$74,200	6.1%	\$4,529
							Total \$74,200		\$4,529
				Total Co	Total Costs for Horizon Year (2040) Improvements) Improvements	\$5,874,360		\$60,521
				Total Project Fair	Total Project Fair Share Contribution to the City of Redlands $^{ m 8}$	ity of Redlands ⁸		\$56,366	
				Total	Total Project Fair Share Contribution to Caltrans 9	tion to Caltrans		\$4,155	

¹ Improvements included in City of Redlands DIF program for local, regional and specific plan components.



² Costs have been estimated using the data provided in Appendix "G" of the CMP (2003 Update) for preliminary construction costs.

 $^{^3}$ Appendix "G" costs escalated by a factor of 1.484 except Traffic Signals to reflect current costs.

⁴ Program improvements constructed by project may be eligible for fee credit, at discretion of City. See Table 1-3 for Fair Share Calculations.

⁵ Rough order of magnitude cost estimate.

 $^{^{6}}$ Improvements are assumed to be in place prior to the buildout of the Project.

⁷ Improvements are to be constructed by other projects since these improvements are needed for site access.

⁹ Total project fair share contribution consists of the improvements which are not already included in a fee program for those intersections wholly or partially within Caltrans' jurisdiction. Caltrans may not provide a 8 Total project fair share contribution consists of the improvements which are not already included in the City-wide DIF for those intersections wholly or partially within the City of Redlands. mechanism in which to receive fair share contributions.

¹⁰ Approximate improvement cost provided by Don Young with the City of Redlands MUED based on cost estimates received by the City from the project developer preparing design plans for the construction of the improvements as of October 2019.

¹¹ Improvements are to be constructed by the Project.

1.5.2 MEASURE "I" FUNDS

In 2004, the voters of San Bernardino County approved the 30-year extension of Measure "I," a one-half of one percent sales tax on retail transactions, through the year 2040, for transportation projects including, but not limited to, infrastructure improvements, commuter rail, public transit, and other identified improvements. The Measure "I" extension requires that a regional traffic impact fee be created to ensure development is paying its fair share. A regional Nexus study was prepared by SBCTA and concluded that each jurisdiction should include a regional fee component in their local programs in order to meet the Measure "I" requirement. The regional component assigns specific facilities and cost sharing formulas to each jurisdiction and was most recently updated in November 2011. Revenues collected through these programs are used in tandem with Measure "I" funds to deliver projects identified in the Nexus Study. While Measure "I" is a self-executing sales tax administered by SBCTA, it bears discussion here because the funds raised through Measure "I" have funded in the past and will continue to fund new transportation facilities in San Bernardino County.

1.5.3 FAIR SHARE CONTRIBUTION

Project mitigation may include a combination of fee payments to established programs, construction of specific improvements, payment of a fair share contribution toward future improvements or a combination of these approaches. Improvements constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate (to be determined at the City's discretion).

When off-site improvements are identified with a minor share of responsibility assigned to proposed development, the approving jurisdiction may elect to collect a fair share contribution or require the development to construct improvements. Detailed fair share calculations, for each peak hour, have been provided on Table 1-3 for the deficient intersections shown previously on Table 1-2.

Improvements included in a defined program and constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate. A rough order of magnitude cost has been prepared to determine the appropriate contribution value based upon the project's fair share of traffic as part of the project approval process. Table 1-2 also summarize the applicable cost associated with each of the recommended improvements based on the preliminary construction cost estimates found in Appendix G of the San Bernardino County CMP in conjunction with a cost escalation factor of 1.484 to reflect current (2019) costs. Based on the Project fair share percentages shown on Table 1-2, the Project's fair share cost is estimated at \$60,521 for the study area intersections. These estimates are a rough order of magnitude only as they are intended only for discussion purposes and do not imply any legal responsibility or formula for contributions or mitigation.



1.5.4 MEASURE "U"

As stated by Measure "U,"

The purpose and intent of this initiative measure is to establish comprehensive and inviolable principles of managed development for the City of Redlands that will preserve, enhance and maintain the special quality of life valued by this community. The principles of managed development established by this initiative measure assure that future development within the City of Redlands occurs in a way that promotes the social and economic well-being of the entire community.

In order to be in compliance with Measure "U", the Project is required to maintain a minimum LOS C or better at all intersections presently at LOS C or better. Where the current level of service at a location within the City of Redlands is below the Level of Service (LOS) C standard, no development project shall be approved that cannot be mitigated so that it does not reduce the existing level of service at that location (i.e. intersections in Redlands that are deficient to start out with are acceptable as long as they do not further degrade LOS). A LOS D standard is acceptable on a case by case basis upon approval by a four-fifths (4/5ths) vote of the total authorized members of the City Council.

1.6 CUMULATIVE IMPACTS

A summary of the cumulatively impacted study area intersections and recommended mitigation measures to address cumulatively significant impacts are described in detail within Section 6 *Opening Year Cumulative (2024) Traffic Conditions* and Section 7 *Horizon Year (2040) Traffic Conditions*. Cumulative impacts are deficiencies that would not be directly caused by the Project. The Project would, however, contribute traffic to these deficient facilities along with other cumulative development projects, resulting in a cumulatively considerable impact.

The following mitigation measures are based on the improvements needed under Horizon Year (2040) traffic conditions. The improvements needed to address Opening Year Cumulative deficiencies would be a sub-set of those improvements recommended under Horizon Year (2040) traffic conditions.

1.6.1 RECOMMENDED IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

A summary of off-site improvements needed to address cumulative traffic impacts for Opening Year Cumulative (2024) and Horizon Year (2040) traffic conditions was included in Table 1-2. Improvements found to be included in City of Redlands (lead agency) DIF program have been identified as such. For improvements that do not appear to be in the City's DIF program, a fair share financial contribution based on the Project's fair share impact shall be imposed (for City of Redlands facilities) and may be imposed by other jurisdictions in order to mitigate the Project's share of impacts in lieu of construction. These fees (both to the City of Redlands, and as determined, to surrounding agencies as fair-share contributions) are collected as part of a funding mechanism aimed at ensuring that regional highways and arterial expansions keep pace with the projected vehicle trip increases.



Table 1-3

Project Fair Share Calculations for Intersections

#	Intersection	Existing	Project	2040 With Project Volume	Total New Traffic	Project % of New Traffic
1	SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.			,		
	AM	: 1,987	47	3,072	1,085	4.3%
	MD	: 2,712	61	4,529	1,817	3.4%
	PN	: 3,083	61	4,831	1,748	3.5%
2	SR-210 NB Ramps/Tennessee St. & San Bernardino Av.					
	AM	: 2,102	85	3,620	1,518	5.6%
	MC	: 2,873	113	5,345	2,472	4.6%
	PM	: 3,131	113	5,403	2,272	5.0%
3	Tennessee St. & San Bernardino Av.					
	AM	: 1,498	85	2,832	1,334	6.4%
	MC	: 1,675	113	3,928	2,253	5.0%
	PM	: 1,749	113	3,724	1,975	5.7%
5	Texas St. & Pioneer Av.					
	AN	: 1,067	8	1,698	631	1.3%
	MD	: 1,045	10	2,254	1,209	0.8%
	PM	: 1,102	10	1,884	782	1.3%
7	Texas St. & San Bernardino Av.					
	AN	,	79	2,864	1,254	6.3%
	ME	,	109	4,010	2,237	4.9%
_	PN	: 1,917	109	3,606	1,689	6.5%
8	Texas St. & Lugonia Av.	: 1,364	38	2,195	831	4.6%
	ME		52	2,195	852	4.0% 6.1%
	PM	'	52	2,553	914	5.7%

BOLD = Denotes highest fair share percentage.



A rough order of magnitude cost has been prepared to determine the appropriate contribution value based upon the Project's fair share of traffic as part of the project approval process. Based on the Project fair share percentages, the Project's fair share cost is estimated at **\$60,521**. Table 1-2 shows the Project's fair share cost for Horizon Year (2040) traffic conditions. These estimates are a rough order of magnitude only as they are intended only for discussion purposes and do not imply any legal responsibility or formula for contributions or mitigation.

1.6.2 CUMULATIVE MITIGATION MEASURES

Mitigation Measure 2.1 – Prior to the issuance of building permits, the Project applicant shall participate in the City's DIF program by paying the requisite DIF fee at the time of building permit; and in addition, shall pay the Project's fair share amount of \$56,366 for the improvements identified in Table 1-2 that are consistent with the improvements shown on Table 7-2, or as agreed to by the City and Project Applicant.

Mitigation Measure 3.1 – The Developer's fair-share amount for the intersections that either share a mutual border with Caltrans or are wholly located within Caltrans' jurisdiction that have recommended improvements for Project Buildout which are not covered by payment of fees equals **\$4,155**. Developer shall be required to pay this **\$4,155** amount to the City of Redlands prior to the issuance of the Project's final certificate of occupancy.

The estimated cost is effective October 2019 and a cost escalation factor based on Construction Cost Index (CCI) should be used for determination of final amount.

1.7 ON-SITE ROADWAY AND SITE ACCESS IMPROVEMENTS

The Project is located south of Pioneer Avenue and west of Texas Street in the City of Redlands. The Project is proposed to access San Bernardino Avenue via Driveway 1 and Texas Street via Driveway 2. Driveway 1 is proposed to have right-in/right-out/left-in only access and Driveway 2 is proposed to have full access.

Driveway 1 at San Bernardino Avenue is proposed to have right-in/right-out/left-in only access in order to achieve acceptable LOS in near-term and long-range traffic conditions. San Bernardino Avenue is anticipated to experience high traffic volumes in the eastbound and westbound directions. A left turning movement out of Driveway 1 is anticipated to increase the delay significantly and degrade the LOS to LOS D or worse.

Regional access to the Project site is provided via the SR-210 Freeway at San Bernardino Avenue interchange. Roadway improvements necessary to provide site access and on-site circulation are assumed to be constructed in conjunction with site development and are described below. These improvements are required to be in place prior to occupancy.

1.7.1 SITE ADJACENT ROADWAY AND SITE ACCESS IMPROVEMENTS

The recommended site-adjacent roadway improvements for the Project are described below. These improvements need to be incorporated into the Project description prior to Project approval or imposed as conditions of approval as part of the Project approval. Exhibit 1-4 illustrates the site-adjacent roadway improvement recommendations.



Exhibit 1-4 also illustrates the on-site and site adjacent recommended roadway lane improvements for the Project under near term traffic conditions. Construction of on-site and site adjacent improvements are recommended to occur in conjunction with adjacent Project development activity or as needed for Project access purposes. Ultimate improvements along San Bernardino Avenue, Texas Street, Pioneer Avenue, and New York Street are consistent with the City of Redlands General Plan.

Texas Street – Texas Street is a north-south oriented roadway located along the Project's eastern boundary. Construct Texas Street from Pioneer Avenue to San Bernardino Avenue along the Project's frontage at its ultimate half-section width as a Minor Arterial (72-foot right-of-way), in compliance with applicable City of Redlands standards.

Pioneer Avenue – Pioneer Avenue is an east-west oriented roadway located along the Project's northern boundary. Construct Pioneer Avenue from the Project's western boundary to Texas Street along the Project's frontage at its ultimate half-section width as a Collector (64-foot right-of-way), in compliance with applicable City of Redlands standards.

San Bernardino Avenue – San Bernardino Avenue is an east-west oriented roadway located along the Project's southern boundary. Construct San Bernardino Avenue from the Project's western boundary to Texas Street along the Project's frontage at its ultimate half-section width as a Major Arterial (132-foot right-of-way), in compliance with applicable City of Redlands standards.

New York Avenue – New York Avenue is a future north-south oriented roadway located along the Project's western boundary designated as a Collector (64-foot right-of-way). Since the Project does not have direct access to New York Avenue, the improvements along New York Avenue from Pioneer Avenue to Texas Street will be based on the City's Final Conditions of Approval for the Project.

The recommended site access driveway improvements for the Project are described below. Exhibit 1-4 also illustrates the on-site and site adjacent recommended roadway lane improvements. Construction of on-site and site adjacent improvements shall occur in conjunction with adjacent Project development activity or as needed for Project access purposes.

Driveway 1 at San Bernardino Avenue – Install a stop control on the southbound approach, provide median modifications at Driveway 1 and San Bernardino to restrict the access to right-in/right-out/left-in access only, and construct the intersection with the following geometrics:

- Northbound Approach: N/A
- Southbound Approach: One right turn lane
- Eastbound Approach: One through lane
- Westbound Approach: One left turn lane, two through lanes, and one shared through-right turn lane



Texas Street at Driveway 2 – Install a stop control on the eastbound approach and construct the intersection with the following geometrics:

- Northbound Approach: One left turn lane and one through lane
- Southbound Approach: One through lane and one shared through-right turn lane
- Eastbound Approach: One shared left-right turn lane
- Westbound Approach: N/A

On-site traffic signing and striping should be implemented in conjunction with detailed construction plans for the Project site.

Sight distance at each project access point should be reviewed with respect to standard Caltrans and City of Redlands sight distance standards at the time of preparation of final grading, landscape and street improvement plans.

1.7.2 QUEUING ANALYSIS AT THE PROJECT DRIVEWAYS

A queuing analysis was conducted along the site adjacent roadways for Horizon Year (2040) traffic conditions to determine the turn pocket lengths necessary to accommodate near term 95th percentile queues. The analysis was conducted for both the weekday AM and weekday PM peak hours.

The traffic modeling and signal timing optimization software package Synchro (Version 10) has been utilized to assess queues at the Project access points. Synchro is a macroscopic traffic software program that is based on the signalized and unsignalized intersection capacity analyses as specified in the HCM. Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length in Synchro. The LOS and capacity analysis performed by Synchro takes into consideration optimization and coordination of signalized intersections within a network.

SimTraffic is designed to model networks of signalized and unsignalized intersections, with the primary purpose of checking and fine-tuning signal operations. SimTraffic uses the input parameters from Synchro to generate random simulations. The 95th percentile queue is not necessarily ever observed; it is simply based on statistical calculations (or Average Queue plus 1.65 standard deviations). However, the average queue is the average of all the two-minute maximum queues observed by SimTraffic. The maximum back of queue observed for every two-minute period is recorded by SimTraffic.

SimTraffic has been utilized to assess peak hour queuing at the site access driveways for Horizon Year (2040) With Project traffic conditions. The random simulations generated by SimTraffic have been utilized to determine the 50th and 95th percentile queue lengths observed for each turn lane. A SimTraffic simulation has been recorded five (5) times, during the weekday AM and weekday PM peak hours, and has been seeded for 60-minute periods with 60-minute recording intervals.



PROVIDE SIGNAL **MODIFICATIONS TO** ACCOMMODATE THE **NEW LANE** PIONEER AV **GEOMETRIES** PIONEER AVENUE IS A EAST-WEST ORIENTED ROADWAY LOCATED ALONG THE PROJECT'S NORTHERN BOUNDARY. CONSTRUCT PIONEER AVENUE FROM THE PROJECT'S WESTERN BOUNDARY TO TEXAS STREET ALONG THE PROJECT'S FRONTAGE AT ITS ULTIMATE HALF-SECTION WIDTH AS A COLLECTOR (64-FOOT RIGHT-OF-WAY), IN COMPLIANCE WITH APPLICABLE CITY OF REDLANDS STANDARDS. NEW YORK AVENUE IS A FUTURE NORTH-SOUTH ORIENTED ROADWAY LOCATED ALONG THE PROJECT'S WESTERN BOUNDARY DESIGNATED AS A COLLECTOR (64-FOOT RIGHT-OF-WAY). SINCE THE PROJECT DOES NOT HAVE DIRECT ACCESS TO NEW YORK AVENUE, THE IMPROVEMENTS ALONG NEW YORK AVENUE FROM PIONEER AVENUE TO TEXAS STREET WILL BE BASED ON THE CITY'S FINAL CONDITIONS OF APPROVAL FOR THE PROJECT 139 98.0 3.375 F 122 140 **TEXAS STREET IS A NORTH-SOUTH ORIENTED ROADWAY LOCATED ALONG THE PROJECT'S EASTERN BOUNDARY. CONSTRUCT TEXAS STREET** SAN BERNARDINO AVENUE IS A FROM PIONEER AVENUE TO SAN BERNARDINO **EAST-WEST ORIENTED ROADWAY** AVENUE ALONG THE PROJECT'S FRONTAGE AT ITS LOCATED ALONG THE PROJECT'S ULTIMATE HALF-SECTION WIDTH AS A MINOR SOUTHERN BOUNDARY. ARTERIAL (72-FOOT RIGHT-OF-WAY), IN CONSTRUCT SAN BERNARDINO COMPLIANCE WITH APPLICABLE CITY OF **AVENUE FROM THE PROJECT'S REDLANDS STANDARDS.** WESTERN BOUNDARY TO TEXAS STREET ALONG THE PROJECT'S FRONTAGE AT ITS ULTIMATE PROVIDE MEDIAN MODIFICATIONS HALF-SECTION WIDTH AS A MAJOR AT DRIVEWAY I AND SAN **ARTERIAL (132-FOOT BERNARDINO AVENUE TO** RIGHT-OF-WAY), IN COMPLIANCE RESTRICT IT TO A RIGHT-IN/ WITH APPLICABLE CITY OF RIGHT-OUT/LEFT-IN ACCESS ONLY. REDLANDS STANDARDS. SAN BERNARDINO AV. 7 ON-SITE TRAFFIC SIGNING AND STRIPING SHOULD BE IMPLEMENTED IN CONJUNCTION WITH DETAILED CONSTRUCTION PLANS FOR THE PROJECT SITE. SIGHT DISTANCE AT EACH PROJECT ACCESS POINT SHOULD BE **LEGEND:** REVIEWED WITH RESPECT TO STANDARD CALTRANS AND CITY OF REDLANDS SIGHT DISTANCE STANDARDS AT THE TIME OF = TRAFFIC SIGNAL PREPARATION OF FINAL GRADING, LANDSCAPE AND STREET = STOP SIGN IMPROVEMENT PLANS. **= EXISTING LANE** Texas St. & 6 Dwy. 1 & Texas St. & Texas St. & San Bernardino Av San Bernardino Av. Pioneer Av. Dwy. 2 = LANE IMPROVEMENT **= MINIMUM TURN POCKET LENGTH** = IMPROVEMENT ASSUMED TO BE IN PLACE PRIOR TO THE BUILDOUT OF THE PROJECT RIRO = RIGHT-IN, RIGHT-OUT 100'= 220 = LEFT IN

EXHIBIT 1-4: SITE ADJACENT ROADWAY AND SITE ACCESS RECOMMENDATIONS



A vehicle is considered queued whenever it is traveling at less than 10 feet/second. A vehicle will only become queued when it is either at the stop bar or behind another queued vehicle. Although only the 95th percentile queue has been utilized for purposes of determining the necessary turn pocket storage lengths, the 50th percentile queues are also reported. The 50th percentile queue is the maximum back of queue on a typical cycle during the peak hour, while the 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes during the peak hour. In other words, if traffic were observed for 100 cycles, the 95th percentile queue would be the queue experienced with the 95th busiest cycle (or 5% of the time).

The storage length recommendations for the turning movements at the Project were shown previously on Exhibit 1-4. The Horizon Year (2040) queuing results are provided in Appendix 1.2 of this report.



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2 METHODOLOGIES

This section of the report presents the methodologies used to perform the traffic analyses summarized in this report. The methodologies described are generally consistent with City of Redlands and San Bernardino County Congestion Management Program (CMP) traffic study guidelines. (2)

2.1 LEVEL OF SERVICE

Traffic operations of roadway facilities are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic flow based on several factors such as speed, travel time, delay, and freedom to maneuver. Six levels are typically defined ranging from LOS A, representing completely free-flow conditions, to LOS F, representing breakdown in flow resulting in stop-and-go conditions. LOS E represents operations at or near capacity, an unstable level where vehicles are operating with the minimum spacing for maintaining uniform flow.

2.2 Intersection Capacity Analysis

The definitions of LOS for interrupted traffic flow (flow restrained by the existence of traffic signals and other traffic control devices) differ slightly depending on the type of traffic control. The LOS is typically dependent on the quality of traffic flow at the intersections along a roadway. The *Highway Capacity Manual* (HCM) methodology expresses the LOS at an intersection in terms of delay time for the various intersection approaches. (3) The HCM uses different procedures depending on the type of intersection control.

2.2.1 SIGNALIZED INTERSECTIONS

The City of Redlands requires signalized intersection operations analysis based on the methodology described in Chapter 18 and Chapter 31 of the HCM 6th Edition. (3) Intersection LOS operations are based on an intersection's average control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For signalized intersections LOS is directly related to the average control delay per vehicle and is correlated to a LOS designation as described in Table 2-1.

TABLE 2-1: SIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Operations with very low delay occurring with favorable progression and/or short cycle length.	0 to 10.00	А	F
Operations with low delay occurring with good progression and/or short cycle lengths.	10.01 to 20.00	В	F
Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.01 to 35.00	С	F



Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.01 to 55.00	D	F
Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.01 to 80.00	E	F
Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths	80.01 and up	F	F

Source: HCM 6th Edition

Study area intersections have been analyzed using the software package Synchro (Version 10). The LOS analysis for signalized intersections has been performed using optimized signal timing for existing traffic conditions. Signal timing optimization has considered pedestrian safety and signal coordination requirements. Appropriate time for pedestrian crossings has also been considered in the signalized intersection analysis. Signal timing for study area intersections have been requested and utilized. Where signal timing was unavailable, the local accepted standards were utilized in lieu of actual signal timing.

The peak hour traffic volumes have been adjusted using a peak hour factor (PHF) to reflect peak 15 minute volumes. Common practice for LOS analysis is to use a peak 15-minute rate of flow. However, flow rates are typically expressed in vehicles per hour. The PHF is the relationship between the peak 15-minute flow rate and the full hourly volume (e.g. PHF = [Hourly Volume] / [4 x Peak 15-minute Flow Rate]). The use of a 15-minute PHF produces a more detailed analysis as compared to analyzing vehicles per hour. Existing PHFs have been used for all analysis scenarios, with the exception of Horizon Year traffic conditions, where a PHF of 0.95 has been used. Per Chapter 4 of the HCM 6th Edition, PHF values over 0.95 often are indicative of high traffic volumes with capacity constraints on peak hour flows while lower PHF values are indicative of greater variability of flow during the peak hour. (3)

Per the Caltrans *Guide for the Preparation of Traffic Impact Studies*, the traffic modeling and signal timing optimization software package Synchro (Version 10) has also been utilized to analyze signalized intersections under Caltrans' jurisdiction, which include interchange to arterial ramps (i.e. SR-210 Freeway ramps at San Bernardino Avenue). (4) Synchro is a macroscopic traffic software program that is based on the signalized intersection capacity analysis as specified in the Chapter 16 of the HCM. Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length. The level of service and capacity analysis performed by Synchro takes into consideration optimization and coordination of signalized intersections within a network. Signal timing for the freeway arterial-to-ramp intersections have been obtained from Caltrans District 8 and were utilized for the purposes of this analysis.



2.2.2 Unsignalized Intersections

The City of Redlands requires the operations of unsignalized intersections be evaluated using the methodology described in Chapter 19, Chapter 20, and Chapter 32 of the HCM 6th Edition. (3) The LOS rating is based on the weighted average control delay expressed in seconds per vehicle (see Table 2-2).

TABLE 2-2: UNSIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay Per Vehicle (Seconds)	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Little or no delays.	0 to 10.00	Α	F
Short traffic delays.	10.01 to 15.00	В	F
Average traffic delays.	15.01 to 25.00	С	F
Long traffic delays.	25.01 to 35.00	D	F
Very long traffic delays.	35.01 to 50.00	E	F
Extreme traffic delays with intersection capacity exceeded.	> 50.00	F	F

Source: HCM 6th Edition

At two-way or side-street stop-controlled intersections, LOS is calculated for each controlled movement and for the left turn movement from the major street, as well as for the intersection as a whole. For approaches composed of a single lane, the delay is computed as the average of all movements in that lane. For all-way stop controlled intersections, LOS is computed for the intersection as a whole.

2.3 TRAFFIC SIGNAL WARRANT ANALYSIS METHODOLOGY

The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or ascertain the potential need for installation of a traffic signal at an otherwise unsignalized intersection. This TIA uses the signal warrant criteria presented in the latest edition of the Caltrans *Manual on Uniform Traffic Control Devices* (MUTCD), as amended by the MUTCD 2014 California Supplement, for all study area intersections. (5)

The signal warrant criteria for Existing study area intersections are based upon several factors, including volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas. Both the Caltrans's MUTCD and the MUTCD 2014 California Supplement indicate that the installation of a traffic signal should be considered if one or more of the signal warrants are met. (5) Specifically, this TIA utilizes the Peak Hour Volume-based Warrant 3 as the appropriate representative traffic signal warrant analysis for existing traffic conditions. Warrant 3 criteria are basically identical for both the Caltrans's MUTCD and the MUTCD 2014 California Supplement. Warrant 3 is appropriate to use for this TIA because it provides specialized warrant criteria for intersections with rural characteristics (e.g. located in communities with populations of less than 10,000 persons or with adjacent major streets



operating above 40 miles per hour). For the purposes of this study, the speed limit was the basis for determining whether Urban or Rural warrants were used for a given intersection.

Future unsignalized intersections, that currently do not exist, have been assessed regarding the potential need for new traffic signals based on future average daily traffic (ADT) volumes, using the Caltrans planning level ADT-based signal warrant analysis worksheets. As shown on Table 2-3, traffic signal warrant analyses were performed for the following unsignalized study area intersections during the peak weekday conditions wherein the Project is anticipated to contribute the highest trips:

TABLE 2-3: TRAFFIC SIGNAL WARRANT ANALYSIS LOCATIONS

ID	Intersection Location	Jurisdiction
3	Tennessee Street & San Bernardino Avenue	Redlands
9	Texas Street & Driveway 2 – Future Intersection	Redlands

The Existing conditions traffic signal warrant analysis is presented in the subsequent section, Section 3 Area Conditions of this report. The traffic signal warrant analysis for future conditions is presented in Section 5 Existing Plus Project Traffic Analysis, Section 6 Opening Year Cumulative (2024) Traffic Analysis, and Section 7 Horizon Year (2040) Traffic Analysis of this report.

It is important to note that a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. Meeting this threshold condition does not require that a traffic control signal be installed at a particular location, but rather, that other traffic factors and conditions be evaluated in order to determine whether the signal is truly justified. It should also be noted that signal warrants do not necessarily correlate with LOS. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

2.4 LOS CRITERIA

2.4.1 CITY OF REDLANDS

The City of Redlands has established specific performance criteria for intersection operations. These performance criteria include standards related to determining the significance of project impacts on the roadway system. The City of Redlands has established LOS C as the minimum level of service for its intersections. Therefore, any intersection operating at LOS D or worse will be considered deficient for the purposes of this analysis. Additionally, General Plan Policy 5.20c from the Redlands General Plan states that: Where the current level of service at a location within the City of Redlands is below the LOS C standard, no development project shall be approved that cannot be mitigated so that it does not reduce the existing level of service at that location (i.e. intersections in Redlands that are deficient to start out with are acceptable as long as they do not further degrade LOS) except as provided in Section 5.20b.



2.4.2 CALTRANS

Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on SHS facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than this target LOS, the existing LOS should be maintained. In general, the region-wide goal for an acceptable LOS on all freeways, roadway segments, and intersections is LOS "D".

2.4.3 MEASURE "U"

General Plan Policy 5.20b of Measure U (see GP Figure 5-1):

The purpose and intent of this initiative measure is to establish comprehensive and inviolable principles of managed development for the City of Redlands that will preserve, enhance and maintain the special quality of life valued by this community. The principles of managed development established by this initiative measure assure that future development within the City of Redlands occurs in a way that promotes the social and economic well-being of the entire community.

In order to be in compliance with Measure U, the Project is required to maintain a minimum LOS C or better at all intersections presently at LOS C or better.

2.5 THRESHOLDS OF SIGNIFICANCE

2.5.1 CITY OF REDLANDS INTERSECTIONS

The following thresholds of significance will be utilized to determine whether the addition of Project traffic at a study intersection results in a significant project-related impact:

- A significant project impact occurs at a study intersection if the addition of project-generated trips reduces the peak hour level of service of the study intersection to change from acceptable operation (e.g., LOS A, B or C) to deficient operation (e.g., LOS D, E or F) and, if applicable, also causes an unsignalized intersection to satisfy a Caltrans traffic signal warrant; or
- A significant project impact occurs at a study intersection if the addition of projectgenerated trips worsens the pre-project level of service grade at a deficiently operating (e.g., LOS D, E or F) intersection and, if applicable, also causes an unsignalized intersection to satisfy a Caltrans traffic signal warrant.

In the event that an intersection is operating at or is forecast to operate at a deficient LOS, the CMP guidelines have defined a series of steps to be completed to determine the Project's contribution to the deficiency of intersections, which the following steps has been applied:

- Determine the mitigation measures necessary to achieve an acceptable service level,
- Calculate the Project's share in the future traffic volume projections for the peak hours,
- Estimate the cost to implement recommended mitigation measures, and



Calculate the Project's fair-share contribution to mitigate the Project's traffic impacts

2.5.2 MEASURE "U"

Per 5.20c of Measure U, where the current LOS at a location within the City of Redlands is below the LOS C standard, no development project shall be approved that cannot be mitigated so that it does not reduce the existing LOS at that location except as provided in Section 5.20b.

2.6 Project Fair Share Calculation Methodology

In cases where this TIA identifies that the proposed Project would have a significant cumulative impact to a study area intersection, and the recommended mitigation measure is a fair share monetary contribution, the following methodology was applied to determine the fair share contribution. A project's fair share contribution at an off-site study area intersection is determined based on the following equation, which is the ratio of project traffic to total traffic, where total traffic is the total Horizon Year (2040) future traffic:

Project Fair Share % = Project Traffic / Total New Traffic

The Project fair share contribution calculations are presented in Section 1.5 *Local and Regional Funding Mechanisms* of this TIA.



3 AREA CONDITIONS

This section provides a summary of the existing circulation network, the City of Redlands General Plan Circulation Network, and a review of existing peak hour intersection operations and traffic signal warrants.

3.1 EXISTING CIRCULATION NETWORK

Pursuant to the Traffic Study Scoping Agreement (Appendix 1.1) and discussion with City of Redlands staff, the study area includes a total of eight existing and future intersections as shown previously on Exhibit 1-2. Of these eight intersections, the existing study area circulation network includes six intersections. Two intersections in the study area are future planned intersections that do not currently exist (Project driveways).

Exhibit 3-1 illustrates the study area intersections located near the proposed Project and identifies the number of through traffic lanes for existing roadways and intersection traffic controls.

3.2 GENERAL PLAN AND EAST VALLEY CORRIDOR SPECIFIC PLAN CIRCULATION ELEMENTS

As previously noted, the Project site is located within the City of Redlands. Exhibit 3-2 shows the City of Redlands General Plan Circulation Element. Exhibit 3-3 shows the City of Redlands General Plan roadway cross-sections. The City of Redlands *East Valley Corridor Specific Plan*, approved on January 3, 1989 and as amended, Circulation Element and roadway cross-sections are as shown on Exhibits 3-4 and 3-5, respectively.

The City of Redlands is located within the County of San Bernardino. The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the City of Redlands in the vicinity of the proposed Project as identified on the City's General Plan Circulation Element or in the East Valley Corridor Specific Plan are described subsequently.

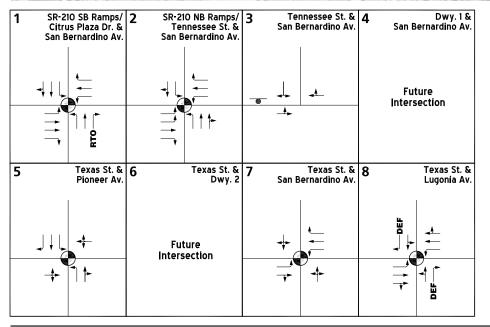
Texas Street is a two-lane undivided roadway in the study area. Texas Street is designated as a Collector north of Pioneer Avenue and as a Minor Arterial south of Pioneer Avenue on the City of Redlands General Plan. The roadway cross-section for a Secondary Highway consists of two travel lanes in each direction and 8-foot shoulders.

Pioneer Avenue is a two-lane undivided roadway west of Texas Street and a two-lane undivided roadway east of Texas Street, with curb and gutter improvements in place along the north side of the road between Tennessee Street and Texas Street. Consistent with the East Valley Corridor Specific Plan, Pioneer Avenue is designated as a Collector (66-foot right-of-way) between Alabama Street and Texas Street. Pioneer Avenue is designated as a collector on the City of Redlands General Plan.



PIONEER AV. TENNESSEE DWY. 2 6 SITE 30 EE 3D **2U** 3 50 6D **2U** SPEED LIMIT 45 20 45 SAN BERNARDINO AV. 355 CITRUS PLAZA DR LUGONIA AV. 4U 40 8 SPEED 2D 20 #4 8

EXHIBIT 3-1: EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS



LEGEND:



- TRAFFIC SIGNAL



= ALL WAY STOP



4 - NUMBER OF LANES

D = DIVIDED

U - UNDIVIDED

RTO = RIGHT TURN OVERLAP

DEF = DEFACTO RIGHT TURN



= SPEED LIMIT (MPH)

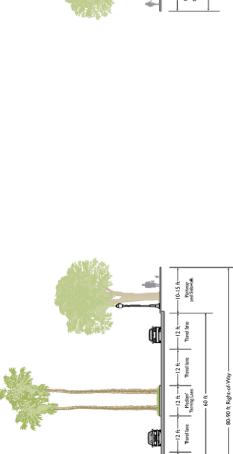


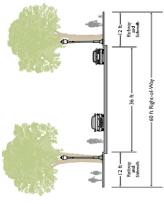
Data Source: City of Redlands. Californ a, 2017; Redlands Corservarcy, 2013; San Bernardino County, 2015; ESRI, 2015: SANBAG, 2015: Dyect & Bhatia, 2017. CROSSROADS Redlands Municipal Airbort CAPRI AVE Sphere of Influence County Boundary City of Redlands Sports Modified Rozds Major Arterial Minor Arrerial Major Arterial Minor Arrerial Rural Arrerial Local Roads Collector Proposed Roads Collector Froeway **Existing Roads** яа мояам E PIONEER AVE F SAN BERNARDINO AVE SGROVEST rs nosan E PENNSYLVANIA AVE ST SCOVE CROVE E CITRUS AVE E BROCKTON AVE SY YAN BUND CENTRAL AVE Sylvan Park **NAINERSITY ST** OCCIDENTAL DR CENTRAL ВЕККЕГЕ<mark>,</mark> DK AWERVIEW DR. HART ZELL AVE DOYLE AVE N CHURCH ST Community F LUGONIA AVE Park Terrace The Orange Alley Ed Hales W REDLANDS BLVD T2 BDNA90 W SUNAVE V BROCKTON AVE Beal Par A PEZZSYLVANIA Israel W WESTERN AVI BSTER ST ED 3FOW DR SITE SITE TZ MORAN Power T W PIONEER AVE DOMESTICAVE Jennie Davis Park state st TENNESSEE ST KAMSAS ST orange ave Teritoge Park W REDLANDS B **MEVADA ST** <u>0</u> MENA JEKSY ST TTO AVE ey. dor

EXHIBIT 3-2: CITY OF REDLANDS GENERAL PLAN ROADWAY CLASSIFICATION



EXHIBIT 3-3 (10F4): CITY OF REDLANDS GENERAL PLAN ROADWAY CROSS-SECTIONS





c. Local Street (Standard)

- Street sections are illustrative. Minor variations and deviations from dimensions are permitted, and would not require a General Plan Amendment.
- Bicycle facilities are based on dimensions included in the Bicycle Facility Design Guidelines for the Bicycle Master Plan (2015).



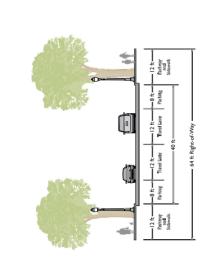
b. Boulevard (Complete Streets)

- 96-106 ft Right-of-Way -

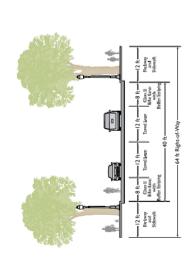
a. Boulevard (Standard)

Parkway and Sidewalk

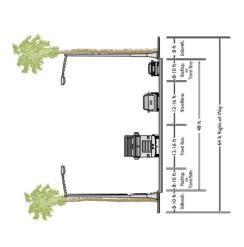
EXHIBIT 3-3 (20F4): CITY OF REDLANDS GENERAL PLAN ROADWAY CROSS-SECTIONS



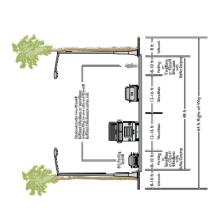




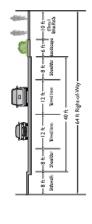
e. Collector – Residential (Complete Streets)



f. Collector - Industrial (Standard)



g. Collector - Industrial (Complete Streets)



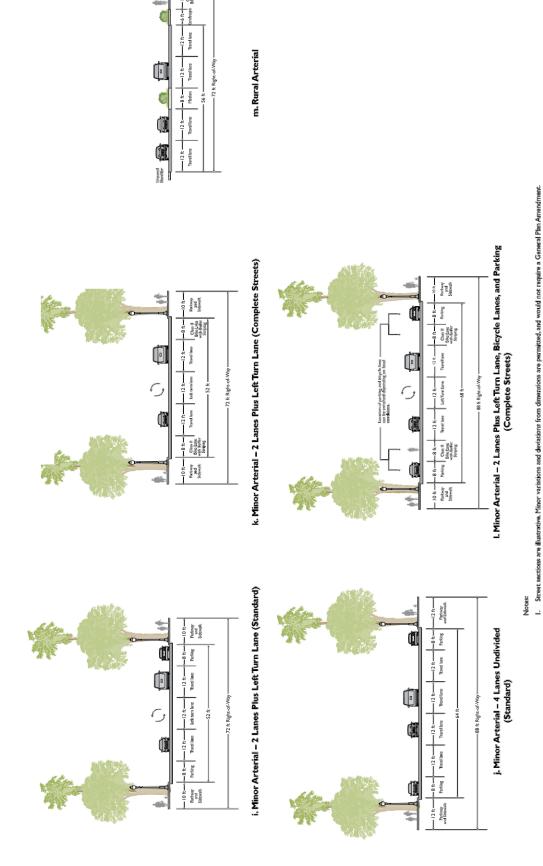
h.Alternative Collector



- Street sections are illustrative. Minor variations and deviations from dimensions are permitted, and would not require a General Plan Amendment.
- Bitycle facilities are based on dimensions included in the Ricycle Facility Design Guidelines for the Bicycle Master Plan (2015).



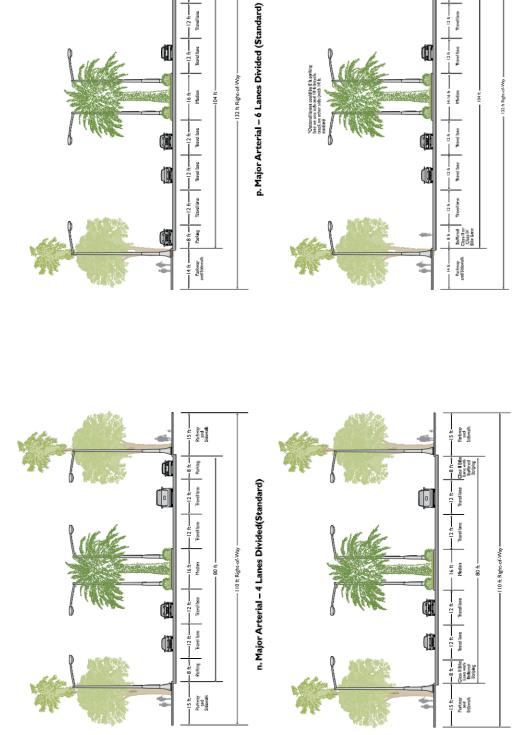
EXHIBIT 3-3 (30F4): CITY OF REDLANDS GENERAL PLAN ROADWAY CROSS-SECTIONS





2. Bicycle facilities are based on dimensions included in the Bicycle Facility Design Guidelines for the Bicycle Master Plan (2015).

EXHIBIT 3-3 (40F4): CITY OF REDLANDS GENERAL PLAN ROADWAY CROSS-SECTIONS



q. Major Arterial – 6 Lanes Divided (Complete Streets)

Buffered Class II or Class IV Bite Lane

*Optional layeur could be 8 ft parking. have on one side and 10 ft bisycle track on other side (with 14 ft. predian)

1. Street sections are illustrative. Prinor variations and devisations from dimensions are permitted, and would not require a General Plan Amendment

o. Major Arterial – 4 Lanes Divided (Complete Streets)

2. Bkycle facilities are based on dimensions included in the Bicycle Facility Design Guidelines for the Bicycle Master Plan (2015).

URBAN CROSSROADS

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EXHIBIT 3-4: EAST VALLEY CORRIDOR SPECIFIC PLAN CIRCULATION ELEMENT

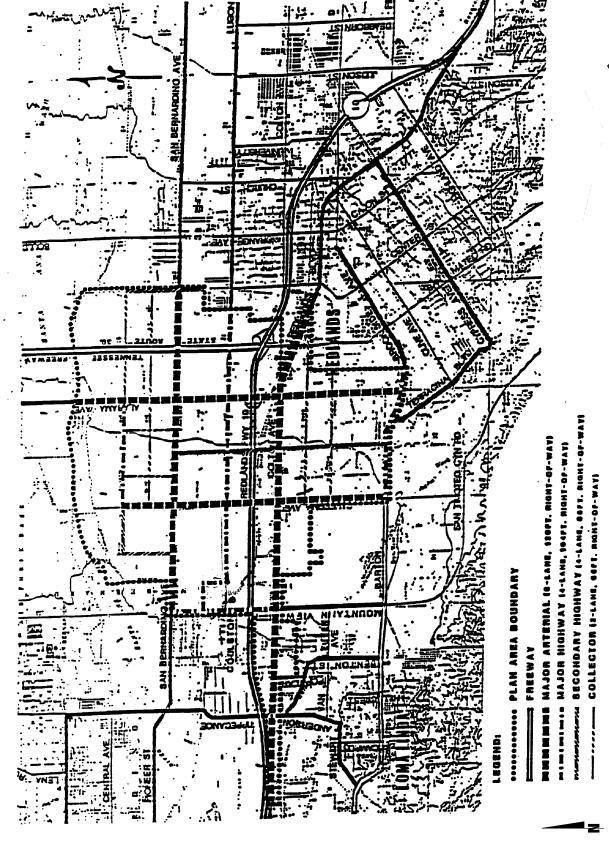
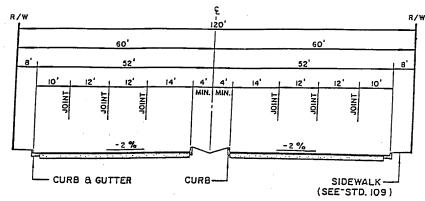


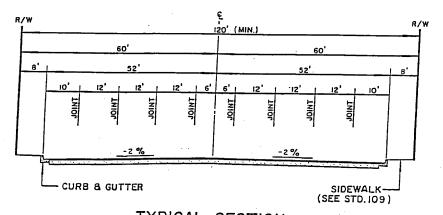
EXHIBIT 3-5 (1 of 5): EAST VALLEY SPECIFIC PLAN ROADWAY CROSS-SECTION

COMMUNITY DESIGN Circulation

City of Redlands as amended July 2, 1996



TYPICAL SECTION WITH RAISED MEDIAN



TYPICAL SECTION

WITH CONTINUOUS LEFT TURN LANE

NOTES:

- I. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS AND SO INDICATED ON CONSTRUCTION PLANS.
- 2. DRAINAGE FACILITIES SHALL BE PROVIDED TO DEWATER RAISED MEDIAN AREAS.
- 3.10' SHOULDER AREAS MAY BE DESIGNATED AS A BIKE LANE AND EMERGENCY PARKING ONLY.

FIGURE 4-2

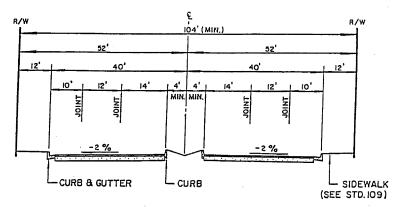
MAJOR ARTERIAL



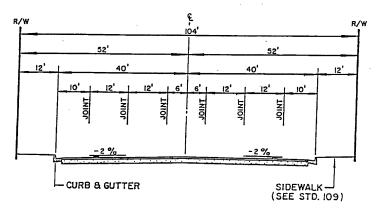
EXHIBIT 3-5 (2 OF 5): EAST VALLEY SPECIFIC PLAN ROADWAY CROSS-SECTION

COMMUNITY DESIGN Circulation

City of Redlands as amended July 2, 1996



TYPICAL SECTION WITH RAISED MEDIAN



TYPICAL SECTION WITH CONTINUOUS LEFT TURN LANE

NOTES:

- I. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS AND SO INDICATED ON CONSTRUCTION PLANS.
- 2. DRAINAGE FACILITIES SHALL BE PROVIDED TO DEWATER RAISED MEDIAN AREAS.
- 3.10' SHOULDER AREAS MAY BE DESIGNATED AS A BIKE LANE AND EMERGENCY PARKING ONLY.

FIGURE 4-3

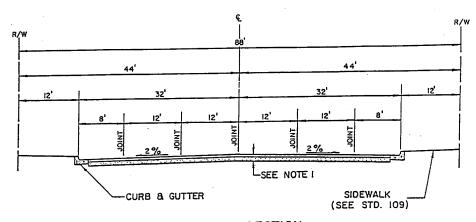
MAJOR HIGHWAY



EXHIBIT 3-5 (3 OF 5): EAST VALLEY SPECIFIC PLAN ROADWAY CROSS-SECTION

COMMUNITY DESIGN Circulation

City of Redlands as amended July 2, 1996



TYPICAL SECTION

NOTES:

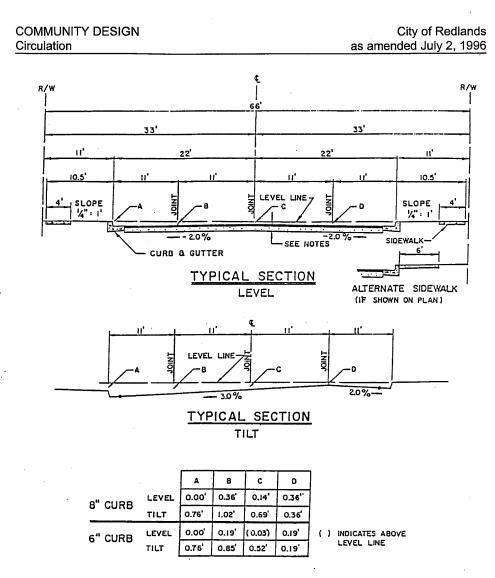
- I. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS AND SO INDICATED ON CONSTRUCTION PLANS.
- 2. 8' SHOULDER AREAS MAY BE DESIGNATED AS A BIKE LANE AND EMERGENCY PARKING ONLY.

FIGURE 4-4

SECONDARY HIGHWAY



EXHIBIT 3-5 (4 of 5): EAST VALLEY SPECIFIC PLAN ROADWAY CROSS-SECTION



NOTE

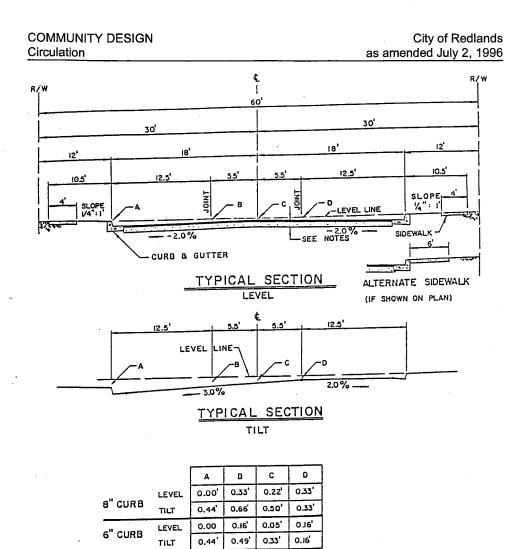
- L STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS AND SO INDICATED ON CONSTRUCTION PLANS.
- 2. MINIMUM DESIGN PAVING THICKNESS SHALL BE 0.20 ASPHALT CONCRETE.
- 3. CONSTRUCTION OUTSIDE R/W WILL REQUIRE SLOPE EASEMENTS.

FIGURE 4-5

COLLECTOR STREET



EXHIBIT 3-5 (5 OF 5): EAST VALLEY SPECIFIC PLAN ROADWAY CROSS-SECTION



NOTE

- I. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS
 AND SD INDICATED ON CONSTRUCTION PLANS,
 2. MINIMUM DESIGN PAVING THICKNESS SHALL BE 0.20' ASPHALT CONCRETE.
 3. CONSTRUCTION OUTSIDE R/W WILL REQUIRE SLOPE EASEMENTS
 4. WHEN PREPARING SUBGRADE FOR PAVING, CENTERLINE CROWN ON THE "LEVEL SECTION" SHALL BE
 RELOCATED EITHER LEFT OR RIGHT 0.50' TO MATCH CROWN BREAK IN PAVING MACHINE.

FIGURE 4-6

LOCAL STREET



Tennessee Street is a two-lane undivided roadway north of Lugonia Avenue and widens to a four-lane undivided roadway south of Lugonia Avenue. There are no curb and gutter improvements north of Lugonia Avenue and only on the right side of the street between Lugonia Avenue and Colton Avenue. South of Colton Avenue, both sides of the street have curb and gutter improvements. Tennessee Street is designated as a Minor Arterial (88-foot right-ofway) on the City of Redlands General Plan, with two travel lanes in each direction and 8-foot shoulders.

San Bernardino Avenue, west of Orange Street, is designated as a major arterial (6 lanes; 120-foot right-of-way) in the East Valley Corridor Specific Plan. The roadway cross-section for a major arterial consists of three travel lanes in each direction. San Bernardino Avenue is designated as a major arterial (132-foot right-of-way) between Texas Street and Orange Street with three travel lanes in each direction, and as a minor arterial (88-foot right-of-way) east of Orange Street with two lanes in each direction on the City of Redlands General Plan.

Lugonia Avenue, west of Karon Street, is designated as a major highway (4 lanes; 104-foot right-of-way) in the East Valley Corridor Specific Plan. The roadway cross-section for a major highway consists of two travel lanes in each direction with a continuous two-way left-turn lane.

3.3 BICYCLE AND PEDESTRIAN FACILITIES

The existing pedestrian facilities within the study area are shown on Exhibit 3-6. Existing bus stop locations, crosswalks, sidewalks and bike lanes are shown. Since many of the roadways are not fully constructed as designated in the City of Redlands Circulation Element, limited pedestrian facilities exist in the vicinity of the Project.

Exhibits 3-7 and 3-8 illustrates the planned trails and bikeways in the vicinity of the Project as included on the City of Redlands General Plan Bicycle Facilities and Multi-Use Trails.

3.4 TRANSIT SERVICE

The study area is currently served by Omnitrans, a public transit agency serving the County of San Bernardino and the City of Redlands, with bus service in the study area along San Bernardino Avenue and Lugonia Avenue via Route 15, as illustrated on Exhibit 3-9. Transit service is reviewed and updated by Omnitrans periodically to address ridership, budget and community demand needs. Changes in land use can affect these periodic adjustments which may lead to either enhanced or reduced service where appropriate.

3.5 Existing (2018) Traffic Counts

The intersection LOS analysis is based on the traffic volumes observed during the peak hour conditions using traffic count data collected in November 2018. The following peak hours were selected for analysis:



TENNESSEE ST DWY. 2 (6 SAN BERNARDINO AV. **TENNESSEE ST** В LUGONIA AV.

EXHIBIT 3-6: EXISTING PEDESTRIAN FACILITIES

LEGEND:





= CROSSWALK ON ALL APPROACHES

- CROSSWALK ON THREE APPROACHES

- BUS STOP В
- = NO CROSSWALK
- 0





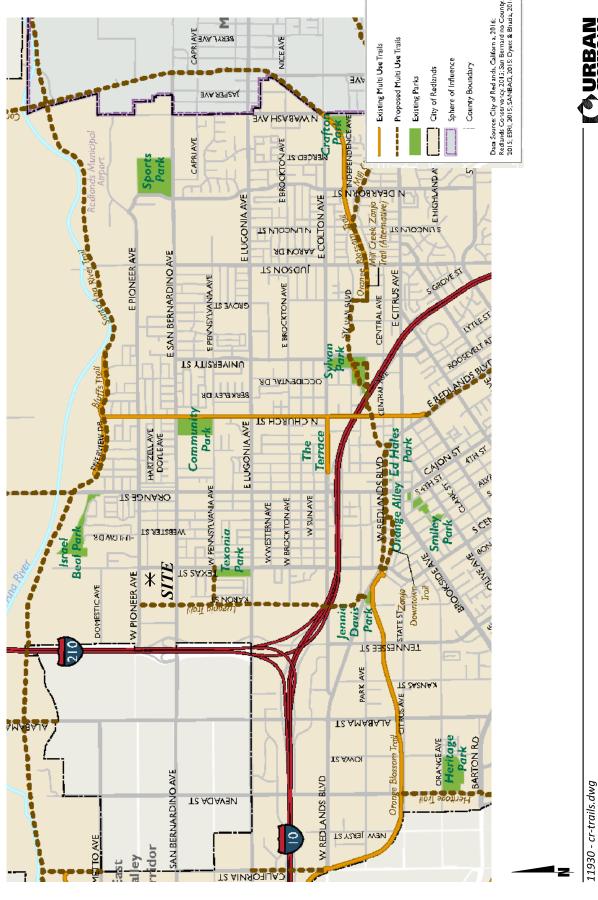


Dam Source: Cry of Redlands, Californ a, 2016; San Berrardino County, 2015; ESRI, 2015; SANBAG, 2015; Dyert & Bhacia, 2016. ELUGONIA AVE Red Red CROSSROADS Existing Class II - Green Paint Proposed Bicycle Route E PIONEEKAVE TS MJO: Sphere of Influence County Boundary Proposed Class | City of Redlands Existing Class II EBROCKTON AVE Existing Class 1 E SAN BERNARDINO AVE Ü UNIVERSITY ST ВЕВКЕГЕ<mark>Л</mark> ОВ UGONIA AV HARTZELL AVE DOYLEAVE Commu •Terrace W SUN AVE W WESTERN AVE T2 AST283W xonia Beal DOMESTIC AVE LEMMESS 15 AMARANA SAN BERNARDING AVE A REDIANDS BIVD NEVADA ST A)V EB2X 2T T2 AIN/AD7IJAD Corridor Valt dino ALMOND AVE MARIGOLD ST 11930 - cr-bikes.dwg

EXHIBIT 3-7: CITY OF REDLANDS GENERAL PLAN BICYCLE FACILITIES

Data Source: City of Red ands, Californ a, 2016; Redlands: Conservancy, 2015; San Bernard no County, 2015; ESRI, 2015; SANBAG, 2015; Dyect & Bhada, 2016. Sphere of Influence County Boundary ROOSEVELT RY Pilling 5 CET 80h Heritage Park BARTON RO

EXHIBIT 3-8: CITY OF REDLANDS GENERAL PLAN MULTI-USE TRAILS



PIONEER AV DWY. 2 6 SITE SAN BERNARDINO AV. **TENNESSEE ST** LUGONIA AV.

EXHIBIT 3-9: EXISTING TRANSIT ROUTES



= OMNITRANS ROUTE 15





- Weekday AM Peak Hour (peak hour between 7:00 AM and 9:00 AM)
- Weekday PM Peak Hour (peak hour between 4:00 PM and 6:00 PM)
- Weekday Mid-day Peak Hour (peak hour between 2:00 PM and 4:00 PM)

The weekday AM, weekday Mid-day, and weekday PM peak hour count data is representative of typical weekday peak hour traffic conditions in the study area. Pursuant to discussions with City staff, all the study area intersections were evaluated during the weekday mid-day peak hour to determine the operational effects of the near-by elementary school to these study area intersections. There were observations made in the field that would indicate atypical traffic conditions on the count dates, such as construction activity or detour routes and near-by schools were in session and operating on normal schedules. Lugonia Avenue experienced lane closures on the date which counts were taken. With the direction of City staff, 2015 and 2017 historical counts at the intersection of Texas Street & Lugonia Avenue were utilized to in order to determine an ambient growth. The resulting ambient growth was applied to the raw November 2018 counts for Texas Street & Lugonia Avenue.

The raw manual peak hour turning movement traffic count data sheets are included in Appendix 3.1. These raw turning volumes have been flow conserved between intersections with limited access, no access and where there are currently no uses generating traffic (e.g., between ramp-to-arterial intersections, etc.).

The traffic counts collected in November 2018 for the Caltrans ramp-to-arterial facilities include the vehicle classifications as shown below:

- Passenger Cars
- 2-Axle Trucks
- 3-Axle Trucks
- 4 or More Axle Trucks

To represent the impact large trucks, buses and recreational vehicles have on traffic flow at Caltrans intersections; all trucks were converted into Passenger Car Equivalents (PCEs). By their size alone, these vehicles occupy the same space as two or more passenger cars. In addition, the time it takes for them to accelerate and slow down is also much longer than for passenger cars, and varies depending on the type of vehicle and number of axles. For the purpose of this analysis, a PCE factor of 1.5 has been applied to 2-axle trucks, 2.0 for 3-axle trucks and 3.0 for 4+axle trucks to estimate each turning movement. These factors are consistent with the values recommended for use in the San Bernardino County CMP. (2)

Existing weekday average daily traffic (ADT) volumes on arterial highways throughout the study area are shown on Exhibit 3-10. Existing ADT volumes are based upon factored intersection peak hour counts collected by Urban Crossroads, Inc. using the following formula for each intersection leg:

Weekday PM Peak Hour (Approach Volume + Exit Volume) x 11.13 = Leg Volume



A comparison of the PM peak hour and daily traffic volumes of various roadway segments within the study area indicated that the peak-to-daily relationship is 8.98 percent. As such, the above equation utilizing a factor of 11.13 estimates the ADT volumes on the study area roadway segments assuming a peak-to-daily relationship of approximately 8.98 percent (i.e., 1/0.0898 = 11.13) and was assumed to sufficiently estimate average daily traffic (ADT) volumes for planning-level analyses. Existing weekday AM and weekday PM peak hour intersection volumes are also shown on Exhibit 3-10. Existing weekday Mid-day peak hour intersection volumes are shown on Exhibit 3-11.

3.6 Existing (2018) Conditions Intersection Operations Analysis

Existing peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.2 *Intersection Capacity Analysis* of this report. The intersection operations analysis results are summarized in Table 3-1 which indicates that the following existing study area intersections are currently operating at an unacceptable LOS during the peak hours:

Tennessee St. & San Bernardino Av. (#3) – LOS E AM peak hour; LOS F mid-day peak hour

Since the preparation of the TIA, a traffic signal has been installed at the intersection of Texas Street and Pioneer Avenue. The addition of a traffic signal is not likely to significantly increase the traffic volumes. The intersection of Texas Street & Pioneer Avenue was evaluated with a traffic signal, and found to operate at acceptable LOS during AM, mid-day and PM peak hours. Consistent with Table 3-1, a summary of the peak hour intersection LOS for Existing conditions are shown on Exhibit 3-12. The intersection operations analysis worksheets are included in Appendix 3.2 of this TIA.

3.7 TRAFFIC SIGNAL WARRANTS ANALYSIS

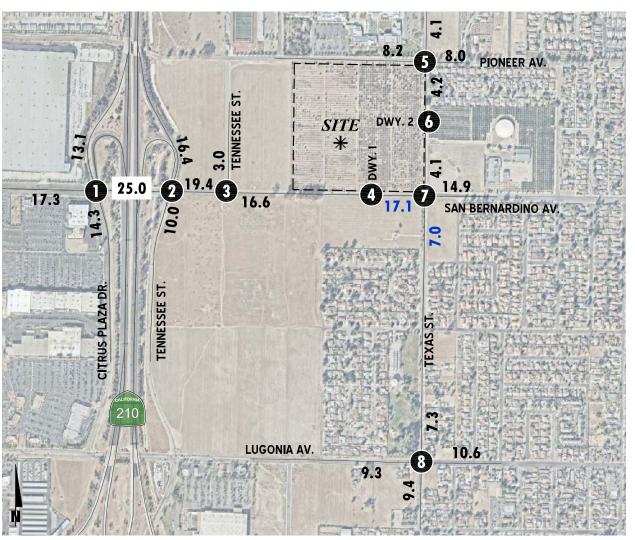
Traffic signal warrants for Existing traffic conditions are based on existing peak hour intersection turning volumes. The following study area intersection currently warrants a traffic signal for Existing traffic conditions:

Tennessee St. & San Bernardino Av. (#3)

Existing conditions traffic signal warrant analysis worksheets are provided in Appendix 3.3.



EXHIBIT 3-10: EXISTING (2018) TRAFFIC VOLUMES (IN PCE)



	1 SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	Tennessee St. &		Dwy. 1 & San Bernardino Av.	5 Texas St. & Pioneer Av.	
_	22(2,049) 22(2,049) 22(3,049) 22(49) 22(49) 22(49) 22(49) 22(49) 22(49) 23(49) 24(49) 24(49) 24(49) 24(49) 25(49) 26(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49) 27(49	135(341) 34(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436) 101(436	218(149) 271(968)	Future Intersection	83(97) 125(48) 69(368) 69(368) 69(54) 72(76) 72(76) 69(54) 72(76) 72(76) 72(76)	
Ī	6 Texas St. & Dwy. 2	7 Texas St. & San Bernardino Av.	8 Texas St. & Lugonia Av.			ı
	Future Intersection	36(34) + + 124(14g) - 65(43) 36(34) + + 124(14g) - 65(43) 30(126) + (1(11g) + (12g) 30(126) + (12g) 30	12(23) + (843) 12(23) + (1661) 159(412) + (1661) 14(42) - (1661) 14(42) - (1661) 14(42) - (1661) 14(42) - (1661) 159(412) + (1661) 14(42) - (1661) 14(10.0 - VEHIC	M) PEAK HOUR INTERSEC CLES PER DAY (1000'S) IAL (COUNT-BASED) VEHI	

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EXHIBIT 3-11: EXISTING (2018) MID-DAY TRAFFIC VOLUMES (IN PCE)



1	SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	2 SR-210 NB Ramps/ Tennessee St. & San Bernardino Av.	San Bernardino Av.	4 Dwy. 1 & San Bernardino Av.	5 Texas St. & Pioneer Av.
	146 + 349 - 155 92 - + 270 - 155 - 250 - 250 - 250 - 250 - 370 - 250 - 370 - 370	472 - 470 472 - 470 472 - 49 472 - 49 472 - 49 88 - 49 98 95 188 - 88	0 E 12 ← 14 +543 125 → 752 →	Future Intersection	95 + 153 → 1 + 153 → 149 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 → 100 →
6	Texas St. & Dwy. 2	7 Texas St. & San Bernardino Av.	8 Texas St. & Lugonia Av.		
	Future Intersection	650 + 70 - 70 - 70 - 70 - 70 - 70 - 70 - 7	34 29 42 375 42 42 42 42 42 43 44 45 45 46 47 47 48 48 48 48 48 48 48 48 48 48	LEGEND: 100 = MID-I	DAY INTERSECTION VOLUMES

URBAN

Intersection Analysis for Existing (2018) Conditions

					_	ıterse	ction	Арр	Intersection Approach Lanes ¹	Lane	3S				Delay ²		ĭ	evel of	Jc	
		Traffic	_	hbou	pur	Sout	npont	pc	Northbound Southbound Eastbound Westbound	puno	>	estbo	pun		(secs.)		S	Service	e	Acceptable
#	# Intersection	Control ³		_	8	L		~	L 1		L	_	R	LTRLTRLTRM H	MD	PM AM MD PM	AM	MD	PM	108
1	1 SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.	TS	1	1	1>	1	2	0	1 2	1	1	1	1	1 1 1 36.4 35.0 37.7 D C	35.0	37.7	Ω	2	Q	Q
7	2 SR-210 NB Ramps/Tennessee St. & San Bernardino Av.	TS	1	7	0	T	T	0	2 1		1	Н	1	1 29.2 42.3 49.4 C	42.3	49.4	S	Ω	٥	Q
3	3 Tennessee St. & San Bernardino Av.	CSS	0	0	0	0	1	0	0 1	0	0	Т	0	0 49.6 122.1 15.9 E	122.1	15.9	ш	ш	C	S
4	4 Driveway 1 & San Bernardino Av.				•	Ĭ.	uture	Inte	uture Intersection	uc										S
2	5 Texas St. & Pioneer Av.	TS	1	П	0	1	Η.		0 1	0	0	Н	0	1 0 1 1 1 0 1 0 0 1 0 20.4 20.7 15.5 C C	20.7	15.5	O	C	В	U
9	6 Texas St. & Driveway 2				•	Ĭ.	uture	Inte	Future Intersection	uc										U
7	7 Texas St. & San Bernardino Av.	TS	0	Т	0	0	1	0	0 0 1 0 1 1 0 1	0	1	Н	1	1 1 12.8 12.8 22.3 B	12.8	22.3	В	В	C	U
8	8 Texas St. & Lugonia Av.	TS	0	1	р	0	1	р	1 2	0	1	2	0	0 1 d 0 1 d 1 2 0 1 2 0 20.5 27.2 27.7 C C C	27.2	27.7	C	С	O	С

BOLD = Level of Service (LOS) does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; > = Right-Turn Overlap Phasing; d= Defacto Right Turn Lane

Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

CSS = Cross-street Stop; TS = Traffic Signal



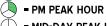
PIONEER AV. SITE DWY. 2 NA SAN BERNARDINO AV. 210 LUGONIA AV.

EXHIBIT 3-12: EXISTING (2018) SUMMARY OF LOS

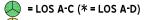


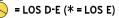


AM PEAK HOUR











NA - NOT AN ANALYSIS LOCATION FOR THIS SCENARIO





4 PROJECTED FUTURE TRAFFIC

This section presents the traffic volumes estimated to be generated by the Project, as well as the Project's trip assignment onto the study area roadway network. The Project is located south of Pioneer Avenue and west of Texas Street in the City of Redlands. The Project is proposed to consist of 207 single family residential dwelling units. It is assumed that the Project will be constructed and at full occupancy by 2024.

The Project is proposed to access San Bernardino Avenue via Driveway 1 and Texas Street via Driveway 2. Driveway 1 is proposed to have right-in/right-out/left-in only access and Driveway 2 is proposed to have full access.

4.1 PROJECT TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to and produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development.

The ITE *Trip Generation* manual is a nationally recognized source for estimating site specific trip generation. ITE recently released an updated edition of the *Trip Generation* manual (10th Edition) in 2017. (1) The Trip Generation manual is based on more than 4,800 trip generation studies submitted to ITE by public agencies, consulting firms, universities/colleges, developers, associations and local sections/districts/student chapters of ITE. The trip generation rates utilized for the purposes of this analysis are based upon data collected by the Institute of Transportation Engineers (ITE) and presented in ITE's most recent edition of *Trip Generation*, (10th Edition, 2017). The trip generation rate used and estimated Project traffic is summarized in Table 4-1. The Project is anticipated to generate a net total of approximately 1,956 trip-ends per day with 153 AM peak hour trips and 205 PM peak hour trips.

4.2 PROJECT TRIP DISTRIBUTION

Trip distribution is the process of identifying the probable destinations, directions or traffic routes that will be utilized by Project traffic. The potential interaction between the planned land uses and surrounding regional access routes are considered, to identify the route where the Project traffic would distribute. The Project trip distribution was developed based on anticipated travel patterns to and from the Project site has been developed based on an understanding of existing travel patterns in the area, the geographical location of the site, the site's proximity to the Citrus Valley High School and regional arterial and state highway system.



Table 4-1

Project Trip Generation Summary

		ITE LU	А	M Peak Ho	ur	P	M Peak Ho	ur	
Land Use	Units ²	Code	In	Out	Total	In	Out	Total	Daily
Project Trip Generation Rates:1									
Single Family Detached Residential	DU	210	0.19	0.55	0.74	0.62	0.37	0.99	9.44

			А	M Peak Ho	ur	Р	M Peak Ho	ur	
Land Use	Quantity	Units ²	In	Out	Total	In	Out	Total	Daily
Project Trip Generation Summary:									
Pioneer & Texas Residential	207	DU	39	114	153	128	77	205	1,956

¹ Trip Generation Source: Institute of Transportation Engineers (ITE), <u>Trip Generation Manual</u>, 10th Edition (2017).
² DU = Dwelling Units



PROJECT TRIP DISTRIBUTION

- 20 % of trips head to/come from north on SR-210
- 20 % of trips head to/come from south on SR-210
- 5 % of trips head to/come from west on San Bernardino Avenue
- 5 % of trips head to/come from south on Citrus Plaza Drive
- 5 % of trips head to/come from south on Tennessee Street
- 25 % of trips head to/come from south on Texas Street
- 15% of trips head to/come from east on San Bernardino Avenue
- 5% of trips head to/come from east on Pioneer Avenue

The total volume on each roadway was divided by the total site traffic generation to indicate the percentage of Project traffic that would use each component of the regional roadway system in each relevant direction. The Project inbound trip distribution pattern is graphically depicted on Exhibit 4-1. The Project outbound trip distribution pattern is graphically depicted on Exhibit 4-2. These distribution patterns were refined in the vicinity of the Project based on discussions with the City of Redlands as part of the traffic study scoping process.

4.3 MODAL SPLIT

Although the use of public transit, walking, and/or bicycling have the potential to reduce Project-related traffic, such reductions have not been taken into considerations in this traffic study in order to provide a conservative analysis of the Project's potential to result in significant traffic impacts.

4.4 PROJECT TRIP ASSIGNMENT

The assignment of traffic from the Project area to the adjoining roadway system is based upon the Project trip generation, trip distribution, and the arterial highway and local street system improvements that would be in place by the time of initial occupancy of the Project. Based on the identified Project traffic generation and trip distribution patterns, Project ADT, AM and PM peak hour volumes for the weekday are shown on Exhibit 4-3. Project mid-day peak hour volumes are shown on Exhibit 4-4.

4.5 BACKGROUND TRAFFIC

Future year traffic forecasts have been based upon six years of background (ambient) growth at 2% per year for 2024 traffic conditions as directed by City staff. This ambient growth rate is added to existing traffic volumes to account for area-wide growth not reflected by cumulative development projects. Ambient growth has been added to daily and peak hour traffic volumes on surrounding roadways, in addition to traffic generated by the development of future projects that have been approved but not yet built and/or for which development applications have been filed and are under consideration by governing agencies.



PIONEER AV TENNESSEE ST DWY. 2 55 SAN BERNARDINO AV. TENNESSEE ST. 210 LUGONIA AV.

EXHIBIT 4-1: PROJECT INBOUND TRIP DISTRIBUTION



10 = PERCENT TO PROJECT





PIONEER AV. TENNESSEE ST DWY. 255 55 SAN BERNARDINO AV. TENNESSEE ST. 210 LUGONIA AV.

EXHIBIT 4-2: PROJECT OUTBOUND TRIP DISTRIBUTION

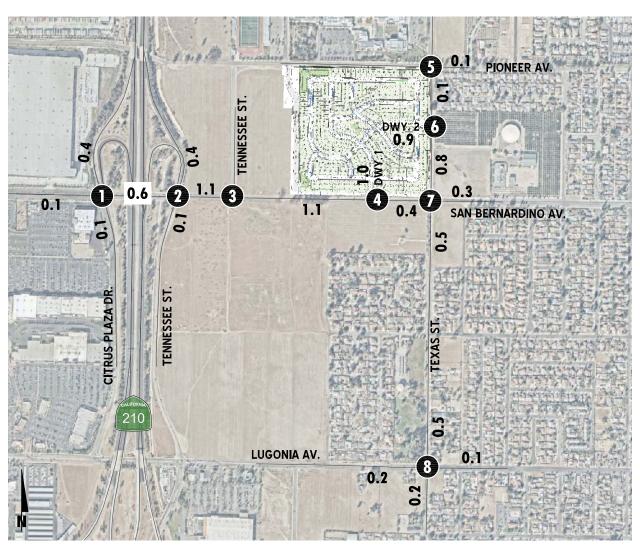


10 = PERCENT FROM PROJECT





EXHIBIT 4-3: PROJECT ONLY TRAFFIC VOLUMES



		O SB Ramps/ Is Plaza Dr. & ernardino Av.		10 NB Ramps/ nnessee St. & Bernardino Av.	San E	nnessee St. & Sernardino Av.	4	Dwy. 1 & San Bernardino Av.	5	Texas St. & Pioneer Av.	
	←0(0) ←0(0) ←8(26)	4—23(15) ←6(4) ←6(4)	←0(0) ←0(0) ←8(26)	23(15) -34(23) -6(4)	(0)0— •	€_0(0) •-63(42)		(2E) 15 ←8(26) ←11(8)	(0)0 (0)0 (0)0	4—0(0) ←0(0) ←2(6)	
	0(0)→ 2(6)→ 0(0)→	0(0) [→] 0(0)→ 2(6)→	0(0)— 12(39)→ 0(0)—		0(0)—• 22(71)—•			6(52)— 6(19)—	0(0)→ 0(0)→ 0(0)→	0(0)→ 0(0)→ 6(4)→	
ŀ	6	Texas St. & Dwy. 2		Texas St. & Bernardino Av.	8	Texas St. & Lugonia Av.					l
	(9)2 → → → 6(4) → 57(38) →	14(45) ^ 0(0)→	000 (000) (000) (000) (000) (000) (000) (000) (000) (000) (000)		(8) (8) (9) (13) (13) (10) (10) (10) (10)	-0(0) -0(0) -0(0) -1(0) -1(0) -1(0) -1(0) -1(0) -1(0)			M) PEAK HOU		TION VOLUMES

DWY. 2. 6

SAN BERNARDING AV.

LICKOR PLAZADOR

SAN BERNARDING AV.

EXHIBIT 4-4: PROJECT ONLY MID-DAY TRAFFIC VOLUMES

1	SR-210 SB Ramps/	2 SR-210 NB Ram	ns/ D Ta	ennessee St. &	1	Dwy. 1 &		Texas St. &
'	SR-210 SB Ramps/ Citrus Plaza Dr. &	Tennessee St	.& San	Bernardino Av.	San Be	ernardino Av.		Pioneer Av.
	San Bernardino Av.	San Bernardino 4_15 0 0 % +-23 - 4	av. 0 ↓ ↓	← 0 ← 42		<u>←</u> 26 ← 8	0	<u>↓</u> 0 ↓ 0 ↓ 6
		0 → 1 → 1 → 1 → 1 → 1 → 1 → 1 → 1 → 1 →	0— 71→	-	52 <u>→</u> 19→		0- 0- 0-,	0 0 4
6	Texas St. & Dwy. 2	7 Texas St San Bernardino	. & 8 Av.	Texas St. & Lugonia Av.				
	1			1	LE	GEND:		
		<u></u>		L _c	10	00 = MID-E	DAY INTERSE	CTION VOLUME
	9 +	∞ 6. 1. 4 13 0 0 0	8 8 4	→ 0				
	4-4 + 6 38-4 + 0	19—1 + F	13— 0— 0—					
			0-					

4.6 CUMULATIVE DEVELOPMENT TRAFFIC

CEQA Guidelines require that the impacts from the Project, along with the incremental cumulative impact from "closely related past, present and reasonable foreseeable probably future projects" to be analyzed. A cumulative project list was developed for the purposes of this analysis based on other studies performed in the area and reviewed by City of Redlands staff. Exhibit 4-5 illustrates the cumulative development location map. Cumulative development ADT, AM and PM peak hour volumes for the weekday are shown on Exhibit 4-6. Cumulative development mid-day peak hour volumes are shown on Exhibit 4-7.

A summary of the cumulative development projects and their respective land uses are provided on Table 4-2.

4.7 OPENING YEAR CUMULATIVE (2024) CONDITIONS

The "buildup" approach combines existing traffic counts with a background ambient growth factor to forecast the near-term 2024 traffic conditions. An ambient growth factor of 12.62% accounts for background (area-wide) traffic increases that occur over time up to the year 2024 from the year 2018 (compounded two percent per year growth over a six year period). Traffic volumes generated by the Project are then added to assess the Opening Year cumulative (2024) With Project traffic conditions. The 2024 roadway network is similar to the existing conditions roadway network with the exception of the following:

• Driveways proposed to be developed by the Project and cumulative developments are assumed.

The near-term traffic analysis includes the following traffic conditions, with the various traffic components:

- Opening Year Cumulative (2024) Without Project
 - Existing counts
 - Ambient growth traffic (12.62%)
 - o Cumulative Development Project traffic
- Opening Year (2024) With Project
 - Existing counts
 - Ambient growth traffic (12.62%)
 - Cumulative Development Project traffic
 - Project traffic



EXHIBIT 4-5: CUMULATIVE DEVELOPMENT LOCATION MAP

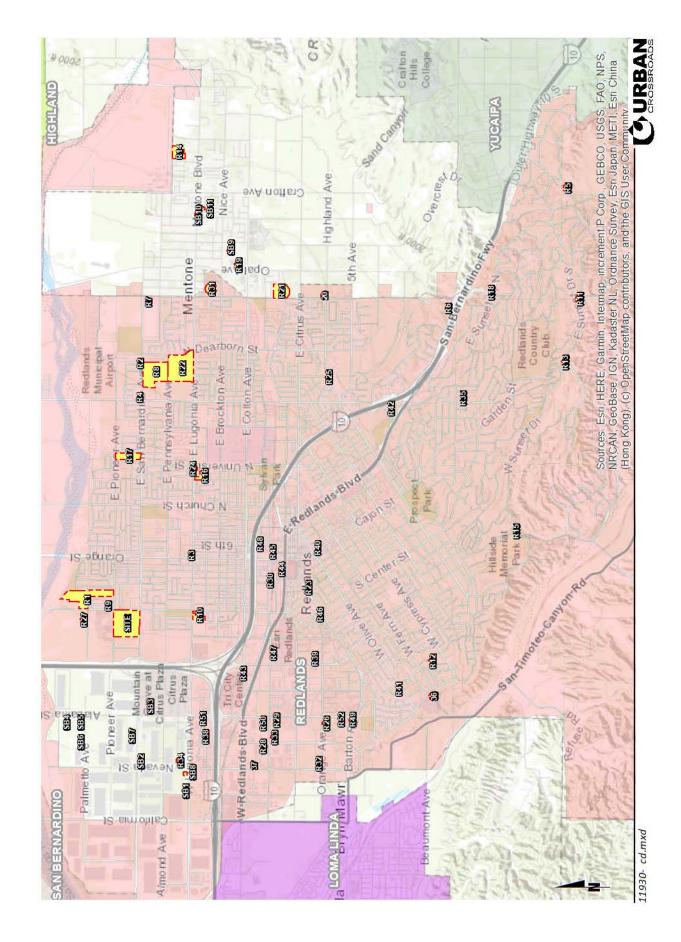


EXHIBIT 4-6: CUMULATIVE DEVELOPMENT ONLY TRAFFIC VOLUMES (IN PCE)



SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	2 SR-210 NB Ramps/ Tennessee St. & San Bernardino Av.	San Bernardino Av.	4	Dwy. 1 & San Bernardino Av.	5	Texas St. & Pioneer Av.	
99 00 = 29(20) -47(32) -15(10)	29(20) 4-75(50) 15(10)	© 0(0) → 77(52)		Future Intersection	←8(5) ←117(78) ←0(0)	←0(0) ←0(0) ←17(11)	
10(19) — T	51(93)→ 32(84)→ 0(0)→ 0(0)0	48(69)— 33(87)→			3(9)— 0(0)— 0(0)—	0(0)→ 41(132)→ 10(19)¬	
6 Texas St. & Dwy. 2	7 Texas St. & San Bernardino Av.	8 Texas St. & Lugonia Av.		LEGEND:			
Future Intersection	(00) (00) (00) (00) (00) (00)	0(0) 4-17(11) 0(0) 0(0) 0(0)		10(10) = AM(PM) 10.0 - VEHICL	PEAK HOUF ES PER DAY		ON VOLUMES
	35(106)→ 10(19)→ 0(0)→ 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0 0(0)0	9(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(19) → 10(1					



EXHIBIT 4-7: CUMULATIVE DEVELOPMENT ONLY MID-DAY TRAFFIC VOLUMES (IN PCE)



1	SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	2 SR-210 NB Ramps/ Tennessee St. & San Bernardino Av.	3 Tennessee St. & San Bernardino Av.	4 Dwy. 1 & San Bernardino Av.	5 Texas St. & Pioneer Av.
	18 - 30 - 9 - 18 - 117 - 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 0 00 00 00 00 00 00 00 00 00 00 00 0	\$\begin{align*} \begin{align*} \delta & -0 \\ \delta & -48 \\ 64 \delta & \text{80} \delta \\ 80 \delta & \text{80} \delta \\ \end{align*}	Future Intersection	0 + 0 + 2 2 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4
ϵ	Texas St. & Dwy. 2	7 Texas St. & San Bernardino Av.	8 Texas St. & Lugonia Av.		
	Future Intersection	0 + 10 	18— 18— 18— 18— 10— 10— 10— 10— 10— 10— 10— 10	LEGEND: 100 = MID-E	DAY INTERSECTION VOLUMES

Table 4-2 Page 1 of 2

Cumulative Development Land Use Summary

#	Name/Location	Land Use ¹	Quantity	Units ²
	City of Rec			
R1	Tract 18988	SFDR	82	DU
R2	Tract 18979	SFDR	55	DU
R3	Tract 18762	SFDR/MFH	228	DU
R4	Tract 20079	SFDR	14	DU
R5	Tract 18845	SFDR	24	DU
R6	Tract 16586	SFDR	76	DU
R7	Tract 16878	SFDR	76	DU
R8	Tract 19975	SFDR	67	DU
R9	Tract 17022	SFDR	12	DU
R10	CUP 1045	MFH	80	DU
R11	Tract 17265	SFDR	24	DU
R12	Tract 17675	SFDR	11	DU
R13	Parcel Map 17548	SFDR	3	DU
R14	Tract 16402	SFDR	26	DU
R15	Tract 16816	SFDR	10	DU
R16	Tract 16287	SFDR	12	DU
R17	Tract 18182	SFDR	27	DU
R18	Tract 17080	SFDR	8	DU
R19	Tract 18952	SFDR	131	DU
R20	Tract 19956	SFDR	40	DU
R21	Tract 19942	SFDR	34	DU
R22	Tract 20126	SFDR	105	DU
R23	CRA 893	MFH	8	DU
R24	CUP 1096	MFH	120	DU
R25	Tract 20065	SFDR	29	DU
R26	CUP 1108, GPA 140, SPA 45 & 46	MFH	412	DU
R27	Meritage Homes Tract	SFDR	173	DU
R28	CRA 879 - 2 Industrial Buildings	Warehouse	78.565	TSF
R29	CRA 880 - 3 Industrial Buildings	Warehouse	170.443	TSF
R30	CUP 905 (Revision 3) - Packing House District	Shopping Center	88.075	TSF
R31	CUP 1065 - RV Storage Expansion	Storage Facility	127.746	TSF
R32	CUP 616 Revision 2 - Addition to Private School	School	1.952	TSF
R33	CRA 894 - Industrial Building	Warehouse	153.944	TSF
R34	CRA 889 - Springhill Suites	Hotel	88.000	RMS



Page 2 of 2

Cumulative Development Land Use Summary

#	Name/Location	Land Use ¹	Quantity	Units ²
R35	CUP 114 (Revision 3) - Expansion of Existing Church/Preschool	Church	4.300	
R36	CUP 335 (Revision 14) Redlands Community Hospital	Hospital	8.530	TSF
R37	CRA 891 - Industrial Building	Light Industrial	16.676	TSF
R38	CUP 1076 - WoodSpring Suites	Hotel	123.000	RMS
R39	CRA 753 - Addition to Private School	School	1.200	TSF
R40	CRA 887 - Building Addition to Dentist Office	Medical-Dental Office Building	0.363	TSF
R41	CUP 343 Revision 1 - Addition to Private School	School	1.800	TSF
D42	CUD 40C4 CDA 000	Retail/Restaurant	5,000.000	TSF
K42	CUP 1061, CRA 889	Daycare	23.490	TSF
R43	CUP 1056 - Hilton Home	Hotel	77.000	RMS
R44	CUP - MOD Packinghouse	Fast Casual Restaurant	14.000	TSF
R45	CRA 898 - Krikorian Retail Center	Retail Center/Bank	15.200	TSF
R46	CUP 1103 - Museum of Redlands	Museum	20.658	TSF
R47	CRA 901 - ESRI Office Building	Office	100.800	TSF
		Gasoline Station w/ Convenience Market	3.000	TSF
R48	CUP 1104	Automatic Car Wash	1.300	TSF
		Fast-food w/o Drive-Through	1.326	TSF
R49	CUP 1107 - Medical Offices	Medical-Dental Office Building	3.098	TSF
R50	CRA 900 - Industrial Buildings	Warehouse	139.000	TSF
R51	CRA 902 - Car Wash self-serve drive-thru	Automatic Car Wash	8.000	TSF
R52	CUP 606, Revision No. 1	School	11.960	TSF
	County of San	Bernardino		
SB1	P201100550	Warehouse	426.000	TSF
SB2	Alabama Venture P201300529	General Light Industrial	94.600	TSF
		Shopping Center	1.850	TSF
SB3	Mountain Grove - SE corner of San Bernardino Av. & Alabama	Apartments	281	DU
363	St.	Hotel	200	RMS
		Theatre	4	SEATS
SB4	North of Palmetto Av., west of Alabama St.	High-Cube Warehouse	230.000	TSF
SB5	Nevada St. & Palmetto Ave. (Newcastle)	High-Cube Warehouse	590.000	TSF
SB6	Oakmont - North of Palmetto Av., between Nevada St. & Alabama St.	High-Cube Warehouse	561.000	TSF
SB7	P201700142	Warehouse	191.036	TSF
SB8	P201700245	MFH	360	DU
SB9	P201700273	Warehouse	205.953	TSF
SB10	P201700339	Shopping Center	9.100	TSF
SB11	P201800149	Carwash		

¹ SFDR = Single Family Detached Residential; MFH = Multifamily Housing



² TSF = Thousand Square Feet; DU = Dwelling Units; RMS = Rooms

4.8 Horizon Year (2040) Conditions

Traffic projections for Horizon Year (2040) Without Project conditions were derived from the San Bernardino Transportation Analysis Model (SBTAM) using accepted procedures for model forecast refinement and smoothing. The traffic forecasts reflect the area-wide growth anticipated between Existing conditions and Horizon Year (2040) traffic conditions. In most instances the traffic model zone structure is not designed to provide accurate turning movements along arterial roadways unless refinement and reasonableness checking is performed. Therefore, the Horizon Year (2040) peak hour forecasts were refined using the model derived long-range forecasts, base (validation) year model forecasts, along with existing peak hour traffic count data. The SBTAM has a base (validation) year of 2012 and a horizon (future forecast) year of 2040. The difference in model volumes (2040-2012) defines the growth in traffic over the 28-year period.

The refined future peak hour approach and departure volumes obtained from the model output data are then entered into a spreadsheet program consistent with the National Cooperative Highway Research Program (NCHRP Report 255), along with initial estimates of turning movement proportions. A linear programming algorithm is used to calculate individual turning movements which match the known directional roadway segment forecast volumes computed in the previous step. This program computes a likely set of intersection turning movements from intersection approach counts and the initial turning proportions from each approach leg.

The SBTAM uses an AM peak period-to-peak hour factor of 0.38 and a PM peak period-to-peak hour factor of 0.28. These factors represent the relationship of the highest single AM peak hour to the modeled three (3) hour AM peak period (an even distribution would result in a factor of 0.33) and the highest single PM peak hour to the modeled four (4) hour PM peak period (an even distribution would result in a factor of 0.25).

Horizon Year (2040) turning volumes were compared to Opening Year Cumulative (2024) volumes in order to ensure a minimum growth as a part of the refinement process. The minimum growth includes any additional growth between Opening Year (2024) and Horizon Year (2040) traffic conditions that is not accounted for by the traffic generated by cumulative development projects and ambient growth rates assumed between Existing and Opening Year (2024) conditions. Future estimated peak hour traffic data was used for new intersections to further refine the Horizon Year (2040) peak hour forecasts.

The future Horizon Year (2040) Without Project peak hour turning movements were then reviewed by Urban Crossroads for reasonableness, and in some cases, were adjusted to achieve reasonable growth. The result of this traffic forecasting procedure is a series of traffic volumes which are suitable for traffic operations analysis.

Post-processing worksheets for Horizon Year (2040) Without Project traffic conditions are provided in Appendix 4.1.



5 EXISTING PLUS PROJECT TRAFFIC ANALYSIS

In an effort to satisfy the CEQA Guideline section 15125(a), an analysis of existing traffic volumes plus traffic generated by the proposed Project (E+P) has been included in this analysis. This section discusses the traffic forecasts for E+P conditions and the resulting intersection operations and traffic signal warrants. Project impacts to baseline traffic conditions (i.e., existing conditions) have been identified along with mitigation measures necessary to reduce project-related impacts to less-than-significant.

5.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for E+P traffic conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

Driveways proposed to be developed by the Project are assumed.

5.2 EXISTING PLUS PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus Project traffic. The existing traffic was redistributed to account for some of the adjacent residential traffic from Riverview Drive accessing Texas Street via Street "B" instead of using Pioneer Avenue, which is congested during peak hours. Exhibit 5-1 shows the ADT, AM and PM peak hour volumes which can be expected for E+P traffic conditions. The mid-day peak hour volumes for E+P traffic are shown on Exhibit 5-2.

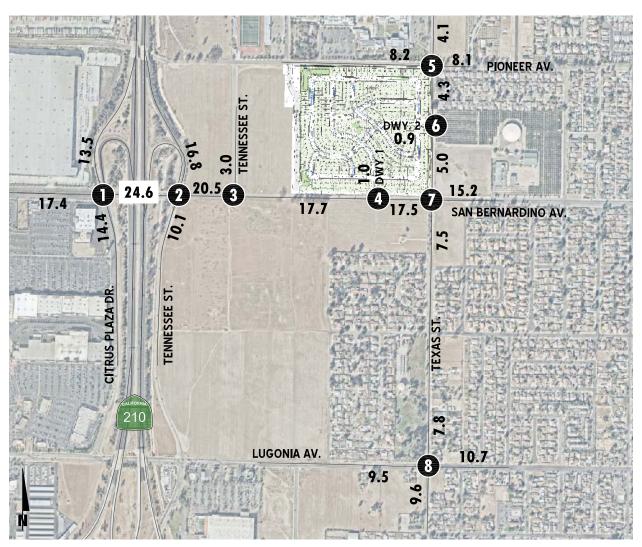
5.3 Intersection Operations Analysis

E+P peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.0 *Methodologies* of this TIA. The intersection analysis results are summarized in Table 5-1, which indicates that there are no additional study area intersections that are anticipated to operate at acceptable levels of service, in addition to the intersection previously identified under Existing (2018) traffic conditions.

Since the preparation of the TIA, a traffic signal has been installed at the intersection of Texas Street and Pioneer Avenue. The addition of a traffic signal is not likely to significantly increase the traffic volumes. The intersection of Texas Street & Pioneer Avenue was evaluated with a traffic signal, and found to operate at acceptable LOS during AM, mid-day and PM peak hours.

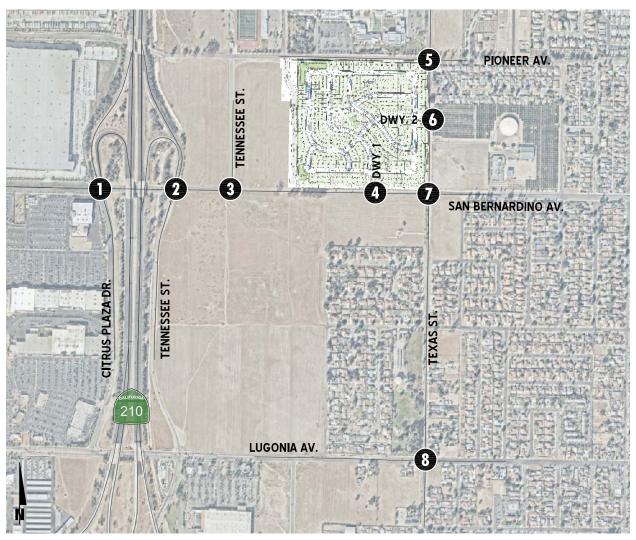


EXHIBIT 5-1: E+P TRAFFIC VOLUMES (IN PCE)



Citr	10 SB Ramps/ us Plaza Dr. & sernardino Av.	Ter	O NB Ramps/ nnessee St. & ernardino Av.	3 Ter San B	nnessee St. & Sernardino Av.	4 San B	Dwy. 1 & ernardino Av.	5	Texas St. & Pioneer Av.	
↑—317(216) ←274(466) ←318(301)	4343(145) 431(353) 447(166)	←135(174) ←5(20) ←162(330)	4—331(183) ←651(441) ←28(41)	^_140(107) ←7(3)	€_57(6) - 870(558)	← 51(35)	€—8(26) < -874(530)	←116(61) ←171(39) ←122(76)	4—28(53) ←192(81) ←51(72)	
28(39)→ 225(797)→ 21(119)→	6(40)— ⁴ 2(49)— 24(454)— ₉	101(436)— 331(777)→ 135(341)—	34(49)— ⁴ 259(373)— 18(81)— ₇	218(149)→ 293(1039)→		16(52)— 284(990)→		20(86)→ 69(368)→ 83(97)→	125(48) 69(54) 31(78) 	
6	Toyon Ct C	_	Texas St. &		Texas St. &			•		
6	Texas St. & Dwy. 2	/ San B	ernardino Av.	8	Lugonia Av.	LE	GEND:			
—————————————————————————————————————	Dwy. 2	←113(41) ←183(165) SS ←64(35) BU	*88(22) *-695(387) *-65(43)	√ ← 59(55) ← 272(224) ← 26(36)		10(M) PEAK HOU		TION VOLUMES

EXHIBIT 5-2: E+P MID-DAY TRAFFIC VOLUMES (IN PCE)



•	SR-210 SB Ram Citrus Plaza Dr San Bernardino	& Te	210 NB Ramps/ ennessee St. & Bernardino Av.	3 Tei San B	nnessee St. & ernardino Av.	4 San B	Dwy. 1 & ernardino Av.	5	Texas St. & Pioneer Av.
	161 -353 -159	← 143 ← 20 ← 251	4—249 ← 493 ← 53	^_210 ←33	<u>←</u> 14 ← 585	← 35	—26 ~ 565	1.56 ←114 ←112	4_77 ←153 _← 47
	92— 672— 57— 57— 57—	472— 635→ 188—		125⊸ 823⊸		52 <u>→</u> 804→		36⊸ 149→ 100⊸	58 4 88 58 7 88
•	Texas St Dwy	& 7 San	Texas St. & Bernardino Av.	8	Texas St. & Lugonia Av.	LE	GEND:		
	4_6 4-254	←72 ←159 ←63	4_45 -408 √46	←38 ←224 ←21	40 ←276 ←73	10	00 = MID-D	DAY INTERSE	CTION VOLUMES
	210 + 45 + 45 + 45 + 45 + 45 + 45 + 45 + 4	84— 650→ 70—	112— 125— 51—	42⊸ 375→ 42⊸,	64 ⁻⁴ 216 125 ⁻				



Intersection Analysis for E+P Conditions

				Exis	Existing (2018)	18)					E+P					
				Delay ¹		Le	evel of	f		Delay ¹		Le	Level of	-		
		Traffic		(secs.)		S	Service	4.)	(secs.)		Se	Service		Acceptable	Significant
#	Intersection	Control ²	AM	MD	PM AM MD PM	AM	MD		AM	MD	PM	AM	AM MD PM	PM	ros	Impact?
1	1 SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.	TS	36.4	35.0	37.7	D	С	D	37.2	35.4	38.3	Q	D	D	Q	No
2	2 SR-210 NB Ramps/Tennessee St. & San Bernardino Av.	TS	29.2	42.3 49.4	49.4	O	٥	۵	29.7	46.6	53.6	U	۵	٥	۵	No
m	3 Tennessee St. & San Bernardino Av.	CSS	49.6	49.6 122.1 15.9	15.9	Ш	ш	U	8.89	206.1	17.5	ш	ш	U	U	Yes
4	Driveway 1 & San Bernardino Av.	CSS	•	Future	Future Intersection	ectio			18.8	13.0	12.6	U	В	В	U	No
2	5 Texas St. & Pioneer Av.	TS	20.4	20.7 15.5 C C	15.5	ပ	O	В	19.7	20.7	14.5	В	O	В	O	No
9	6 Texas St. & Driveway 2	CSS		Future	Future Intersection	ectio			10.9	10.4	9.9	В	В	⋖	U	No
7	7 Texas St. & San Bernardino Av.	TS	12.8	12.8 22.3	22.3	В	В	O	14.5	14.0	28.1	В	В	U	O	No
∞	8 Texas St. & Lugonia Av.	TS	20.5	20.5 27.2 27.7 C C C 21.3 28.0	27.7	С	C	C	21.3	28.0	30.0 C	C	С	С	С	No

* BOLD = Level of Service (LOS) does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cros street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

² CSS = Cross-street Stop; TS = Traffic Signal; CSS = Improvement

A summary of the peak hour intersection LOS for E+P conditions are shown on Exhibit 5-3. The intersection operations analysis worksheets for E+P traffic conditions are included in Appendix 5.1 of this TIA.

These findings are consistent with the results of the Existing conditions analysis. Based on the City of Redlands' significance criteria as discussed in Section 2.5 Thresholds of Significance and as shown on Table 3-1, the addition of Project traffic is forecasted for result in a significant impact at the following intersections:

Tennessee St. & San Bernardino Avenue (#3)

5.4 TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for E+P traffic conditions are based on E+P ADT volumes. No future unsignalized intersections appear to warrant a traffic signal under E+P conditions in addition to those already warranted under Existing (2018) conditions.

Traffic signal warrant worksheets for E+P traffic conditions are included in Appendix 5.2 of this TIA.

5.5 IMPACTS AND RECOMMENDED IMPROVEMENTS

This section provides a summary of Project impacts and recommended improvements. Based on the significance criteria discussed in Section 2.5 *Thresholds of Significance*, the following intersections were found to be impacted by Project. Improvements necessary to reduce project-related traffic impacts to less than significant are also discussed below.

5.5.1 RECOMMENDED IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

The effectiveness of the proposed recommended mitigation measures is presented in Table 5-2 for E+P traffic conditions. With the implementation of the intersection mitigation measures discussed below, there are no project-related impacts anticipated to the study area intersections. The intersection operations analysis worksheets for E+P traffic conditions, with improvements, are included in Appendix 5.3 of this TIA.

Impact 1.1 – Tennessee Street & San Bernardino Avenue (#3) – Although this intersection was found to operate at an unacceptable LOS (LOS E or worse) during the AM and mid-day peak hours under Existing traffic conditions, the intersection is anticipated to continue to operate at unacceptable levels during both peak hours with the addition of Project traffic. As such, the impact is considered significant (Project Impact 1.1).

Mitigation Measure 1.1 – Tennessee Street & San Bernardino Avenue (#3) – The intersection of Tennessee Street & San Bernardino Avenue is currently operating at an unacceptable LOS and is anticipated to continue to operate at an unacceptable LOS under future scenarios. It is recommended that the Project stripe a southbound right turn lane in order to improve the traffic conditions to pre-project conditions or better.



PIONEER AV. TENNESSEE ST DWY. 2 SAN BERNARDINO AV. 210 LUGONIA AV.

EXHIBIT 5-3: E+P SUMMARY OF LOS





AM PEAK HOUR = PM PEAK HOUR



= MID-DAY PEAK HOUR



= LOS A-C (* = LOS A-D)



= LOS D-E (* = LOS E)



- LOS F





Table 5-2

Intersection Analysis for E+P Conditions With Improvements

					Int	erse	ctior	Аρр	roac	Intersection Approach Lanes ¹	es				Delay ²		7	Level of	f
		Traffic	Northbound Southbound Eastbo	hbol	pur	ont	hbou	lud E	astb	onno	<u>≯</u>	/estbounc	pund		(secs.)		S	Service	4
# Intersection		Control ³ L	1	_	8	1	⊢	R	. 7	T R	1	_	R	AM	TRLTRRDMMD PW MD PW MD PW	PM	AM	MD	PM
3 Tennessee St. & San Bernard	n Bernardino Av.																		
- Without Improvements	ments	CSS 0	0	0	0	0	1	0	0	1 0	0	1	0	49.6	0 0 0 0 1 0 0 1 0 0 1 0 0 1 0 49.6 122.1 15.9 E	15.9	ш	щ	O
- With Improvements	nts	CSS	0	0	0	П	0	1	0	1 0	0	1	0	39.8	0 0 0 1 <u>1 0 1</u> 0 1 0 0 1 0 <mark>39.8 44.3 16.0 E</mark>	16.0	Ε	Е	C

When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

 $L = Left; T = Through; R = Right; \underline{1} = Improvement$

control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop

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6 OPENING YEAR CUMULATIVE (2024) TRAFFIC ANALYSIS

This section discusses the methods used to develop Opening Year Cumulative (2024) Without and With Project traffic forecasts and the resulting intersection operations and traffic signal warrants.

6.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Opening Year Cumulative (2024) Without and With Project conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

 Driveways proposed to be developed by the Project and cumulative developments are assumed.

6.2 OPENING YEAR CUMULATIVE (2024) WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes, an ambient growth factor of 12.62% and traffic from pending and approved but not yet constructed known development projects in the area. The weekday ADT, AM and PM peak hour volumes which can be expected for Opening Year Cumulative (2024) Without Project traffic conditions are shown on Exhibit 6-1. Opening Year Cumulative (2024) Without Project mid-day peak traffic volumes are shown on Exhibit 6-2.

6.3 OPENING YEAR CUMULATIVE (2024) WITH PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes, an ambient growth factor of 12.62%, traffic from pending and approved but not yet constructed known development projects in the area and the addition of Project traffic. The ADT, AM and PM peak hour volumes which can be expected for Opening Year Cumulative (2024) With Project traffic conditions are shown on Exhibit 6-3. Opening Year (2024) With Project mid-day peak traffic volumes are shown on Exhibit 6-4.

6.4 Intersection Operations Analysis

LOS calculations were conducted for the study intersections to evaluate their operations under Opening Year Cumulative (2024) Without Project conditions with roadway and intersection geometrics consistent with Existing conditions. As shown on Table 6-1, the study area intersections are anticipated to operate at acceptable levels of service under Opening Year Cumulative (2024) Without Project conditions with the exception of the following intersections:



EXHIBIT 6-1: OPENING YEAR CUMULATIVE (2024) WITHOUT PROJECT TRAFFIC VOLUMES (IN PCE)



1 SR-210 SB Ram Citrus Plaza D San Bernardino	r. & Tennessee St. &	San Bernardino Av.	4 Dwy. 1 & Pioneer Av. San Bernardino Av. 5 Texas St. & Pioneer Av.
392(16 308(272) 392(16 312(322) 392(16) 392(16) 392(16)	7) 999 - 776(524)	66(17) 68(7) 64(7) 41020(655)	Future Intersection $ \begin{array}{c c} \widehat{\mathbb{R}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} \\ \widehat{\mathbb{R}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} \\ \widehat{\mathbb{R}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} \\ \widehat{\mathbb{R}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} \\ \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}} & \widehat{\mathbb{C}$
332(1040) + (2, 2) (8, 8) (8, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1, 1040) + (1,	152(383) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105) (105)	293(237)→ 350(1215)→	28(109) 38(109) 38(109) 4 (109) 4 (109) 5 (109) 7 (109)
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	1 2		_



EXHIBIT 6-2: OPENING YEAR CUMULATIVE (2024) WITHOUT PROJECT MID-DAY TRAFFIC VOLUMES (IN PCE)



1	SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	2 SR-210 NB Ramps/ Tennessee St. & San Bernardino Av.	3 Tennessee St. & San Bernardino Av.	Dwy. 1 & San Bernardino Av.	5 Texas St. & Pioneer Av.
	221 +504 +504 -218 148 148 147 147 148 148 148 148 148 148 148 148	212 - 4 - 758 88 212 - 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 - 759 1 4 -	236→ 1124→	Future - Intersection	44—172 167—1986 44—172 167—1986 112—7
6	Texas St. & Dwy. 2	7 Texas St. & San Bernardino Av.	8 Texas St. & Lugonia Av.	LEGEND:	
	Future Intersection	297 - 457 297 - 454 297 - 451 297 - 451 783 - 454 297 - 454	440 + 666 + 147		DAY INTERSECTION VOLUMES



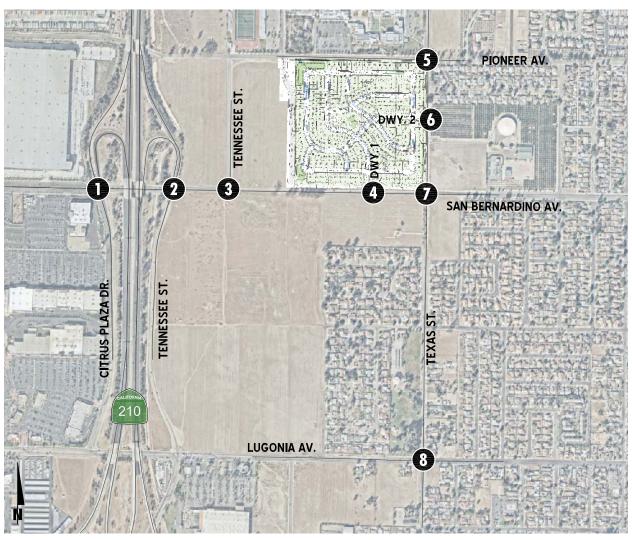
EXHIBIT 6-3: OPENING YEAR CUMULATIVE (2024) WITH PROJECT TRAFFIC VOLUMES (IN PCE)



Citru	IO SB Ramps/ IS Plaza Dr. & ernardino Av.	Tei	IO NB Ramps/ nnessee St. & sernardino Av.	3 Tei San B	nnessee St. & ernardino Av.	4 San i	Dwy. 1 & Bernardino Av.	5	Texas St. & Pioneer Av.	
←440(299) ←308(525) ←383(376)	4-415(181) 4-535(431) 6-67(196)	←168(206) ←6(23) ←205(417)	4—398(224) ←810(547) ←45(56)	^_170(129) ←8(3)	€—64(7) ← 1083(697)	← 51(35)	4 8(26) 4 1095(670)	←139(73) ←309(122) ←137(86)	4—31(60) ← 216(91) ← 74(91)	
41(63)→ 334(1046)→ 24(134)→	6(45)— 2(55)— 33(539)—	165(584)—⁴ 433(994)→ 152(383)—,	38(55)— 291(419)— 27(111)—	293(237)— ⁴ 372(1286)→		16(52)— 364(1237)→		26(106)— 78(414)→ 93(109)—	140(53)— ⁴ 119(193)— 44(106)— ₇	
6	Texas St. & Dwy. 2	7 San B	Texas St. & sernardino Av.	8	Texas St. & Lugonia Av.		CCND.			
22(38) (38) (4) (-2(6) (-2(6)	14(45)→ 297(348)→	249(38) - (241(203) - (241(203) - (241(203) - (241(203) - (241(203))	84(143) -799(445) -799(445) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443) -799(443		29(40) -443(298) -212(49) -(102)68	10	• • • • • • • • • • • • • • • • • • • •	M) PEAK HOU		TION VOLUMES



EXHIBIT 6-4: OPENING YEAR CUMULATIVE (2024) WITH PROJECT MID-DAY TRAFFIC VOLUMES (IN PCE)



Citrus F	SB Ramps/ Plaza Dr. & nardino Av.	Te	10 NB Ramps/ nnessee St. & Bernardino Av.	3 Ter San B	nnessee St. & ernardino Av.	4 San B	Dwy. 1 & ernardino Av.	5	Texas St. & Pioneer Av.
4 4 5 8	-236 -508 -222	170 ←23 ←356	4—306 ←-754 72	^_294 ←37	<u>←</u> 16 ← 839	← 35	<u>4</u> _26 - 821	←67 ←359 ←126	4—86 ←172 ←59
148→ 983→ 64→	67→ 431¬	632 981→ 212	41—4 435— 94—7	236⊸ 1195→		52 <i>—</i> ∲ 1181 <i>→</i>		44	358+ 81-
5 T	Texas St. & Dwy. 2	7 San i	Texas St. & Bernardino Av.	8	Texas St. & Lugonia Av.	LE	GEND:		
^_6 +-524		^_244 ←239 ←81	←51 ←477 ←51	←50 ←266 ←23	44 ←322 √83	1	00 = MID-0	DAY INTERSE	CTION VOLUMES
38— 38— 54	203 →	316— 783→ 82—		70⊸ 440→ 66⊸	84 ⁻⁴ 258 ⁻ 141 ⁻				

- SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av. (#1) LOS E PM peak hour only
- SR-210 NB Ramps/Tennessee St. & San Bernardino Av. (#2) LOS F mid-day and PM peak hours
- Tennessee St. & San Bernardino Av. (#3) LOS F AM, mid-day, and PM peak hours
- Texas St. & Pioneer Av. (#5) LOS D mid-day peak hour only
- Texas St. & San Bernardino Av. (#7) LOS E mid-day and PM peak hours
- Texas St. & Lugonia Av. (#8) LOS D AM and mid-day peak hours; LOS E PM peak hour

As shown on Table 6-1, the addition of Project traffic is not anticipated to result in any additional intersections to operate at an unacceptable LOS as compared to those identified previously for Opening Year Cumulative (2024) Without Project traffic conditions.

Based on the City of Redlands' significance criteria as discussed in Section 2.5 *Thresholds of Significance* and as shown on Table 6-1, the addition of Project traffic is forecasted for result in a significant cumulative impact at the following intersections:

- SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av. (#1)
- SR-210 NB Ramps/Tennessee St. & San Bernardino Av. (#2)
- Tennessee St. & San Bernardino Av. (#3)
- Texas St. & San Bernardino Av. (#7)
- Texas St. & Lugonia Av. (#8)

Consistent with Table 6-1, a summary of the peak hour intersection LOS for Opening Year Cumulative (2024) Without Project traffic conditions are shown on Exhibit 6-5. Consistent with Table 6-1, a summary of the peak hour intersection LOS for Opening Year Cumulative (2024) With Project conditions are shown on Exhibit 6-6.

The intersection operations analysis worksheets for Opening Year Cumulative (2024) Without Project conditions are included in Appendix 6.1 of this TIA. The intersection operations analysis worksheets for Opening Year Cumulative (2024) With Project conditions are included in Appendix 6.2 of this TIA. Measures to address the cumulatively considerable impacts for Opening Year Cumulative (2024) With Project traffic conditions are discussed in Section 6.6 Opening Year Cumulative (2024) Impacts and Recommended Improvements.

6.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for Opening Year Cumulative (2024) traffic conditions are based on Opening Year Cumulative (2024) Without and With Project ADT volumes. For Opening Year Cumulative (2024) Without Project traffic conditions, no additional intersections appear to warrant a traffic signal. With the addition of Project traffic, no study area intersections appear to warrant a traffic signal (see Appendix 6.3).



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Intersection Analysis for Opening Year Cumulative (2024) Conditions

			2	.024 Wi	2024 Without Project	rojec	t			2024 \	2024 With Project	ject			
				Delay ¹		Le	Level of			Delay ¹		Le	Level of		
		Traffic		(secs.)		Se	Service)	(secs.)		Š	Service	Acceptabl	Acceptable Significant
#	# Intersection	Control ²	AM	MD	PM	AM	AM MD PM		AM	MD	PM	AM	AM MD PM	V LOS	Impact?
1	1 SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.	TS	39.4	45.6	62.4	Q	٥	E '	40.8	49.9	0.99	O	D E	Ο	Yes
7	2 SR-210 NB Ramps/Tennessee St. & San Bernardino Av.	TS	36.0	36.0 128.5 106.9	106.9	۵	ш	ш.	38.8	144.0	38.8 144.0 123.1	۵	<u>.</u>	٥	Yes
m	3 Tennessee St. & San Bernardino Av.	CSS	100.0	>100.0	>100.0 >100.0 >100.0 F	ш	ш	Т.	100.0	100.0	F >100.0 >100.0 >100.0	ш	<u>.</u>	O	Yes
4	4 Driveway 1 & San Bernardino Av.	CSS	•	Future	Future Intersection	ction	•		14.1	14.1 12.0 11.1	11.1	В	В В	U	8
Ŋ	5 Texas St. & Pioneer Av. ³	TS	22.0	40.0	22.0 40.0 20.2 C D	O	٥	<u>၂</u>	21.6	31.1	16.5	U	C	U	8
9	6 Texas St. & Driveway 2	CSS	-	Future	Future Intersection	ction	-		11.1	12.1	10.3	В	В	O	N _o
7	7 Texas St. & San Bernardino Av.	TS	29.9	57.7	64.7 C		ш	ш	31.7	79.0	83.6	ပ	ш	O	Yes
∞	8 Texas St. & Lugonia Av.	TS	37.4	51.8	37.4 51.8 78.6 D D	۵	۵	E '	40.7	53.2	84.3	Δ	۵	J	Yes

* **BOLD** = Level of Service (LOS) does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

² CSS = Cross-street Stop; TS = Traffic Signal; <u>CSS</u> = Improvement

³ The Project is anticipated to construct an EB right turn lane. As such, the improvement has been assumed for the With Project scenario.

PIONEER AV. SITE DWY. 2 NA SAN BERNARDINO AV. 210 LUGONIA AV.

EXHIBIT 6-5: OPENING YEAR CUMULATIVE (2024) WITHOUT PROJECT SUMMARY OF LOS





AM PEAK HOUR



= PM PEAK HOUR = MID-DAY PEAK HOUR



= LOS A-C (* = LOS A-D)



= LOS D-E (* = LOS E)





- NOT AN ANALYSIS LOCATION FOR THIS SCENARIO





PIONEER AV. DWY. 2 SAN BERNARDINO AV. 210 LUGONIA AV.

EXHIBIT 6-6: OPENING YEAR CUMULATIVE (2024) WITH PROJECT SUMMARY OF LOS





AM PEAK HOUR = PM PEAK HOUR



= MID-DAY PEAK HOUR



= LOS A-C (* = LOS A-D)



= LOS D-E (* = LOS E)



- LOS F





6.6 RECOMMENDED IMPROVEMENTS

6.6.1 RECOMMENDED IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

Improvement strategies have been recommended at intersections that have been identified as significantly impacted by the Project, in an effort to reduce each location's peak hour delay and improve the associated LOS grade to pre-Project conditions or better. Significant impacts have been identified at deficient intersections if the Project contributes 50 or more peak hours.

The effectiveness of the recommended improvement strategies discussed below to address Opening Year Cumulative (2024) traffic deficiencies is presented in Table 6-2. Worksheets for Opening Year Cumulative (2024) Without and With Project conditions, with improvements, HCM calculation worksheets are provided in Appendix 6.4.





Intersection Analysis for Opening Year Cumulative (2024) Conditions With Improvements

					nter	ectic	on Ap	Intersection Approach Lanes	ch L	ane	г.,			Delay	ay²		Le	Level of	
		Traffic Northbound Southbound	North	nnoq	dSoι	ıthbc	punc		poq	۱ pu	Nest	Eastbound Westbound	р	(secs.	:s.)		Se	Service	
#	Intersection	Control ³	1	T R	1	-	R	_	-	R	_	T R	AM	MD MD		PM /	AM	MD	PM
1	1 SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.																		
	- Without Improvements	TS	⊣	1 1>	7	7	0	Н	7	П	1	1 1	40.8	8 49.9		0.99	۵	۵	ш
	- With Improvements	TS	1	1 1>	^	2	0	1	2	1	1	<u>2</u> 1	35.1	1 44.7		54.2	D	D	D
2	2 SR-210 NB Ramps/Tennessee St. & San Bernardino Av.																		
	- Without Improvements	TS	Т	2 0	1	7	0	7	1	1	Т	1 1	38.8		144.0 1	123.1	۵	ш	ш
	- With Improvements	TS	1	2 0	1	1	0	2	3	1	1	2 1	32.9	9 54.2		53.8	С	D	D
3	3 Tennessee St. & San Bernardino Av.																		
	- Without Improvements	CSS	0	0 0	0	Н	0	0	1	0	0	1 0	1209.9	9.9 164.4		1291.1	ш	ш	ш
	- With Improvements ⁴	CSS	0	0 0	1	0	1	0	1	0	0	1 0	214.8	.8 116.3		161.3	Ъ	F	ч
7	7 Texas St. & San Bernardino Av.																		
	- Without Improvements	TS	0	1 0	0	П	0	Н	1	0	Т	1 1	31.7	7 79.0		93.6	O	ш	ш
	- With Improvements ⁴	TS	1	1 0	1	1	1	1	7	0	1	<u>2</u> <u>0</u>	23.7	7 28.3		25.2	С	С	C
8	8 Texas St. & Lugonia Av.																		
	- Without Improvements	TS	0	1 d	0	Т	р	Т	7	0	П	2 0	40.7	7 53.2		84.3	۵	۵	ш
	- With Improvements	TS	T	1 d	0	П	р	П	7	0	Т	2 0	17.1	1 14.4		15.2	В	В	В
,																			

When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through



L = Left; T = Through; R = Right; > = Right-Turn Overlap Phasing; d= Defacto Right Turn Lane; $\underline{1}$ = Improvement

Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

CSS = Cross-street Stop; TS = Traffic Signal; <u>TS</u> = Improvement

⁴ Intersection delay is anticipated to improve with the construction of New York Street along the Project's western boundary.

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7 HORIZON YEAR (2040) TRAFFIC ANALYSIS

This section discusses the methods used to develop Horizon Year (2040) Without and With Project traffic forecasts and the resulting intersection operations and traffic signal warrants.

7.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Horizon Year (2040) Without and With Project conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

• Driveways proposed to be developed by the Project and cumulative developments are assumed.

7.2 HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-processed volumes obtained from the SBTAM (see Section 4.8 *Horizon Year (2040) Conditions* of this TIA for a detailed discussion on the post-processing methodology). The weekday ADT, AM and PM peak hour volumes which can be expected for Horizon Year (2040) Without Project traffic conditions are shown on Exhibit 7-1. Horizon Year (2040) Without Project mid-day peak traffic volumes are shown on Exhibit 7-2.

7.3 HORIZON YEAR (2040) WITH PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-processed volumes obtained from the SBTAM, plus the traffic generated by the proposed Project (see Section 4.8 *Horizon Year (2040) Conditions* of this TIA for a detailed discussion on the post-processing methodology). The ADT, AM and PM peak hour volumes which can be expected for Horizon Year (2040) With Project traffic conditions are shown on Exhibit 7-3. Horizon Year (2040) With Project mid-day peak traffic volumes are shown on Exhibit 7-4.

7.4 Intersection Operations Analysis

LOS calculations were conducted for the study intersections to evaluate their operations under Horizon Year (2040) Without Project conditions with roadway and intersection geometrics consistent with Existing conditions. As shown on Table 7-1, there are no additional study area intersections that are anticipated to operate at acceptable levels of service under Horizon Year (2040) Without Project conditions, in addition to the intersections previously identified under Opening Year Cumulative (2024) traffic conditions.



EXHIBIT 7-1: HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC VOLUMES (IN PCE)



SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	2 SR-210 NB Ramps/ Tennessee St. & San Bernardino Av.	San Bernardino Av.	4 San Be	Dwy. 1 & rnardino Av	5	Texas St. & Pioneer Av.	
(622) 87 -560(418) -573(528) -73(256)	637(512) -637(512) -97(914) -97(914) -44(80)	105(55) 105(55) 1001(1045	Futi Interse		152(80) -340(134) -177(94)	4—34(78) ←238(117) ←114(248)	
46(67)—3 ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑	181(609) 567(1284) 167(422) 3 (128) 167(422) 181(609) 1 (128) 1 (128	421(395)→ 552(1617)→			28(116)— ⁴ 87(432)→ 103(149)— ₄	179(59)— 131(212)— 107(154)—	
6 Texas St. & Dwy. 2		8 Texas St. & Lugonia Av.					
Future Intersection	49(142) 49(142) 49(142) 49(142) 49(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(142) 40(29(116) + (10,27) 8,8 8,6 6 208(716) + (20,27) 8,8 8,6 6 208(716) + (20,27) 8,8 8,6 6 208(716) + (20,27) 8,8 8,6 6	100		(PM) PEAK HO		CTION VOLUMES



EXHIBIT 7-2: HORIZON YEAR (2040) WITHOUT PROJECT MID-DAY TRAFFIC VOLUMES (IN PCE)



1	SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	Te	10 NB Ramps/ nnessee St. & Bernardino Av.	3 Tei San B	nnessee St. & ernardino Av.	4 San Bernai	Dwy. 1 & 5 rdino Av.	Texas St. & Pioneer Av.
	478 478 478 479 157 1128 70 70 70 70 70 70 70 70 70 70	662 1177 7 234 – 497	4 4 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	330-≯ 330-≯ 1450->	€_128 1460	Future Intersectio	on	48- 175- 191- 191-
6	Texas St. & Dwy. 2	7 San I	Texas St. & Bernardino Av.	8	Texas St. & Lugonia Av.			
	Future Intersection	79 — ↓ 351 — ↓ 1072 — 1273 191 — 191	===	25 	43 ←401 ←91 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 10	100		 Intersection volumes



EXHIBIT 7-3: HORIZON YEAR (2040) WITH PROJECT TRAFFIC VOLUMES (IN PCE)



Citru	IO SB Ramps/ IS Plaza Dr. & ernardino Av.	Tei	O NB Ramps/ nnessee St. & ernardino Av.	3 Te San E	nnessee St. & Bernardino Av.	4 San E	Dwy. 1 & Bernardino Av.	5	Texas St. & Pioneer Av.	
←484(329) ←331(577) ←481(484)	4—583(433) ←579(532) ←79(260)	←185(227) ←8(23) ←382(626)	←660(527) ←1013(937) ←50(84)	^_259(461) 9(38)	<u>105(55)</u> 1464(1087	(—51(35)	← 8(26) ← 1517(1108)	←152(80) ←340(134) ←177(94)	4—34(78) ←238(117) ←116(254)	
46(67)→ 393(1257)→ 28(147)→	10(50) - 5(83) - 53(612) -	181(609)— 579(1323)— 167(422)—	42(61)→ 318(430)→ 34(134)→	421(395)— ⁴ 574(1688)→		16(52)— 567(1674)→		28(116)— 87(432)→ 103(149)—	179(59)— ⁴ 131(212)— 113(158)— ₇	
6	Texas St. & Dwy. 2	7 San B	Texas St. & ernardino Av.	8	Texas St. & Lugonia Av.		-CEND			
6(4) 57(38)	14(45)→ 417(425)→	122(194) 122(194) 396(1338) 49(142)	121(185) 160(243) 26(88) 17(185) 18(183) 18(183) 19(182) 19(182) 19(182) 19(182) 19(182) 19(182) 19(182)	28(76) → 208(716) → 29(116) → 29(116) →	30(43) +777(371) -245(53) (S11)31 (S11)36	10	• • • • • • • • • • • • • • • • • • • •	M) PEAK HOU CLES PER DA		TION VOLUMES

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EXHIBIT 7-4: HORIZON YEAR (2040) WITH PROJECT MID-DAY TRAFFIC VOLUMES (IN PCE)



1	SR-210 SB Ramps/ Citrus Plaza Dr. & San Bernardino Av.	Tennessee St. &	3 Tennessee St. & San Bernardino Av.	4 Dwy. 1 & Fexal San Bernardino Av. 5 Texal Pion	s St. & eer Av.
	157 + 100 157 + 100	234 234 234 234 234 24 25 25 25 27 27 27 27 27 27 27 27 27 27	8 25 ←128 → 1502 330→ 1521→	52_3 1521-+ 26 48_3	7
6	Texas St. & Dwy. 2		8 Texas St. & Lugonia Av.	LEGEND:	
	9 + + + +	370 - 7 - 78 4 6 7 - 78 - 78 - 78 - 78 - 78 - 78 - 78 - 78	9 8 8 8 401 49 4401 -401 -91	100 = MID-DAY INTERSECTION	N VOLUMES
	38-4-54-80	79— 76 5 8 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	7 2 3 0 2 8 8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6		

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Intersection Analysis for Horizon Year (2040) Conditions

			2	.040 Wi	2040 Without Project	rojec	ŗ			2040 \	2040 With Project	ject				
				Delay ¹		Le	Level of			Delay ¹		Le	Level of			
		Traffic		(secs.)		Se	Service			(secs.)		Se	Service		ptable	Acceptable Significant
#	Intersection	Control ²	AM	MD	PM AM MD PM AM	٩M	MD	Z		MD	PM AM MD PM	IM	MD P		SOT	Impact?
1	1 SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.	TS	57.0	8.09	89.7	Е	E	ш	62.1	F 62.1 65.9 94.2		Е	_	ш.	D	Yes
2	2 SR-210 NB Ramps/Tennessee St. & San Bernardino Av.	TS	79.7	79.7 250.7 252.9	252.9	ш	ш	ш	86.7	86.7 269.3 271.9	271.9	ш			٥	Yes
3	3 Tennessee St. & San Bernardino Av.	CSS	×100.0	>100.0	>100.0 >100.0 >100.0 F	ш	ш		100.0	F >100.0 >100.0 >100.0	>100.0	ш			U	Yes
4	4 Driveway 1 & San Bernardino Av.	CSS	•	Future	Future Intersection	tion	•		18.7	18.7 19.1 14.0		C	ر د	<u> </u>	O	No
2	5 Texas St. & Pioneer Av. ³	TS	30.3	138.4	138.4 47.4 C F	ပ		٥	27.7	27.7 106.9 46.0	46.0	U	ш	_	O	Yes
9	6 Texas St. & Driveway 2	CSS	-	Future	Future Intersection	tion	•		12.0	12.0 16.4 11.9	11.9	В	-	<u>м</u>	O	No
7	7 Texas St. & San Bernardino Av.	TS	106.8	355.4	106.8 355.4 217.5 F	ш	ш	ш	108.4	108.4 475.6 227.4	227.4	ш			O	Yes
8	8 Texas St. & Lugonia Av.	TS	66.5	142.8	66.5 142.8 221.3 E		ш	ш	72.3	152.0	F 72.3 152.0 231.1 E	ш	ш	ш	C	Yes

* BOLD = Level of Service (LOS) does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

² CSS = Cross-street Stop; TS = Traffic Signal; CSS = Improvement

³ The Project is anticipated to construct an EB right turn lane. As such, the improvement has been assumed for the With Project scenario.



As shown on Table 7-1, the addition of Project traffic is not anticipated to result in any additional intersections to operate at an unacceptable LOS as compared to those identified previously for Horizon Year (2040) Without Project traffic conditions.

Based on the City of Redlands' significance criteria as discussed in Section 2.5 *Thresholds of Significance* and as shown on Table 7-1, the addition of Project traffic is forecasted for result in a significant cumulative impact at the following intersections:

- SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av. (#1)
- SR-210 NB Ramps/Tennessee St. & San Bernardino Av. (#2)
- Tennessee St. & San Bernardino Av. (#3)
- Texas St. & Pioneer Av. (#5)
- Texas St. & San Bernardino Av. (#7)
- Texas St. & Lugonia Av. (#8)

Consistent with Table 7-1, a summary of the peak hour intersection LOS for Horizon Year (2040) Without Project traffic conditions are shown on Exhibit 7-5. Consistent with Table 7-1, a summary of the peak hour intersection LOS for Horizon Year (2040) With Project conditions are shown on Exhibit 7-6.

The intersection operations analysis worksheets for Horizon Year (2040) Without Project conditions are included in Appendix 7.1 of this TIA. The intersection operations analysis worksheets for Horizon Year (2040) With Project conditions are included in Appendix 7.2 of this TIA. Measures to address the cumulatively considerable impacts for Horizon Year (2040) With Project traffic conditions are discussed in Section 7.6 Horizon Year (2040) Impacts and Recommended Improvements.

7.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for Horizon Year (2040) traffic conditions are based on Horizon Year (2040) Without and With Project volumes. For Horizon Year (2040) Without Project traffic conditions, no additional intersections appear to warrant a traffic signal. With the addition of Project traffic, no study area intersections appear to warrant a traffic signal (see Appendix 7.3).

7.6 HORIZON YEAR (2040) DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

7.6.1 RECOMMENDED IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

Improvement strategies have been recommended at intersections that have been identified as significantly impacted by the Project, in an effort to reduce each location's peak hour delay and improve the associated LOS grade to pre-Project conditions or better. Significant impacts have been identified at deficient intersections if the Project contributes 50 or more peak hours. The effectiveness of the recommended improvement strategies discussed below to address Horizon Year (2040) traffic deficiencies is presented in Table 7-2.



PIONEER AV. SITE DWY. 2 NA SAN BERNARDINO AV. 210 LUGONIA AV.

EXHIBIT 7-5: HORIZON YEAR (2040) WITHOUT PROJECT SUMMARY OF LOS





AM PEAK HOUR = PM PEAK HOUR



= MID-DAY PEAK HOUR



= LOS A-C (* = LOS A-D)



= LOS D-E (* = LOS E)





- NOT AN ANALYSIS LOCATION FOR THIS SCENARIO



PIONEER AV. DWY. 2 SAN BERNARDINO AV. 210 LUGONIA AV.

EXHIBIT 7-6: HORIZON YEAR (2040) WITH PROJECT SUMMARY OF LOS





AM PEAK HOUR = PM PEAK HOUR



= MID-DAY PEAK HOUR



= LOS A-C (* = LOS A-D)



= LOS D-E (* = LOS E)



- LOS F





Intersection Analysis for Horizon Year (2040) Conditions With Improvements

					Int	Intersection Approach Lanes	ction	App	roa	ch La	nes				De	Delay ²		Le	Level of	
		Traffic	Nort	hboı	pun	NorthboundSouthbound	noqu		Eastbound	nnoc		Westbound	uno	Б	es)	secs.)		Se	Service	
#	Intersection	Control ³	1	T	R	٦	T	R	. 7		R		R		AM N	MD	PM /	AM	MD	PM
1	1 SR-210 SB Ramps/Citrus Plaza Dr. & San Bernardino Av.																			
	- Without Improvements	TS	1	1	1	1	7	0	1	7	1	_	. 1		62.1 6	62.9	94.2	ш	ш	ш
	- With Improvements	TS	1	1	1>	1	2	0	1	3	1	. <u>3</u>	1		49.8 5	54.6	54.5	D	D	D
2	2 SR-210 NB Ramps/Tennessee St. & San Bernardino Av.																			
	- Without Improvements	TS	Т	7	0	1	1	0	7	Τ.	1	_	Π.	8	86.7 26	269.3	271.9	ш	ш	ш
	- With Improvements	TS	1	2	0	2	1	0	2	3	1	l <u>3</u>	1	46.	8	53.6	53.0	D	D	D
3	3 Tennessee St. & San Bernardino Av.																			
	- Without Improvements	CSS	0	0	0	0	1	0	0	Τ	0	0	0		>100.0 >100.0 >100.0	>0.00	100.0	ш	ш	ш
	- With Improvements ⁴	TS	0	0	0	1	0	1	1	3	0	0 3	0	32.	.6 24.	2	31.4	С	С	С
2	5 Texas St. & Pioneer Av.																			
	- Without Improvements	TS	1	1	0	1	7	0	1	1	1	_	0		27.7 10	106.9	46.0	ပ	ш	۵
	- With Improvements	TS	1	2	0	1	2	0	1	2 (0	<u>1</u> 2	0		30.2 3.	31.0	24.7	С	С	С
7	7 Texas St. & San Bernardino Av.																			
	- Without Improvements	TS	0	1	0	0	1	0	1	, T	0	_	. 1		108.4 47	475.6	227.4	ш	ш	ш
	- With Improvements ⁴	TS	1	2	0	1	1	1>	2	3	0	l <u>3</u>	0	23.	.7 30.	2	26.4	С	С	С
8	8 Texas St. & Lugonia Av.																			
	- Without Improvements	TS	0	1	σ	0	1	ъ	1	7	0	1 2	0		72.3 15	152.0 2	231.1	ш	ш	ш
	- With Improvements	TS	τI	1	σ	0	П	ъ	τ.	7	0	1 2	0		19.3 17	17.9	20.2	В	В	ပ
7					١															1

When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through



L = Left; T = Through; R = Right; >= Right-Turn Overlap Phasing; d= Defacto Right Turn Lane; <u>1</u> = Improvement

² Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

³ CSS = Cross-street Stop; TS = Traffic Signal; <u>TS</u> = Improvement

⁴ Intersection delay is anticipated to improve with the construction of New York Street along the Project's western boundary.

The Project Applicant shall participate in the funding of off-site improvements, including traffic signals that are needed to serve cumulative traffic conditions through the payment of City of Redlands DIF (if the improvements are included in the DIF program) or on a fair share basis (if the improvements are not included in the DIF program. These fees shall be collected by the City of Redlands, with the proceeds solely used as part of a funding mechanism aimed at ensuring that regional highways and arterial expansions keep pace with the projected population increases. Each of the improvements shown on Table 7-2 have been identified as being included as part of City DIF fee program or fair share contribution in Section 1.5 Local and Regional Funding Mechanisms of this TIA.

Worksheets for Horizon Year (2040) Without and With Project conditions, with improvements, HCM calculation worksheets are provided in Appendix 7.4.



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8 REFERENCES

- 1. Institute of Transportation Engineers. *Trip Generation*. 10th Edition. 2017.
- 2. **San Bernardino Associated Governments.** Congestion Management Program for County of San Bernardino: s.n., Updated June 2016.
- 3. **Transportation Research Board.** *Highway Capacity Manual (HCM).* s.l.: National Academy of Sciences, 6th Edition.
- 4. California Department of Transportation. Guide for the Preparation of Traffic Impact Studies.

 December 2002.
- 5. —. Manual on Uniform Traffic Control Devices (MUTCD). [book auth.] California Department of Transportation. *California Manual on Uniform Traffic Control Devices (CAMUTCD)*. 2014.



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Appendix H2 Traffic Impact Analysis Peer Review Letter

HERITAGE SPECIFIC PLAN
INITIAL STUDY



MEMORANDUM

To: Don Young, City of Redlands JN: 173796

From: Carla Dietrich, Michael Baker International

Date: August 5, 2019

Subject: Peer Review of the Pioneer & Texas Residential Traffic Impact Analysis in the City of Redlands

(Tentative Tract No. 20257, Heritage Specific Plan)

Michael Baker International has reviewed the draft Pioneer & Texas Residential Traffic Impact Analysis dated April 16, 2019, by Urban Crossroads. This peer review focused on the adequacy of the traffic study analysis (TIA) and documentation with respect to compliance with the jurisdictional requirements and standard industry practices, and the reasonableness of results. This memorandum is structured to discuss the study content including references to the subjects examined as part of the peer review. The comments on the TIA are organized separately following the topics evaluated.

Topics Evaluated

- Scoping Agreement/Coordination with the City Coordination with the City regarding the TIA for this project was conducted via an approved scoping agreement dated October 18, 2018, as documented in the appendices.
- Guidelines The study considered the following guidelines:
 - Congestion Management Program for County of San Bernardino (updated December 2007) The TIA references the use of the San Bernardino County CMP guidelines and the references section of the report states that the December 2007 version of the document was referenced. The latest version of the CMP guidelines is dated June 2016.
 - California Department of Transportation's (Caltrans) Guide for the Preparation of Traffic Impact Studies (December 2002).
 - The TIA stated that the methodologies utilized were consistent with City of Redlands traffic study guidelines.
 The City of Redlands does not have a formal study guideline document specific to the City and instead follows the CMP guidelines and industry standards.
- Site Map A site plan is provided in the TIA.
- Existing Intersection Geometry The intersection geometry identified in Exhibit 3-1 represents current conditions.
- Analysis Scenarios The TIA evaluated the appropriate analysis scenarios which are consistent with the San Bernardino County CMP guidelines and the approved scoping agreement.
- Traffic Count Data Traffic counts were conducted at the study intersections on Thursday, November 1, 2018, while local schools were in session. Additional counts along Lugonia Avenue from 2015 were also utilized per the direction of City staff.

- Heavy Vehicles Conversion of project trips to passenger car equivalents (PCE) was conducted using the San Bernardino County CMP factors.
- Project Land Use and Size The project description identifies 207 single-family residential dwelling units, which
 is consistent with the site plan. A total of 214 dwelling units were utilized in the preparation of the approved
 scoping agreement; however, this difference does not require revisions as the general findings of the scoping
 agreement are still applicable.
- Project Trip Generation Rates The daily AM peak and PM peak project trips were estimated based on the trip rates published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition*, which is an appropriate data source. The midday project trip calculation is not documented in Table 4-1.
- Project Trips The trip generation rates were correctly applied using 207 single-family dwelling units to obtain
 the AM peak hour and PM peak hour number of trips. The daily trip rate of 9.44 equates to 1,954 daily trips while
 Table 4-1 identifies 1,956 daily trips. Although the daily trips are slightly overestimated, this is not a significant
 issue which needs to be addressed.
- Project Trip Distribution Patterns The trip distribution patterns identified in Exhibits 4-1 and 4-2 of the TIA are
 not consistent with the trip distribution values documented in Exhibits 3 and 4 of the approved scoping
 agreement in the area of Texas Street and Lugonia Avenue.
- *Trip Assignments* Project trip assignments at the study intersections are consistent with the distributions shown in Exhibits 4-1 and 4-2. The project trips are not balanced between intersections; however, this results in a +/- 1 vehicle difference, which is negligible.
- Opening Year The project description states that all units are anticipated to be occupied by the year 2024.
 Thus the analysis of the opening year was assumed to be 2024, as documented in the approved scoping agreement.
- Study Analysis Locations The selection of the six off-site analysis intersections and two proposed site driveway
 intersections is reasonable based on the project trip generation and trip distribution. The study intersections are
 consistent with those listed in the approved scoping agreement.
- Study Period The analysis time periods contained in the TIA (weekday AM peak, weekday midday peak, and weekday PM peak) are consistent with the proposed land use type and existing surrounding land uses.
- Average Daily Traffic (ADT) Volumes The method utilized to determine ADTs based on a k-factor is sufficient.
- Traffic Volume Forecasts
 - Growth Rate The ambient growth rate of 2 percent per year was utilized, consistent with the assumption documented in the approved scoping agreement.
 - Existing + Project The TIA states on page 65 that Existing traffic was redistributed to account for some of the adjacent residential traffic from Riverview Drive accessing Texas Street via Street "B" instead of using Pioneer Avenue, which is congested during the peak hours. This would imply that Existing traffic was reassigned based on the desire to avoid congestion, which is not an appropriate method. The TIA does not provide enough information to determine if this assumption is appropriate.
- Cumulative Trip Generation Methodology



- The TIA includes a list of 64 cumulative projects in the region; however, it does not specifically identify which projects resulted in trips being added to the study intersections, how those trips were estimated, or the number of trips. The cumulative trip assignment could not be confirmed without this information.
- The TIA states that the Existing plus Project condition includes driveways proposed by cumulative projects. Were cumulative project volumes included in the Existing plus Project condition?

Operations Analysis

- The TIA utilized Synchro (version 10) as the analysis software.
- The analysis was based upon the latest version of the HCM, as appropriate.

Performance Standards

- o City of Redlands The TIA documents LOS C as the minimum level of service for intersections.
- Caltrans The TIA documents LOS D as the minimum level of service for intersections.
- Measure "U" The TIA documents LOS C as the minimum level of service for intersections.

Thresholds of Significance

- City of Redlands The TIA clearly states the thresholds of significance for City intersections, and states that the thresholds are based on the City of Redlands traffic study guidelines. This could not be confirmed since the City indicated that it does not have a traffic study guideline document. However, the thresholds presented in the report are consistent with those documented in the approved scoping agreement.
- Caltrans The TIA states that Caltrans does not have a threshold of significance for its facility. Utilizing the City thresholds for Caltrans facilities is appropriate.
- Measure "U" The TIA includes the Measure "U" thresholds, which require intersections to maintain LOS C or better, or not cause further level of service degradation where currently operating at worse than LOS C.
- Determination of Significant Impacts The process and results shown in the TIA are consistent with the methodologies documented.

Mitigation

- The mitigation measures identified result in acceptable projected traffic operations.
- Has Caltrans reviewed this proposed mitigation (Table 1-2 of the TIA) at the SR-210 Interchange with San Bernardino Avenue?

Mitigation Costs

- It appears that the costs associated with some of the improvements are incomplete. Do the costs include the additional turn lane or through lane, as well as any required receiving lanes? Not all of the receiving lanes are accounted for in other improvements/line items.
- The cost associated with adding a through lane under the 210 structure is shown as \$267,120, which is consistent with other widening costs in Table 1-2. This cross-section of roadway under the 210 appears to be maxed out. Are adding lanes under the crossing feasible, and if so, does the improvement cost include retaining walls or the necessary infrastructure?
- The fair share contribution summary indicates that \$15,770 would be contributed to Caltrans. Does Caltrans provide a mechanism in which to receive fair share payments?
- There appear to be some inconsistencies and errors in the column "Improvements in the City DIF?"

Project Access Control

- Traffic operations analysis was conducted for the two proposed access driveways. Driveways are projected to operate acceptably as stop-controlled conditions.
- The analysis of Texas Street @ Driveway #2 (Intersection #6) shows a northbound left-turn lane under the Horizon Year condition and a shared left-through lane under the Opening Year condition. Exhibit 1-4



indicates that a northbound left-turn lane will be provided via the diagram at the bottom of the exhibit; however, it is not discussed as part of the text on the Exhibit text.

- Project Driveway Sight Distance The TIA states that sight distance will be reviewed at the time of the final grading, landscape, and street improvement plans.
- Traffic Signal Warrant The warrant analysis utilized the California Manual on Uniform Traffic Control Devices
 (California MUTCD). Traffic signal warrant analysis results could not be confirmed since it appears that some of
 the warrant worksheets are missing from the appendices.
- Freeway Analysis Per the San Bernardino County CMP guidelines, freeway segments shall be analyzed if they
 carry at least 100 two-way peak hour trips. The estimated project trips do not meet this criterion, and thus the
 exclusion of freeway segment analysis in the TIA is appropriate.
- Senate Bill (SB) 743 The study does not provide any analysis or discussion relating to SB 743 or vehicle miles traveled. This is appropriate since the guidelines and the approved scoping agreement do not identify this as a requirement.
- Pedestrian and Bicycle Facilities The study documents the location of existing and planned bicycle and pedestrian facilities.
- Transit Services The study documents the existing transit services.
- Fair Share The TIA includes fair share calculations since off-site mitigation measures were identified. The fair share calculation methodology is appropriate.

Concerns and Recommendations

Below is a summary of the concerns regarding the traffic impact analysis.

Comment #1 – Summary of Improvements and Rough Order of Magnitude Costs – Page 12

Confirm that the improvements identified at the SR-210 intersections are feasible and that the cost considers the available right-of-way under the existing structure. Has a project been identified at this interchange and has Caltrans reviewed this improvement?

Comment #2 – Summary of Improvements and Rough Order of Magnitude Costs – Pages 12-13

Confirm that unit costs include both the approach and receiving lanes. Update the table to include the receiving lane costs if necessary.



<u>Comment #3</u> – Summary of Improvements and Rough Order of Magnitude Costs – Pages 12-13

The "Improvements in City DIF?" column appears to conflict with the projects listed in Tables IV-F5 through IV-F8 of the *Development Impact Fee Justification Study* (January 9, 2017). Reexamine the following improvements and update Table 1-2 as needed:

	Intersection	Improvement NOT included in City DIF projects
2	SR-210 NB Ramps/Tennessee St. & San Bernardino Av.	2 nd SB through lane
	SK-210 NB Kamps/Termessee St. & San Bernardino AV.	2 nd WB right turn lane
		SB shared through-right turn lane
5	Texas St. & Pioneer Av.	2 nd NB through lane
		2 nd EB through lane
7	Texas St. & San Bernardino Ave.	2 nd NB through lane

Comment #4 – Summary of Improvements and Rough Order of Magnitude Costs – Pages 11,13

The fair share contribution summary indicates that \$15,770 would be contributed to Caltrans. Update as needed to address the fact that Caltrans may not provide a mechanism in which to receive fair share payments.

Comment #5 – Exhibit 1-4, Page 20

Add text to support the Intersection #6 graphic to clearly state that a northbound left-turn lane will be provided at the intersection of Texas Street @ Driveway #2.

Comment #6 – Page 27

Under Section 2.5.1, the thresholds of significance are attributed to the City of Redlands traffic study guidelines. The City does not have a formal traffic study guideline document. Update the text to clarify the reference.

Comment #7 – Exhibit 3-8, Page 45

Exhibit 3-8 is missing. Replace Exhibit 3-10 on Page 45 with Exhibit 3-8.

Comment #8 – *Table 4-1, Page 54*

Update the exhibit to document the midday peak hour trip generation calculation.

Comment #9 - Exhibits 4-1 and 4-2, Pages 56-57

The project inbound and outbound trip distribution exhibits (Exhibits 4-1 and 4-2) do not match those included in the approved scoping agreement. Update the exhibits and analysis as needed to match the approved scoping agreement or provide documentation if the change was approved after the scoping agreement was finalized.

Comment #10 – Cumulative Development Traffic Page 60

Provide additional information regarding the cumulative projects including which projects are estimated to generate trips at the study intersection, the number of trips, and the source of the trip generation.

Comment #11 – Existing plus Project Roadway Improvements, Page 65

The TIA states that the Existing plus Project condition includes driveways proposed by cumulative developments. Update the text and confirm that analysis does not include cumulative projects under the Existing plus Project condition.

Comment #12 – Existing plus Project Traffic Volume Forecasts, Page 65

The reassignment of traffic implies that Existing traffic was adjusted based on the desire to avoid congestion, which is not an appropriate method. Expand the discussion to provide additional reasoning for this method or update the traffic volumes as appropriate.



Comment #13 – Table 5-1, Intersection Analysis for E+P Conditions, Page 68

Table 5-1 is consistent with the Synchro worksheet for Intersection #2. During the PM peak hour, the Synchro report shows a delay of 53.6 sec/veh, which results in a change in delay of 4.2 seconds. Update the table with the correct delay values.

Comment #14 – Table 5-1, Intersection Analysis for E+P Conditions, Page 68

Intersection #6 has a delay of 9.9 sec/veh which results in a LOS A. Update the table to change LOS B to LOS A.

Comment #15 – References, Page 97

The Congestion Management Program for County of San Bernardino references a December 2007 date; however, the latest version is dated June 2016. Update reference and confirm appropriate use of reference throughout the TIA.

Comment #16 – Appendices

Provide all warrant worksheets in the appendices.

