CSU Fullerton Eastside 2 Parking Structure

Initial Study – Mitigated Negative Declaration

prepared by

California State University, Fullerton
800 North State College Boulevard
Fullerton, California 92831
Contact: John Spencer, Project Manager
Office of Construction Management

prepared with the assistance of

Rincon Consultants, Inc.
250 East 1st Street, Suite 301
Los Angeles, California 90012

February 2019

RINCON CONSULTANTS, INC.
Environmental Scientists | Planners | Engineers
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Initial Study

1. Project Title

CSU Fullerton Eastside 2 Parking Structure

2. Lead Agency Name and Address

Trustees of the California State University
California State University, Fullerton
800 North State College Boulevard
Fullerton, California 92831

3. Contact Person and Phone Number

John Spencer, Project Manager
Office of Construction Management
(657) 278-7665

4. Project Location

The approximately 2.3-acre project site is located on the California State University Fullerton (CSU Fullerton) campus. CSU Fullerton is located in Orange County, just west of the Orange Freeway (State Route [SR]-57) in Fullerton, California. The campus is located approximately 10 miles southeast of the City of Los Angeles, 40 miles northwest of the City of San Diego, and 3 miles northwest of the City of Anaheim. The approximately 241-acre main campus comprises flat, urbanized area, and is interspersed with campus academic buildings, housing, athletic fields and facilities, and a circulation system. SR-57, Nutwood Avenue, State College Boulevard, and Yorba Linda Boulevard provide access routes to the campus.

The project site is located at the eastern edge of the campus, just west of SR-57 and Folino Road, as shown in Figure 2. Folino Road is an internal campus road that passes along the eastern edge of the CSU Fullerton campus, between Nutwood Avenue to the south and North Campus Drive to the north. The existing East Side Parking Structure, located on Lot E, is located just south of the project site.

5. Project Sponsor's Name and Address

California State University, Fullerton
800 North State College Boulevard
Fullerton, California 92831

6. CSU Fullerton Facilities Master Plan Designation

Surface Parking Lot E

7. Description of Project

Background

In 2003, CSU Fullerton prepared a Master Development Plan (MDP) which outlined growth and development on the campus. A Final Environmental Impact Report (FEIR) was prepared and approved that same year to analyze environmental impacts resulting from implementation of the MDP.

The MDP and FEIR accounted for an increase in student enrollment, building square footage on campus, and additional amenities needed to support these increases, including parking. In the 2003 MDP, a total of 2,477 new parking spaces were envisioned to be constructed on the campus in four commuter and three residential parking structures. This would bring the total number of on campus parking spaces to 12,341 by the end buildout of facilities included in the 2003 MDP.

While some of these parking spaces have been constructed, many have not, or have been constructed with fewer parking spaces than originally anticipated. The MDP envisioned a 2,000-space parking structure just south of the project site, and this structure was analyzed in the 2003 FEIR. In 2012, the Eastside Parking Structure was constructed; however only 1,500 spaces were built. Current parking space inventories show that a total of 11,262 parking spaces are present on campus. This is 1,079 spaces fewer than analyzed in the 2003 FEIR. An additional 544 parking spaces are available at the CSU Fullerton Irvine Campus, 186 more are provided at Titan Hall, and 59 previously provided in Byrnes Circle, Lot A South, and Lot G have been removed since 2003. These spaces were not included in the total number of parking spaces analyzed in the 2003 MDP and FEIR.

Since 2012, CSU Fullerton has found the demand for on-campus parking continues to increase, and the full number of parking spaces included in the 2003 MDP and analyzed in the FEIR are in demand. Although the 2003 MDP shows the site remaining in its current configuration as a surface parking lot, it was determined that this location could support an additional parking structure given its proximity to the Eastside Parking Structure constructed in 2012. The number of parking spaces included in the proposed parking structure cannot exceed the total number of parking spaces approved in the 2003 MDP and analyzed in the FEIR without triggering the need for additional environmental analysis.

Table 1 details the number of parking spaces that can be constructed under the 2003 MDP and FEIR. The total number of parking spaces approved under the 2003 MDP but not constructed were utilized to determine the maximum size of the Eastside 2 Parking Structure, within the limits approved in the 2003 MDP and FEIR. Per information provided by CSU Fullerton staff, the project also includes the removal of 59 parking spaces to accommodate the realignment of East Campus Drive, and 48 spaces to accommodate the realignment of West Campus Drive. Construction of the project would also require removal of 364 spaces in the Lot E surface parking lot. These spaces would be reconstructed in the proposed parking structure. To provide no more parking than was analyzed in the 2003 FEIR, the maximum size of the Eastside 2 Parking Structure is 1,902 spaces.

Table 1 Parking Space Allocation

Project	Number of Existing Spaces	Number of Spaces to be Removed	Number of Spaces to be Constructed	Total Number of Spaces
On-campus Parking (not related to project)	9,862	–	–	9,862
Parking Lot E	900	364	–	536
Realignment of East Campus Drive	100	59	–	41
West Campus Drive Reconfiguration	48	48	–	–
North Drive Reconfiguration	70	70	–	–
Student Housing Parking Structure	198	198	–	–
Student Housing Surface Parking	84	84	–	–
Eastside 2 Parking Structure	–	–	1,900	1,900
Total	**11,262**	**823**	**1,900**	**12,339**

Proposed Development

The proposed project involves the demolition of a 198 space, three-level parking structure located just west of the student housing complex, and construction of an approximately 586,700 gross square foot, five-story, six-level parking structure containing a total of approximately 1,900 parking spaces and a 500kW solar canopy. The project site currently contains a portion of "Lot E", a 900-space surface parking lot shown on campus maps and in the 2003 MDP. A total of 364 parking spaces will be removed from Lot E to accommodate the proposed parking structure. Figure 1 shows the project site's location in the region, Figure 2 shows an aerial photo of the project site and its immediate surroundings, Figure 3 shows the project site's location on a map of the CSU Fullerton campus, Figure 4 shows photos of the project site, Figure 5 shows photos of surrounding uses, and Figure 4 shows the locations and directions in which these photos were taken.

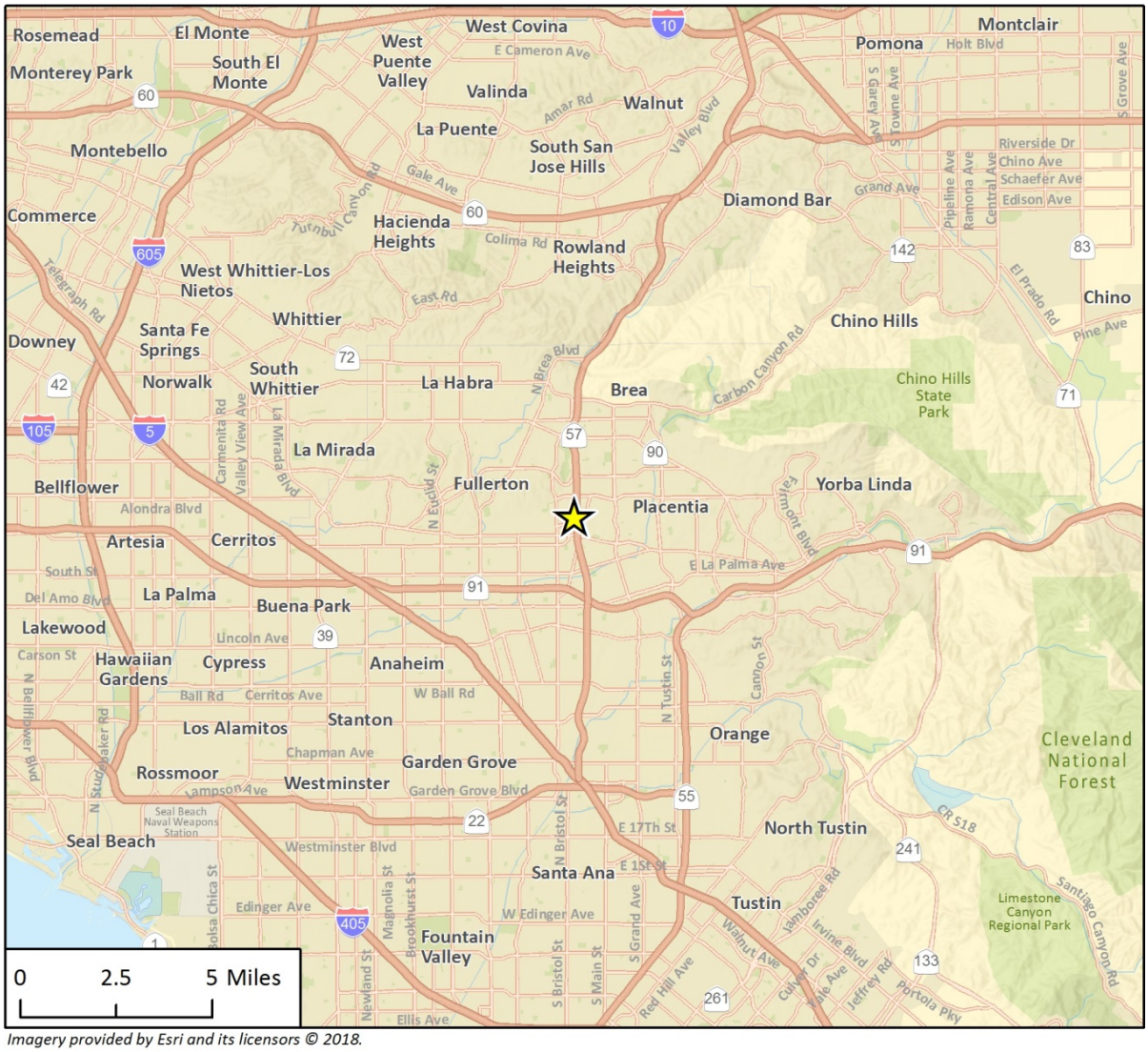
The parking structure would be constructed of reinforced cast-in-place, post-tensioned concrete. Each floor of the structure would contain five parking bays, two of which would be double helix ramps. Vertical pedestrian circulation consists of a centrally located three-bank elevator and a main staircase at the building pedestrian entrance/plaza. Additional staircases would be constructed as required to meet Building Code requirements. An automatic fire sprinkler system may be required.

In general, the project site contains minimal fill materials to a depth of approximately one to three feet over native alluvial soils. Similar CSU Fullerton projects have been supported by a drilled pier foundation system (CSU Fullerton 2018). A July 2018 Geotechnical Report prepared by Leighton Consulting, Inc. determined that the use of a shallow foundation system would be appropriate to support the structure if ground improvement is performed to improve the support characteristics of the soils to depths of 10 to 20 feet below grade. If the support characteristics of the soils are not improved, then the use of a deep foundation system would be required (Leighton Consulting 2018).

Circulation and Access

The campus layout is designed to serve students who commute to and from the campus. Buildings were planned so that no student needs more than 10 minutes to go from one class to another. Main academic and administrative functions are located towards the center of campus, with vehicular circulation, parking lots and parking structures located around the periphery. (CSU Fullerton 2003)

Figure 1 Regional Location



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Project Site

N

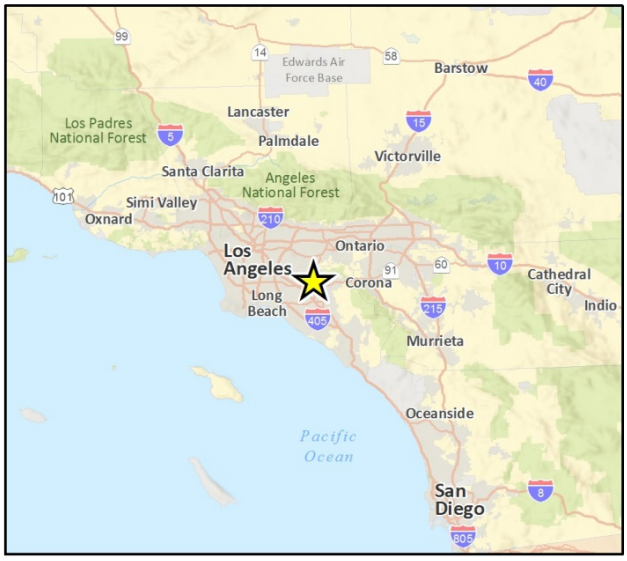

Figure 2 Project Site Location

Imagery provided by Microsoft and its licensors © 2018.

Fig 2 Project Location

Figure 3 Project Site Location on Campus Map

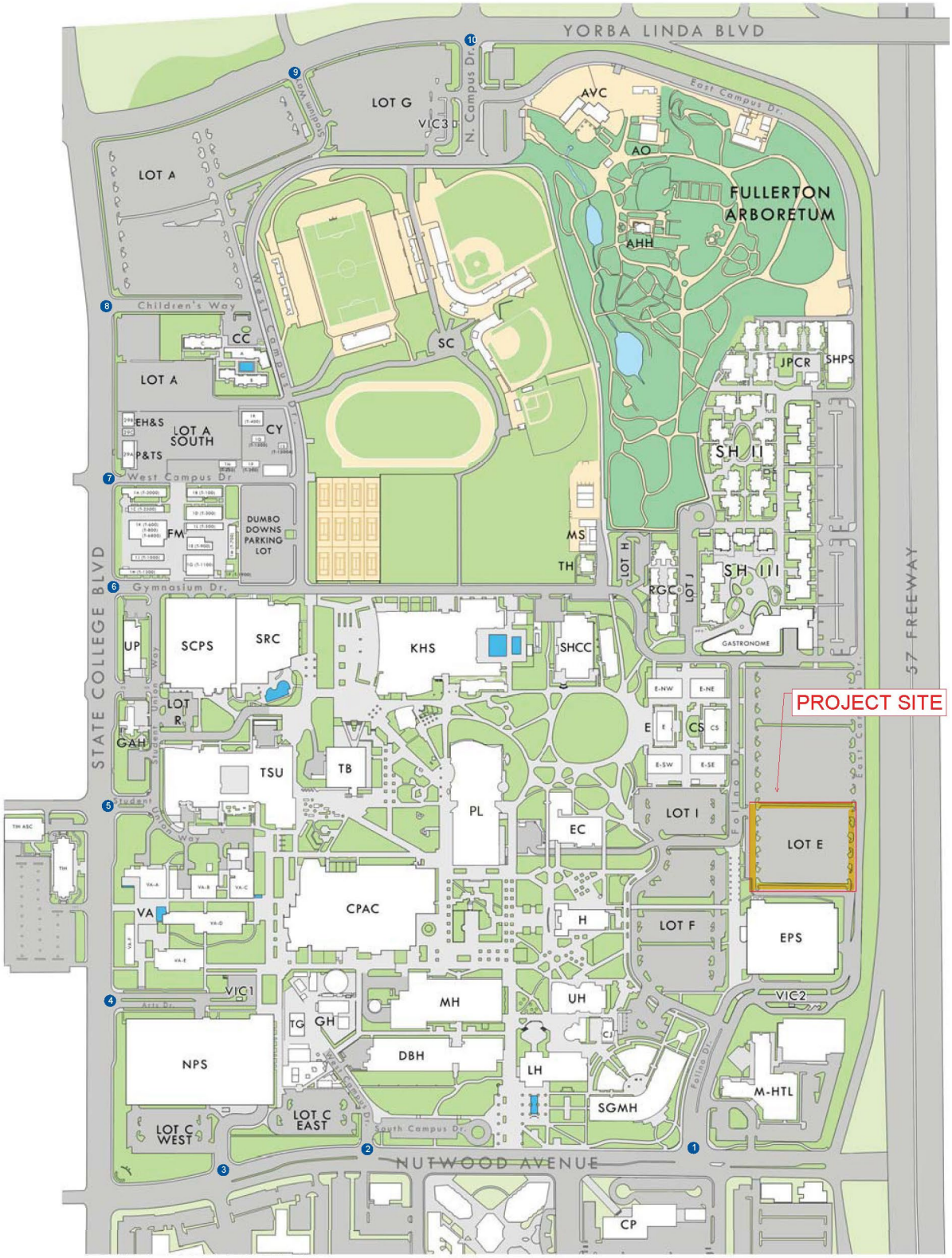

Figure 4 Photo Locations Map

Imagery provided by Microsoft and its licensors © 2018.

Fig 6 Photo Locations Map

The CSU Fullerton campus is bounded by Yorba Linda Boulevard to the north, State College Boulevard to the west, and Nutwood Avenue to the south. These streets are maintained by the City of Fullerton. These streets provide access to the campus via several access streets and driveways. Gymnasium Campus Drive bisects the center of campus while Folino Drive runs along the eastern edge of the campus and is located within the campus limits. This street connects with North Campus Drive and Yorba Linda Boulevard at the northern edge of the campus, and Nutwood Avenue at the southern edge of the campus. Folino Drive would provide direct access to the Eastside 2 Parking Structure.

Open Space, Landscaping, Exterior Lighting, and Walls/Fencing

Site amenities will include an exterior pedestrian plaza, accent landscaping, parking guidance and information systems, lighting, signage and motorcycle and bicycle parking.

Utility Infrastructure

Dry Utilities

Lighting will be provided throughout the parking structure for visibility and safety purposes. Connections will be made to existing electrical lines located near the project site.

Construction Activity

Construction is expected to begin in Summer 2019 and finish in Fall 2020. Construction activity would begin with the demolition of the existing asphalt parking lot, site preparation and grading which will utilize equipment such as tractors, dozers, graders, and scrapers. Building construction and paving activities would utilize cranes, forklifts, welders, concrete and delivery trucks, rollers, and other paving equipment for construction activities. Folino Drive will be closed to vehicular traffic for the duration of construction.

8. Surrounding Land Uses and Setting

The project site is surrounded by the CSU Fullerton campus. The project site is bordered by the uses listed in Table 2.

Table 2 Surrounding Land Uses

	Existing Land Use
Project Site	Surface Parking Lot (364 spaces)
North	Surface Parking Lot (450 spaces)
West	Main Campus, Academic Building
South	Eastside Parking Structure (1500 spaces)
East	Folino Drive, SR 57

9. Required Approvals

The proposed project requires the following approvals from the California State University (CSU):

- Approval of master plan revision, capital outlay amendment, and schematic plans
- Adoption of IS-MND
- Others as necessary

10. Other Public Agencies Whose Approval May Be Required

Other project approvals may include:

- Division of the State Architect (accessibility compliance)
- State of California Fire Marshall (fire/life safety)
- City of Fullerton Fire Department (access)

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Environmental Factors Potentially Affected

This project would potentially affect the environmental factors checked below, involving at least one impact that is "Potentially Significant" or "Less than Significant with Mitigation Incorporated" as indicated by the checklist on the following pages.

☐	Aesthetics	☐	Agriculture and Forestry Resources	☐	Air Quality
■	Biological Resources	■	Cultural Resources	☐	Energy
■	Geology/Soils	☐	Greenhouse Gas Emissions	☐	Hazards & Hazardous Materials
■	Hydrology/Water Quality	☐	Land Use/Planning	☐	Mineral Resources
■	Noise	☐	Population/Housing	☐	Public Services
☐	Recreation	■	Transportation	☐	Tribal Cultural Resources
■	Utilities/Service Systems	☐	Wildfire	■	Mandatory Findings of Significance

Determination

Based on this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

■ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potential significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

	2/12/19
Signature	**Date**
SARAB SINGH	DIRECTOR CONST. MGMT.
Printed Name	**Title**

Environmental Checklist

1 Aesthetics

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Except as provided in Public Resources Code Section 21099, would the project:				
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☐	■
b. Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	■
c. In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	■	☐
d. Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	☐	☐	■	☐

a. Would the project have a substantial adverse effect on a scenic vista?

There are no state scenic highways in the vicinity of the project site (Caltrans 2018) and the City of Fullerton does not identify any streets in the vicinity of the project site as scenic corridors (City of Fullerton 2012). As shown in the photos in Figure 5 and Figure 6, the project site and its surroundings are characterized by a generally flat landscape, with limited views into the distance that are mostly blocked by trees and buildings. Currently, motorists driving by the site on the Orange Freeway (SR-57) have a view looking west that consists mostly of the surface parking lots along the east side of campus, including the project site. No views into the distance are available from this viewing location. Views looking east and southeast through the project site are limited to areas in surface Parking Lots F and I and Engineering and Computer Sciences buildings to the west and northwest of the site. No views into the distance are available from these locations because they are blocked by trees and other obstructions on and around the project site, and by structures along the Orange Freeway (such as sound walls and buildings on the opposite side of the freeway).

Figure 5 Photographs of the Project Site

Photograph 1. View from eastern boundary of project site, looking northwest, with College of Engineering & Computer Science Building in background

Photograph 2. View from top of Eastside Parking Structure looking north, with project site on the right, interior campus roadways and walkways on left, and College of Engineering & Computer Science Building in background

Figure 6 Photos of Surrounding Uses

Photograph 3. West side of Eastside Parking Structure, looking west

Photograph 4. Looking south along Folino Drive, with portion of Lot E to the north of the project site to the center and right, and the Orange Freeway (SR-57) to the left.

The freeway is slightly higher than the project site in this location, which adds to its effect of blocking views to the east from the project site. Views to the north and south looking through the project site are obstructed by trees, buildings, and other obstructions on and around the project site. In summary, no scenic vistas are available on or around the project site that would be blocked or otherwise adversely affected by the proposed project. No impact would occur.

NO IMPACT

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

There are no officially-designated scenic resources on the project site, and there are no state scenic highways in the vicinity of the project site (Caltrans, 2018). As described in Impact Discussion 1.a., conversion of the project site from a surface parking lot to a parking structure would not block scenic vistas, and there are no other scenic resources on or around the project site that would be directly or indirectly impacted by having views of such resources blocked by the proposed project. No impact would occur.

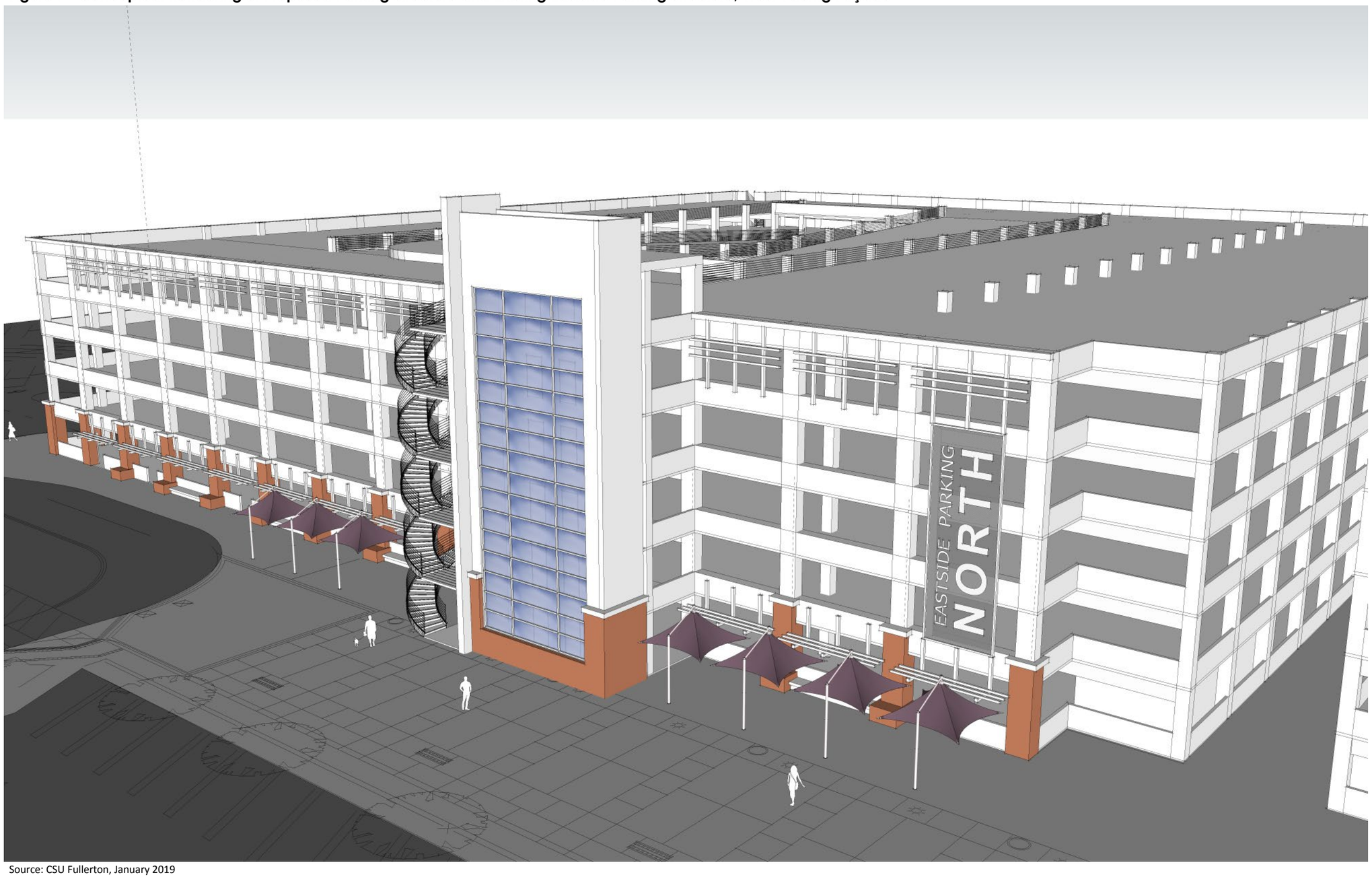
NO IMPACT

c. Would the project in non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

The project is located in an urbanized area within the CSUF campus and in the city of Fullerton. As shown in the conceptual rendering in Figure 7, the proposed parking structure is planned to be similar in scale and design to the existing Eastside Parking Structure just to the south of the project site. The proposed project would be subject to standards contained in the 2003 MDP relating to visual character and quality. For example, Section 6.3 of the 2003 MDP (AC Martin Partners, Inc. 2004) states that the design of parking structures should acknowledge certain guidelines, applicable portions of which are provided below.

- The exterior of above-grade parking structures within public view should avoid a utilitarian appearance and should be integrated with the architectural design of the campus in terms of scale, materials and appearance. Considerations of façade articulation and the selection of façade materials will be particularly important for the design of these buildings. The design of parking structure elevations should acknowledge main campus entry points and public roadways and should be commensurate with other public architectural statements made at campus edges and entries.
- Specific design elements should be used to integrate parking structures with the campus. These elements may include: intensive planting of screening trees or other vegetation at the exterior of the structure, use of exterior cladding and patterns like those of adjacent buildings, creation of areas of accent and architectural focus such as entry and vertical circulation area points, and articulation of the façade (see Section 6.1).
- Sloping floors should not be expressed on the exterior of the building.
- The visual presence of automobiles in parking structures should be minimized as seen from public view, through architectural or landscape screens. Because the parking structures are located at the campus edges, “public view” refers to views from within and outside the campus.

Figure 7 Conceptual Rendering of Proposed Parking Structure and Existing Eastside Parking Structure, West-Facing Façade



Source: CSU Fullerton, January 2019

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- The pedestrian entry/egress should be deliberately connected to the pedestrian circulation system in such a way that pedestrians do not have to cross vehicular traffic to access the campus pathway system. Stair/elevator cores should be well articulated and tall enough to serve as visible wayfinding signals.
- The design of parking structures should make good use of daylighting and must incorporate sufficient artificial lighting to ensure safety within and outside of the structure. Landscape and screening via plant materials should be applied such that pedestrian entry/egress points have clear visual sightlines in order to increase actual and perceived personal safety. Stair towers and elevator enclosures should be clad in transparent materials to increase personal safety.

Building plans would be submitted by project architects before construction of the proposed structure to California State University. This review would determine if project plans comply with the standards contained in the 2003 MDP, including those cited above. This would ensure potential impacts to the visual character and quality of the project site and its surroundings would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

The project site is currently developed as a surface parking lot and contains existing light poles. The 2003 MDP (AC Martin Partners, Inc. 2004) contains various standards for lighting in general and parking lot lighting in particular. For example, Section 5.2.6 of the 2003 MDP states the following:

> The recommended fixtures are metal halide fixtures on 20’-0” poles to illuminate entry drives and vehicular corridors, and a similar fixture on 12’-0” poles flanking both sides of all pedestrian spines greater than 8’-0” wide and used on one side for narrower walks. Entry courts, specialty plazas, and vehicular arrival areas are defined by illuminated bollards providing foot-level lighting to clearly illuminate changes in grade and edges.

Section 5.2.7 of the 2003 MDP states “…low energy light sources with long life, integrated with glare shields should be employed where possible.” Section 5.3.4 of the 2003 MDP states “Outdoor lighting should be designed to minimize light spilling onto adjacent, non-University properties.”

Although building and site plans have not yet been developed for the project, plans would be submitted by project architects before construction of the proposed structure, and these plans would be reviewed by California State University before approval to ensure compliance with these standards.

As there are existing light poles on the surface lot, the proposed project would not add a substantial source of new light. The project site is not located next to residential or other light- or glare-sensitive uses. Immediately surrounding uses include the Orange Freeway (SR-57) to the east, the Eastside Parking Structure to the south, surface parking lots F and I and Engineering and Computer Sciences buildings to the west, and surface parking Lot E to the north. All of these uses include lighting of some kind, and the proposed project would not substantially increase lighting levels in the area.

Impacts from daytime glare would be less than significant due to cars being parked in a covered structure, and not exposed to the reflective sun. Nighttime glare impacts from parking lot lighting would be reduced by compliance with the standards of the 2003 MDP discussed above (including

integration of glare shield where possible and minimization of light spilling onto adjacent, non-University properties), and would be similar to the amount of light and glare from existing light fixtures. Nighttime glare impacts from vehicle headlights would be reduced compared to existing conditions due to cars circulating through an enclosed structure rather through an unenclosed surface parking lot and would be less than significant.

LESS THAN SIGNIFICANT IMPACT

2 Agriculture and Forestry Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	■
b. Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	■
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)); timberland (as defined by Public Resources Code Section 4526); or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	☐	☐	☐	■
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	■
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	■

a. Would the project convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

c. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?

d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

e. Would the project involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?

The project site is currently developed with a surface parking lot. The project site is planned for the proposed parking structure use in the MDP. According to the California Department of Conservation's (2015) map of Williamson Act Contract Land, the project site and its vicinity are designated as "urban and built-up land" and are not within an area of "prime farmland". Therefore, the project would not conflict with agricultural zoning and would not involve any development that would result in the conversion of designated farmland to non-agricultural use. Neither the project site nor the surrounding parcels are zoned for forest land or timberland, and there is no timberland production at the project site. Therefore, the project would have no impact on such resources.

NO IMPACT

3 Air Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Conflict with or obstruct implementation of the applicable air quality plan?	■	☐	☐	☐
b. Violate any air quality standard or result in a cumulatively considerable net increase in an existing or projected air quality violation?	☐	☐	☐	■
c. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	■
d. Result in substantial emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☐	■

The project site is within the South Coast Air Basin (SCAB), one of 15 statewide air basins established by the California Air Resource Board (CARB). The SCAB is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. The regional climate in the SCAB is semi-arid and is characterized by warm summers, mild winters, infrequent seasonal rainfall, moderate daytime onshore breezes, and moderate humidity. The air quality within the SCAB is primarily influenced by meteorology and a wide range of emission sources, such as dense population centers, substantial vehicular traffic, and industry.

The United States Environmental Protection Agency (USEPA) has set primary national ambient air quality standards (NAAQS) for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter with diameters of up to ten microns (PM_{10}) and up to 2.5 microns ($PM_{2.5}$), and lead (Pb). Primary standards are those levels of air quality deemed necessary, with an adequate margin of safety, to protect public health. In addition, California has established health-based ambient air quality standards (known as the California ambient air quality standards [CAAQS]) for these and other pollutants, some of which are more stringent than the federal standards. Depending on whether or not the standards are met or exceeded, the air basin is classified as being in “attainment” or “nonattainment.” The health effects associated with criteria pollutants upon which attainment of state and federal air quality standards is measured are described in Table 3.

The South Coast Air Quality Management District (SCAQMD) is the designated air quality control agency in the SCAB, which is required to monitor air pollutant levels to ensure that state and federal air quality standards are met. The SCAB is a non-attainment area for the federal standards for ozone, particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and lead, and the state standards for ozone, particulate matter less than 10 microns in diameter (PM_{10}), $PM_{2.5}$ nitrogen dioxide (NO_2) and lead. This non-attainment status is a result of several factors, the primary ones being the naturally adverse meteorological conditions that limit the dispersion and diffusion of pollutants, the limited capacity of the local airshed to eliminate air pollutants, and the number,

type, and density of emission sources within the SCAB. Because the SCAB currently exceeds several state and federal ambient air quality standards, the SCAQMD is required to implement strategies to reduce pollutant levels to recognized acceptable standards. To accomplish this requirement, the SCAQMD has adopted an Air Quality Management Plan (AQMP) that provides a strategy for the attainment of state and federal air quality standards.

Table 3 Health Effects Associated with Criteria Pollutants

Pollutant	Adverse Effects
Ozone (O_3)	(1) Short-term exposures: pulmonary function decrements and localized lung edema in humans and animals, risk to public health implied by alterations in pulmonary morphology and host defense in animals; (2) long-term exposures: risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (3) vegetation damage; and (4) property damage.
Carbon monoxide (CO)	Reduces oxygen delivery leading to: (1) Aggravation of chest pain (angina pectoris) and other aspects of coronary heart disease; (2) decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (3) impairment of central nervous system functions; and (4) possible increased risk to fetuses.
Nitrogen dioxide (NO_2)	(1) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (2) risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and (3) contribution to atmospheric discoloration.
Sulfur dioxide (SO_2)	(1) Bronchoconstriction accompanied by symptoms that may include wheezing, shortness of breath, and chest tightness during exercise or physical activity in persons with asthma.
Suspended particulate matter (PM_{10})	(1) Excess deaths from short-term and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease (including asthma).[1]
Suspended particulate matter ($PM_{2.5}$)	(1) Excess deaths from short- and long-term exposures; (2) excess seasonal declines in pulmonary function, especially in children; (3) asthma exacerbation and possibly induction; (4) adverse birth outcomes, including low birth weight; (5) increased infant mortality; (6) increased respiratory symptoms in children, such as cough and bronchitis; and (7) increased hospitalization for both cardiovascular and respiratory disease, including asthma.[1]

[1] More detailed discussions on the health effects associated with exposure to suspended particulate matter can be found in the following documents: Office of Environmental Health Hazard Assessment, Particulate Matter Health Effects and Standard Recommendations, www.oehha.ca.gov/air/toxic_contaminants/PM10notice.html#may, May 9, 2002; and EPA, Air Quality Criteria for Particulate Matter, October 2004.

Source: United States Environmental Protection Agency (USEPA) 2015

Existing Air Quality

The SCAQMD operates a network of air quality monitoring stations throughout the SCAB in order to determine whether ambient air quality meets the state and federal standards. The monitoring station for 8-hour and 1-hour O_3, NO_2, $PM_{2.5}$, and PM_{10} closest to the project is the Anaheim-Pampas Lane monitoring station, located at 1630 Pampas Lane in Anaheim, approximately 4.8 miles southwest of the project site. Table 4 indicates the number of days that each standard has been exceeded at this station in each of the last three years for which data is available. The data collected at the station indicate that the federal and state 8-hour ozone standards were exceeded each year from 2015 to 2017, and the state worst hour ozone standard was exceeded in both 2015 and 2016.

In addition, the PM_{10} state standard and the $PM_{2.5}$ federal standard were both exceeded each year from 2015 to 2017. No other state or federal standards were exceeded at these monitoring stations.

Table 4 Ambient Air Quality at the Anaheim-Pampas Monitoring Station

Pollutant[1]	2015[2]	2016[2]	2017[2]
Ozone (ppm), maximum concentration 8-hour average	0.080	0.074	0.076
Number of days of state exceedances (> 0.070 ppm)	1	4	4
Number of days of federal exceedances (> 0.070 ppm)	1	4	4
Ozone (ppm), maximum concentration 1-hour	0.100	0.103	0.090
Number of days of state exceedances (> 0.09 ppm)	1	2	0
Nitrogen Dioxide (ppm), maximum concentration 1-hour	0.059	0.064	0.081
Number of days of state exceedances (> 0.18 ppm)	0	0	0
Number of days of federal exceedances (> 0.10 ppm)	0	0	0
Particulate Matter <10 microns ($\mu g/m^3$), maximum concentration 24-hour average	59.0	74.0	95.7
Number of days above state standard (> 50 $\mu g/m^3$)	2	3	5
Number of days above federal standard (> 150 $\mu g/m^3$)	0	0	0
Particulate Matter <2.5 microns, $\mu g/m^3$, maximum concentration 24-our average	45.8	44.4	53.9
Number of days above federal standard (> 35 $\mu g/m^3$)	3	1	7

ppm: parts per million; μg/m3: micrograms per cubic meter

Sources: 1.CARB 2016; 2. CARB 2019

Sensitive Receptors

CARB and the Office of Environmental Health Hazard Assessment (OEHHA) have identified the following groups of individuals as the most likely to be affected by air pollution: the elderly over 65, children under 14, infants (including in utero in the third trimester of pregnancy), and persons with cardiovascular and chronic respiratory diseases such as asthma, emphysema, and bronchitis (CARB 2005, OEHHA 2015). Some land uses are considered more sensitive to air pollution than others due to the types of population groups or activities involved and are referred to as sensitive receptors. Examples of these sensitive receptors are residences, schools, hospitals, and daycare centers. The closest sensitive receptors include existing buildings on the CSU Fullerton campus, approximately 200 feet to the northwest of the western edge of the project site.

Methodology and Thresholds

Criteria pollutant emissions for project construction and operation were calculated using the California Emissions Estimator Model (CalEEMod), Version 2016.3.2. CalEEMod is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant emissions associated with both construction and operations from a variety of land use projects. The model was developed for the California Air Pollution Control Officers Association (CAPCOA) in collaboration with the California air districts. CalEEMod allows for the use of default data (e.g., emission factors,

trip lengths, meteorology, source inventory) provided by the various California air districts to account for local requirements and conditions, and/or user-defined inputs. The model calculates emissions of CO, PM_{10}, $PM_{2.5}$, SO_2, and the ozone precursors ROG and NO_X. The calculation methodology and input data used in CalEEMod can be found in the CalEEMod User's Guide Appendices A, D, and E (CAPCOA 2017). The input data and subsequent construction and operation emission estimates for the proposed project are discussed below. CalEEMod output files for the project are included in Appendix A to this report.

Project construction would generate short-term emissions of criteria air pollutants. Construction activities would generate fugitive dust from on and off-road vehicle usage, demolition, site preparation and site grading. Criteria air pollutants would be generated from construction equipment assumed to be diesel powered. The construction emissions were calculated by estimating the types and number of pieces of equipment to be used on-site during each of the construction phases.

Material export, which would generate fugitive dust emissions during site preparation, grading and demolition construction phases, was estimated from visual inspection of the future parking structure site and existing parking structure to be demolished. Export during the site preparation and grading phases used an estimate for the future structure's footprint area, 2.3 acres, measured through Google Earth satellite imagery. Site preparation would involve the removal of the existing asphalt surface, which was estimated to be 4 inches thick, with a mass of 145 pounds per cubic foot (NAPA, n.d.), resulting in the export of 2,435 tons of debris. Grading phase material export was estimated using the future structure footprint area and an overexcavation depth of 3 feet, suggested in the 2018 Geotechnical Exploration Report (Leighton Consulting, Inc. 2018), resulting in export of 11,333 cubic yards of material. Material export from demolition was estimated using CalEEMod default values, generated from an estimate of the existing structure's floor space of 77,400 square feet. This was done by measuring the parking structure's footprint from Google Earth satellite imagery and multiplying by four to account for the number of garage floors. Values determined are assumed to be conservative.

The project would comply with SCAQMD Rule 403, which identifies measures to reduce fugitive dust, is required by the SCAQMD to be implemented at all construction sites located within the SCAB. The following conditions would be required as construction Best Management Practices (BMPs) to reduce fugitive dust in compliance with SCAQMD Rule 403.

- **Minimization of Disturbance.** Construction contractors shall minimize the area disturbed by clearing, grading, earth moving, or excavation operations to the maximum extent feasible to prevent excessive amounts of dust.
- **Soil Treatment.** Construction contractors shall treat all graded and excavated material, exposed soil areas, and active portions of the construction site, including unpaved on-site roadways to minimize fugitive dust. Treatment shall include, but not necessarily be limited to, periodic watering, application of environmentally safe soil stabilization materials, and/or roll compaction as appropriate. Watering shall be done as often as necessary, and at least twice daily, preferably in the late morning and after work is done for the day.
- **Soil Stabilization.** Construction contractors shall monitor all graded and/or excavated inactive areas of the construction site at least weekly for dust stabilization. Soil stabilization methods, such as water and roll compaction, and environmentally safe dust control materials, shall be applied to portions of the construction site that are inactive for over four days. If no further grading or excavation operations are planned for the area, the area shall be seeded and

watered until landscape growth is evident, or periodically treated with environmentally safe dust suppressants, to prevent excessive fugitive dust.

- **No Grading During High Winds.** Construction contractors shall stop all clearing, grading, earth moving, and excavation operations during periods of high winds (20 miles per hour or greater, as measured continuously over a one-hour period).
- **Street Sweeping.** Construction contractors shall sweep all on-site driveways and adjacent streets and roads at least once per day, preferably at the end of the day, if visible soil material is carried over to adjacent streets and roads.
- **Soil Moisture and Vehicle Speed Restrictions.** Construction contractors shall maintain exposed surfaces at a minimum soil moisture of 12 percent and restrict vehicle speeds on unpaved roads to 15 miles per hour.

The project would also need to comply with SCAQMD Rule 1113 regarding the use of low-volatile organic compound (VOC) architectural coatings, and Rule 402 which states that a person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.[1]

CalEEMod defaults were used for construction equipment, while default phase lengths were adjusted to match the project scale and timeframe of phases (see Appendix A for specific adjustments). Construction of the project is expected to begin May 2019 and be completed August 2020, with the demolition of the separate structure to occur during May 2020. It was assumed that to reduce fugitive dust emissions as directed under SCAQMD Rule 403, exposed areas would be watered twice daily during earthmoving activities, soil moisture content on exposed surface would be maintained at a minimum of 12 percent, and on site vehicle speeds would be limited to 15 miles per hour. Architectural coatings with a maximum VOC content of 100 grams per liter would also be used in compliance with SCAQMD Rule 1113.

Project operation would generate long term emissions of criteria pollutants as well. The project would not generate any new mobile source emissions not previously analyzed in the 2003 FEIR; therefore, operational emissions exclusively include area source emissions. Area source emissions are generated by landscape maintenance equipment, consumer products and architectural coating.

The SCAQMD provides numerical thresholds to analyze the significance of a project's construction and operational emissions to regional air quality. These thresholds, listed in Table 5, are designed such that a project consistent with the thresholds would not have an individual or cumulatively significant impact to SCAB air quality.

[1] SCAQMD rules are enforced by SCAQMD and citizens can report non-compliance.

Table 5 SCAQMD Air Quality Significance Thresholds

Pollutant	Mass Daily Thresholds	
	Operation Thresholds (lbs/day)	Construction Thresholds (lbs/day)
NO_X	55	100
ROG[1]	55	75
PM_{10}	150	150
$PM_{2.5}$	55	55
SO_X	150	150
CO	550	550

[1] Reactive Organic Gases (ROG) are formed during combustion and evaporation of organic solvents. ROG are also referred to as Volatile Organic Compounds (VOC).

lbs/day = pounds per day; SCAQMD = South Coast Air Quality Management District

Source: SCAQMD 2015

In addition to the above regional thresholds, the SCAQMD has also developed Localized Significance Thresholds (LST) in response to the Governing Board's Environmental Justice Enhancement Initiative (1-4), which was prepared to update the *CEQA Air Quality Handbook* (1993). LSTs were devised in response to concerns regarding the exposure of individuals to criteria pollutants in local communities and have been developed for NO_x, CO, $PM_{2.5}$ and PM_{10}. LSTs represent the maximum emissions from a project that will not cause or contribute to an air quality exceedance of the most stringent applicable federal or state ambient air quality standard at the nearest sensitive receptor. Calculation of the thresholds takes into consideration ambient concentrations in each source receptor area, project size, and distance to the sensitive receptor. LSTs only apply to emissions with a fixed stationary location, including idling emissions during both project construction and operation. LSTs are not applicable to mobile sources such as vehicles on a roadway (SCAQMD 2008). As such, LSTs are applied only to on-site construction emissions because the majority of operational emissions are typically associated with project-generated vehicle trips.

The project site is located in Source Receptor Area 16 (SRA-16) and is approximately 2.3 acres in size (SCAQMD 2008b). LSTs are provided for sites that are one, two, and five acres in size, and for receptors at a distance of 82, 164, 328, 656, and 1,640 feet from the project site boundary. LSTs are more restrictive for smaller sites. For receptors located within 82 feet of a project site, SCAQMD's LST Methodology document recommends using the closest modeled distance of 82 feet. Therefore, this analysis assumes that the nearest receptor is located at a distance of 82 feet from a two acre site, for which LSTs are shown in Table 6.

Table 6 SCAQMD LSTs for Construction Emissions

Pollutant	Allowable Emissions from a 2-acre Site in SRA-16 for a Receptor 82 Feet Away (lbs/day)
Gradual conversion of NO_X to NO_2	147
CO	762
PM_{10}	6
$PM_{2.5}$	4

Source: SCAQMD 2008b

The SCAQMD has also established significance thresholds for toxic air contaminants (TAC), including carcinogens and non-carcinogens. The proposed project involves the demolition of one and construction of another parking garage that would not emit TACs.

a. Would the project conflict with or obstruct implementation of the applicable air quality plan?

A project may be inconsistent with the AQMP if it would generate population, housing, or employment growth exceeding forecasts used in the development of the AQMP. The 2016 AQMP, the most recent AQMP adopted by the SCAQMD, incorporates local city general plans and the Southern California Association of Governments (SCAG) 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) socioeconomic forecast projections of regional population, housing, and employment growth (SCAQMD 2017). The proposed project consists of a parking structure for CSU Fullerton students and does not generate population, housing, or employment growth. Therefore, the project would be consistent with the 2016 RTP/SCS incorporated under the local AQMP. Furthermore, the project's increase of parking spaces is consistent with the CSU Fullerton MDP. In addition, as discussed under item b, the project would not exceed SCAQMD criteria pollutant thresholds. The proposed project would not conflict with or obstruct any applicable air quality plan; therefore, impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project violate any air quality standard or result in a cumulatively considerable net increase in an existing or projected air quality violation?

Construction Emissions

Table 7 summarizes the estimated maximum daily emissions (lbs) of criteria pollutants from project construction. As shown below, ROG, NO_X, CO, SO_2, PM_{10}, and $PM_{2.5}$ emissions would not exceed SCAQMD regional thresholds or LSTs. Because the project would not exceed these thresholds, project construction would not result in a cumulatively considerable net increase of a criteria pollutant, and impacts would be less than significant.

Table 7 Project Construction Emissions

	Maximum Emissions (lbs/day)					
	ROG	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Construction Year 2019	4.3	36.7	28.2	< 0.1	5.0	2.8
Construction Year 2020	8.6	52.3	42.4	0.1	7.0	3.2
Maximum Emissions	**8.6**	**52.3**	**42.4**	**0.1**	**7.0**	**3.2**
SCAQMD Regional Thresholds	75	100	550	150	150	55
Threshold Exceeded?	No	No	No	No	No	No
Maximum On-site Emissions	**8.4**	**38.4**	**30.0**	**< 0.1**	**4.0**	**2.5**
SCAQMD Localized Significance Thresholds (LSTs)	N/A	147	762	N/A	6	4
Threshold Exceeded?	N/A	No	No	N/A	No	No

Notes: Emissions modeling was completed using CalEEMod. See Appendix A for modeling results. Some numbers may not add up due to rounding. Emission data is pulled from "mitigated" results, which account for compliance with regulations and project design features. Maximum on-site emissions are the highest emissions that would occur on the project site from on-site sources such as heavy construction equipment and architectural coatings and excludes off-site emissions from sources such as construction worker vehicle trips and haul truck trips. Maximum emissions occur during the overlap of the building construction and demolition phase in 2020, except for ROG where maximum emissions occur during architectural coatings, and PM_{10} where maximum on-site emissions occur during grading. Since LSTs are specific to the project site and the immediate surroundings, only on-site emissions are considered.

Operational Emissions

Table 8 summarizes the project's operational emissions by emission source (area, energy, or mobile). As shown below, the emissions generated by operation of the proposed project would not exceed SCAQMD regional thresholds for criteria pollutants. Therefore, the project would not contribute substantially to an existing or projected air quality violation. In addition, because criteria pollutant emissions and regional thresholds are cumulative in nature, the project would not result in a cumulatively considerable net increase of criteria pollutants.

Table 8 Project Operational Emissions

	Maximum Daily Emissions (lbs/day)					
Emission Source	**ROG**	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Area	0.3	<0.1	<0.1	<0.1	<0.1	<0.1
Energy	0	0	0	0	0	0
Mobile	0	0	0	0	0	0
Project Emissions	**0.3**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
SCAQMD Regional Thresholds	55	55	550	150	150	55
Threshold Exceeded?	No	No	No	No	No	No

Notes: Emissions modeling was completed using CalEEMod. See Appendix A for modeling results. Some numbers may not add up due to rounding. Emission data is pulled from "mitigated" results that include compliance with regulations and project design features that will be included in the project. The project would only generate area emissions from architectural coatings, landscape maintenance equipment and consumer products. There are no emissions from mobile sources as the project does not generate VMT, and no emissions from energy use as the project will not utilize natural gas combustion.

c. Would the project expose sensitive receptors to substantial pollutant concentrations?

Construction Emissions

Localized Criteria Pollutant Emissions

LSTs were developed by the SCAQMD to protect sensitive groups from exposure to high concentrations of criteria air pollutants. As shown in Table 7 above, no LSTs were exceeded for any of the criteria air pollutants for which standards have been developed. Therefore, project-related criteria air pollutant emission impacts would not expose sensitive receptors to substantial pollutant concentrations.

Toxic Air Contaminants

The greatest potential for TAC emissions during construction would be related to diesel particulate matter (DPM) associated with heavy equipment operations during earth-moving activities. The SCAQMD does not consider diesel-related cancer risks from construction equipment to be an issue due to the short-term nature of construction activities. Construction activities associated with the proposed project would be sporadic, transitory, and short term in nature. The assessment of cancer risk is typically based on a 30-year exposure duration. Because exposure to diesel exhaust would be well below 30 years, construction of the proposed project is not anticipated to result in an elevated cancer risk to exposed persons due to the short-term nature of construction. As such, project-related TAC emission impacts during construction would be less than significant.

Operational Emissions

CO Hot Spots

A CO hotspot is a localized concentration of CO that is above a CO ambient air quality standard. Localized CO hotspots can occur at intersections with heavy peak hour traffic. Specifically, hotspots can be created at intersections where traffic levels are sufficiently high such that the local CO

concentration exceeds the federal one-hour standard of 35.0 parts per million (ppm) or the federal and state eight-hour standard of 9.0 ppm (CARB 2016).

The SCAB is in conformance with state and federal CO standards, and most air quality monitoring stations no longer report CO levels. No stations within the vicinity of the project site have monitored CO since 2012. In 2012, the Anaheim-Pampas station detected an 8-hour maximum CO concentration of 2.34 ppm, which is substantially below the state and federal standards (CARB 2019a). The proposed project would result in no new vehicle trips; therefore, mobile emissions of CO would not be generated. Area emissions of CO are less than 0.1 lbs per day, which would not significantly contribute to local CO levels. Based on the low background level of CO in the project area, improving vehicle emissions standards for new cars in accordance with state and federal regulations, and the project's low level of operational CO emissions, the project would not create new hotspots or contribute substantially to existing hotspots, and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

d. Would the project result in substantial emissions (such as those leading to odors) adversely affecting a substantial number of people?

For construction activities, odors would be short-term in nature and are subject to SCAQMD Rule 402 *Nuisance* (CARB 2018a) and may be reported to the AQMD. Construction activities would be temporary and transitory and associated odors would cease upon construction completion. Accordingly, the proposed project would not create objectionable odors affecting a substantial number of people during construction, and short-term impacts would be less than significant.

Common sources of operational odor complaints include sewage treatment plants, landfills, recycling facilities, and agricultural uses. The proposed project, a parking structure, would not include these uses. Therefore, operational odor impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

4 Biological Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	■	☐	☐
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	■
c. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	■
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	■
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	■
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	■

a. Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as candidate, sensitive, or special status in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?

The project site has already been developed as a surface parking lot, and therefore consists mostly of pavement and other hardscaping. However, there are trees located on the site in planter strips and boxes that could provide suitable nesting habitat for birds protected under the Migratory Bird Treaty Act. The proposed project therefore has potential to impact migratory and other bird species if construction activities occur during the nesting season, which is typically February 1 through September 15. Construction-related disturbance could result in nest abandonment or premature fledging of the young, resulting in potentially significant impacts unless mitigation is incorporated. Therefore, Mitigation Measure BIO-1 is required to reduce potential impacts to migratory and resident nesting bird species to a less than significant level.

BIO-1 Nesting Birds

If vegetation clearing or other soil disturbance is to be initiated during the bird breeding season (typically February 15 through September 15), a nesting bird pre-construction surveys shall be conducted by a qualified biologist no more than seven days prior to the initiation of clearance/construction work. The nesting bird pre-construction survey shall be conducted on foot inside the project boundary, including a 300-foot buffer (500-foot for raptors). If any active *non-raptor* bird nests are found, a suitable buffer area (varying from 250-300 feet, depending on the particular species found), shall be established from the nest, and that area shall be avoided until the nest becomes inactive (vacated). If any active *raptor* bird nests are found, a suitable buffer area of typically 250-500 feet from the nest shall be established, and that area shall be avoided until the nest becomes inactive (vacated). The limits of construction to avoid a nest shall be established in the field with flagging and stakes or construction fencing. Construction personnel shall be instructed on the sensitivity of the area by a qualified biologist hired by, and acceptable to, CSU Fullerton. Encroachment into buffers around active nests must be conducted only at the discretion of a qualified biologist. The construction contractor shall record the results of the recommended protective measures described above to document compliance with applicable State and federal laws pertaining to the protection of nesting birds.

Implementation of Mitigation Measure BIO-1 would reduce potential impacts to nesting birds to a less than significant level. The proposed project would not have any other potentially significant impacts to special-status species, due to the fully-developed nature of the site and its surroundings, and the corresponding lack of sensitive natural habitats (see also Impact Discussion 4.b.).

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

c. Would the project have a substantial adverse effect on federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

The project site is currently developed with a surface parking lot. No riparian habitat, sensitive natural communities, or federally protected wetlands are present on or around the site. There is no

natural habitat on or around the project site that could support sensitive natural communities or wetlands. No impact would occur.

NO IMPACT

d. Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

The project site is currently disturbed, developed, and actively used as a surface parking lot. It is completely surrounded by similarly developed land, including the Orange Freeway (SR-57) immediately to the east. There are no wildlife corridors that traverse the site and the site is not used as a wildlife nursery.

NO IMPACT

e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

f. Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

As discussed above, there are no biological resources on the project site other than trees, and no tree preservation policies or ordinances apply to the project site. There are also no sensitive habitats on the project site, and the site is not subject to an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan (CSU Fullerton 2003).

NO IMPACT

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5 Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☐	■	☐	☐
b. Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	■	☐	☐
c. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	■	☐

This section provides an analysis of the project's impacts on cultural resources, including historical, archaeological, and paleontological resources, as potential impacts to buried human remains.

a. Would the project cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?

b. Would the project cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?

Rincon conducted a search of the California Historical Resources Information System at the South Central Coastal Information Center (SCCIC) located at CSU Fullerton on September 6, 2018. The search was performed to identify previously recorded cultural resources, as well as previously conducted cultural resources studies, within the project site and a 0.5-mile radius surrounding it. The SCCIC search, included in Appendix B, included a review of resource records, the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the Office of Historic Preservation Historic Properties Directory, California Historical Landmarks listings, California Points of Historical Interest, the Archaeological Determinations of Eligibility list, and historical maps.

The SCCIC records search identified 12 cultural resources studies conducted within a 0.5-mile radius of the project site, none of which included the project site. The records search identified eight previously recorded cultural resources within the 0.5-mile radius, each consisting of built environment resources located outside of the project site. No known archaeological sites are located within a 0.5-mile radius of the project site. The Native American Heritage Commission (NAHC) completed a Sacred Lands File (SLF) search for the project site on September 11, 2018. The search was completed with negative results.

State CEQA Guidelines §15064.5 define historical resources to include a resource listed in or determined to be eligible for the CRHR or a local historical register or if a lead agency considers any object, building, structure, site, area, place, record, or manuscript to be historically significant. There

are no known or potential historical resources within or immediately adjacent to the project site, which is currently developed as a surface parking lot and bordered to the east by the Orange Freeway (SR-57), surface parking lots to the north and west, and a five-story parking garage, completed in 2010, to the south. The SCCIC records search identified three previously-identified historic buildings on the CSU Fullerton campus that are within a 0.5-mile radius of the project site: the Mahr House, the Hetebrink House, and the George C. Clark Home. None of these are within proximity to or visible from the project site due to buildings, trees, and other visual obstructions. As such, there is no potential for the project to directly or indirectly materially impair any of these resources or their setting. Further, while there are other 50+ year old buildings on the campus that have not been previously evaluated and may be potential historical resources, the project would not result in a significant adverse change to any of these buildings due to location of the project site and the character of its immediate surroundings. The project site is located at the periphery of the campus in an area that is already characterized by parking lots and a parking garage and the introduction of a similar feature would be consistent with the existing setting. The project therefore does not have potential to result in any negative indirect effects and would not cause a substantial adverse change in the significance of a historical resource.

The results of the cultural resources records search, SLF search, and pedestrian field survey concluded that no known archaeological resources exist within the project site or a 0.5-mile radius. The project site is considered low sensitivity for prehistoric or historic archaeological resources. However, ground disturbance for construction of the proposed project is expected to extend to 10 to 20 feet below grade and could encounter previously unknown archaeological resources. The following mitigation measure is required to reduce impacts due to the unanticipated discovery of archaeological resources, which may be considered historical resources.

CUL-1 Unanticipated Discovery of Archaeological Resources

If archaeological resources are encountered during ground disturbing activities, work in the immediate area should be halted and an archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If necessary, the evaluation may require preparation of a treatment plan and testing for CRHR eligibility. If the discovery proves to be significant under CEQA and cannot be avoided by the project, additional work, such as data recovery excavation, may be required to mitigate any significant impacts to historical resources.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

c. Would the project disturb any human remains, including those interred outside of formal cemeteries?

No human remains are known to be present within the project site. If human remains are found, the State of California 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 (PRC) Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be prehistoric, the Coroner will notify the NAHC which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site and provide recommendations for treatment to the landowner within 48 hours of being granted access. With adherence to existing regulations, impacts to human remains would be less than significant.

LESS THAN SIGNIFICANT IMPACT

6 Energy

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	■	☐
b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	■

Electricity and Natural Gas

In 2017, California used 292,039 gigawatt-hours (GWh) of electricity, of which 29 percent were from renewable resources (CEC 2018a). California also consumed approximately 12,500 million U.S. therms (MMthm) of natural gas in 2017. (CEC 2017b). The project would be provided electricity by Southern California Edison (SCE) for the operation of lighting and safety infrastructure within the structure. No natural gas would be used in the operation of the parking structure. Table 9 shows the electricity consumption by sector and total for SCE. In 2017, SCE provided approximately 29 percent of the total electricity used in California.

Table 9 Electricity Consumption in the Southern California Edison Service Area in 2017

Agriculture and Water Pump	Commercial Building	Commercial Other	Industry	Mining and Construction	Residential	Streetlight	Total Usage
2,975.4	31,925.3	4,283.3	13,094.0	2,410..6	28,975.0	627.9	84,291.6

Notes: All usage expressed in GWh

Source: CEC 2017a,http://ecdms.energy.ca.gov/elecbyutil.aspx

Petroleum

In 2016, approximately 40 percent of the state's energy consumption was used for transportation activities (EIA 2018a). Californians presently consume over 19 billion gallons of motor vehicle fuels per year (CEC 2018b). Though California's population and economy are expected to grow, gasoline demand is projected to decline from roughly 15.8 billion gallons in 2017 to between 12.3 billion and 12.7 billion gallons in 2030, a 20 percent to 22 percent reduction. This decline comes in response to both increasing vehicle electrification and higher fuel economy for new gasoline vehicles (CEC 2018b).

a. Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Construction Energy Demand

During project construction, energy would be consumed in the form of petroleum-based fuels used to power off-road construction vehicles and equipment on the project site, construction worker travel to and from the project site, and vehicles used to deliver materials to the site. The proposed project would require demolition of an existing parking structure and asphalt areas; site preparation and grading; pavement and asphalt installation; building construction; architectural coating; and hardscaping.

The total consumption of gasoline and diesel fuel during project construction was estimated using the assumptions and factors from CalEEMod used to estimate construction air emissions in the air quality modeling (Appendix A). Table 10 presents the estimated construction phase energy consumption, indicating construction equipment, vendor trips, and worker trips would consume approximately 57,207 gallons of diesel fuel over the project construction period. Construction equipment would consume an estimated 51,519 gallons of fuel; vendor and hauling trips would consume approximately 5,522 gallons of fuel; and worker trips would consume approximately 166 gallons of fuel over the combined phases of project construction.

Table 10 Estimated Fuel Consumption during Construction

Fuel Type	Gallons of Fuel	MMBtu[4]
Diesel Fuel (Construction Equipment)[1]	51,519.4	6,566.9
Diesel Fuel (Hauling & Vendor Trips)[2]	5,522.0	703.9
Other Petroleum Fuel (Worker Trips)[3]	166.0	18.2
Total	**57,207.4**	**7,289.0**

[1] Fuel demand rate for construction equipment is derived from the total hours of operation, the equipment's horse power, and the equipment's fuel usage per horse power per hour of operation, which are all taken from CalEEMod outputs (see Appendix A). Fuel consumed for all construction equipment is assumed to be diesel fuel.
[2] Fuel demand rate for hauling and vendor trips (cut material imports) is derived from hauling and vendor trip number, hauling and vendor trip length, and hauling and vendor vehicle class from "Trips and VMT" Table contained in Section 3.0, *Construction Detail*, of the CalEEMod results (see Appendix A). The fuel economy for hauling and vendor trip vehicles is derived from the United States Department of Transportation (DOT 2018). Fuel consumed for all hauling trucks is assumed to be diesel fuel.
[3] The fuel economy for worker trip vehicles is derived from the U.S. Department of Transportation National Transportation Statistics (24 mpg) (DOT 2018). Fuel consumed for all worker trips is assumed to be gasoline fuel.
[4] CaRFG CA-GREET 2.0 fuel specification of 109,786 Btu/gallon used to identify conversion rate for fuel energy consumption for worker trips specified above (California Air Resources Board [CARB] 2015). Low-sulfur Diesel CA-GREET 2.0 fuel specification of 127,464 Btu/gallon used to identify conversion rate for fuel energy consumption for construction equipment specified above (CARB 2015). Totals may not add up due to rounding.

The fuel consumption from construction activities represent a small percentage of the total fuel consumption in the State, which is approximately 19 billion gallons (CEC 2018b). Construction equipment would be maintained to all applicable standards, and construction activity and associated fuel consumption and energy use would be temporary and typical for construction sites. It is also reasonable to assume contractors would avoid wasteful, inefficient, and unnecessary fuel consumption during construction to reduce construction costs. Therefore, the proposed project would not involve the inefficient, wasteful, and unnecessary use of energy during construction, and the construction-phase impact related to energy consumption would be less than significant.

Operational Energy Demand

The operation of the project would increase area energy demand from greater electricity consumption from the operation of a new parking structure at CSUF. The inclusion of a 500kW solar rooftop canopy would offset some of the operational electricity demand. Electricity would be used primarily for lighting and safety components in the parking structure. Natural gas would not be used in the operation of the proposed project. Since the project would not increase the number of classrooms or enrollment at CSUF, gasoline consumption was not included in the operational energy analysis as the project would not generate any additional trips than what currently exists on campus. Table 11 shows the estimated electricity usage per year from the buildout of all phases of the project. Electricity consumption is based on CalEEMod outputs from the air quality modeling results (Appendix A). The outputs included Title 24 standards and are based on baseline values determined through CEC surveys and studies.

Table 11 Estimated Project Energy Use Compared to Utility Provider Sources

Form of Energy	Units	Annual Project-Related Energy Use	Utility Provider Energy Use
Electricity	GWh	2.745[1]	84,291.6[2]

[1] Electricity Use provided in the CalEEMod output for the Air Quality and Greenhouse Gas Analysis (see Appendix A)
[2] CEC 2017, http://ecdms.energy.ca.gov/elecbyutil.aspx.

Operation of the proposed parking structure would consume approximately 2.7 GWh of electricity per year. As mentioned, the project's energy demands would be served by SCE, which provided 84,291.6 GWh of electricity in 2017. The inclusion of a 500kW solar rooftop canopy would also offset some of the operational electricity demand. Therefore, SCE would have sufficient supplies for the project and would not place a significant demand on the electrical supply. Additionally, the project would be removing a 282 space, three-level parking structure located just west of the student housing complex, which currently consumes electricity. The analysis of operational energy use of the project did not account for the reduction in electricity use from the removal of the 282 space parking structure. Therefore, overall energy use from the operation of the project would be further reduced from the electrical estimates in Table 11.

The project would comply with all standards set in California Building Code (CBC) Title 24, which would minimize the wasteful, inefficient, or unnecessary consumption of energy resources during operation**.** California's Green Building Standards Code (CALGreen; California Code of Regulations, Title 24, Part 11) requires implementation of energy efficient light fixtures and building materials into the design of new construction projects. Furthermore, the 2019 Building Energy Efficiency Standards (CBC Title 24, Part 6) requires newly constructed buildings to meet energy performance standards set by the Energy Commission. As the name implies, these standards are specifically crafted for new buildings to result in energy efficient performance so that the buildings do not result in wasteful, inefficient, or unnecessary consumption of energy. The standards are updated every three years and each iteration is more energy efficient than the previous standards. For example, according to the CEC, residences built with the 2019 standards will use about seven percent less energy due to energy efficiency measures versus those built under the 2016 standards, or 53 percent less energy with rooftop solar, and nonresidential buildings will use about 30 percent less energy due mainly to lighting upgrades (CEC 2018c). Furthermore, the project would further reduce

its use of nonrenewable energy resources as the electricity generated by renewable resources provided by SCE continues to increase to comply with state requirements through Senate Bill 100, which requires electricity providers to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020, 60 percent by 2030, and 100 percent by 2045.

In conclusion, the construction of the project would be temporary and typical of similar projects, and not result in wasteful use energy. The operation of the project would increase the use of electricity on-site. However, the increase would be in conformance with the latest version of California's Green Building Standards Code and Building Energy Efficiency Standards. In addition, SCE has sufficient supplies to serve the project. Therefore, the operation would not result in wasteful or unnecessary energy consumption.

LESS THAN SIGNIFICANT IMPACT

b. Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

The 2003 FMP does not include renewable energy or energy efficiency measures. The City of Fullerton adopted a Climate Action Plan (CAP) in 2012, which includes energy efficiency strategies and measures to reduce greenhouse has emissions in the City.

> **Measure E-1: GHG Emissions from Electrical Generation.** Support regional and sub-regional efforts to reduce greenhouse gas emissions associated with electrical generation through energy conservation strategies and alternative/renewable energy programs (City of Fullerton 2012h).

One of the action items listed in Measure E-1 of the CAP is to achieve a 15% improvement in efficiency through a variety of strategies, including encouraging new projects or rehabilitations of projects to incorporate solar or other renewable energy generation. The project will incorporate a 500kW solar canopy that will provide some of the parking structure's energy needs. Therefore, the project would not conflict with or obstruct a plan for renewable or energy efficiency, and there would be no impacts.

NO IMPACT

7 Geology and Soils

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Directly or indirectly cause potential adverse effects, including the risk of loss, injury, or death involving:				
1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?	☐	☐	■	☐
2. Strong seismic ground shaking?	☐	■	☐	☐
3. Seismic-related ground failure, including liquefaction?	☐	☐	■	☐
4. Landslides?	☐	☐	☐	■
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	■	☐
c. Be located on a geologic unit or soil that is made unstable as a result of the project, and potentially result in on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	■	☐	☐
d. Be located on expansive soil, as defined in Table 1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☐	■
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	■
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	■	☐

The following analysis is based upon the Geotechnical Exploration Report for the Proposed Eastside Parking Structure prepared by Leighton Consulting, Inc. (2018) for the proposed project. This technical report is included as Appendix C.

a.1. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?

The project site is not located within the boundaries of an Earthquake Fault Zone as defined by the Alquist-Priolo Earthquake Fault Zoning Act of 1972 (California Geological Survey 1999). The closest active faults to the site are the Puente Hills fault (located approximately 1.8 miles north of the site) and the San Andreas fault (approximately 37 miles northeast of the project site). There are no known active or potentially active faults traversing the project site and the risk of ground rupture due to fault displacement beneath the site is low.

LESS THAN SIGNIFICANT IMPACT

a.2. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

The project site is located in the seismically active Southern California region and has the potential to be affected by high levels of ground motion from nearby faults. The most significant of the nearby faults due to its proximity is the Whittier Fault, located approximately 4 miles (7 kilometers) north of the project site.

The subsurface is underlain by a thin veneer of artificial fill material overlying Quaternary-age young alluvial fan deposits which is likely associated with prior grading of the campus to construct the existing facility. The fill consists of primarily clayey sand, silty sand, and sandy silt which may extend to varied depths across the site. The native soils underlying the fill consists of young alluvial fan deposits approximately 10 to 20 feet below grade. The soils below 20 feet of depth generally consist of interlayered, medium dense to dense silt, sand, silty sand and clayey sand. These fill materials exhibit relatively low strength and high compressibility. The undocumented fill is not considered to be suitable for direct support of foundations or floor slabs. However, the 2018 Geotechnical Exploration Report has pointed out that potential effects related to seismic shaking can be reduced. In-situ ground improvement, a deep foundation system, or other means of building support are recommended for structural support.

Based on the described conditions, impacts related to seismic ground motion would require the following mitigation due to the potential for substantial adverse effects.

GEO-1 Geotechnical Design Considerations

The recommendations included in the 2018 Geotechnical Exploration Report for the Proposed Eastside Parking Structure shall be incorporated into the proposed project grading and building plans. Per the Geotechnical Investigation, in order to account for the potential for seismic ground motion and seismic subsidence, the parking structure shall be supported on pile foundations and have a pile supported structural slab.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

a.3. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction?

Liquefaction occurs when saturated, cohesionless soils undergo a temporary loss of strength during severe ground shaking and acquire a degree of mobility sufficient to permit ground deformation. Generally, liquefaction occurs primarily in loose to medium dense deposits of saturated, sandy soils. The project site is not located in an identified liquefaction zone, as delineated in the Seismic Hazard Zone map for the La Habra Quadrangle (California Department of Conservation 2017). Additionally, the historical shallowest groundwater level at the project site is reported to be greater than 50 feet below the surface. As a result, the 2018 Geotechnical Exploration Report found that soil liquefaction is unlikely to occur at the project site.

LESS THAN SIGNIFICANT IMPACT

a.4. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

The project site is relatively flat with minimal elevation change. The Hazard Zone Map for the La Habra Quadrangle (California Geological Survey, 2017) does not identify the project site location as unstable or as an area potentially susceptible to seismically induced landslides.

NO IMPACT

b. Would the project result in substantial soil erosion or the loss of topsoil?

The site of the proposed parking structure is currently developed as a surface parking lot. The area is paved with asphalt concrete. Upon completion of the proposed project, there would not be a substantial amount of exposed soil such that there is a risk for substantial soil erosion to occur.

Construction activities have the potential to expose surface soils to wind and water erosion. Site development would affect an area larger than one acre; therefore, the project would be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit. Construction activities would be required to comply with the General Construction Activities Stormwater Permit (GCASP) approved by the State Water Resources Control Board by Water Quality Order 99-08-DWQ (RBMC § 5-7.216). A Storm Water Pollution Prevention Plan (SWPPP) would be required to address erosion and discharge impacts associated with the proposed on-site grading. For additional information, see Impact Discussion 9.a. through 9.j. As the proposed project would be required to obtain an NPDES permit, and prepare a SWPPP, soil erosion hazard impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. Would the project be located on a geologic unit or soil that is made unstable as a result of the project, and potentially result in on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?

As described in the 2018 Geotechnical Exploration Report, near-surface native soils beneath the site consist of alluvial fan and fluvial deposits of Quaternary age. These soils are considered to have a low potential for expansion. The Hazard Zone Map for the La Habra Quadrangle (California Geological Survey, 2017) does not identify the project site, or the surrounding area, as unstable or as an area potentially susceptible to seismically induced landslides. Seismically-triggered liquefaction may also result in the phenomenon of lateral spreading in proximity to slopes and in gently sloping terrain. Because liquefaction is not considered a hazard at the site, seismically-

induced lateral spreading and the associated ground displacements are also not considered to be a hazard at the project site.

Based on the described conditions, impacts related to soil stability would require the following mitigation due to the potential for substantial adverse effects.

GEO-2 Geotechnical Design Considerations

Per the 2018 Geotechnical Exploration Report, in order to account for the potential for soil material expansion, upon completion of grading and exposure of subgrade, additional expansion testing is recommended to confirm the Expansion Index (EI) testing presented in the report.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

d. Would the project be located on expansive soil, as defined in Table 1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried (GeoSoils 2018). As described in the 2018 Geotechnical Exploration Report, the project site consists of predominantly clayey sand with lesser amounts of silty clay. The expansion potential of this soil is considered to be low. There would be no impact.

NO IMPACT

e. Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

The project will not include bathroom facilities. No septic or alternative wastewater disposal would be needed for the project.

NO IMPACT

f. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Rincon evaluated the paleontological sensitivity of the geologic units that underlie the project site using the results of a paleontological locality search and review of existing information in the scientific literature concerning known fossils within those geologic units. Rincon reviewed fossil collections records from the University of California Museum of Paleontology (UCMP) online database, which contains known fossil localities for Orange County.

Following the literature review and museum record search a paleontological sensitivity classification was assigned to the geologic units within the project site. The potential for impacts to significant paleontological resources is based on the potential for ground disturbance to directly impact paleontologically sensitive geologic units. The Society of Vertebrate Paleontology (SVP; 2010) has developed a system for assessing paleontological sensitivity and describes sedimentary rock units as having high, low, undetermined, or no potential for containing scientifically significant nonrenewable paleontological resources. This criterion is based on rock units within which vertebrate or significant invertebrate fossils have been determined by previous studies to be present or likely to be present.

The project site is located in the Santa Ana Valley in Orange County, within the southeastern portion of the Los Angeles Basin (Morton and Miller 2006; Yerkes et al. 1965). The Los Angeles Basin is a

northwest-trending lowland plain at the northern end of the Peninsular Ranges Province, one of eleven major geomorphic provinces in California (California Geological Survey 2002). The project site is situated in an alluvial drainage along Fullerton Creek, east of the Coyote Hills, west of the Peralta Hills, and south of the Puente Hills. The southwestern Los Angeles Basin near the project site is underlain by Eocene to Holocene terrestrial to marine sedimentary deposits (Eisentraut et al. 2010; Morton and Miller 2006).

The project is mapped at a scale of 1:24,000 by Dibblee and Ehrenspeck (2001) and includes one geologic unit mapped at ground surface: younger Quaternary (Holocene) alluvium. The Quaternary sediments are composed of unconsolidated brown to tan gravely sand, silt, and clay deposited on an alluvial fan. The Holocene deposits are underlain by the terrestrial sediments of the Pleistocene La Habra Formation at substantial depth – more than 200 feet below ground surface, according to exploratory oil well data described in Yerkes et al. (1972). The results of the UCMP records search resulted in no previously recorded vertebrate fossil localities from Holocene sedimentary deposits within the project area or vicinity. Holocene sedimentary deposits, particularly those younger than 5,000 years old, are generally too young to contain fossilized material. Therefore, the Holocene alluvium mapped in the project site has been assigned a low paleontological sensitivity, in accordance with SVP (2010) guidelines.

Holocene alluvial deposits mapped in the project site have a low paleontological sensitivity. These younger alluvial sediments are underlain at substantial depth by older Pleistocene deposits (i.e., the La Habra Formation), but are very unlikely to be disturbed by project construction, which will be limited to a depth of approximately 20 feet below grade (Leighton Consulting, Inc. 2018). As a result, potential impacts to paleontological resources would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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8 Greenhouse Gas Emissions

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	■	☐
b. Conflict with any applicable plan, policy, or regulation adopted for the purposes of reducing the emissions of greenhouse gases?	☐	☐	☐	■

Climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans along with other substantial changes in climate (such as wind patterns, precipitation, and storms) over an extended period of time. Climate change is the result of numerous, cumulative sources of greenhouse gases (GHGs) that contribute to the "greenhouse effect," a natural occurrence that takes place in Earth's atmosphere to help regulate the temperature of the planet. The majority of radiation from the sun hits Earth's surface and warms it. The surface, in turn, radiates heat back towards the atmosphere in the form of infrared radiation. Gases and clouds in the atmosphere trap and prevent some of this heat from escaping into space and re-radiate it in all directions. However, anthropogenic activities since the beginning of the industrial revolution (approximately 250 years ago) are adding to the natural greenhouse effect by increasing the gases in the atmosphere that trap heat. Emissions resulting from human activities thereby contribute to an average increase in Earth's temperature.

GHGs occur both naturally and as a result of human activities, such as fossil fuel burning, methane generated by landfill wastes and raising livestock, deforestation activities, and some agricultural practices. GHGs produced by human activities include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). Since 1750, estimated concentrations of CO_2, CH_4, and N_2O in the atmosphere have increased over by 36 percent, 148 percent, and 18 percent, respectively, primarily due to human activity. The different GHGs have varying global warming potentials (GWPs). The GWP of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified time interval. This metric is used to compare how effective a GHG is with respect to CO_2, with emissions of GHGs reported as CO_2 equivalent (CO_2e).

Globally, climate change has the potential to affect numerous environmental resources though potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. Long-term trends have found that each of the past three decades has been warmer than all the previous decades in the instrumental record, and the decade from 2000 through 2010 has been the warmest. Potential climate change impacts in California may include loss of snow pack, sea level rise, more

extreme heat days per year, more high ozone days, more large forest fires, and more drought years. California is taking numerous steps to further understand and address the potential human, financial and environmental impacts (State of California, 2018)

In response to climate change, California implemented Assembly Bill (AB) 32, the "California Global Warming Solutions Act of 2006." AB 32 requires achievement by 2020 of a statewide GHG emissions limit equivalent to 1990 emissions (essentially a 15 percent reduction below 2005 emission levels) and the adoption of rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emissions reductions. On September 8, 2016, the governor signed Senate Bill (SB) 32 into law, extending AB 32 by requiring the State to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). On December 14, 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 target. As with the 2013 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends local governments adopt policies and locally-appropriate quantitative thresholds consistent with a statewide per capita goal of six metric tons (MT) CO_2e by 2030 and two MT CO_2e by 2050 (CARB 2017).

Threshold

The vast majority of individual projects do not generate sufficient GHG emissions to directly influence climate change. However, physical changes caused by a project can contribute incrementally to cumulative effects that are significant, even if individual changes resulting from a project are limited. The issue of climate change typically involves an analysis of whether a project's contribution towards an impact would be cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines, Section 15064[h][1]).

According to CEQA Guidelines, projects can tier off of a qualified GHG reduction plan, which allows for project-level evaluation of GHG emissions through the comparison of the project's consistency with the GHG reduction policies included in a qualified GHG reduction plan. This approach is considered by the Association of Environmental Professionals (AEP) in its white paper, *Beyond Newhall and 2020*, to be the most defensible approach presently available under CEQA to determine the significance of a project's GHG emissions (AEP 2016). In 2014, the CSU system completed a Sustainability Report which committed to reducing CO_2 emissions to 1990 levels by 2020, in accordance with AB 32, and 80 percent below 1990 levels by 2040 (CSU 2014). CSU does not provide target emission levels that correspond to these reduction targets, however, and no 1990 baseline emissions and population data are available at the system-wide or campus level from which target reductions can be calculated. Additionally, the Sustainability Report is not a qualified climate action plan per CEQA Section 15183.5. Thus, this approach is not currently feasible for this analysis.

To evaluate whether a project may generate a quantity of GHG emissions that may have a significant impact on the environment, a number of operational bright-line significance thresholds have been developed by State agencies. Significance thresholds are numeric mass emissions thresholds which identify the level at which additional analysis of project GHG emissions is necessary. Projects that attain the significance target, with or without mitigation, would result in less than significant GHG emissions. Many significance thresholds have been developed to reflect a 90 percent capture rate tied to the 2020 reduction target established in AB 32, such as the SCAQMD bright-line threshold of 3,000 MT of CO_2e per year for development projects. These targets have

been identified by numerous lead agencies as appropriate significance screening tools for projects. Therefore, if the project exceeds the SCAQMD bright-line threshold of 3,000 MT of CO_2e per year, impacts would be significant.

Methodology

The GHG analysis has been conducted using CalEEMod version 2016.3.2, the input data and assumptions discussed under Methodology and Thresholds in Section 3, and the methodologies recommended by CAPCOA (CAPCOA 2008) CEQA and Climate Change white paper. The analysis focuses on CO_2, N_2O, and CH_4 as these are the GHG emissions that onsite development would generate in the largest quantities. Fluorinated gases, such as HFCs, PFCs, and SF6, were also considered for the analysis. However, emissions of fluorinated gases would not occur from a parking garage as these gases are primarily associated with industrial processes.

Construction of the proposed project would generate temporary GHG emissions primarily due to the operation of construction equipment and vehicle trips associated with construction (e.g., worker hauling, and vendor trips). Per SCAQMD guidance, construction emissions are amortized over 30 years and added to operational GHG emissions to determine the overall GHG emissions from the project.

CalEEMod provides operational emissions from area, energy, mobile, waste, and water sources. Emissions from energy use include emissions from electricity. Electricity emissions are calculated by multiplying the energy use times the carbon intensity of the utility district per kilowatt hour (CAPCOA 2017). The proposed project is a parking structure that would replace an existing parking lot. Because the parking structure would be enclosed and include lights and elevators, it would generate emissions from the use of energy, but not from waste or water sources. The project would not generate mobile-source emissions because no new trips would be generated. Minor emissions would occur from area sources (e.g., landscaping equipment).

Complete CalEEMod results and assumptions can be viewed in Appendix A.

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

This section evaluates potential impacts of the proposed project related to the generation of GHG emissions. Complete modeling results are included as Appendix A of this report.

Construction Emissions

For the purpose of this analysis, it is assumed that construction activity would begin May 2019 with completion by the end of August 2020. As shown in Table 12, construction activity for the project would generate an estimated 1,035 MT CO_2e. When amortized over 30 years, project construction would generate 35 MT CO_2e per year as shown in Table 13.

Table 12 Estimated Construction Emissions of Greenhouse Gases

Construction Year	Annual Emissions MT CO_2e
2019	513.8
2020	520.7
Total	1,034.5
Amortized over 30 years	34.5

Notes: Emissions modeling was completed using CalEEMod. See Appendix A for modeling results. Some numbers may not add up due to rounding. Emission data is pulled from "mitigated" results that include compliance with regulations and project design features that will be included in the project.

Operational and Total Project Emissions

Table 13 Combined Annual Emissions MT CO_2e/year

Emission Source	Annual Emissions MT CO_2e
Construction	34.5
Operational	
Area	<0.1
Energy	877.7
Mobile	0
Solid Waste	0
Water	0
Net Total	**912.2**
SCAQMD Threshold	3,000
Exceeds Threshold?	No

Notes: Emissions modeling was completed using CalEEMod. See Appendix A for modeling results. Some numbers may not add up due to rounding. Emission data is pulled from "mitigated" results that include compliance with regulations and project design features that will be included in the project. The project would not produce emissions from mobile sources because no new VMT are generated. Solid waste and water emissions would not be generated as there will be no water use or solid waste generation associated with the parking structure.

Table 13 combines the construction and operational GHG emissions associated with development of the project. As shown, annual emissions from the proposed project would be 912 MT CO_2e. These emissions would not exceed the 3,000 MT CO_2e per year threshold. Therefore, impacts from GHG emissions would be less than significant.

LESS THAN SIGNIFICANT IMPACT

b. Would the project conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

There are numerous state plans, policies, and regulations adopted for the purpose of reducing GHG emissions. Senate Bill 375 (SB 375), signed in August 2008, enhances the State's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from vehicles for 2020 and 2035. In addition, SB 375 directs each of the State's 18 major Metropolitan Planning Organizations (MPO) to prepare a "sustainable communities strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the Regional Transportation Plan (RTP). In April 2016, SCAG adopted the *2016-2040 Regional Transportation Plan/Sustainable Communities Strategy* (RTP/SCS). SCAG's RTP/SCS includes a commitment to reduce emissions from transportation sources by promoting compact and infill development to comply with SB 375.

The proposed project would replace an existing surface parking lot with a multi-level parking garage that would accommodate more students in the same footprint area. The proposed project would be consistent with the goal of promoting infill development and would not conflict with SCAG's RTP/SCS or any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. Additionally, the project would serve as a central parking location for CSU Fullerton, which would allow students to park once and walk to their destinations, rather than moving their cars between parking areas on the outer edges of campus. This aligns with the Transportation Demand Management goal set forth in the 2014 CSU Sustainability Report because students would be discouraged from relocating their vehicles throughout the day. Furthermore, the project would not result in new vehicle trips as compared to the 2003 MDP since the trips are already accounted for under the Plan. Therefore, the project would not conflict with applicable GHG reduction plans, policies, or goals.

NO IMPACT

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9 Hazards and Hazardous Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	■	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	■	☐
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?	☐	☐	■	☐
d. Be located on a site that is included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	■
e. For a project located in 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 result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	■
f. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	■
g. Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?	☐	☐	☐	■

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

b. Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

The proposed project would involve replacement of an existing parking lot with a five-story, six-level parking structure containing a maximum of 1,902 total parking spaces. Operation of the proposed project would not involve the routine transport, use or disposal of hazardous substances, other than minor amounts typically used for maintenance.

Potentially hazardous materials such as fuels, lubricants, and solvents could be used during grading and construction of the proposed project. Further, construction activities could use hazardous and flammable substances/oils during heavy equipment operation for site preparation and building construction. However, the transport, use, and storage of hazardous materials during construction of the project would be conducted in accordance with all applicable State and federal laws and regulations, such as the Hazardous Materials Transportation Act, Resource Conservation and Recovery Act, the California Hazardous Material Management Act, and the California Code of Regulations, Title 22. In addition, in the event of an unanticipated spill or related accident during the construction of the project, the applicant and any contractors would be required to comply with applicable local, State, and federal laws for responding to spills or handling potentially hazardous materials. Adherence to these requirements would reduce potential impacts to a less than significant level.

LESS THAN SIGNIFICANT IMPACT

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school?

There are no schools, other than CSU Fullerton, within 0.25 mile of the project site. The schools closest to the project site are Robert C. Fisler Elementary School (located approximately 6.6 miles to the east), D. Russell Parks Junior High School (located approximately 5.7 miles to the east), and Fullerton Union High School (located approximately 2.9 miles to the east). Furthermore, the proposed project would not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste, other than minor amounts typically used for construction and maintenance, as described in discussion 8a, b.

LESS THAN SIGNIFICANT IMPACT

d. Would the project be located on a site included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

The following databases and listings compiled pursuant to Government Code Section 65962.5 were checked for known hazardous materials contamination at the project site:

- **USEPA**
  - Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)/Superfund Enterprise Management System (SEMS)/Envirofacts database search

- **State Water Resources Control Board (SWRCB)**
  - GeoTracker search for leaking underground storage tanks (LUST) and other Cleanup Sites
- **California Department of Toxic Substances Control (DTSC)**
  - EnviroStor search for hazardous facilities or known contamination sites

The project site is not located on or adjacent to any known hazardous or contaminated sites. The USEPA is retiring the CERCLIS database and is replacing it with SEMS. The SEMS database search did not produce any results associated with the project site, indicating that the site is free of known hazards and contaminants (USEPA 2018). A search of the EnviroStor database did not identify Resource Conservation and Recovery Act sites within 0.25 mile of project site (DTSC 2018). According to GeoTracker, there are no LUST or other clean-up sites within 0.25 mile of the project site (SWRCB 2018). Therefore, the project site is not located on a known hazardous materials site and construction and operation would not create a significant hazard to the public or the environment from such a source. Impacts related to hazardous material sites would not occur.

NO IMPACT

e. For a project located within 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 result in a safety hazard for people residing or working in the project area?

The project site is located 6.5 miles southeast of the Fullerton Municipal Airport, a general aviation airport. The project site is not within the Airport Impact Zone, the Height Restriction Zone, or the Accident Potential Zone for the Fullerton Municipal Airport (Orange County Airport Land Use Commission 2004)**.**

NO IMPACT

f. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The proposed project involves infill development and would not conflict with an adopted emergency response plan or emergency evacuation plan. The proposed project would not obstruct access to the project vicinity through road closures or other project actions that could impair evacuation during emergencies. Primary access to the site would continue to be provided through the access roadway off of Folino Drive or Nutwood Ave, with secondary access from the Orange Freeway (SR-57).

NO IMPACT

g. Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

The proposed project would not expose people or structures to a significant risk of loss, injury, or death from wildland fires. The project site is located in a developed area and is not in a designated Very High Fire Hazard Severity Zone (City of Fullerton 2015).

NO IMPACT

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10 Hydrology and Water Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	■	☐	☐
b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	■
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
(i) Result in substantial erosion or siltation on- or off-site;	☐	■	☐	☐
(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;	☐	☐	☐	■
(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	☐	■	☐	☐
(iv) Impede or redirect flood flows?	☐	☐	☐	■
d. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	■	☐
e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	■

a. Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

c.i. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would result in substantial erosion or siltation on- or off-site?

c.iii. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

The project site is currently developed with a surface parking lot. It is served by the CSU Fullerton on-campus drainage system, which connects to local and regional drainage systems. During construction and operation of the proposed project, runoff would be discharged to this system. Construction of a project resulting in the disturbance of more than one acre requires an National Pollutant Discharge Elimination System (NPDES) permit. Construction project proponents are also required to prepare a SWPPP, to ensure compliance with the RWQCB stormwater discharge requirements. Because the project site is approximately 2.2 acres, and the project would involve development on the whole site, construction of the project would involve disturbance of more than one acre, and therefore require a SWPPP to ensure compliance with the RWQCB. Mitigation Measure 14 of the Final EIR for the 2003 MDP (CSU Fullerton, 2003) reinforces these requirements by requiring a SWPPP for construction activities totaling more than one acre and specifying measures that may be included in the SWPPP. These requirements would ensure that the project would not violate any water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality. This mitigation measure has been adapted from the 2003 FEIR below as Mitigation Measure HYD-1 and is required of the proposed project to ensure that this impact would be less than significant.

Because impermeable surfaces would not appreciably increase with construction of the project, and the drainage pattern of the site would not be altered after project construction, the project would not increase runoff, alter drainage patterns, or create erosion. It would thus not create new sources of polluted runoff or create new runoff that would exceed the capacity of existing or planned stormwater drainage systems.

HYD-1 Prepare Stormwater Pollution Prevention Plan

The University shall institute a stormwater pollution prevention plan (SWPPP) for construction of the proposed project to reduce the entry of construction debris, sediment, and other material from all construction sites into local waterways. The SWPPP may include the following measures:

- Schedule excavation and grading work for dry weather
- Use as little water as possible for dust control
- Never hose down dirty pavement or impermeable surfaces where fluids have spilled
- Utilize revegetation, if feasible, for erosion control after clearing, grading, or excavating
- Avoid excavation and grading activities during wet weather
- Construct diversion dikes to channel runoff around the site, and line channels with grass or roughened pavement to reduce velocity of runoff
- Install sediment filters and/or debris traps at or near entrances to the storm drain system

- Cover stockpiles and excavated soil with tarps and plastic sheeting
- Remove existing vegetation only when absolutely necessary; consider planting temporary vegetation for erosion control on slopes or where construction is not immediately planned; and plant permanent vegetation as soon as possible

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

The proposed project would involve the construction of a parking structure that would not include any bathrooms or other water-consuming features. Although building and site plans have not yet been developed for the project, it could include landscaping around the parking structure that would consume water. However, landscaping already exists on the project site, and no substantial increase in landscaping irrigation would result from construction of a parking structure on the site. The project would therefore lead to no substantial increase in water use that would increase demand on groundwater supplies. Additionally, because impermeable surfaces would not appreciably increase with construction of the project, groundwater recharge would not be affected by the project, and the project would have no impact on groundwater recharge or impede sustainable groundwater management.

NO IMPACT

c.ii. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Because impermeable surfaces would not appreciably increase with construction of the proposed project, and the drainage pattern of the site would not be altered after project construction, the project would not increase runoff or alter drainage patterns in a manner that would result in flooding on- or off-site.

NO IMPACT

c.iv. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would impede or redirect flood flows?

The project site is located within FEMA Flood Zone X, defined as “Areas determined to be outside the 0.2% annual chance floodplain” (FEMA Flood Insurance Rate Map No. 06059C0044J). All areas surrounding the project site are also designated FEMA Flood Zone X. The project would not place any housing in a flood zone. Additionally, the project would not redirect flood flows because there is no designated flood zone near the project.

NO IMPACT

d. Would the project in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

The project site is not in a dam inundation area, as shown on Exhibit 5.8-2 of the FEIR for the Fullerton General Plan (City of Fullerton 2012). The Fullerton General Plan FEIR does not identify any risk of flooding from levees in the city, and there are no levees in the vicinity of the project site that could produce flooding on the project site as a result of their failure. Due to its inland location, the potential for a tsunami to impact any property in the city is low (City of Fullerton 2012). Additionally, the project site is located in a fully developed area that is not on or near a hillside, or in a flood zone or other area where mudflows could be carried to the project site from such areas. Therefore, the potential for such impacts to release pollutants is low, and this impact is less than significant.

LESS THAN SIGNIFICANT IMPACT

e. Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

As discussed under impact a above, the project would be required to obtain a NPDES permit. Construction project proponents would also require a SWPPP, to ensure compliance with the RWQCB stormwater discharge requirements. These requirements would ensure that the project would not violate any water quality standards or waste discharge requirements. Therefore, the project would not conflict with the implementation of the water quality control plan in the RWQCB.

The project site is located within the Orange County Groundwater Basin. The California Department of Water Resources (DWR) currently ranks the Basin as medium priority based on the most recent results of the statewide prioritization process (DWR 2018). The Sustainable Groundwater Management Act (SGMA) requires that all high- and medium-priority basins be managed under a Groundwater Sustainability Plan. In 2015, the Orange County Water District (OCWD) published the fifth update to the Groundwater Management Plan for the Orange County Groundwater Basin. The Plan incorporated new regulations and requirements of the SGMA (OCWD 2015).

As discussed under impact b above, the parking structure would not include any water-consuming feature which would increase water demand. The project could include landscaping around the structure which would utilize water for irrigation. However, this would replace existing landscaping and would not result in an increase in water use. The project would also not increase the amount of impervious surfaces on-site which would impact groundwater recharge in the Basin. Therefore, the project would not conflict or obstruct implementation of the Groundwater Management Plan and impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

11 Land Use and Planning

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Physically divide an established community?	☐	☐	☐	■
b. Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	■

a. Would the project physically divide an established community?

The proposed project consists of the construction of a parking structure on land currently used as a surface parking lot. The project site is surrounded by university and residential buildings, and the project would not create any physical boundary or division to surrounding uses.

NO IMPACT

b. Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

As described in Section 7 of the Initial Study section of this IS-MND, the 2003 MDP shows the site remaining in its current configuration as a surface parking lot, it was determined that this location could support an additional parking structure given its proximity to the Eastside Parking Structure that was constructed in 2012. The proposed project would involve demolition of the existing parking lot and construction of a five-story, six-level parking structure in its place. The proposed project would increase the number of parking spaces on the project site, but that increase would be within the increase in parking spaces planned for in the MDP, and the project would therefore be consistent with the MDP, both in terms of use and intensity of use. As described throughout this IS-MND, the proposed project would comply with state and federal requirements. The proposed project would therefore not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

NO IMPACT

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12 Mineral Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	■
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	■

a. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

b. Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

The City of Fullerton General Plan Natural Environment Element (City of Fullerton 2012a) does not identify any mineral resources or mineral resource recovery sites on or near the project site.

NO IMPACT

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13 Noise

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in:				
a. 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?	☐	■	☐	☐
b. Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	■	☐
c. 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?	☐	☐	☐	■

General Noise Background

Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz).

Sound pressure level is measured on a logarithmic scale with the 0 dBA level based on the lowest detectable sound pressure level that people can perceive (an audible sound that is not zero sound pressure level). Based on the logarithmic scale, a doubling of sound energy is equivalent to an increase of 3 dBA, and a sound that is 10 dBA less than the ambient sound level has no effect on ambient noise. Because of the nature of the human ear, a sound must be about 10 dBA greater than the ambient noise level to be judged as twice as loud. In general, a 3 dBA change in the ambient noise level is noticeable, while 1-2 dBA changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while areas adjacent to arterial streets are typically in the 50 to 60+ dBA range. Normal conversational levels are usually in the 60 to 65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations.

Noise from point sources, such as from individual pieces of machinery, typically attenuates (or drops off) at a rate of 6 dBA per doubling of distance from the noise source. Noise levels from lightly traveled roads typically attenuate at a rate of about 4.5 dBA per doubling of distance. Noise levels

from heavily traveled roads typically attenuate at about 3 dBA per doubling of distance. Noise levels may also be reduced by intervening structures. Generally, a single row of buildings between the receptor and the noise source reduces noise levels by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA (Federal Transit Administration [FTA] 2006). The manner in which buildings in California are constructed generally provides a reduction of exterior-to-interior noise levels of approximately 25 dBA with closed windows (FTA 2006).

In addition to the instantaneous measurement of sound levels, the duration of sound is important since sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. One of the most frequently used noise metrics that considers both duration and sound power level is the equivalent noise level (Leq). The Leq is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). Typically, Leq is summed over a one-hour period. Lmax is the highest RMS (root mean squared) sound pressure level within the measurement period, and Lmin is the lowest RMS sound pressure level within the measurement period.

The time period in which noise occurs is also important since nighttime noise tends to disturb people more than daytime noise. Community noise is usually measured using Day-Night Average Level (Ldn), which is the 24-hour average noise level with a 10-dBA penalty for noise occurring during nighttime (10:00 PM to 7:00 AM) hours, or Community Noise Equivalent Level (CNEL), which is the 24-hour average noise level with a 5 dBA penalty for noise occurring from 7:00 PM to 10:00 PM and a 10 dBA penalty for noise occurring from 10:00 PM to 7:00 AM. Noise levels described by Ldn and CNEL typically do not differ by more than 1 dBA. In practice, CNEL and Ldn are often used interchangeably.

The relationship between peak hourly Leq values and associated Ldn/CNEL values depends on the distribution of traffic over the entire day. There is no precise way to convert a peak hourly Leq to Ldn/CNEL. However, in urban areas near heavy traffic, the peak hourly Leq value is typically 2 to 4 dBA lower than the daily Ldn/CNEL value (California State Water Resources Control Board [SWRCB] 1999). In less heavily developed areas, such as suburban areas, the peak hour Leq is often roughly equal to the daily Ldn/CNEL. For rural areas with little nighttime traffic, the peak hour Leq will often be 3 to 4 dBA greater than the daily Ldn/CNEL value.

Vibration

Vibration refers to groundborne noise and perceptible motion. Vibration is a unique form of noise because its energy is carried through buildings, structures, and the ground, whereas noise is simply carried through the air. Thus, vibration is generally felt rather than heard. Some vibration effects can be caused by noise; e.g., the rattling of windows from passing trucks. This phenomenon is caused by the coupling of the acoustic energy at frequencies that are close to the resonant frequency of the material being vibrated. Typically, groundborne vibration generated by manmade activities attenuates rapidly as distance from the source of the vibration increases. The ground motion caused by vibration is measured as particle velocity in inches per second and is referenced as vibration decibels (VdB) in the U.S.

The background vibration velocity level in residential areas is usually around 50 VdB. The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. The range of interest is from approximately 50 VdB, which is the typical background vibration velocity level, to 100 VdB, which is the general threshold where minor damage can occur

in fragile buildings (FTA 2006). Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel wheeled trains, and traffic on rough roads.

Project Area Noise Conditions

The primary off-site noise sources in the project area are motor vehicles (e.g., automobiles, buses, and trucks), particularly along the Orange Freeway (SR-57). Motor vehicle noise is a concern because it is characterized by a high number of individual events that often create sustained noise levels. Ambient noise levels would be expected to be highest during the daytime and rush hour unless congestion slows speeds substantially.

To determine ambient noise levels in the project area, four 15-minute sound level measurements were taken using an Extech ANSI Type II integrating sound level meter during evening peak traffic hours between 4:00 PM and 6:00 PM on September 6, 2018 (refer to Appendix D for sound measurement data). Measurement locations were selected based on the potential exposure of surrounding noise-sensitive receptors, mainly residences, to noise generated during construction and operation of the proposed project. See Figure 8 for the locations of sound measurements. As shown in Table 14, the ambient noise level at the project site range from approximately from 58 dBA Leq along the project site's western boundary to 68 dBA Leq along the project site's eastern boundary.

Table 14 Sound Level Measurement Results

	Measurement Location	Primary Source of Noise	Approximate Distance to Centerline of Roadway	Sample Time	Leq[15] (dBA)[1]
1	Northeast corner of Parking Lot E adjacent to highway	Traffic on SR-57	10 feet from Folino Dr.	4:13 PM – 4:28 PM	67.9
2	Northwest corner of Parking Lot E adjacent to campus	Traffic on SR-57	10 feet from Gymnasium Campus Dr.	4:30 PM – 4:45 PM	58.1
3	Southwest corner of Parking Lot E adjacent to campus	Traffic on SR-57	10 feet from Folino Dr.	4:52 PM – 5:07 PM	59.7
4	Southeast corner of Parking Lot E adjacent to highway	Traffic on SR-57	10 feet from Folino Dr.	5:09PM- 5:24 PM	67.1

See Figure 8 for a map of sound level measurement locations and Appendix D sound level measurement data.

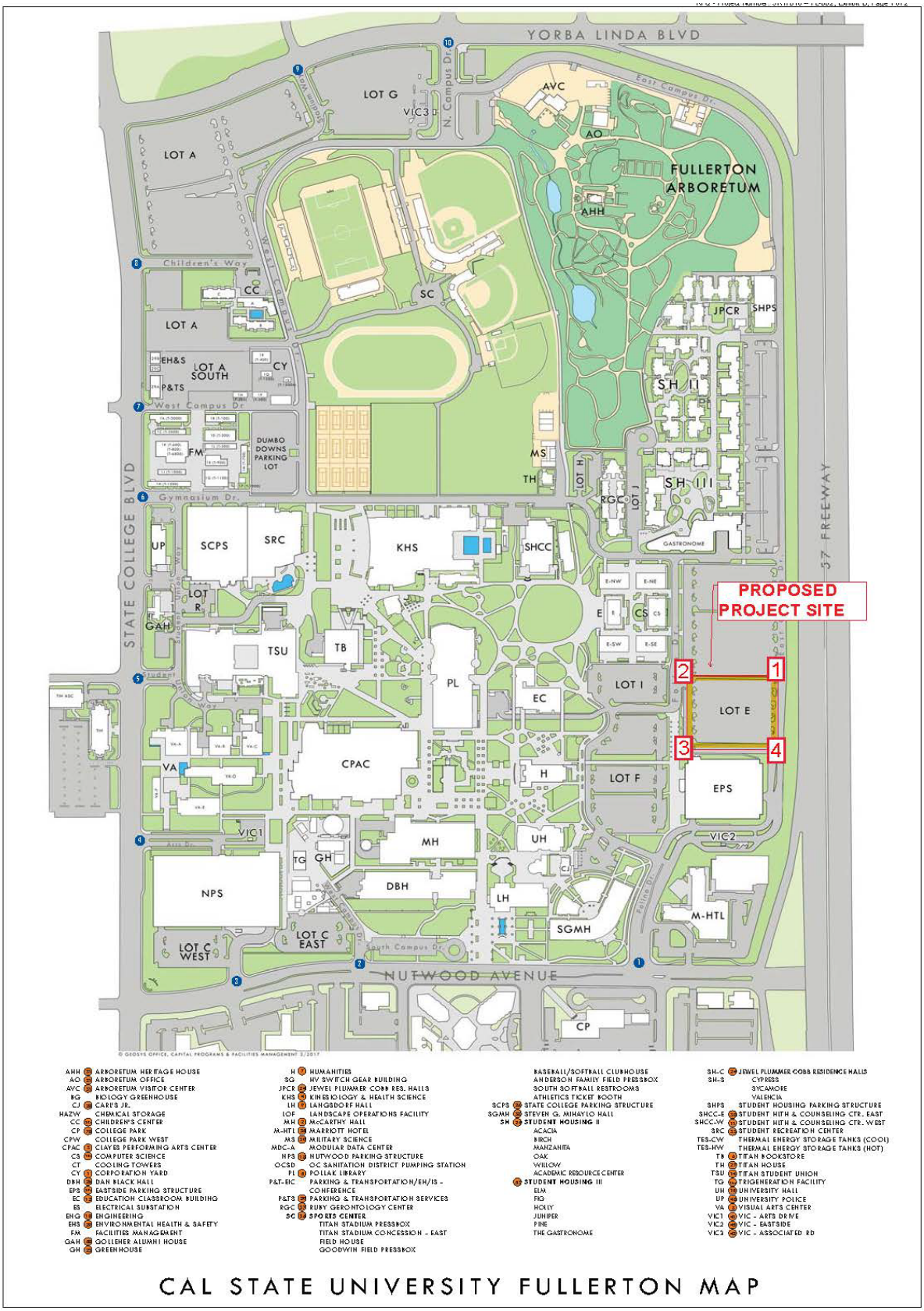
[1] The equivalent noise level (Leq) is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). For this measurement, the Leq was over a 15-minute period (Leq[15]) .

Source: Rincon Consultants, field measurements on September 6, 2018 using ANSI Type II Integrating sound level meter

Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. The predominant noise sensitive land uses on the campus include student housing and campus classroom buildings. Student housing is located approximately 620 feet north of the existing parking lot. There are classrooms approximately 120 feet west of the project site.

Figure 8 Sound Level Measurement and Sensitive Receptor Locations



Regulatory Setting

Neither the University nor the overall CSU system have adopted policies or standards related to temporary or long-term noise control.

a. Would the project result in 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?

Operational Noise

Neither the University nor the overall CSU system have adopted policies or standards related to temporary or long-term noise control. Nonetheless, the proposed land use (parking structure) would be compatible with the existing noise environment because the project site currently operates as a parking lot.

The existing noise at the project site is primarily from traffic along the Orange Freeway (SR-57), as well as cars parking in the existing surface parking lot. As discussed under *Transportation and Traffic* below, the proposed project does not have any components that would increase or redistribute traffic on the local circulation system. Additionally, the proposed parking structure would not exceed the total number of parking spaces approved in the 2003 FEIR. Because noise generated by operation of the proposed parking structure would be similar to existing use of the parking lot (i.e., cars parking) and the project would not generate new trips, the project would not result in a substantial permanent increase in ambient noise levels above levels existing without the project.

Construction Noise

The proposed project would generate temporary (construction-related) noise. Temporary, construction-related noise would occur during grading, infrastructure installation, and vertical construction of the parking structure. While the noise levels associated with project construction would be substantially higher than existing ambient noise levels in the project vicinity, construction noise would cease upon the completion of construction. Noise impacts experienced on-site would vary depending on the type of construction equipment, the equipment's location, the sensitivity of nearby land uses, and the timing/duration of construction.

Construction noise was estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). RCNM predicts construction noise levels for a variety of construction operations based on empirical data and the application of acoustical propagation formulas. RCNM provides reference noise levels for standard construction equipment, with an attenuation of 6 dBA per doubling of distance for stationary equipment and 3 dBA per doubling of distance for mobile equipment. The model does not take into consideration topographic variation of the area; as such, it provides more conservative results. The nearest noise sensitive receptors are a classroom located approximately 120 feet west of the project site and student housing located approximately 620 feet north of the project site. There are also residences 380 feet east of the project site, across SR 57. However, due to distance and noise generated by the intervening highway, temporary construction would not substantially increase ambient noise levels at these off-campus residences.

Table 15 shows the maximum expected noise levels at the nearest sensitive receptors based on the combined construction equipment anticipated to be used concurrently during each phase of construction.

Table 15 Construction Noise Levels by Phase

		Classrooms (120 feet west)		Student Housing (620 feet north)	
Construction Phase	Equipment	Maximum Noise Level (dBA Lmax)	Hourly Noise Level (dBA Leq)	Maximum Noise Level (dBA Lmax)	Hourly Noise Level (dBA Leq)
Site Preparation	Grader, Scraper, Backhoe	77.4	76.2	63.1	61.9
Grading	Grader, Dozer, Backhoe	77.4	75.6	63.1	61.9
Construction	Crane, Forklift, Generator, Backhoe, Welder	73.0	73.0	58.8	58.7
Paving	Concrete Mixer, Paver, Roller, Backhoe	72.4	72.4	58.1	58.1
Architectural Coating	Air Compressor	70.1	66.1	55.8	51.8

See Appendix E for RCNM results and Appendix A for CalEEMod results with construction equipment list.

As shown in Table 15, construction noise would be as high as 77.4 dBA Lmax and 76.2 dBA Leq at classrooms during the site preparation phase. However, because project construction would start at the end of May, the vast majority of the site preparation and grading phases would overlap with the summer break and many classrooms would be empty as enrollment levels drop dramatically during the summer session. Building construction, paving, and architectural coating phases could overlap with classroom operations and noise levels during those phases would range from 70.1 to 73 dBA Lmax and 66.1 to 73 dBA Leq. Existing ambient noise near the classrooms is 58.1 to 59.7 dBA Leq (see noise measurement results in Table 14). Therefore, noise would exceed existing ambient noise levels by as much as 14.9 dBA Leq (73 – 58.1 dBA Leq) during peak construction activities. Impacts would be potentially significant.

Construction noise generated by the project would range from 51.8 to 61.9 dBA Leq at the student housing north of the project site. The student housing area is exposed to the same primary noise source in the area, SR-57, as the project site; therefore, ambient noise there is similar to that measured on the project site, which ranges from 58 to 68 dBA Leq, increasing with proximity to SR-57. Construction generated noise would be less than or within the range of existing ambient noise levels at the student housing; therefore, construction would not generate temporary noise levels substantially in excess of existing ambient noise at the student housing and impacts would be less than significant.

The following mitigation would be required to reduce temporary construction noise impacts at nearby classrooms to a less than significant level.

N-1 Mufflers

During project construction, all equipment, fixed or mobile, shall be operated with closed engine doors and shall be equipped with properly operating and maintained industrial grade mufflers capable of reducing engine noise by at least 15 dBA, and air-inlet silencers where appropriate, consistent with manufacturers' standards. Mobile or fixed "package" equipment (e.g., arc-welders, air compressors) shall be equipped with shrouds and noise control features that are readily available for that type of equipment.

Industrial grade mufflers have been proven to reduce noise levels by at least 15 dBA at 50 feet of distance. This reduction is greater than the increase in ambient noise levels that are anticipated to occur during peak construction activities (14.9 dBA Leq). Implementation of mitigation measure N-1 would ensure that temporary construction noise impacts are less than significant.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Would the project result generation of excessive groundborne vibration or groundborne noise levels?

Certain types of construction equipment can generate high levels of groundborne vibration. Construction of the proposed project would potentially utilize loaded trucks during most construction phases and a large bulldozer during the grading phase. CSU has not adopted a significance threshold to assess vibration impacts during construction and operation. Therefore, the FTA guidelines set forth in the FTA Transit Noise and Vibration Assessment (2006), are used to evaluate potential impacts related to construction vibration for both potential building damage and human annoyance. Based on the FTA criteria, construction vibration impacts would be significant if vibration levels exceed 94 VdB, which is the general threshold where minor damage can occur in fragile buildings, 75 VdB at institutional land uses with primary daytime use (such as the classrooms), or 72 VdB at residences during nighttime hours (FTA 2006).

As shown in Table 16, groundborne vibration from construction equipment would not exceed 75 VdB at the nearest classrooms, which is the threshold for institutional uses with primary daytime uses. Construction would be restricted to daytime hours and therefore, would not substantially impact student housing north of the project site. In addition, construction related vibration would also not exceed 72 VdB at student housing north of the project site, which is the threshold for residences during nighttime hours. Therefore, construction-related vibration impacts would be less than significant.

Table 16 Vibration Levels at Sensitive Receptors

	Estimated VdB at Nearest Sensitive Receptors	
Equipment	**Classrooms (120 feet)**	**Student Housing (620 feet)**
Loaded Truck	65	44
Large bulldozer	67	45
FTA Threshold	75	72
Threshold Exceeded?	No	No

See Appendix F for vibration analysis worksheets.
Source: FTA 2006

Operation of the proposed parking structure would generate vibration levels similar to existing use of the parking lot because the source of vibration would be the same (i.e. cars parking). The project would not perceptibly increase groundborne vibration or groundborne noise on the project site. Operational vibration impacts would be less than significant.

LESS THAN SIGNIFICANT IMPACT

c. 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?

The project site is located approximately 5.6 miles east of Fullerton Municipal Airport. The project site is not located within the Airport Land Use Plan and is not within the airport's 65 dBA noise contours (Airport Land Use Commission [ALUC] 2004). Fullerton Municipal Airport is a general aviation use airport and not a private airstrip. There are no private airstrips within the vicinity of the proposed project. The proposed project would not expose people to excessive noise levels related to airports or private airstrips.

NO IMPACT

14 Population and Housing

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Induce substantial unplanned population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	☐	☐	☐	■
b. Displace substantial amounts of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■

a. Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

Similar to the Eastside Parking Structure, which was explained in the 2003 MDP and analyzed in the FEIR, the project would not result in substantial population growth, because it would accommodate, not cause, growth in student enrollment generated by housing and employment growth in the University's service area. The currently proposed project would increase the number of parking spaces on the project site, but that increase would be within the increase in parking spaces identified in the Master Development Plan. Additionally, increasing the number of parking spaces on campus would not increase enrollment or otherwise induce population growth.

NO IMPACT

b. Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The proposed project would be constructed on the site of an existing surface parking lot and would not directly or indirectly displace housing or people.

NO IMPACT

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15 Public Services

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
1 Fire protection?	☐	☐	☐	■
2 Police protection?	☐	☐	■	☐
3 Schools?	☐	☐	☐	■
4 Parks?	☐	☐	☐	■
5 Other public facilities?	☐	☐	☐	■

a.1 Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered fire protection facilities, or the need for new or physically fire protection facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives?

The Fullerton Fire Department Headquarters would provide fire protection services to the project site. The fire station closest to the project site is the Fullerton Fire Department Headquarters, located at 312 E. Commonwealth Avenue in Fullerton. The project site is located approximately 2.35 miles from this fire station. The Fire Prevention Division conducts ongoing inspection for the purpose of life safety, reduction in property loss, weed and rubbish abatement, and the enforcement of federal (NPDES), state and local fire regulations (City of Fullerton 2015).

As discussed in Impact Discussion 13.a., development of the proposed parking structure would not increase the population of CSU Fullerton or the city of Fullerton. It would, therefore, also not increase demand for fire protection services. The project would be developed in accordance with applicable CSU Fullerton fire codes and policies (CSU Fullerton 2017), including adequate vehicle access, adequate fire flow, and the use of proper fire-resistant construction methods. No impact would occur.

NO IMPACT

a.2 Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered police protection facilities, or the need for new or physically altered police protection facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives?

Police services to the project site would be provided by the University Police Department (UPD), located on the CSU Fullerton campus, where the project site is located. UPD has a written agreement with the Fullerton Police Department (FPD) which designates which law enforcement agency has operational responsibility for the investigation of violent crimes and defines the specific geographical boundaries of each agency's operational responsibility (UPD 2019). The nearest FPD station is located at 237 W. Commonwealth Ave in Fullerton, approximately 3.5 miles west of the project site (FPD 2015). The proposed project would not increase the population of the campus or the city. While a minor increase in campus police services could be required to patrol the new parking structure compared to the existing parking lot, these would be minimal and would not require upgrade to existing or construction of new police facilities. The impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

a.3 Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered schools, or the need for new or physically altered schools, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives?

As discussed in Impact Discussion 13.a., the proposed parking structure would not increase the population of CSU Fullerton or the city of Fullerton. The project would therefore not generate new students within the local school district or require the provision of new or physically altered schools. No impact would occur.

NO IMPACT

a.4 Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered parks, or the need for new or physically altered parks, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios or other performance objectives?

As discussed in Impact Discussion 13.a., development of the proposed parking structure would not increase the population of CSU Fullerton or the city of Fullerton. It would, therefore, not increase demand for parks or otherwise lead to the need for more parks. No impact would occur.

NO IMPACT

a.5 Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for other public facilities?

Impacts to other public facilities (e.g. sewer, storm drains, and roadways) are discussed in Impact Discussion 16, *Transportation/Traffic* and Impact Discussion 18, *Utilities* of this IS-MND. As discussed in Impact Discussion 13 of this IS-MND, *Population and Housing*, the proposed project would not

increase population and as a result would not increase demand for any other public facilities. No impact would occur

NO IMPACT

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16 Recreation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	■
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	■

a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The proposed project would not increase the use of recreational facilities, since it consists solely of a parking garage that would serve the existing needs of the CSU Fullerton campus and would not, as discussed in Impact Discussion 13.a., increase the population of CSU Fullerton or the city of Fullerton. The project also does not include any recreational facilities. No impact would occur.

NO IMPACT

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17 Transportation

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	■	☐	☐
b. Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	■	☐	☐
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?	☐	☐	☐	■
d. Result in inadequate emergency access?	☐	■	☐	☐

The project site is located on the campus of CSU Fullerton. The project site is on the eastern edge of the campus, just west of the Orange Freeway (SR-57) and Folino Road, an internal campus road that passes along the eastern edge of the campus. Folino Road connects to Nutwood Avenue on the south side of campus and Yorba Linda Drive (via North Campus Drive) on the north side of campus. The existing East Side Parking Structure, located on Lot E, is located just south of the project site. The remainder of surface parking Lot E is located just to the north of the project site, and extends to Gymnasium Campus Drive about 500 feet north of the project site. Gymnasium Campus Drive runs in an east-west direction through campus, connecting Folino Drive on the east side of campus to State College Boulevard on the west side of campus.

a. Would the project conflict with a plan, ordinance or policy addressing the performance of the circulation system, including transit, roadways, bicycle lanes and pedestrian paths?

b. For a land use project, would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)(1)?

The potential traffic/transportation impacts of buildout of the facilities proposed in the 2003 MDP were analyzed in the FEIR for that plan (CSU Fullerton 2003). This includes discussions of impacts to the circulation systems on and off campus, transit, roadways, bicycle lanes and pedestrian paths for projects. The number of parking spaces included in the proposed parking structure would not exceed the total number of parking spaces approved in the 2003 MDP and FEIR (see Section 7, *Description of Project* of this Initial Study). In order to achieve this, the project will utilize spaces that were envisioned in the 2003 MDP, but ultimately not constructed. For example, in the 2003 MDP the Eastside Parking Structure was planned as a 2,000 space structure, although only 1,500 spaces were constructed. In this case 500 spaces were planned for adjacent to the project site but not constructed. An additional 600 spaces were envisioned as part of the student housing project

located just north of the project site, but were never constructed. Another 364 existing parking spaces will be removed as part of the proposed project, and will be reconstructed in the proposed parking garage, while additional spaces will be removed as roadways are reconfigured. The proposed project would therefore lead to a net increase of a maximum 1,536 parking spaces on the project site and 1,077 across the campus as a whole. While the proposed project would lead to an increase of 1,131 parking spaces on the project site, this would not lead to a significant change in the distribution of the 12,341 total on-campus parking spaces analyzed in the 2003 FEIR.

Typically, provision of parking does not generate vehicle trips; it is the development the parking serves that generates trips, for example in this instance classroom space, on-campus retail, etc. The campus development projects that constructed fewer parking spaces than envisioned in the 2003 MDP are located in the vicinity of the project site, as are the majority of parking spaces that will be eliminated as part of this project or other campus projects. Vehicles traveling to the proposed project would not be creating new traffic patterns on campus roadways, as had the parking spaces been constructed as envisioned in the 2003 MDP, vehicles would have traveled near the vicinity of the project site to access the parking spaces. The exception to this is the 48 parking spaces located along West Campus Drive and the 59 parking spaces located along East Campus Drive. These 107 parking spaces are located in the northern part of the campus, north of the proposed parking structure. Fehr & Peers conducted trip surveys at these 107 spaces to determine impacts to on campus circulation patterns could potentially occur from the relocation of these spaces. The surveys determined that the maximum number of displaced trips would be 20-22 trips during the AM and PM peak hours. This number of trips is relatively small and would not change the operations at surrounding intersections and roadways (Fehr & Peers 2019).

In addition, the proposed project does not have any components that would increase or redistribute traffic on the local circulation system, and would not change the traffic impacts already analyzed in the FEIR for the 2003 MDP because traffic conditions in the vicinity of the project have not changed substantially since approval of the 2003 FEIR. Only two of the intersections projected to operate at LOS E or F during one or both peak hours under Future With Project conditions in the 2003 FEIR, are still projected to operate at unacceptable levels in the 2012 FEIR for The Fullerton Plan (City of Fullerton 2012g). Both the Chapman Avenue/SR 57 SB ramps and State College Boulevard/Chapman Avenue are projected to operate at an unacceptable LOS under Buildout 2030 conditions. The 2012 FEIR does not include specific mitigation measures related to these intersections, and instead focuses on analyzing and evaluating urban streets using an integrated approach that considers the points of view of automobile drivers, transit passengers, bicyclists and pedestrians rather than auto-centric thresholds which conflict with other policies of The Fullerton Plan – including better environments for walking and bicycling, safer streets, increased transit use, cost-effective infrastructure investments, reduced greenhouse gas emissions, and the preservation of open space (City of Fullerton 2012g).

Although the project will accommodate automobile drivers, it will not conflict with the alternative transportation programs in place at the CSU Fullerton campus, and promoted in The Fullerton Plan. The project site is located near transit; approximately 0.25 mile from bus stops located along Nutwood Avenue and 0.42 mile from bus stops located along State College Boulevard. Pedestrians will be able to access these bus stops and the campus via existing sidewalks and pedestrian pathways.

The 2003 EIR identified several impacts requiring mitigation related to construction of projects that would be carried out under the 2003 MDP. These included traffic congestion from addition of construction vehicle traffic onto area roads, tracking of dust and debris onto adjacent streets, loss of

on-campus parking during construction, and adverse effects on pedestrian flows and bus and bicycle circulation routes on campus. The following mitigation measures (adapted from mitigation measure 18-22 of the 2003 FEIR) apply to the proposed project:

T-1 All heavy construction equipment must access and exit the project site as right turns or at signalized intersections, to the extent practicable. The City of Fullerton shall be provided information about proposed haul routes and staging areas within the City rights-of-way to determine the most appropriate haul routes.

T-2 If the total number of parking spaces on campus is temporarily reduced by 100 spaces or more to accommodate construction activities, prior to start of construction the University shall either:

a. Provide temporary replacement parking on-campus or off-campus with shuttle service to campus provided throughout the duration of construction activities, or

b. Provide incentives for carpooling, transit, or other programs to reduce the number of trips to/from campus throughout the duration of construction activities.

T-3 If major pedestrian or bicycle routes on campus are temporarily blocked by construction activities, alternate routes around construction areas shall be provided. These alternative routes shall be posted on campus for the duration of construction.

T-4 If any bus stop or other transit facility on campus is obstructed by construction activities, the University, in cooperation with transit service providers, shall temporarily relocate the transit facility on campus as appropriate and shall appropriately inform the public of the relocation.

T-5 Heavy truck deliveries and haul trips will be scheduled to avoid peak travel times on the SR-57 and SR-91 freeways to the extent practicable.

Mitigation measures T-1 through T-5 would reduce the proposed project's construction-related transportation/traffic impacts to a less than significant level. After mitigation, the project would not have a significant impact on the circulation system that would conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

c. For a transportation project, would the project conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)(2)?

The proposed project would involve construction of a five-story, six-level parking structure on the project site, replacing the existing surface parking lot. The structure is considered a land use project, and consistency with CEQA Guidelines Section 15064.3, subdivision (b)(2) is discussed above in Impact Discussion 17.b. Furthermore, the provisions of this section do not apply until July 1, 2020, and are not applicable to the project at this time.

NO IMPACT

d. Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?

Although a site plan for the proposed parking structure has not yet been developed, CSU Fullerton intends for it to be similar in size and design to the existing East Side Parking Structure, which has two entrances/exits, one on its south side and one on its east side, both of which are to/from Folino Drive. Entrances/exits to the proposed parking structure would therefore most likely be to/from Folino Drive, although the proposed structure could also utilize the unnamed internal campus drive that runs between Lot E and Lot I and then northward to Gymnasium Campus Drive.

With proper design, entrances/exits to and from these roads would not create hazards such as sharp curves or dangerous intersections. Building and site plans would be submitted by project architects before construction of the proposed structure, and these plans would be reviewed by California State University before approval to ensure that no such hazards would be created. The proposed parking structure would be compatible with all surrounding uses, which consist of parking structures or lots on all sides and would fit into the planned circulation and land use system of the campus. No impact would occur.

NO IMPACT

e. Would the project result in inadequate emergency access?

The project site is already the site of a surface parking lot, and construction of the proposed parking structure on this site would not change the use of the site or, as explained in Impact Discussions 16.a. and 16.b. above, substantially change, interfere with, or worsen the performance of the local circulation system. Although temporary impacts to vehicular circulation are anticipated during construction, potential impacts from construction of the proposed project on emergency access would be less than significant with implementation of mitigation measure T-3.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

18 Tribal Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in a Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	■
b. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Cod Section 2024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significant of the resource to a California Native American tribe.	☐	☐	☐	■

As of July 1, 2015, California Assembly Bill 52 of 2014 (AB 52) was enacted and expands CEQA by defining a new resource category, “tribal cultural resources.” AB 52 establishes that “a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment” (PRC Section 21084.2). It further states that the lead agency shall establish measures to avoid impacts that would alter the significant characteristics of a tribal cultural resource, when feasible (PRC Section 21084.3).

PRC Section 21074 (a)(1)(A) and (B) defines tribal cultural resources as “sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe” and is:

1. Listed or eligible for listing in the CRHR, or in a local register of historical resources as defined in PRC section 5020.1(k), or
2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC Section 5024.1. In applying these criteria, the lead agency shall consider the significance of the resource to a California Native American tribe.

AB 52 also establishes a formal consultation process for California tribes regarding those resources. The consultation process must be completed before a CEQA document can be certified. Under AB 52, lead agencies are required to "begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project." Native American tribes to be included in the process are those that have requested notice of projects proposed within the jurisdiction of the lead agency.

a. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074 that is listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)?*

b. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074 that is a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 2024.1?*

CSU Fullerton has not received any requests for project notification under AB 52. Because no tribes have requested to be contacted, no notices in accordance with AB 52 were sent and no further action is required. The results of the SCCIC records search and the SLF search conducted through the NAHC were negative for the project area. As a result, CSU Fullerton assumes that no known tribal cultural resources are present on the project site. No impact would occur.

NO IMPACT

19 Utilities and Service Systems

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	■
b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	■
c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	■
d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	■	☐	☐
e. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	■

a. Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment, or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

c. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

The proposed project would involve the construction of a parking structure that would not include any bathrooms or other water-consuming or wastewater-producing features. It would therefore not produce any wastewater that would exceed treatment requirements of the applicable Regional

Water Quality Control Board or the capacity of any wastewater treatment provider or require or result in the construction of new wastewater treatment facilities or expansion of existing facilities.

Although building and site plans have not yet been developed for the project, it could include landscaping around the parking structure that would consume water. However, landscaping already exists on the project site, and a substantial increase in landscaping irrigation would not result from construction of a parking structure on the site. The proposed project would therefore not require or result in the construction of new water treatment facilities or expansion of existing facilities.

NO IMPACT

b. Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

The FEIR for the 2003 MDP determined that sufficient water supplies were available to serve the uses envisioned in the plan (CSU Fullerton 2003). The proposed project would not substantially increase water use compared to existing conditions or the demands analyzed in the 2003 EIR, and no new or expanded entitlements would be needed.

The proposed project would involve the construction of a parking structure that would not include any bathrooms or other water-consuming features. Although building and site plans have not yet been developed for the project, it could include landscaping around the parking structure that would consume water. However, landscaping already exists on the project site, and the project would not increase water use over existing conditions. Therefore, the project would not impact existing and future water supplies, and there would be no impacts.

NO IMPACT

d. Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

The proposed project is a parking structure that would serve the existing and already-planned-for future parking needs of the CSU Fullerton campus. It would not create or lead to any growth in enrollment or visitors to the campus. Operation of the facility would not generate waste, but construction of the facility could temporarily generate construction waste. The FEIR for the 2003 MDP (CSU Fullerton 2003) determined that sufficient landfill capacity was available to serve the uses envisioned in the plan, but also included Mitigation Measure 23, which requires that construction debris and materials be recycled to the extent practicable. It concluded that this mitigation measure would reduce impacts from construction waste to a less than significant level. The proposed project would not increase waste generation compared to existing conditions or the demands analyzed in the FEIR, and no additional landfill capacity would be required to serve it. Mitigation Measure U-1 (adapted from Mitigation Measure 23 of the 2003 EIR) is required of the proposed project in order to reduce construction waste to the greatest extent practicable.

U-1 Construction Debris and Materials shall be Recycled to the Extent Practicable

Implementation of Mitigation Measure U-1 would reduce impacts from construction waste to a less than significant level, and all other solid waste impacts would be less than significant without the need for mitigation.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

e. Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

During and after construction of the proposed project, CSU Fullerton would be required to comply with applicable elements of AB 1327, Chapter 18 (California Solid Waste Reuse and Recycling Access Act of 1991), and other applicable local, State, and Federal solid waste disposal standards. As stated in the FEIR for the 2003 MDP, CSU Fullerton will continue recycling programs on campus, provide space for recycling facilities, and provide adequate storage area for collection and removal of recyclable materials at new facilities. The impact would be less than significant.

LESS THAN SIGNIFICANT IMPACT

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20 Wildfire

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a. Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	■
b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	■
c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	■
d. Expose people or structures to significant risks, including downslopes or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	■

a. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

b. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

c. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

d. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project expose people or structures to significant risks, including downslopes

or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

The project site is not located in a State Responsibility Area (SRA) (Cal Fire 2011a). The project site is also not located in or near a very high fire hazard severity zone (Cal Fire 2011b). Therefore, there would be no wildfire impacts.

NO IMPACT

21 Mandatory Findings of Significance

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Does the project:				
a. Have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	■	☐	☐
b. Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	■	☐
c. Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	■	☐	☐

a. Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

The project site does not contain any known archaeological or historical resources and as a result the proposed project would not eliminate important examples of the major periods of California history or prehistory. As discussed in Impact Discussion 4, *Biological Resources*, the project site has already been developed as a surface parking lot, and therefore consists mostly of pavement and other hardscaping. Therefore, the project site does not include any mapped essential habitat connectivity areas or sensitive species. There is no riparian habitat, sensitive natural communities, or federally protected wetlands on site. However, the project site currently has existing trees that

would be removed for project construction, which may contain nesting or breeding birds. Therefore, implementation of mitigation measure BIO-1 would require nesting bird surveys to be completed prior to construction activities and, therefore, would reduce potential impacts to a less than significant level.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

As presented in Impact Discussions 1 through 18, the proposed project would have no impact, a less than significant impact, or a less than significant impact after mitigation with respect to all environmental issues. The project has been examined within the context of the 2003 MDP and FEIR and would be consistent with the FEIR findings. Due to the limited scope of direct physical impacts to the environment associated with the proposed project, the impacts are project-specific in nature and would not be cumulatively considerable.

LESS THAN SIGNIFICANT IMPACT

c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

In general, impacts to human beings are associated with air quality, hazards and hazardous materials, and noise impacts. The South Coast Air Basin is currently designated as a non-attainment area for ozone, PM_{10}, $PM_{2.5}$, and lead. Construction of the proposed project would contribute to air pollutant emissions on a short-term basis, but project-related construction emissions were modeled as part of this Initial Study and found to be below applicable thresholds (see Section 3). As discussed in Section 3, b, c, operational emissions of the proposed project would also be below applicable thresholds. The project would also not create objectionable odors affecting a substantial number of people or expose sensitive receptors to substantial pollutant concentrations. Construction related noise and exterior noise levels were found to exceed applicable thresholds. Mitigation measure N-1 is required to reduce temporary noise impacts to less than significant levels. With implementation of these measures, potential impacts on human beings would be less than significant.

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED

References

Bibliography

AC Martin Partners, Inc. *California State University Fullerton Master Development Plan.* November 2004.

California Air Pollution Control Officers Association (CAPCOA). 2008. CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act. Accessed September 2018. http://www.capcoa.org/wp-content/uploads/2012/ 03/CAPCOA-White-Paper.pdf

California Air Resources Board (ARB). 2005. Air Quality and Land Use Handbook: A Community Health Perspective. Accessed September 2018. https://www.arb.ca.gov/ch/handbook.pdf

____. 2014, 2015 & 2016. iADAM: Air Quality Data Statistics, Top 4 Measurements and Days Above the Standard. http://www.arb.ca.gov/adam/topfour/topfour1.php

____. 2016. Ambient Air Quality Standards. Last modified: May 4, 2016. http://www.arb.ca.gov/research/aaqs/aaqs2.pdf (accessed January 2019).

____. 2019. iADAM Air Quality Data Statistics Top 4 Summary. https://www.arb.ca.gov/adam/topfour/topfour1.php (accessed January 2019)

California Air Resources Board (CARB). 2015. CA-Greet 2.0. September 29, 2015 https://www.arb.ca.gov/fuels/lcfs/ca-greet/ca-greet.htm (Accessed September 2018).

California Climate Action Registry (CCAR). 2009. General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1. Accessed September 2018. https://sfenvironment.org/ sites/default/files/fliers/files/ccar_grp_3-1_january2009_sfe-web.pdf)

California Department of Conservation (DOC). 1982. Mineral Land Classification Map. Accessed September 2018. ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sr/SR_143/PartIV/Plate_4-10.pdf

_____. 2017. State of California Williamson Act Contract Land [map]. Tabular digital data and vector digital data. Division of Land Resource Protection. ftp://ftp.consrv.ca.gov/pub/dlrp/wa/2016%20Statewide%20Map/WA_2016_11X17.pdf.

California Emissions Estimator Model (CalEEMod). 2017. User's Guide Version 2016.3.2. Accessed September 2018. http://www.aqmd.gov/docs/ default-source/caleemod/user's-guide---october-2017.pdf?sfvrsn=6)

California Department of Conservation (CDOC). 2017. State of California Williamson Act Contract Land [map]. Tabular digital data and vector digital data. Division of Land Resource Protection. ftp://ftp.consrv.ca.gov/pub/dlrp/wa/2016%20Statewide%20Map/WA_2016_11X17.pdf.

California Department of Fish and Wildlife (CDFW) 2018. Habitat Conservation Programs. Accessed September 2018 at: https://www.wildlife.ca.gov/Explore/Organization/HCPB

California Department of Forestry and Fire Protection (CalFire). 2011a. Fire Hazard Severity Zones in LRA. October 2007. http://frap.fire.ca.gov/webdata/maps/orange/fhszl_map.30.jpg. Accessed January 2019.

____. 2011b. State Responsibility Area Viewer. http://www.fire.ca.gov/fireprevention fee/sraviewer. Accessed January 2019.

California Energy Commission (CEC). 2018a. Total System Electric Generation. https://www.energy.ca.gov/almanac/electricity_data/total_system_power.html. Accessed January 2019.

_____. 2018b. Revised Transportation Energy Demand Forecast 2018-2030. https://efiling.energy.ca.gov/getdocument.aspx?tn=221893. Accessed January 2019.

____. 2018c. 2019 Building Energy Efficiency Standards. https://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_Standards_FAQ.pdf. Accessed January 2019.

____. 2017a. Electricity Consumption by Entity. http://ecdms.energy.ca.gov/elecbyutil.aspx. Accessed January 2019.

____. 2017b. Gas Consumption by County. http://ecdms.energy.ca.gov/gasbycounty.aspx. Accessed January 2019.

____. 2017c. Gas Consumption by Entity. http://ecdms.energy.ca.gov/gasbyutil.aspx. Accessed January 2019.

California Geological Survey (CGS). 2002. California Geomorphic Provinces, Note 36.

____. 2017. Earthquake Zones of Required Investigation: Los Angeles Quadrangle. Accessed September 2018. http://gmw.conservation.ca.gov/SHP/EZRIM/Maps/LOS_ANGELES_EZRIM.pdf

California State University, Fullerton 2017. California State University Fullerton 2017 Fire Safety Report. Accessed September 2018 at: https://www.fullerton.edu/housing/_resources/pdfs/fire-safety-report-2017.pdf

CalRecycle. 2018. SWIS Facility/Site Search. Accessed September 2018. http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx

Caltrans. 2011. Los Angeles Official Scenic Highways. Accessed September 2018. http://www.dot.ca.gov/hq/LandArch/16_livability/scenic_highways/

____.2013. Transportation and Construction Vibration Guidance Manual. Accessed September 2018. http://www.dot.ca.gov/hq/env/noise/pub/TCVGM_Sep13_FINAL.pdf

County of Los Angeles. 2012. Airports and Airport Influence Areas. Accessed September 2018. http://planning.lacounty.gov/assets/upl/project/ALUC_Airports_June2012_rev2d.pdf

____.2014. Countywide Integrated Waste Management Plan. Accessed September 2018 at: https://dpw.lacounty.gov/epd/swims/ShowDoc.aspx?id=4710&hp=yes&type=PDF

Department of Toxic Substances Control (DTSC). 2018. EnviroStor. Accessed September 2018. http://www.envirostor.dtsc.ca.gov/public/map/?myaddress=2121+Hanscom+Drive++

Environmental Geotechnology Laboratory, Inc. (EGL). 2018. Geotechnical and Engineering Geological Investigation Report; Proposed Eastside Parking Structure California State University- Fullerton.

Federal Emergency Management Agency (FEMA). 2009. Flood Insurance Rate Map 06059C0044J. https://msc.fema.gov/ (accessed September 2018).

Federal Emergency Management Agency (FEMA). 2018. FEMA Flood Map Service Center: Search By Address. Accessed April 2018. https://msc.fema.gov/portal/search?AddressQuery=2121%20Hanscom%20Drive%2C%20South%20Pasadena#searchresultsanchor

Fehr & Peers. 2019. California State University-Fullerton Parking Structure Transportation Assessment. January 18, 2019.

Fullerton, City of. 2017. Fire Department. Accessed September 2018. https://www.cityoffullerton.com/gov/departments/fire/about_fire_department/default.asp

____.2012a. General Plan Part I: The Fullerton Vision. Accessed September 2018. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=7501

____. 2012b. General Plan Part II: The Fullerton Plan Elements. Accessed September 2018. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=7502

____.2012c. General Plan The Built Environment Element. Accessed September 2018. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=7503

____.2012d. General Plan The Fullerton Economy Element. Accessed September 2018. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=7504

____.2012e. General Plan The Fullerton Community Element. Accessed September 2018. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=7505

____.2012f. General Plan The Fullerton Natural Environment Element. Accessed September 2018. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=7506

____. 2012g. *Final Environmental Impact Report, The Fullerton Plan.* https://www.cityoffullerton.com/gov/departments/dev_serv/general_plan_update/final_program_eir.asp (accessed September 2018).

____. 2012h. General Plan The Fullerton Plan Climate Action Plan. Accessed February 2019. https://www.cityoffullerton.com/civicax/filebank/blobdload.aspx?blobid=8991

Fullerton Police Department (FPD). 2015. Fullerton Police Department 2015 Annual Report. Accessed September 2018. https://www.fullertonpd.org/

Leighton Consulting, Inc. 2018. *Geotechnical Exploration Report Proposed Eastside Parking Structure California State University-Fullerton Lot E, Folino Drive* Fullerton, CA July 24, 2018

Office of Environmental Health Hazard Assessment. 2015. Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Available at: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.Parmesan, C. August 2006. Ecological and Evolutionary Responses to Recent Climate Change.

Orange County Airport Land Use Commission. 2004. Airport Environs Land Use Plan for Fullerton Municipal Airport. Accessed September 2018. https://www.ocair.com/commissions/aluc/docs/FMA_AELUP-November-18-2004.pdf

South Coast Air Quality Management District (SCAQMD). 1993. CEQA Air Quality Handbook.

____. 2008a. Final Localized Significance Threshold Methodology. Accessed September 2018. http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/final-lst-methodology-document.pdf

____. 2008b. Appendix C. Mass Rate LST Look Up Table. October 2009. Accessed September 2018. http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/appendix-c-mass-rate-lst-look-up-tables.pdf?sfvrsn=2

____. 2010. Greenhouse Gas CEQA Significance Threshold Stakeholder Working Group Meeting #15: "Proposed Tier 3 Quantitative Thresholds – Option 1". Accessed September 2018. http://www.aqmd.gov/ceqa/handbook/GHG/2010/sept28mtg/ghgmtg15-web.pdf

____. 2015. SCAQMD Air Quality Significance Thresholds. Accessed September 2018. http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf

____. 2017. 2016 AQMP. Accessed September 2018. http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf

The Trustees of the California State University, California State University Fullerton (CSU Fullerton). 2003. *Final Environmental Impact Report CSU Fullerton 2003 Master Development Plan.* August, 2003.

State of California. 2018. California's Fourth Climate Change Assessment Statewide Summary Report. August 27, 2018. http://www.climateassessment.ca.gov/state/ (accessed January 2019).

U.S. Department of Transportation. 2018. National Transportation Statistics. https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsentire2018q4.pdf. Accessed January 2019.

U.S. Energy Information Administration (EIA). 2018a. Table F30: Total Energy Consumption, Price, and Expenditure Estimates, 2016. State Energy Data 2016: Updates by Energy Source. Washington, DC.

____. 2018b. *May 2018 Monthly Energy Review, Table 1.8 Motor Vehicle Mileage, Fuel Consumption, and Fuel Economy.* Washington, DC. May 2018.

United States Environmental Protection Agency (USEPA). 2018. Superfund Enterprise Management System. Accessed September 2018. https://iaspub.epa.gov/enviro/efsystemquery.sems?fac_search=primary_name&fac_value=&fac_search_type=Beginning&postal_code=91030&location_address=2121+Hanscom+Drive&add_search_type=Beginning2&city_name=South+Pasadena&county_name=Los+Angeles+&state_code=CA&program_search=multi&report=basic&page_no=1&output_sql_switch=TRUE&database_type=SEMS

____. 2015. Environments and Contaminants Criteria Air Pollutants. Accessed January 2019.https://www.epa.gov/sites/production/files/2015-10/documents/ace3_criteria_air_pollutants.pdf

University Police Department (UPD). 2019. University Police. Accessed February 2019. https://police.fullerton.edu/

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Appendix A

Air Quality Modeling Results

CSU Fullerton

South Coast Air Basin, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	1,581.00	Space	2.90	465,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	8			**Operational Year**	2021
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - applicant provided information

Construction Phase - Default construction, demolition removed and architectural coating extended to reflect a more accurate construction schedule

Demolition -

Area Coating - VOC levels fixed

Architectural Coating - SCAQMD Rule 1113

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblConstructionPhase	NumDays	10.00	110.00
tblConstructionPhase	PhaseEndDate	4/29/2020	5/8/2020
tblConstructionPhase	PhaseEndDate	4/1/2020	4/9/2020
tblConstructionPhase	PhaseEndDate	4/15/2020	4/23/2020
tblConstructionPhase	PhaseStartDate	4/16/2020	12/9/2019
tblConstructionPhase	PhaseStartDate	5/30/2019	6/7/2019
tblConstructionPhase	PhaseStartDate	4/2/2020	4/10/2020
tblLandUse	LandUseSquareFeet	632,400.00	465,000.00
tblLandUse	LotAcreage	14.23	2.90

2.0 Emissions Summary

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/day										lb/day					
2019	5.5567	30.3542	29.0015	0.0730	6.6641	1.2981	7.7380	3.3971	1.2488	4.3851	0.0000	7,214.6209	7,214.6209	0.7705	0.0000	7,233.0243
2020	5.1241	27.8983	27.5343	0.0721	3.1019	1.1193	4.2212	0.8337	1.0767	1.9103	0.0000	7,097.6760	7,097.6760	0.7004	0.0000	7,115.1865
Maximum	**5.5567**	**30.3542**	**29.0015**	**0.0730**	**6.6641**	**1.2981**	**7.7380**	**3.3971**	**1.2488**	**4.3851**	**0.0000**	**7,214.6209**	**7,214.6209**	**0.7705**	**0.0000**	**7,233.0243**

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					
2019	5.5567	30.3542	29.0015	0.0730	6.6641	1.2981	7.7380	3.3971	1.2488	4.3851	0.0000	7,214.6209	7,214.6209	0.7705	0.0000	7,233.0243
2020	5.1241	27.8983	27.5343	0.0721	3.1019	1.1193	4.2212	0.8337	1.0767	1.9103	0.0000	7,097.6760	7,097.6760	0.7004	0.0000	7,115.1865
Maximum	**5.5567**	**30.3542**	**29.0015**	**0.0730**	**6.6641**	**1.2981**	**7.7380**	**3.3971**	**1.2488**	**4.3851**	**0.0000**	**7,214.6209**	**7,214.6209**	**0.7705**	**0.0000**	**7,233.0243**

	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**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated 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	lb/day										lb/day					
Area	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**	**0.0000**	**5.8000e-004**	**5.8000e-004**	**0.0000**	**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**	**0.0000**	**0.3690**

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	lb/day										lb/day					
Area	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**	**0.0000**	**5.8000e-004**	**5.8000e-004**	**0.0000**	**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**	**0.0000**	**0.3690**

	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**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	5/26/2019	5/29/2019	5	3	
2	Grading	Grading	5/30/2019	6/6/2019	5	6	
3	Building Construction	Building Construction	6/7/2019	4/9/2020	5	220	
4	Paving	Paving	4/10/2020	4/23/2020	5	10	
5	Architectural Coating	Architectural Coating	12/9/2019	5/8/2020	5	110	

Acres of Grading (Site Preparation Phase): 4.5

Acres of Grading (Grading Phase): 3

Acres of Paving: 2.9

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 27,900 (Architectural Coating – sqft)

OffRoad Equipment

CSU Fullerton - South Coast Air Basin, Winter

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Scrapers	1	8.00	367	0.48
Site Preparation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	8.00	231	0.29
Building Construction	Forklifts	2	7.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Building Construction	Welders	3	8.00	46	0.45
Paving	Cement and Mortar Mixers	1	8.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	1	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
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	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	8	195.00	76.00	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	39.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2019

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	lb/day										lb/day					
Fugitive Dust					1.5908	0.0000	1.5908	0.1718	0.0000	0.1718			0.0000			0.0000
Off-Road	1.7557	21.5386	11.9143	0.0245		0.8537	0.8537		0.7854	0.7854		2,426.5408	2,426.5408	0.7677		2,445.7341
Total	**1.7557**	**21.5386**	**11.9143**	**0.0245**	**1.5908**	**0.8537**	**2.4445**	**0.1718**	**0.7854**	**0.9572**		**2,426.5408**	**2,426.5408**	**0.7677**		**2,445.7341**

3.2 Site Preparation - 2019

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	0.0427	0.0299	0.3256	8.9000e-004	0.0894	7.0000e-004	0.0901	0.0237	6.4000e-004	0.0244		88.5734	88.5734	2.7800e-003		88.6428
Total	**0.0427**	**0.0299**	**0.3256**	**8.9000e-004**	**0.0894**	**7.0000e-004**	**0.0901**	**0.0237**	**6.4000e-004**	**0.0244**		**88.5734**	**88.5734**	**2.7800e-003**		**88.6428**

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	lb/day										lb/day					
Fugitive Dust					1.5908	0.0000	1.5908	0.1718	0.0000	0.1718			0.0000			0.0000
Off-Road	1.7557	21.5386	11.9143	0.0245		0.8537	0.8537		0.7854	0.7854	0.0000	2,426.5408	2,426.5408	0.7677		2,445.7341
Total	**1.7557**	**21.5386**	**11.9143**	**0.0245**	**1.5908**	**0.8537**	**2.4445**	**0.1718**	**0.7854**	**0.9572**	**0.0000**	**2,426.5408**	**2,426.5408**	**0.7677**		**2,445.7341**

3.2 Site Preparation - 2019

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	0.0427	0.0299	0.3256	8.9000e-004	0.0894	7.0000e-004	0.0901	0.0237	6.4000e-004	0.0244		88.5734	88.5734	2.7800e-003		88.6428
Total	**0.0427**	**0.0299**	**0.3256**	**8.9000e-004**	**0.0894**	**7.0000e-004**	**0.0901**	**0.0237**	**6.4000e-004**	**0.0244**		**88.5734**	**88.5734**	**2.7800e-003**		**88.6428**

3.3 Grading - 2019

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	lb/day										lb/day					
Fugitive Dust					6.5523	0.0000	6.5523	3.3675	0.0000	3.3675			0.0000			0.0000
Off-Road	2.0287	22.7444	10.1518	0.0206		1.0730	1.0730		0.9871	0.9871		2,041.2539	2,041.2539	0.6458		2,057.3997
Total	**2.0287**	**22.7444**	**10.1518**	**0.0206**	**6.5523**	**1.0730**	**7.6253**	**3.3675**	**0.9871**	**4.3546**		**2,041.2539**	**2,041.2539**	**0.6458**		**2,057.3997**

3.3 Grading - 2019

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	0.0533	0.0373	0.4070	1.1100e-003	0.1118	8.7000e-004	0.1127	0.0296	8.1000e-004	0.0305		110.7167	110.7167	3.4700e-003		110.8035
Total	**0.0533**	**0.0373**	**0.4070**	**1.1100e-003**	**0.1118**	**8.7000e-004**	**0.1127**	**0.0296**	**8.1000e-004**	**0.0305**		**110.7167**	**110.7167**	**3.4700e-003**		**110.8035**

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	lb/day										lb/day					
Fugitive Dust					6.5523	0.0000	6.5523	3.3675	0.0000	3.3675			0.0000			0.0000
Off-Road	2.0287	22.7444	10.1518	0.0206		1.0730	1.0730		0.9871	0.9871	0.0000	2,041.2539	2,041.2539	0.6458		2,057.3997
Total	**2.0287**	**22.7444**	**10.1518**	**0.0206**	**6.5523**	**1.0730**	**7.6253**	**3.3675**	**0.9871**	**4.3546**	**0.0000**	**2,041.2539**	**2,041.2539**	**0.6458**		**2,057.3997**

3.3 Grading - 2019

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	0.0533	0.0373	0.4070	1.1100e-003	0.1118	8.7000e-004	0.1127	0.0296	8.1000e-004	0.0305		110.7167	110.7167	3.4700e-003		110.8035
Total	**0.0533**	**0.0373**	**0.4070**	**1.1100e-003**	**0.1118**	**8.7000e-004**	**0.1127**	**0.0296**	**8.1000e-004**	**0.0305**		**110.7167**	**110.7167**	**3.4700e-003**		**110.8035**

3.4 Building Construction - 2019

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	lb/day										lb/day					
Off-Road	2.5581	18.9103	15.2545	0.0250		1.0901	1.0901		1.0449	1.0449		2,312.1454	2,312.1454	0.4810		2,324.1705
Total	**2.5581**	**18.9103**	**15.2545**	**0.0250**		**1.0901**	**1.0901**		**1.0449**	**1.0449**		**2,312.1454**	**2,312.1454**	**0.4810**		**2,324.1705**

3.4 Building Construction - 2019

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	0.3090	8.7349	2.3826	0.0190	0.4863	0.0588	0.5451	0.1400	0.0562	0.1962		2,030.2558	2,030.2558	0.1501		2,034.0092
Worker	1.0397	0.7280	7.9359	0.0217	2.1796	0.0171	2.1967	0.5781	0.0157	0.5938		2,158.9763	2,158.9763	0.0677		2,160.6686
Total	**1.3487**	**9.4629**	**10.3185**	**0.0407**	**2.6660**	**0.0758**	**2.7418**	**0.7181**	**0.0719**	**0.7900**		**4,189.2322**	**4,189.2322**	**0.2178**		**4,194.6778**

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	lb/day										lb/day					
Off-Road	2.5581	18.9103	15.2545	0.0250		1.0901	1.0901		1.0449	1.0449	0.0000	2,312.1454	2,312.1454	0.4810		2,324.1705
Total	**2.5581**	**18.9103**	**15.2545**	**0.0250**		**1.0901**	**1.0901**		**1.0449**	**1.0449**	**0.0000**	**2,312.1454**	**2,312.1454**	**0.4810**		**2,324.1705**

3.4 Building Construction - 2019

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	0.3090	8.7349	2.3826	0.0190	0.4863	0.0588	0.5451	0.1400	0.0562	0.1962		2,030.2558	2,030.2558	0.1501		2,034.0092
Worker	1.0397	0.7280	7.9359	0.0217	2.1796	0.0171	2.1967	0.5781	0.0157	0.5938		2,158.9763	2,158.9763	0.0677		2,160.6686
Total	**1.3487**	**9.4629**	**10.3185**	**0.0407**	**2.6660**	**0.0758**	**2.7418**	**0.7181**	**0.0719**	**0.7900**		**4,189.2322**	**4,189.2322**	**0.2178**		**4,194.6778**

3.4 Building Construction - 2020

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	lb/day										lb/day					
Off-Road	2.2879	17.4336	14.8972	0.0250		0.9482	0.9482		0.9089	0.9089		2,288.8877	2,288.8877	0.4646		2,300.5014
Total	**2.2879**	**17.4336**	**14.8972**	**0.0250**		**0.9482**	**0.9482**		**0.9089**	**0.9089**		**2,288.8877**	**2,288.8877**	**0.4646**		**2,300.5014**

3.4 Building Construction - 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/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	0.2638	8.0015	2.1575	0.0189	0.4863	0.0402	0.5265	0.1400	0.0385	0.1785		2,016.8682	2,016.8682	0.1418		2,020.4138
Worker	0.9622	0.6495	7.2069	0.0210	2.1796	0.0166	2.1963	0.5781	0.0153	0.5934		2,092.0600	2,092.0600	0.0602		2,093.5654
Total	**1.2260**	**8.6510**	**9.3644**	**0.0399**	**2.6660**	**0.0569**	**2.7228**	**0.7181**	**0.0538**	**0.7718**		**4,108.9282**	**4,108.9282**	**0.2020**		**4,113.9792**

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	lb/day										lb/day					
Off-Road	2.2879	17.4336	14.8972	0.0250		0.9482	0.9482		0.9089	0.9089	0.0000	2,288.8877	2,288.8877	0.4646		2,300.5014
Total	**2.2879**	**17.4336**	**14.8972**	**0.0250**		**0.9482**	**0.9482**		**0.9089**	**0.9089**	**0.0000**	**2,288.8877**	**2,288.8877**	**0.4646**		**2,300.5014**

3.4 Building Construction - 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/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	0.2638	8.0015	2.1575	0.0189	0.4863	0.0402	0.5265	0.1400	0.0385	0.1785		2,016.8682	2,016.8682	0.1418		2,020.4138
Worker	0.9622	0.6495	7.2069	0.0210	2.1796	0.0166	2.1963	0.5781	0.0153	0.5934		2,092.0600	2,092.0600	0.0602		2,093.5654
Total	**1.2260**	**8.6510**	**9.3644**	**0.0399**	**2.6660**	**0.0569**	**2.7228**	**0.7181**	**0.0538**	**0.7718**		**4,108.9282**	**4,108.9282**	**0.2020**		**4,113.9792**

3.5 Paving - 2020

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	lb/day										lb/day					
Off-Road	1.1547	11.5873	11.8076	0.0178		0.6565	0.6565		0.6051	0.6051		1,709.2180	1,709.2180	0.5417		1,722.7605
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1547**	**11.5873**	**11.8076**	**0.0178**		**0.6565**	**0.6565**		**0.6051**	**0.6051**		**1,709.2180**	**1,709.2180**	**0.5417**		**1,722.7605**

3.5 Paving - 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/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	0.0740	0.0500	0.5544	1.6200e-003	0.1677	1.2800e-003	0.1689	0.0445	1.1800e-003	0.0456		160.9277	160.9277	4.6300e-003		161.0435
Total	**0.0740**	**0.0500**	**0.5544**	**1.6200e-003**	**0.1677**	**1.2800e-003**	**0.1689**	**0.0445**	**1.1800e-003**	**0.0456**		**160.9277**	**160.9277**	**4.6300e-003**		**161.0435**

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	lb/day										lb/day					
Off-Road	1.1547	11.5873	11.8076	0.0178		0.6565	0.6565		0.6051	0.6051	0.0000	1,709.2180	1,709.2180	0.5417		1,722.7605
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1547**	**11.5873**	**11.8076**	**0.0178**		**0.6565**	**0.6565**		**0.6051**	**0.6051**	**0.0000**	**1,709.2180**	**1,709.2180**	**0.5417**		**1,722.7605**

3.5 Paving - 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/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	0.0740	0.0500	0.5544	1.6200e-003	0.1677	1.2800e-003	0.1689	0.0445	1.1800e-003	0.0456		160.9277	160.9277	4.6300e-003		161.0435
Total	**0.0740**	**0.0500**	**0.5544**	**1.6200e-003**	**0.1677**	**1.2800e-003**	**0.1689**	**0.0445**	**1.1800e-003**	**0.0456**		**160.9277**	**160.9277**	**4.6300e-003**		**161.0435**

3.6 Architectural Coating - 2019

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2664	1.8354	1.8413	2.9700e-003		0.1288	0.1288		0.1288	0.1288		281.4481	281.4481	0.0238		282.0423
Total	**1.4420**	**1.8354**	**1.8413**	**2.9700e-003**		**0.1288**	**0.1288**		**0.1288**	**0.1288**		**281.4481**	**281.4481**	**0.0238**		**282.0423**

3.6 Architectural Coating - 2019

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	0.2079	0.1456	1.5872	4.3400e-003	0.4359	3.4100e-003	0.4393	0.1156	3.1400e-003	0.1188		431.7953	431.7953	0.0135		432.1337
Total	**0.2079**	**0.1456**	**1.5872**	**4.3400e-003**	**0.4359**	**3.4100e-003**	**0.4393**	**0.1156**	**3.1400e-003**	**0.1188**		**431.7953**	**431.7953**	**0.0135**		**432.1337**

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2664	1.8354	1.8413	2.9700e-003		0.1288	0.1288		0.1288	0.1288	0.0000	281.4481	281.4481	0.0238		282.0423
Total	**1.4420**	**1.8354**	**1.8413**	**2.9700e-003**		**0.1288**	**0.1288**		**0.1288**	**0.1288**	**0.0000**	**281.4481**	**281.4481**	**0.0238**		**282.0423**

3.6 Architectural Coating - 2019

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	0.2079	0.1456	1.5872	4.3400e-003	0.4359	3.4100e-003	0.4393	0.1156	3.1400e-003	0.1188		431.7953	431.7953	0.0135		432.1337
Total	**0.2079**	**0.1456**	**1.5872**	**4.3400e-003**	**0.4359**	**3.4100e-003**	**0.4393**	**0.1156**	**3.1400e-003**	**0.1188**		**431.7953**	**431.7953**	**0.0135**		**432.1337**

3.6 Architectural Coating - 2020

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109		281.4481	281.4481	0.0218		281.9928
Total	**1.4178**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**		**281.4481**	**281.4481**	**0.0218**		**281.9928**

3.6 Architectural Coating - 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/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	0.1924	0.1299	1.4414	4.2000e-003	0.4359	3.3300e-003	0.4393	0.1156	3.0600e-003	0.1187		418.4120	418.4120	0.0120		418.7131
Total	**0.1924**	**0.1299**	**1.4414**	**4.2000e-003**	**0.4359**	**3.3300e-003**	**0.4393**	**0.1156**	**3.0600e-003**	**0.1187**		**418.4120**	**418.4120**	**0.0120**		**418.7131**

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109	0.0000	281.4481	281.4481	0.0218		281.9928
Total	**1.4178**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**	**0.0000**	**281.4481**	**281.4481**	**0.0218**		**281.9928**

3.6 Architectural Coating - 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/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	0.1924	0.1299	1.4414	4.2000e-003	0.4359	3.3300e-003	0.4393	0.1156	3.0600e-003	0.1187		418.4120	418.4120	0.0120		418.7131
Total	**0.1924**	**0.1299**	**1.4414**	**4.2000e-003**	**0.4359**	**3.3300e-003**	**0.4393**	**0.1156**	**3.0600e-003**	**0.1187**		**418.4120**	**418.4120**	**0.0120**		**418.7131**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	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					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
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
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.551391	0.043400	0.201050	0.120272	0.016162	0.005864	0.021029	0.030512	0.002059	0.001866	0.004766	0.000706	0.000924

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	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					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas 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/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas 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/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	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					
Mitigated	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Unmitigated	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690

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	lb/day										lb/day					
Architectural Coating	0.0354					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1647					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0151	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**		**5.8000e-004**	**5.8000e-004**		**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**		**0.3690**

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/day										lb/day					
Architectural Coating	0.0354					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1647					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0151	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**		**5.8000e-004**	**5.8000e-004**		**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**		**0.3690**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

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

CSU Fullerton

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	1,581.00	Space	2.90	465,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	8			**Operational Year**	2021
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - applicant provided information

Construction Phase - Default construction, demolition removed and architectural coating extended to reflect a more accurate construction schedule

Demolition -

Area Coating - VOC levels fixed

Architectural Coating - SCAQMD Rule 1113

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblConstructionPhase	NumDays	10.00	110.00
tblConstructionPhase	PhaseEndDate	4/29/2020	5/8/2020
tblConstructionPhase	PhaseEndDate	4/1/2020	4/9/2020
tblConstructionPhase	PhaseEndDate	4/15/2020	4/23/2020
tblConstructionPhase	PhaseStartDate	4/16/2020	12/9/2019
tblConstructionPhase	PhaseStartDate	5/30/2019	6/7/2019
tblConstructionPhase	PhaseStartDate	4/2/2020	4/10/2020
tblLandUse	LandUseSquareFeet	632,400.00	465,000.00
tblLandUse	LotAcreage	14.23	2.90

2.0 Emissions Summary

2.1 Overall Construction

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	tons/yr										MT/yr					
2019	0.3039	2.2309	1.9789	5.0800e-003	0.2199	0.0919	0.3118	0.0637	0.0879	0.1516	0.0000	455.7548	455.7548	0.0497	0.0000	456.9980
2020	0.2030	1.0877	1.0924	2.7900e-003	0.1150	0.0448	0.1598	0.0309	0.0430	0.0739	0.0000	249.3851	249.3851	0.0256	0.0000	250.0238
Maximum	**0.3039**	**2.2309**	**1.9789**	**5.0800e-003**	**0.2199**	**0.0919**	**0.3118**	**0.0637**	**0.0879**	**0.1516**	**0.0000**	**455.7548**	**455.7548**	**0.0497**	**0.0000**	**456.9980**

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	tons/yr										MT/yr					
2019	0.3039	2.2309	1.9789	5.0800e-003	0.2199	0.0919	0.3118	0.0637	0.0879	0.1516	0.0000	455.7546	455.7546	0.0497	0.0000	456.9978
2020	0.2030	1.0877	1.0924	2.7900e-003	0.1150	0.0448	0.1598	0.0309	0.0430	0.0739	0.0000	249.3850	249.3850	0.0256	0.0000	250.0237
Maximum	**0.3039**	**2.2309**	**1.9789**	**5.0800e-003**	**0.2199**	**0.0919**	**0.3118**	**0.0637**	**0.0879**	**0.1516**	**0.0000**	**455.7546**	**455.7546**	**0.0497**	**0.0000**	**456.9978**

	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**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**5-26-2019**	**8-25-2019**	1.0215	1.0215
2	**8-26-2019**	**11-25-2019**	1.0583	1.0583
3	**11-26-2019**	**2-25-2020**	1.1053	1.1053
4	**2-26-2020**	**5-25-2020**	0.6178	0.6178
		Highest	1.1053	1.1053

2.2 Overall Operational

Unmitigated 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	0.0384	1.9000e-004	0.0203	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.0392	0.0392	1.0000e-004	0.0000	0.0418
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	868.2115	868.2115	0.0358	7.4200e-003	871.3176
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0384**	**1.9000e-004**	**0.0203**	**0.0000**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**868.2508**	**868.2508**	**0.0359**	**7.4200e-003**	**871.3594**

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	0.0384	1.9000e-004	0.0203	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.0392	0.0392	1.0000e-004	0.0000	0.0418
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	868.2115	868.2115	0.0358	7.4200e-003	871.3176
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0384**	**1.9000e-004**	**0.0203**	**0.0000**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**868.2508**	**868.2508**	**0.0359**	**7.4200e-003**	**871.3594**

	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**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	5/26/2019	5/29/2019	5	3	
2	Grading	Grading	5/30/2019	6/6/2019	5	6	
3	Building Construction	Building Construction	6/7/2019	4/9/2020	5	220	
4	Paving	Paving	4/10/2020	4/23/2020	5	10	
5	Architectural Coating	Architectural Coating	12/9/2019	5/8/2020	5	110	

Acres of Grading (Site Preparation Phase): 4.5

Acres of Grading (Grading Phase): 3

Acres of Paving: 2.9

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 27,900 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Scrapers	1	8.00	367	0.48
Site Preparation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	8.00	231	0.29
Building Construction	Forklifts	2	7.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Building Construction	Welders	3	8.00	46	0.45
Paving	Cement and Mortar Mixers	1	8.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	1	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
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	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	8	195.00	76.00	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	39.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2019

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	tons/yr										MT/yr					
Fugitive Dust					2.3900e-003	0.0000	2.3900e-003	2.6000e-004	0.0000	2.6000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.6300e-003	0.0323	0.0179	4.0000e-005		1.2800e-003	1.2800e-003		1.1800e-003	1.1800e-003	0.0000	3.3020	3.3020	1.0400e-003	0.0000	3.3281
Total	**2.6300e-003**	**0.0323**	**0.0179**	**4.0000e-005**	**2.3900e-003**	**1.2800e-003**	**3.6700e-003**	**2.6000e-004**	**1.1800e-003**	**1.4400e-003**	**0.0000**	**3.3020**	**3.3020**	**1.0400e-003**	**0.0000**	**3.3281**

3.2 Site Preparation - 2019

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	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	6.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.3000e-004	0.0000	1.3000e-004	3.0000e-005	0.0000	4.0000e-005	0.0000	0.1224	0.1224	0.0000	0.0000	0.1225
Total	**6.0000e-005**	**5.0000e-005**	**5.0000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**3.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1224**	**0.1224**	**0.0000**	**0.0000**	**0.1225**

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	tons/yr										MT/yr					
Fugitive Dust					2.3900e-003	0.0000	2.3900e-003	2.6000e-004	0.0000	2.6000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.6300e-003	0.0323	0.0179	4.0000e-005		1.2800e-003	1.2800e-003		1.1800e-003	1.1800e-003	0.0000	3.3020	3.3020	1.0400e-003	0.0000	3.3281
Total	**2.6300e-003**	**0.0323**	**0.0179**	**4.0000e-005**	**2.3900e-003**	**1.2800e-003**	**3.6700e-003**	**2.6000e-004**	**1.1800e-003**	**1.4400e-003**	**0.0000**	**3.3020**	**3.3020**	**1.0400e-003**	**0.0000**	**3.3281**

3.2 Site Preparation - 2019

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	6.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.3000e-004	0.0000	1.3000e-004	3.0000e-005	0.0000	4.0000e-005	0.0000	0.1224	0.1224	0.0000	0.0000	0.1225
Total	**6.0000e-005**	**5.0000e-005**	**5.0000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**3.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1224**	**0.1224**	**0.0000**	**0.0000**	**0.1225**

3.3 Grading - 2019

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	tons/yr										MT/yr					
Fugitive Dust					0.0197	0.0000	0.0197	0.0101	0.0000	0.0101	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.0900e-003	0.0682	0.0305	6.0000e-005		3.2200e-003	3.2200e-003		2.9600e-003	2.9600e-003	0.0000	5.5554	5.5554	1.7600e-003	0.0000	5.5993
Total	**6.0900e-003**	**0.0682**	**0.0305**	**6.0000e-005**	**0.0197**	**3.2200e-003**	**0.0229**	**0.0101**	**2.9600e-003**	**0.0131**	**0.0000**	**5.5554**	**5.5554**	**1.7600e-003**	**0.0000**	**5.5993**

3.3 Grading - 2019

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	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	1.4000e-004	1.2000e-004	1.2500e-003	0.0000	3.3000e-004	0.0000	3.3000e-004	9.0000e-005	0.0000	9.0000e-005	0.0000	0.3061	0.3061	1.0000e-005	0.0000	0.3063
Total	**1.4000e-004**	**1.2000e-004**	**1.2500e-003**	**0.0000**	**3.3000e-004**	**0.0000**	**3.3000e-004**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.3061**	**0.3061**	**1.0000e-005**	**0.0000**	**0.3063**

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	tons/yr										MT/yr					
Fugitive Dust					0.0197	0.0000	0.0197	0.0101	0.0000	0.0101	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.0900e-003	0.0682	0.0305	6.0000e-005		3.2200e-003	3.2200e-003		2.9600e-003	2.9600e-003	0.0000	5.5554	5.5554	1.7600e-003	0.0000	5.5993
Total	**6.0900e-003**	**0.0682**	**0.0305**	**6.0000e-005**	**0.0197**	**3.2200e-003**	**0.0229**	**0.0101**	**2.9600e-003**	**0.0131**	**0.0000**	**5.5554**	**5.5554**	**1.7600e-003**	**0.0000**	**5.5993**

3.3 Grading - 2019

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	1.4000e-004	1.2000e-004	1.2500e-003	0.0000	3.3000e-004	0.0000	3.3000e-004	9.0000e-005	0.0000	9.0000e-005	0.0000	0.3061	0.3061	1.0000e-005	0.0000	0.3063
Total	**1.4000e-004**	**1.2000e-004**	**1.2500e-003**	**0.0000**	**3.3000e-004**	**0.0000**	**3.3000e-004**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.3061**	**0.3061**	**1.0000e-005**	**0.0000**	**0.3063**

3.4 Building Construction - 2019

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	tons/yr										MT/yr					
Off-Road	0.1893	1.3994	1.1288	1.8500e-003		0.0807	0.0807		0.0773	0.0773	0.0000	155.2182	155.2182	0.0323	0.0000	156.0255
Total	**0.1893**	**1.3994**	**1.1288**	**1.8500e-003**		**0.0807**	**0.0807**		**0.0773**	**0.0773**	**0.0000**	**155.2182**	**155.2182**	**0.0323**	**0.0000**	**156.0255**

3.4 Building Construction - 2019

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	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	0.0223	0.6585	0.1679	1.4300e-003	0.0354	4.3100e-003	0.0398	0.0102	4.1200e-003	0.0144	0.0000	138.4764	138.4764	9.7200e-003	0.0000	138.7193
Worker	0.0695	0.0554	0.6026	1.6300e-003	0.1583	1.2600e-003	0.1596	0.0420	1.1600e-003	0.0432	0.0000	147.2220	147.2220	4.6200e-003	0.0000	147.3374
Total	**0.0918**	**0.7140**	**0.7705**	**3.0600e-003**	**0.1938**	**5.5700e-003**	**0.1993**	**0.0523**	**5.2800e-003**	**0.0576**	**0.0000**	**285.6984**	**285.6984**	**0.0143**	**0.0000**	**286.0567**

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	tons/yr										MT/yr					
Off-Road	0.1893	1.3994	1.1288	1.8500e-003		0.0807	0.0807		0.0773	0.0773	0.0000	155.2180	155.2180	0.0323	0.0000	156.0253
Total	**0.1893**	**1.3994**	**1.1288**	**1.8500e-003**		**0.0807**	**0.0807**		**0.0773**	**0.0773**	**0.0000**	**155.2180**	**155.2180**	**0.0323**	**0.0000**	**156.0253**

3.4 Building Construction - 2019

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	0.0223	0.6585	0.1679	1.4300e-003	0.0354	4.3100e-003	0.0398	0.0102	4.1200e-003	0.0144	0.0000	138.4764	138.4764	9.7200e-003	0.0000	138.7193
Worker	0.0695	0.0554	0.6026	1.6300e-003	0.1583	1.2600e-003	0.1596	0.0420	1.1600e-003	0.0432	0.0000	147.2220	147.2220	4.6200e-003	0.0000	147.3374
Total	**0.0918**	**0.7140**	**0.7705**	**3.0600e-003**	**0.1938**	**5.5700e-003**	**0.1993**	**0.0523**	**5.2800e-003**	**0.0576**	**0.0000**	**285.6984**	**285.6984**	**0.0143**	**0.0000**	**286.0567**

3.4 Building Construction - 2020

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	tons/yr										MT/yr					
Off-Road	0.0824	0.6276	0.5363	9.0000e-004		0.0341	0.0341		0.0327	0.0327	0.0000	74.7520	74.7520	0.0152	0.0000	75.1313
Total	**0.0824**	**0.6276**	**0.5363**	**9.0000e-004**		**0.0341**	**0.0341**		**0.0327**	**0.0327**	**0.0000**	**74.7520**	**74.7520**	**0.0152**	**0.0000**	**75.1313**

3.4 Building Construction - 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	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	9.2600e-003	0.2934	0.0740	6.9000e-004	0.0172	1.4400e-003	0.0187	4.9700e-003	1.3700e-003	6.3500e-003	0.0000	66.9355	66.9355	4.4700e-003	0.0000	67.0472
Worker	0.0313	0.0241	0.2663	7.7000e-004	0.0770	6.0000e-004	0.0776	0.0205	5.5000e-004	0.0210	0.0000	69.4018	69.4018	2.0000e-003	0.0000	69.4518
Total	**0.0405**	**0.3174**	**0.3403**	**1.4600e-003**	**0.0943**	**2.0400e-003**	**0.0963**	**0.0254**	**1.9200e-003**	**0.0274**	**0.0000**	**136.3373**	**136.3373**	**6.4700e-003**	**0.0000**	**136.4989**

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	tons/yr										MT/yr					
Off-Road	0.0824	0.6276	0.5363	9.0000e-004		0.0341	0.0341		0.0327	0.0327	0.0000	74.7519	74.7519	0.0152	0.0000	75.1312
Total	**0.0824**	**0.6276**	**0.5363**	**9.0000e-004**		**0.0341**	**0.0341**		**0.0327**	**0.0327**	**0.0000**	**74.7519**	**74.7519**	**0.0152**	**0.0000**	**75.1312**

3.4 Building Construction - 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	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	9.2600e-003	0.2934	0.0740	6.9000e-004	0.0172	1.4400e-003	0.0187	4.9700e-003	1.3700e-003	6.3500e-003	0.0000	66.9355	66.9355	4.4700e-003	0.0000	67.0472
Worker	0.0313	0.0241	0.2663	7.7000e-004	0.0770	6.0000e-004	0.0776	0.0205	5.5000e-004	0.0210	0.0000	69.4018	69.4018	2.0000e-003	0.0000	69.4518
Total	**0.0405**	**0.3174**	**0.3403**	**1.4600e-003**	**0.0943**	**2.0400e-003**	**0.0963**	**0.0254**	**1.9200e-003**	**0.0274**	**0.0000**	**136.3373**	**136.3373**	**6.4700e-003**	**0.0000**	**136.4989**

3.5 Paving - 2020

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	tons/yr										MT/yr					
Off-Road	5.7700e-003	0.0579	0.0590	9.0000e-005		3.2800e-003	3.2800e-003		3.0300e-003	3.0300e-003	0.0000	7.7529	7.7529	2.4600e-003	0.0000	7.8143
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.7700e-003**	**0.0579**	**0.0590**	**9.0000e-005**		**3.2800e-003**	**3.2800e-003**		**3.0300e-003**	**3.0300e-003**	**0.0000**	**7.7529**	**7.7529**	**2.4600e-003**	**0.0000**	**7.8143**

3.5 Paving - 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	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	3.3000e-004	2.6000e-004	2.8500e-003	1.0000e-005	8.2000e-004	1.0000e-005	8.3000e-004	2.2000e-004	1.0000e-005	2.2000e-004	0.0000	0.7415	0.7415	2.0000e-005	0.0000	0.7420
Total	**3.3000e-004**	**2.6000e-004**	**2.8500e-003**	**1.0000e-005**	**8.2000e-004**	**1.0000e-005**	**8.3000e-004**	**2.2000e-004**	**1.0000e-005**	**2.2000e-004**	**0.0000**	**0.7415**	**0.7415**	**2.0000e-005**	**0.0000**	**0.7420**

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	tons/yr										MT/yr					
Off-Road	5.7700e-003	0.0579	0.0590	9.0000e-005		3.2800e-003	3.2800e-003		3.0300e-003	3.0300e-003	0.0000	7.7529	7.7529	2.4600e-003	0.0000	7.8143
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.7700e-003**	**0.0579**	**0.0590**	**9.0000e-005**		**3.2800e-003**	**3.2800e-003**		**3.0300e-003**	**3.0300e-003**	**0.0000**	**7.7529**	**7.7529**	**2.4600e-003**	**0.0000**	**7.8143**

3.5 Paving - 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	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	3.3000e-004	2.6000e-004	2.8500e-003	1.0000e-005	8.2000e-004	1.0000e-005	8.3000e-004	2.2000e-004	1.0000e-005	2.2000e-004	0.0000	0.7415	0.7415	2.0000e-005	0.0000	0.7420
Total	**3.3000e-004**	**2.6000e-004**	**2.8500e-003**	**1.0000e-005**	**8.2000e-004**	**1.0000e-005**	**8.3000e-004**	**2.2000e-004**	**1.0000e-005**	**2.2000e-004**	**0.0000**	**0.7415**	**0.7415**	**2.0000e-005**	**0.0000**	**0.7420**

3.6 Architectural Coating - 2019

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	tons/yr										MT/yr					
Archit. Coating	9.9900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2600e-003	0.0156	0.0157	3.0000e-005		1.0900e-003	1.0900e-003		1.0900e-003	1.0900e-003	0.0000	2.1703	2.1703	1.8000e-004	0.0000	2.1749
Total	**0.0123**	**0.0156**	**0.0157**	**3.0000e-005**		**1.0900e-003**	**1.0900e-003**		**1.0900e-003**	**1.0900e-003**	**0.0000**	**2.1703**	**2.1703**	**1.8000e-004**	**0.0000**	**2.1749**

3.6 Architectural Coating - 2019

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	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	1.6000e-003	1.2700e-003	0.0138	4.0000e-005	3.6400e-003	3.0000e-005	3.6700e-003	9.7000e-004	3.0000e-005	9.9000e-004	0.0000	3.3821	3.3821	1.1000e-004	0.0000	3.3848
Total	**1.6000e-003**	**1.2700e-003**	**0.0138**	**4.0000e-005**	**3.6400e-003**	**3.0000e-005**	**3.6700e-003**	**9.7000e-004**	**3.0000e-005**	**9.9000e-004**	**0.0000**	**3.3821**	**3.3821**	**1.1000e-004**	**0.0000**	**3.3848**

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	tons/yr										MT/yr					
Archit. Coating	9.9900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2600e-003	0.0156	0.0157	3.0000e-005		1.0900e-003	1.0900e-003		1.0900e-003	1.0900e-003	0.0000	2.1703	2.1703	1.8000e-004	0.0000	2.1749
Total	**0.0123**	**0.0156**	**0.0157**	**3.0000e-005**		**1.0900e-003**	**1.0900e-003**		**1.0900e-003**	**1.0900e-003**	**0.0000**	**2.1703**	**2.1703**	**1.8000e-004**	**0.0000**	**2.1749**

3.6 Architectural Coating - 2019

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	1.6000e-003	1.2700e-003	0.0138	4.0000e-005	3.6400e-003	3.0000e-005	3.6700e-003	9.7000e-004	3.0000e-005	9.9000e-004	0.0000	3.3821	3.3821	1.1000e-004	0.0000	3.3848
Total	**1.6000e-003**	**1.2700e-003**	**0.0138**	**4.0000e-005**	**3.6400e-003**	**3.0000e-005**	**3.6700e-003**	**9.7000e-004**	**3.0000e-005**	**9.9000e-004**	**0.0000**	**3.3821**	**3.3821**	**1.1000e-004**	**0.0000**	**3.3848**

3.6 Architectural Coating - 2020

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	tons/yr										MT/yr					
Archit. Coating	0.0547					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0113	0.0783	0.0852	1.4000e-004		5.1600e-003	5.1600e-003		5.1600e-003	5.1600e-003	0.0000	11.8726	11.8726	9.2000e-004	0.0000	11.8956
Total	**0.0659**	**0.0783**	**0.0852**	**1.4000e-004**		**5.1600e-003**	**5.1600e-003**		**5.1600e-003**	**5.1600e-003**	**0.0000**	**11.8726**	**11.8726**	**9.2000e-004**	**0.0000**	**11.8956**

3.6 Architectural Coating - 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	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	8.0700e-003	6.2100e-003	0.0688	2.0000e-004	0.0199	1.5000e-004	0.0201	5.2800e-003	1.4000e-004	5.4300e-003	0.0000	17.9288	17.9288	5.2000e-004	0.0000	17.9417
Total	**8.0700e-003**	**6.2100e-003**	**0.0688**	**2.0000e-004**	**0.0199**	**1.5000e-004**	**0.0201**	**5.2800e-003**	**1.4000e-004**	**5.4300e-003**	**0.0000**	**17.9288**	**17.9288**	**5.2000e-004**	**0.0000**	**17.9417**

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	tons/yr										MT/yr					
Archit. Coating	0.0547					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0113	0.0783	0.0852	1.4000e-004		5.1600e-003	5.1600e-003		5.1600e-003	5.1600e-003	0.0000	11.8726	11.8726	9.2000e-004	0.0000	11.8956
Total	**0.0659**	**0.0783**	**0.0852**	**1.4000e-004**		**5.1600e-003**	**5.1600e-003**		**5.1600e-003**	**5.1600e-003**	**0.0000**	**11.8726**	**11.8726**	**9.2000e-004**	**0.0000**	**11.8956**

3.6 Architectural Coating - 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	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	8.0700e-003	6.2100e-003	0.0688	2.0000e-004	0.0199	1.5000e-004	0.0201	5.2800e-003	1.4000e-004	5.4300e-003	0.0000	17.9288	17.9288	5.2000e-004	0.0000	17.9417
Total	**8.0700e-003**	**6.2100e-003**	**0.0688**	**2.0000e-004**	**0.0199**	**1.5000e-004**	**0.0201**	**5.2800e-003**	**1.4000e-004**	**5.4300e-003**	**0.0000**	**17.9288**	**17.9288**	**5.2000e-004**	**0.0000**	**17.9417**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	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					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
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
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.551391	0.043400	0.201050	0.120272	0.016162	0.005864	0.021029	0.030512	0.002059	0.001866	0.004766	0.000706	0.000924

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	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					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	868.2115	868.2115	0.0358	7.4200e-003	871.3176
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	868.2115	868.2115	0.0358	7.4200e-003	871.3176
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas 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	tons/yr										MT/yr					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas 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	tons/yr										MT/yr					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Enclosed Parking with Elevator	2.7249e+006	868.2115	0.0358	7.4200e-003	871.3176
Total		**868.2115**	**0.0358**	**7.4200e-003**	**871.3176**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Enclosed Parking with Elevator	2.7249e+006	868.2115	0.0358	7.4200e-003	871.3176
Total		**868.2115**	**0.0358**	**7.4200e-003**	**871.3176**

6.0 Area Detail

6.1 Mitigation Measures Area

	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					
Mitigated	0.0384	1.9000e-004	0.0203	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.0392	0.0392	1.0000e-004	0.0000	0.0418
Unmitigated	0.0384	1.9000e-004	0.0203	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.0392	0.0392	1.0000e-004	0.0000	0.0418

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	6.4700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0301					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.8900e-003	1.9000e-004	0.0203	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.0392	0.0392	1.0000e-004	0.0000	0.0418
Total	**0.0384**	**1.9000e-004**	**0.0203**	**0.0000**		**7.0000e-005**	**7.0000e-005**		**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.0392**	**0.0392**	**1.0000e-004**	**0.0000**	**0.0418**

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	tons/yr										MT/yr					
Architectural Coating	6.4700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0301					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.8900e-003	1.9000e-004	0.0203	0.0000		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	0.0392	0.0392	1.0000e-004	0.0000	0.0418
Total	**0.0384**	**1.9000e-004**	**0.0203**	**0.0000**		**7.0000e-005**	**7.0000e-005**		**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.0392**	**0.0392**	**1.0000e-004**	**0.0000**	**0.0418**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

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

CSU Fullerton

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	1,581.00	Space	2.90	465,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	8			**Operational Year**	2021
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - applicant provided information

Construction Phase - Default construction, demolition removed and architectural coating extended to reflect a more accurate construction schedule

Demolition -

Area Coating - VOC levels fixed

Architectural Coating - SCAQMD Rule 1113

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	100.00	50.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	50.00
tblConstructionPhase	NumDays	10.00	110.00
tblConstructionPhase	PhaseEndDate	4/29/2020	5/8/2020
tblConstructionPhase	PhaseEndDate	4/1/2020	4/9/2020
tblConstructionPhase	PhaseEndDate	4/15/2020	4/23/2020
tblConstructionPhase	PhaseStartDate	4/16/2020	12/9/2019
tblConstructionPhase	PhaseStartDate	5/30/2019	6/7/2019
tblConstructionPhase	PhaseStartDate	4/2/2020	4/10/2020
tblLandUse	LandUseSquareFeet	632,400.00	465,000.00
tblLandUse	LotAcreage	14.23	2.90

2.0 Emissions Summary

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/day										lb/day					
2019	5.4324	30.2649	29.7287	0.0753	6.6641	1.2972	7.7380	3.3971	1.2479	4.3851	0.0000	7,441.9318	7,441.9318	0.7707	0.0000	7,460.2247
2020	5.0076	27.8315	28.2130	0.0742	3.1019	1.1187	4.2206	0.8337	1.0761	1.9098	0.0000	7,320.1267	7,320.1267	0.6962	0.0000	7,337.5310
Maximum	**5.4324**	**30.2649**	**29.7287**	**0.0753**	**6.6641**	**1.2972**	**7.7380**	**3.3971**	**1.2479**	**4.3851**	**0.0000**	**7,441.9318**	**7,441.9318**	**0.7707**	**0.0000**	**7,460.2247**

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					
2019	5.4324	30.2649	29.7287	0.0753	6.6641	1.2972	7.7380	3.3971	1.2479	4.3851	0.0000	7,441.9318	7,441.9318	0.7707	0.0000	7,460.2247
2020	5.0076	27.8315	28.2130	0.0742	3.1019	1.1187	4.2206	0.8337	1.0761	1.9098	0.0000	7,320.1267	7,320.1267	0.6962	0.0000	7,337.5310
Maximum	**5.4324**	**30.2649**	**29.7287**	**0.0753**	**6.6641**	**1.2972**	**7.7380**	**3.3971**	**1.2479**	**4.3851**	**0.0000**	**7,441.9318**	**7,441.9318**	**0.7707**	**0.0000**	**7,460.2247**

	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**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated 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	lb/day										lb/day					
Area	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**	**0.0000**	**5.8000e-004**	**5.8000e-004**	**0.0000**	**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**	**0.0000**	**0.3690**

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	lb/day										lb/day					
Area	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**	**0.0000**	**5.8000e-004**	**5.8000e-004**	**0.0000**	**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**	**0.0000**	**0.3690**

	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**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	5/26/2019	5/29/2019	5	3	
2	Grading	Grading	5/30/2019	6/6/2019	5	6	
3	Building Construction	Building Construction	6/7/2019	4/9/2020	5	220	
4	Paving	Paving	4/10/2020	4/23/2020	5	10	
5	Architectural Coating	Architectural Coating	12/9/2019	5/8/2020	5	110	

Acres of Grading (Site Preparation Phase): 4.5

Acres of Grading (Grading Phase): 3

Acres of Paving: 2.9

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 27,900 (Architectural Coating – sqft)

OffRoad Equipment

CSU Fullerton - South Coast Air Basin, Summer

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Scrapers	1	8.00	367	0.48
Site Preparation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	8.00	231	0.29
Building Construction	Forklifts	2	7.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Building Construction	Welders	3	8.00	46	0.45
Paving	Cement and Mortar Mixers	1	8.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	1	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
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	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	8	195.00	76.00	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	39.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2019

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	lb/day										lb/day					
Fugitive Dust					1.5908	0.0000	1.5908	0.1718	0.0000	0.1718			0.0000			0.0000
Off-Road	1.7557	21.5386	11.9143	0.0245		0.8537	0.8537		0.7854	0.7854		2,426.5408	2,426.5408	0.7677		2,445.7341
Total	**1.7557**	**21.5386**	**11.9143**	**0.0245**	**1.5908**	**0.8537**	**2.4445**	**0.1718**	**0.7854**	**0.9572**		**2,426.5408**	**2,426.5408**	**0.7677**		**2,445.7341**

3.2 Site Preparation - 2019

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	0.0388	0.0272	0.3584	9.5000e-004	0.0894	7.0000e-004	0.0901	0.0237	6.4000e-004	0.0244		94.4289	94.4289	2.9600e-003		94.5029
Total	**0.0388**	**0.0272**	**0.3584**	**9.5000e-004**	**0.0894**	**7.0000e-004**	**0.0901**	**0.0237**	**6.4000e-004**	**0.0244**		**94.4289**	**94.4289**	**2.9600e-003**		**94.5029**

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	lb/day										lb/day					
Fugitive Dust					1.5908	0.0000	1.5908	0.1718	0.0000	0.1718			0.0000			0.0000
Off-Road	1.7557	21.5386	11.9143	0.0245		0.8537	0.8537		0.7854	0.7854	0.0000	2,426.5408	2,426.5408	0.7677		2,445.7341
Total	**1.7557**	**21.5386**	**11.9143**	**0.0245**	**1.5908**	**0.8537**	**2.4445**	**0.1718**	**0.7854**	**0.9572**	**0.0000**	**2,426.5408**	**2,426.5408**	**0.7677**		**2,445.7341**

3.2 Site Preparation - 2019

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	0.0388	0.0272	0.3584	9.5000e-004	0.0894	7.0000e-004	0.0901	0.0237	6.4000e-004	0.0244		94.4289	94.4289	2.9600e-003		94.5029
Total	**0.0388**	**0.0272**	**0.3584**	**9.5000e-004**	**0.0894**	**7.0000e-004**	**0.0901**	**0.0237**	**6.4000e-004**	**0.0244**		**94.4289**	**94.4289**	**2.9600e-003**		**94.5029**

3.3 Grading - 2019

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	lb/day										lb/day					
Fugitive Dust					6.5523	0.0000	6.5523	3.3675	0.0000	3.3675			0.0000			0.0000
Off-Road	2.0287	22.7444	10.1518	0.0206		1.0730	1.0730		0.9871	0.9871		2,041.2539	2,041.2539	0.6458		2,057.3997
Total	**2.0287**	**22.7444**	**10.1518**	**0.0206**	**6.5523**	**1.0730**	**7.6253**	**3.3675**	**0.9871**	**4.3546**		**2,041.2539**	**2,041.2539**	**0.6458**		**2,057.3997**

3.3 Grading - 2019

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	0.0486	0.0340	0.4479	1.1900e-003	0.1118	8.7000e-004	0.1127	0.0296	8.1000e-004	0.0305		118.0362	118.0362	3.7000e-003		118.1286
Total	**0.0486**	**0.0340**	**0.4479**	**1.1900e-003**	**0.1118**	**8.7000e-004**	**0.1127**	**0.0296**	**8.1000e-004**	**0.0305**		**118.0362**	**118.0362**	**3.7000e-003**		**118.1286**

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	lb/day										lb/day					
Fugitive Dust					6.5523	0.0000	6.5523	3.3675	0.0000	3.3675			0.0000			0.0000
Off-Road	2.0287	22.7444	10.1518	0.0206		1.0730	1.0730		0.9871	0.9871	0.0000	2,041.2539	2,041.2539	0.6458		2,057.3997
Total	**2.0287**	**22.7444**	**10.1518**	**0.0206**	**6.5523**	**1.0730**	**7.6253**	**3.3675**	**0.9871**	**4.3546**	**0.0000**	**2,041.2539**	**2,041.2539**	**0.6458**		**2,057.3997**

3.3 Grading - 2019

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	0.0486	0.0340	0.4479	1.1900e-003	0.1118	8.7000e-004	0.1127	0.0296	8.1000e-004	0.0305		118.0362	118.0362	3.7000e-003		118.1286
Total	**0.0486**	**0.0340**	**0.4479**	**1.1900e-003**	**0.1118**	**8.7000e-004**	**0.1127**	**0.0296**	**8.1000e-004**	**0.0305**		**118.0362**	**118.0362**	**3.7000e-003**		**118.1286**

3.4 Building Construction - 2019

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	lb/day										lb/day					
Off-Road	2.5581	18.9103	15.2545	0.0250		1.0901	1.0901		1.0449	1.0449		2,312.1454	2,312.1454	0.4810		2,324.1705
Total	**2.5581**	**18.9103**	**15.2545**	**0.0250**		**1.0901**	**1.0901**		**1.0449**	**1.0449**		**2,312.1454**	**2,312.1454**	**0.4810**		**2,324.1705**

3.4 Building Construction - 2019

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	0.2962	8.7242	2.1513	0.0195	0.4863	0.0578	0.5441	0.1400	0.0553	0.1953		2,086.2925	2,086.2925	0.1404		2,089.8018
Worker	0.9467	0.6626	8.7347	0.0231	2.1796	0.0171	2.1967	0.5781	0.0157	0.5938		2,301.7049	2,301.7049	0.0721		2,303.5084
Total	**1.2429**	**9.3867**	**10.8860**	**0.0427**	**2.6660**	**0.0749**	**2.7408**	**0.7181**	**0.0710**	**0.7891**		**4,387.9973**	**4,387.9973**	**0.2125**		**4,393.3102**

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	lb/day										lb/day					
Off-Road	2.5581	18.9103	15.2545	0.0250		1.0901	1.0901		1.0449	1.0449	0.0000	2,312.1454	2,312.1454	0.4810		2,324.1705
Total	**2.5581**	**18.9103**	**15.2545**	**0.0250**		**1.0901**	**1.0901**		**1.0449**	**1.0449**	**0.0000**	**2,312.1454**	**2,312.1454**	**0.4810**		**2,324.1705**

3.4 Building Construction - 2019

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	0.2962	8.7242	2.1513	0.0195	0.4863	0.0578	0.5441	0.1400	0.0553	0.1953		2,086.2925	2,086.2925	0.1404		2,089.8018
Worker	0.9467	0.6626	8.7347	0.0231	2.1796	0.0171	2.1967	0.5781	0.0157	0.5938		2,301.7049	2,301.7049	0.0721		2,303.5084
Total	**1.2429**	**9.3867**	**10.8860**	**0.0427**	**2.6660**	**0.0749**	**2.7408**	**0.7181**	**0.0710**	**0.7891**		**4,387.9973**	**4,387.9973**	**0.2125**		**4,393.3102**

3.4 Building Construction - 2020

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	lb/day										lb/day					
Off-Road	2.2879	17.4336	14.8972	0.0250		0.9482	0.9482		0.9089	0.9089		2,288.8877	2,288.8877	0.4646		2,300.5014
Total	**2.2879**	**17.4336**	**14.8972**	**0.0250**		**0.9482**	**0.9482**		**0.9089**	**0.9089**		**2,288.8877**	**2,288.8877**	**0.4646**		**2,300.5014**

3.4 Building Construction - 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/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	0.2523	8.0045	1.9471	0.0194	0.4863	0.0396	0.5259	0.1400	0.0379	0.1779		2,073.2140	2,073.2140	0.1327		2,076.5314
Worker	0.8747	0.5913	7.9478	0.0224	2.1796	0.0166	2.1963	0.5781	0.0153	0.5934		2,230.4808	2,230.4808	0.0643		2,232.0878
Total	**1.1270**	**8.5958**	**9.8949**	**0.0418**	**2.6660**	**0.0563**	**2.7222**	**0.7181**	**0.0532**	**0.7713**		**4,303.6948**	**4,303.6948**	**0.1970**		**4,308.6193**

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	lb/day										lb/day					
Off-Road	2.2879	17.4336	14.8972	0.0250		0.9482	0.9482		0.9089	0.9089	0.0000	2,288.8877	2,288.8877	0.4646		2,300.5014
Total	**2.2879**	**17.4336**	**14.8972**	**0.0250**		**0.9482**	**0.9482**		**0.9089**	**0.9089**	**0.0000**	**2,288.8877**	**2,288.8877**	**0.4646**		**2,300.5014**

3.4 Building Construction - 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/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	0.2523	8.0045	1.9471	0.0194	0.4863	0.0396	0.5259	0.1400	0.0379	0.1779		2,073.2140	2,073.2140	0.1327		2,076.5314
Worker	0.8747	0.5913	7.9478	0.0224	2.1796	0.0166	2.1963	0.5781	0.0153	0.5934		2,230.4808	2,230.4808	0.0643		2,232.0878
Total	**1.1270**	**8.5958**	**9.8949**	**0.0418**	**2.6660**	**0.0563**	**2.7222**	**0.7181**	**0.0532**	**0.7713**		**4,303.6948**	**4,303.6948**	**0.1970**		**4,308.6193**

3.5 Paving - 2020

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	lb/day										lb/day					
Off-Road	1.1547	11.5873	11.8076	0.0178		0.6565	0.6565		0.6051	0.6051		1,709.2180	1,709.2180	0.5417		1,722.7605
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1547**	**11.5873**	**11.8076**	**0.0178**		**0.6565**	**0.6565**		**0.6051**	**0.6051**		**1,709.2180**	**1,709.2180**	**0.5417**		**1,722.7605**

3.5 Paving - 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/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	0.0673	0.0455	0.6114	1.7200e-003	0.1677	1.2800e-003	0.1689	0.0445	1.1800e-003	0.0456		171.5755	171.5755	4.9400e-003		171.6991
Total	**0.0673**	**0.0455**	**0.6114**	**1.7200e-003**	**0.1677**	**1.2800e-003**	**0.1689**	**0.0445**	**1.1800e-003**	**0.0456**		**171.5755**	**171.5755**	**4.9400e-003**		**171.6991**

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	lb/day										lb/day					
Off-Road	1.1547	11.5873	11.8076	0.0178		0.6565	0.6565		0.6051	0.6051	0.0000	1,709.2180	1,709.2180	0.5417		1,722.7605
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1547**	**11.5873**	**11.8076**	**0.0178**		**0.6565**	**0.6565**		**0.6051**	**0.6051**	**0.0000**	**1,709.2180**	**1,709.2180**	**0.5417**		**1,722.7605**

3.5 Paving - 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/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	0.0673	0.0455	0.6114	1.7200e-003	0.1677	1.2800e-003	0.1689	0.0445	1.1800e-003	0.0456		171.5755	171.5755	4.9400e-003		171.6991
Total	**0.0673**	**0.0455**	**0.6114**	**1.7200e-003**	**0.1677**	**1.2800e-003**	**0.1689**	**0.0445**	**1.1800e-003**	**0.0456**		**171.5755**	**171.5755**	**4.9400e-003**		**171.6991**

3.6 Architectural Coating - 2019

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2664	1.8354	1.8413	2.9700e-003		0.1288	0.1288		0.1288	0.1288		281.4481	281.4481	0.0238		282.0423
Total	**1.4420**	**1.8354**	**1.8413**	**2.9700e-003**		**0.1288**	**0.1288**		**0.1288**	**0.1288**		**281.4481**	**281.4481**	**0.0238**		**282.0423**

3.6 Architectural Coating - 2019

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	0.1893	0.1325	1.7469	4.6200e-003	0.4359	3.4100e-003	0.4393	0.1156	3.1400e-003	0.1188		460.3410	460.3410	0.0144		460.7017
Total	**0.1893**	**0.1325**	**1.7469**	**4.6200e-003**	**0.4359**	**3.4100e-003**	**0.4393**	**0.1156**	**3.1400e-003**	**0.1188**		**460.3410**	**460.3410**	**0.0144**		**460.7017**

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2664	1.8354	1.8413	2.9700e-003		0.1288	0.1288		0.1288	0.1288	0.0000	281.4481	281.4481	0.0238		282.0423
Total	**1.4420**	**1.8354**	**1.8413**	**2.9700e-003**		**0.1288**	**0.1288**		**0.1288**	**0.1288**	**0.0000**	**281.4481**	**281.4481**	**0.0238**		**282.0423**

3.6 Architectural Coating - 2019

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	0.1893	0.1325	1.7469	4.6200e-003	0.4359	3.4100e-003	0.4393	0.1156	3.1400e-003	0.1188		460.3410	460.3410	0.0144		460.7017
Total	**0.1893**	**0.1325**	**1.7469**	**4.6200e-003**	**0.4359**	**3.4100e-003**	**0.4393**	**0.1156**	**3.1400e-003**	**0.1188**		**460.3410**	**460.3410**	**0.0144**		**460.7017**

3.6 Architectural Coating - 2020

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109		281.4481	281.4481	0.0218		281.9928
Total	**1.4178**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**		**281.4481**	**281.4481**	**0.0218**		**281.9928**

3.6 Architectural Coating - 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/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	0.1749	0.1183	1.5896	4.4800e-003	0.4359	3.3300e-003	0.4393	0.1156	3.0600e-003	0.1187		446.0962	446.0962	0.0129		446.4176
Total	**0.1749**	**0.1183**	**1.5896**	**4.4800e-003**	**0.4359**	**3.3300e-003**	**0.4393**	**0.1156**	**3.0600e-003**	**0.1187**		**446.0962**	**446.0962**	**0.0129**		**446.4176**

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	lb/day										lb/day					
Archit. Coating	1.1756					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109	0.0000	281.4481	281.4481	0.0218		281.9928
Total	**1.4178**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**	**0.0000**	**281.4481**	**281.4481**	**0.0218**		**281.9928**

3.6 Architectural Coating - 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/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	0.1749	0.1183	1.5896	4.4800e-003	0.4359	3.3300e-003	0.4393	0.1156	3.0600e-003	0.1187		446.0962	446.0962	0.0129		446.4176
Total	**0.1749**	**0.1183**	**1.5896**	**4.4800e-003**	**0.4359**	**3.3300e-003**	**0.4393**	**0.1156**	**3.0600e-003**	**0.1187**		**446.0962**	**446.0962**	**0.0129**		**446.4176**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	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					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Enclosed Parking with Elevator	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
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
Enclosed Parking with Elevator	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Enclosed Parking with Elevator	0.551391	0.043400	0.201050	0.120272	0.016162	0.005864	0.021029	0.030512	0.002059	0.001866	0.004766	0.000706	0.000924

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	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					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas 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/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas 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/day										lb/day					
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	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					
Mitigated	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Unmitigated	0.2153	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690

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	lb/day										lb/day					
Architectural Coating	0.0354					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1647					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0151	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**		**5.8000e-004**	**5.8000e-004**		**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**		**0.3690**

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/day										lb/day					
Architectural Coating	0.0354					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1647					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0151	1.4900e-003	0.1621	1.0000e-005		5.8000e-004	5.8000e-004		5.8000e-004	5.8000e-004		0.3460	0.3460	9.2000e-004		0.3690
Total	**0.2153**	**1.4900e-003**	**0.1621**	**1.0000e-005**		**5.8000e-004**	**5.8000e-004**		**5.8000e-004**	**5.8000e-004**		**0.3460**	**0.3460**	**9.2000e-004**		**0.3690**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

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

Appendix B

SCCIC Records Search

GEOTECHNICAL EXPLORATION REPORT
PROPOSED EASTSIDE PARKING STRUCTURE
CALIFORNIA STATE UNIVERSITY - FULLERTON
LOT E, FOLINO DRIVE
FULLERTON, CALIFORNIA

Prepared for:

California State University, Fullerton

Capital Programs & Facilities Management

800 North State College Boulevard
T-300, Fullerton, California 92831

Project No. 11922.002

July 24, 2018

Leighton Consulting, Inc.

A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
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July 24, 2018

Project No. 11922.002

California State University, Fullerton
Capital Programs & Facilities Management
800 North State College Boulevard
T-300, Fullerton, California 92831

Attention: Mr. John D. Spencer, Project Manager

Subject: Geotechnical Exploration Report
Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive
Fullerton, California

In accordance with our proposal dated March 16, 2018, authorized by you on May 4, 2018, Leighton Consulting, Inc. performed a geotechnical exploration for the proposed six-level parking structure to be located in the university campus. The purpose of our study was to evaluate the subsurface soil and groundwater conditions at the site and to provide preliminary geotechnical recommendations for the design and construction of the proposed structure as assumed for analysis. The results of our exploration and recommendations are presented in this report.

We appreciate the opportunity to provide our services for this project. We trust that the information contained herein meets your objectives. If you have any questions or concerns, please contact us at your convenience. The undersigned can be reached at **(866) *LEIGHTON***, specifically at the phone extension and e-mail address listed below.

Respectfully submitted,

LEIGHTON CONSULTING INC.

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1.0 INTRODUCTION

1.1 Site Description

The project site is located at the California State University, Fullerton (CSUF) at the juncture of Nutwood Avenue and 57 (Orange) Freeway. The site location (latitude 33.88114°, longitude -117.88163°) and immediate vicinity are shown on Figure 1, *Site Location Map*.

The proposed multi-level parking structure is to be constructed within the southern portion of the existing College of Engineering & Computer Science parking log (Lot E). Developments neighboring the proposed parking structure include an existing multi-story parking structure (Parking Lot 12) to the south, Folino Drive and 57 Freeway to the east, College of Engineering & Computer Science to northwest, and Lot I and Lot F to west and southwest, respectively. The existing site features include asphalt-paved vehicle parking isles and planters containing trees and/or other vegetation.

Review of the United States Geological Survey (USGS) 7.5-Minute La Habra Quadrangle (USGS, 2015) indicates the site is relatively flat at an elevation (El.) of approximately +240 feet mean sea level (msl).

1.2 Proposed Development

The proposed parking structure is understood to be similar in overall size and height as the structure that currently exists to the south of the proposed location. The existing structure includes six levels of parking above grade. The ground floor will transition to one level below grade in a portion of the structure. Structural analysis of the parking structure has not been performed as the proposed project will be executed using a design-build contract. For purposes of this report, we have assumed the maximum structural load supported by interior columns will be 800 to 1,200 kips.

The finish floor elevation of the ground floor has been assumed to be within 1 foot of the current site grade. On this basis, no significant cut or fill is expected to be necessary to establish site grades, exclusive of remedial overexcavation required to prepare the building area.

1.3 Purpose and Scope

The purpose of our work was to evaluate the subsurface conditions at the site relative to the proposed development and provide preliminary geotechnical recommendations to aid in design and construction. The scope of this evaluation included the following tasks:

- *Background Review* – We reviewed readily available geotechnical reports, literature, aerial photographs, and maps relevant to the site available from our in-house library or in the public domain. We evaluated geological hazards and potential geotechnical issues that may significantly affect the site. The documents reviewed are listed in Appendix A, *References*.

- *Site Reconnaissance* – We performed a visual site reconnaissance to mark the locations of our subsurface exploration and notify Underground Service Alert (USA) for utility clearance. Site conditions were visually evaluated to confirm existing topography, development and drainage patterns.

- *Test Boring Field Exploration* – Our field exploration was performed on June 8, 2018 and consisted of four (4) hollow-stem auger borings (designated LB-1 through LB-4) drilled to an approximate depth of 51½ feet below existing ground surface (bgs). The approximate locations of the borings are shown on Figure 2, *Exploration Location Map.*

  During drilling of the hollow-stem auger borings both bulk and drive samples were obtained from the borings for geotechnical laboratory testing. Drive ring samples were collected from the borings using a Modified California ring-lined sampler conducted in accordance with ASTM Test Method D 3550. Standard Penetration Tests (SPTs) were also performed within the borings in accordance with ASTM Test Method D 1586. The ring and SPT samplers were driven for a total penetration of 18 inches using a 140-pound automatic hammer falling freely for 30 inches. The number of blows per 6 inches of penetration was recorded on the boring logs, see Appendix B, *Exploration Logs.*

  The borings were logged in the field by a member of our technical staff. Each soil sample collected was reviewed and described in general accordance with the Unified Soil Classification System. The samples were sealed and packaged for transportation to our Irvine laboratory. After completion of

drilling the hollow-stem auger borings were backfilled with soil cuttings and patched with asphalt concrete to match existing site conditions.

- *CPT Field Exploration* – The subsurface conditions identified at the test boring locations were supplemented by three (3) Cone Penetrometer Test (CPT) soundings performed on June 13, 2018. The CPT soundings were extended to depths of approximately 68 to 71 below grade in accordance with ASTM D5778-12 technical specifications. The approximate locations of the CPT soundings are also shown on Figure 2, *Exploration Location Map.*

- *Percolation Testing* – Temporary percolation test wells were installed in proximity to Test Boring Nos. LB-1 and LB-2. The test wells were each set to a depth of 15 feet below grade and each were fitted with slotted PVC pipe. In-situ percolation testing was performed in general accordance with the Orange County *Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Programs (WQMPs)* (OCPW, 2013).

- *Laboratory Testing* – Geotechnical laboratory testing was performed on select soil samples collected during our field exploration to determine the engineering properties of the encountered subsurface soils. The results of laboratory testing are presented in Appendix C, *Laboratory Test Data.*

- *Engineering Analysis* – Geotechnical analysis was performed on the collected data to develop conclusions and recommendations for design and construction of the improvements as currently planned.

- *Report Preparation* – This report presents our findings, conclusions and preliminary recommendations for the proposed development. Once development plans are produced they should be provided to Leighton Consulting, Inc. for review to ensure our recommendations have been properly interpreted and remain appropriate for the project.

2.0 GEOTECHNICAL FINDINGS

2.1 Regional Geology

The subject site is located southeast of the Coyote Hills within the northeastern portion of the Los Angeles basin, a large structural depression within the Peninsular Ranges geomorphic province of California. The Peninsular Ranges province extends approximately 900 miles southward from the Santa Monica Mountains to the tip of Baja California (Yerkes, et al., 1965). The province is characterized by elongate northwest-trending mountain ranges and sediment-filled valleys. The province includes numerous northwest trending fault zones, most of which either die out, merge with, or are terminated by faults that form the southern margin of the Transverse Ranges province. These northwest trending fault zones include the San Jacinto, Whittier-Elsinore, Palos Verdes, and Newport-Inglewood fault zones.

Approximately 65 million years ago (at the end of the Cretaceous Period) a deep, structural trough existed off the current coast of southern California (Yerkes, 1972). Over time, sedimentation would slowly fill the trough with tremendous amounts of sediments. About 7 million years ago, as sedimentation continued, an eastward shift of the boundary between the Pacific and North American plates to its present position would begin shaping the Los Angeles basin from this deep trough. Today the Los Angeles basin refers to the area defined by the Santa Monica, Whittier and Palos Verdes faults, and San Joaquin Hills. Basin depth is limited to the sediments deposited over the basement rock in the last 7 million years (Wright, 1991). The deepest part of the Los Angeles basin contains Tertiary to Quaternary-aged (65 million years and younger) marine and nonmarine sedimentary rocks that are about 24,000 feet thick (Yerkes, et al, 1965; Wright, 1991). During the Pleistocene epoch (the last two million years) the region was flooded as sea level rose in response to the worldwide melting of the Pleistocene glaciers.

2.2 Surficial Geology

Regional geologic mapping of the project site and vicinity indicates that near-surface native soils beneath the site consist young alluvial fan and fluvial deposits (Qyf) of Quaternary age (Holocene) originating in the Coyote Hills to the north and from Brea Creek. These sediments are comprised of varying proportions of sand, silt and clay (Morton and Miller, 2006). The surficial

geologic units mapped in the vicinity of the project site are shown on Figure 3, *Regional Geology Map*.

2.3 Subsurface Soil Conditions

Based on the conditions encountered during our field exploration, the site is underlain by a thin veneer of artificial fill material overlying Quaternary-age young alluvial fan deposits and/or old alluvial valley deposits. The stratigraphy of the subsurface soils encountered in each soil boring are depicted on the borings logs in Appendix B. A general description of the encountered earth materials is described below.

The artificial (and possible) fill encountered in our borings at the explored locations extended to depths that ranged from approximately 4 to 7 feet below grade. The possible fill designation was used due to the appearance of the soil samples and the somewhat inconsistent results of field testing (i.e., blowcounts).

The existing and possible fill material is likely associated with prior grading of the campus to construct the existing facility. The fill consists primarily of clayey sand, silty sand and sandy silt. The fill may extend to greater depths in unexplored locations and the actual depth may vary across the site.

The native soils that underlie the fill consists of young alluvial fan deposits, which were encountered in our borings to the maximum depth explored (51½ feet bgs). The alluvium generally consists of loose silts, sands and silty sands to depth of approximately 10 to 20 feet below grade The soils below a depth of 20 feet generally consisted of interlayered, medium dense to dense silt, sand, silty sand and clayey sand, with interlayers of stiff to very stiff clay to at least the maximum depth explored of 51½ feet.

As evidenced by the interpreted soil profile depicted at the CPT soundings in which “very stiff fine-grained soils” were encountered and the inconsistent and high N-values recorded during field testing, zones of soils at depths of 20 to 30 feet below grade were considered to be indurated, exhibiting very dense relative density and hard comparative consistency.

Detailed descriptions of the subsurface soils encountered in the borings and CPT soundings are presented on the boring logs (Appendix B). The locations of the borings and CPT soundings are shown on Figure 2, *Exploration Location Map*.

2.4 Groundwater Conditions

According to groundwater information obtained from the Seismic Hazard Zone Report for the La Habra 7.5-Minute Quadrangle (California Department of Conservation, 1997), the historically shallowest groundwater depth at the site is reported to be approximately 90 to 100 feet below ground surface (bgs).

Available on the Geotracker database, the Second Semester 2015 Groundwater Monitoring Report/Request for Case Closure report prepared by URS (January 6, 2016), indicates that on November 30th, 2015, the depth to groundwater at the Mobile Station # 18-LCC located approximately 0.6-mile northwest (2601 Yorba Linda Boulevard) ranged from approximately 116 to 124 feet bgs.

The presence of granular sols underlain by less pervious (and indurated) material indicates the potential exists for the development of perched water.

2.5 Infiltration

In-situ percolation testing was performed to evaluate the infiltration characteristics of the site soil at locations being considered for stormwater infiltration as indicated to us by the project design team. The tests were performed in general accordance with the Orange County Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Programs (WQMPs) (OCPW, 2013).

Borings LP-1 and LP-2 (offset from LB-1 and LB-2, respectively) were each drilled to 15 feet bgs. These borings were converted to temporary percolation test wells upon completion of drilling and sampling (Figure 2, Boring Location Map). A 2-inch-diameter, perforated PVC pipe was placed in each borehole and the annulus was filled with clean sand (#3 Monterey Sand) from the bottom of the boring to approximately 6 feet above the bottom of the boring. After the conclusion of the percolation tests, the PVC pipes were removed and the test holes were backfilled with excess soil cuttings.

The tests at locations LP-1 and LP-2 were performed using a falling-head method which records the drop of water levels inside the well over the testing period. The measured infiltration rate for the percolation test was calculated by dividing the rate of discharge (i.e., volume of water discharged from the well during the test) by the infiltration surface area, or flow area. Taking into consideration of the drop in water level during the test, the flow area was

determined based on the average water height within the test well and incorporating a porosity reduction factor to account for the porosity of the annulus material at the end of the test period. The flow area was based on the average water height within the slotted pipe section of the test well.

Detailed results of the field testing data and measured infiltration rate for the test well are presented in Appendix D, *Percolation Test Results*. The test results are summarized below:

Table 1 – Measured (Unfactored) Infiltration Rate

Percolation Test Well Designation	Approximate Depth of Test Zone Below Ground Surface (feet, bgs)	Measured Infiltration Rate (inches per hour)
LP-1	10 to 15	1.13
LP-2	10 to 15	0.12

The test results indicate low to very low infiltration rates at the tested locations and depths. The measured infiltration rate at test well location LP-2 (Figure 2) does not meet the minimum requirement for stormwater infiltration feasibility (0.3 inches per hour) after accounting for soil amendments per the Orange County *Technical Guidance Document* (OCPW, 2013).

As per the County of Orange, the field infiltration rates must be reduced by applying an appropriate factor of safety to determine design values that will represent long-term performance of the proposed infiltration BMPs. Based on the type of test performed, number of tests performed, site variability, thoroughness of the subsurface exploration and long term performance of the proposed infiltration BMPs, the recommended minimum factor of safety is 2.0 based upon Worksheet H included in Appendix VII of the TGD. This factor of safety has been based upon a Suitability Assessment Factor (S_A) of 2.0 (Category A in Worksheet H, p. VII-35) and may be adjusted/increased pending review by the project Civil Engineer with regard to items under Category B of the worksheet. Specially, the calculated factor of safety was based upon the following criteria under Category A:

Table 2 –Infiltration Rate Reduction Factors – Category A

Factor Description	Factor Value
Soil Assessment Methods	2
Predominant Soil Texture	2
Site Soil Variability	2
Depth of Groundwater/Impervious Layer	2

2.6 Engineering Properties

Geotechnical engineering properties determined to be relevant for the proposed development were evaluated on the basis of field and laboratory testing; and review of the interpreted subsurface profiles and engineering correlations. The following summarizes the relevant properties evaluated for this project.

2.6.1 Expansive Soil Characteristics

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subject to uplifting forces caused by the swelling. Without proper mitigation measures, heaving and cracking of both building foundations and slabs-on-grade could result.

Based on our exploration, the near surface onsite soils consist predominantly of clayey sand with lesser amounts of silty clay. The expansion potential is considered to be low. Expansion Index (EI) testing conducted on a composite sample of the near-surface soils (i.e., upper 5 feet below ground surface) yielded an EI of 34.

Based upon the test results, fill material derived from onsite soils are considered to have a low potential for expansion. However, upon completion of grading and exposure of subgrade, additional expansion testing is recommended to confirm the values presented in this report.

2.6.2 Soil Corrosivity

For screening purposes, a composite bulk sample of the soils soil from boring LB-4 to a depth of approximately 5 feet were tested to provide a preliminary evaluation of corrosivity. The test results indicated soluble

sulfate concentration of 200 parts per million (ppm), chloride content of 381 ppm, pH of 7.79 and minimum resistivity of 860 ohm-cm. Discussion of these tests is presented in Section 4.11. The chemical analysis test results for the onsite soil from our geotechnical exploration are included in Appendix C of this report.

2.6.3 Soil Compressibility

Select samples of the onsite soils recovered from the borings at various depth below grade were subjected to consolidation testing to evaluate the compressibility of these materials under loads representative of anticipated structural bearing stresses and in-situ overburden pressures. The results of testing indicated the compressibility of the soils below depths of 10 to 20 feet is relatively low under the stresses anticipated to be associated with the proposed 6-story structure. The results of testing are presented in Appendix C, Laboratory Test Results and yield compression index ($C_{c\varepsilon}$) values of 0.05 to 0.07 and recompression index ($C_{r\varepsilon}$) values of 0.005 to 0.009.

2.6.4 Shear Strength

The laboratory testing program also included direct shear testing of select samples to evaluate shear strength. The results of testing are included Appendix C.

2.7 Surface Fault Rupture

Our review of available in-house literature indicates that no known active faults have been mapped across the site, and the site is not located within a designated Alquist-Priolo Earthquake Fault Zone (CGS, 1986; Bryant and Hart, 2007). Therefore, a surface fault rupture hazard evaluation is not mandated for this site and the potential for surface fault rupture at the site is expected to be low.

The locations of the closest active faults to the site were evaluated using the United States Geological Survey (USGS) Earthquake Hazards Program National Seismic Hazard Maps (USGS, 2008c). The closest active faults to the site are the Puente Hills fault, located approximately 1.8 miles from the site. The Puente Hills fault is a blind thrust fault that are concealed at depth, without the potential for surface fault rupture. The San Andreas fault, which is the largest active fault in California, is approximately 37 miles northeast of the site. Major regional faults

with surface expression in proximity to the site are shown on Figure 3, *Regional Fault and Historic Seismicity Map*).

2.8 Seismicity and Ground Shaking

The principal seismic hazard to the site is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in southern California (Figure 4). The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the source, and the site response characteristics.

Accordingly, design of the project should be performed in accordance with all applicable current codes and standards utilizing the appropriate seismic design parameters to reduce seismic risk as defined by California Geological Survey (CGS) Chapter 2 of Special Publication 117a (CGS, 2008). The 2016 edition of the California Building Code (CBC) is the current edition of the code. Through compliance with these regulatory requirements and the utilization of appropriate seismic design parameters selected by the design professionals, potential effects relating to seismic shaking can be reduced.

The following code-based seismic parameters should be considered for design under the 2016 CBC:

Table 3 - 2016 CBC Seismic Design Parameters

Categorization/Coefficients	Value
Site Longitude (decimal degrees) West	-117.88168°
Site Latitude (decimal degrees) North	33.88111°
Site Class	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s	1.827 g
Mapped Spectral Response Acceleration at 1s Period, S_1	0.669 g
Short Period Site Coefficient at 0.2s Period, F_a	1.0
Long Period Site Coefficient at 1s Period, F_v	1.5
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS}	1.827 g
Adjusted Spectral Response Acceleration at 1s Period, S_{M1}	1.003 g
Design Spectral Response Acceleration at 0.2s Period, S_{DS}	1.218 g
Design Spectral Response Acceleration at 1s Period, S_{D1}	0.669 g
Site-adjusted geometric mean Peak Ground Acceleration, PGA_M	0.684 g
All were derived from the USGS web page: http://earthquake.usgs.gov/designmaps/us/application.php	

2.9 Liquefaction Potential

Depth to groundwater beneath the site plays a significant role in determining the potential susceptibility to liquefaction and subsequent effects. In general, liquefaction hazards are the most severe in the upper 50 feet below ground surface (bgs). As shown on the State of California Seismic Hazard Zones map for the La Habra Quadrangle (CGS, 1998), the project site is not located within an area that has been identified by the State of California as being potentially susceptible to liquefaction (Figure 5, Seismic Hazard Map). In addition, the historically shallowest groundwater level at the site is reported to be greater than 50 feet below ground surface. Based on these findings, the potential for liquefaction is unlikely and a site-specific liquefaction analysis is not required.

2.10 Seismically-Induced Settlement

Seismically-induced settlement consists of dynamic settlement of unsaturated soil (above groundwater) and liquefaction-induced settlement (below groundwater). These settlements occur primarily within low density sandy soil due to reduction in volume during and shortly after an earthquake event.

The potential for seismically-induced settlement at the site is considered low since the site is not susceptible to liquefaction and the subsurface profile did not include prominent layers of low-density and relatively clean sand that may be susceptible to significant amount of seismically-induced unsaturated soil “dry sand” settlement.

2.11 Seismically-Induced Lateral Displacements

Seismically-triggered liquefaction may also result in the phenomenon of lateral spreading in proximity to slopes and in gently sloping terrain. Lateral spread generally requires the presence of liquefied zones of relatively large lateral extent in which the non-liquefied overlying soils gradually displace down-gradient or toward a free slope face such as the bank of a channel. Because liquefaction is not considered a hazard at the site, seismically-induced lateral spreading and the associated ground displacements are also not considered to be a hazard at the site.

2.12 Seismically-Induced Landsliding

The potential for seismically-induced landsliding to occur at the site is considered low due to the absence of slopes at the site. In addition, based on the State of California Seismic Hazard Zones Map for the La Habra Quadrangle (CGS, 1998), the site is not located within an area that has been identified by the State of California as being potentially susceptible to seismically induced landslides (Figure 4, Seismic Hazard Map). Proposed slopes, if any, should be engineered and constructed at a gradient of 2:1 (horizontal: vertical) or flatter.

2.13 Flooding

According to a Federal Emergency Management Agency (FEMA) flood insurance rate map (FEMA, 2008), the project site is located within a flood hazard area identified as “Zone X”, which is defined as an area of minimal flood hazard. Regionally, storm runoff flow is generally directed to the southwest to the Dominguez Channel. As shown on Figure 6, *Flood Hazard Zone Map*, the site is **not** located within a flood hazard zone.

2.14 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the absence of an enclosed water body near the site and the inland location of the site, seiche and tsunami risks at the site are considered negligible.

3.0 GEOTECHNICAL FINDINGS AND CONCLUSIONS

Based upon this study, we conclude that the proposed development for the subject site is feasible from a geotechnical standpoint, provided that the recommendations presented in this report are properly incorporated in design and construction. Presented below is a summary of findings based upon the results of our geotechnical exploration of the site:

- The site **is not** located in a designated Alquist-Priolo Earthquake Fault Zone.
- The site will experience moderate to strong ground shaking should an earthquake occur along one of the major regional faults.
- The site **is not** located within an area shown as susceptible to liquefaction or seismically-induced landslides on the California Seismic Hazard Zones Map for the La Habra Quadrangle; therefore, the potential for these hazards to occur at the site is low.
- The site is underlain by artificial fill materials overlying Quaternary-age old alluvial fan deposits comprised of varying proportions of sand, silt and clay. Fill soils and soils suspected to be fill were estimated to extend to depth of 4 to 7 feet below grade.
- Native soils that underlie the fill and possible fill soils exhibited very loose to loose relative density to depths ranging from approximately 10 to 20 feet below grade.
- The subsurface profile includes zones of very dense, hard consistency indurated soils, typically between depths of approximately 20 to 30 feet below grade.
- The historically shallowest groundwater depth is reported by the CGS to be greater than 50 feet below the existing ground surface. No groundwater was encountered at the test boring locations.
- Groundwater is not anticipated to pose a constraint during and after construction.
- Infiltration may be feasible at this site but will be dependent upon location based upon the variance in the results of on-site percolation testing.
- Use of a shallow foundation system to support the parking structure will require some form of ground improvement to improve the support characteristics of the soils to depths do 10 to 20 feet below grade.

- The structural load demands that are anticipated to associated with the parking structure are will require the use of a deep foundation system if the support characteristics of the soils are not improved.

4.0 RECOMMENDATIONS

Geotechnical recommendations for the proposed development are presented in the following sections and are intended to provide sufficient geotechnical information to develop the project plans in accordance with 2016 CBC requirements. The following recommendations may be superseded by more restrictive requirements of the architect, structural engineer, and the local building official.

Based upon the findings of the geotechnical exploration, the soils above depths of 10 to 20 feet below grade exhibited variances in support and compressibility characteristics and are not considered to be suitable for support of a spread footing foundation system for the proposed parking structure due to the anticipated load demands of the structure. As a result, other means of building support are recommended such as in-situ ground improvement or a deep foundation system. Ancillary, lightly loaded structures may be supported by a shallow spread footing foundation system with proper preparation of those building areas.

The recommendations below are based upon the exhibited geotechnical engineering properties of the soils and their anticipated response both during and after construction. The recommendations are also predicated upon proper field observation and testing during construction. The project geotechnical engineer should be notified of suspected variances in field conditions to determine the effect upon the recommendations subsequently presented.

The geotechnical consultant should review the grading plan, foundation plan and specifications as they become available to verify that the recommendations presented in this report have been properly interpreted and incorporated into the plans prepared for the project.

4.1 Earthwork

Based upon the anticipated conceptual plan, site grading is not expected to require significant cut or fill. All site grading should be performed in accordance with the applicable local code, California Building Code (CBC 2016) and in accordance with the project specifications that are prepared by the appropriate design professional.

We recommend that earthwork and grading operations be observed and appropriate testing be performed by representatives of our firm to verify that the site is properly prepared, the selected fill materials are satisfactory, and that

placement and compaction of fills has been performed in accordance with our recommendations and the project specifications.

4.1.1 Site Preparation

Initial preparation of the site should include demolition and removal of the pavements and underground utilities that will not be salvaged with the proposed development or would otherwise interfere with construction. Utilities that will remain active should be properly rerouted to preserve their function.

4.1.2 Overexcavation and Recompaction

Preparation of the site to support ancillary, lightly loaded structures separate from the parking structure should include overexcavation and recompaction of all existing fill soil and, where necessary, native soils to establish a layer of structural compacted fill that extends to a minimum depth of 3 feet below building pad grade. Deeper removals may be necessary depending upon conditions exposed during grading. The lateral extent of overexcavation beyond foundations is recommended to be equal to the depth of overexcavation. Backhoe test pits are recommended to be performed in these proposed building areas to better evaluate the depth of fill and determine the required depth of overexcavation.

4.1.3 Subgrade Preparation

Exposed subgrades, including all excavation or removal bottoms, should be observed by a representative of the geotechnical engineer prior to placement of fill or other improvements to verify that the subgrade is suitable for fill placement.

Subgrades determined to be suitable for fill placement or other improvements should be scarified to a depth of at least 8 inches, moisture-conditioned 2 to 4 percent above the optimum moisture content and then compacted to a minimum of 90 percent of the ASTM Test Method D1557 (Modified Proctor) laboratory maximum density.

4.1.4 General Fill Placement and Compaction

The onsite soil, free of organic material, cobbles, boulders, rubble, and rock less than 8 inches in largest dimension, is suitable to be used as general fill. All fill soil should be placed in loose lifts no greater than 8 inches in thickness, moisture-conditioned as necessary to a moisture content 1 to 3 percentage points above optimum moisture content and compacted using proper equipment to the minimum standard as noted below, unless stated otherwise in the specific sections.

- Fill soil should be moisture-conditioned and compacted to a minimum of 90 percent relative compaction as determined by ASTM Test Method D1557.
- Base course material should be compacted to a minimum of 95 percent relative compaction.
- Utility trench backfill is discussed in Section 4.8.

Material imported to the site for use as fill should be reviewed and approved by the geotechnical engineer prior to import to the site and placement as fill. Imported soils should be low in expansion potential (EI less than 30); non-corrosive to metals and concrete; and be free of hazardous substances.

4.1.5 Reuse of Concrete and Asphalt Rubble

Proper processing of construction rubble (i.e., Portland cement concrete and asphalt concrete) may allow the material to be incorporated in the proposed development. For use as structural fill, the processed material should be crushed to develop a relatively well-graded mixture with a maximum particle size of 3-inch nominal diameter. Concrete rubble should be free of rebar; processed asphalt pavement rubble may be used if mixed with the existing base course (where present) and soils in proportion of 1 part processed asphalt to 3 parts soil. A discernible base course was identified at the test boring locations that ranged from 4 to 12 inches. For use as pavement base course, rubble should be crushed to satisfy gradation requirements of Section 200-2.4 of the Standard Specifications for Public Works Construction (SSPWC; “Greenbook”). Such materials must be free of and segregated from any hazardous materials and/or organic material of any kind.

4.2 Rammed Aggregate Piers

The use of a shallow spread footing foundation system will require improvement of the underlying soil to depths ranging from 10 to 20 feet below grade due to the presence of fill and the variance in the support characteristics of the underlying native soils. Based upon the depths (10 to 20 feet) to which suitable bearing native soils appear to exist in the area proposed for construction of the parking structure, the use of the proprietary Rammed Aggregate Pier (a.k.a., “Geopier®”) method of ground improvement is considered to a feasible manner to improve the support characteristics of the soils to allow the use of a spread footing foundation system.

The design of the Geopier ground improvement program is performed by a specialty contractor. Based upon prior experience with the use of this technique, an allowable foundation bearing pressure of 6,000 psf is anticipated to be feasible. Design of the Geopier system will input form the project structural engineer regarding structural loads and foundation configuration to allow the Geopier design to be performed.

4.3 Cast-in-Place Drilled Pile Foundations

A deep foundation system may also be used to support the proposed structure. Based upon the encountered conditions, a cast-in-place drilled pile (i.e., drilled shaft) foundation system is considered to be feasible and is recommended for support of the proposed parking structure.

4.3.1 Axial Load Capacity

The recommended nominal (ultimate) vertical downward pile capacities are presented in Figure 7, Cast-in-Drilled Hole Piles, as a function of penetration into soils below the bottom of the pile cap. Plotted downward capacities are for total dead loads and frequently applied live loads. Plotted pile capacities shown are for friction only. End bearing has **not** been included based on conventional drilled cast-in-place concrete pile construction methods in which cleaning the bottom of the borehole and the subgrade for end bearing to remove disturbed soils is not performed. Uplift capacity can be assumed to be 50% of downward capacities plotted on Figure 7 in addition to the weight of the pile. Depicted capacities can be interpolated for different diameters.

The recommended design capacities are based upon geotechnical considerations and do not consider the pile as a reinforced-concrete structural element. Pile reinforcement should be designed by the project Structural Engineer. Capacities may be increased based on results of pile load tests. These values are for isolated single piles or pile groups in which piles are spaced at a minimum of three (3) diameters on-center. Otherwise, a group action reduction in capacity will be required for piles spaced closer than three diameters/widths on center. For closely spaced piles, vertical capacities should be reduced as follows:

Table 4 - Reduction in Vertical Capacity for **Closely-Spaced Piles**

Horizontal Pile Spacing Center-To-Center (Diameters)	Reduced Static Vertical Capacity (percent)*	
	2 Piles in a Row	3 Piles in a Row
2½	90	80
2	80	70
1½	70	60
*Percent of capacity for pile spaced three or more diameters on center Piles should not be spaced closer than 1½ diameters on center		

4.3.2 Drilled Pile Construction

Bottoms of drilled cast-in-place pile excavations should be reasonably free of loose soil before reinforcing steel is installed and concrete is placed. We recommend that Leighton Consulting, Inc. observe pile drilling, in accordance with Section 1705.8 of the 2016 California Building Code, to establish that piles are founded in suitable undisturbed native materials and constructed in accordance with the recommendations presented in this report. Cast-in-place piles should be constructed in accordance with Section 205-3.3.2 of the 2018Standard Specifications for Public Works Construction (Green Book) and ACI 336.1-01.

Due to the loose nature of fill and layers of cohesionless alluvium, casing of each shaft may be necessary. If water is present and cannot be removed from excavations prior to concrete placement, then concrete will need to be placed by tremie pipe or concrete pump hose. The concrete should be tremied or pumped to the bottom of the hole keeping the tremie

or pipe below the surface of the concrete to avoid entrapment of water in placed concrete. As concrete is poured, water is displaced out of the hole.

Difficult drilling may be experienced due to the indurated/cement nature of the soils in zones at depths of 20 to 30 feet below grade. The drilling contractor should be equipped to penetrate through this cemented material.

For new piles placed closer-than (<) 2½ diameters on center, construction sequencing should require curing concrete in one shaft before drilling the adjacent closely spaced shaft. Or, multiple (two or more) temporary steel casings can be used to stabilize multiple (two or more) adjacent closely-spaced shafts simultaneously. Other options can be considered as the means-and-methods of the foundation contractor.

4.3.3 Lateral Load Capacity

Passive Pressure: Short duration lateral wind and seismic loads exerted on new shear walls supported on piles and grade beams may be resisted by passive pressures against both the piles and grade beams. A passive equivalent fluid pressure of 250 pounds-per-square-foot per foot of embedment (pcf) acting against grade beams or pile caps can be used, not to exceed total passive pressure of 4,000 pounds-per-square-foot (psf). A passive resistance based on an equivalent fluid pressure of 500 pcf, acting against the projected area of an individual pile or “flagpole” pier below lowest adjacent grade, can also be used for design, assuming ½-inch lateral deflection of a free pile head. This maximum passive pressure on piles, however, should not exceed 4,000 psf.

Non-Linear Soil Response: As an alternate to lateral load resistance analysis using passive earth pressure, the soil surrounding a pile may be modeled as a series of non-linear springs along the length of the pile to capture the nonlinear load transfer from the pile to the supporting soil. The non-linear reaction of the spring model is commonly referenced as “p-y curve” method.

A preliminary analysis was undertaken using the p-y method for a 60-foot long pile with level ground around the pile in the direction of loading.

Table 5 – Drilled Cast-in-Place Pile Lateral Capacities

Pile Diameter (inches)	Deflection at Top of Pile (inches)	Free Head Condition			Fixed Head Condition		
		Lateral Load at Top of Pile (kips)	Maximum Bending Moment (kip-feet)	Depth to Maximum Moment (feet)	Lateral Load at Top of Pile (kips)	Maximum Bending Moment (kip-feet)	Depth to Maximum Moment (feet)
24	0.25	12.2	54.6	7.8	26.6	115.1	At fixed head (-0-)
	0.5	18.3	72.0	6.6	45.4	202.8	
	1.0	30.4	127.7	6.6	62.5	265.3	
36	0.25	27.5	187.8	12.0	50.6	277.1	
	0.5	35.7	194.8	10.2	77.1	404.5	
	1.0	53.9	271.1	8.4	103.0	462.9	
42	0.25	35.3	275.9	14.4	64.2	388.8	
	0.5	45.6	281.8	11.4	92.2	511.3	
	1.0	66.2	359.4	9.6	123.1	564.1	

No factor of safety has been applied to these capacities. Individual pile lateral load/deflection criteria can also be developed upon request, based upon the pile stiffness (EI) and sustained vertical load.

Lateral capacities should be reduced for pile groups when the lateral (horizontal) load vector is in the direction of aligned piles as follows:

Table 6 – Reduction in Lateral Capacities of Closely-Spaced Piles

Horizontal Pile Spacing Center-To-Center (pile diameters)	Reduced Pile Capacity In Direction of Lateral Load (percent)*
7	94
6	88
5	82
4	75
3	70
2	65
1½	60

4.3.4 Pile Settlement

Settlement of drilled cast-in-place concrete piles includes elastic shortening of the pile, as well as settlement of surrounding soil induced by mobilization skin-fiction resistance. For design loads presented above, individual pile settlement is anticipated to be on the order of ½-inch or less (in areas of 6 feet of undocumented fill or less where raising grade is **not** proposed), and will most likely be negligible. These settlement estimates are based on the assumption that finish grades will be approximately the same as existing grades.

Total post construction settlement for the recommended pile foundations should not exceed ¼-inch, and post construction differential settlement between columns spaced no more than 50 feet on center (founded solely on piles) should be less-than (<) ½ -inch due to static loads.

4.4 Spread Footing Foundations

Preparation of ancillary building areas should be performed as described in Section 4.1 of this report. Upon completion of pad preparation, the soils that will provide support of the foundations are expected to consist of properly moisture-conditioned structural compacted fill that exhibits low to moderate expansion potential underlain by suitable bearing native soils.

4.4.1 Vertical Load Bearing Capacity

The foundation system recommended for the proposed ancillary structures consists of a shallow foundation system in which continuous strip footings are used for wall support and isolated square pad footings for column support. Footings are recommended to be designed for a maximum net allowable soil bearing pressure of 2,000 psf.

The allowable bearing values may be increased by one-third when considering short-term seismic or wind loads. The recommended bearing pressure is net so the unit weight of concrete may be assumed to be 50 pcf when calculating the component of load demand due to foundation weight; the weight of soil backfill can be neglected when determining the downward loads.

Minimum footing widths are recommended to be 18 inches for continuous strip footings and 24 inches for square pad footings. Minimum footing embedment depth for exterior and perimeter footings is recommended to be 18 inches. The minimum embedment depth for interior footings is recommended to be 12 inches. The depth of embedment should be determined from the finish subgrade elevation adjacent to the building for the perimeter footings and the finish floor elevation within the structure for interior footings.

The minimum quantity of steel reinforcing in continuous strip footings is recommended to consist of four (4) No. 5 bars (2 top and 2 bottom). Additional reinforcement may be required due to structural design considerations.

4.4.2 Lateral Load Resistance

Lateral loads may be resisted by friction between the footings and the supporting subgrade and passive resistance of the soil adjacent to the vertical side of the foundation provided the foundations are poured neat against properly compacted fill or undisturbed native soils. We recommend an allowable frictional coefficient of 0.30 and allowable passive resistance equal to an equivalent fluid density of 300 pounds-per-cubic-foot (pcf) to a maximum of 3,000 psf be used in design. No reduction will be needed to any of the above two components for computing the total resistance to lateral loads. The use of passive resistance in lateral load analysis requires the foundations to be cast neat against vertical, undisturbed trench walls or any voids along the footing be backfilled with structural compacted fill.

4.4.3 Settlement Estimates

Estimated post-construction total and differential settlement under the assumed loading conditions are estimated to be on the order of 1 inch and ½ inch, respectively. The differential settlement is expected to occur over a minimum span of 30 feet, thereby resulting in an angular distortion less than 0.002 which is expected to be within tolerable limits for the proposed structure.

4.5 Slab-on-Grade Floors

Parking Structure: The slab of the at-grade and lower level of the structure will be subjected to vehicle wheel loads and will, therefore, serve as a Portland cement concrete pavement. Recommendations for design and construction are presented in Section 4.12.3 of this report.

Ancillary Structures: Upon completion of the recommended building pad preparation, the subgrade of the slabs supported on grade will consist of structural compacted fill placed in conjunction with preparation of the site as described in Section 4.1.

Based upon the anticipated subgrade conditions, slab-on-grade building floors may be designed and constructed as a mat on elastic foundation using a modulus of subgrade reaction (k_{v1}) of 110 pounds per cubic inch (pci). These slabs are recommended to be a minimum of 4 inches in thickness and include No. 3 rebar placed at center of the slab at 18 inches on-center in each direction based on geotechnical considerations. Increase in the slab thickness and/or reinforcing may be necessary due to structural engineering considerations as determined by the structural engineer.

Minor cracking of the concrete as it cures, due to drying and shrinkage is normal and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. Low slump concrete can reduce the potential for shrinkage cracking. The structural engineer may consider using additional reinforcement in slabs and foundations to reduce the potential for concrete cracking.

Interior slabs-on-grade are recommended to be underlain by a synthetic sheeting to serve as a retarder to moisture vapor transmission in areas where moisture-sensitive floor covering (such as vinyl, tile, or carpet) or personnel equipment is planned. Prior to installing the synthetic sheeting, the exposed subgrade surface should be clear of all extruding rock and gravel that could damage the sheeting. The sheeting should be evaluated for the presence of punctures or tears by the installer prior to pouring concrete. Installation of the sheeting should include proper overlap and taping of seams.

Appropriate synthetic sheeting should be determined by others qualified in evaluating and mitigating moisture vapor transmission through concrete slabs. Our firm does not practice in the field of moisture vapor transmission evaluation, since this is not specifically a geotechnical issue. Therefore, we recommend that a qualified person, such as the flooring subcontractor and/or structural engineer, be consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction with respect to the storage facility and retail areas. That person should provide recommendations for mitigation of the potential adverse effects of moisture vapor transmission on various components of the structures as deemed appropriate.

4.6 Temporary Excavations

All temporary excavations, including utility trenches, retaining wall excavations, and other excavations should be performed in accordance with project plans, specifications and all Occupational Safety and Health Administration (OSHA) requirements. Excavations to a depth of 5 feet or less may be excavated near vertical provided the soil conditions are evaluated and found to be suitable by the "competent person" present in site during trenching and excavating activities as defined by OSHA regulations. Excavations greater than 5 feet in depth or in areas where the sidewalls cannot be sloped for stability and safety should be shored using temporary excavation support systems appropriate for the excavation and site conditions.

Design of shoring systems are recommended to be based upon either an equivalent active fluid [pressure of 35 psf per foot of retained height (pcf) or 54 pcf under at-rest conditions assuming the shoring system will support the onsite soils as generally encountered to depths of 10 to 15 feet below grade . If temporary excavations are braced at the top of the excavation and at specific design intervals, design may be based upon a uniform horizontal pressure of 23H where H is the height of retained material.

The earth pressure condition, i.e., At-Rest vs. Active, is dependent upon the allowable rotation or deflection of the wall. Free-standing walls separate from the proposed buildings may be designed on the basis of the Active earth pressure condition. However, the walls that are not free to rotate are recommended to be designed under the At-Rest earth pressure condition.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the slope, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structures.

Temporary excavations should be treated in accordance with the State of California version of OSHA excavation regulations, Construction Safety Orders for Excavation General Requirements, Article 6, Section 1541, effective October 1, 1995. The sides of excavations should be shored or sloped in accordance with OSHA regulations. OSHA allows the sides of unbraced excavations, up to a maximum height of 20 feet, to be cut to a ¾H:1V (horizontal:vertical) slope for Type A soils, 1H:1V for Type B soils, and 1½H:1V for Type C soils.

OSHA regulations are applicable in areas with no restriction of surrounding ground deformations. Shoring should be designed for areas with deformation restrictions. The soil type should be verified or revised based on geotechnical observation and testing during construction, as soil classifications may vary over short horizontal distances. Heavy construction loads, such as those resulting from stockpiles and heavy machinery, should be kept a minimum distance equivalent to the excavation height or 5 feet, whichever is greater, from the excavation unless the excavation is shored, and these surcharges are considered in the design of the shoring system, if required.

4.7 Earth Retaining Structures

The exterior walls of subterranean level of the proposed structure will serve as earth retaining structures. The recommendations subsequently presented pertain to wall construction by open-cut in which the walls will be backfilled upon completion of construction.

4.7.1 Backfill and Drainage

The design of the retaining structures will be dependent upon the type of backfill material that is used and the applicable earth pressure condition. Retaining structures planned for the project should be backfilled with granular, very low expansive soil and be constructed with a backdrain, see Figure 8, *Retaining Wall Detail.* Select backfill soils should exhibit very

low expansion potential (EI less than 20) and exhibit a Sand Equivalent (SE) greater than 30.

Soils generated from excavation and earthwork activities may be suitable for reuse as wall backfill with proper evaluation and testing by the geotechnical engineer. Soils that are not free-draining will require a zone of uniform coarse crushed aggregate to provide proper drainage. Soils with significant silt and clay are generally not suitable for retaining wall backfill due to the greater magnitude of lateral pressure exerted by these types of soil and their poor drainage characteristics. Onsite materials used for backfill should also be free of organics.

Backfill for retaining walls should be compacted to a minimum of 90 percent relative compaction (based on ASTM Test Method D1557). Relatively light construction equipment should be used to backfill the retaining walls and the walls should be properly braced during backfilling operations.

The design parameters in the table below are based upon drained conditions. The design of the walls should, therefore, include provisions for wall drainage with a backdrain system in accordance with the recommendations provided on Figure 8 and the materials behind the wall should be free-draining (i.e., less than 5 percent passing the No. 200 sieve). If the soils that are planned for use as backfill are not free-draining such as the onsite fill soils, a narrow zone of free-draining material should be provided.

All soils selected for wall backfill (on-site and import) should be reviewed and approved by the geotechnical engineer prior to placement as fill.

4.7.2 Lateral Load Demand

The earth pressure condition, i.e., At-Rest vs. Active, is dependent upon the allowable rotation or deflection of the wall. Free-standing walls separate from the proposed buildings may be designed on the basis of the Active earth pressure condition. However, the exterior walls of the proposed structures are recommended to be designed under the At-Rest earth pressure condition. The design parameters summarized in the

following table are recommended for use in design of the retaining structures.

Table 7 – Retaining Wall Design Parameters

Design Parameter	Backfill Material	
	Common Soil[1]	Select Fill[2]
Soil Density (pcf)	125	135
Angle of Internal Friction (ø)	32	38
Equivalent Fluid Pressure (pcf)		
Level Backfill		
Active Earth Pressure	38	32
At-Rest Earth Pressure	59	52
Seismic Demand[3] (pcf)		
Level Backfill		
Active Static Earth Pressure	38	32
Seismic Increment (k_h = 0.23)	20	19

Notes:

[1] Very low to non-expansive soil. On-site soils may be used pending approval by Geotechnical Engineer. A free-draining layer may be required between the backfill and the wall depending upon soil type and fines content.

[2] Select, free-draining granular soils (P200<5%) such as Caltrans Class 2 crushed aggregate or similar.

[3] Total load demand on wall due to seismic shaking is sum of the Static earth pressure and the Seismic Increment; both pressures applied as equivalent fluid, i.e., linearly increasing with depth below top of wall.

Lateral pressures from surcharges and superimposed loads i.e., loads from vehicle traffic, the foundation bearing stresses of adjacent structures, etc., should be included in the design of the retaining structures in situations where the surface loads are located adjacent to or in proximity. The magnitude of the surcharge pressure for surface loads of limited lateral extent and at various distances from the subterranean walls can be determined on a case-by-case basis.

4.8 Trench Backfill

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the *Standard Specifications for Public Works*

Construction, (SSPWC, "Greenbook"), 2018 Edition. Utility trenches can be backfilled with onsite material free of rubble, debris, organic and oversized material up to 3 inches in largest dimension. Prior to backfilling trenches, pipes should be bedded in and covered with either:

(1) **Granular Bedding:** a) ½-inch open grade aggregate; or b) a uniform sand material with a Sand Equivalent (SE) greater-than-or-equal-to (≥) 30, passing the No. 4 U.S. Standard Sieve (or as specified by the pipe manufacturer).

(2) **CLSM:** Controlled Low Strength Material (CLSM) conforming to Section 201-6 of the SPWC. CLSM bedding should be placed to 1-foot (0.3 m) over the top of the conduit, and vibrated. CLSM should **not** be jetted.

Pipe bedding should extend at least 4-inches below the pipeline invert and at least 12 inches over the top of the pipeline. The bedding and shading sand is recommended to be densified in place by vibratory, lightweight compaction equipment and not by water jetting. Jetting or hydro-consolidation is not suitable for this project site and will result in unstable saturated subgrade.

Trench backfill over the pipe bedding zone may consist of native and clean fill soils. All backfill should be placed in thin lifts (appropriate for the type of compaction equipment), moisture conditioned above optimum, and mechanically compacted to at least 90 percent relative compaction, relative to the ASTM D 1557 laboratory maximum density.

4.9 Cement Type

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates and/or pH values of less than 5.5. Section 4.3 of ACI 318 (ACI, 2014). ACI provides specific guidelines for the concrete mix-design when the soluble sulfate content of the soil exceeds 0.1 percent by weight or 1,000 parts per million (ppm).

Laboratory test results indicate that onsite soils at shallow depth have "negligible" soluble sulfate content (per Section 4.3 of ACI 318). Concrete structures in contact with the on-site soils may be designed for negligible sulfate exposure in accordance with ACI 318 (ACI, 2014). If the concrete is expected to be in contact with reclaimed water, Type V cement and a water/cement ratio of 0.45

should be used. Samples should be collected from compacted subgrade upon completion of grading to confirm the initial findings of this investigation.

4.10 Corrosion Protection Measures

In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor for corrosion to ferrous metals. Table 3 presents an approximate relationship between soil resistivity and soil corrosiveness.

Table 8 - Soil Corrosivity as a Function of Resistivity

Soil Resistivity (ohm-cm)	Classification of Soil Corrosiveness
0 to 900	Very severe corrosion
900 to 2,300	Severely corrosive
2,300 to 5,000	Moderately corrosive
5,000 to 10,000	Mildly corrosive
10,000 to >100,000	Very mildly corrosive
Note: [1] ASTM STP 1013 titled *Effects of Soil Characteristics on Corrosion* (February, 1989).	

In addition to resistivity, the concentration of chloride ions can also be used to evaluate corrosive potential to steel, either in the form of reinforcement protected by concrete cover or plain steel substructures, such as steel pipes. As a general guideline, the chloride threshold adopted by Caltrans is a concentration of 500 ppm or greater as determined by California Test 532. Concentrations of chloride ions above the stated concentration or other characteristics such as soil resistivity or redox potential may warrant special corrosion protection measures. The results of corrosivity testing are summarized in Table 4.

Table 9 – Summary of Corrosivity Testing

Test Parameter	Test Results LB-4	General Classification of Hazard
Water-Soluble Sulfate in Soil (ppm)	200	Negligible sulfate exposure to buried concrete
Water-Soluble Chloride in Soil (ppm)	381	Non-corrosive to buried reinforced concrete
pH	7.79	Mildly acidic
Minimum Resistivity (saturated, ohm-cm)	860	Severely Corrosive to buried ferrous pipes

The results of the resistivity tests indicate that the underlying soil is corrosive to buried ferrous metals per ASTM STP 1013. The samples tested for water-soluble chloride content indicate a low potential for corrosion of steel in concrete due to the chloride content of the soil.

Based on the test results, ferrous pipes buried in moist to wet site earth materials should be avoided by using high-density polyethylene (HDPE), polyvinyl chloride (PVC) and/or other non-ferrous pipe when possible provided the pipe walls possess sufficient strength for the embedment and external loading to which the pipe will be subjected. Ferrous pipe can also be protected by polyethylene bags, tape or coatings, di-electric fittings or other means to separate pipe from on-site soils. If buried ferrous pipes are planned for this site, further corrosivity testing of soil samples should be performed upon completion of rough grading and specific corrosion protection measures should be recommended by a qualified corrosion engineer.

4.11 Surface Drainage

Positive drainage of surface water away from structures is very important. Water should not be allowed to pond adjacent to buildings or new site improvements. Water should not be allowed to flow directly over the slope faces. Positive drainage may be accomplished by providing drainage away at a minimum of 2 percent for earthen surfaces for a lateral distance of at least five feet and further maintained by a swale or drainage path at a gradient of at least 1 percent. Where necessary, drainage paths may be shortened by the use of area drains and collector pipes. Eave gutters are recommended and should reduce water infiltration into the subgrade materials. Downspouts should be connected to appropriate outlet devices.

Irrigation of landscaping should be controlled to maintain, as much as possible, consistent moisture content sufficient to provide healthy plant growth without over watering.

4.12 Pavements

4.12.1 Pavement Subgrades

The pavement subgrades should be prepared as described in Section 4.1 of this report. In accordance with the recommendations, preparation of the subgrade within the areas of new pavement construction are recommended to be overexcavated to a depth of 2 feet below the current grade or planned subgrade elevation, or to the depth of undocumented fill whichever is greater, to allow placement of a minimum of 2 feet of structural fill to develop a suitable bearing subgrade for pavement support.

Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet.

Landscape areas must be separated from pavements with concrete curbs and/or edge drains. Excessive over-irrigation will have an adverse impact on adjacent pavements. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from paving, will result in premature pavement failure.

4.12.2 Hot Mix Asphalt (HMA) Pavement Sections

Given the current conceptual layout, we anticipate the lower parking area will consist of Portland Cement Concrete. If Asphalt pavements are planned, based on the anticipated subgrade conditions and the results of laboratory testing, the following recommendations for pavement design have been based on assumed design R-value of 20 for the anticipated subgrade. R-value tests should be performed upon completion of grading to verify the design value is appropriate for the actual subgrade conditions. Based on the design procedures outlined in the current Orange County Highway Design Manual and using an R-value of 78 for the pavement base course, the following flexible pavement sections may be used for Traffic Index values that correspond to various levels of vehicle traffic.

Table 10 – Asphalt Pavement Sections

Traffic Index	Asphalt Concrete (inches)	Base Course (inches)	
		CAB	CMB
4 or less	3	6	6
5.0	3	7	8
6.0	4	9	10

Notes: CAB – Crushed Aggregate Base Course; Caltrans Class 2, Section 26 or SSPWC Section 200-2.2

CMB – Crushed Miscellaneous Base Course; SSPWC Section 200-2.4

The asphalt concrete should conform to the specifications outlined in Section 203-6 of the Standard Specifications for Public Works Construction (SSPWC, a.k.a. "Green Book"), and asphalt concrete construction methods should meet the requirements of Section 302-5 of the Green Book.

The base course should conform to requirements of Section 26 of State of California Department of Transportation Standard Specifications (Caltrans), latest edition, or meet the specifications for untreated base as defined in Section 200-2.2 of the SSPWC (Green Book). As an alternate, the base course may comply with the specifications for Crushed Miscellaneous Base per SSPWC Section 200-2.4.

Prior to placement of aggregate base, the subgrade soil should be processed to a minimum depth of 8 inches, moisture-conditioned to 2 to 4 percent above optimum moisture content, and recompacted to a minimum of 90 percent relative compaction. Base course should be placed in thin lifts, moisture conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction.

4.12.3 Portland Cement Concrete (PCC) Pavements

Portland cement concrete is anticipated for the at-grade and below-grade levels of the parking structure. The slab is recommended to consist of a minimum 6-inch thick Portland Concrete Cement (PCC) pavement section reinforced with No. 4 rebar at a maximum on-center spaced at 16 inches in each direction. The recommended PCC pavement section was based on the procedures described in the *Guide for Design and Construction of*

*Concrete Parking Lots by the American Concrete Inst*itute (ACI 330R-08). All PCC pavements should have a minimum 28-day concrete compressive strength of 3,000 pounds-per-square-inch (psi). The reinforcement should be evaluated by the civil/structural engineer to accommodate any additional structural loading requirements. Control joints are recommended to be installed at a maximum on-center spacing of 12 feet and should form square panels.

Concrete pavement may be underlain by a minimum 4-inch thick layer of compacted granular base to serve as a leveling mat for construction and to assist in load transfer at construction joints.

Integral curbs should be used at the perimeter of PCC pavement. Longitudinal joints should be avoided near curbs and gutters. Use of concrete cutoff or edge barriers should be considered at the perimeter of common parking or driveway areas when abutting either open (unfinished) or landscaped areas.

4.12.4 Construction and Performance

All pavement construction should be performed in accordance with the *Standard Specifications for Public Works Construction* (SSPWC, "Greenbook") or the project specifications as prepared by others. Field observation and periodic testing, as needed during placement of the base course materials, should be undertaken to ensure that the requirements of the project specifications are fulfilled.

The recommended pavement sections are based upon the assumed traffic intensity and the subgrade conditions that are expected to result upon completion of the recommended site preparation. The planned site grading may have an effect upon these recommendations and should be reviewed after the project plans have been prepared.

Care should be used in the selection of the pavement section to ensure the traffic intensity is consistent with the design assumption. Premature pavement wear and possible distress should be expected where the pavement section is not appropriate for the actual traffic loading conditions.

4.13 Exterior Concrete Flat Work

Exterior concrete slabs-on-grade should have a minimum thickness of 4 inches. Common Type II cement should be adequate for concrete flatwork not exposed to recycled water. Concrete flatwork should be placed on previously compacted fill. If this material has been disturbed or become dry, the subgrade soil to a depth of 12 inches should be moisture conditioned 2 to 4 percent above the optimum moisture content and recompacted to minimum 90 percent relative compaction.

Exterior concrete driveways, ramps, curbs, gutters, sidewalks often crack. Inclusion of joints at frequent intervals and reinforcement will help control the locations of the cracks, and thus reduce the unsightly appearance. Construction or weakened plane joints should be spaced at intervals of 6 feet or less for sidewalks, curbs and gutters. The spacing may be increased to 10 feet for ramps and driveways. If cracking occurs, repairs may be needed to mitigate the trip hazard and/or improve the appearance.

Because the site soils exhibit expansion potential, cracking and/or uneven slab due to heave of soil is expected over time which may cause tripping hazards. Standard methods to mitigate trip hazards include the following:

- Saw Cutting
- Grinding
- Patching and ramping
- Removing and replacement

A regular maintenance program should be implemented to mitigate trip hazards and comply with safety requirements. A 2-foot layer of non-expansive material can be placed below exterior concrete flatwork to reduce the potential for expansive soils to affect site construction. It is anticipated material of this nature will not be exposed during excavation.

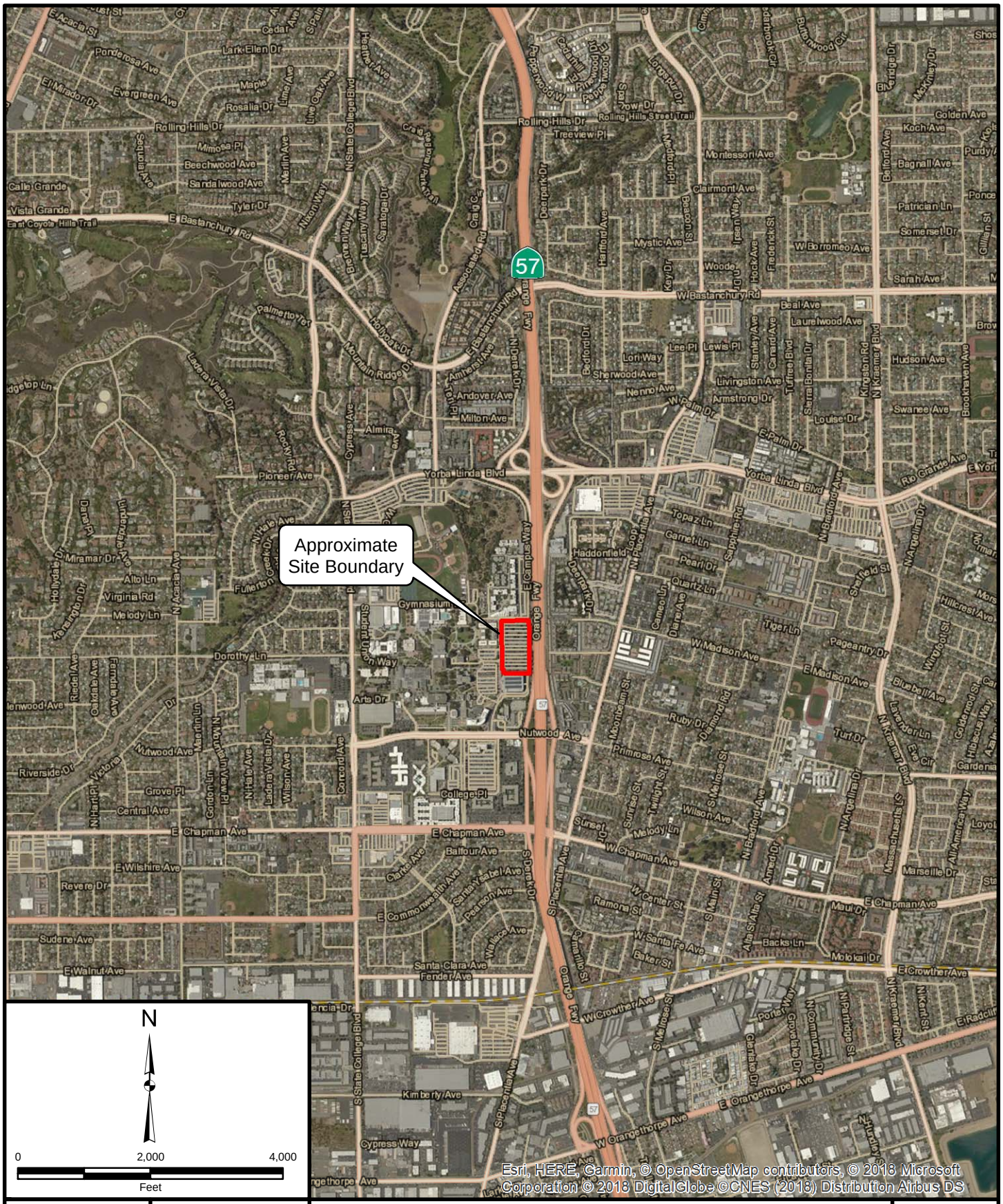
4.14 Additional Geotechnical Services

The geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations, limited laboratory testing and information available at the time the report is prepared. Additional geotechnical investigation and analysis may be required based on final

improvement plans. Leighton Consulting, Inc. should review the site and grading plans when available and comment further on the geotechnical aspects of the project. Geotechnical observation and testing should be conducted during excavation and all phases of grading operations. Our conclusions and recommendations should be reviewed and verified by Leighton Consulting Inc. during earthwork construction and revised accordingly if geotechnical conditions encountered vary from our preliminary findings and interpretations.

Geotechnical observation and testing should be provided during the following activities:

- Grading and excavation of the site;
- During overexcavation and removal of unsuitable soil;
- Subgrade preparation;
- Compaction of all fill materials;
- Utility trench backfilling and compaction;
- Footing excavation and slab-on-grade preparation;
- Pavement subgrade and base preparation;
- Placement of asphalt concrete and/or concrete; and
- When conditions are encountered on site that are not consistent with the conditions described in this report.



Project: 11922.002	Eng/Geol: JEH
Scale:1 " = 2,000 '	Date: July 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

SITE LOCATION MAP

Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive
Fullerton, California

Figure 1

Leighton

Map Saved as V:\Drafting\11922\002\Maps\11922-002_F01_SLM_2018-07-23.mxd on 7/23/2018 11:02:57 AM

Project: 11922.002	Eng/Geol: JEH
Scale:1 " = 80 '	Date: July 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

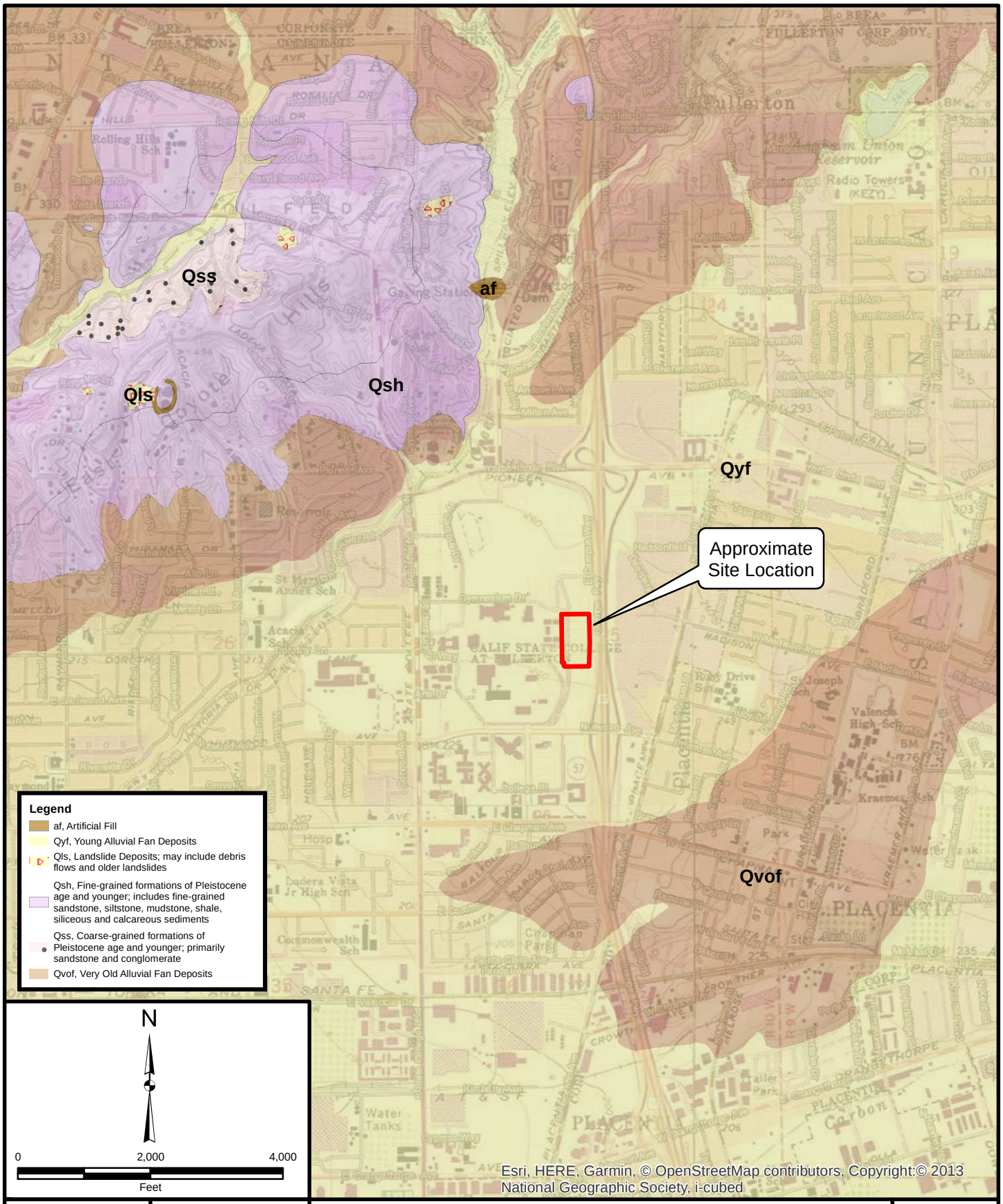
BORING LOCATION MAP

Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive
Fullerton, California

Figure 2

Leighton

Map Saved as V:\Drafting\11922\002\Maps\11922-002_F02_BLM_2018-07-23.mxd on 7/23/2018 11:43:40 AM



Project: 11922.002	Eng/Geol: JEH
Scale:1 " = 2,000 '	Date: July 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton, USGS
Author: Leighton Geomatics (btran)

REGIONAL GEOLOGY MAP

Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive
Fullerton, California

Figure 3

Leighton

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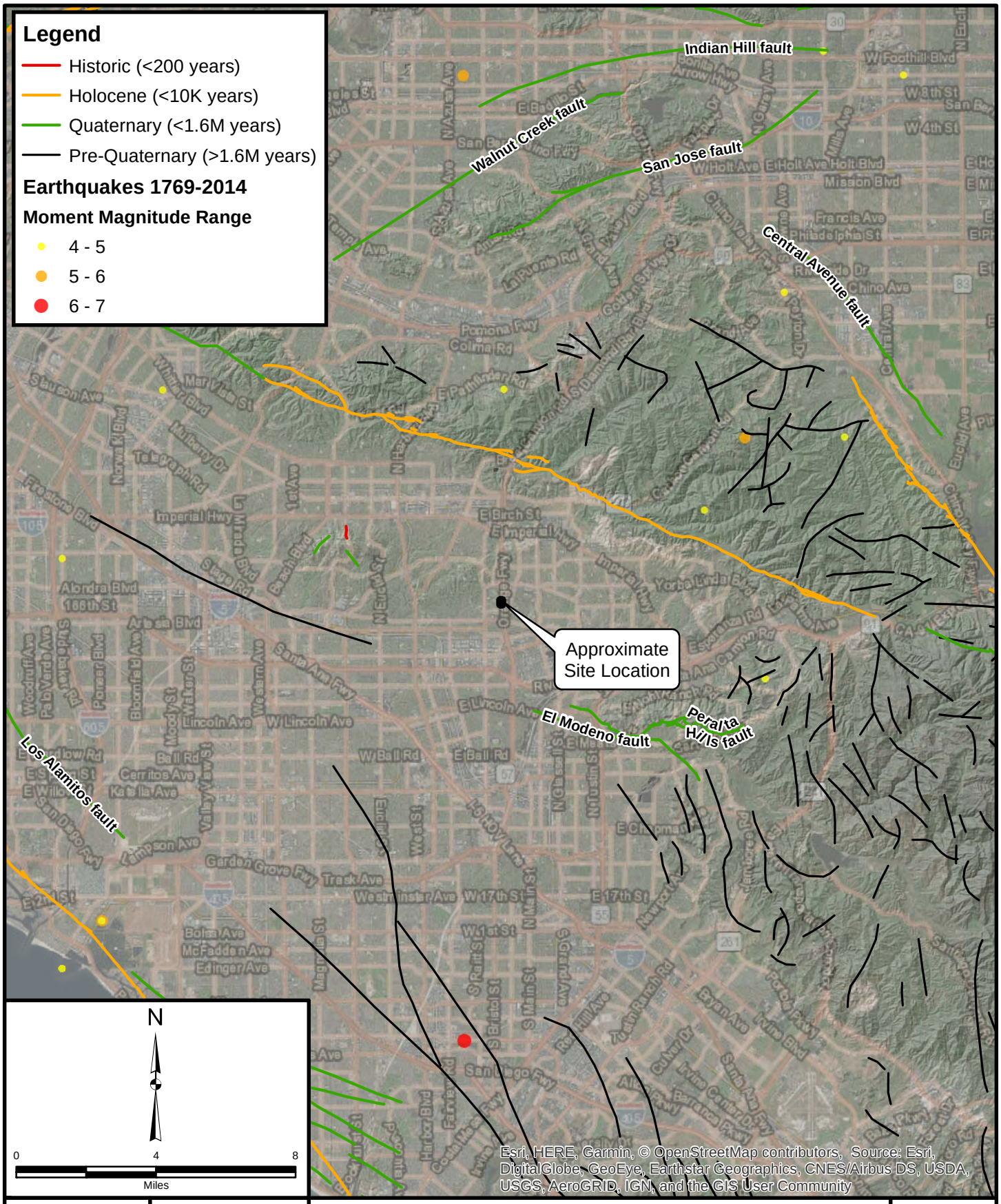

Project: 11922.002	Eng/Geol: JEH
Scale:1 " = 4 miles	Date: July 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton, CGS, Bryant 2010
Author: Leighton Geomatics (btran)

REGIONAL FAULT AND HISTORIC SEISMICITY MAP

Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive, Fullerton, California

Figure 4

Leighton

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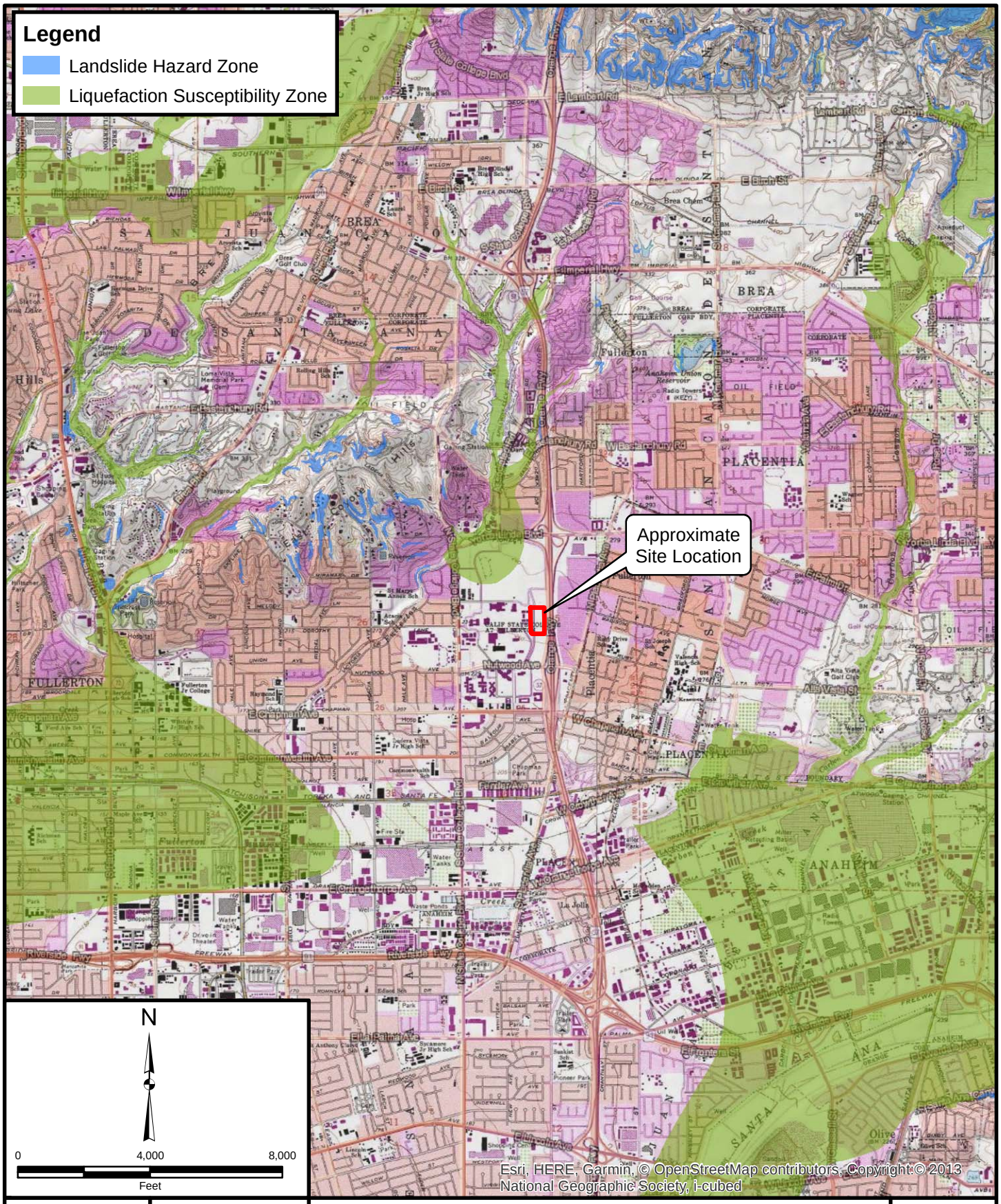


Project: 11922.002	Eng/Geol: JEH
Scale:1 " = 4,000 '	Date: July 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton, CGS
Author: Leighton Geomatics (btran)

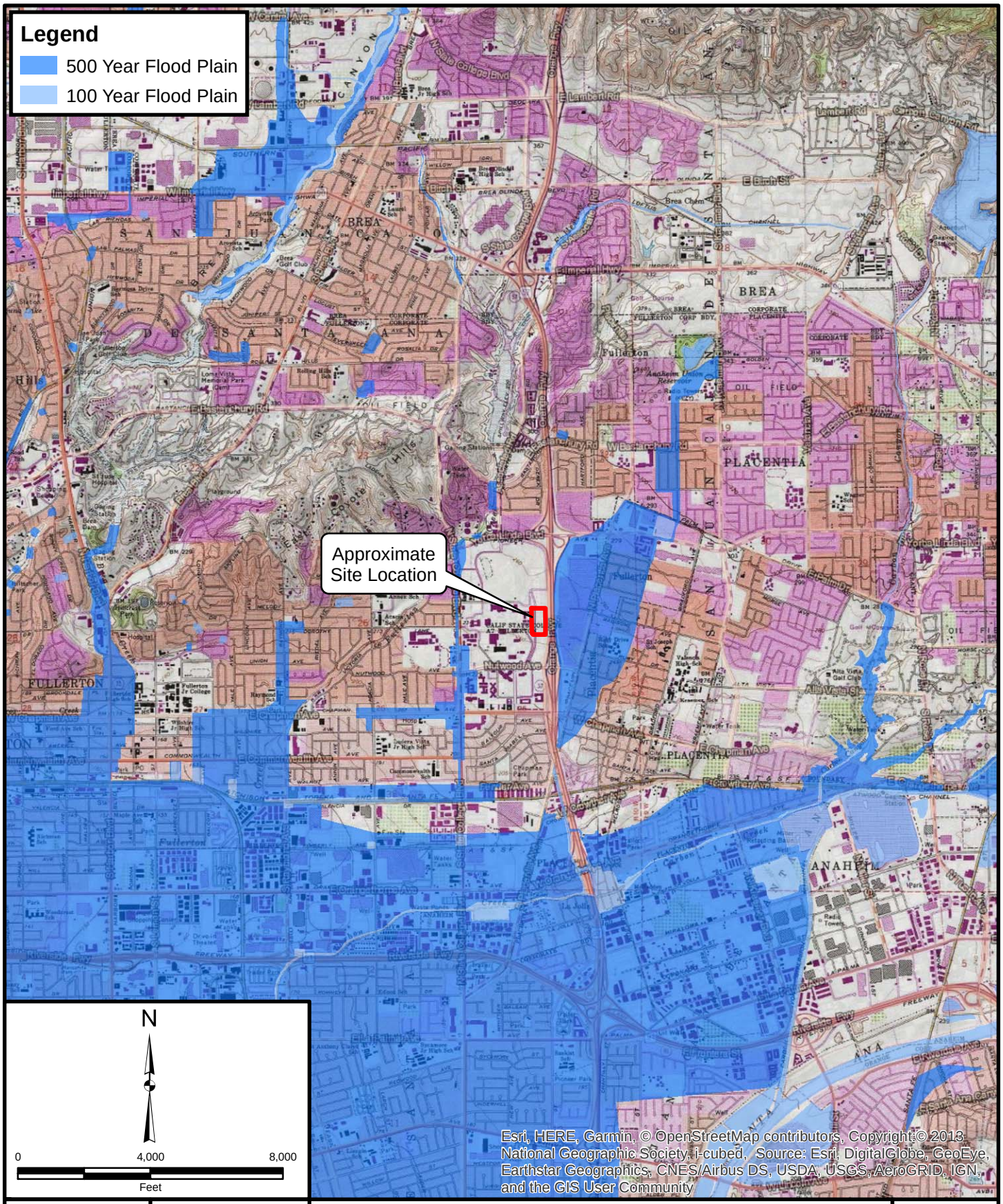
SEISMIC HAZARD MAP

Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive
Fullerton, California

Figure 5

Leighton

Map Saved as V:\Drafting\11922\002\Maps\11922-002_F05_SHM_2018-07-23.mxd on 7/23/2018 11:48:00 AM



Project: 11922.002	Eng/Geol: JEH
Scale:1 " = 4,000 '	Date: July 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton, CA DWR, FEMA
Author: Leighton Geomatics (btran)

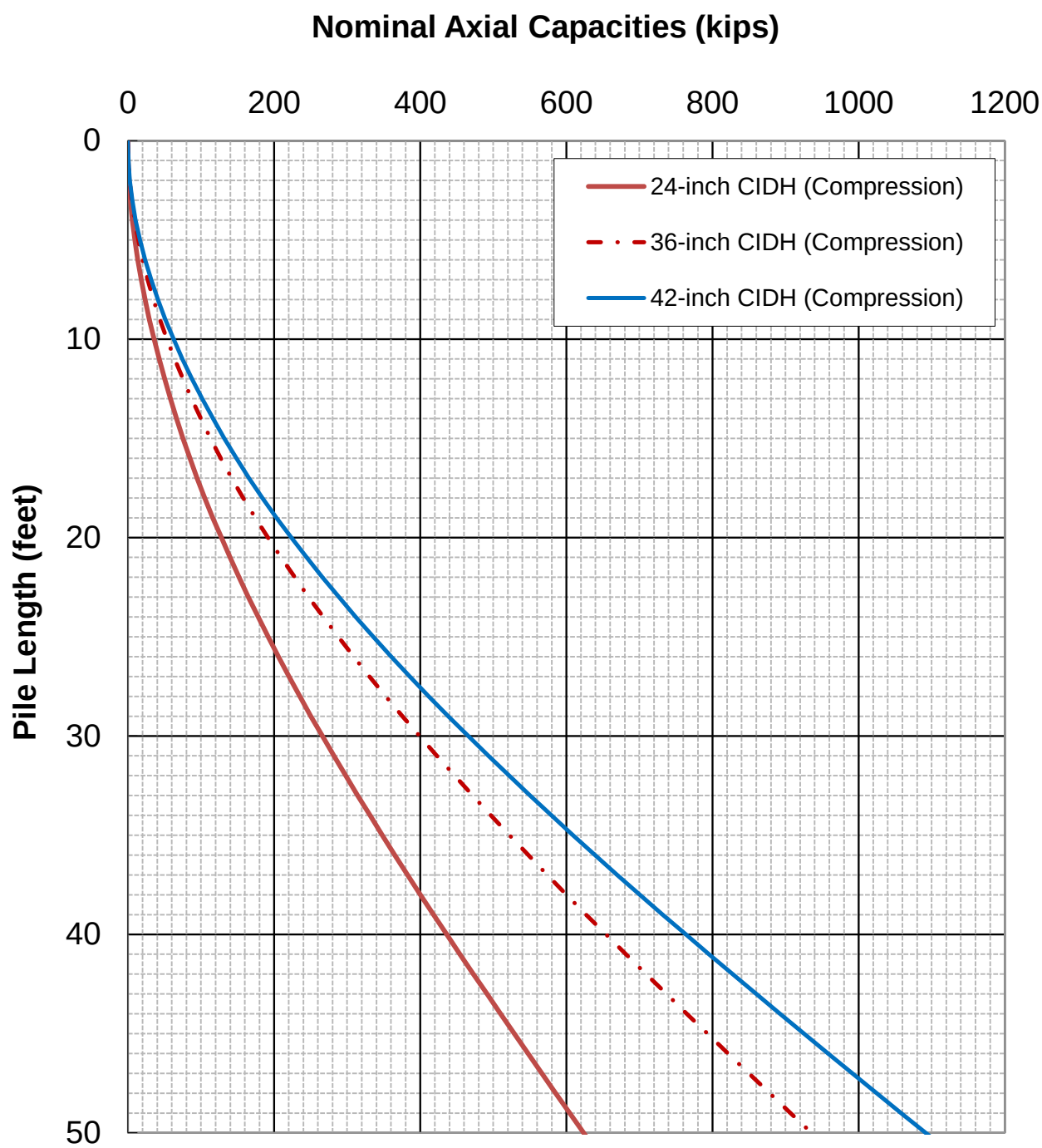
FLOOD HAZARD ZONE MAP

Proposed Eastside Parking Structure
California State University – Fullerton
Lot E, Folino Drive
Fullerton, California

Figure 6

Leighton

Map Saved as V:\Drafting\11922\002\Maps\11922-002_F06_FHM_2018-07-23.mxd on 7/23/2018 11:49:40 AM



Note:
1. A minimum factor of safety (FS) of 2.0 should be applied to estimate allowable capacities.
2. For seismic loading condition, a FS of 1.0 may be used to estimate allowable capacities.
3. Axial capacity in tension may be estimated by taking 50% of the nominal axial capacity in compression.
4. Pile length referenced to bottom of pile cap asumed to be approxmaly 3 feet belw original grade.

NOMINAL AXIAL CAPACITY GROUND LEVEL 24-, 36- & 42-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILES	PROJECT NAME : Eastside Prkg Structure PROJECT NUMBER : 11922.002 DESIGNED/CHECKED BY: CD/JEH DATE: 7/23/2018	**Figure 7**

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

American Society of Civil Engineers (ASCE), 2013, Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10, Third Printing, Errata Incorporated through March 15.

California Building Standards Commission, 2016, 2016 California Building Code (CBC), California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Based on 2015 International Building Code, Effective January 1, 2017.

California Geological Survey (CGS; formerly California Division of Mines and Geology, CDMG), 1998, Seismic Hazard Zone Report for the La Habra 7.5-Minute Quadrangle, Los Angeles County, California, 1998, SHZ Report 027.

_____, 2008, Special Publication 117a, Guidelines for Evaluating and Mitigating Seismic Hazards in California.

California State Water Resources Control Board (CSWRCB), GeoTracker, http://geotracker.waterboards.ca.gov/.

County of Orange, 2005, Resources and Development Management Department (RDMD), Orange County Highway Design Manual, June 2005.

Federal Emergency Management Agency, 2008, Flood Insurance Rate Map, Los Angeles County and Incorporated Areas, Map Number 06037C1790F, dated September 26, 2008.

Orange County Public Works (OCPW), 2013, Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs), dated December 20, 2013.

Public Works Standards, Inc., 2015, The “Greenbook”, Standard and Specifications for Public Works Constructions, 2015 Edition, BNI Building News.

United States Geological Survey (USGS), 1964, Photorevised 1981, La Habra Quadrangle, California, 7.5 Minute Series (Topographic Series), map scale 1:24,000.

_____, 2008a, U.S. Seismic Design Maps, http://earthquake.usgs.gov/designmaps/us/application.php

_____, 2014, Unified Hazard Tool, https://earthquake.usgs.gov/hazards/interactive/

_____, 2008c, National Seismic Hazard Maps – Fault Parameters, https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/query_main.cfm

_____, 2015a, Interactive Fault Map, http://earthquake.usgs.gov/hazards/qfaults/map/

_____, 2015b, Interactive Geologic Map, http://ngmdb.usgs.gov/maps/MapView/

Wright, T.L., 1991, Structural Geology and Tectonic Evolution if the Los Angeles Basin, California, in Biddle, K.T. (editor), Active Margin Basins: American Association of Petroleum Geologists Memoir 52, pp. 35-134.

Yerkes, R.F., McCulloh, T.H., Schoellhamer, J.E. and Vedder, J.G., 1965, Geology of the Los Angeles Basin, California -- An Introduction: U. S. Geological Survey Professional Paper 420-A, 57 p.

Yerkes, R.F., 1972, Geology and Oil Resources of the Western Puente Hills Area, Southern California: U.S. Geological Survey Professional Paper 420-C, 63 p.

APPENDIX B

EXPLORATION LOGS

GEOTECHNICAL BORING LOG LB-1

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~240'
Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								Surface: 3.5 inches of asphalt concrete over 12 inches of aggregate base	
				B-1				SC	Possible Fill: @ 1.3': Clayey SAND, brown, moist, fine to coarse sand, low plasticity	MD
	5			R-2	5 5 7	104	10		@ 5': Medium dense, mostly fine to medium sand	
								SM	**Native**:	
	10			S-3	2 2 2				@ 10': Silty fine to medium SAND, very loose, dark yellow brown, damp.	
				R-4	4 5 6	86	15	ML	@ 12.5': SILT, some fine sand, little clay, trace organic matter (roots), damp	
	15			S-5	2 3 4			SM	@ 15': Silty fine to medium SAND, brown, loose, damp.	
	20			R-6	10 20 36	119	11	CL	@ 20': Clayey SAND with Gravel, indurated, brown, moist, fine to coarse sand, little fine gravel, medium plasticity	AL, CN
	25			S-7	6 9 9			SC-SM	@ 25': Silty SAND, medium dense, brown, moist, fine to medium sand	
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-1

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
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Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R-8	4 7 11	111	9	SM	@ 30': Silty SAND, medium dense, brown, moist, mostly fine to medium sand, some fines, trace fine gravel, nonplastic	
	35			S-9	7 8 9				@ 35': fine to medium grained, trace coarse sand, damp	
	40			R-10	11 18 15			SP-SM	@40': SAND with silt, olive brown, medium dense, trace gravel	SA
	45			S-11	7 8 10			SM	@ 45': Silty SAND, medium dense, brown, moist, fine to medium sand, trace clay, low plasticity	
	50			R-12	3 14 21			CL	@ 50': Lean CLAY with Sand, hard, brown, moist, little fine sand, medium plasticity, PP>4.5 tsf	
	55								Total Depth of Boring: 51.5 feet. Boring terminated at planned depth. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings and patched with cold asphalt at surface.	
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-2

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~240'
Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0	N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
				B-1				CL	**Surface**: 2.5 inches of asphalt concrete over 5.5 inches of aggregate base **Fill**: @ 0.7': Sandy lean CLAY, brown, moist, some fine to coarse sand, trace fine gravel, medium plasticity	RV
								SC		
	5			S-2	4 5 6				@ 5': Clayey SAND, dark grey brown, hard, fine to medium sand, damp	
								ML	**Native**: @7': Sandy SILT, brown to light brown, fine grained, trace clay, damp	
	10			R-3	20 14 10	108	11		@ 10': Few light brown leachate seams, little clay, damp	CN
	15			S-4	9 14 14			SC	@ 15': Clayey SAND, brown to orange brown, fine to medium grained, medium dense, possibly indurated, damp	
	20			R-5	12 19 37	118	13	CL	@20': Sandy Silty CLAY, hard, brown, few light brown leachate seams, indurated, fine to medium grained, low to medium plasticity, damp	CO
	25			S-6	5 7 7			ML	@25': Sandy SILT with little clay, brown, fine grained, damp	
	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-2

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~240'
Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R-7	8 17 50/5"	103	9	ML	@ 30': Sandy SILT, hard, indurated, brown, moist, mostly fines, some fine to medium sand, low plasticity, PP>4.5 tsf	CN
	35			S-8	15 16 20			SP-SM	@ 35': Poorly-graded SAND with SILT, dense, brown, moist, mostly fine sand, few fines, nonplastic	
	40			R-9	9 22 32	104	2	SP	@ 40': SAND, fine to medium grained, dense, pale gray with orange, dry to moist, mostly fine to coarse sand, few fine gravel, trace silt, nonplastic	
	45			S-10	10 10 12			SC-SM	@ 45': Silty Clayey SAND, medium dense, brown, moist, mostly fine sand, some fines, low to medium plasticity	
	50			R-11	16 20 30	101	16	SM CL	@ 50': Silty SAND with Gravel, dense, mostly fine to medium sand, some fines, little fine gravel, nonplastic; silty CLAY at 51 feet	
	55								Total Depth of Boring: 51.5 feet. Boring terminated at planned depth. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings and patched with cold asphalt at surface.	
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
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- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
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- CO COLLAPSE
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- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-3

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~240'
Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0			B-1				SC	**Surface**: 2.5 inches of asphalt concrete over 4 inches of aggregate base **Possible Fill**: @ 0.7': Clayey SAND, brown to dark brown, moist, some fine to medium sand, medium plasticity	AL, EI
	5			S-2	2 2 6					
								ML	**Native:** @7': Sandy SILT, dark yellow brown, fine grained, medium dense, damp	
	10			R-3	5 6 10	91	10		@ 10': Few visible pores/pinhole porosity, damp	
				S-4	4 4 5					
	15			R-5	6 11 15	117	5			CO
	20			S-6	9 12 16			CL	@ 20': Silty CLAY and clayey SAND, brown, fine to medium grained, hard, indurated, damp, PP>4.5 tsf	
	25			R-7	8 10 16	101	8	ML	@ 25': Sandy SILT, brown, fine-grained, pinhole porosity, damp	DS
	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-3

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~240'
Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-8	16 22 27			SC	@ 30': Clayey SAND, very dense, indurated, brown, moist, fine grained sand, low to medium plasticity, damp	
	35			R-9	9 26 28	103	10	ML	@ 35': Sandy SILT, dense, indurated, brown, damp, fine to medium sand, PP>4.5 tsf	
	40			S-10	8 10 12				@ 40': Sandy SILT, medium dense, light brown, damp, some fine to medium sand, nonplastic	
	45			R-11	19 24 34	104	8	SM	@ 45': Silty SAND, dense, indurated, light brown, damp, fine to medium sand, trace fine gravel, few light brown leachate seams, nonplastic	
	50			S-12	7 15 19			CL	@ 50': Lean CLAY, hard, brown, moist, few fine sand, trace fine gravel, medium plasticity, PP>4.5 tsf	
	55								Total Depth of Boring: 51.5 feet. Boring terminated at planned depth. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings and patched with cold asphalt at surface.	
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
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GEOTECHNICAL BORING LOG LB-4

Project No.	11922-002	**Date Drilled**	6-8-18
Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~240'
Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0	N S		B-1				SC	**Surface**: 3 inches of asphalt concrete over 9 inches of aggregate base **Possible Fill:** @ 1': Clayey SAND, brown, moist, mostly fine to medium sand, some fines, trace fine gravel, low to medium plasticity	CR
	5			R-2	6 11 14	99	11	ML	**Native:** @ 5': Sandy SILT with little clay, light brown, some porosity, medium dense, fine-grained, damp	CN
	10			S-3	2 4 5			CL	@ 10': Sandy lean CLAY, very stiff, brown, moist, some fine sand, medium plasticity	
	15			R-4	17 11 13	90	12		@ 15': Hard, PP>4.5 tsf	DS
	20			S-5	10 17 22			CL SC	@ 20': Sandy CLAY grading to clayey SAND, brown to grey brown, hard to dense, indurated, fine to medium grained, damp, PP>4.5 tsf	
	25			R-6	12 21 28	116	12	CL	@ 25': Sandy CLAY, dense, indurated, gray-brown, damp, fine grained sand, trace fine gravel, medium plasticity	DS
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
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GEOTECHNICAL BORING LOG LB-4

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Project	CSUF - Proposed New Parking Structure	**Logged By**	BNS
Drilling Co.	Martini Drilling Corp.	**Hole Diameter**	8"
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Location	See Figure 2 - *Boring Location Map*	**Sampled By**	BNS

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			S-7	7 10 16			ML	@ 30': Sandy SILT, medium dense, brown, few light brown leachate seams, fine-grained, damp to moist	
	35			R-8	11 21 38	111	6	SM	@ 35': Silty SAND, very dense, indurated, brown, moist, mostly fine to medium sand, little fines, nonplastic	DS
	40			S-9	8 11 11			SP	@ 40': SAND with Silt, medium dense, brown, moist, fine to medium sand, few fine gravel	
	45			R-10	11 15 22	109	8	SM	@ 45': Silty SAND, medium dense, brown, moist, fine to medium sand, trace fine gravel	
	50			S-11	4 8 10			CL	@ 50': Lean CLAY with Sand, hard, brown, moist, little fine sand, medium plasticity, PP>4.5 tsf	
	55								Total Depth of Boring: 51.5 feet. Boring terminated at planned depth. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings and patched with cold asphalt at surface.	
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
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- R RING SAMPLE
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- T TUBE SAMPLE

TYPE OF TESTS:
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6/14/18

Leighton Consulting, Inc.
Attn: Vincent Ip

Subject: CPT Site Investigation
CSUF
Fullerton, California
GREGG Project Number: D1180572SH

Dear Mr. Ip:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☐
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	UVOST Laser Induced Fluorescence	(UVOST)	☐
5	Groundwater Sampling	(GWS)	☐
6	Soil Sampling	(SS)	☐
7	Vapor Sampling	(VS)	☐
8	Pressuremeter Testing	(PMT)	☐
9	Vane Shear Testing	(VST)	☐
10	Dilatometer Testing	(DMT)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (562) 427-6899.

Sincerely,
GREGG Drilling & Testing, Inc.

Frank Stolfi
HRSC Division Manager, Gregg Drilling & Testing, Inc.

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (feet)	Depth of Groundwater Samples (feet)	Depth of Soil Samples (feet)	Depth of Pore Pressure Dissipation Tests (feet)
CPT-18-1	6/13/2018	72.83	-	-	-
CPT-18-2	6/13/2018	70.05	-	-	-
CPT-18-3	6/13/2018	69.88	-	-	-

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

Mayne, P.W., "NHI (2002) Manual on Subsurface Investigations: Geotechnical Site Characterization", available through www.ce.gatech.edu/~geosys/Faculty/Mayne/papers/index.html, Section 5.3, pp. 107-112.

Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986 pp. 791-803.

Robertson, P.K., Sully, J., Woeller, D.J., Lunne, T., Powell, J.J.M., and Gillespie, D.J., "Guidelines for Estimating Consolidation Parameters in Soils from Piezocone Tests", Canadian Geotechnical Journal, Vol. 29, No. 4, August 1992, pp. 539-550.

Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

Copies of ASTM Standards are available through www.astm.org

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*.

The cone takes measurements of tip resistance (q_c), sleeve resistance (f_s), and penetration pore water pressure (u_2). Measurements are taken at either 2.5 or 5 cm intervals during penetration to provide a nearly continuous profile. CPT data reduction and basic interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored electronically for further analysis and reference. All CPT soundings are performed in accordance with revised ASTM standards (D 5778-12).

The 5mm thick porous plastic filter element is located directly behind the cone tip in the u_2 location. A new saturated filter element is used on each sounding to measure both penetration pore pressures as well as measurements during a dissipation test (*PPDT*). Prior to each test, the filter element is fully saturated with oil under vacuum pressure to improve accuracy.

When the sounding is completed, the test hole is backfilled according to client specifications. If grouting is used, the procedure generally consists of pushing a hollow tremie pipe with a "knock out" plug to the termination depth of the CPT hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

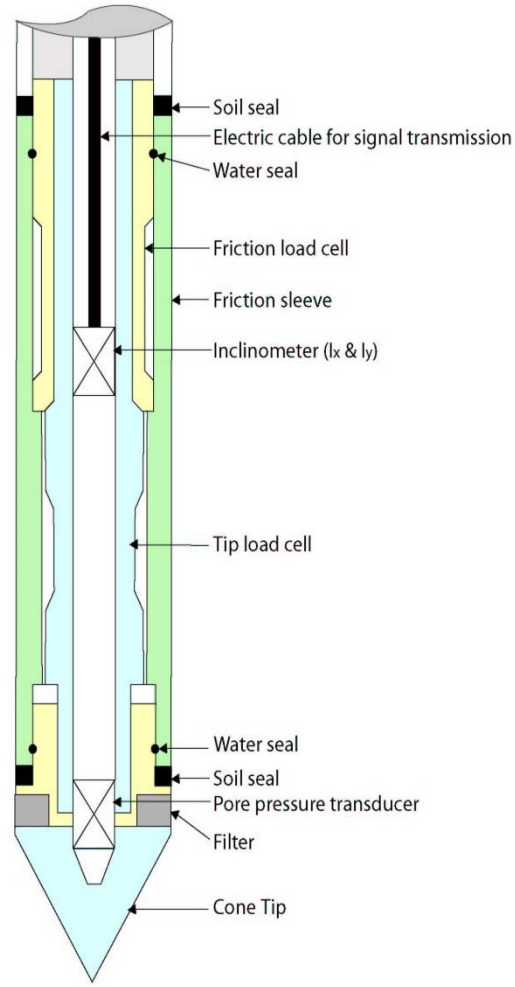


Figure CPT

Gregg 15cm^2 Standard Cone Specifications

Dimensions	
Cone base area	15 cm^2
Sleeve surface area	225 cm^2
Cone net area ratio	0.80
Specifications	
Cone load cell	
Full scale range	180 kN (20 tons)
Overload capacity	150%
Full scale tip stress	120 MPa (1,200 tsf)
Repeatability	120 kPa (1.2 tsf)
Sleeve load cell	
Full scale range	31 kN (3.5 tons)
Overload capacity	150%
Full scale sleeve stress	1,400 kPa (15 tsf)
Repeatability	1.4 kPa (0.015 tsf)
Pore pressure transducer	
Full scale range	7,000 kPa (1,000 psi)
Overload capacity	150%
Repeatability	7 kPa (1 psi)

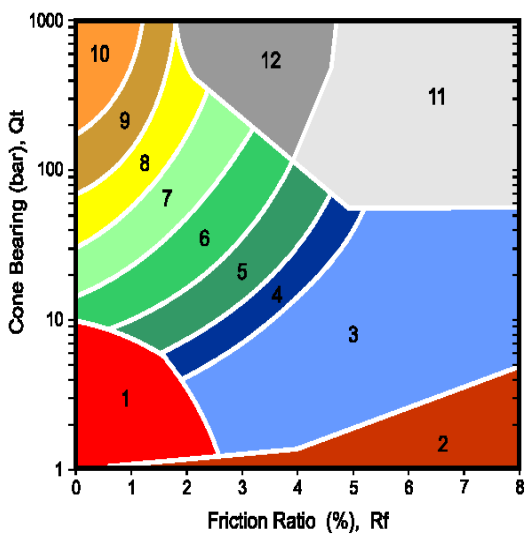
Note: The repeatability during field use will depend somewhat on ground conditions, abrasion, maintenance and zero load stability.

Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected are presented in graphical and electronic form in the report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings deeper than 30m, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson (Guide to Cone Penetration Testing, 2015). The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling & Testing Inc. does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software. Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



ZONE		SBT
1		Sensitive, fine grained
2		Organic materials
3		Clay
4		Silty clay to clay
5		Clayey silt to silty clay
6		Sandy silt to clayey silt
7		Silty sand to sandy silt
8		Sand to silty sand
9		Sand
10		Gravely sand to sand
11		Very stiff fine grained*
12		Sand to clayey sand*

*over consolidated or cemented

Figure SBT (After Robertson et al., 1986) – Note: Colors may vary slightly compared to plots

Cone Penetration Test (CPT) Interpretation

Gregg uses a proprietary CPT interpretation and plotting software. The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1. Units for display (Imperial or metric) (atm. pressure, p_a = 0.96 tsf or 0.1 MPa)
2. Depth interval to average results (ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3. Elevation of ground surface (ft or m)
4. Depth to water table, z_w (ft or m) – input required
5. Net area ratio for cone, a (default to 0.80)
6. Relative Density constant, C_{Dr} (default to 350)
7. Young's modulus number for sands, α (default to 5)
8. Small strain shear modulus number
   a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
   b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9. Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10. Over Consolidation ratio number, k_{ocr} (default to 0.3)
11. Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1. Depth, z, (m) – CPT data is collected in meters
2. Depth (ft)
3. Cone resistance, q_c (tsf or MPa)
4. Sleeve resistance, f_s (tsf or MPa)
5. Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6. Other – any additional data
7. Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \sigma z$
12	In-situ pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with I_c)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT (Lunne et al., 1997 and table below)

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT (Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n Lunne et al. (1997)

4 SBT_n Index, I_c $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, n = 0.5 (clean sand)
When $I_c > 3.30$, n = 1.0 (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} based on Normalized SBT_n (Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\, C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan \phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$
Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go
a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*
b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*
Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

The following updated and simplified SBT descriptions have been used in the software:

SBT Zones		**SBT_n Zones**	
1	sensitive fine grained	1	sensitive fine grained
2	organic soil	2	organic soil
3	clay	3	clay
4	clay & silty clay	4	clay & silty clay
5	clay & silty clay		
6	sandy silt & clayey silt		

7	silty sand & sandy silt	5	silty sand & sandy silt
8	sand & silty sand	6	sand & silty sand
9	sand		
10	sand	7	sand
11	very dense/stiff soil*	8	very dense/stiff soil*
12	very dense/stiff soil*	9	very dense/stiff soil*

*heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print 'clays & silty clays')

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals can be used to measure equilibrium water pressure (at the time of the CPT). If conditions are hydrostatic, the equilibrium water pressure can be used to determine the approximate depth of the ground water table. A PPDT is conducted when penetration is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (*u)* with time is measured behind the tip of the cone and recorded.

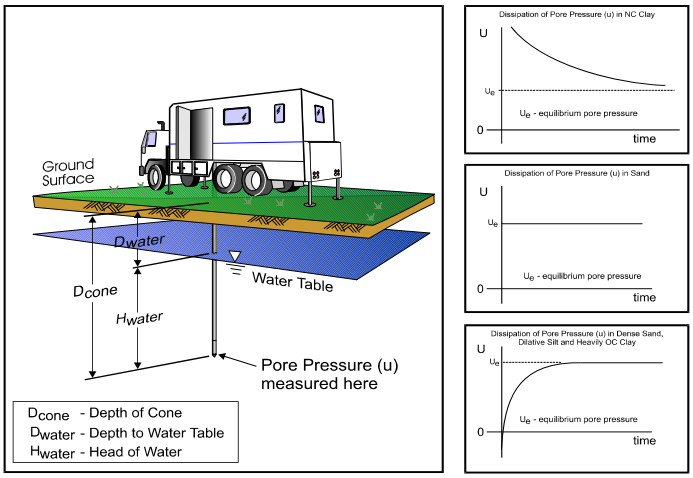
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until it reaches equilibrium, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992 and Lunne et al. 1997.

A summary of the pore pressure dissipation tests are summarized in Table 1.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

Seismic Cone Penetration Testing (SCPT)

Seismic Cone Penetration Testing (SCPT) can be conducted at various intervals during the Cone Penetration Test. Shear wave velocity (Vs) can then be calculated over a specified interval with depth. A small interval for seismic testing, such as 1-1.5m (3-5ft) allows for a detailed look at the shear wave profile with depth. Conversely, a larger interval such as 3-6m (10-20ft) allows for a more average shear wave velocity to be calculated. Gregg's cones have a horizontally active geophone located 0.2m (0.66ft) behind the tip.

To conduct the seismic shear wave test, the penetration of the cone is stopped and the rods are decoupled from the rig. An automatic hammer is triggered to send a shear wave into the soil. The distance from the source to the cone is calculated knowing the total depth of the cone and the horizontal offset distance between the source and the cone. To calculate an interval velocity, a minimum of two tests must be performed at two different depths. The arrival times between the two wave traces are compared to obtain the difference in time (Δt). The difference in depth is calculated (Δd) and velocity can be determined using the simple equation: $v = \Delta d/\Delta t$

Multiple wave traces can be recorded at the same depth to improve quality of the data.

A complete reference on seismic cone penetration tests is presented by Robertson et al. 1986 and Lunne et al. 1997.

A summary the shear wave velocities, arrival times and wave traces are provided with the report.

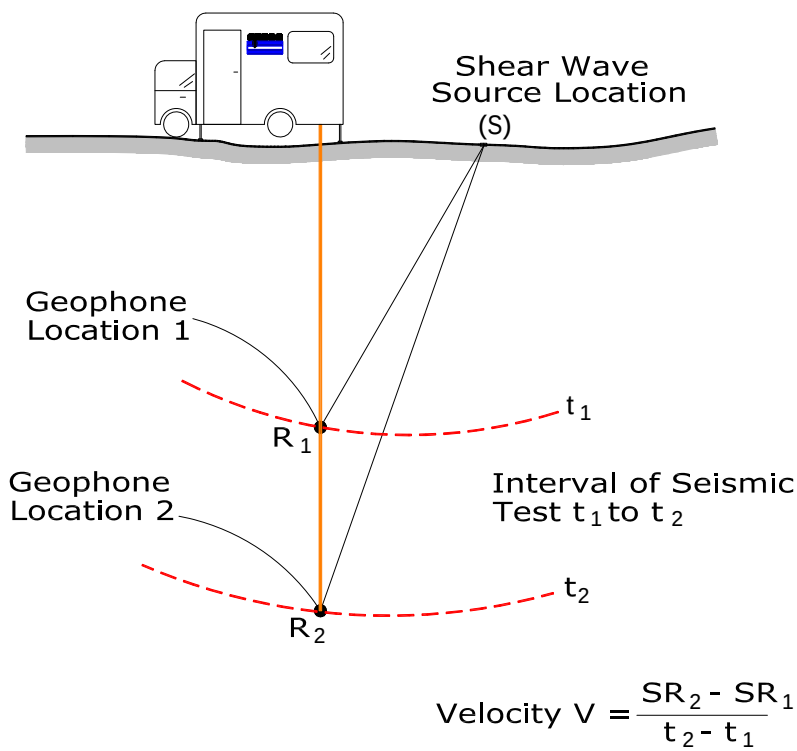


Figure SCPT

Groundwater Sampling

Gregg Drilling & Testing, Inc. conducts groundwater sampling using a sampler as shown in *Figure GWS*. The groundwater sampler has a retrievable stainless steel or disposable PVC screen with steel drop off tip. This allows for samples to be taken at multiple depth intervals within the same sounding location. In areas of slower water recharge, provisions may be made to set temporary PVC well screens during sampling to allow the pushing equipment to advance to the next sample location while the groundwater is allowed to infiltrate.

The groundwater sampler operates by advancing 44.5mm (1¾ inch) hollow push rods with the filter tip in a closed configuration to the base of the desired sampling interval. Once at the desired sample depth, the push rods are retracted; exposing the encased filter screen and allowing groundwater to infiltrate hydrostatically from the formation into the inlet screen. A small diameter bailer (approximately ½ or ¾ inch) is lowered through the push rods into the screen section for sample collection. The number of downhole trips with the bailer and time necessary to complete the sample collection at each depth interval is a function of sampling protocols, volume requirements, and the yield characteristics and storage capacity of the formation. Upon completion of sample collection, the push rods and sampler, with the exception of the PVC screen and steel drop off tip are retrieved to the ground surface, decontaminated and prepared for the next sampling event.

For a detailed reference on direct push groundwater sampling, refer to Zemo et. al., 1992.

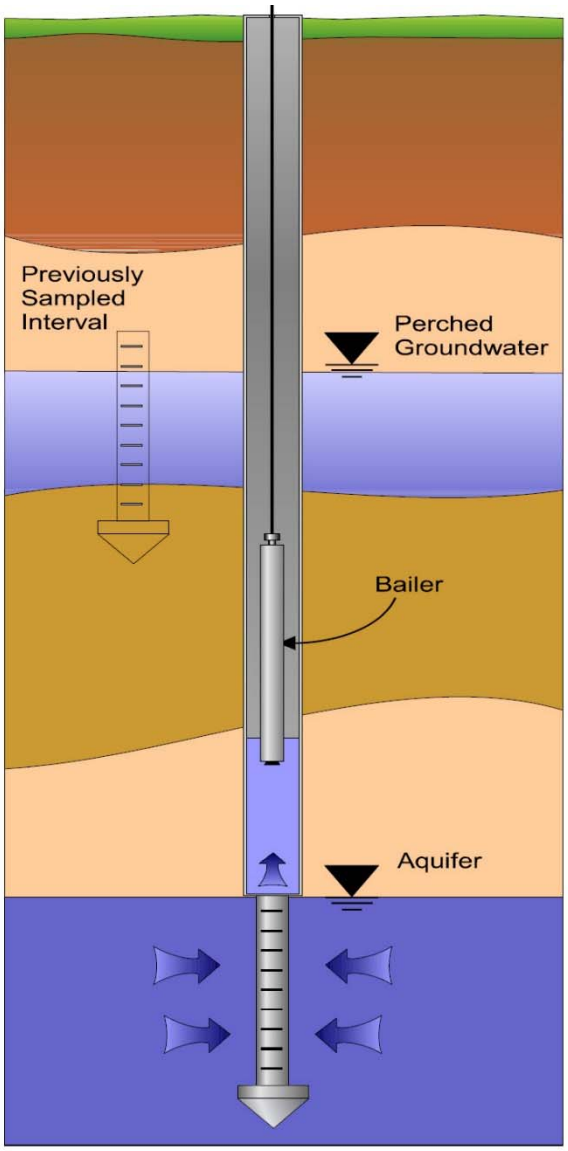


Figure GWS

Soil Sampling

Gregg Drilling & Testing, Inc. uses a piston-type push-in sampler to obtain small soil samples without generating any soil cuttings, *Figure SS*. Two different types of samplers (12 and 18 inch) are used depending on the soil type and density. The soil sampler is initially pushed in a "closed" position to the desired sampling interval using the CPT pushing equipment. Keeping the sampler closed minimizes the potential of cross contamination. The inner tip of the sampler is then retracted leaving a hollow soil sampler with inner 1¼" diameter sample tubes. The hollow sampler is then pushed in a locked "open" position to collect a soil sample. The filled sampler and push rods are then retrieved to the ground surface. Because the soil enters the sampler at a constant rate, the opportunity for 100% recovery is increased. For environmental analysis, the soil sample tube ends are sealed with Teflon and plastic caps. Often, a longer "split tube" can be used for geotechnical sampling.

For a detailed reference on direct push soil sampling, refer to Robertson et al, 1998.

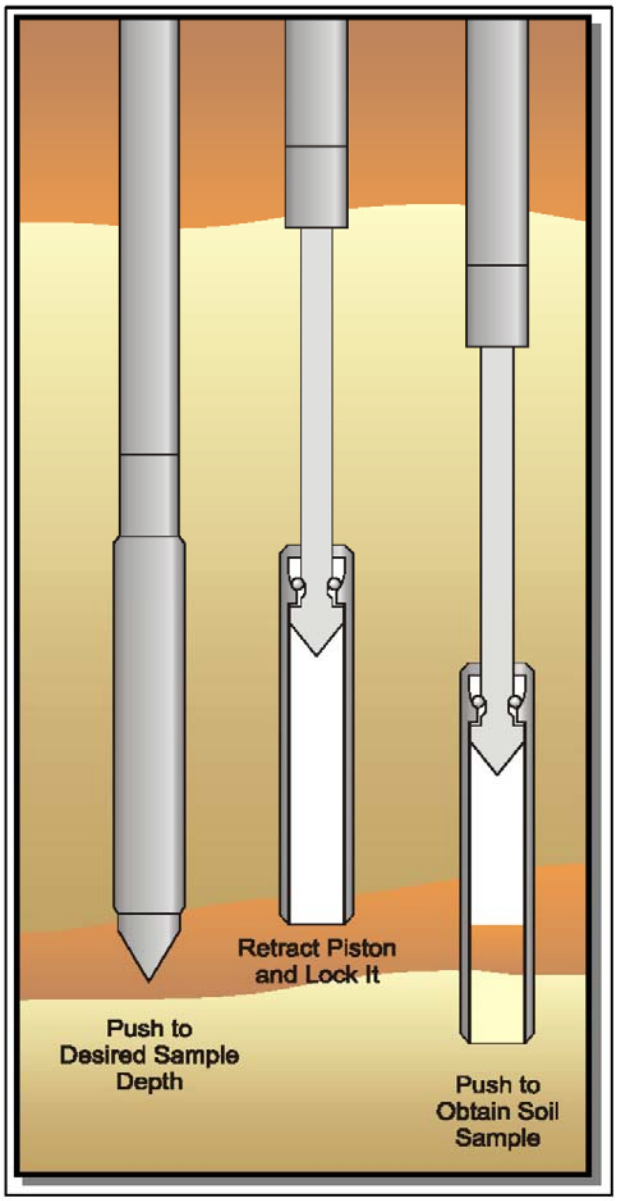


Figure SS

GREGG DRILLING, INC.
www.greggdrilling.com

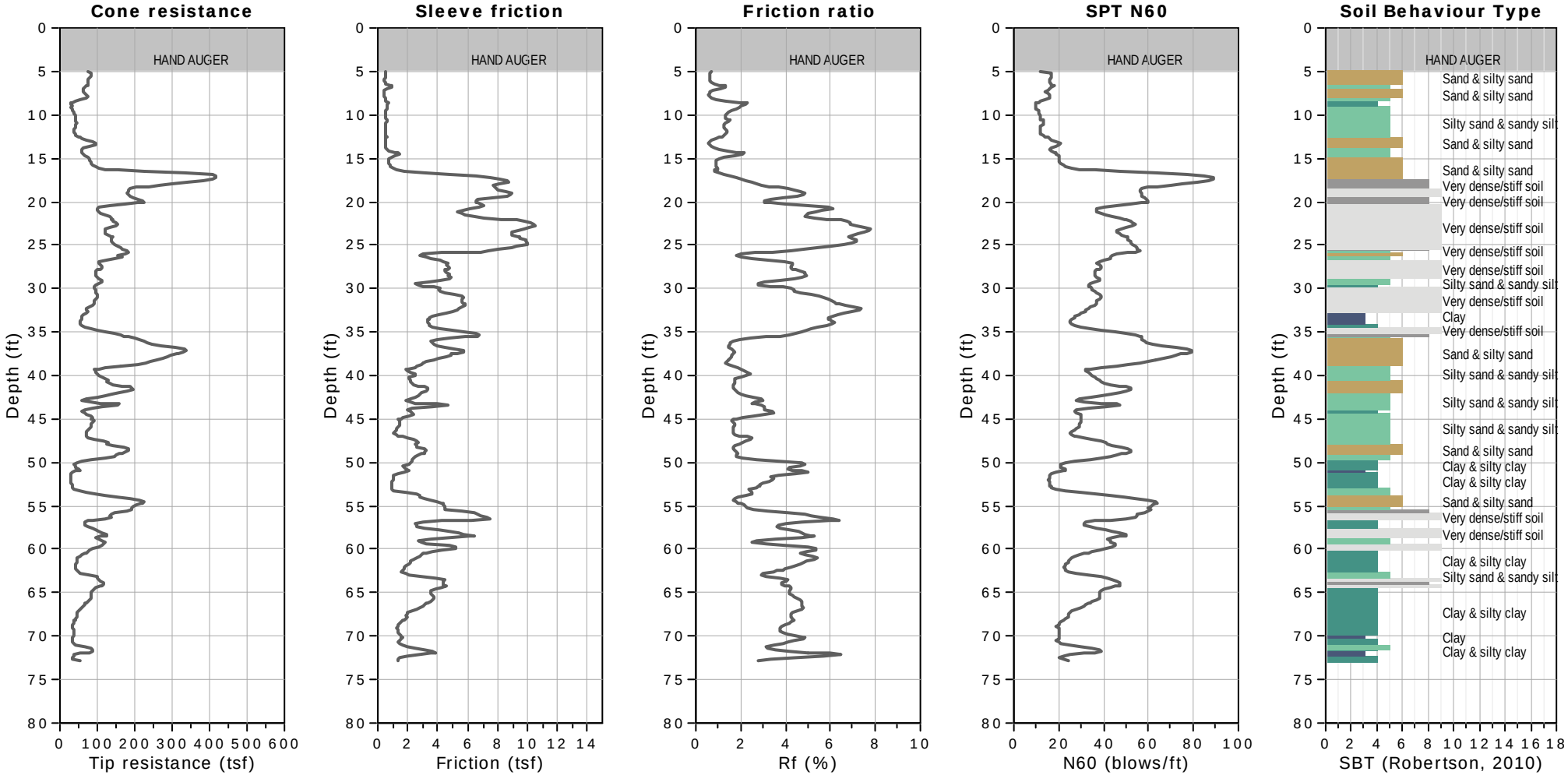
CPT: CPT-18-1

CLIENT: LEIGHTON

SITE: CSUF ENGINEERING - FULLERTON, CA

Field Rep: BARZIN

Total depth: 72.83 ft, Date: 6/13/2018



SBTn legend

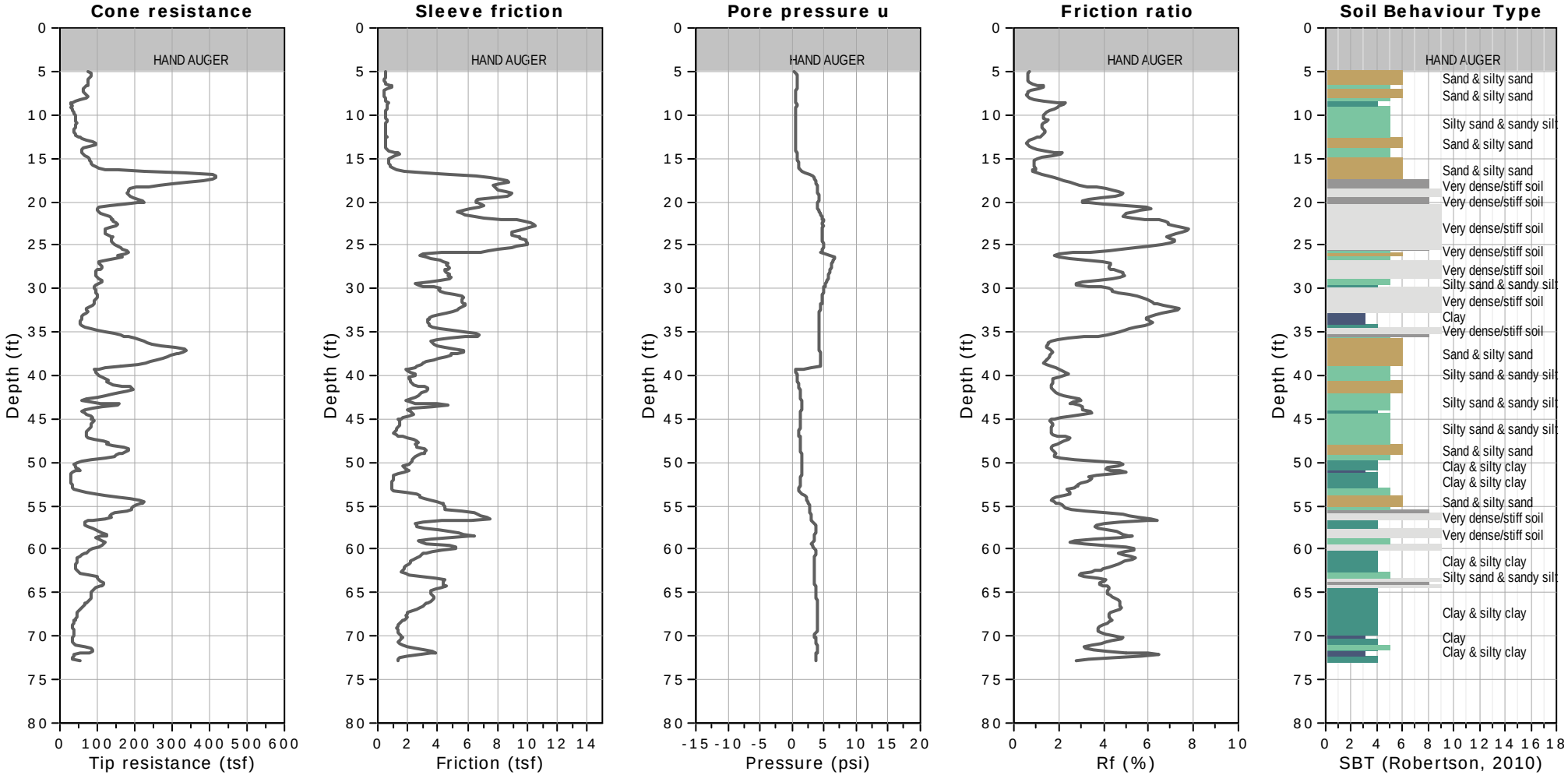
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

GREGG DRILLING, INC.
www.greggdrilling.com

CPT: CPT-18-1

CLIENT: LEIGHTON
SITE: CSUF ENGINEERING - FULLERTON, CA

Field Rep: BARZIN
Total depth: 72.83 ft, Date: 6/13/2018



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

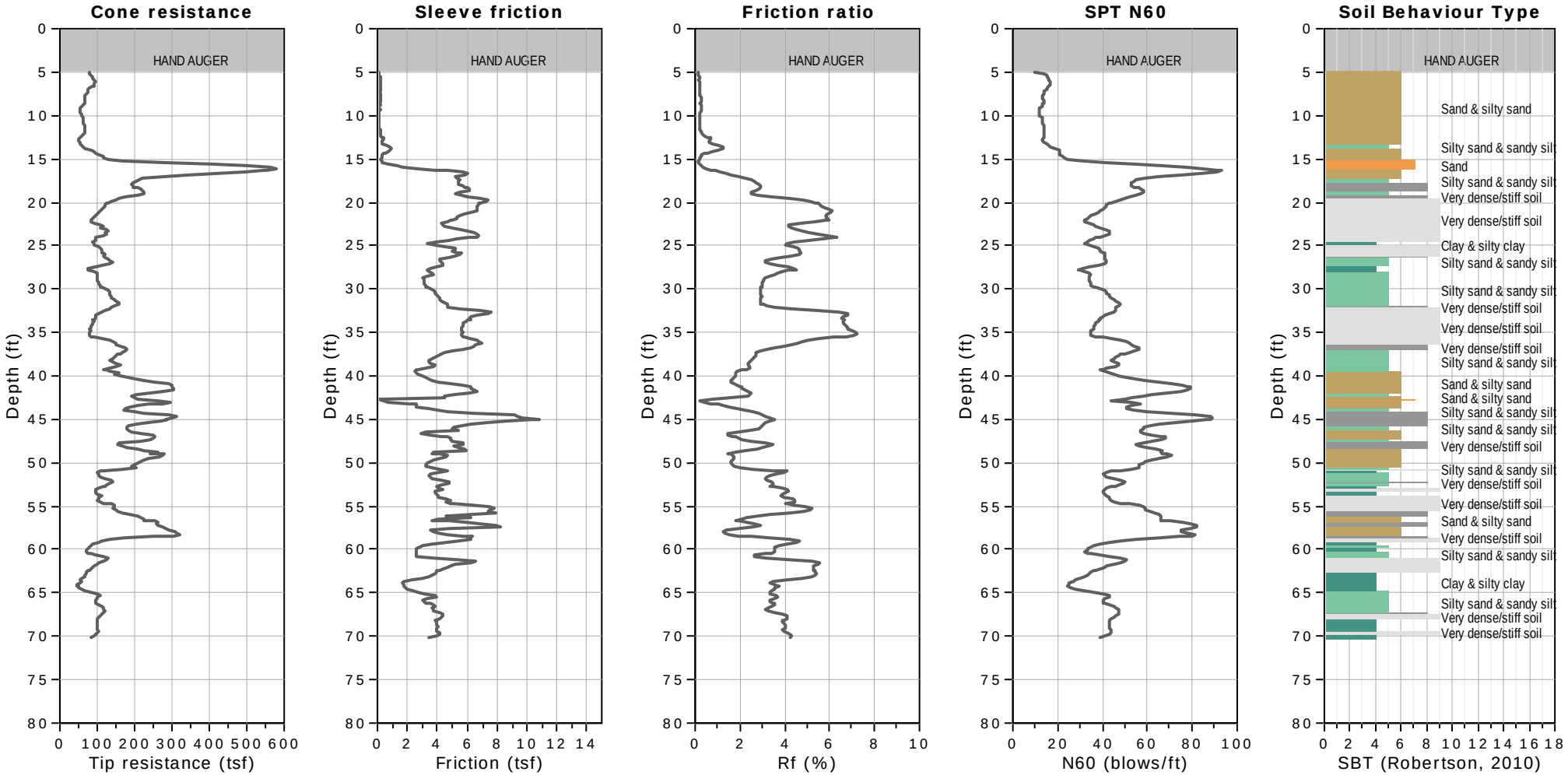
WATER TABLE FOR ESTIMATING PURPOSES ONLY

GREGG DRILLING, INC.
www.greggdrilling.com

CPT: CPT-18-2

CLIENT: LEIGHTON
SITE: CSUF ENGINEERING - FULLERTON, CA

Field Rep: BARZIN
Total depth: 70.05 ft, Date: 6/13/2018



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

GREGG DRILLING, INC.
www.greggdrilling.com

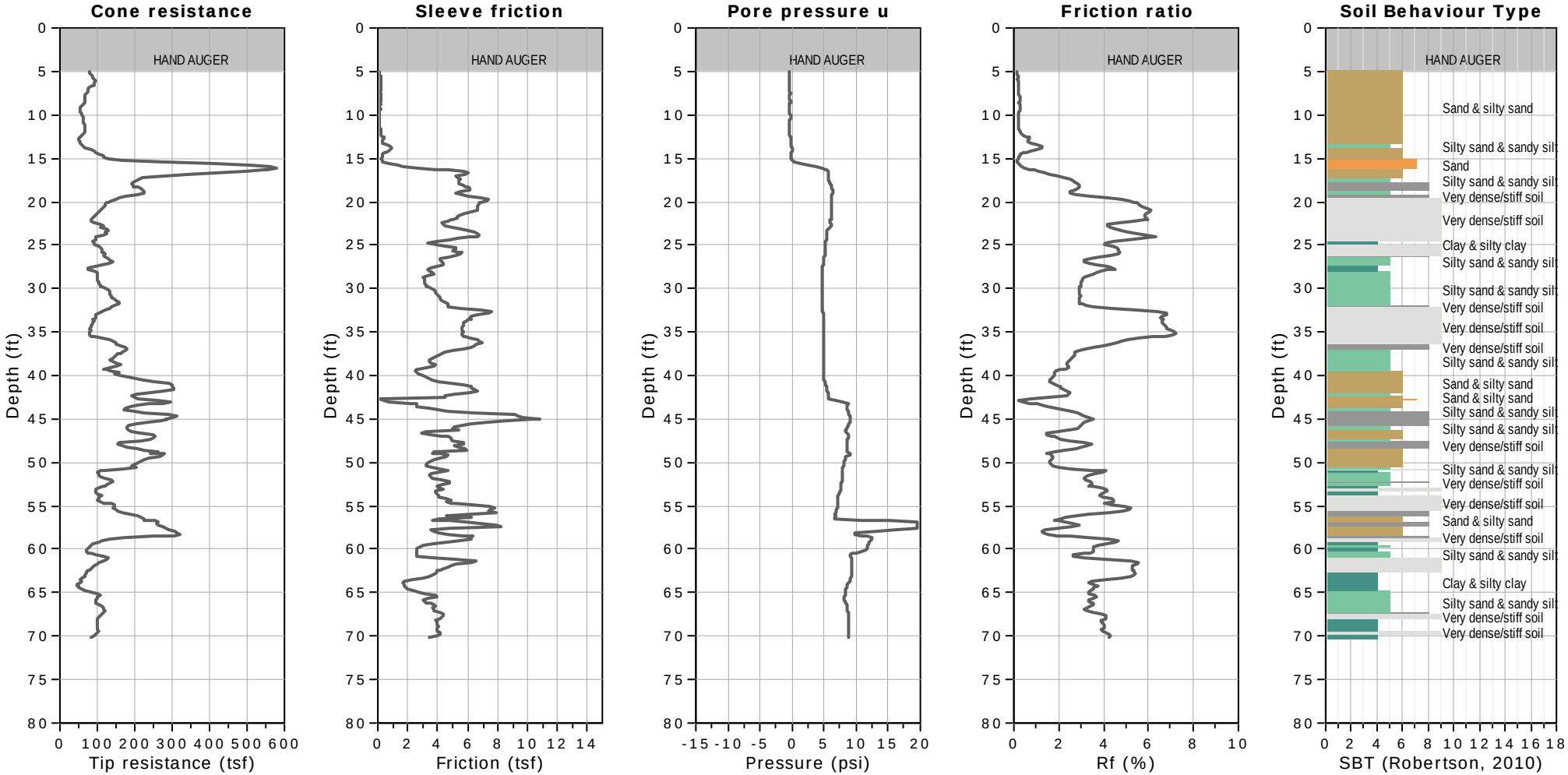
CPT: CPT-18-2

CLIENT: LEIGHTON

SITE: CSUF ENGINEERING - FULLERTON, CA

Field Rep: BARZIN

Total depth: 70.05 ft, Date: 6/13/2018



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

WATER TABLE FOR ESTIMATING PURPOSES ONLY

GREGG DRILLING, INC.
www.greggdrilling.com

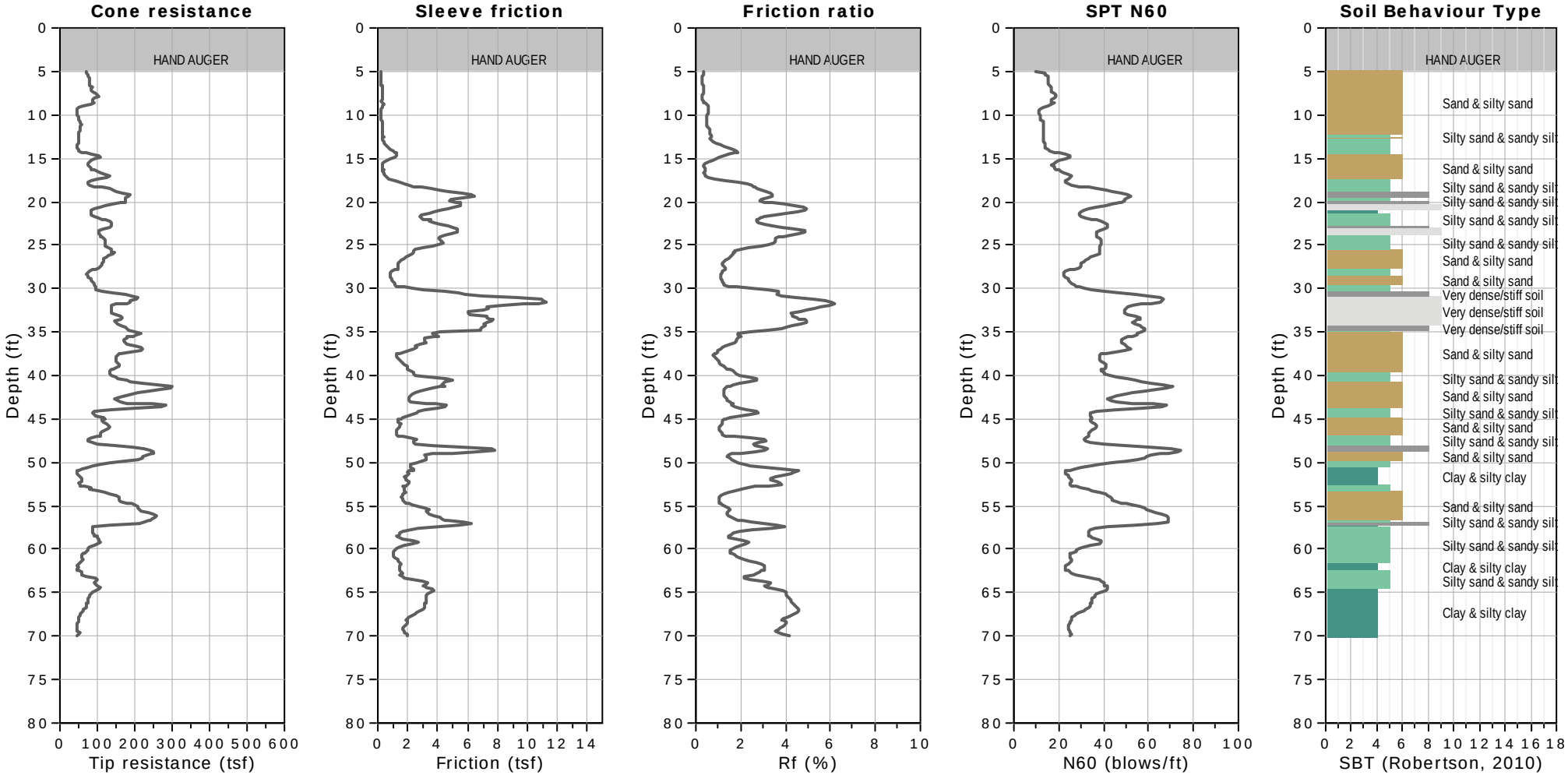
CPT: CPT-18-3

CLIENT: LEIGHTON

SITE: CSUF ENGINEERING - FULLERTON, CA

Field Rep: BARZIN

Total depth: 69.88 ft, Date: 6/13/2018



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

GREGG DRILLING, INC.
www.greggdrilling.com

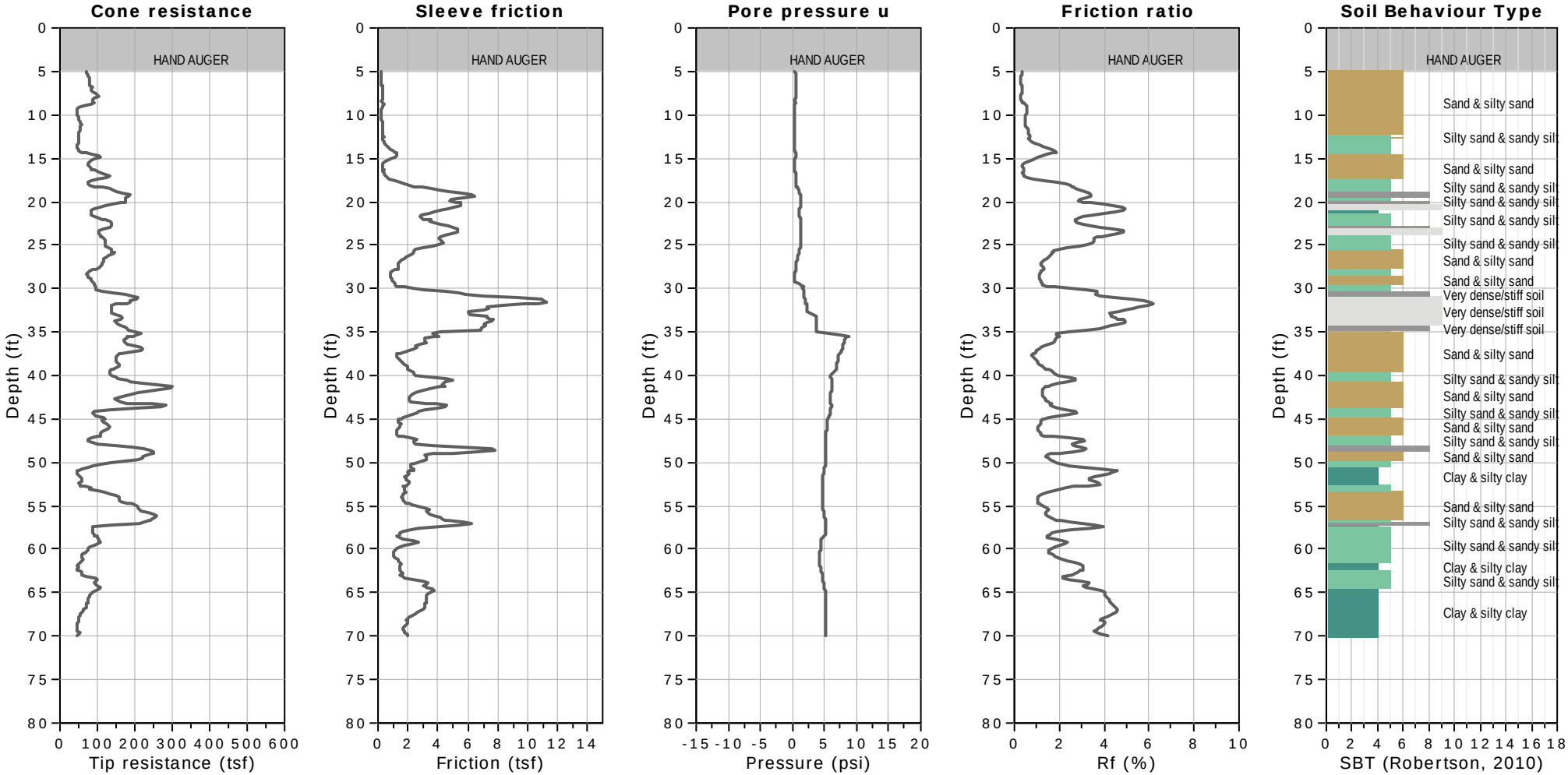
CPT: CPT-18-3

CLIENT: LEIGHTON

SITE: CSUF ENGINEERING - FULLERTON, CA

Field Rep: BARZIN

Total depth: 69.88 ft, Date: 6/13/2018



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

WATER TABLE FOR ESTIMATING PURPOSES ONLY

APPENDIX C

LABORATORY TEST DATA

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	O. Figueroa	Date:	07/03/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-3	Depth (ft.):	0.63		
Sample No.:	B-1				
Soil Identification:	Dark brown clayey sand (SC)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0335
Wt. Comp. Soil + Mold	(g)	603.10	430.11
Wt. of Mold	(g)	204.00	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	808.60	634.11
Dry Wt. of Soil + Cont.	(g)	738.50	568.44
Wt. of Container	(g)	0.00	204.00
Moisture Content	(%)	9.49	18.02
Wet Density	(pcf)	120.4	125.5
Dry Density	(pcf)	109.9	106.4
Void Ratio		0.533	0.585
Total Porosity		0.348	0.369
Pore Volume	(cc)	72.0	79.0
Degree of Saturation (%) [S_{meas}]		**48.1**	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.)
07/03/18	14:00	1.0	0	0.0415
07/03/18	14:10	1.0	10	0.0410
Add Distilled Water to the Specimen				
07/03/18	15:10	1.0	60	0.0740
07/05/18	7:05	1.0	2455	0.0750
07/05/18	8:10	1.0	2520	0.0750

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**34**

ATTERBERG LIMITS

ASTM D 4318

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	R. Manning	Date:	07/02/18
Project No. :	11922.002	Input By:	J. Ward	Date:	07/09/18
Boring No.:	LB-1	Checked By:	J. Ward		
Sample No.:	R-6	Depth (ft.)	20.0		
Soil Identification:	Dark yellowish brown sandy lean clay s(CL)				

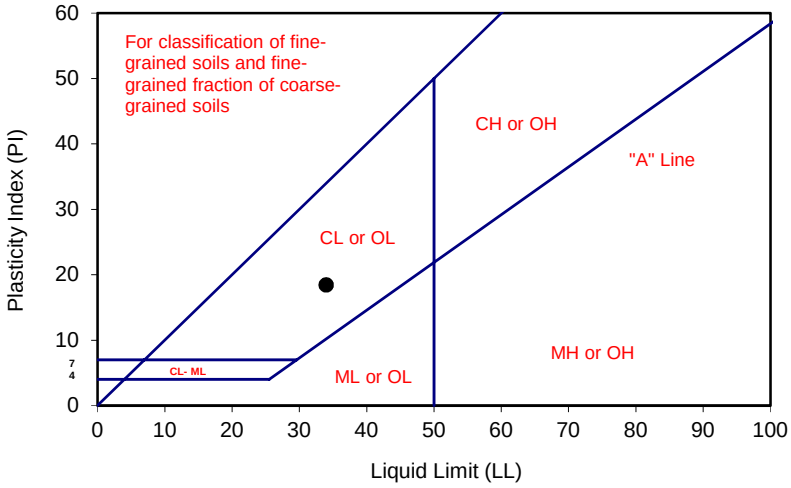
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			30	23	15	
Wet Wt. of Soil + Cont. (g)	18.31	18.42	27.16	25.51	26.35	
Dry Wt. of Soil + Cont. (g)	17.32	17.45	23.87	22.47	22.87	
Wt. of Container (g)	11.05	11.11	13.71	13.54	13.48	
Moisture Content (%) [Wn]	15.79	15.30	32.38	34.04	37.06	

Liquid Limit	**34**
Plastic Limit	**16**
Plasticity Index	**18**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 10.22

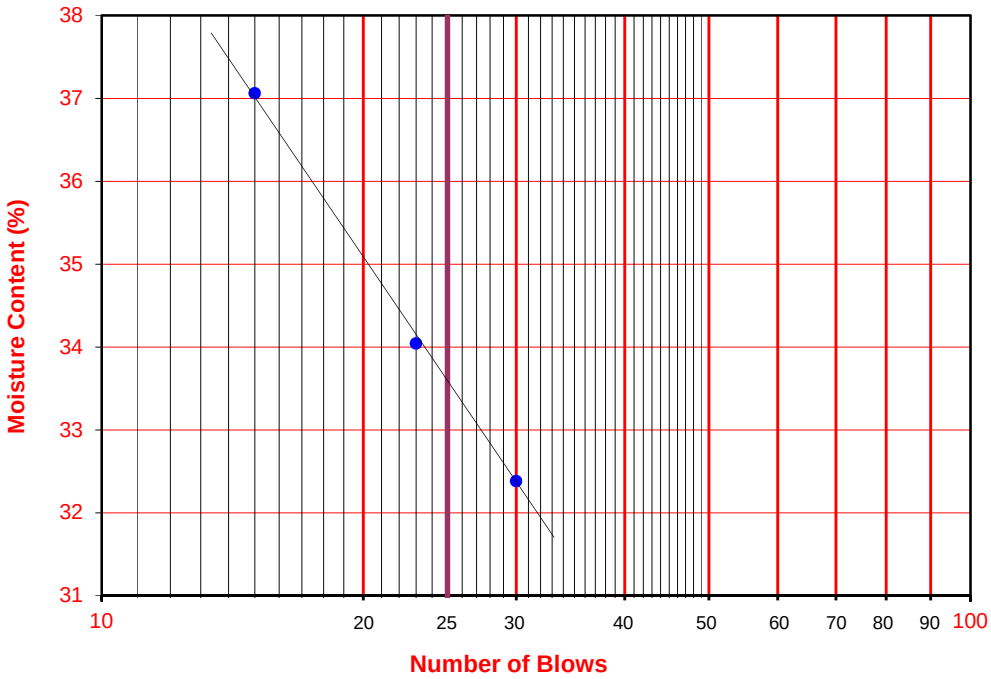
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS

ASTM D 4318

Leighton

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	R. Manning	Date:	07/05/18
Project No. :	11922.002	Input By:	J. Ward	Date:	07/09/18
Boring No.:	LB-3	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	0.63		
Soil Identification:	Dark brown clayey sand (SC)				

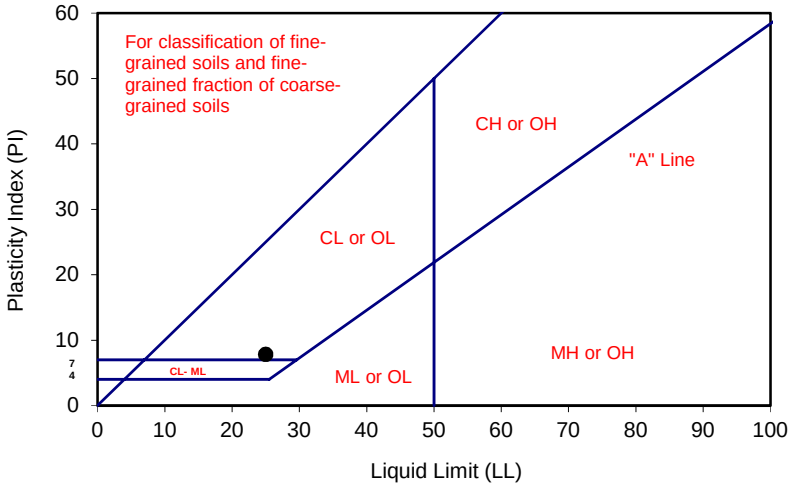
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			30	21	16	
Wet Wt. of Soil + Cont. (g)	20.07	20.29	31.35	26.60	25.67	
Dry Wt. of Soil + Cont. (g)	18.75	18.97	27.86	23.93	23.13	
Wt. of Container (g)	11.11	11.23	13.69	13.52	13.55	
Moisture Content (%) [Wn]	17.28	17.05	24.63	25.65	26.51	

Liquid Limit	**25**
Plastic Limit	**17**
Plasticity Index	**8**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 3.65

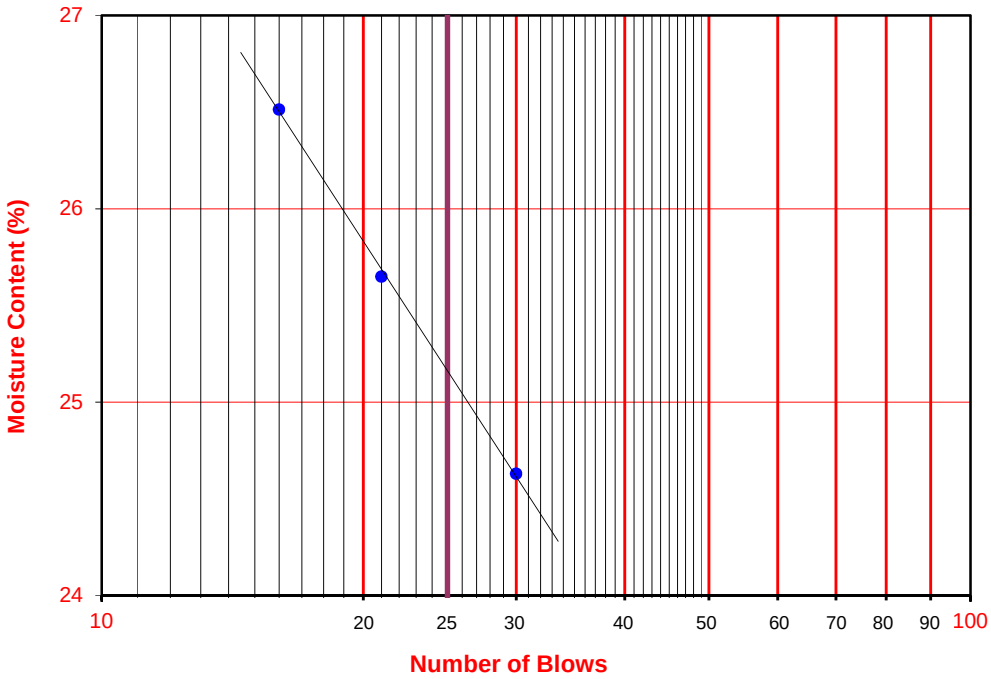
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [x] Dry Preparation
  Multipoint - Dry
- [x] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



Leighton

TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: CSUF - Proposed New Parking Structure | Tested By : A. Santos | Date: 07/03/18

Project No. : 11922.002 | Data Input By: J. Ward | Date: 07/10/18

Boring No.	LB-4			
Sample No.	B-1			
Sample Depth (ft)	1.0			
Soil Identification:	Olive brown SM			
Wet Weight of Soil + Container (g)	207.03			
Dry Weight of Soil + Container (g)	200.30			
Weight of Container (g)	76.73			
Moisture Content (%)	5.45			
Weight of Soaked Soil (g)	100.50			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	152			
Crucible No.	14			
Furnace Temperature (°C)	860			
Time In / Time Out	10:00/10:45			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	24.1529			
Wt. of Crucible (g)	24.1483			
Wt. of Residue (g) (A)	0.0046			
PPM of Sulfate (A) x 41150	189.29			
PPM of Sulfate, Dry Weight Basis	**200**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	15			
ml of AgNO3 Soln. Used in Titration (C)	2.0			
PPM of Chloride (C -0.2) * 100 * 30 / B	360			
PPM of Chloride, Dry Wt. Basis	**381**			

pH TEST, DOT California Test 643

pH Value	**7.79**			
Temperature °C	22.5			

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name: CSUF - Proposed New Parking Structure

Tested By : O. Figueroa Date: 07/09/18

Project No. : 11922.002

Data Input By: J. Ward Date: 07/10/18

Boring No.: LB-4

Depth (ft.) : 1.0

Sample No. : B-1

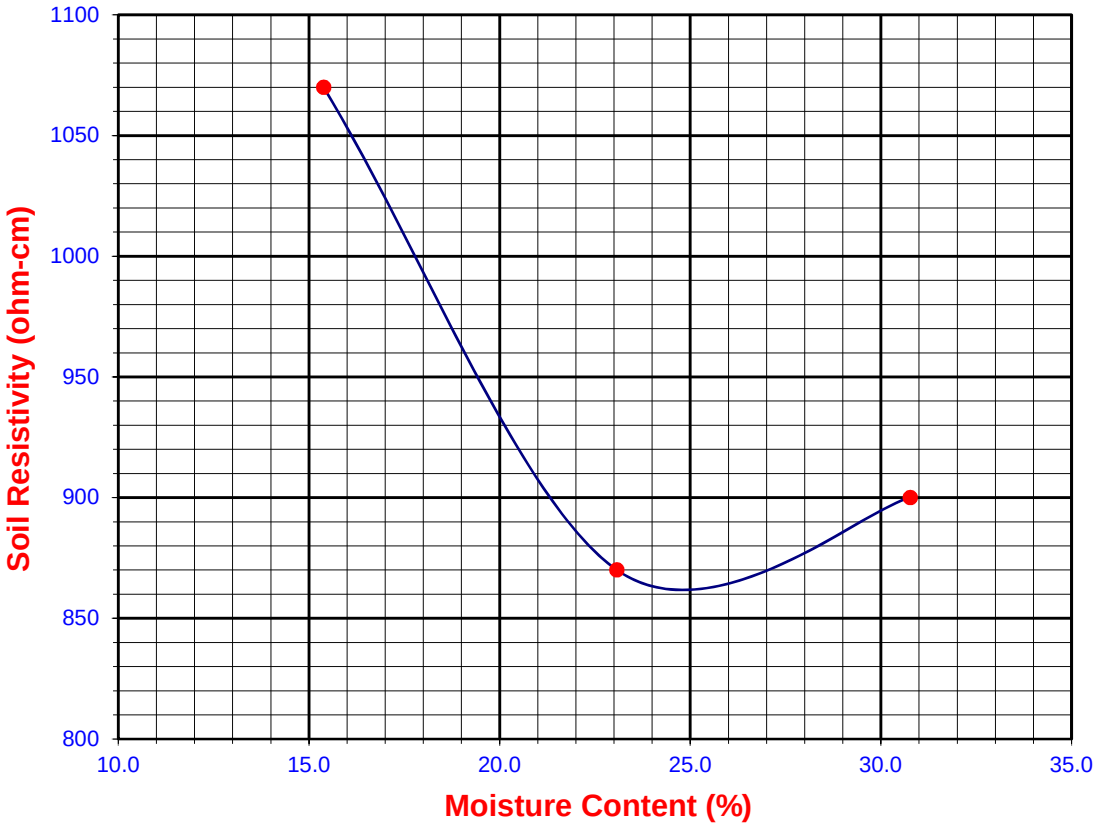
Soil Identification:* Olive brown SM

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	15.38	1070	1070
2	30	23.08	870	870
3	40	30.77	900	900
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
860	**24.8**	**200**	**381**	**7.79**	**22.5**



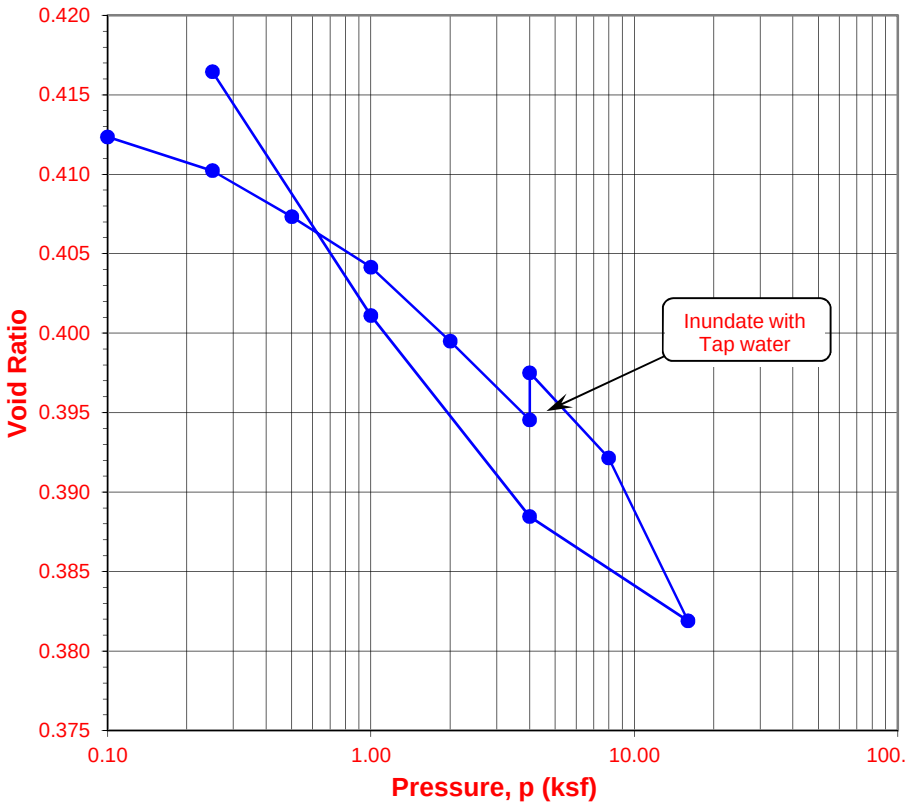
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	06/25/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-1	Depth (ft.):	20.0		
Sample No.:	R-6	Sample Type:	Ring		
Soil Identification:	Dark yellowish brown sandy lean clay s(CL)				

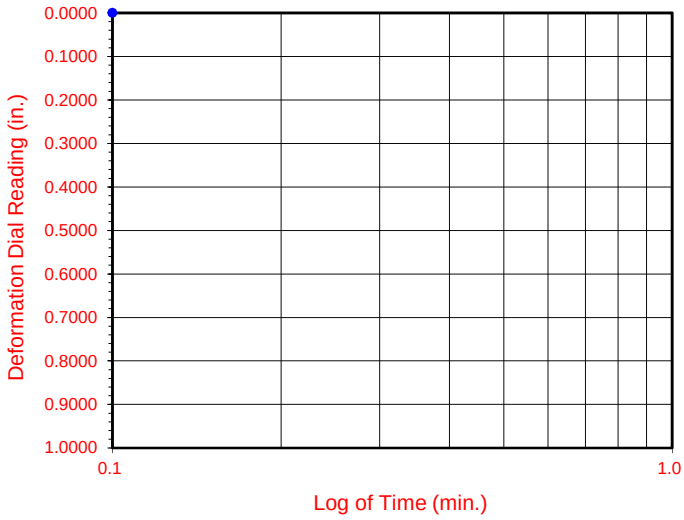
Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	203.48
Weight of Ring (g):	44.63
Height after consol. (in.):	1.0028
Before Test	
Wt. of Wet Sample+Cont. (g):	360.05
Wt. of Dry Sample+Cont. (g):	329.04
Weight of Container (g):	39.31
Initial Moisture Content (%)	10.7
Initial Dry Density (pcf)	119.3
Initial Saturation (%):	70
Initial Vertical Reading (in.)	0.1704
After Test	
Wt. of Wet Sample+Cont. (g):	243.12
Wt. of Dry Sample+Cont. (g):	223.16
Weight of Container (g):	35.71
Final Moisture Content (%)	13.98
Final Dry Density (pcf):	118.4
Final Saturation (%):	89
Final Vertical Reading (in.)	0.1681
Specific Gravity (assumed):	2.70
Water Density (pcf):	62.43

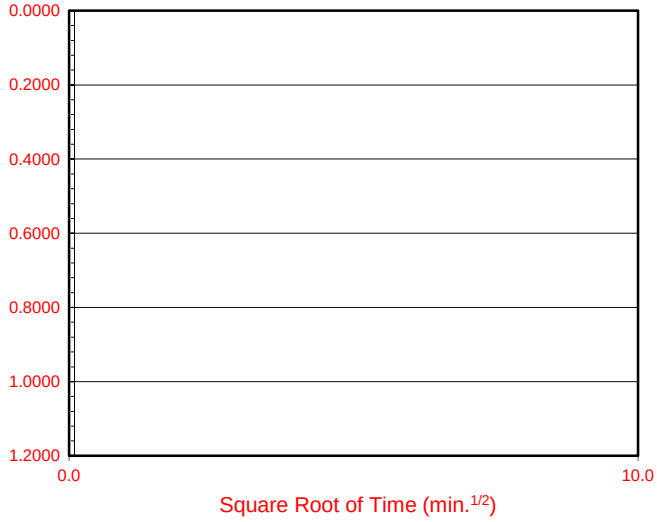


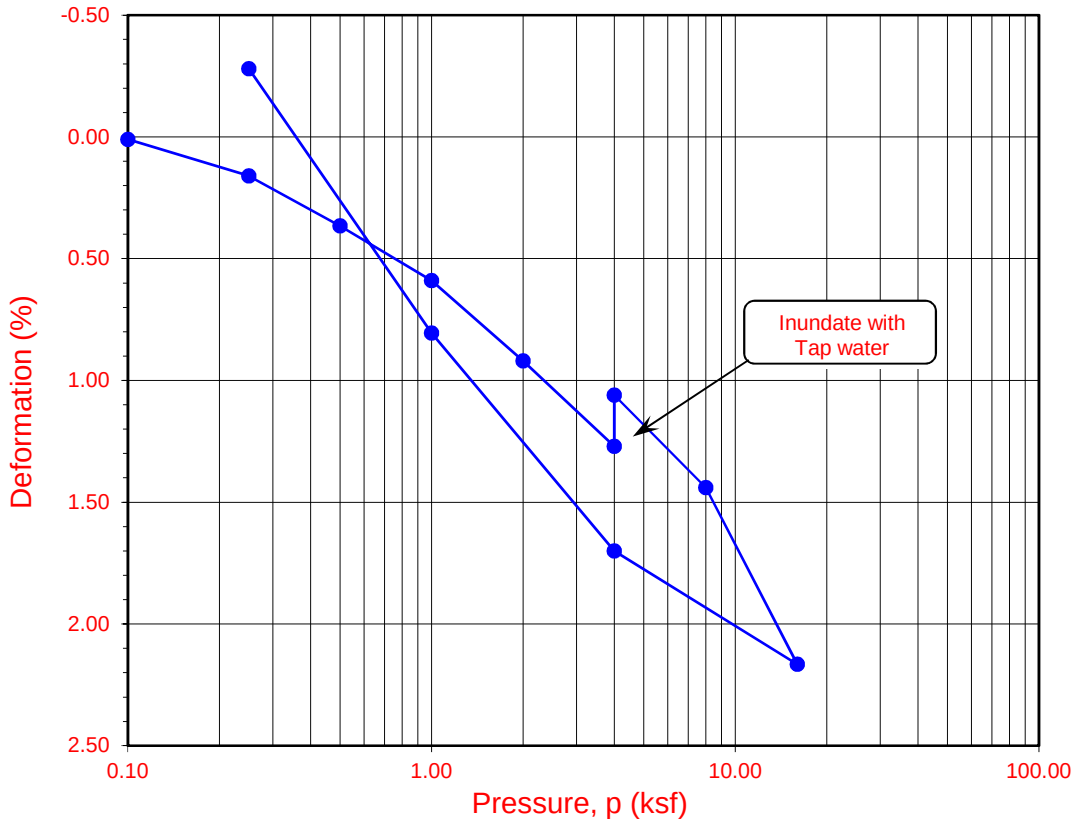
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.1705	0.9999	0.00	0.01	0.412	0.01
0.25	0.1721	0.9983	0.01	0.17	0.410	0.16
0.50	0.1743	0.9962	0.02	0.39	0.407	0.37
1.00	0.1766	0.9938	0.03	0.62	0.404	0.59
2.00	0.1802	0.9902	0.06	0.98	0.399	0.92
4.00	0.1841	0.9863	0.10	1.37	0.395	1.27
4.00	0.1820	0.9884	0.10	1.16	0.398	1.06
8.00	0.1863	0.9841	0.15	1.59	0.392	1.44
16.00	0.1943	0.9762	0.22	2.39	0.382	2.17
4.00	0.1888	0.9816	0.14	1.84	0.388	1.70
1.00	0.1793	0.9912	0.08	0.89	0.401	0.81
0.25	0.1681	1.0023	0.05	-0.23	0.416	-0.28

Time Readings				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-1	**R-6**	**20**	**10.7**	**14.0**	**119.3**	**118.4**	**0.412**	**0.416**	**70**	**89**

Soil Identification: Dark yellowish brown sandy lean clay s(CL)

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18

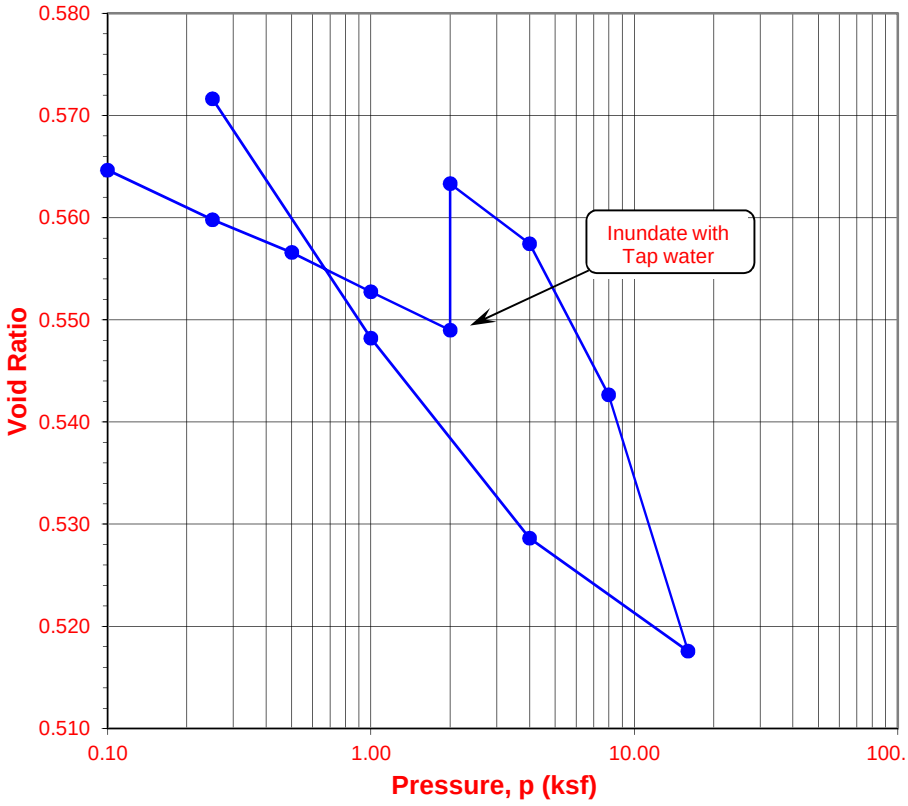
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	06/25/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-2	Depth (ft.):	10.0		
Sample No.:	R-3	Sample Type:	Ring		
Soil Identification:	Olive brown silty clay (CL-ML), caliche noted				

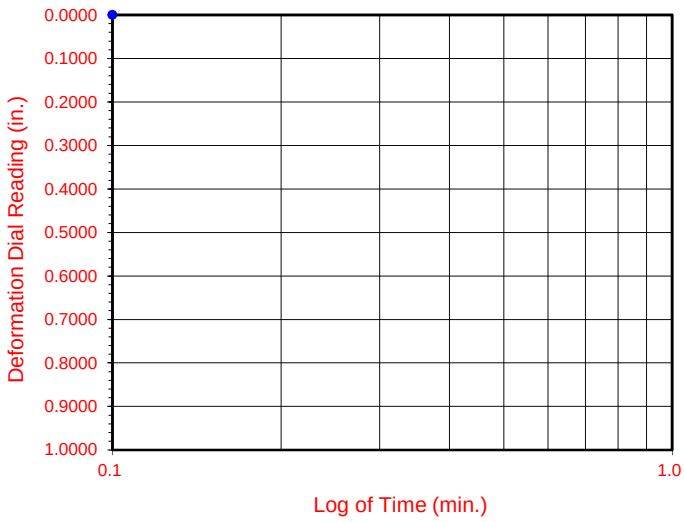
Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	186.05
Weight of Ring (g):	42.29
Height after consol. (in.):	1.0034
Before Test	
Wt. of Wet Sample+Cont. (g):	189.11
Wt. of Dry Sample+Cont. (g):	174.05
Weight of Container (g):	38.40
Initial Moisture Content (%)	11.1
Initial Dry Density (pcf)	107.6
Initial Saturation (%):	53
Initial Vertical Reading (in.)	0.1938
After Test	
Wt. of Wet Sample+Cont. (g):	255.05
Wt. of Dry Sample+Cont. (g):	228.77
Weight of Container (g):	58.69
Final Moisture Content (%)	20.56
Final Dry Density (pcf):	105.9
Final Saturation (%):	94
Final Vertical Reading (in.)	0.1959
Specific Gravity (assumed):	2.70
Water Density (pcf):	62.43

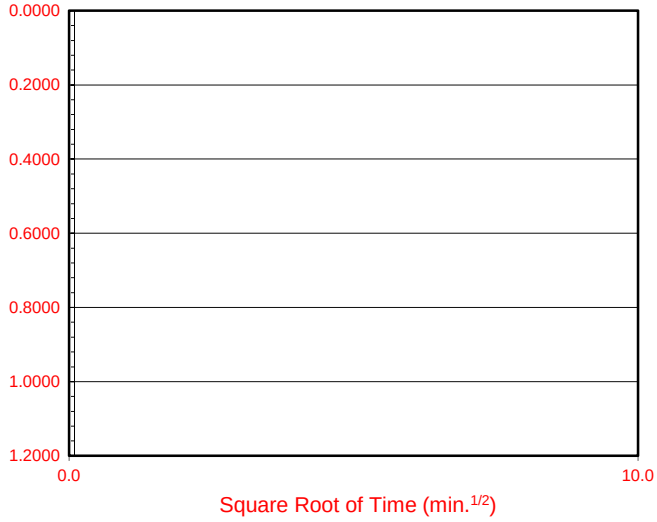


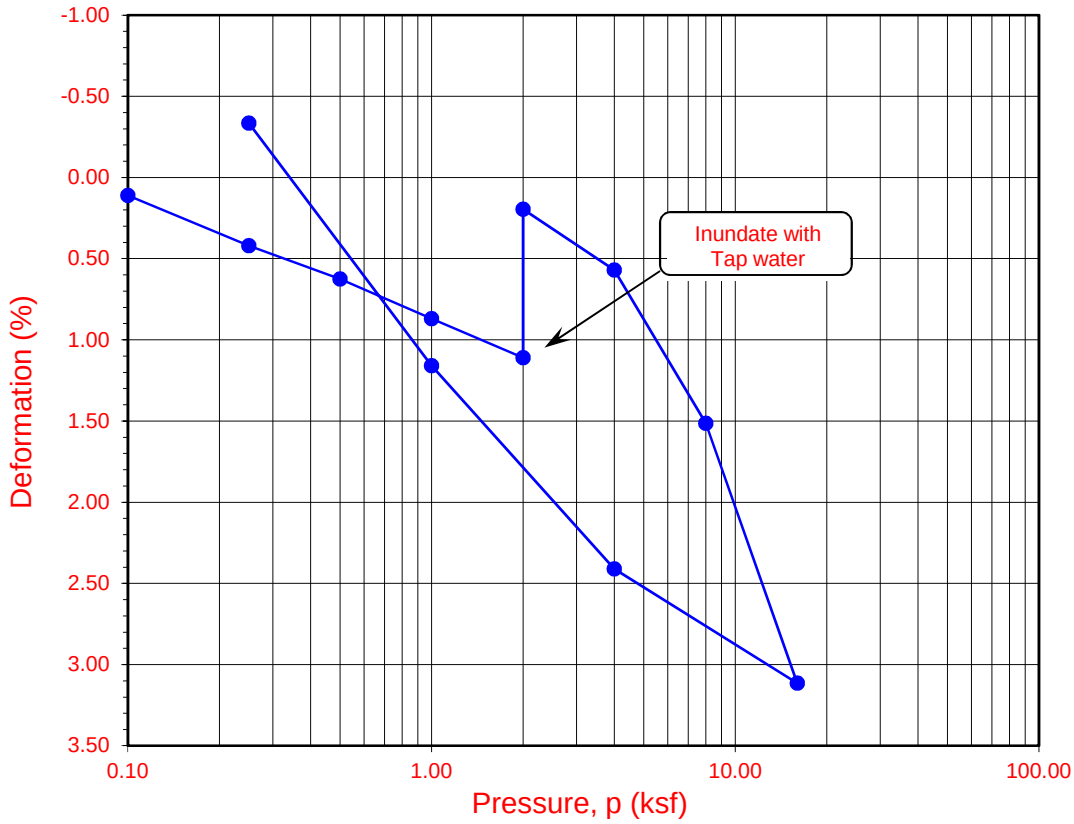
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deforma-tion (%)
0.10	0.1949	0.9989	0.00	0.11	0.565	0.11
0.25	0.1989	0.9949	0.09	0.51	0.560	0.42
0.50	0.2020	0.9919	0.19	0.81	0.557	0.62
1.00	0.2059	0.9879	0.34	1.21	0.553	0.87
2.00	0.2098	0.9840	0.49	1.60	0.549	1.11
2.00	0.2007	0.9932	0.49	0.69	0.563	0.20
4.00	0.2058	0.9880	0.63	1.20	0.557	0.57
8.00	0.2165	0.9774	0.75	2.27	0.543	1.52
16.00	0.2339	0.9600	0.89	4.01	0.518	3.12
4.00	0.2254	0.9684	0.75	3.16	0.529	2.41
1.00	0.2117	0.9821	0.63	1.79	0.548	1.16
0.25	0.1959	0.9980	0.54	0.21	0.572	-0.34

Time Readings				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-2	**R-3**	**10**	**11.1**	**20.6**	**107.6**	**105.9**	**0.566**	**0.572**	**53**	**94**

Soil Identification: Olive brown silty clay (CL-ML), caliche noted

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18

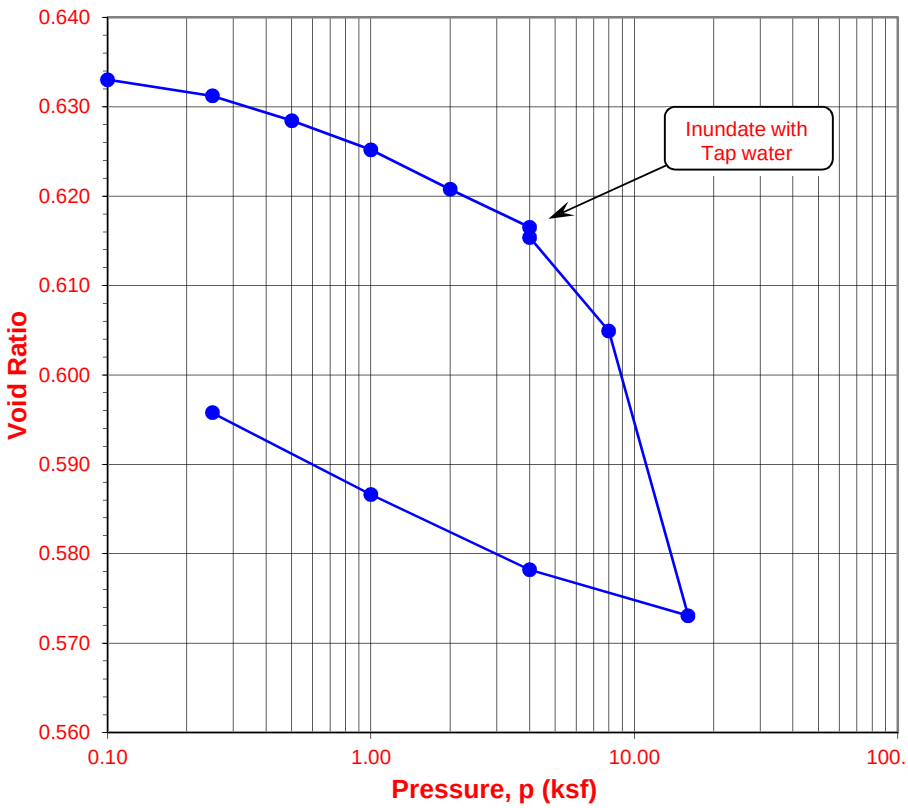
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	06/25/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-2	Depth (ft.):	30.0		
Sample No.:	R-7	Sample Type:	Ring		
Soil Identification:	Dark yellowish brown silty clay with sand (CL-ML)s				

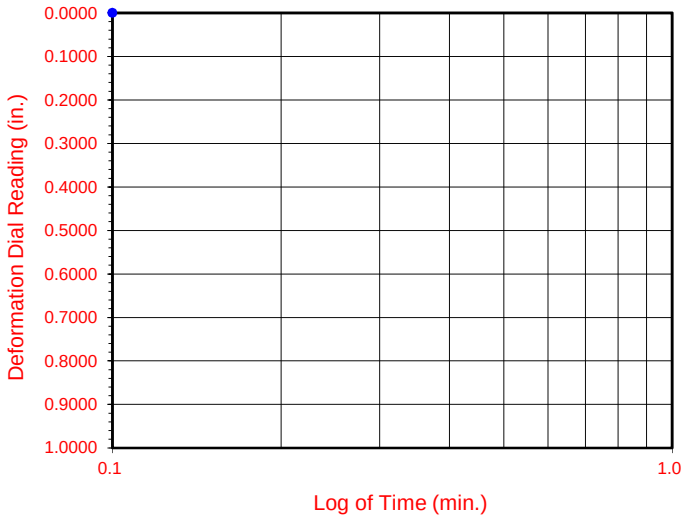
Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	180.58
Weight of Ring (g):	44.85
Height after consol. (in.):	0.9771
Before Test	
Wt. of Wet Sample+Cont. (g):	202.41
Wt. of Dry Sample+Cont. (g):	190.80
Weight of Container (g):	66.89
Initial Moisture Content (%)	9.4
Initial Dry Density (pcf)	103.2
Initial Saturation (%):	40
Initial Vertical Reading (in.)	0.1832
After Test	
Wt. of Wet Sample+Cont. (g):	229.77
Wt. of Dry Sample+Cont. (g):	204.94
Weight of Container (g):	37.10
Final Moisture Content (%)	20.19
Final Dry Density (pcf):	104.7
Final Saturation (%):	89
Final Vertical Reading (in.)	0.2069
Specific Gravity (assumed):	2.70
Water Density (pcf):	62.43

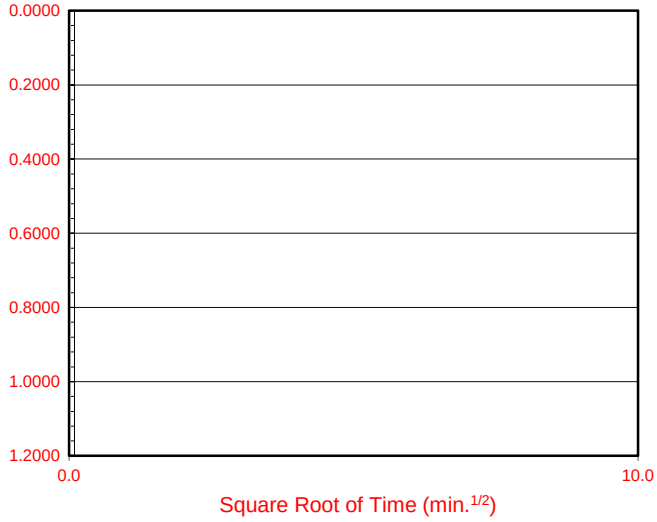


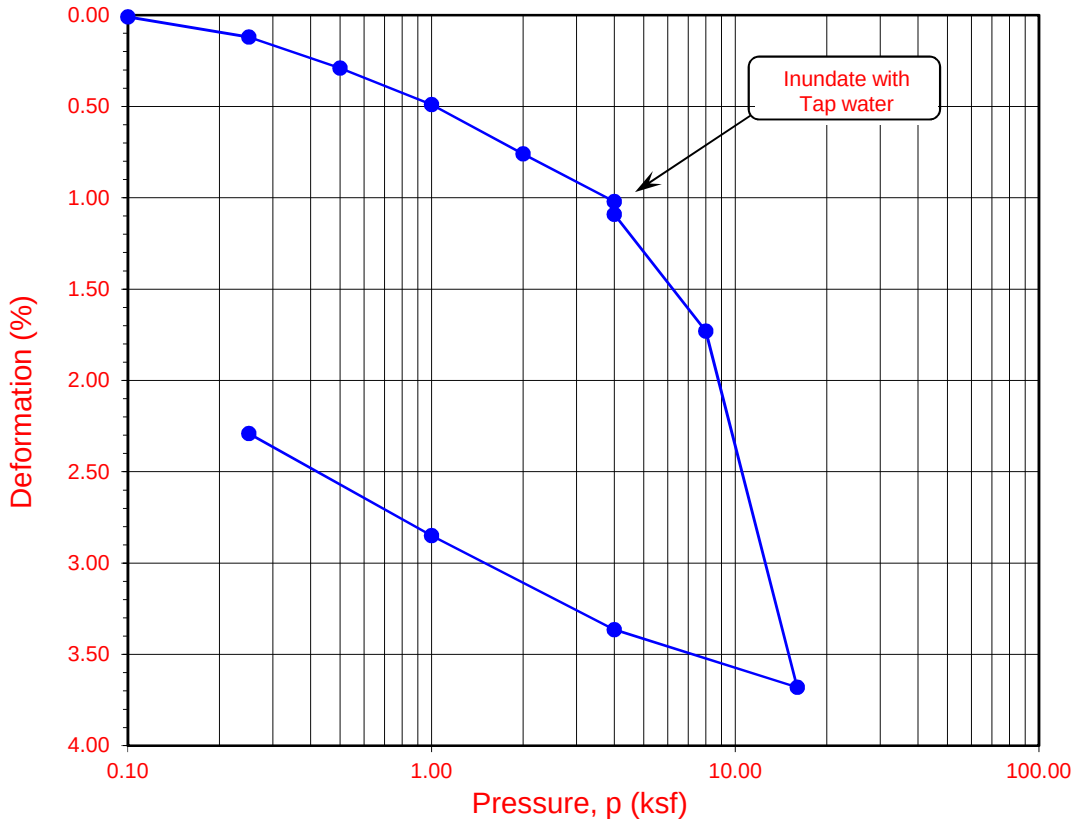
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deforma-tion (%)
0.10	0.1833	0.9999	0.00	0.01	0.633	0.01
0.25	0.1845	0.9987	0.01	0.13	0.631	0.12
0.50	0.1866	0.9966	0.05	0.34	0.628	0.29
1.00	0.1889	0.9943	0.08	0.57	0.625	0.49
2.00	0.1921	0.9911	0.13	0.89	0.621	0.76
4.00	0.1955	0.9877	0.21	1.23	0.617	1.02
4.00	0.1962	0.9870	0.21	1.30	0.615	1.09
8.00	0.2038	0.9794	0.33	2.06	0.605	1.73
16.00	0.2252	0.9580	0.52	4.20	0.573	3.68
4.00	0.2194	0.9639	0.25	3.62	0.578	3.37
1.00	0.2131	0.9701	0.14	2.99	0.587	2.85
0.25	0.2069	0.9763	0.08	2.37	0.596	2.29

Time Readings				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-2	**R-7**	**30**	**9.4**	**20.2**	**103.2**	**104.7**	**0.633**	**0.596**	**40**	**89**

Soil Identification: Dark yellowish brown silty clay with sand (CL-ML)s

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18

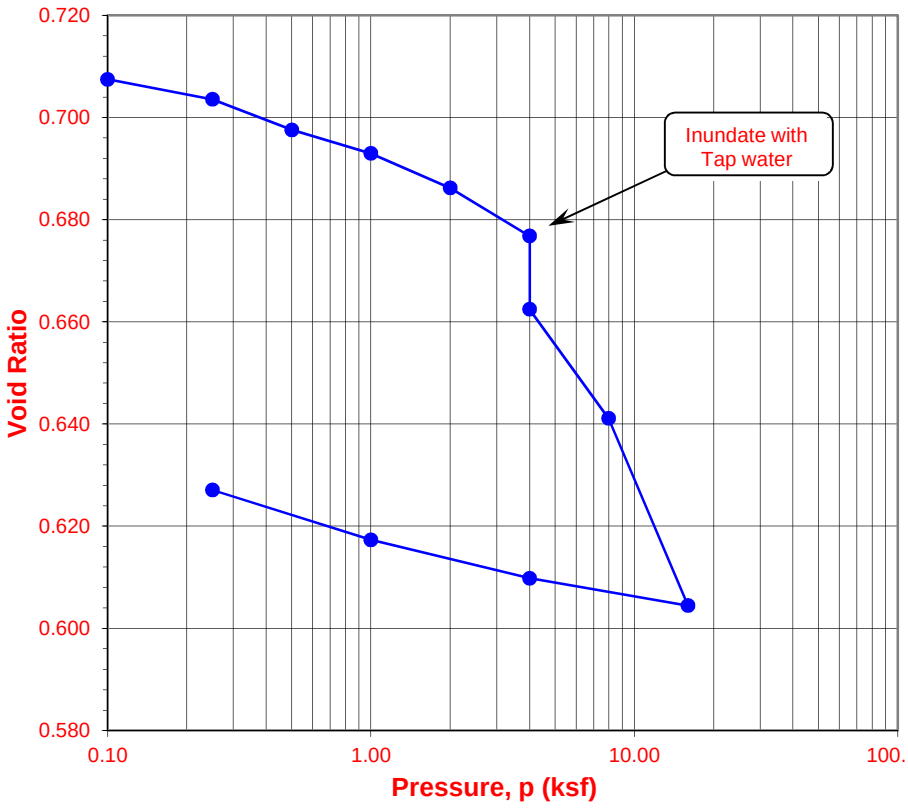
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	06/25/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-4	Depth (ft.):	5.0		
Sample No.:	R-2	Sample Type:	Ring		
Soil Identification:	Olive brown silty clay (CL-ML), caliche noted				

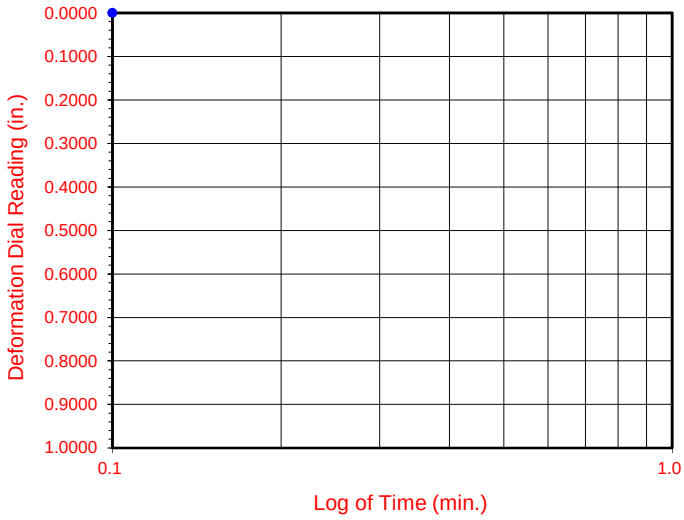
Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	177.00
Weight of Ring (g):	45.35
Height after consol. (in.):	0.9524
Before Test	
Wt. of Wet Sample+Cont. (g):	179.32
Wt. of Dry Sample+Cont. (g):	167.48
Weight of Container (g):	59.54
Initial Moisture Content (%)	11.0
Initial Dry Density (pcf)	98.7
Initial Saturation (%):	42
Initial Vertical Reading (in.)	0.1683
After Test	
Wt. of Wet Sample+Cont. (g):	247.22
Wt. of Dry Sample+Cont. (g):	225.37
Weight of Container (g):	55.52
Final Moisture Content (%)	17.55
Final Dry Density (pcf):	108.7
Final Saturation (%):	86
Final Vertical Reading (in.)	0.2163
Specific Gravity (assumed):	2.70
Water Density (pcf):	62.43

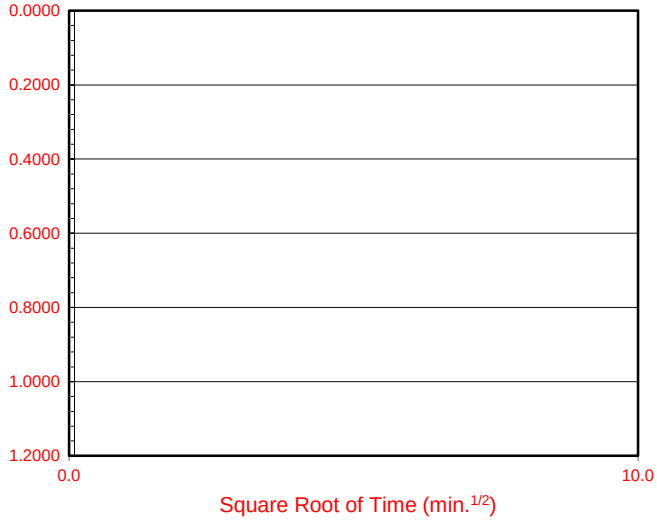


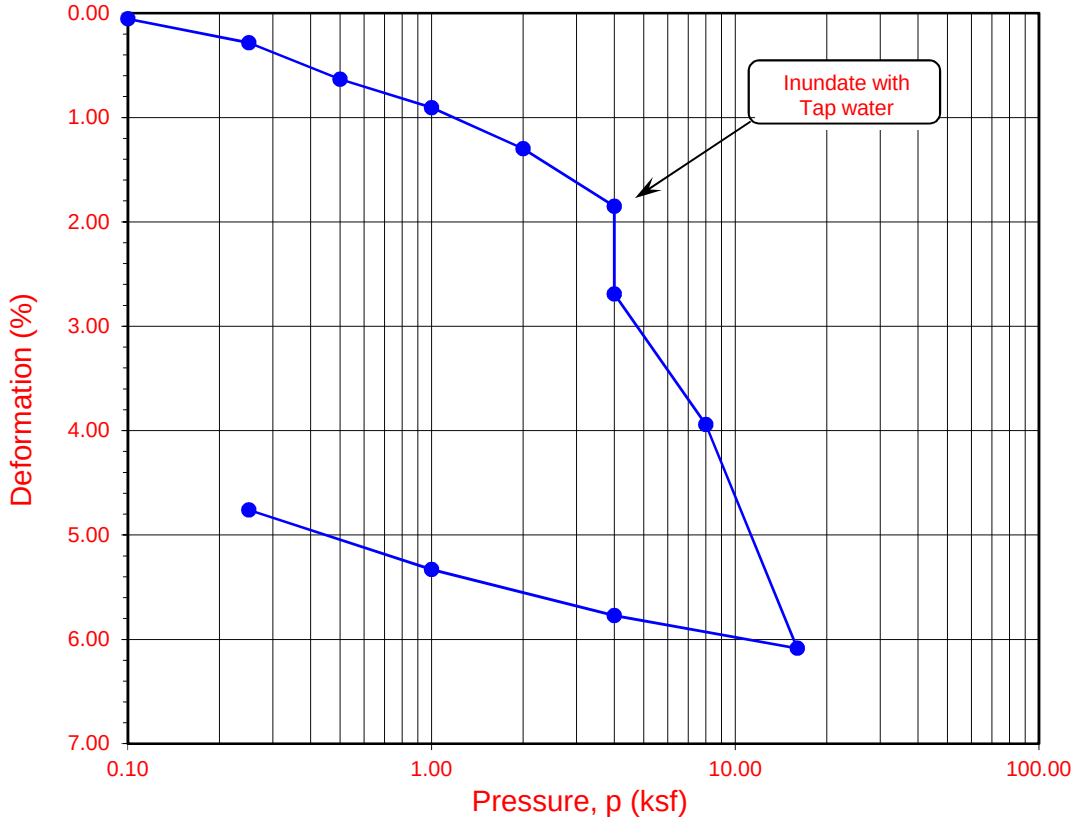
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.1689	0.9995	0.00	0.06	0.707	0.06
0.25	0.1713	0.9971	0.01	0.30	0.704	0.29
0.50	0.1750	0.9934	0.03	0.67	0.698	0.64
1.00	0.1779	0.9905	0.05	0.95	0.693	0.90
2.00	0.1821	0.9862	0.08	1.38	0.686	1.30
4.00	0.1879	0.9804	0.11	1.96	0.677	1.85
4.00	0.1963	0.9720	0.11	2.80	0.662	2.69
8.00	0.2094	0.9589	0.17	4.11	0.641	3.94
16.00	0.2316	0.9368	0.24	6.33	0.604	6.09
4.00	0.2275	0.9408	0.15	5.92	0.610	5.77
1.00	0.2224	0.9459	0.08	5.41	0.617	5.33
0.25	0.2163	0.9520	0.04	4.80	0.627	4.76

Time Readings				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-4	**R-2**	**5**	**11.0**	**17.6**	**98.7**	**108.7**	**0.708**	**0.627**	**42**	**86**

Soil Identification: Olive brown silty clay (CL-ML), caliche noted

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS
ASTM D 4546

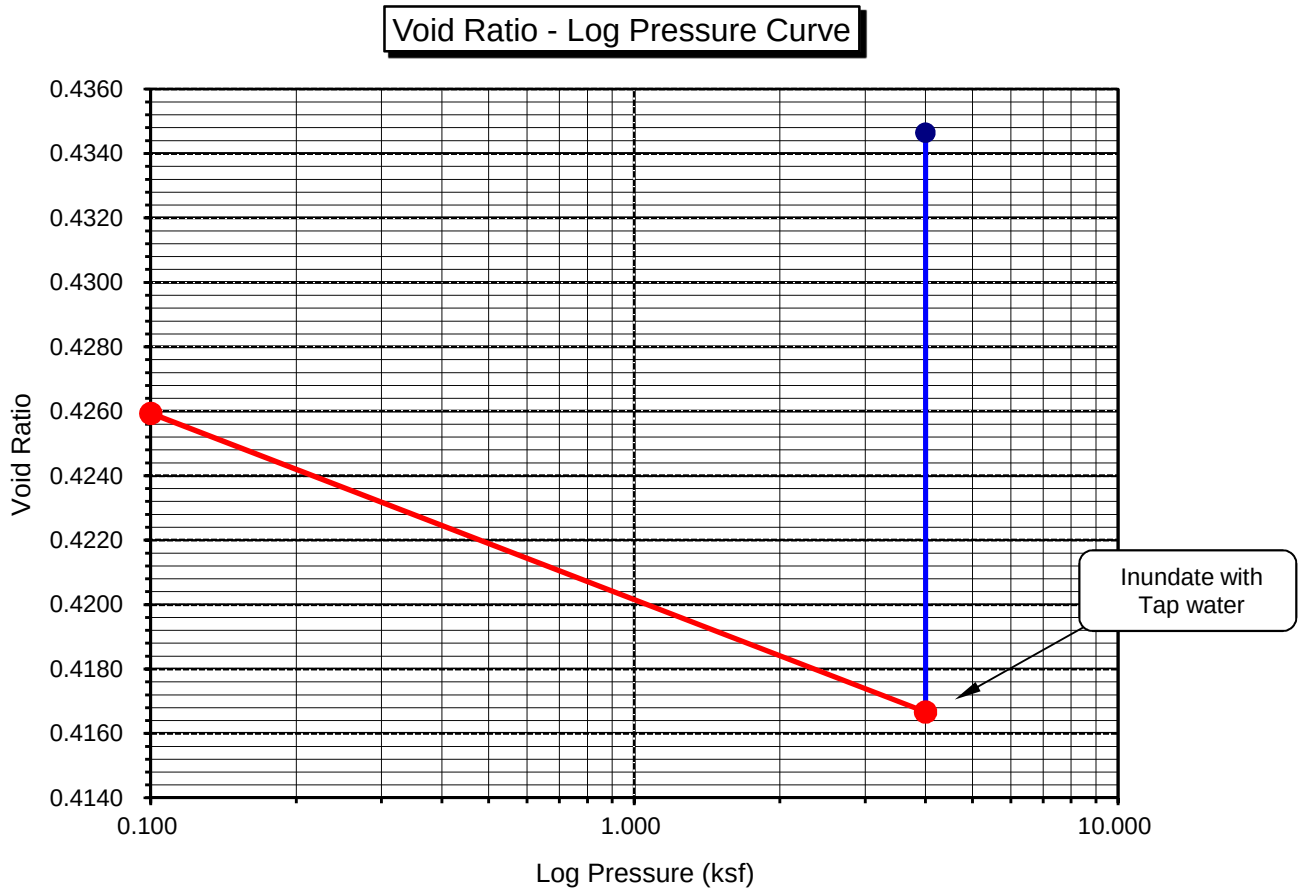
Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	07/02/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-2	Sample Type:	Ring		
Sample No.:	R-5	Depth (ft.)	20.0		
Sample Description:	Yellowish brown lean clay (CL)				

Initial Dry Density (pcf):	118.2
Initial Moisture (%):	12.91
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2690
Diameter(in):	2.415

Final Dry Density (pcf):	117.5
Final Moisture (%) :	16.7
Initial Void Ratio:	0.4267
Specific Gravity(assumed):	2.70
Initial Saturation (%)	81.7

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2685	0.9995	0.00	-0.05	0.4259	-0.05
4.000	0.2578	0.9888	0.42	-1.12	0.4167	-0.70
H2O	0.2704	1.0014	0.42	0.14	0.4346	0.56

Percent Swell (+) / Settlement (-) After Inundation = 1.27



ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

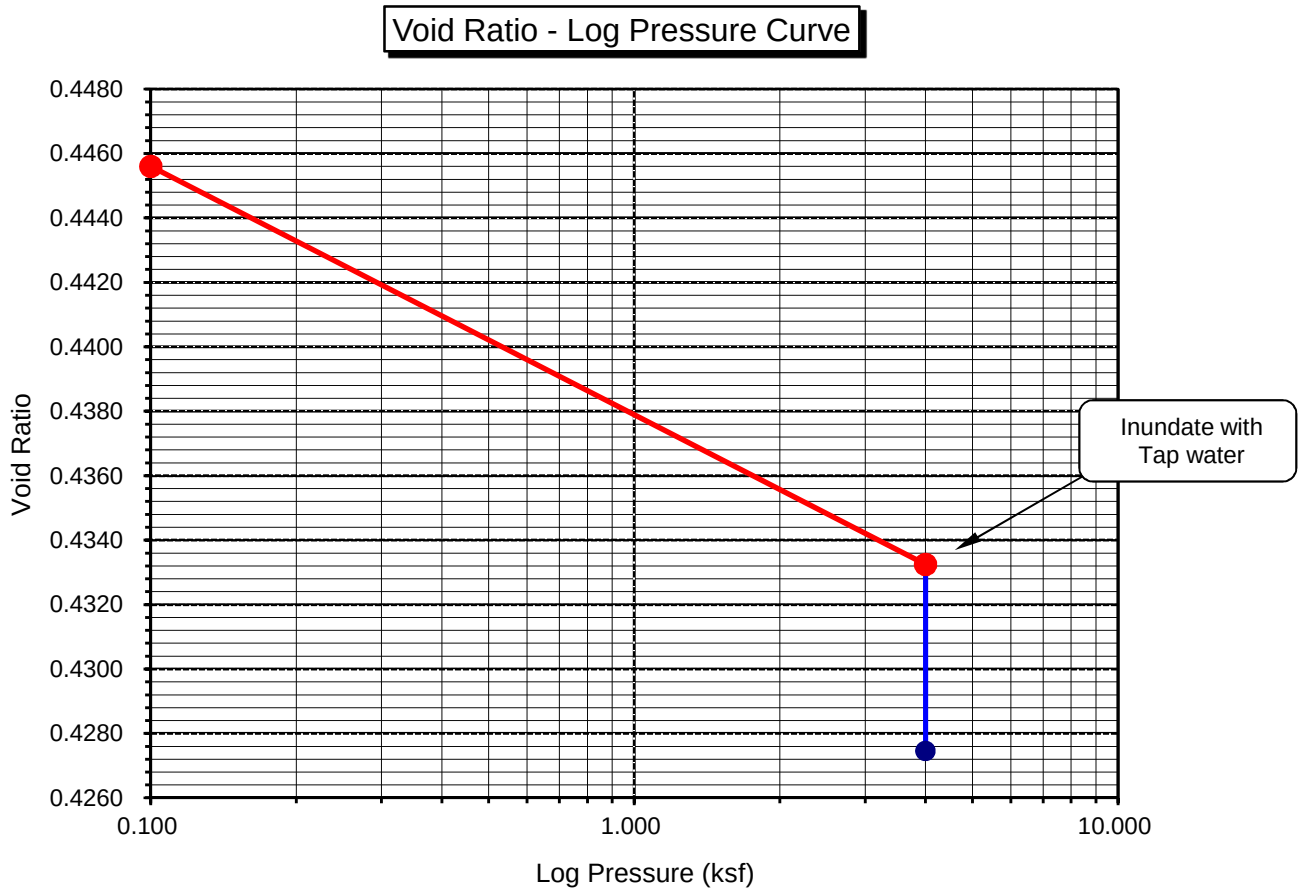
Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	07/02/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-3	Sample Type:	Ring		
Sample No.:	R-5	Depth (ft.)	15.0		
Sample Description:	Dark yellowish brown silty clay (CL-ML)				

Initial Dry Density (pcf):	116.6
Initial Moisture (%):	5.03
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2680
Diameter(in):	2.415

Final Dry Density (pcf):	118.1
Final Moisture (%) :	14.1
Initial Void Ratio:	0.4457
Specific Gravity(assumed):	2.70
Initial Saturation (%)	30.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2679	0.9999	0.00	-0.01	0.4456	-0.01
4.000	0.2548	0.9869	0.45	-1.32	0.4332	-0.87
H2O	0.2508	0.9829	0.45	-1.72	0.4275	-1.27

Percent Swell (+) / Settlement (-) After Inundation = -0.40



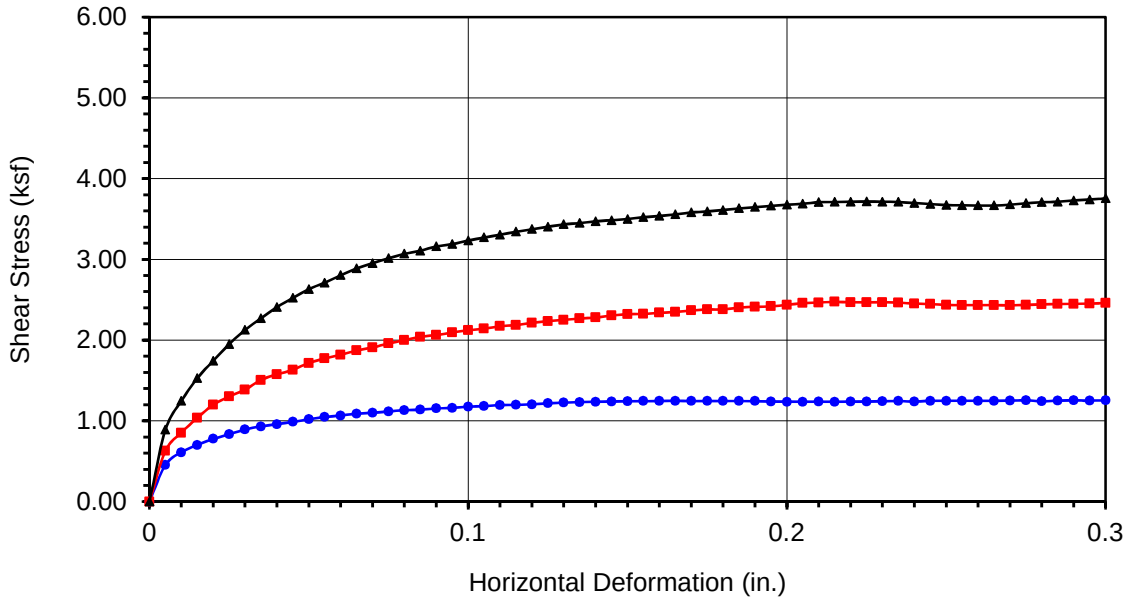
Leighton

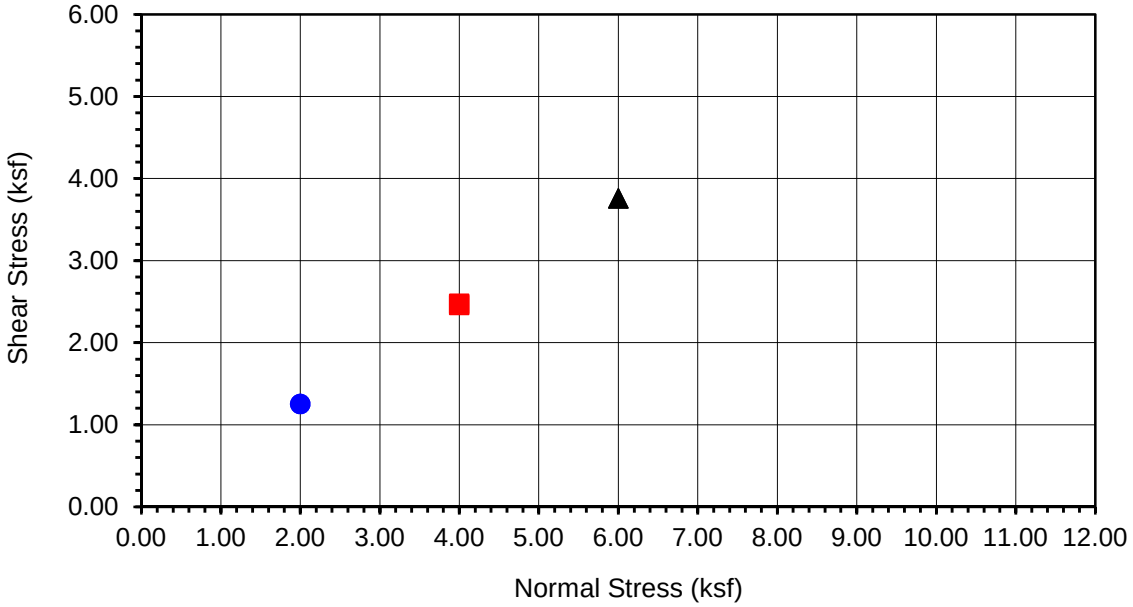
DIRECT SHEAR TEST

Consolidated Undrained

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	06/24/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-3	Sample Type:	Ring		
Sample No.:	R-7	Depth (ft.):	25.0		
Soil Identification:	Dark yellowish brown silt (ML)				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	170.93	175.87	180.76
Weight of Ring(gm):	41.62	45.87	45.04
Before Shearing			
Weight of Wet Sample+Cont.(gm):	163.62	163.62	163.62
Weight of Dry Sample+Cont.(gm):	154.45	154.45	154.45
Weight of Container(gm):	38.71	38.71	38.71
Vertical Rdg.(in): Initial	0.2664	0.0000	0.2874
Vertical Rdg.(in): Final	0.2829	-0.0431	0.3324
After Shearing			
Weight of Wet Sample+Cont.(gm):	198.06	210.07	212.52
Weight of Dry Sample+Cont.(gm):	173.48	186.90	189.86
Weight of Container(gm):	57.88	70.32	68.56
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-3**
Sample No.	**R-7**
Depth (ft)	**25**

Sample Type:

Ring

Soil Identification:
Dark yellowish brown silt (ML)

Normal Stress (kip/ft²)	2.000	4.000	6.000
Peak Shear Stress (kip/ft²)	● 1.254	■ 2.474	▲ 3.754
Shear Stress @ End of Test (ksf)	○ 1.254	□ 2.458	△ 3.754
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.92	7.92	7.92
Dry Density (pcf)	99.6	100.2	104.6
Saturation (%)	30.9	31.3	35.0
Soil Height Before Shearing (in.)	0.9835	0.9569	0.9550
Final Moisture Content (%)	21.3	19.9	18.7

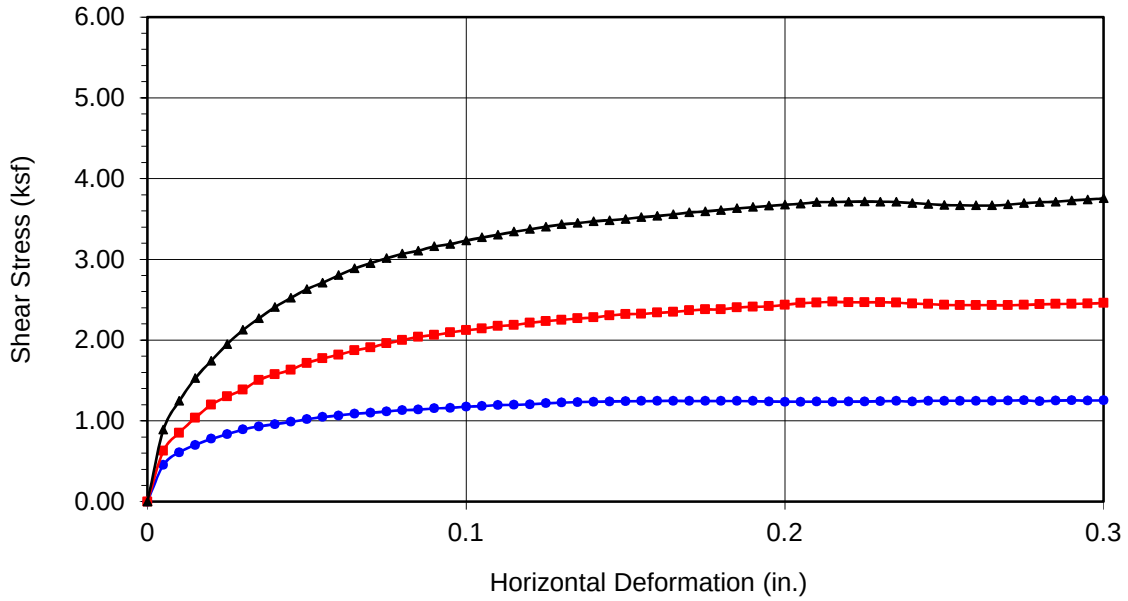
Leighton

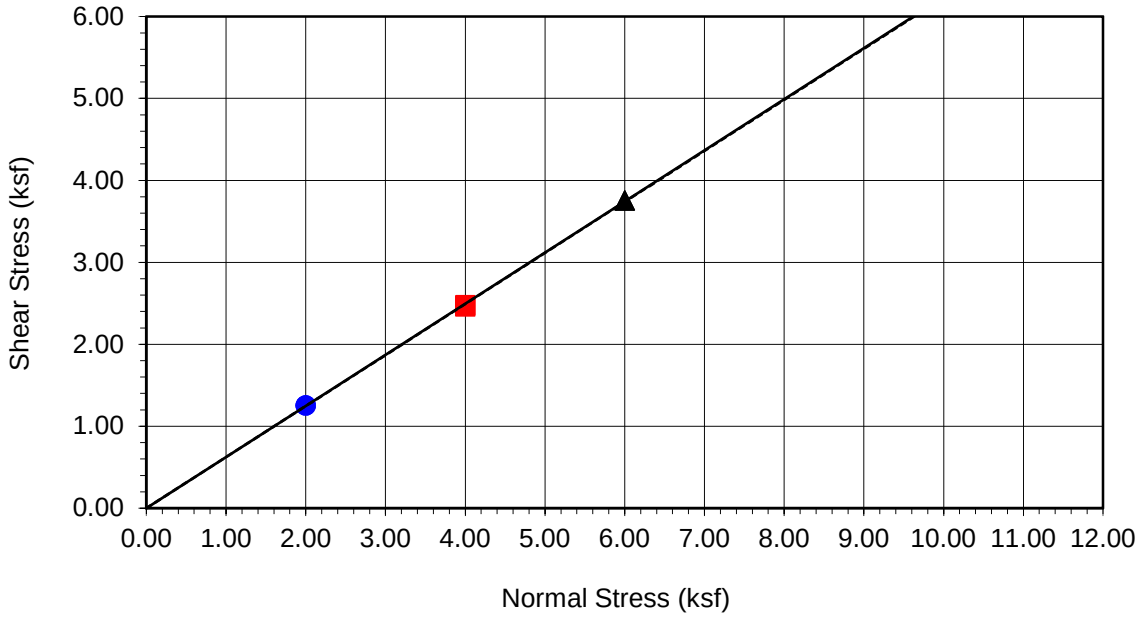
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

06-18





Boring No.	**LB-3**
Sample No.	**R-7**
Depth (ft)	**25**
Sample Type:	Ring

Soil Identification:
Dark yellowish brown silt (ML)

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	0	32
Ultimate	0	32

Normal Stress (kip/ft²)	2.000	4.000	6.000
Peak Shear Stress (kip/ft²)	● 1.254	■ 2.474	▲ 3.754
Shear Stress @ End of Test (ksf)	○ 1.254	□ 2.458	△ 3.754
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.92	7.92	7.92
Dry Density (pcf)	99.6	100.2	104.6
Saturation (%)	30.9	31.3	35.0
Soil Height Before Shearing (in.)	0.9835	0.9569	0.9550
Final Moisture Content (%)	21.3	19.9	18.7

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DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

06-18

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DIRECT SHEAR TEST

Consolidated Undrained

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	07/02/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/09/18
Boring No.:	LB-4	Sample Type:	Ring		
Sample No.:	R-4	Depth (ft.):	15.0		
Soil Identification:	Light olive brown silty clay (CL-ML)				

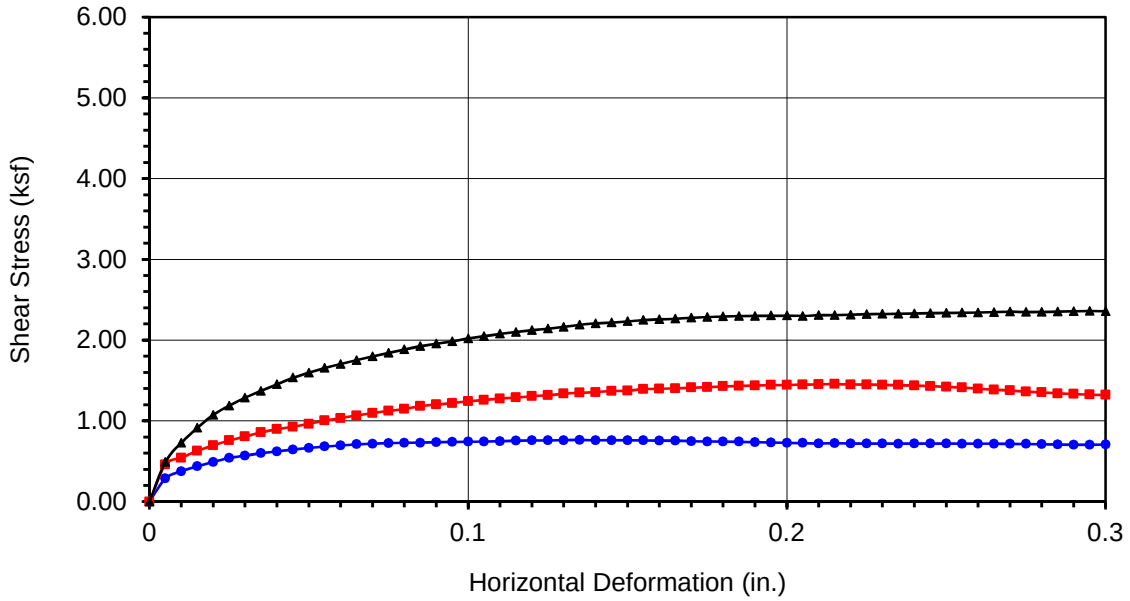
Sample Diameter(in):	2.370	2.370	2.370
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	176.20	185.96	188.25
Weight of Ring(gm):	64.03	68.50	64.46

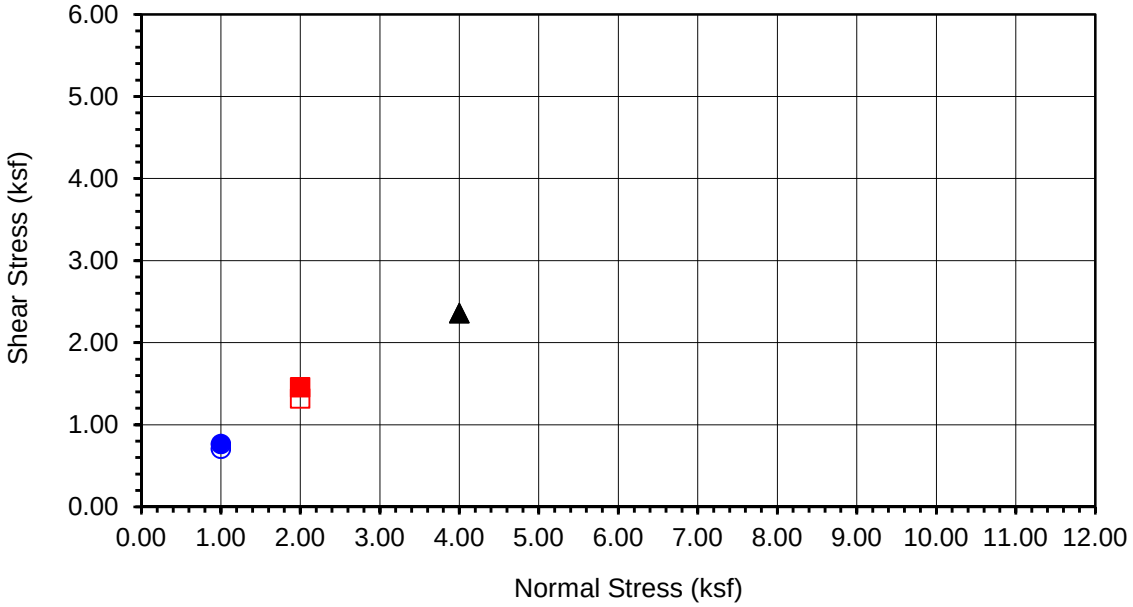
Before Shearing

Weight of Wet Sample+Cont.(gm):	189.97	189.97	189.97
Weight of Dry Sample+Cont.(gm):	175.91	175.91	175.91
Weight of Container(gm):	58.99	58.99	58.99
Vertical Rdg.(in): Initial	0.0000	0.2470	0.2533
Vertical Rdg.(in): Final	-0.0259	0.3066	0.3385

After Shearing

Weight of Wet Sample+Cont.(gm):	184.00	187.59	191.12
Weight of Dry Sample+Cont.(gm):	151.84	166.46	168.59
Weight of Container(gm):	54.45	57.18	57.42
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-4**
Sample No.	**R-4**
Depth (ft)	**15**

Sample Type:

Ring

Soil Identification:
Light olive brown silty clay (CL-ML)

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.764	■ 1.456	▲ 2.361
Shear Stress @ End of Test (ksf)	○ 0.707	□ 1.320	△ 2.358
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.370	2.370	2.370
Initial Moisture Content (%)	12.03	12.03	12.03
Dry Density (pcf)	86.5	90.5	95.4
Saturation (%)	34.2	37.7	42.4
Soil Height Before Shearing (in.)	0.9741	0.9404	0.9148
Final Moisture Content (%)	33.0	19.3	20.3

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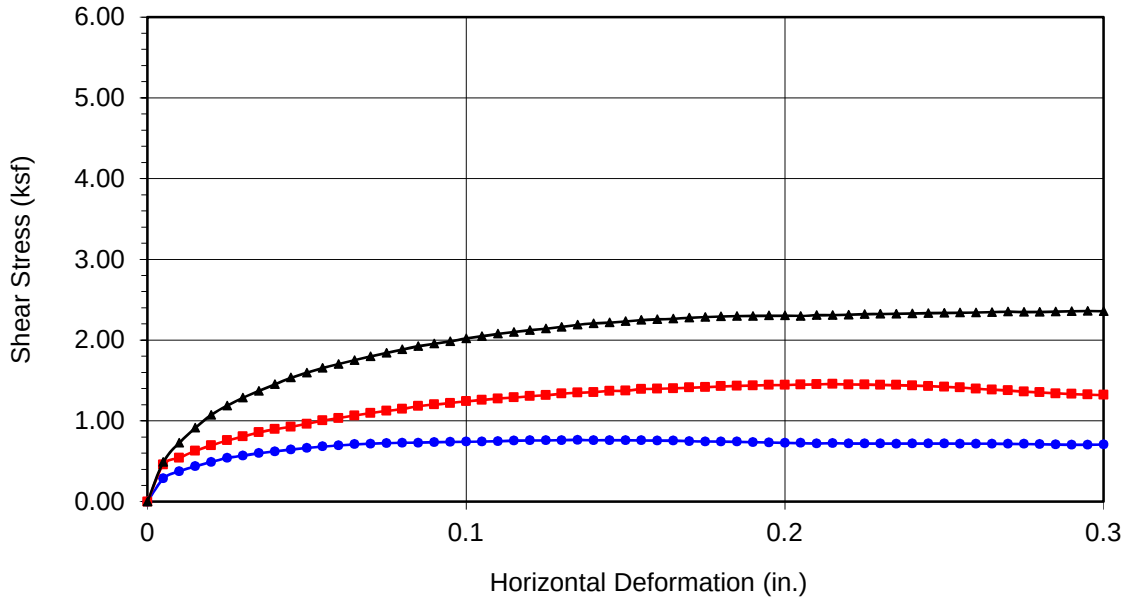
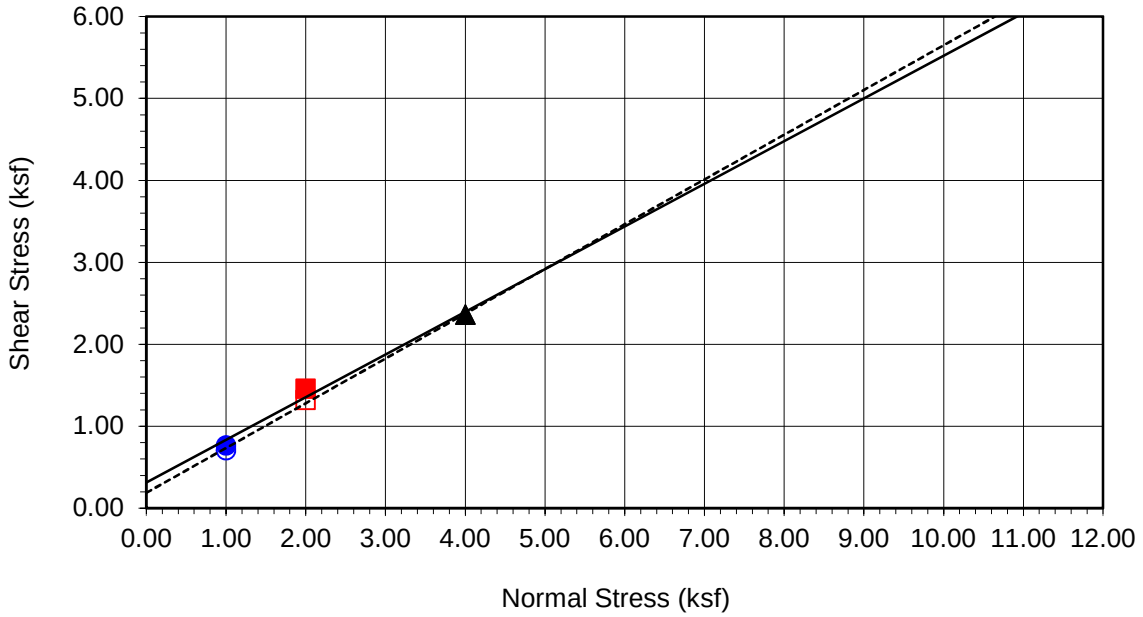
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18





Boring No.	**LB-4**
Sample No.	**R-4**
Depth (ft)	**15**
Sample Type:	Ring
Soil Identification: Light olive brown silty clay (CL-ML)	

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	312	28
Ultimate	188	29

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.764	■ 1.456	▲ 2.361
Shear Stress @ End of Test (ksf)	○ 0.707	□ 1.320	△ 2.358
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.370	2.370	2.370
Initial Moisture Content (%)	12.03	12.03	12.03
Dry Density (pcf)	86.5	90.5	95.4
Saturation (%)	34.2	37.7	42.4
Soil Height Before Shearing (in.)	0.9741	0.9404	0.9148
Final Moisture Content (%)	33.0	19.3	20.3

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DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18

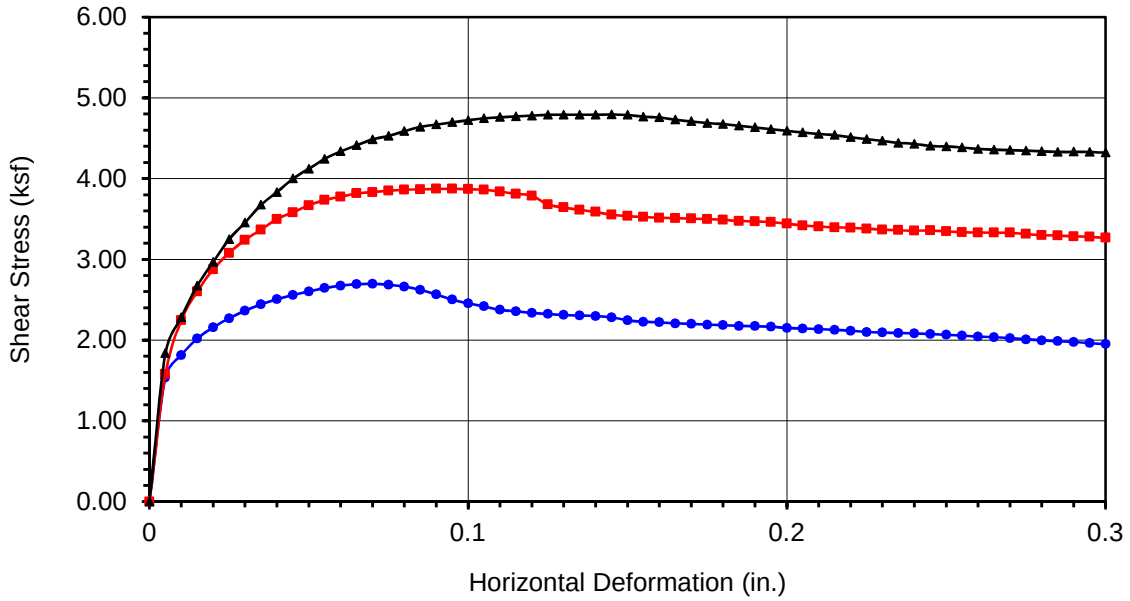
Leighton

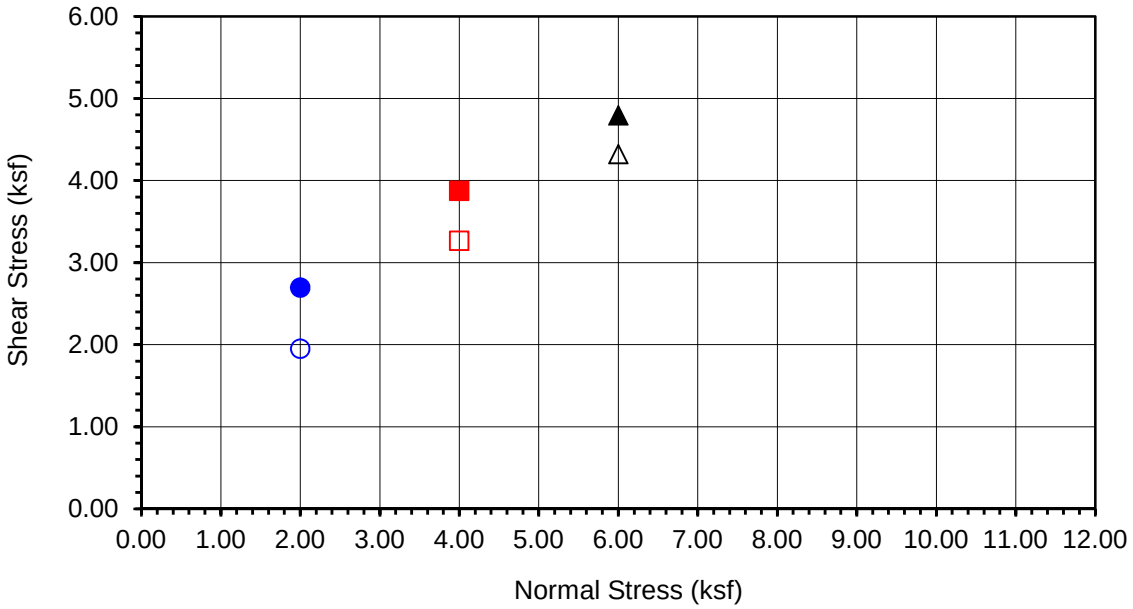
DIRECT SHEAR TEST

Consolidated Undrained

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	07/02/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/10/18
Boring No.:	LB-4	Sample Type:	Ring		
Sample No.:	R-6	Depth (ft.):	25.0		
Soil Identification:	Dark olive gray lean clay (CL)				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	197.86	199.22	201.07
Weight of Ring(gm):	43.11	43.01	44.50
Before Shearing			
Weight of Wet Sample+Cont.(gm):	236.76	236.76	236.76
Weight of Dry Sample+Cont.(gm):	218.32	218.32	218.32
Weight of Container(gm):	67.46	67.46	67.46
Vertical Rdg.(in): Initial	0.2474	0.2774	0.0000
Vertical Rdg.(in): Final	0.2503	0.2856	-0.0178
After Shearing			
Weight of Wet Sample+Cont.(gm):	221.89	195.62	197.76
Weight of Dry Sample+Cont.(gm):	197.10	171.87	174.76
Weight of Container(gm):	63.43	35.71	39.58
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-4**
Sample No.	**R-6**
Depth (ft)	**25**

Sample Type:

Ring

Soil Identification:
Dark olive gray lean clay (CL)

Normal Stress (kip/ft²)	2.000	4.000	6.000
Peak Shear Stress (kip/ft²)	● 2.697	■ 3.873	▲ 4.794
Shear Stress @ End of Test (ksf)	○ 1.952	□ 3.266	△ 4.320
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	12.22	12.22	12.22
Dry Density (pcf)	114.7	115.8	116.0
Saturation (%)	70.2	72.4	72.9
Soil Height Before Shearing (in.)	0.9971	0.9918	0.9822
Final Moisture Content (%)	18.5	17.4	17.0

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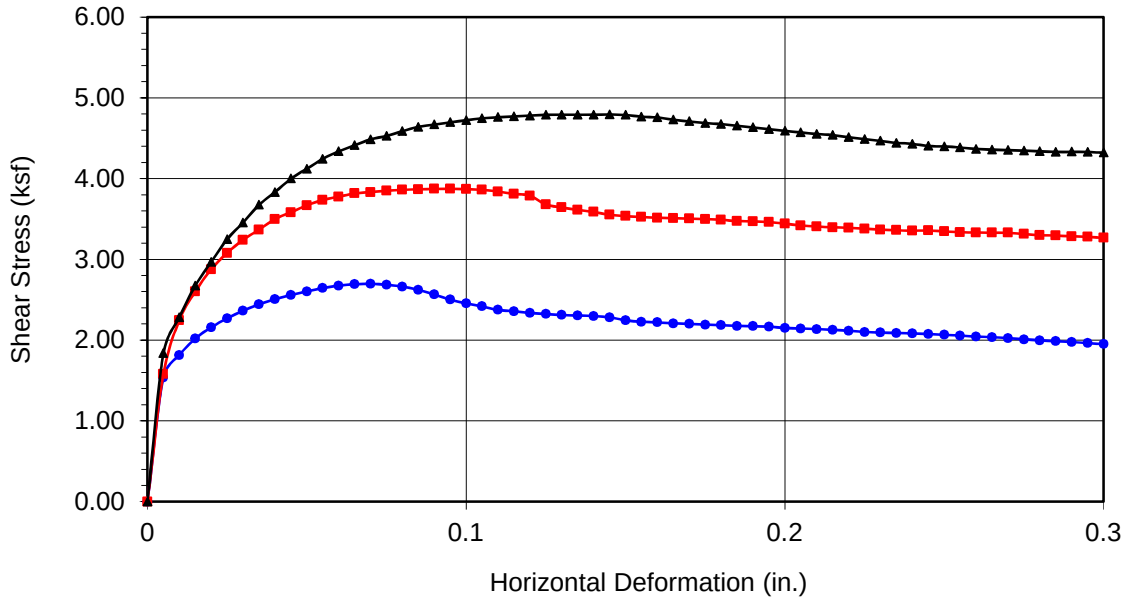
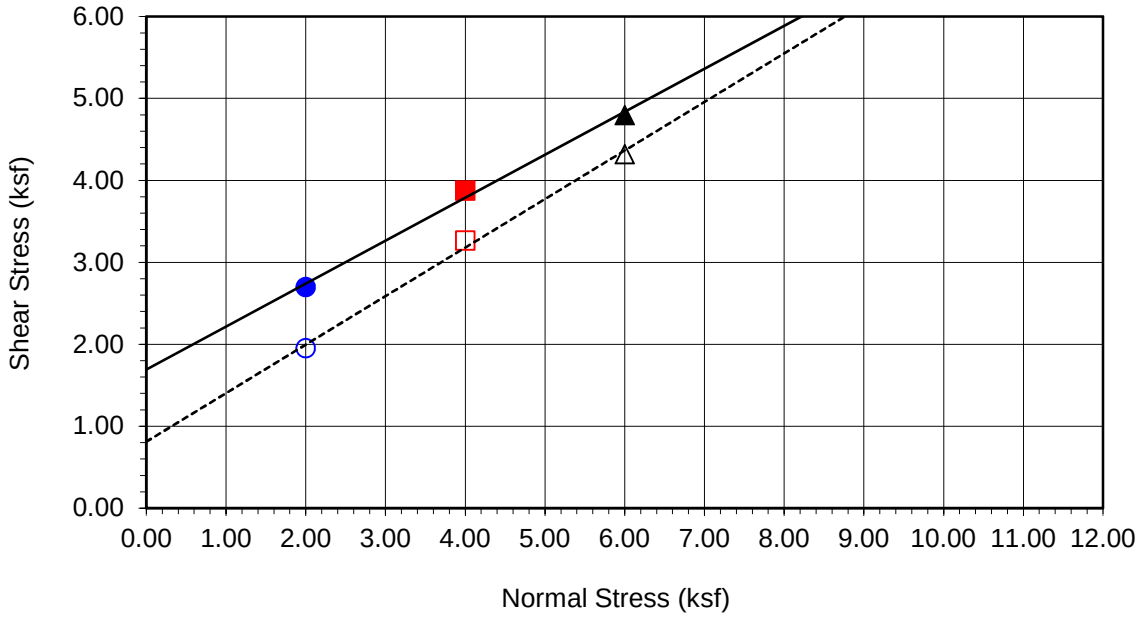
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18





Boring No.	**LB-4**
Sample No.	**R-6**
Depth (ft)	**25**
Sample Type:	Ring

Soil Identification:
Dark olive gray lean clay (CL)

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	1691	28
Ultimate	811	31

Normal Stress (kip/ft²)	2.000	4.000	6.000
Peak Shear Stress (kip/ft²)	● 2.697	■ 3.873	▲ 4.794
Shear Stress @ End of Test (ksf)	○ 1.952	□ 3.266	△ 4.320
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	12.22	12.22	12.22
Dry Density (pcf)	114.7	115.8	116.0
Saturation (%)	70.2	72.4	72.9
Soil Height Before Shearing (in.)	0.9971	0.9918	0.9822
Final Moisture Content (%)	18.5	17.4	17.0

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DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

07-18

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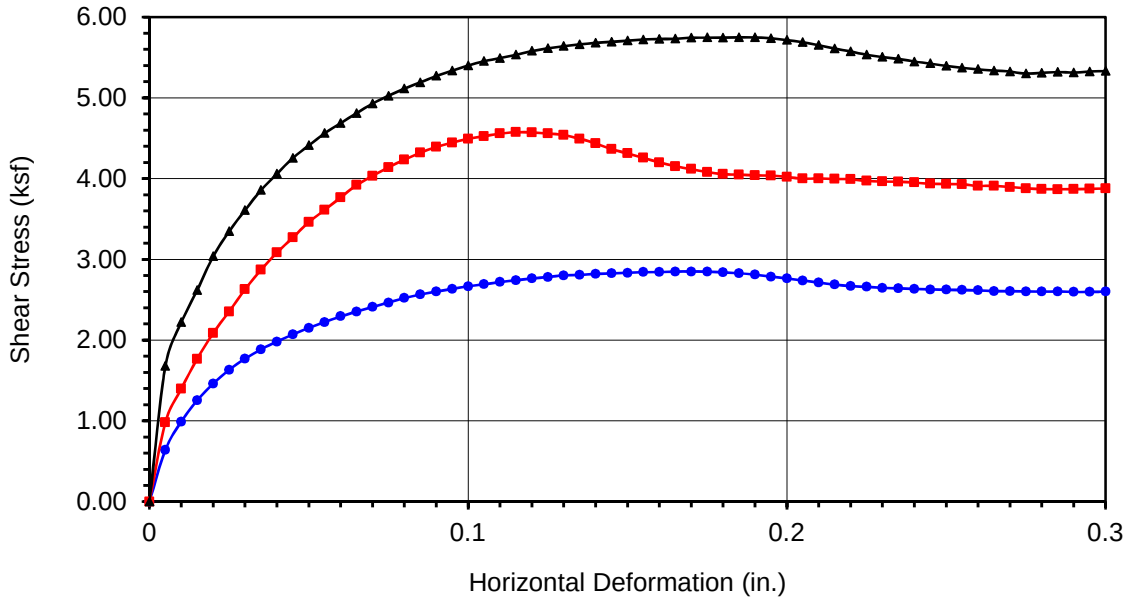
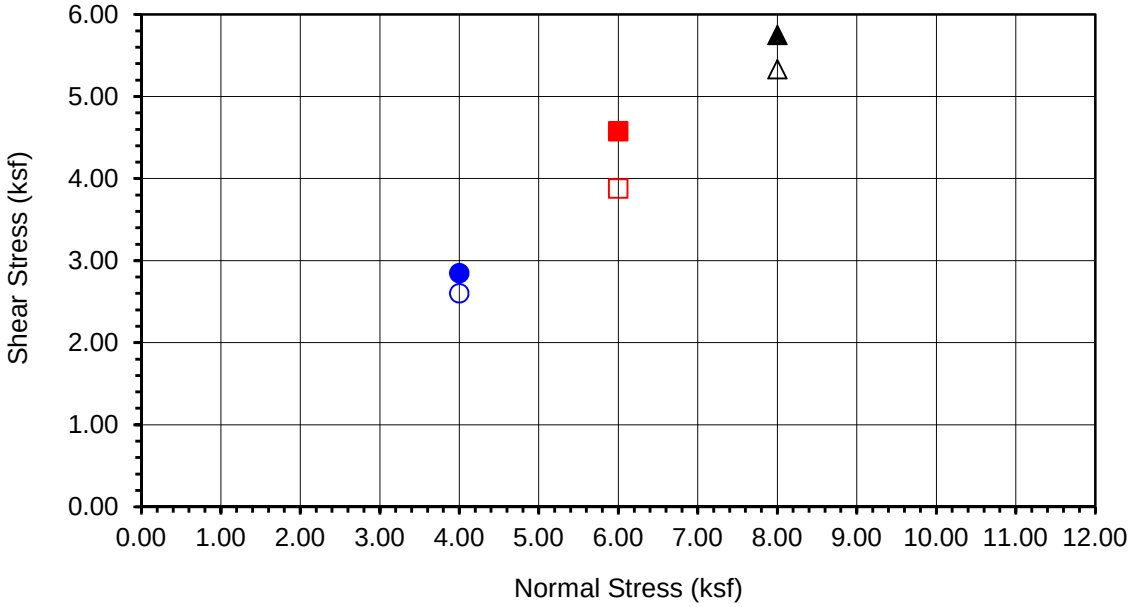
DIRECT SHEAR TEST

Consolidated Undrained

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	G. Bathala	Date:	06/24/18
Project No.:	11922.002	Checked By:	J. Ward	Date:	07/10/18
Boring No.:	LB-4	Sample Type:	Ring		
Sample No.:	R-8	Depth (ft.):	35.0		
Soil Identification:	Yellowish brown silty, clayey sand (SC-SM)				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	185.50	188.30	186.21
Weight of Ring(gm):	45.13	46.00	43.51
Before Shearing			
Weight of Wet Sample+Cont.(gm):	206.25	206.25	206.25
Weight of Dry Sample+Cont.(gm):	198.29	198.29	198.29
Weight of Container(gm):	65.42	65.42	65.42
Vertical Rdg.(in): Initial	0.3121	0.0000	0.0000
Vertical Rdg.(in): Final	0.3341	-0.0289	-0.0271
After Shearing			
Weight of Wet Sample+Cont.(gm):	206.71	204.18	209.82
Weight of Dry Sample+Cont.(gm):	187.09	185.58	191.63
Weight of Container(gm):	57.18	53.70	57.43
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-4**
Sample No.	**R-8**
Depth (ft)	**35**

Sample Type:

Ring

Soil Identification:
Yellowish brown silty, clayey sand (SC-SM)

Normal Stress (kip/ft²)	4.000	6.000	8.000
Peak Shear Stress (kip/ft²)	● 2.848	■ 4.574	▲ 5.750
Shear Stress @ End of Test (ksf)	○ 2.600	□ 3.876	△ 5.332
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	5.99	5.99	5.99
Dry Density (pcf)	110.1	111.7	112.0
Saturation (%)	30.5	31.7	32.0
Soil Height Before Shearing (in.)	0.9780	0.9711	0.9729
Final Moisture Content (%)	15.1	14.1	13.6

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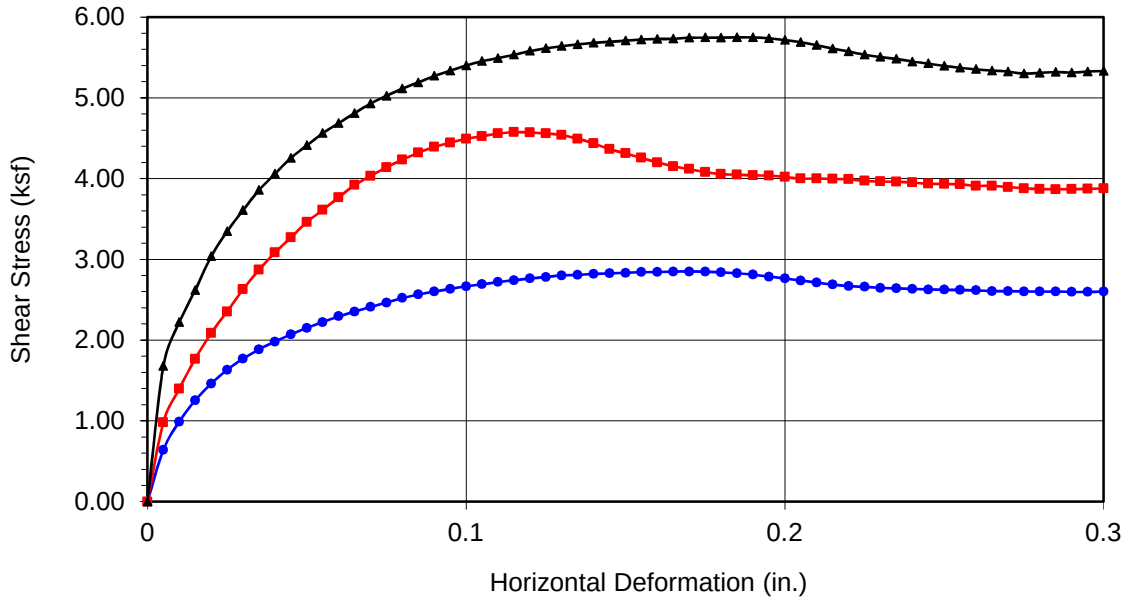
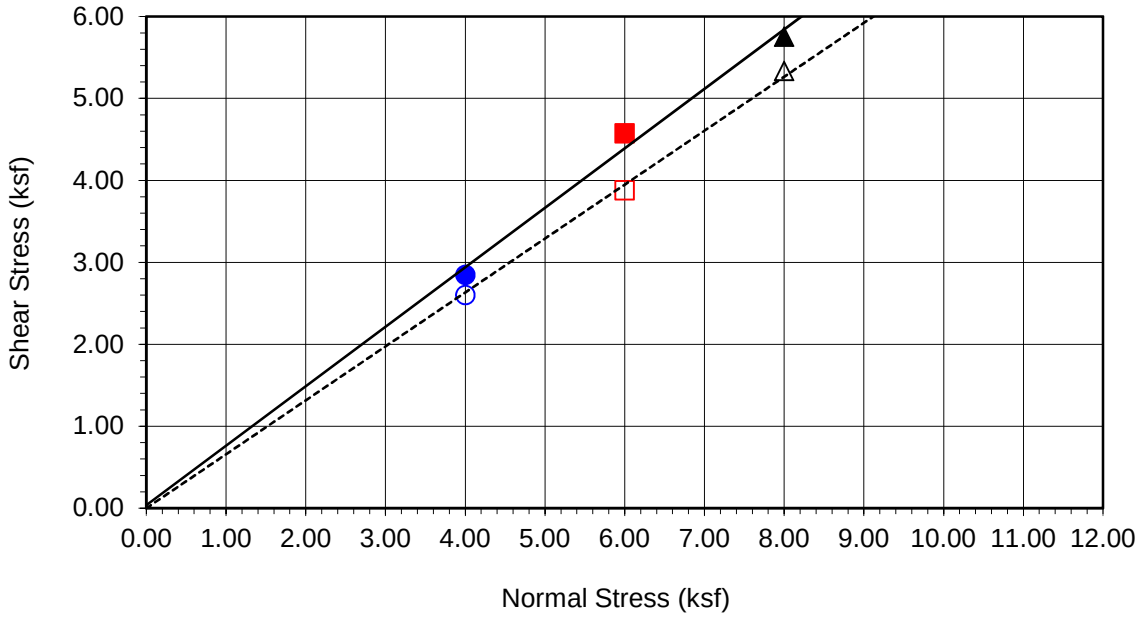
DIRECT SHEAR TEST RESULTS
Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

06-18





Boring No.	**LB-4**
Sample No.	**R-8**
Depth (ft)	**35**
Sample Type:	Ring
Soil Identification: Yellowish brown silty, clayey sand (SC-SM)	

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	38	36
Ultimate	0	33

Normal Stress (kip/ft²)	4.000	6.000	8.000
Peak Shear Stress (kip/ft²)	● 2.848	■ 4.574	▲ 5.750
Shear Stress @ End of Test (ksf)	○ 2.600	□ 3.876	△ 5.332
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	5.99	5.99	5.99
Dry Density (pcf)	110.1	111.7	112.0
Saturation (%)	30.5	31.7	32.0
Soil Height Before Shearing (in.)	0.9780	0.9711	0.9729
Final Moisture Content (%)	15.1	14.1	13.6

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DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Project No.: 11922.002

CSUF - Proposed New Parking Structure

06-18

Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	O. Figueroa	Date:	07/03/18
Project No.:	11922.002	Input By:	J. Ward	Date:	07/10/18
Boring No.:	LB-1	Depth (ft.):	1.3		
Sample No.:	B-1				
Soil Identification:	Dark yellowish brown silty, clayey sand (SC-SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03330

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3768	3857	3912	3850		
Weight of Mold (g)	1848	1848	1848	1848		
Net Weight of Soil (g)	1920	2009	2064	2002		
Wet Weight of Soil + Cont. (g)	385.0	396.8	433.2	457.8		
Dry Weight of Soil + Cont. (g)	360.0	363.1	388.3	400.3		
Weight of Container (g)	39.0	38.8	39.2	39.4		
Moisture Content (%)	7.79	10.39	12.86	15.93		
Wet Density (pcf)	127.1	133.0	136.6	132.5		
Dry Density (pcf)	117.9	120.5	121.1	114.3		

Maximum Dry Density (pcf) 121.5 **Optimum Moisture Content (%)** 12.0

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

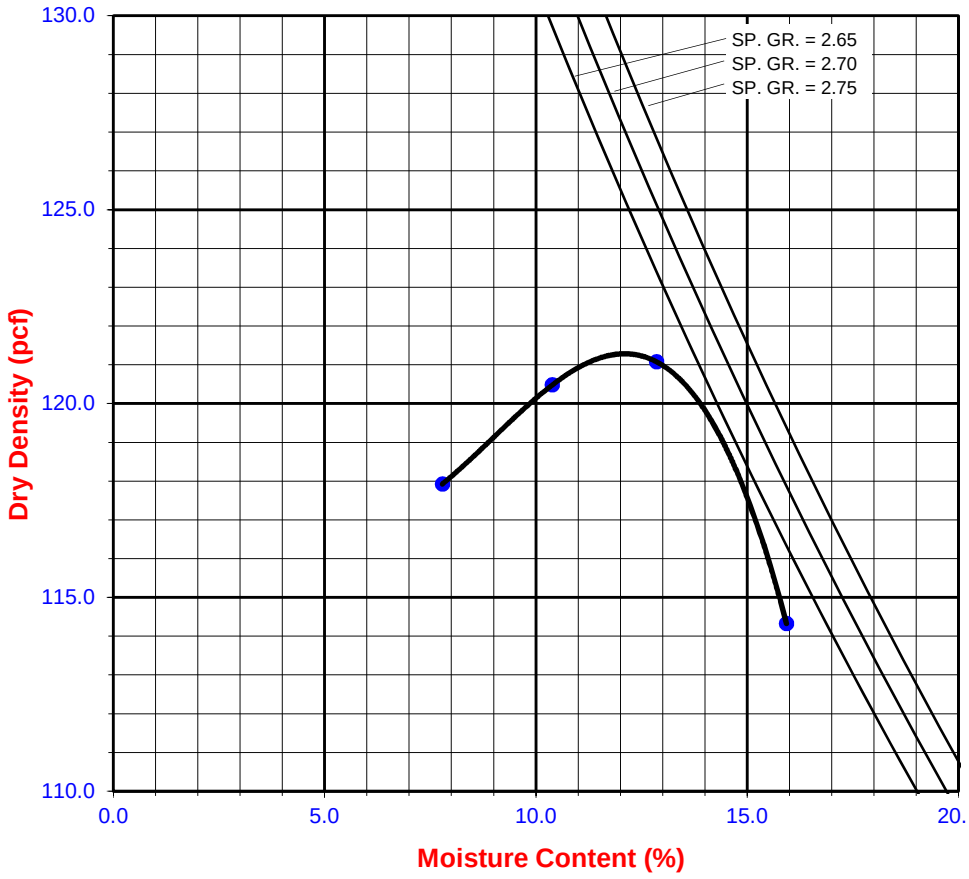
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



MX LB-1, B-1 @ 1.3

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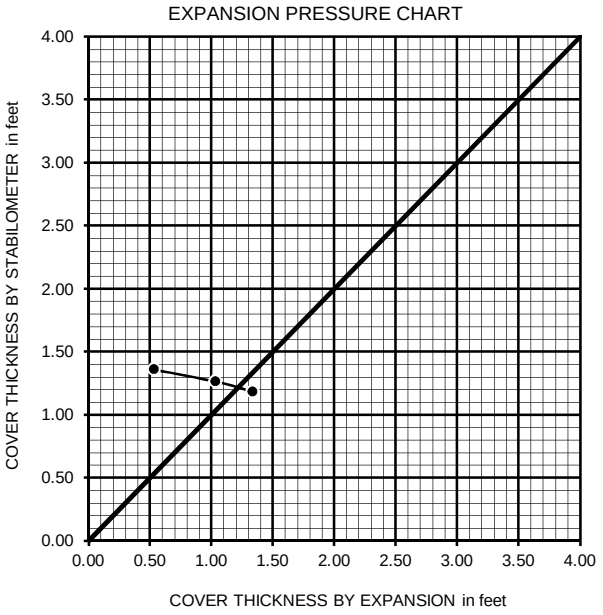
R-VALUE TEST RESULTS

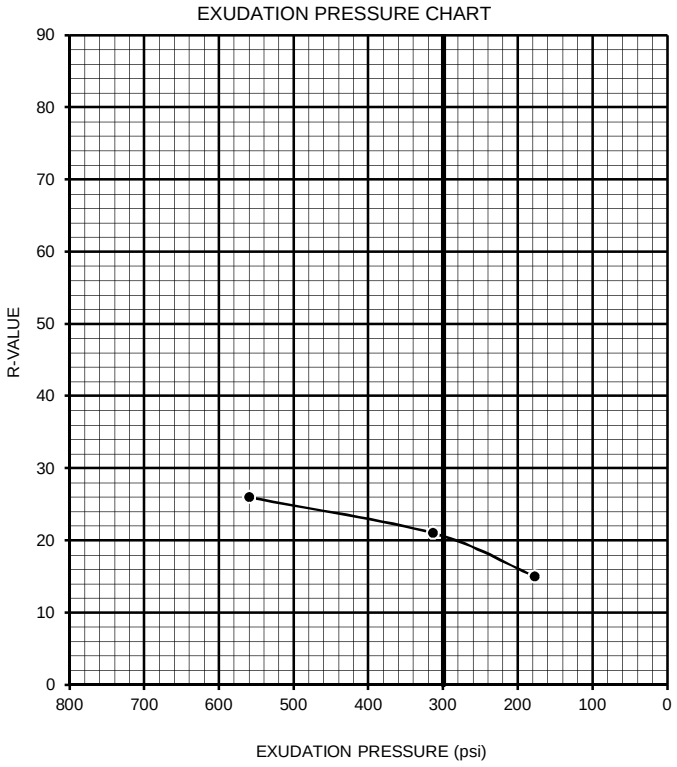
DOT CA Test 301

PROJECT NAME:	CSUF - Proposed New Parking Structure	PROJECT NUMBER:	11922.002
BORING NUMBER:	LB-2	DEPTH (FT.):	0.67
SAMPLE NUMBER:	B-1	TECHNICIAN:	S. Felter
SAMPLE DESCRIPTION:	Brown silty clay (CL-ML)	DATE COMPLETED:	7/3/2018

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	17.1	18.0	18.3
HEIGHT OF SAMPLE, Inches	2.59	2.60	2.51
DRY DENSITY, pcf	109.9	107.4	107.3
COMPACTOR PRESSURE, psi	150	75	50
EXUDATION PRESSURE, psi	560	313	177
EXPANSION, Inches x 10exp-4	40	31	16
STABILITY Ph 2,000 lbs (160 psi)	108	116	124
TURNS DISPLACEMENT	3.61	3.90	4.11
R-VALUE UNCORRECTED	25	20	15
R-VALUE CORRECTED	26	21	15

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.18	1.26	1.36
EXPANSION PRESSURE THICKNESS, ft.	1.33	1.03	0.53





R-VALUE BY EXPANSION:	24
R-VALUE BY EXUDATION:	20
EQUILIBRIUM R-VALUE:	20

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Leighton

Project Name:	CSUF - Proposed New Parking Structure	Tested By:	GB/ACS	Date:	07/05/18
Project No.:	11922.002	Data Input By:	J. Ward	Date:	07/10/18
Boring No.:	LB-1				
Sample No.:	R-10	Depth (feet):	40.0		
Soil Identification:	Olive poorly-graded sand with silt (SP-SM)				

		Soil Type
% Gravel	0	SP-SM
% Sand	91	
% Fines	9	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	75.06	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	75.04	234.31
Wt.of Air-Dry Soil + Cont. (g)	815.30	Wt. of Container No.___ (g)	1.00	60.27	142.28
Wt. of Container	81.60	Moisture Content (%)	0.00	0.14	
Dry Wt. of Soil (g)	733.70	Wt. of Dry Soil (g)			92.03

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"	0.00	100.0
1½"	0.00	100.0
3/4"	0.00	100.0
3/8"	0.00	100.0
No. 4	0.21	100.0
No. 10	6.64	99.1
Pan		

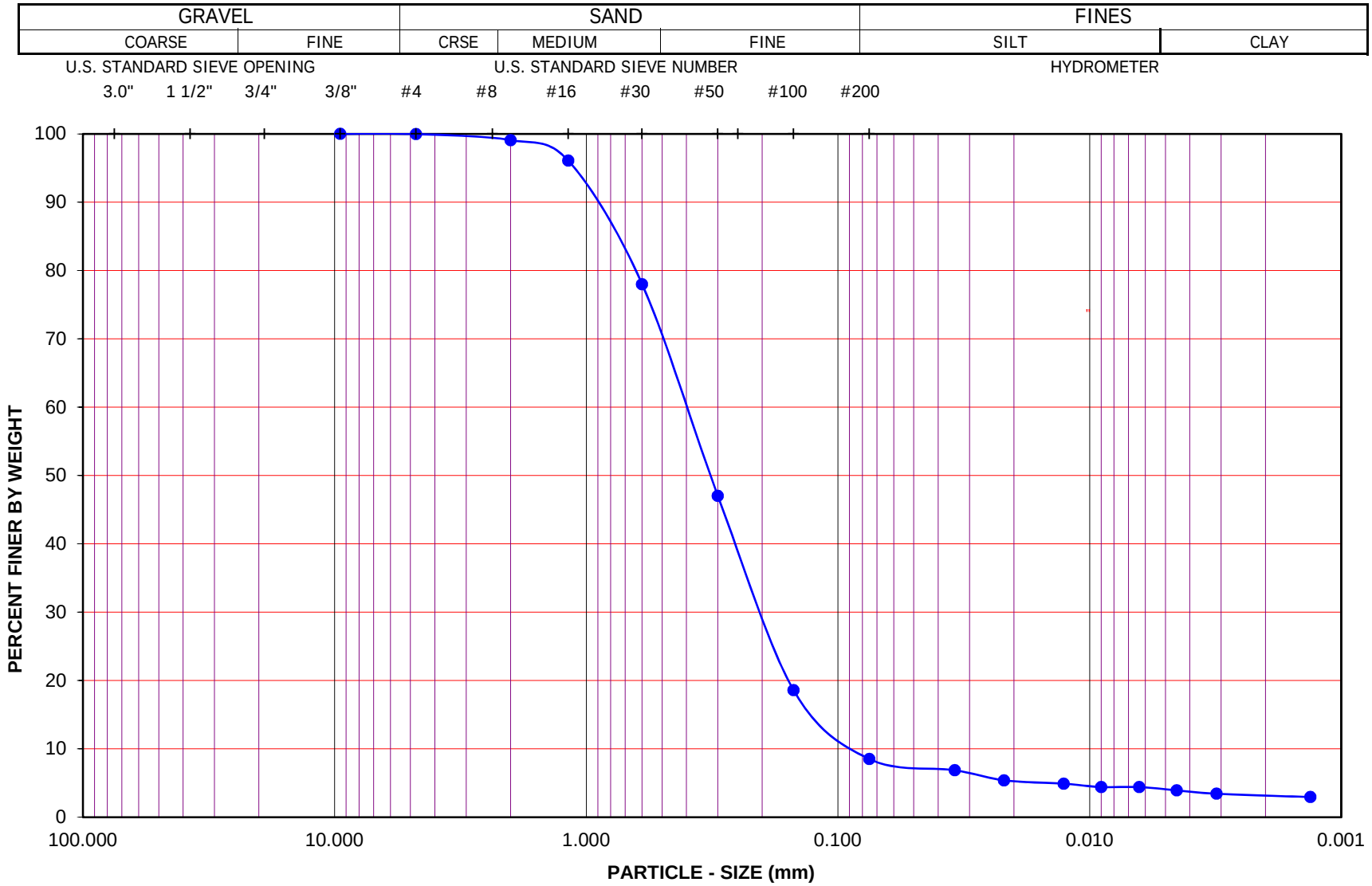
Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	99.1
No. 16	3.03	97.0	96.1
No. 30	21.29	78.7	78.0
No. 50	52.58	47.5	47.0
No. 100	81.29	18.8	18.6
No. 200	91.46	8.6	8.5
Pan			

Hydrometer Wt. of Air-Dry Soil (g) 100.20 Wt. of Dry Soil (g) 100.06

Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
06-Jul-18	7:35	0		7.0			
	7:37	2	23.5	7.0	14.0	6.9	0.0343
	7:40	5	23.5	7.0	12.5	5.4	0.0219
	7:50	15	23.4	7.0	12.0	4.9	0.0127
	8:05	30	23.4	7.0	11.5	4.4	0.0090
	8:35	60	23.4	7.0	11.5	4.4	0.0064
	9:35	120	23.5	7.0	11.0	3.9	0.0045
	11:45	250	23.6	7.0	10.5	3.4	0.0031
07-Jul-18	7:35	1440	22.9	7.0	10.0	2.9	0.0013



Project Name: CSUF - Proposed New Parking Structure

Project No.: 11922.002

Boring No.: LB-1 Sample No.: R-10

Depth (feet): 40.0 Soil Type : SP-SM

Soil Identification: Olive poorly-graded sand with silt (SP-SM)

GR:SA:FI : (%) 0 : 91 : 9

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 422

Jul-18

SA & Hyd LB-1, R-10 @ 40

APPENDIX D

ENGINEERING ANALYSES

A P P E N D I X

D.1

Field Percolation Testing

Boring Percolation Test Data Sheet

Project Number:	11922.002	**Test Hole Number:**	LP-1
Project Name:	CSUF Eastside Structure	**Date Excavated:**	6/8/2018
Earth Description:	Alluvium	**Date Tested:**	6/8/2018
Liquid Description:	Tap water	**Depth of boring (ft):**	15
Tested By:	KMD	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	7:14 AM	**Length of slotted of casing (ft):**	5
Start Time for Standard:	8:42 AM	**Depth to Initial Water Depth (ft):**	10
Standard Time Interval		**Porosity of Annulus Material, *n* :**	0.35
Between Readings, mins:	30		

Percolation Data

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
P1	7:14	25	10.00	60.0	25.3	0.99	0.96
	7:39		12.11	34.7			
P2	7:44	21	10.00	60.0	21.4	0.98	0.93
	8:05		11.78	38.6			
1	8:42	30	10.00	60.0	25.1	1.20	0.79
	9:12		12.09	34.9			
2	9:17	30	10.00	60.0	24.5	1.23	0.77
	9:47		12.04	35.5			
3	9:50	30	10.00	60.0	25.6	1.17	0.81
	10:20		12.13	34.4			
4	10:22	30	10.00	60.0	25.2	1.19	0.80
	10:52		12.10	34.8			
5	10:54	30	10.00	60.0	25.3	1.18	0.80
	11:24		12.11	34.7			
6	11:26	30	10.00	60.0	24.5	1.23	0.77
	11:56		12.04	35.5			
7	11:59	10	10.00	60.0	13.2	0.76	1.12
	12:09		11.10	46.8			
8	12:12	9	10.00	60.0	13.0	0.69	1.22
	12:21		11.08	47.0			
9	12:22	10	10.00	60.0	15.5	0.65	1.34
	12:32		11.29	44.5			
10	12:33	10	10.00	60.0	13.3	0.75	1.13
	12:43		11.11	46.7			
11	12:45	10	10.00	60.0	13.1	0.76	1.11
	12:55		11.09	46.9			
12	12:56	10	10.00	60.0	13.3	0.75	1.13
	13:06		11.11	46.7			

Infiltration Rate, I (Last Reading) = 1.13 in./hr.

Boring Percolation Test Data Sheet

Project Number:	11922.002	**Test Hole Number:**	LP-2
Project Name:	CSUF Eastside Structure	**Date Excavated:**	6/8/2018
Earth Description:	Alluvium	**Date Tested:**	6/8/2018
Liquid Description:	Tap water	**Depth of boring (ft):**	15
Tested By:	KMD	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	7:47 AM	**Length of slotted of casing (ft):**	5
Start Time for Standard:	9:05 AM	**Depth to Initial Water Depth (ft):**	10
Standard Time Interval		**Porosity of Annulus Material, *n* :**	0.35
Between Readings, mins:	10		

Percolation Data

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
P1	7:47	44	8.83	74.0	14.0	3.13	0.22
	8:31		10.00	60.0			
P2	8:31	30	10.00	60.0	4.8	6.25	0.13
	9:01		10.40	55.2			
1	9:05	30	10.00	60.0	5.3	5.68	0.14
	9:35		10.44	54.7			
2	9:37	30	10.00	60.0	5.4	5.56	0.14
	10:07		10.45	54.6			
3	10:10	30	10.00	60.0	5.3	5.68	0.14
	10:40		10.44	54.7			
4	10:43	33	10.00	60.0	5.6	5.85	0.14
	11:16		10.47	54.4			
5	11:18	30	10.00	60.0	5.0	5.95	0.13
	11:48		10.42	55.0			
6	11:50	36	10.00	60.0	5.9	6.12	0.13
	12:26		10.49	54.1			
7	12:29	30	10.00	60.0	4.9	6.10	0.13
	12:59		10.41	55.1			
8	13:02	30	10.00	60.0	4.8	6.25	0.13
	13:32		10.40	55.2			
9	13:35	30	10.00	60.0	4.8	6.25	0.13
	14:05		10.40	55.2			
10	14:09	25	10.00	60.0	4.0	6.31	0.12
	14:34		10.33	56.0			

Infiltration Rate, I (Last Reading) = 0.12 in./hr.

A P P E N D I X

D.2

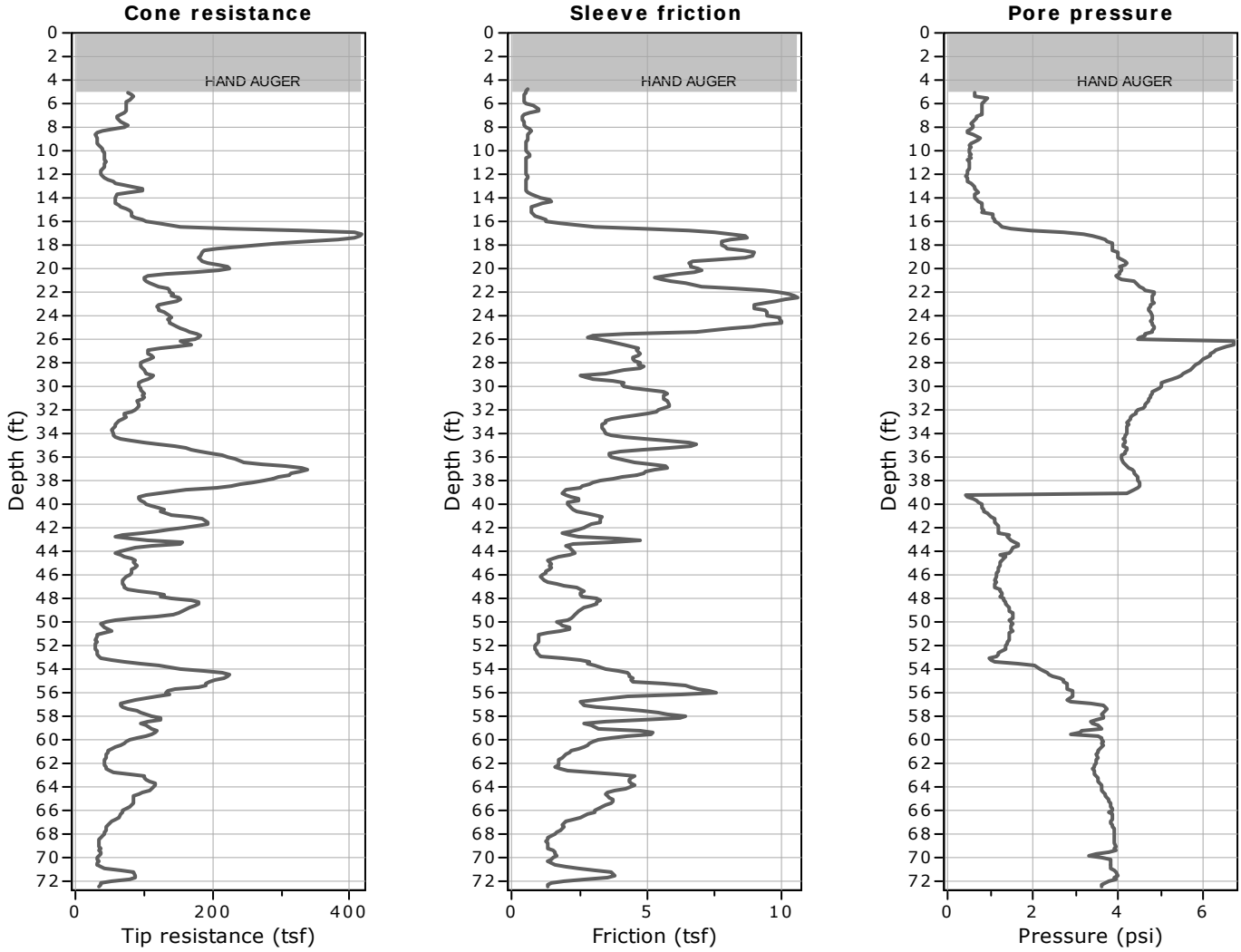
CPT Subsurface Profile

Interpretations and Correlations

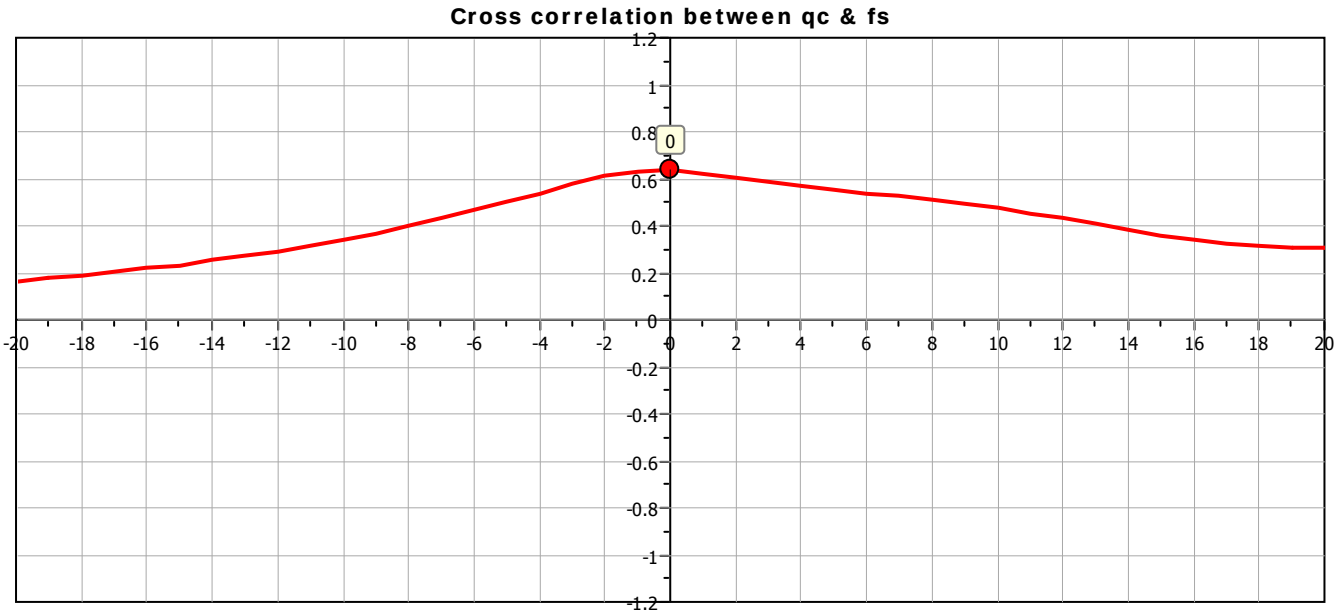
Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-1
Total depth: 72.51 ft, Date: 6/13/2018



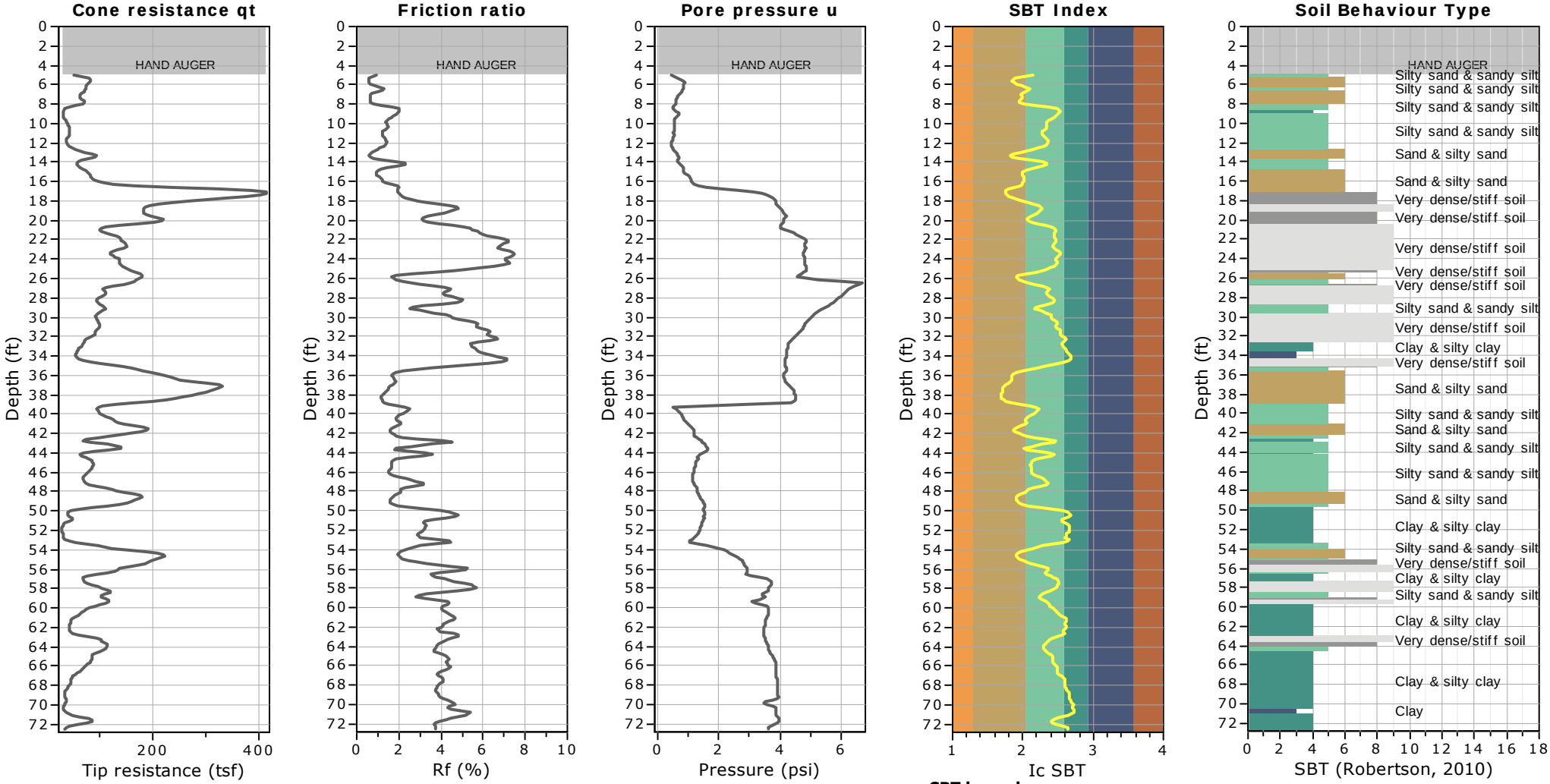
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-1
Total depth: 72.51 ft, Date: 6/13/2018



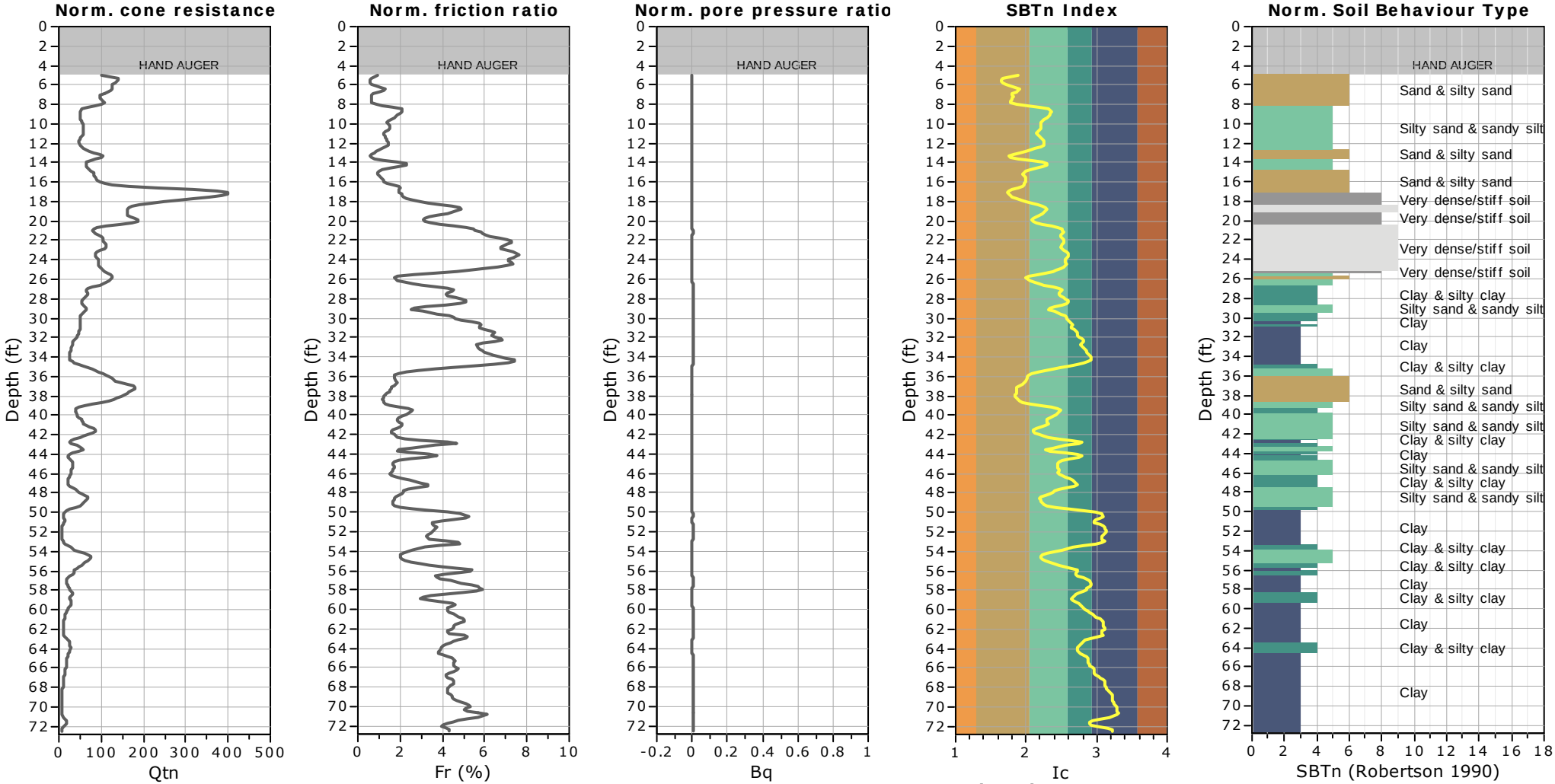
SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-1
Total depth: 72.51 ft, Date: 6/13/2018



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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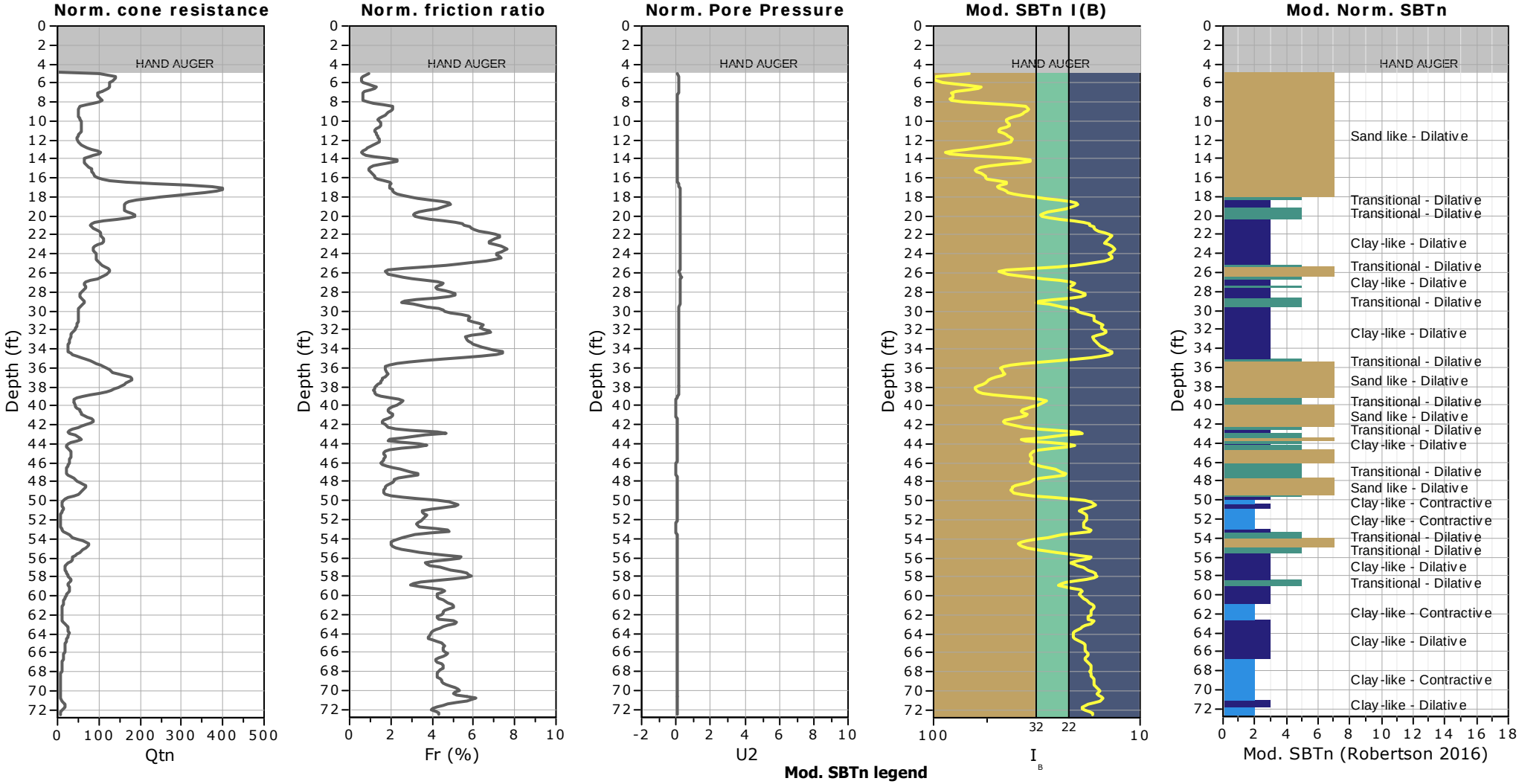
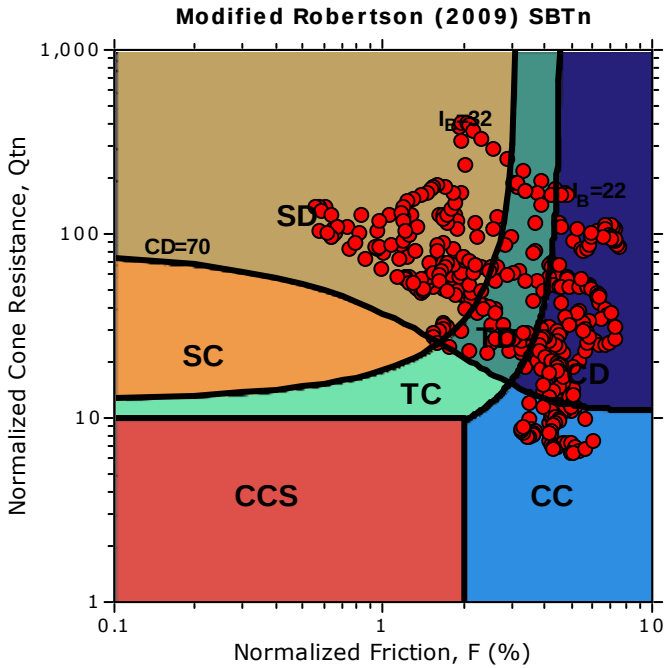
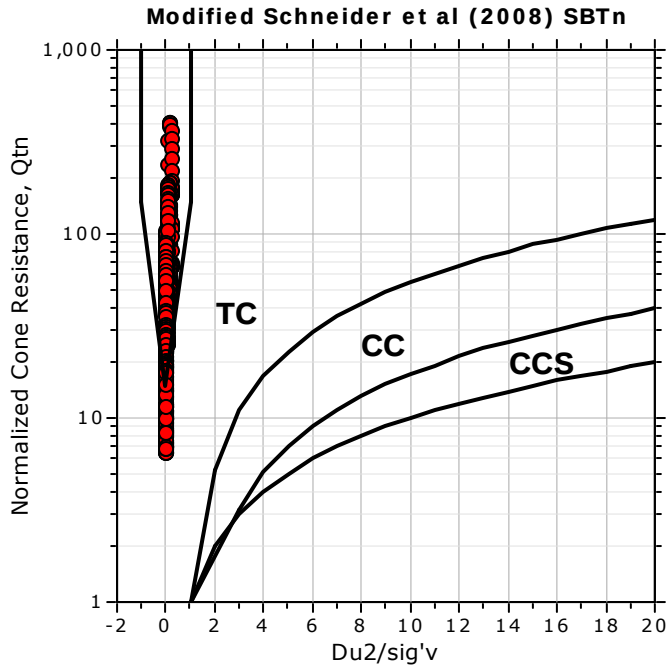


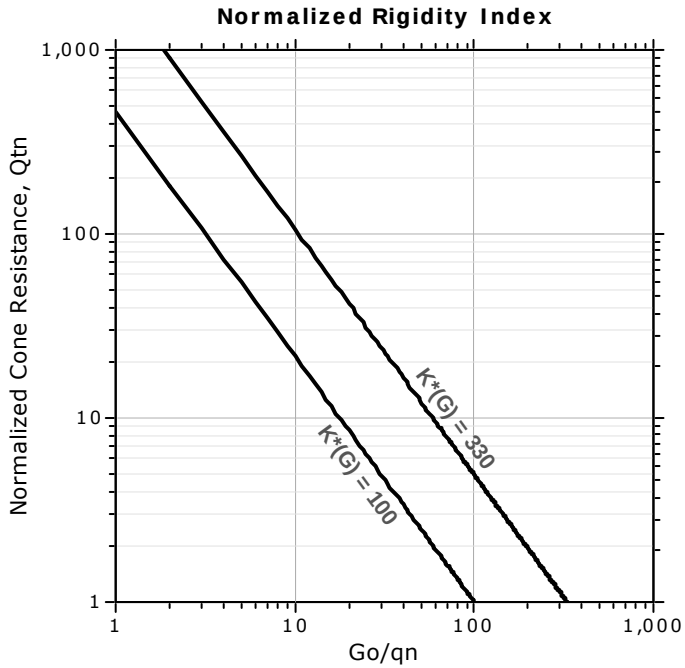
Mod. SBTn legend

1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

Updated SBTn plots







CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

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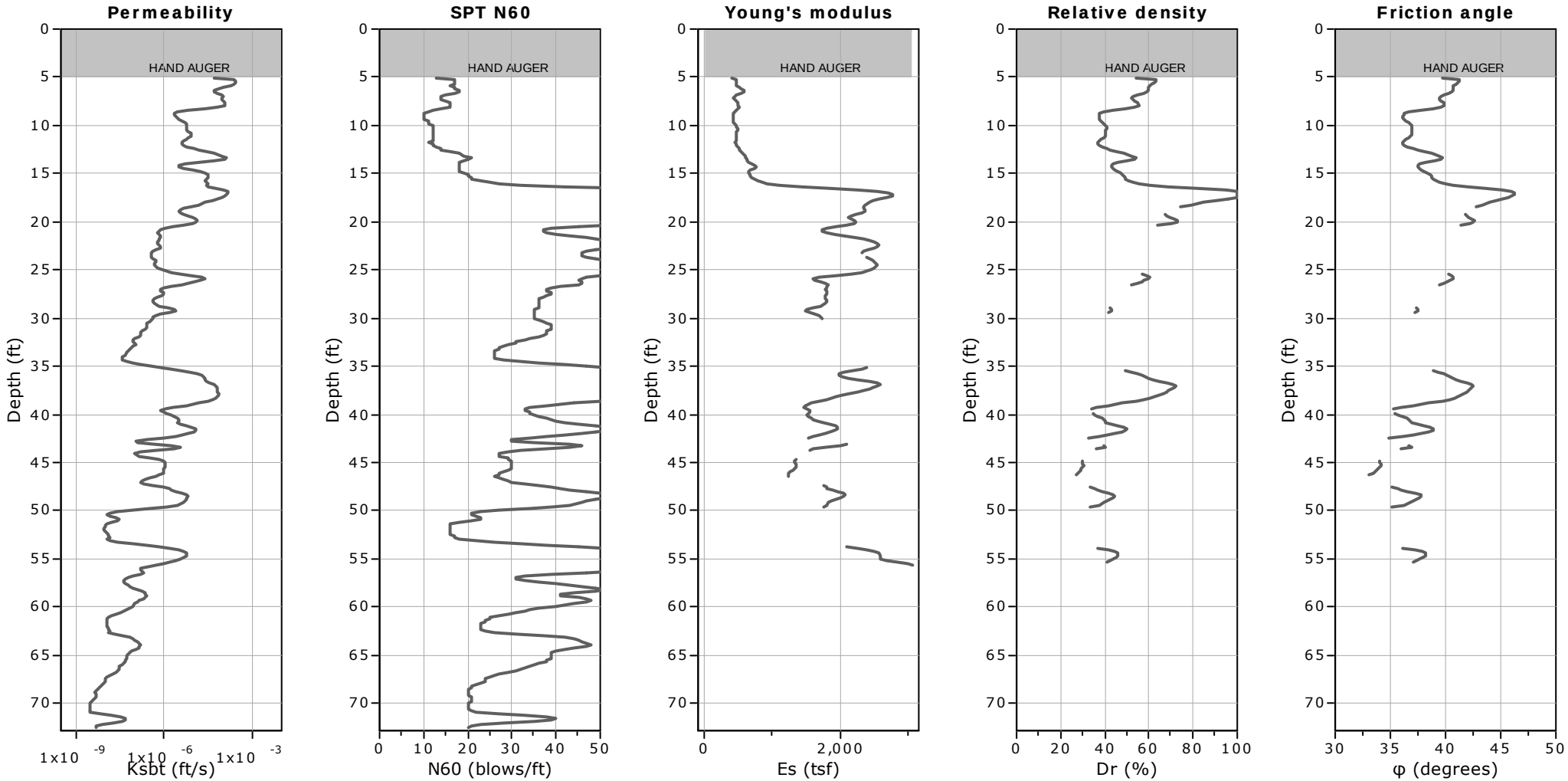

Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

Leighton Consulting, Inc.
Geotechnical Engineering

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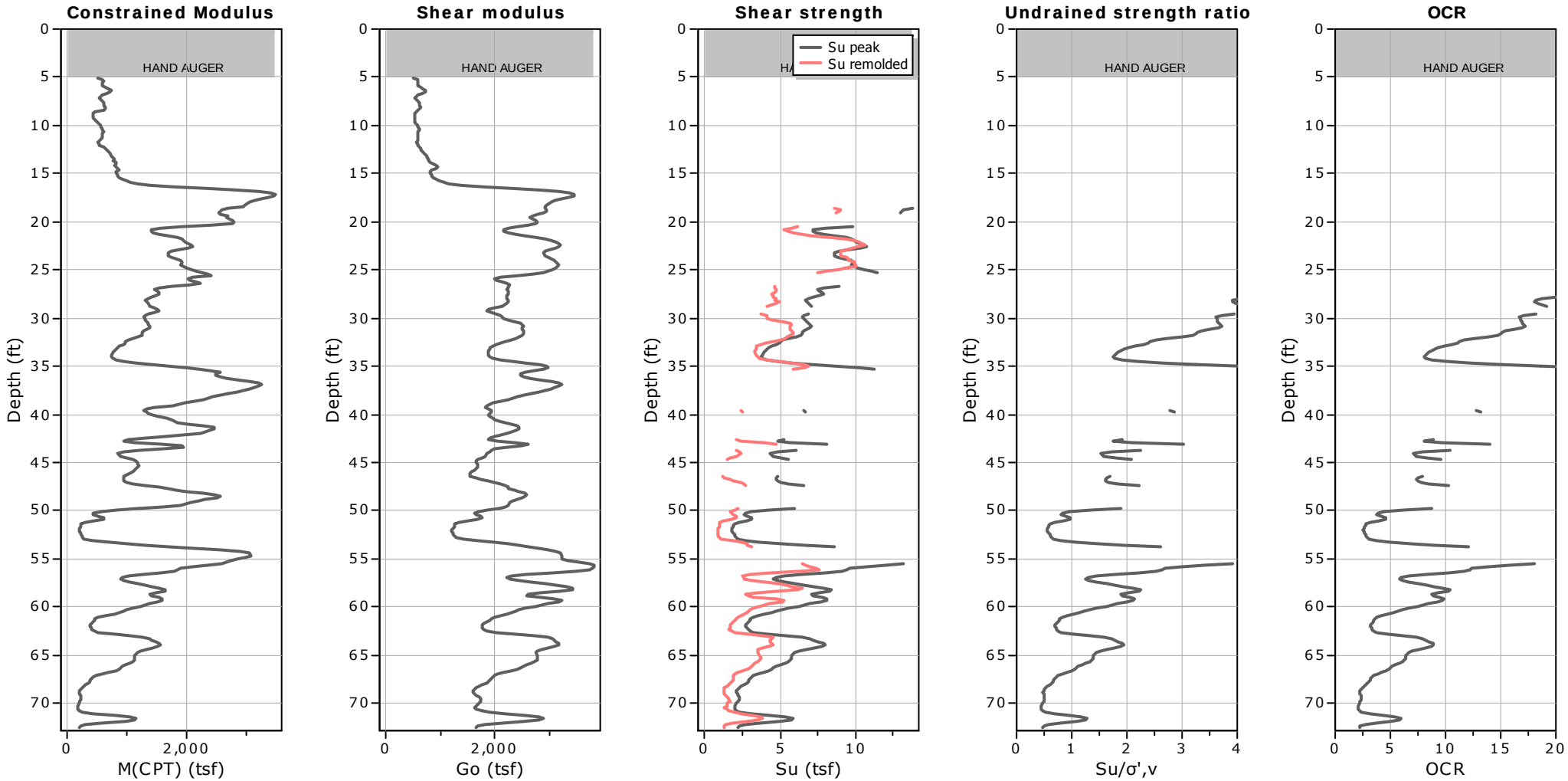

Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
User defined estimation data
Flat Dilatometer Test data

Leighton Consulting, Inc.
Geotechnical Engineering

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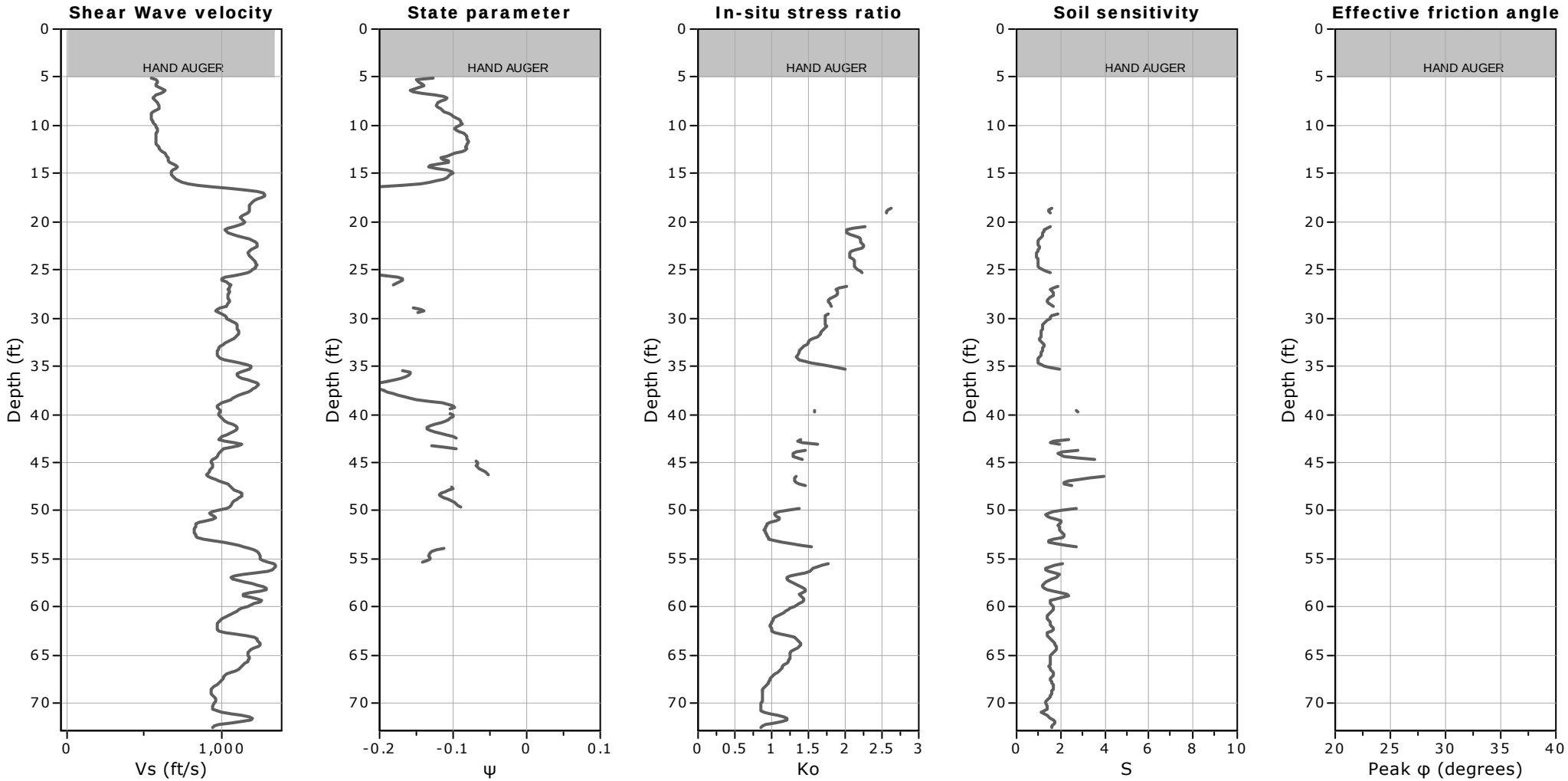


Calculation parameters

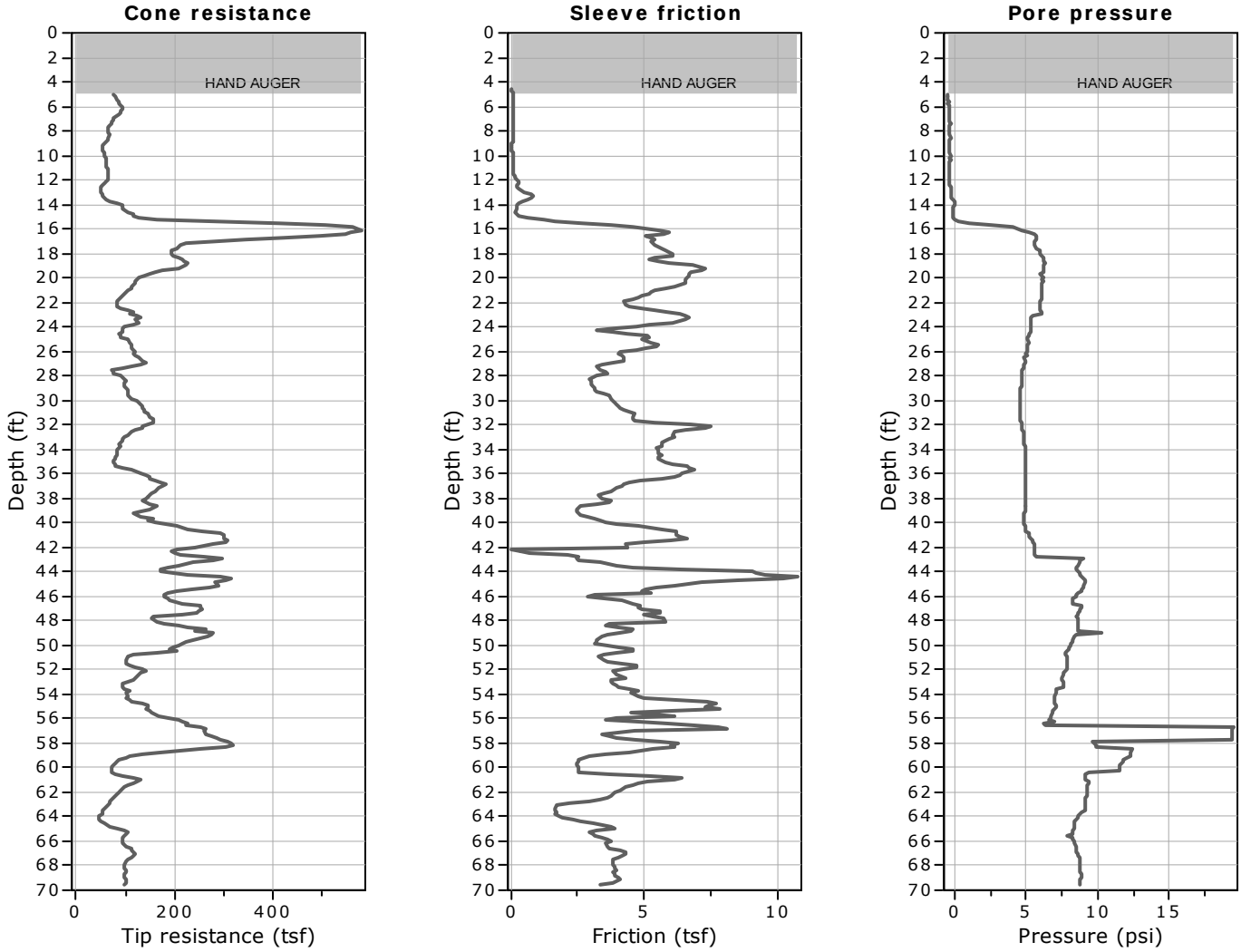
Soil Sensitivity factor, N_S: 7.00

User defined estimation data

Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-2
Total depth: 69.55 ft, Date: 6/13/2018



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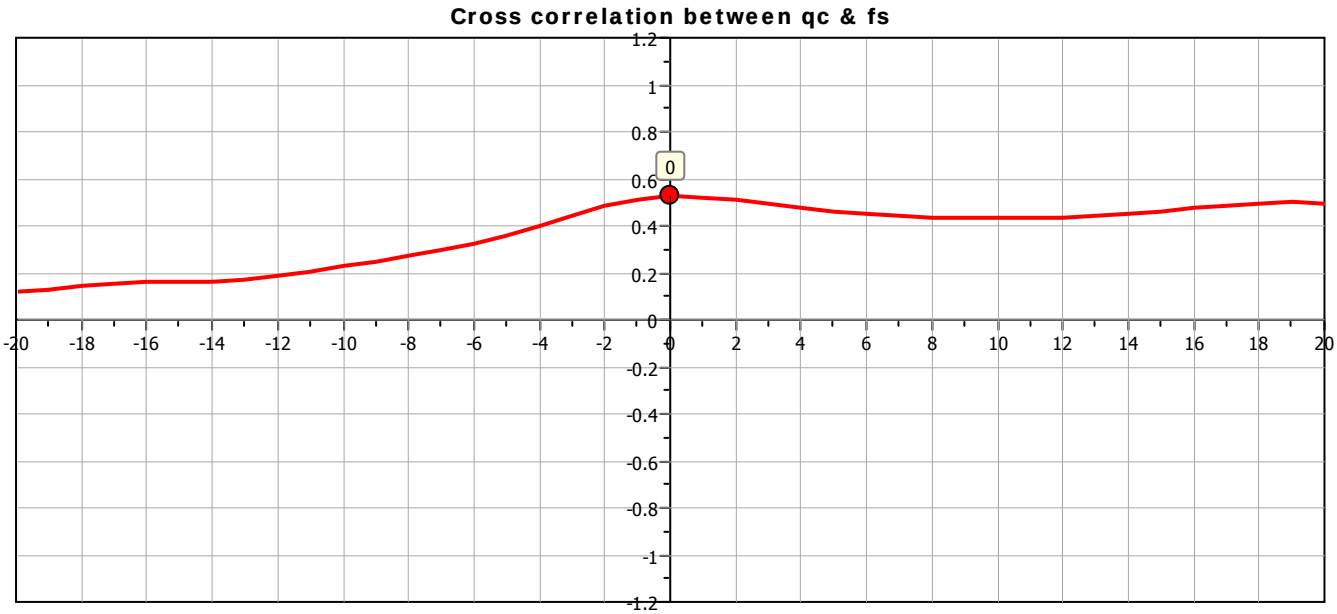

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CPT-18-2
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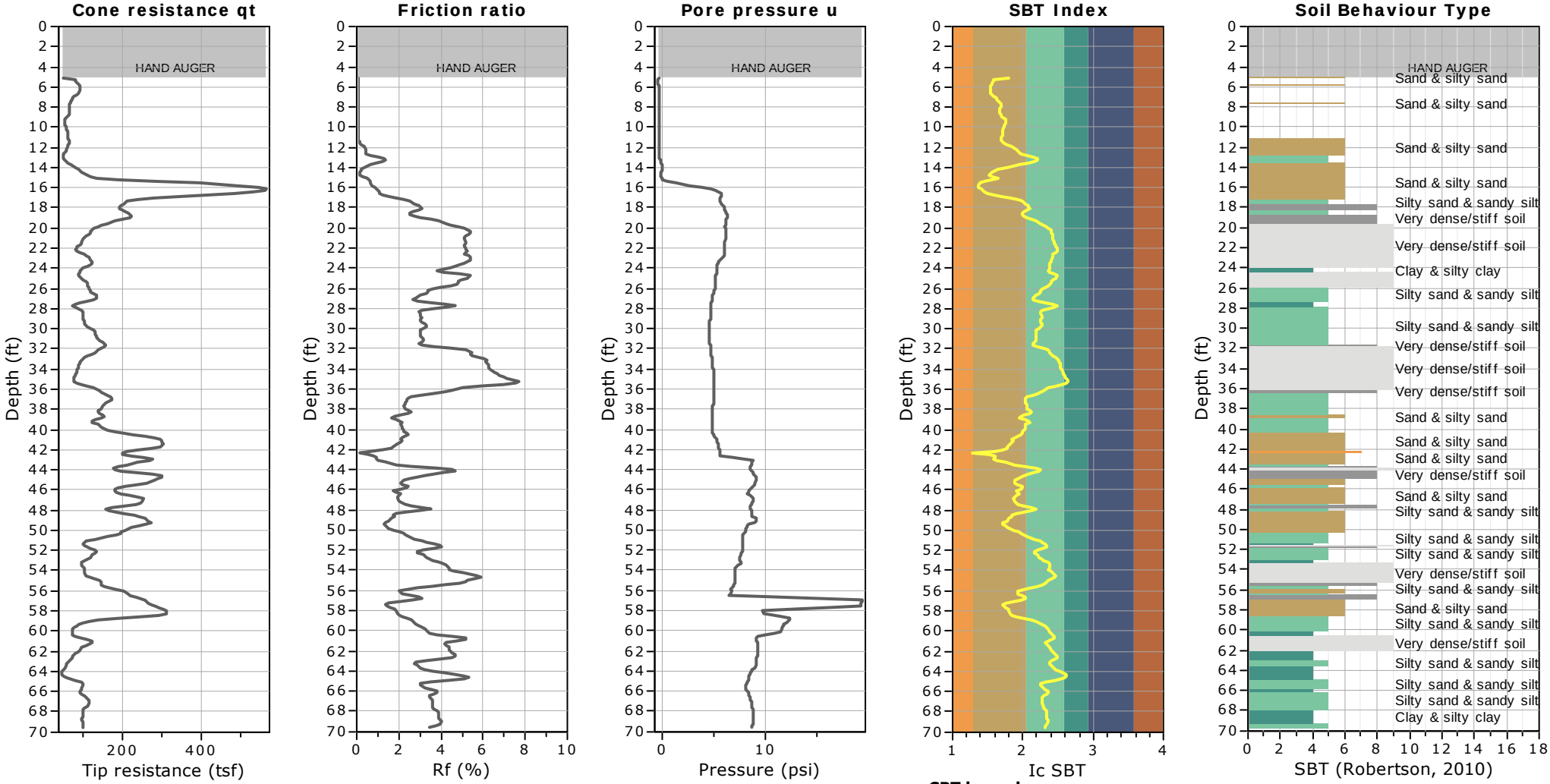

SBT legend

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2. Organic material
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4. Clayey silt to silty clay
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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Leighton Consulting, Inc.
Geotechnical Engineering

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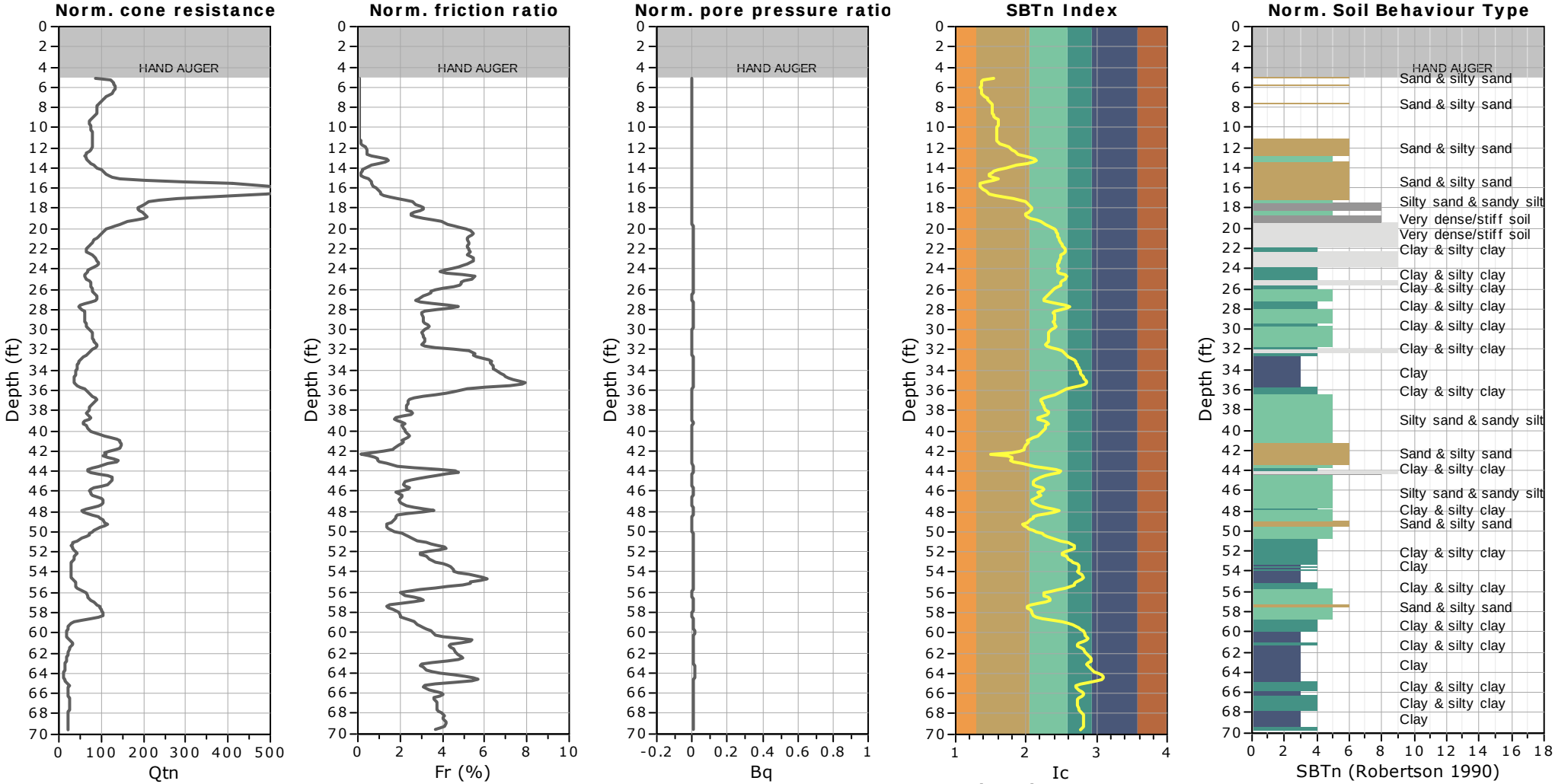
Location: **CSUF, Parking Lot E**

CPT-18-2
Total depth: 69.55 ft, Date: 6/13/2018



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Geotechnical Engineering

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CPT-18-2
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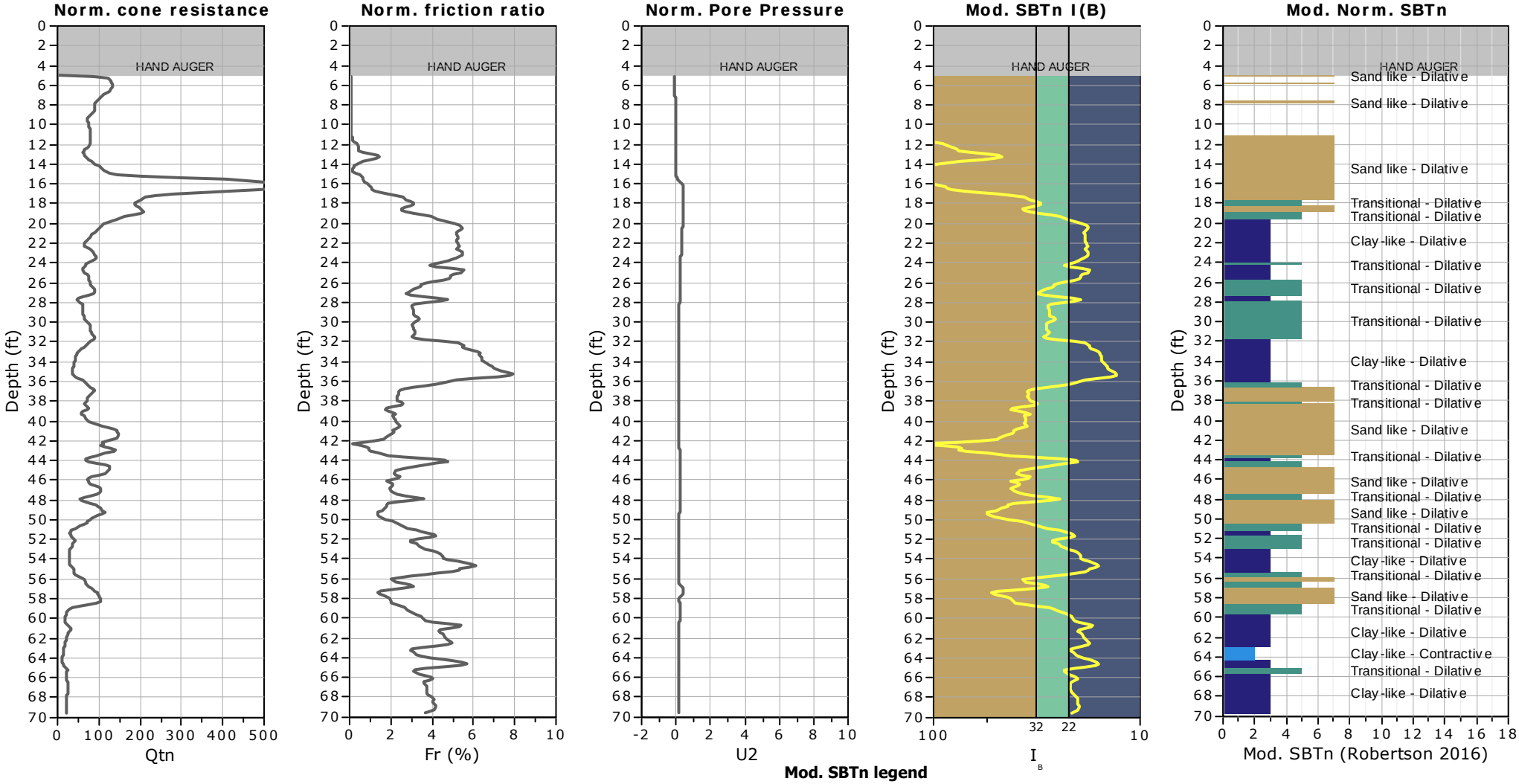

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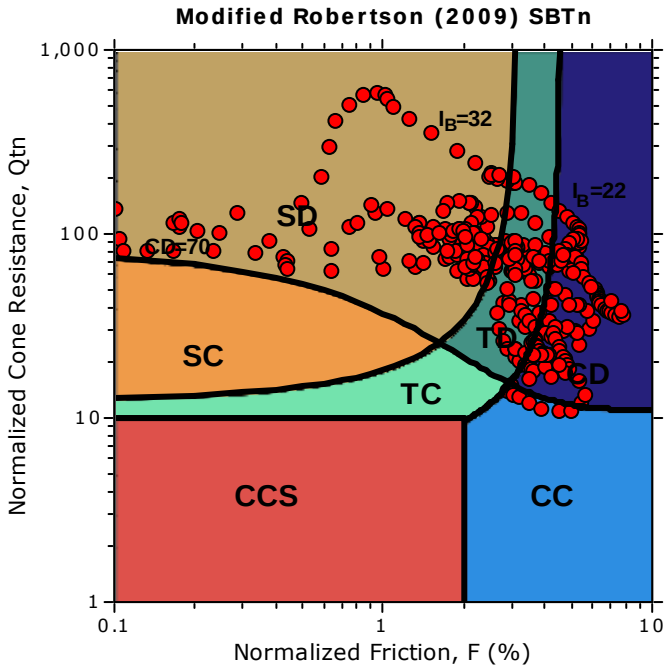
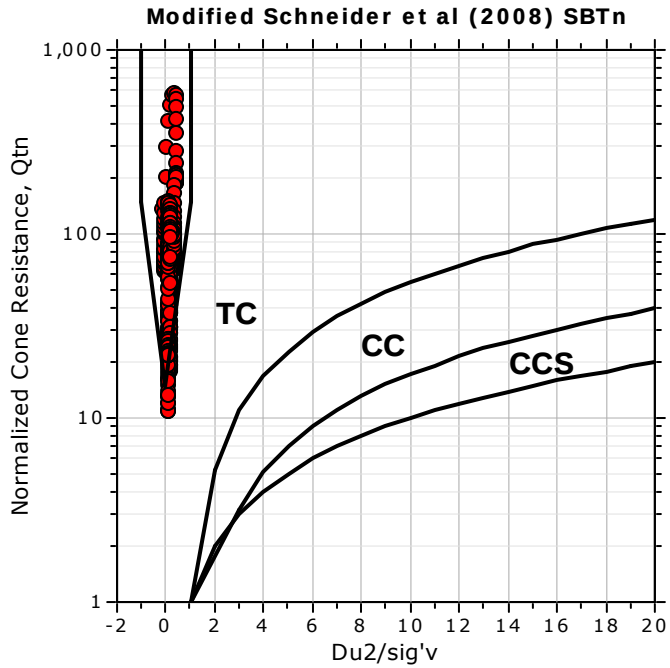
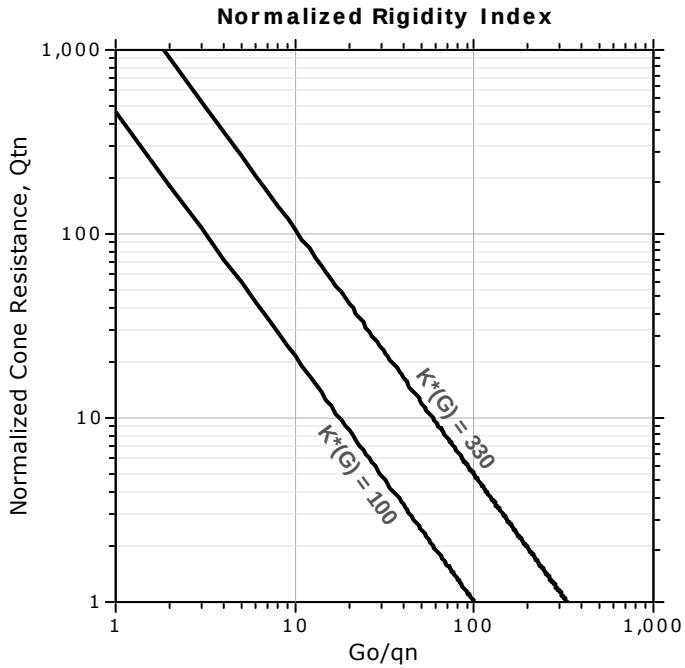
7. SD: Sand-like - Dilative

Updated SBTn plots







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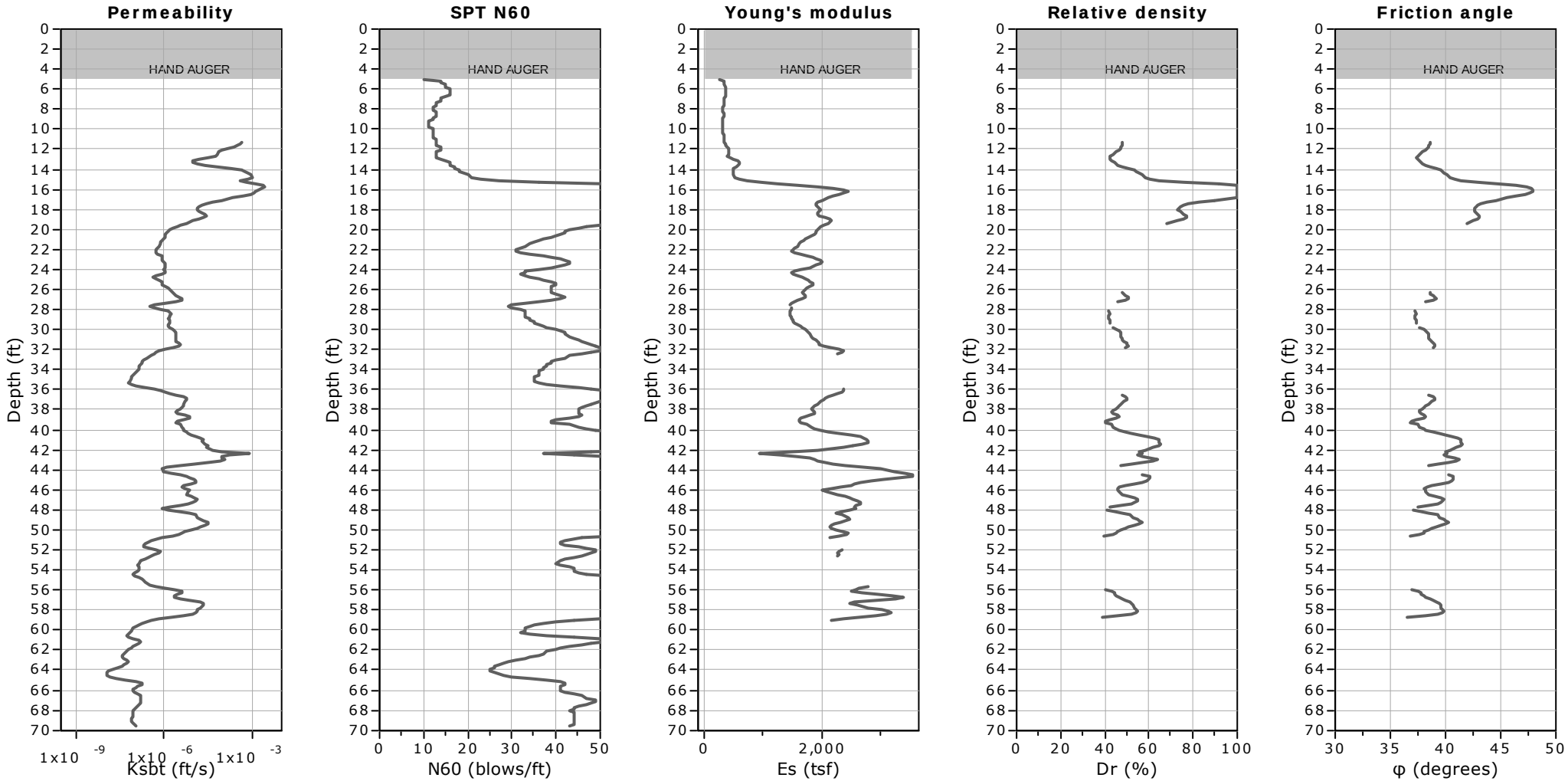
SD: Sand-like - Dilative

K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-2
Total depth: 69.55 ft, Date: 6/13/2018



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

Leighton Consulting, Inc.
Geotechnical Engineering

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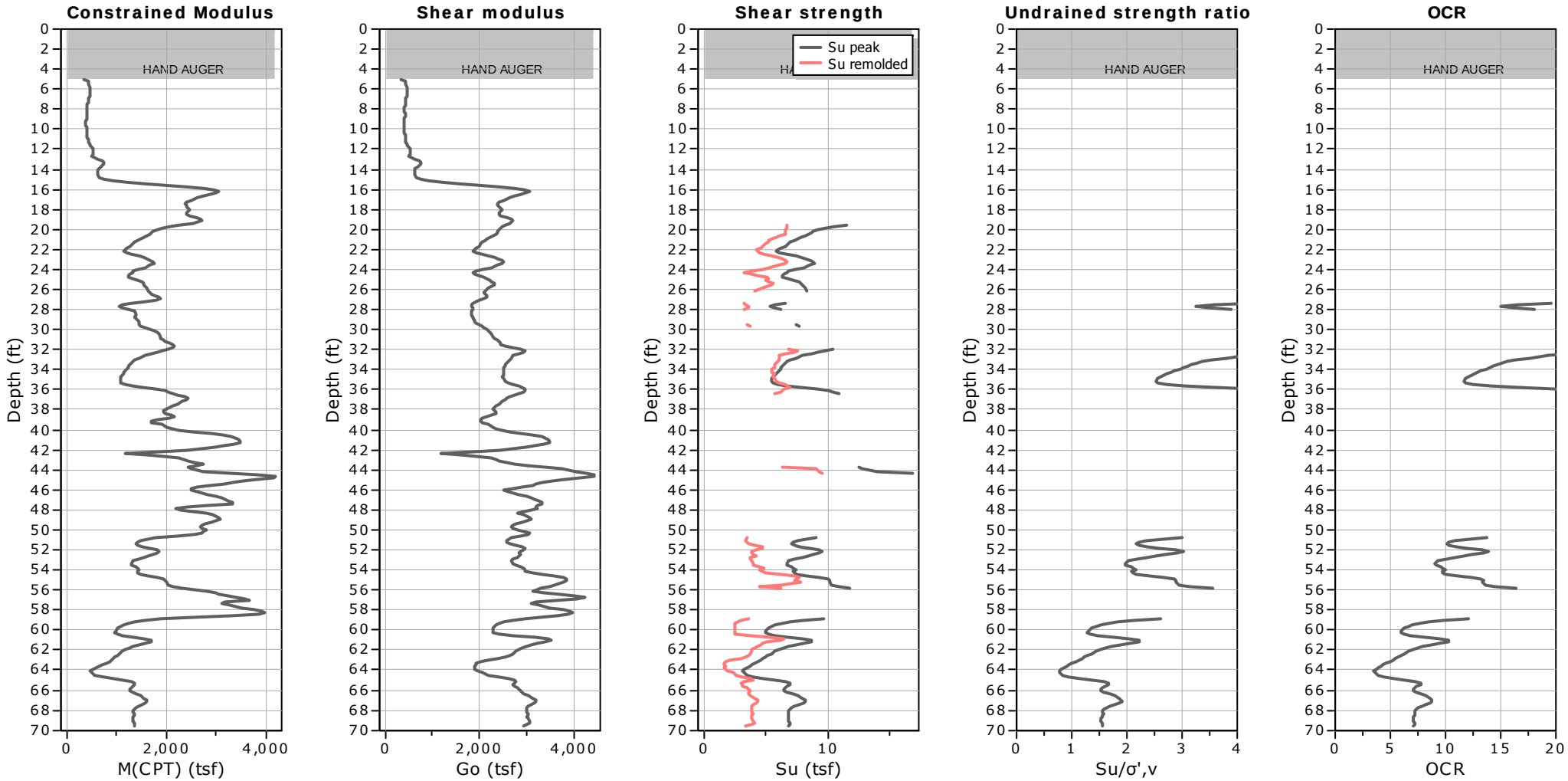
Location: **CSUF, Parking Lot E**

CPT-18-2
Total depth: 69.55 ft, Date: 6/13/2018



Calculation parameters

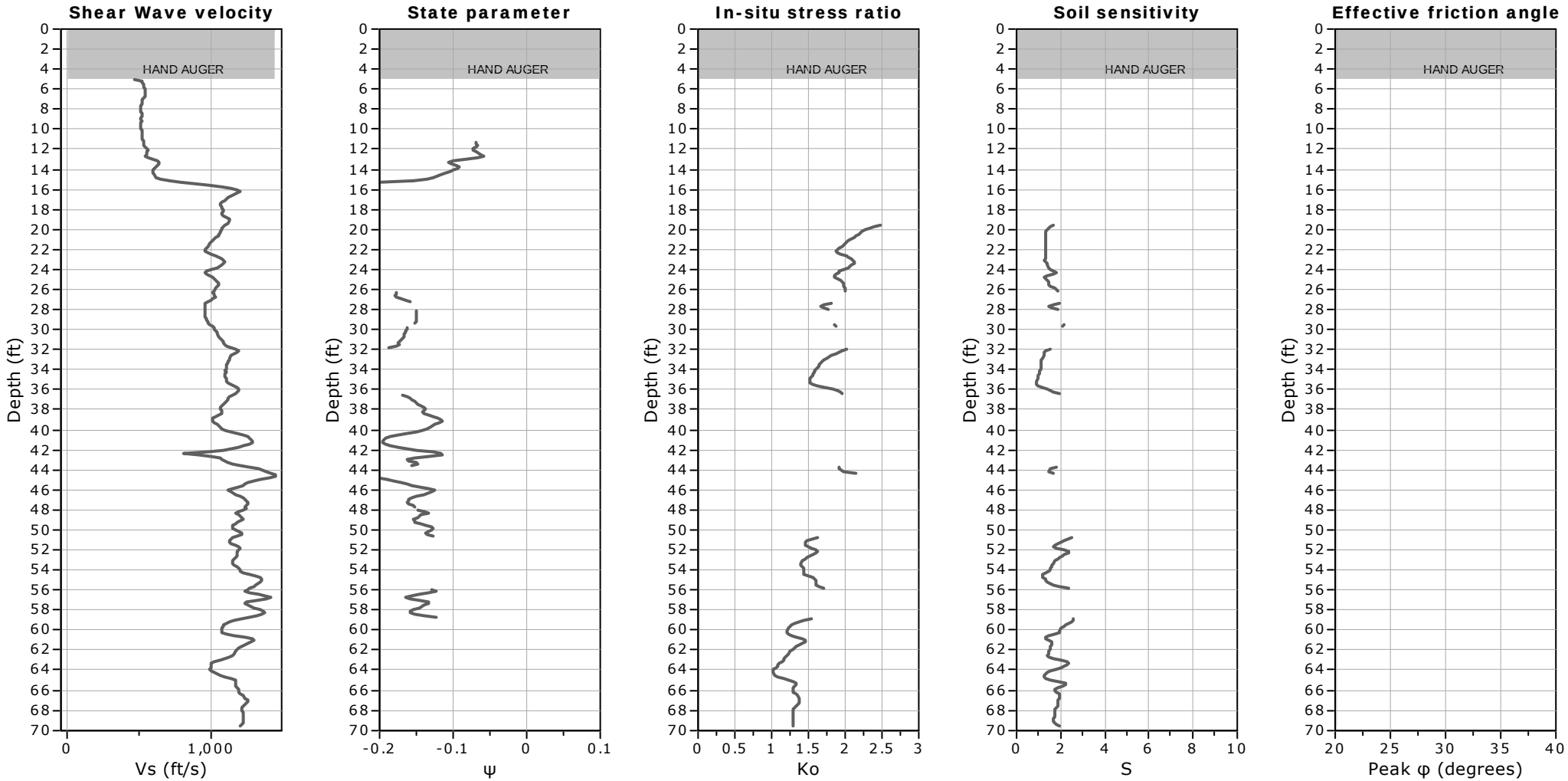
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
User defined estimation data
Flat Dilatometer Test data

Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-2
Total depth: 69.55 ft, Date: 6/13/2018



Calculation parameters

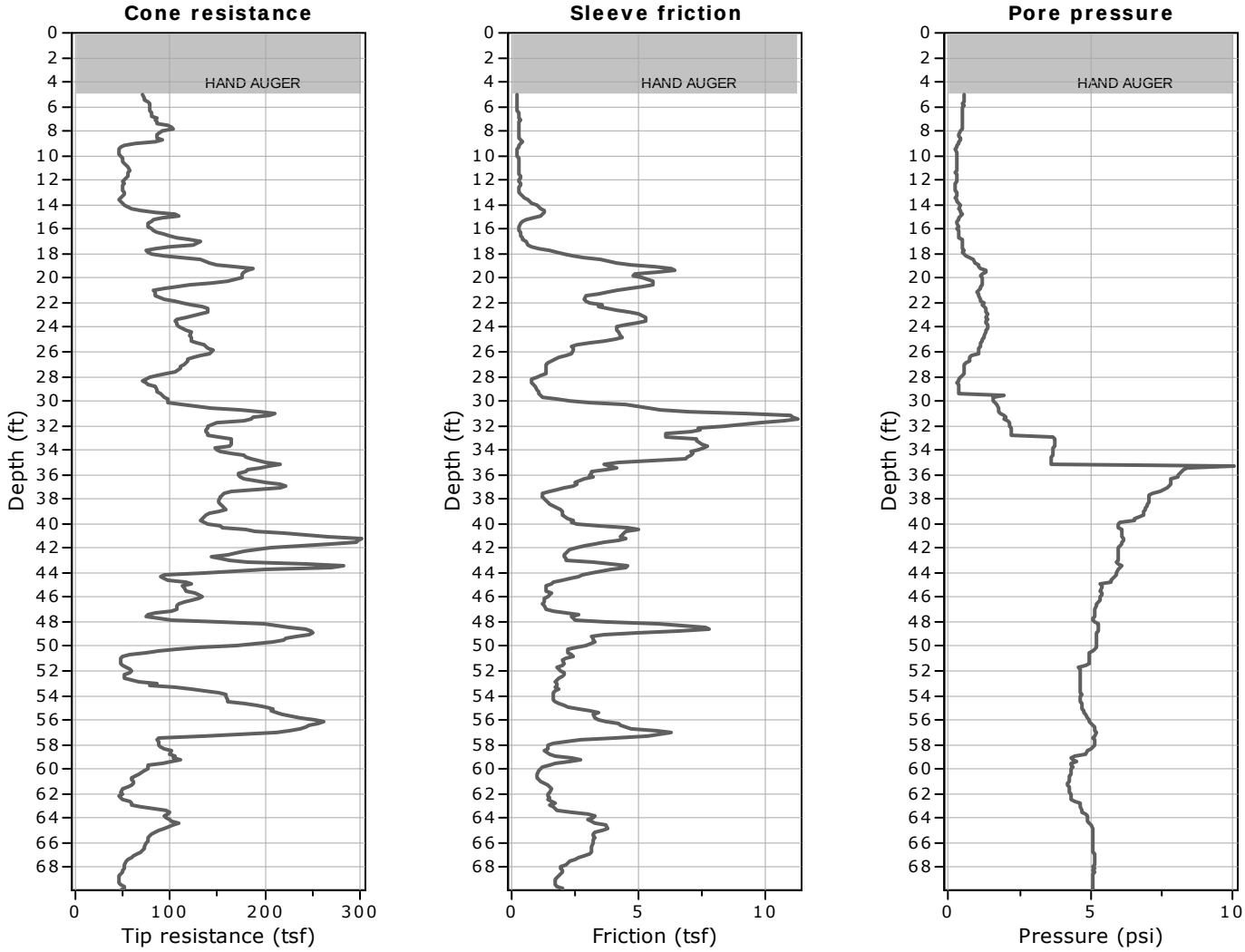
Soil Sensitivity factor, N_S: 7.00

User defined estimation data

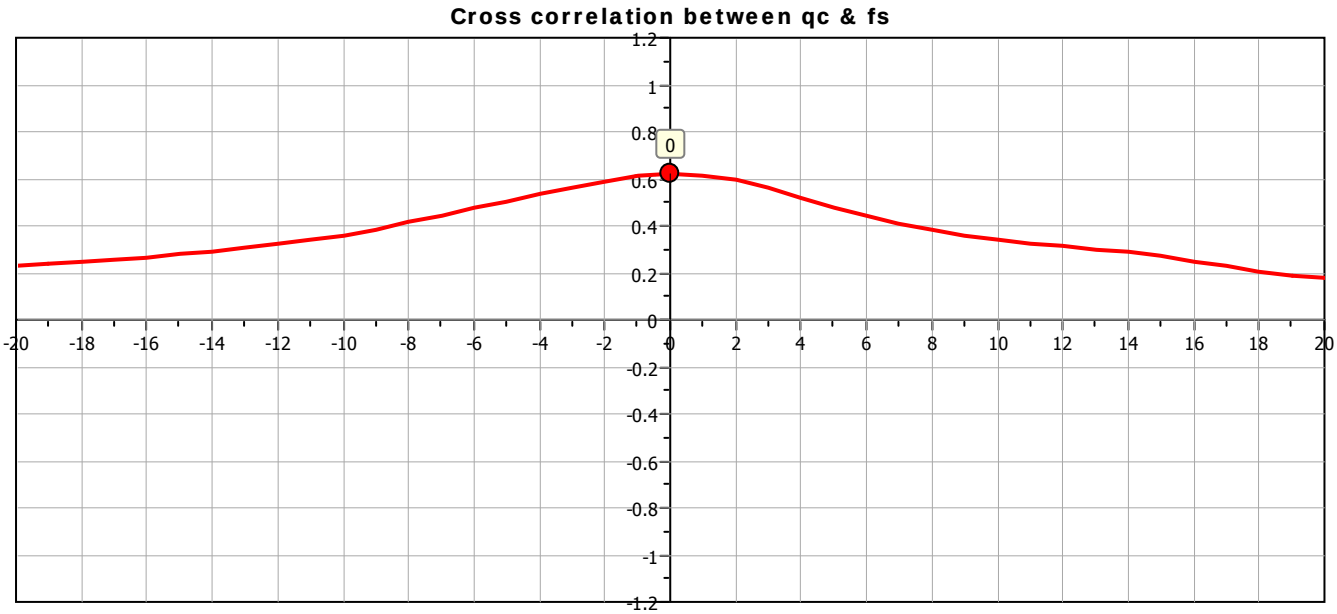
Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-3
Total depth: 69.88 ft, Date: 6/13/2018



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



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CPT-18-3
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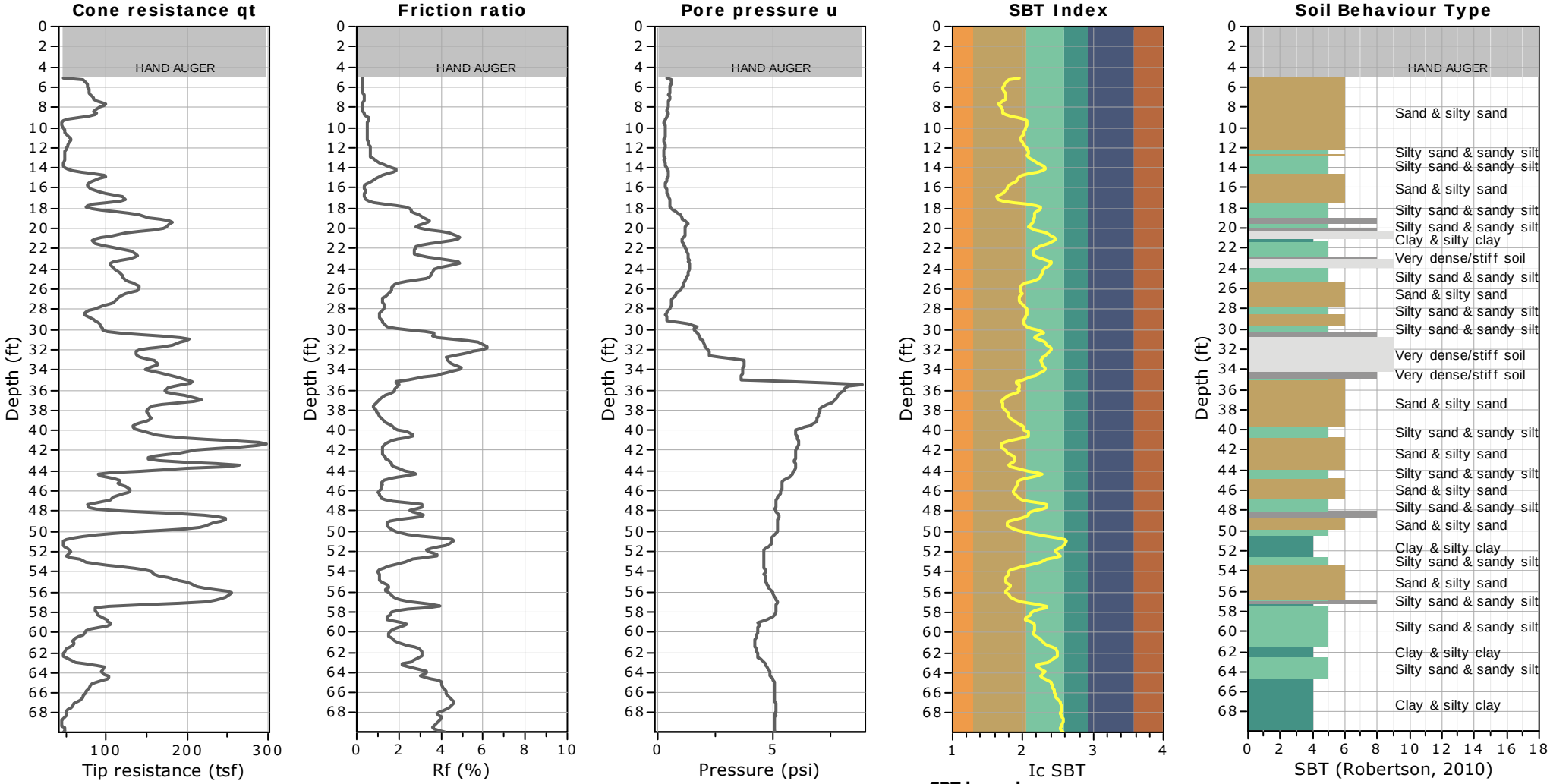

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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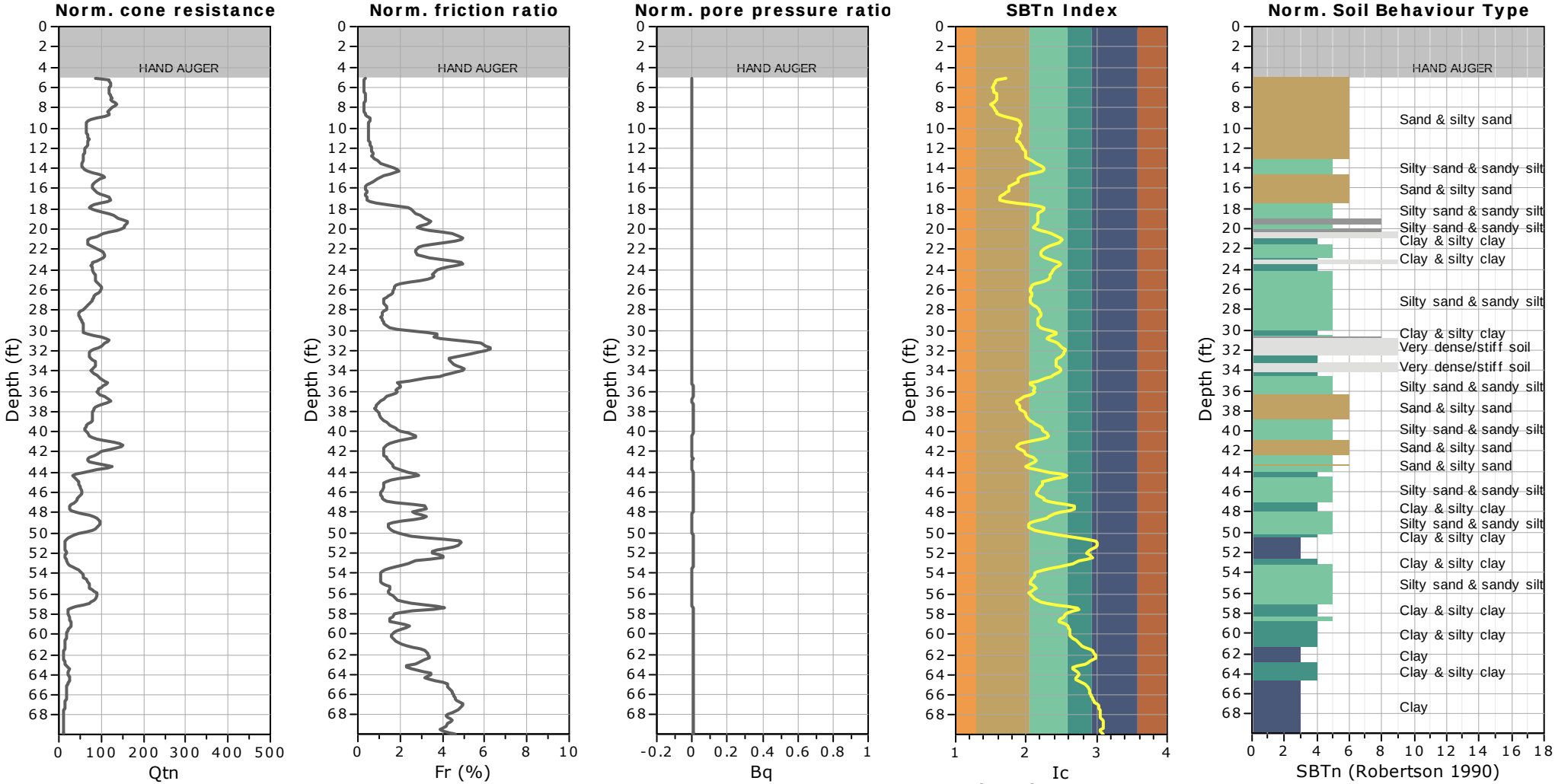

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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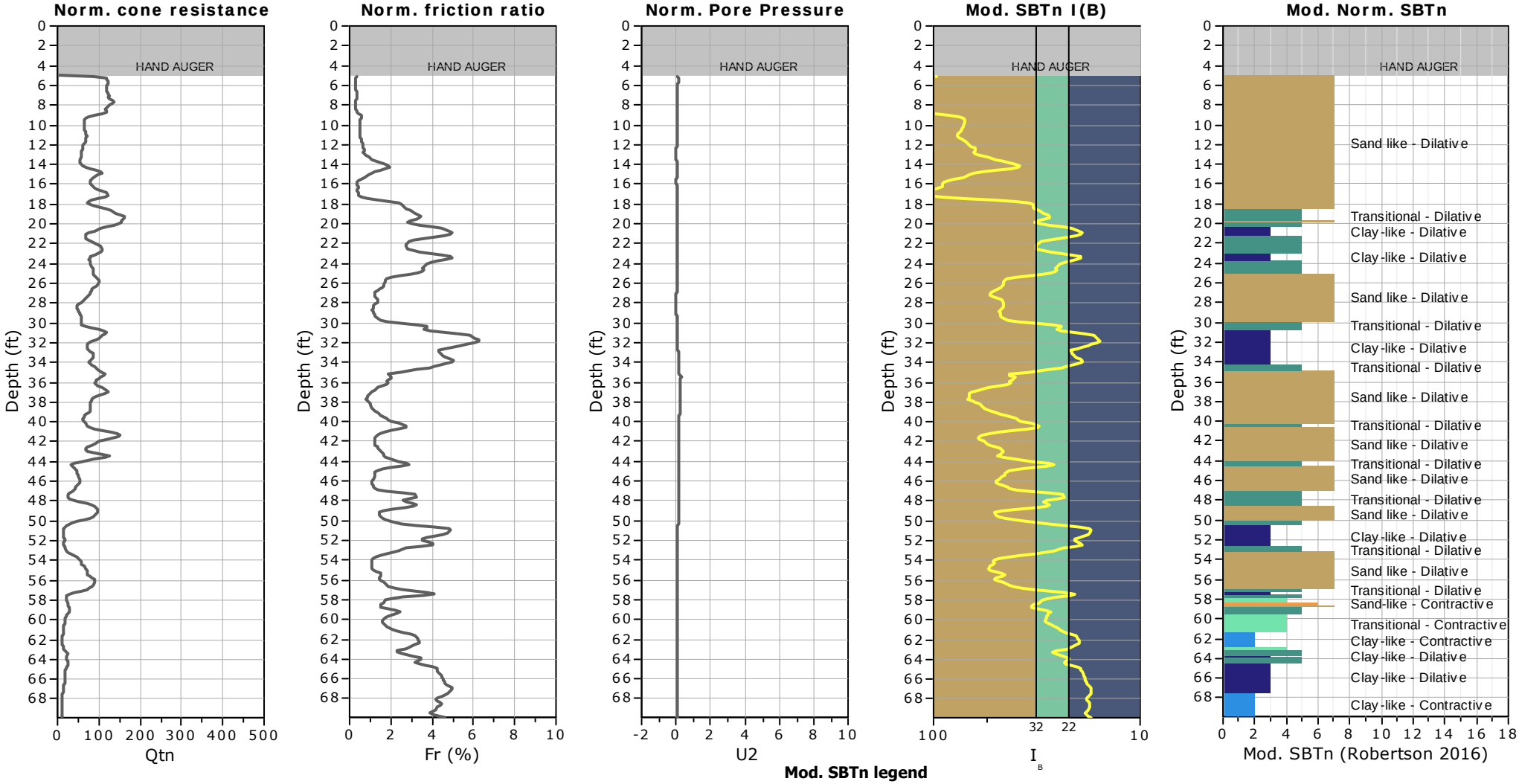
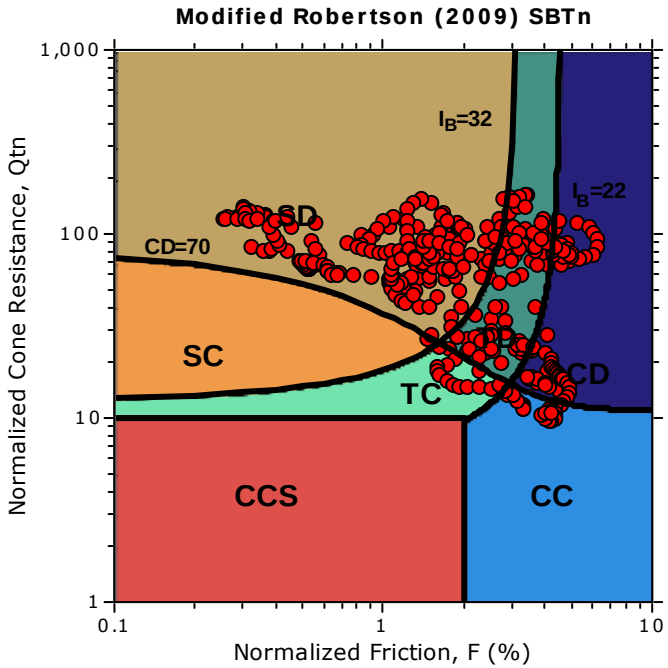
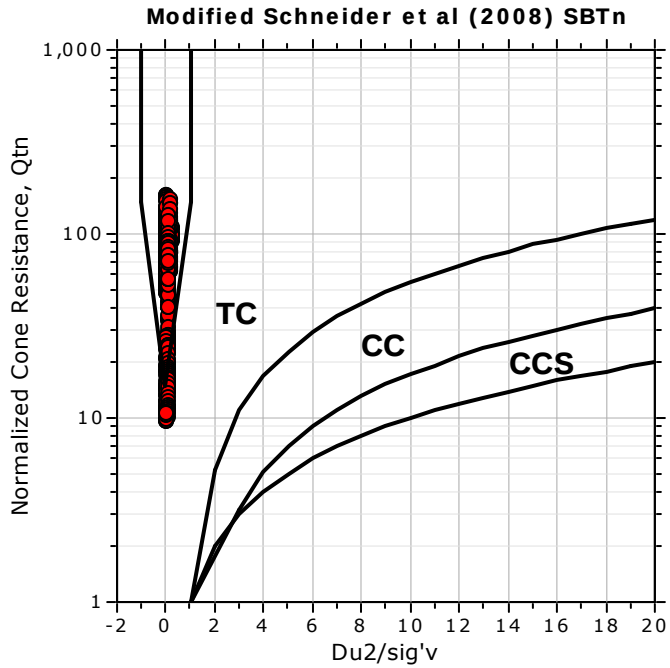


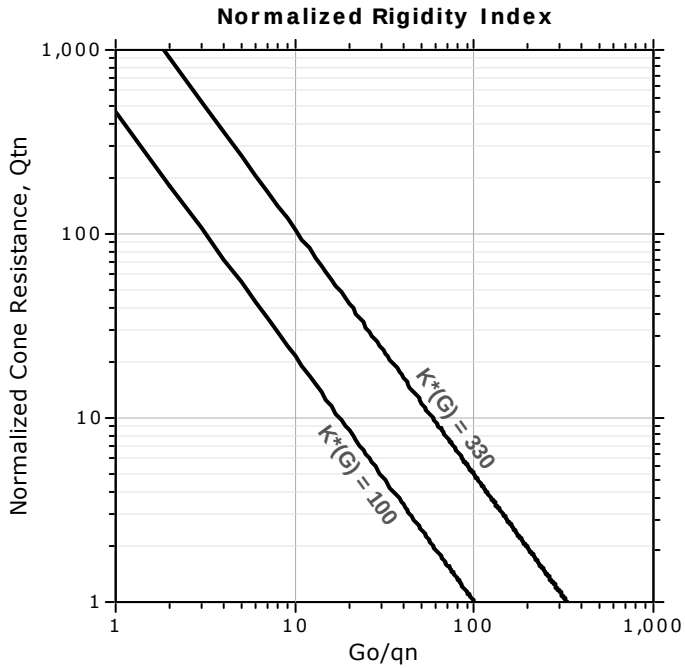
Mod. SBTn legend

1. CCS: ClayLike - Contractive, Sensitive
2. CC: Clay-like - Contractive
3. CD: Clay-Like: Dilative
4. TC: Transitional - Contractive
5. TD: Transitional - Dilative
6. SC: Sand-like - Contractive
7. SD: Sand-like - Dilative

Updated SBTn plots







CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

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Geotechnical Engineering

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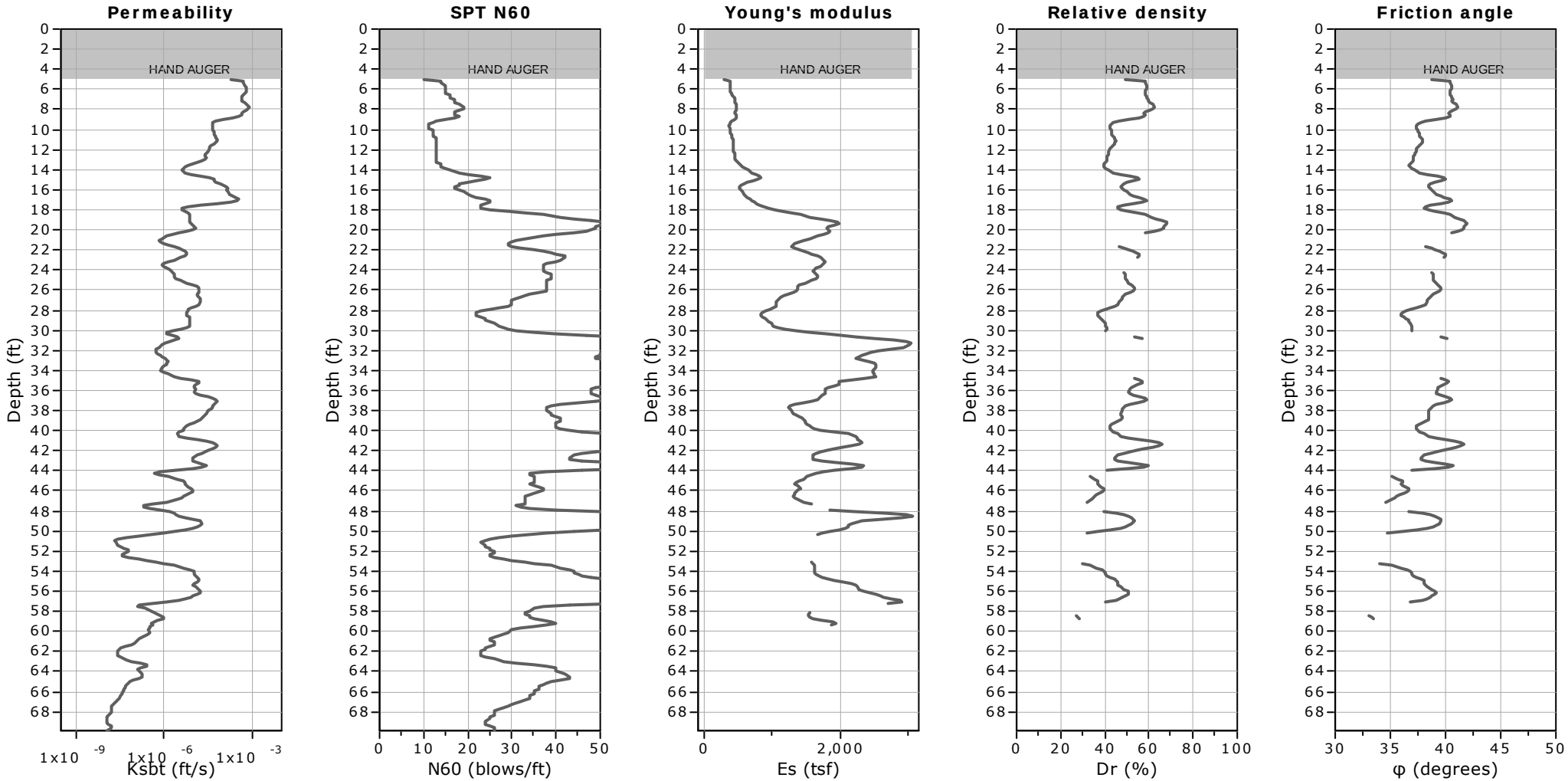
Location: **CSUF, Parking Lot E**

CPT-18-3
Total depth: 69.88 ft, Date: 6/13/2018



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

Leighton Consulting, Inc.
Geotechnical Engineering

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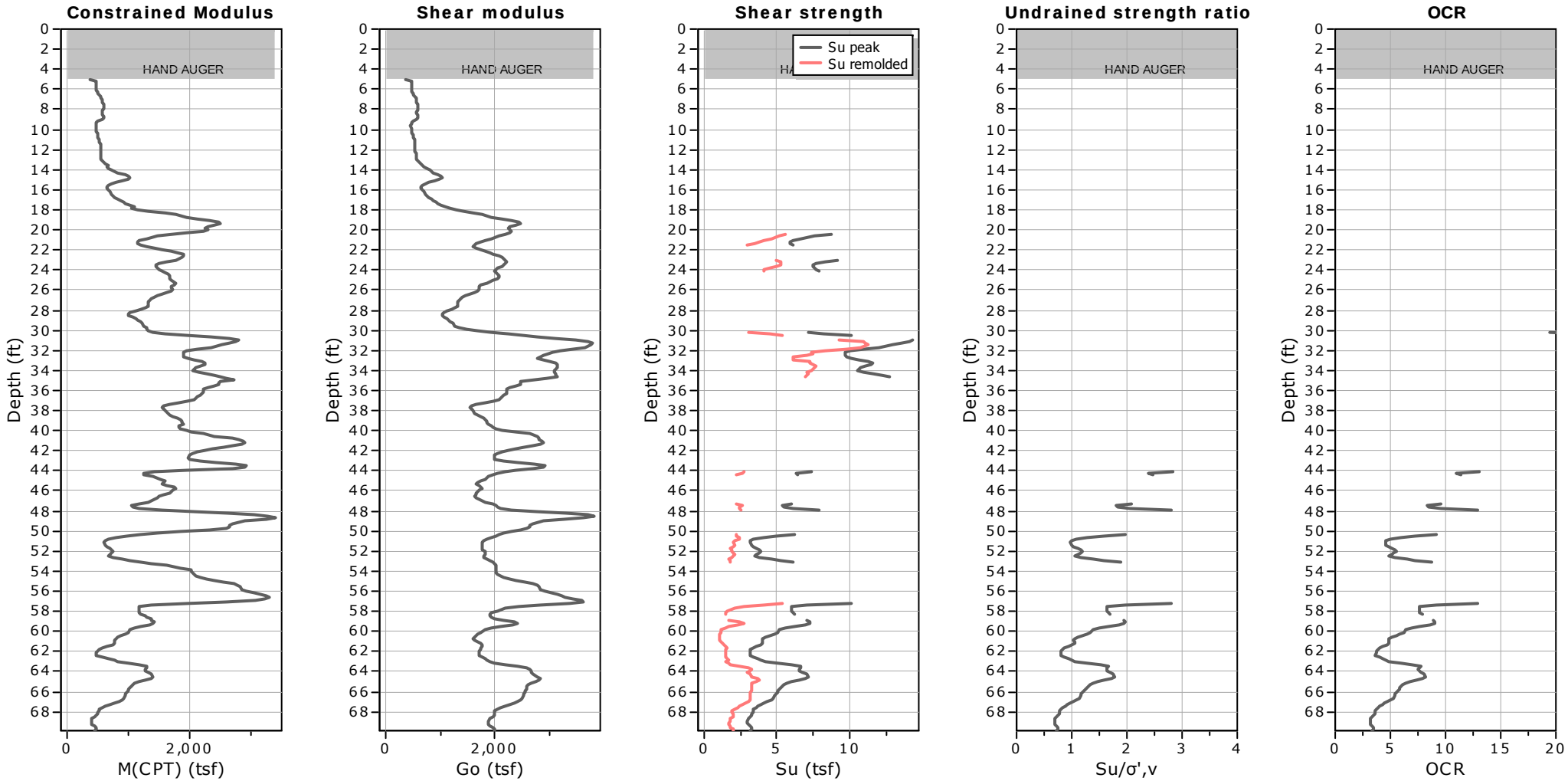
CPT-18-3
Total depth: 69.88 ft, Date: 6/13/2018



Calculation parameters

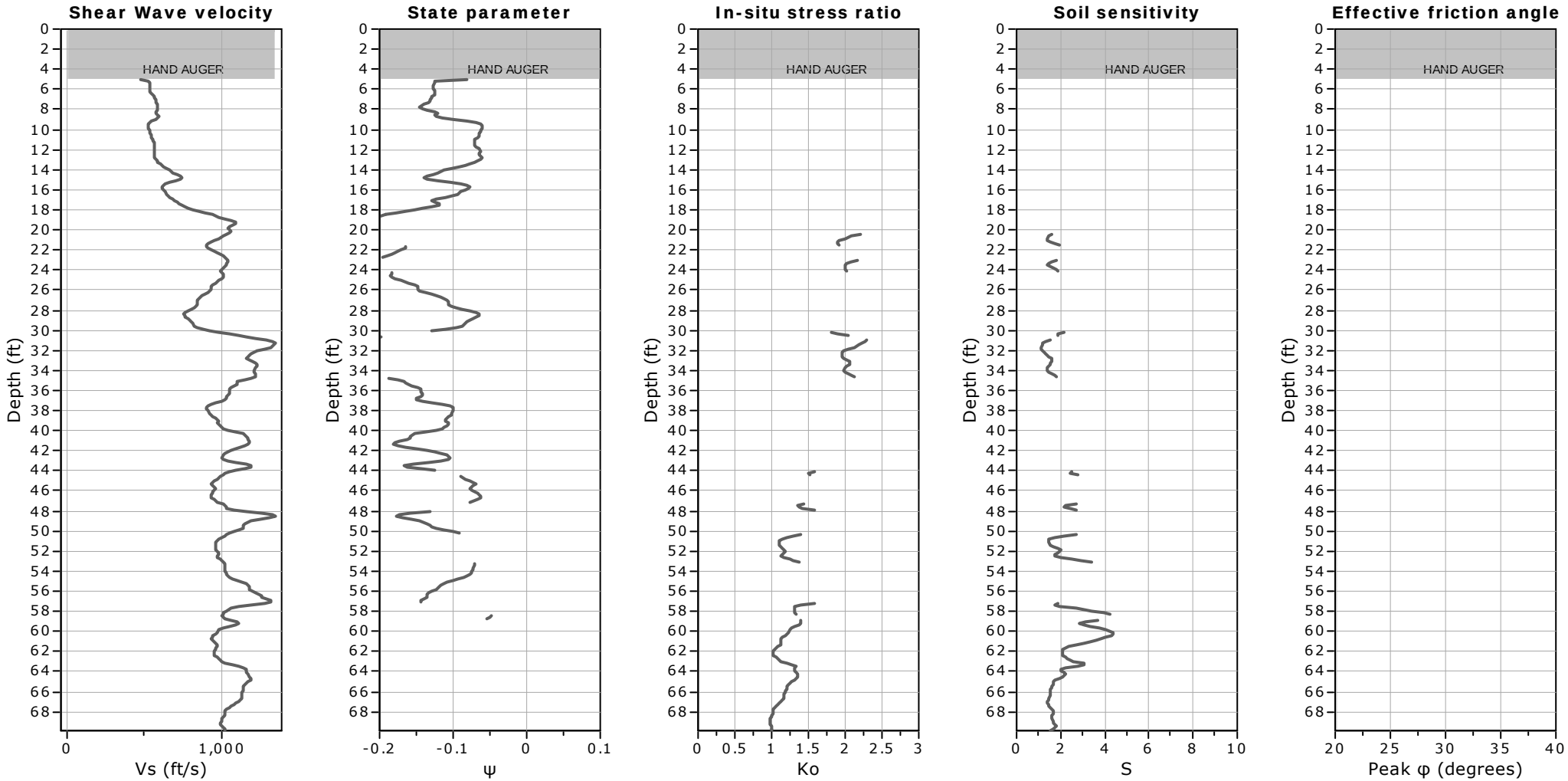
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
User defined estimation data
Flat Dilatometer Test data

Leighton Consulting, Inc.
Geotechnical Engineering

Project: **CSUF Proposed Parking Structure**
Location: **CSUF, Parking Lot E**

CPT-18-3
Total depth: 69.88 ft, Date: 6/13/2018



Calculation parameters

Soil Sensitivity factor, N_S: 7.00

User defined estimation data

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236\right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \le 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a}\right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Peak drained friction angle, φ (°) ::

$$\varphi = 17.60 + 11 \cdot \log(Q_{tn})$$

(applicable only to SBT_n: 5, 6, 7 and 8)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$

$\alpha = 14$ for $Q_{tn} > 14$

$\alpha = Q_{tn}$ for $Q_{tn} \le 14$

$M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \le 2.20$

$M_{CPT} = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho}\right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 \cdot +7 \cdot \log(F_r))}\right]^{1.25}$$ or user defined

$OCR = k_{OCR} \cdot Q_{tn}$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_O = (1 - \sin\varphi') \cdot OCR^{\sin\varphi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c_cutoff}$)

:: Effective Stress Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10 < B_q < 1.00$)

References

• Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012

• Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

A P P E N D I X

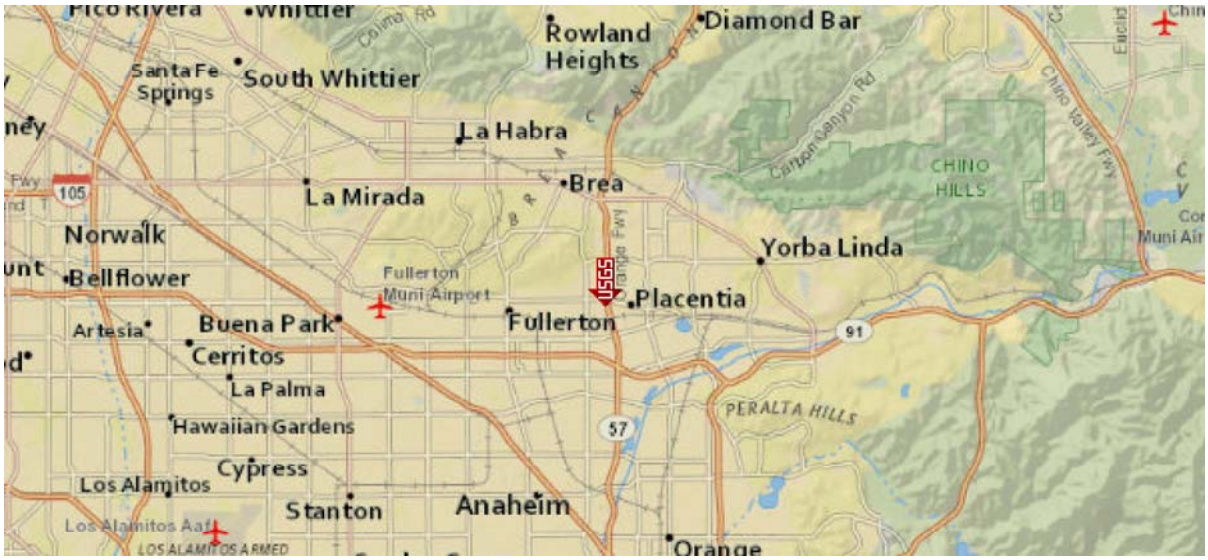
D.3

Seismic Design Parameters

USGS Design Maps Summary Report

User–Specified Input

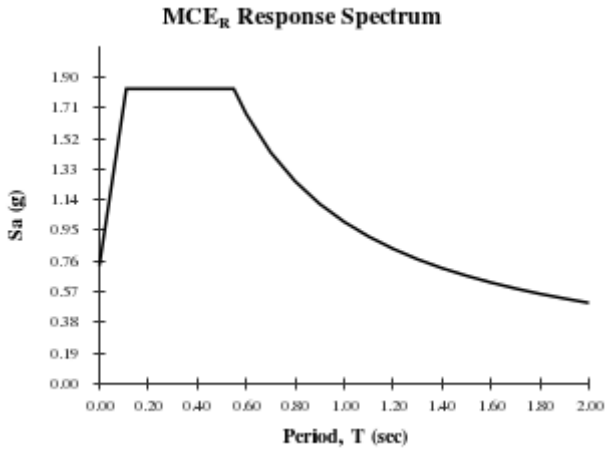
Report Title	CSUF Proposed Parking Structure Fri June 22, 2018 23:03:41 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	33.88111°N, 117.88168°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

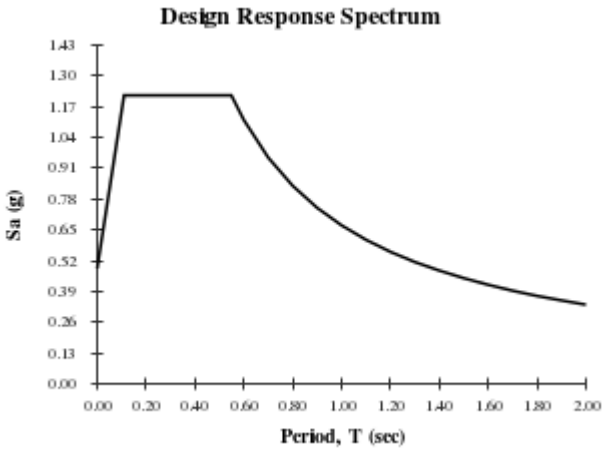


USGS–Provided Output

S_S =	1.827 g	S_{MS} =	1.827 g	S_{DS} =	1.218 g
S_1 =	0.669 g	S_{M1} =	1.003 g	S_{D1} =	0.669 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

Design Maps Detailed Report

ASCE 7-10 Standard (33.88111°N, 117.88168°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1]	S_S = 1.827 g
From Figure 22-2 [2]	S_1 = 0.669 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ **or** $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content w ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 1.827 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.669 g, F_v = 1.500

Equation (11.4–1): $S_{MS} = F_a S_S = 1.000 \times 1.827 = 1.827$ g

---

Equation (11.4–2): $S_{M1} = F_v S_1 = 1.500 \times 0.669 = 1.003$ g

---

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–3): $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 1.827 = 1.218$ g

---

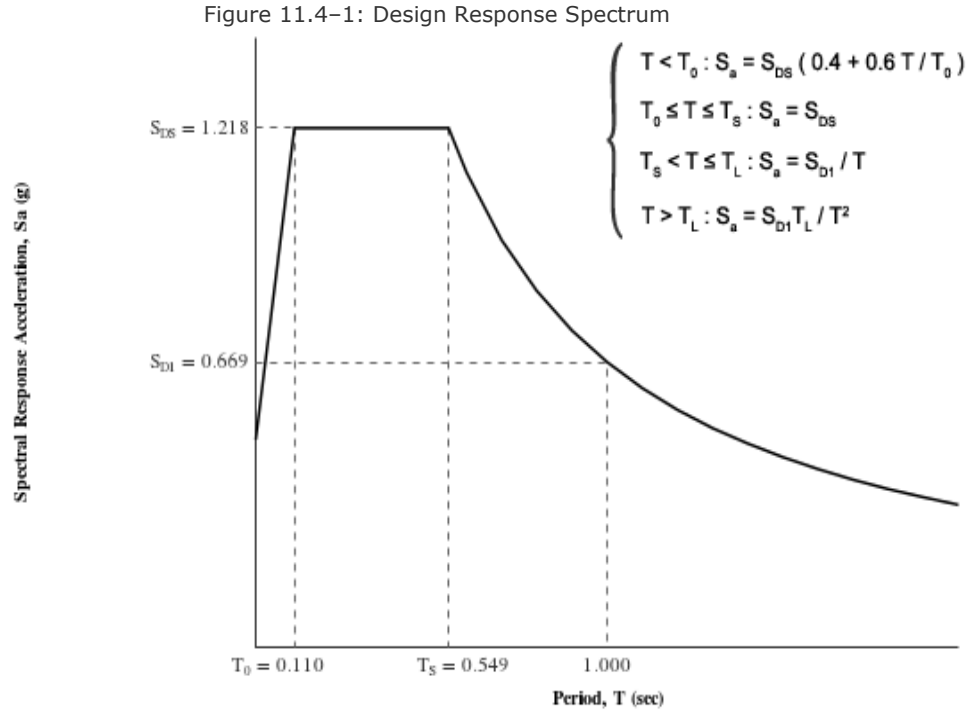
Equation (11.4–4): $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 1.003 = 0.669$ g

---

Section 11.4.5 — Design Response Spectrum

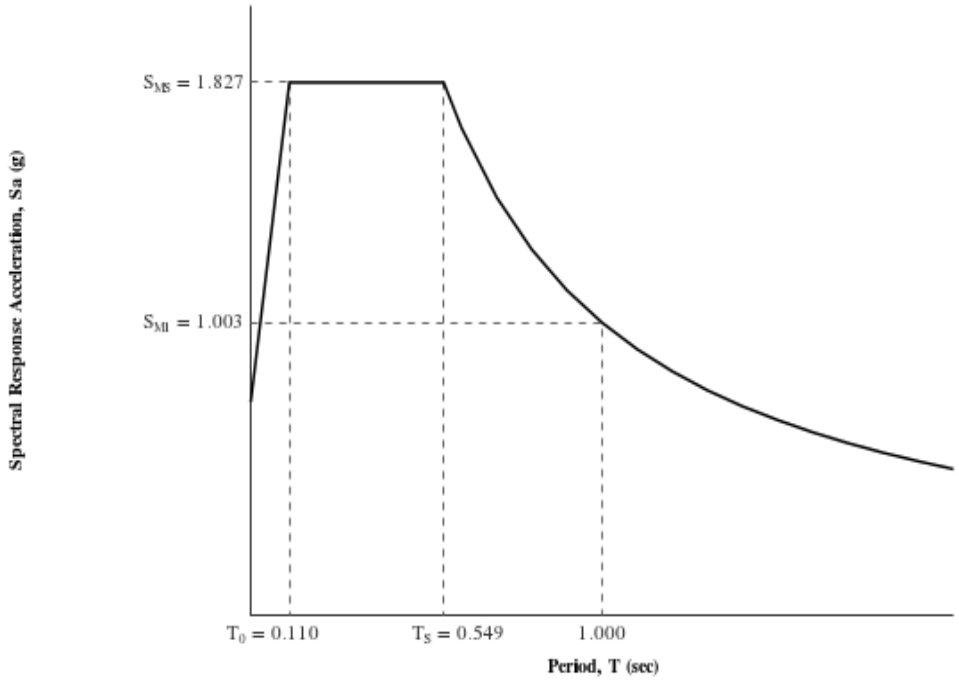
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.684

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.684 = 0.684$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.684 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.982

From Figure 22-18 [6] C_{R1} = 1.002

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	**RISK CATEGORY**		
	I or II	**III**	**IV**
S_{DS} < 0.167g	A	A	A
0.167g ≤ S_{DS} < 0.33g	B	B	C
0.33g ≤ S_{DS} < 0.50g	C	C	D
0.50g ≤ S_{DS}	D	D	D

For Risk Category = I and S_{DS} = 1.218 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	**RISK CATEGORY**		
	I or II	**III**	**IV**
S_{D1} < 0.067g	A	A	A
0.067g ≤ S_{D1} < 0.133g	B	B	C
0.133g ≤ S_{D1} < 0.20g	C	C	D
0.20g ≤ S_{D1}	D	D	D

For Risk Category = I and S_{D1} = 0.669 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2008 (v3.3.1)

Spectral Period

Peak ground acceleration

Latitude

Decimal degrees

33.8811

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-117.8817

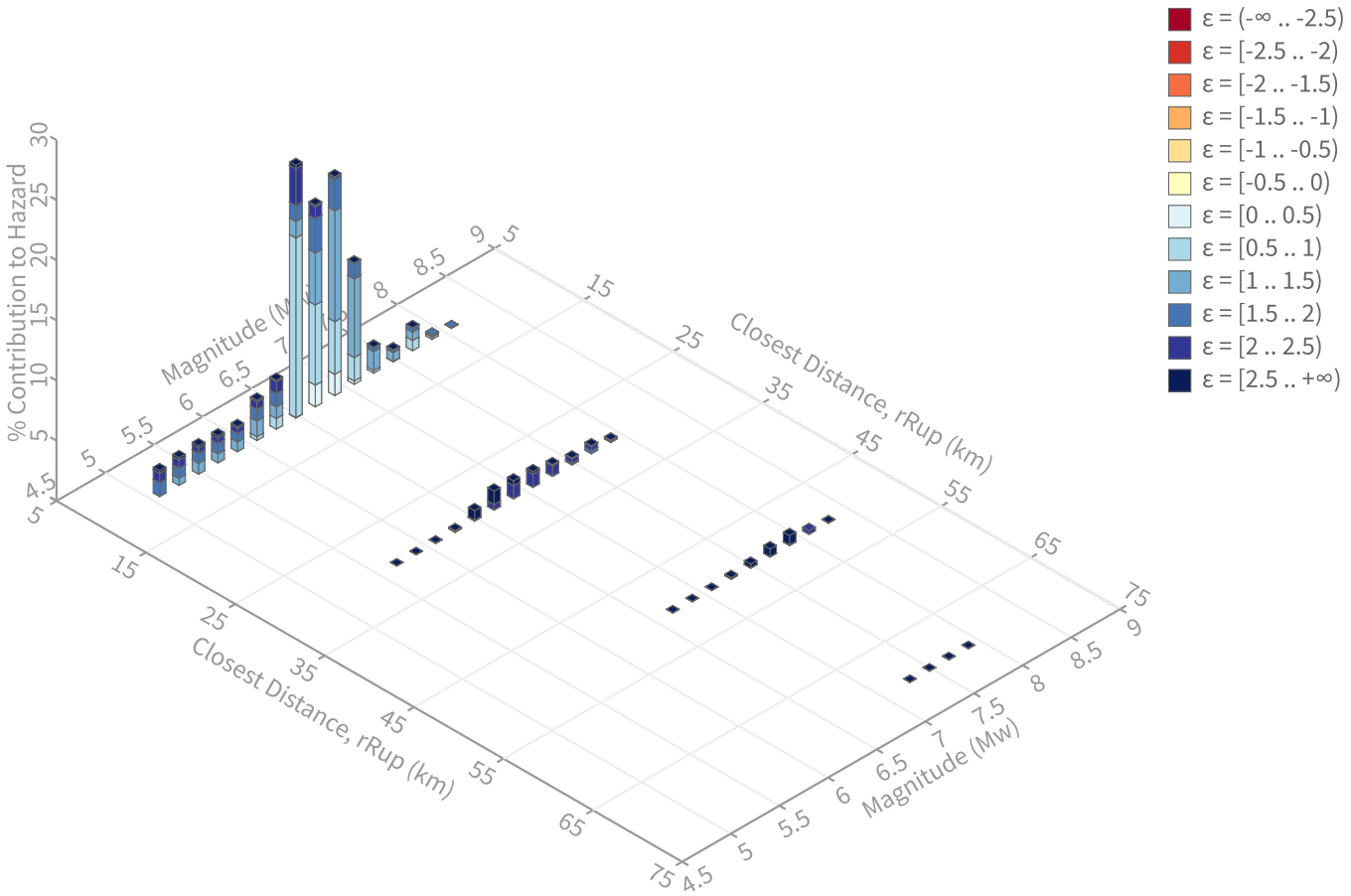
Site Class

259 m/s (Site class D)

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.68459363 g

Recovered targets

Return period: 2933.2261 yrs
Exceedance rate: 0.00034092155 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (for all sources)

r: 9.33 km
m: 6.67
ε_0: 1.34 σ

Mode (largest r-m bin)

r: 5.88 km
m: 6.53
ε_0: 0.99 σ
Contribution: 20.99 %

Mode (largest ε_0 bin)

r: 3.15 km
m: 6.54
ε_0: 0.63 σ
Contribution: 14.93 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
bFault.ch	Fault							29.47
Puente Hills (Coyote Hills)		2.95	6.69	0.58	117.867°W	33.898°N	35.69	16.93
Puente Hills		7.16	7.05	1.01	117.867°W	33.927°N	14.66	4.93
Chino - alt 1		14.27	6.53	2.07	117.708°W	33.965°N	59.60	1.54
Puente Hills (Santa Fe Springs)		14.02	6.53	2.08	118.018°W	33.931°N	293.89	1.21
Chino - alt 2		17.08	6.70	2.07	117.710°W	33.972°N	57.27	1.14
bFault.gr	Fault							19.15
Puente Hills (Coyote Hills)		3.11	6.61	0.63	117.867°W	33.898°N	35.69	11.54
Puente Hills		8.68	6.80	1.26	117.867°W	33.927°N	14.66	3.22
aFault_MoBal	Fault							16.09
Elsinore : W		6.01	6.93	1.38	117.852°W	33.930°N	26.89	11.87
aFault_aPriori_D2.1	Fault							10.88
Elsinore : W		6.01	6.95	1.37	117.852°W	33.930°N	26.89	8.04
CAmap.21.ch.in (opt)	Grid							7.29
PointSourceFinite: -117.882, 33.904		5.71	5.73	1.39	117.882°W	33.904°N	0.00	3.46
PointSourceFinite: -117.882, 33.949		8.45	5.91	1.70	117.882°W	33.949°N	0.00	1.21
CAmap.24.ch.in (opt)	Grid							7.21
PointSourceFinite: -117.882, 33.904		5.75	5.71	1.40	117.882°W	33.904°N	0.00	3.40
PointSourceFinite: -117.882, 33.949		8.45	5.91	1.70	117.882°W	33.949°N	0.00	1.21
CAmap.21.gr.in (opt)	Grid							3.57
PointSourceFinite: -117.882, 33.904		5.71	5.73	1.39	117.882°W	33.904°N	0.00	1.73
CAmap.24.gr.in (opt)	Grid							3.44
PointSourceFinite: -117.882, 33.904		5.84	5.67	1.43	117.882°W	33.904°N	0.00	1.63
aFault_unseg	Fault							2.90
Elsinore		7.20	7.46	1.28	117.852°W	33.930°N	26.89	2.85

A P P E N D I X

D.4

Pile Axial Capacity

```
==========================================================================

                  SHAFT for Windows, Version 2012.7.10

                   Serial Number :  158517381

                VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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     Path to file locations      : P:\INFOCUS PROJECTS\11501-12000\11922 CSU
Fullerton\002 Eastside Parking\Analyses\SHAFT\
     Name of input data file     : Ground Level - CIDH 24-inch.sfd
     Name of output file         : Ground Level - CIDH 24-inch.sfo
     Name of plot output file    : Ground Level - CIDH 24-inch.sfp
     Name of runtime file        : Ground Level - CIDH 24-inch.sfr


     --------------------------------------------------------------------------
                         Time and Date of Analysis
     --------------------------------------------------------------------------

          Date:  July 23, 2018     Time:  15:33:39

     11922.002 - CSUF Eastside Parking Structure - Ground Level 24" CIDH


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    7
     ------------------


     WATER TABLE DEPTH =     100.0 FT.
     -------------------



     FACTOR OF SAFETY APPLIED TO THE ULTIMATE SIDE FRICTION CAPACITY = 2.00
     ----------------------------------------------------------
     FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 2.00
     -----------------------------------------------------------


     SOIL INFORMATION
     ----------------

     LAYER NO 1----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.100E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00
```



```
       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.977E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.100E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.150E+02

     LAYER NO 2----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.977E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.150E+02


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.799E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.270E+02

     LAYER NO 3----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.799E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.350E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.270E+02


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.748E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.350E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.310E+02


     LAYER NO 4----SAND
```

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.748E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.310E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

LAYER NO 5----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.615E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.430E+02

LAYER NO 6----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.615E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.110E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.430E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.499E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00

INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.110E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.550E+02

LAYER NO 7----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.464E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.550E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.464E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.700E+02

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	2.000	FT.
DIAMETER OF BASE	=	2.000	FT.
END OF STEM TO BASE	=	0.000	FT.
ANGLE OF BELL	=	0.000	DEG.
IGNORED TOP PORTION	=	0.000	FT.
IGNORED BOTTOM PORTION	=	0.000	FT.
AREA OF ONE PERCENT STEEL	=	4.524	SQ.IN.
ELASTIC MODULUS, Ec	=	0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	=	0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

Ground Level - CIDH 24-inch

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.12	0.19	0.00	0.19	0.19	0.09	1.62
2.0	0.23	0.75	0.00	0.75	0.75	0.38	3.24
3.0	0.35	1.70	0.00	1.70	1.70	0.85	4.86
4.0	0.47	3.02	0.00	3.02	3.02	1.51	6.48
5.0	0.58	4.71	0.00	4.71	4.71	2.36	8.10
6.0	0.70	6.73	0.00	6.73	6.73	3.37	9.64
7.0	0.81	9.07	0.00	9.07	9.07	4.53	11.13
8.0	0.93	11.70	0.00	11.70	11.70	5.85	12.57
9.0	1.05	14.62	0.00	14.62	14.62	7.31	13.96
10.0	1.16	17.83	0.00	17.83	17.83	8.91	15.32
11.0	1.28	21.30	0.00	21.30	21.30	10.65	16.64
12.0	1.40	25.03	9.58	34.61	29.82	17.30	24.78
13.0	1.51	29.01	21.67	50.68	39.84	25.34	33.50
14.0	1.63	33.23	28.73	61.96	47.59	30.98	38.03
15.0	1.75	37.68	30.41	68.09	52.88	34.04	39.01
16.0	1.86	42.39	32.08	74.47	58.43	37.23	40.00
17.0	1.98	47.37	33.16	80.53	63.95	40.26	40.70
18.0	2.09	52.61	33.52	86.13	69.37	43.06	41.12
19.0	2.21	58.11	33.52	91.63	74.87	45.81	41.44
20.0	2.33	63.85	33.52	97.37	80.61	48.69	41.84
21.0	2.44	69.84	33.52	103.35	86.59	51.68	42.29
22.0	2.56	76.04	33.52	109.56	92.80	54.78	42.80
23.0	2.68	82.47	33.52	115.99	99.23	58.00	43.34
24.0	2.79	89.11	36.51	125.63	107.37	62.81	44.98
25.0	2.91	95.96	40.10	136.06	116.01	68.03	46.77
26.0	3.03	103.00	41.90	144.89	123.94	72.45	47.89
27.0	3.14	110.22	41.90	152.12	131.17	76.06	48.41
28.0	3.26	117.63	41.90	159.53	138.58	79.77	48.96
29.0	3.37	125.23	41.90	167.13	146.18	83.56	49.52
30.0	3.49	133.00	41.90	174.90	153.95	87.45	50.10
31.0	3.61	140.94	41.90	182.84	161.89	91.42	50.68
32.0	3.72	149.03	41.90	190.93	169.98	95.47	51.27
33.0	3.84	157.26	41.90	199.16	178.21	99.58	51.86
34.0	3.96	165.61	41.90	207.50	186.56	103.75	52.45
35.0	4.07	174.07	41.90	215.97	195.02	107.99	53.03
36.0	4.19	182.66	41.90	224.56	203.61	112.28	53.60
37.0	4.31	191.36	41.90	233.26	212.31	116.63	54.17
38.0	4.42	200.17	41.90	242.07	221.12	121.04	54.74
39.0	4.54	209.09	41.90	250.99	230.04	125.49	55.30
40.0	4.65	218.10	38.91	257.01	237.56	128.51	55.21
41.0	4.77	227.21	35.31	262.53	244.87	131.26	55.02
42.0	4.89	236.40	33.52	269.92	253.16	134.96	55.23
43.0	5.00	245.67	33.52	279.19	262.43	139.60	55.79
44.0	5.12	255.01	33.52	288.53	271.77	144.26	56.35
45.0	5.24	264.39	33.52	297.91	281.15	148.96	56.89
46.0	5.35	273.82	33.52	307.34	290.58	153.67	57.41
47.0	5.47	283.29	33.52	316.81	300.05	158.40	57.92
48.0	5.59	292.79	33.52	326.31	309.55	163.16	58.42
49.0	5.70	302.32	33.52	335.84	319.08	167.92	58.90
50.0	5.82	311.87	33.52	345.39	328.63	172.70	59.36
51.0	5.93	321.45	33.52	354.97	338.21	177.48	59.81
52.0	6.05	331.03	46.80	377.83	354.43	188.92	62.44
53.0	6.17	340.63	62.73	403.36	371.99	201.68	65.40
54.0	6.28	350.23	70.69	420.92	385.58	210.46	66.98
55.0	6.40	359.83	70.69	430.52	395.18	215.26	67.27
56.0	6.52	367.12	70.69	437.81	402.46	218.91	67.18
57.0	6.63	374.40	70.69	445.10	409.75	222.55	67.10
58.0	6.75	381.69	70.69	452.38	417.04	226.19	67.02
59.0	6.87	388.97	70.69	459.67	424.32	229.83	66.95
60.0	6.98	396.26	70.69	466.96	431.61	233.48	66.88

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1137E+00	0.6130E-04	0.2327E-02	0.1000E-04
0.5683E+00	0.3065E-03	0.1164E-01	0.5000E-04
0.1137E+01	0.6130E-03	0.2327E-01	0.1000E-03
0.5769E+02	0.3096E-01	0.1164E+01	0.5000E-02
0.8526E+02	0.4631E-01	0.1745E+01	0.7500E-02
0.1110E+03	0.6120E-01	0.2327E+01	0.1000E-01
0.2208E+03	0.1353E+00	0.5818E+01	0.2500E-01
0.3051E+03	0.2112E+00	0.1164E+02	0.5000E-01
0.3489E+03	0.2647E+00	0.1745E+02	0.7500E-01
0.3744E+03	0.3068E+00	0.2327E+02	0.1000E+00
0.4170E+03	0.4888E+00	0.4041E+02	0.2500E+00
0.4285E+03	0.7494E+00	0.5629E+02	0.5000E+00
0.4337E+03	0.8791E+00	0.6167E+02	0.6250E+00
0.4362E+03	0.1038E+01	0.6453E+02	0.7812E+00
0.4395E+03	0.1460E+01	0.6857E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1901E+00	0.9123E-04	0.3476E-02	0.1000E-04
0.9506E+00	0.4562E-03	0.1738E-01	0.5000E-04
0.1901E+01	0.9123E-03	0.3476E-01	0.1000E-03
0.9553E+02	0.4617E-01	0.1738E+01	0.5000E-02
0.1375E+03	0.6820E-01	0.2607E+01	0.7500E-02
0.1735E+03	0.8874E-01	0.3476E+01	0.1000E-01
0.3035E+03	0.1799E+00	0.8690E+01	0.2500E-01
0.3771E+03	0.2548E+00	0.1738E+02	0.5000E-01
0.4054E+03	0.3007E+00	0.2607E+02	0.7500E-01
0.4227E+03	0.3393E+00	0.3476E+02	0.1000E+00
0.4463E+03	0.5094E+00	0.5367E+02	0.2500E+00
0.4546E+03	0.7669E+00	0.6492E+02	0.5000E+00
0.4579E+03	0.8948E+00	0.6816E+02	0.6250E+00
0.4593E+03	0.1052E+01	0.6955E+02	0.7812E+00
0.4601E+03	0.1472E+01	0.7034E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.5844E-01	0.3795E-04	0.1178E-02	0.1000E-04
0.2922E+00	0.1897E-03	0.5891E-02	0.5000E-04
0.5844E+00	0.3795E-03	0.1178E-01	0.1000E-03
0.2946E+02	0.1904E-01	0.5891E+00	0.5000E-02
0.4427E+02	0.2862E-01	0.8837E+00	0.7500E-02
0.5876E+02	0.3814E-01	0.1178E+01	0.1000E-01
0.1341E+03	0.9130E-01	0.2946E+01	0.2500E-01
0.2210E+03	0.1633E+00	0.5891E+01	0.5000E-01
0.2791E+03	0.2214E+00	0.8837E+01	0.7500E-01
0.3185E+03	0.2702E+00	0.1178E+02	0.1000E+00
0.3878E+03	0.4681E+00	0.2716E+02	0.2500E+00
0.4024E+03	0.7319E+00	0.4766E+02	0.5000E+00

Ground Level - CIDH 24-inch

0.4095E+03	0.8633E+00	0.5517E+02	0.6250E+00
0.4131E+03	0.1023E+01	0.5941E+02	0.7812E+00
0.4187E+03	0.1447E+01	0.6645E+02	0.1200E+01

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==========================================================================

                  SHAFT for Windows, Version 2012.7.10

                   Serial Number :  158517381

                VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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     Path to file locations      : P:\INFOCUS PROJECTS\11501-12000\11922 CSU
Fullerton\002 Eastside Parking\Analyses\SHAFT\
     Name of input data file     : Ground Level - CIDH 36-inch.sfd
     Name of output file         : Ground Level - CIDH 36-inch.sfo
     Name of plot output file    : Ground Level - CIDH 36-inch.sfp
     Name of runtime file        : Ground Level - CIDH 36-inch.sfr


     --------------------------------------------------------------------------
                         Time and Date of Analysis
     --------------------------------------------------------------------------

               Date:  July 23, 2018     Time:  15:41:51

     11922.002 - CSUF Eastside Parking Structure - Ground Level 36" CIDH


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    7
     ------------------


     WATER TABLE DEPTH =     100.0 FT.
     -------------------



     FACTOR OF SAFETY APPLIED TO THE ULTIMATE SIDE FRICTION CAPACITY = 2.00
     ----------------------------------------------------------
     FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 2.00
     -----------------------------------------------------------


     SOIL INFORMATION
     ----------------

     LAYER NO 1----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.100E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00
```



```
       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.977E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.100E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.150E+02

     LAYER NO 2----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.977E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.150E+02


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.799E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.270E+02

     LAYER NO 3----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.799E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.350E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.270E+02


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.748E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.350E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.310E+02


     LAYER NO 4----SAND
```

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.748E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.310E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

LAYER NO 5----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.615E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.430E+02

LAYER NO 6----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.615E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.110E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.430E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.499E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00

INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.110E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.550E+02

LAYER NO 7----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.464E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.550E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.464E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.700E+02

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	3.000	FT.
DIAMETER OF BASE	=	3.000	FT.
END OF STEM TO BASE	=	0.000	FT.
ANGLE OF BELL	=	0.000	DEG.
IGNORED TOP PORTION	=	0.000	FT.
IGNORED BOTTOM PORTION	=	0.000	FT.
AREA OF ONE PERCENT STEEL	=	10.180	SQ.IN.
ELASTIC MODULUS, Ec	=	0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	=	0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

Ground Level - CIDH 36-inch

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.26	0.28	0.00	0.28	0.28	0.14	1.08
2.0	0.52	1.13	0.00	1.13	1.13	0.57	2.16
3.0	0.79	2.55	0.00	2.55	2.55	1.27	3.24
4.0	1.05	4.52	0.00	4.52	4.52	2.26	4.32
5.0	1.31	7.07	0.00	7.07	7.07	3.53	5.40
6.0	1.57	10.10	0.00	10.10	10.10	5.05	6.43
7.0	1.83	13.60	0.00	13.60	13.60	6.80	7.42
8.0	2.09	17.55	0.00	17.55	17.55	8.77	8.38
9.0	2.36	21.94	0.00	21.94	21.94	10.97	9.31
10.0	2.62	26.74	8.53	35.27	31.01	17.64	13.47
11.0	2.88	31.95	18.82	50.76	41.36	25.38	17.63
12.0	3.14	37.54	30.93	68.47	53.01	34.24	21.79
13.0	3.40	43.51	40.07	83.58	63.55	41.79	24.56
14.0	3.67	49.84	46.01	95.86	72.85	47.93	26.15
15.0	3.93	56.52	48.53	105.05	80.78	52.52	26.75
16.0	4.19	63.58	51.04	114.62	89.10	57.31	27.36
17.0	4.45	71.05	53.55	124.60	97.83	62.30	27.99
18.0	4.71	78.91	56.07	134.98	106.95	67.49	28.64
19.0	4.97	87.16	58.58	145.74	116.45	72.87	29.30
20.0	5.24	95.78	61.10	156.88	126.33	78.44	29.96
21.0	5.50	104.75	63.61	168.36	136.56	84.18	30.62
22.0	5.76	114.07	69.86	183.92	148.99	91.96	31.93
23.0	6.02	123.71	76.77	200.48	162.10	100.24	33.29
24.0	6.28	133.67	84.37	218.04	175.85	109.02	34.70
25.0	6.55	143.94	89.87	233.81	188.87	116.90	35.72
26.0	6.81	154.49	93.13	247.62	201.06	123.81	36.37
27.0	7.07	165.33	93.99	259.32	212.32	129.66	36.68
28.0	7.33	176.45	94.27	270.72	223.59	135.36	36.93
29.0	7.59	187.84	94.27	282.12	234.98	141.06	37.15
30.0	7.86	199.50	94.27	293.77	246.64	146.89	37.40
31.0	8.12	211.41	94.27	305.69	258.55	152.84	37.66
32.0	8.38	223.55	94.27	317.82	270.69	158.91	37.93
33.0	8.64	235.89	94.27	330.16	283.02	165.08	38.21
34.0	8.90	248.41	94.27	342.68	295.55	171.34	38.49
35.0	9.16	261.11	94.27	355.38	308.25	177.69	38.78
36.0	9.43	273.99	94.27	368.26	321.12	184.13	39.07
37.0	9.69	287.04	94.27	381.31	334.18	190.66	39.36
38.0	9.95	300.26	90.27	390.53	345.40	195.27	39.25
39.0	10.21	313.64	85.70	399.34	356.49	199.67	39.11
40.0	10.47	327.16	80.56	407.72	367.44	203.86	38.93
41.0	10.74	340.82	77.13	417.95	379.38	208.97	38.93
42.0	11.00	354.60	75.42	430.02	392.31	215.01	39.10
43.0	11.26	368.51	75.42	443.93	406.22	221.96	39.43
44.0	11.52	382.51	75.42	457.93	420.22	228.97	39.75
45.0	11.78	396.59	75.42	472.01	434.30	236.00	40.06
46.0	12.04	410.73	75.42	486.15	448.44	243.08	40.36
47.0	12.31	424.94	75.42	500.35	462.64	250.18	40.66
48.0	12.57	439.19	75.42	514.60	476.90	257.30	40.95
49.0	12.83	453.48	75.42	528.90	491.19	264.45	41.22
50.0	13.09	467.81	93.16	560.97	514.39	280.49	42.85
51.0	13.35	482.17	113.44	595.61	538.89	297.80	44.60
52.0	13.62	496.55	136.25	632.80	564.68	316.40	46.48
53.0	13.88	510.94	151.46	662.40	586.67	331.20	47.73
54.0	14.14	525.34	159.06	684.41	604.88	342.20	48.41
55.0	14.40	539.74	159.06	698.81	619.28	349.40	48.53
56.0	14.66	550.67	159.06	709.74	630.20	354.87	48.40
57.0	14.92	561.60	159.06	720.67	641.13	360.33	48.29
58.0	15.19	572.53	159.06	731.60	652.06	365.80	48.17
59.0	15.45	583.46	159.06	742.52	662.99	371.26	48.07
60.0	15.71	594.39	159.06	753.45	673.92	376.73	47.96

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.8310E-01	0.2879E-04	0.3491E-02	0.1000E-04
0.4155E+00	0.1439E-03	0.1745E-01	0.5000E-04
0.8310E+00	0.2879E-03	0.3491E-01	0.1000E-03
0.4167E+02	0.1440E-01	0.1745E+01	0.5000E-02
0.6270E+02	0.2164E-01	0.2618E+01	0.7500E-02
0.8370E+02	0.2888E-01	0.3491E+01	0.1000E-01
0.2036E+03	0.7171E-01	0.8726E+01	0.2500E-01
0.3428E+03	0.1310E+00	0.1745E+02	0.5000E-01
0.4305E+03	0.1795E+00	0.2618E+02	0.7500E-01
0.4897E+03	0.2210E+00	0.3491E+02	0.1000E+00
0.6297E+03	0.4119E+00	0.7304E+02	0.2500E+00
0.6697E+03	0.6766E+00	0.1064E+03	0.5000E+00
0.6782E+03	0.8051E+00	0.1175E+03	0.6250E+00
0.6957E+03	0.1087E+01	0.1376E+03	0.9000E+00
0.7108E+03	0.1993E+01	0.1543E+03	0.1800E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1263E+00	0.3772E-04	0.5214E-02	0.1000E-04
0.6314E+00	0.1886E-03	0.2607E-01	0.5000E-04
0.1263E+01	0.3772E-03	0.5214E-01	0.1000E-03
0.6361E+02	0.1892E-01	0.2607E+01	0.5000E-02
0.9567E+02	0.2843E-01	0.3910E+01	0.7500E-02
0.1277E+03	0.3794E-01	0.5214E+01	0.1000E-01
0.3001E+03	0.9291E-01	0.1303E+02	0.2500E-01
0.4686E+03	0.1615E+00	0.2607E+02	0.5000E-01
0.5551E+03	0.2116E+00	0.3910E+02	0.7500E-01
0.6022E+03	0.2510E+00	0.5214E+02	0.1000E+00
0.6932E+03	0.4323E+00	0.1037E+03	0.2500E+00
0.7205E+03	0.6930E+00	0.1329E+03	0.5000E+00
0.7264E+03	0.8204E+00	0.1406E+03	0.6250E+00
0.7373E+03	0.1100E+01	0.1527E+03	0.9000E+00
0.7428E+03	0.2002E+01	0.1583E+03	0.1800E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.4741E-01	0.2099E-04	0.1767E-02	0.1000E-04
0.2370E+00	0.1050E-03	0.8837E-02	0.5000E-04
0.4741E+00	0.2099E-03	0.1767E-01	0.1000E-03
0.2370E+02	0.1050E-01	0.8837E+00	0.5000E-02
0.3559E+02	0.1575E-01	0.1326E+01	0.7500E-02
0.4754E+02	0.2101E-01	0.1767E+01	0.1000E-01
0.1184E+03	0.5253E-01	0.4418E+01	0.2500E-01
0.2174E+03	0.1012E+00	0.8837E+01	0.5000E-01
0.2983E+03	0.1463E+00	0.1326E+02	0.7500E-01
0.3625E+03	0.1876E+00	0.1767E+02	0.1000E+00
0.5643E+03	0.3910E+00	0.4233E+02	0.2500E+00
0.6181E+03	0.6599E+00	0.7989E+02	0.5000E+00

Ground Level - CIDH 36-inch

0.6289E+03	0.7894E+00	0.9453E+02	0.6250E+00
0.6542E+03	0.1075E+01	0.1225E+03	0.9000E+00
0.6780E+03	0.1984E+01	0.1495E+03	0.1800E+01

```
==========================================================================

                  SHAFT for Windows, Version 2012.7.10

                   Serial Number :  158517381

                VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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==========================================================================


     Path to file locations      : P:\INFOCUS PROJECTS\11501-12000\11922 CSU
Fullerton\002 Eastside Parking\Analyses\SHAFT\
     Name of input data file     : Ground Level - CIDH 42-inch.sfd
     Name of output file         : Ground Level - CIDH 42-inch.sfo
     Name of plot output file    : Ground Level - CIDH 42-inch.sfp
     Name of runtime file        : Ground Level - CIDH 42-inch.sfr


     --------------------------------------------------------------------------
                         Time and Date of Analysis
     --------------------------------------------------------------------------

               Date:  July 23, 2018     Time:  15:42:44

     11922.002 - CSUF Eastside Parking Structure - Ground Level 42" CIDH


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    7
     ------------------


     WATER TABLE DEPTH =     100.0 FT.
     -------------------



     FACTOR OF SAFETY APPLIED TO THE ULTIMATE SIDE FRICTION CAPACITY = 2.00
     ----------------------------------------------------------
     FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 2.00
     ----------------------------------------------------------


     SOIL INFORMATION
     ----------------

     LAYER NO 1----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.100E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00
```



```
       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.977E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.100E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.150E+02

     LAYER NO 2----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.977E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.150E+02


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.799E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.270E+02

     LAYER NO 3----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                  = 0.799E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.350E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.270E+02


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                  = 0.748E+00
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                    = 0.350E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.310E+02


     LAYER NO 4----SAND
```

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.748E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.310E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.115E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

LAYER NO 5----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.701E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.350E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.615E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.350E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.430E+02

LAYER NO 6----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.615E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.110E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.430E+02

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.499E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00

INTERNAL FRICTION ANGLE, DEG.	= 0.340E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.110E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.550E+02

LAYER NO 7----CLAY

AT THE TOP

STRENGTH REDUCTION FACTOR-ALPHA	= 0.464E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.550E+02

AT THE BOTTOM

STRENGTH REDUCTION FACTOR-ALPHA	= 0.464E+00
END BEARING COEFFICIENT-Nc	= 0.900E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.500E+04
INTERNAL FRICTION ANGLE, DEG.	= 0.000E+00
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.125E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.100E+11
DEPTH, FT	= 0.700E+02

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	3.500	FT.
DIAMETER OF BASE	=	3.500	FT.
END OF STEM TO BASE	=	0.000	FT.
ANGLE OF BELL	=	0.000	DEG.
IGNORED TOP PORTION	=	0.000	FT.
IGNORED BOTTOM PORTION	=	0.000	FT.
AREA OF ONE PERCENT STEEL	=	13.856	SQ.IN.
ELASTIC MODULUS, Ec	=	0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	=	0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

Ground Level - CIDH 42-inch

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.36	0.33	0.00	0.33	0.33	0.16	0.93
2.0	0.71	1.32	0.00	1.32	1.32	0.66	1.85
3.0	1.07	2.97	0.00	2.97	2.97	1.48	2.78
4.0	1.43	5.28	0.00	5.28	5.28	2.64	3.70
5.0	1.78	8.24	0.00	8.24	8.24	4.12	4.63
6.0	2.14	11.78	0.00	11.78	11.78	5.89	5.51
7.0	2.49	15.86	0.00	15.86	15.86	7.93	6.36
8.0	2.85	20.47	0.00	20.47	20.47	10.24	7.18
9.0	3.21	25.59	8.34	33.94	29.76	16.97	10.58
10.0	3.56	31.20	18.25	49.45	40.32	24.72	13.87
11.0	3.92	37.27	29.79	67.06	52.17	33.53	17.11
12.0	4.28	43.80	40.93	84.73	64.27	42.37	19.81
13.0	4.63	50.77	49.53	100.30	75.53	50.15	21.65
14.0	4.99	58.15	55.40	113.55	85.85	56.77	22.76
15.0	5.35	65.94	58.33	124.27	95.11	62.14	23.25
16.0	5.70	74.18	61.27	135.44	104.81	67.72	23.75
17.0	6.06	82.89	64.20	147.09	114.99	73.54	24.28
18.0	6.41	92.07	67.13	159.20	125.63	79.60	24.82
19.0	6.77	101.69	70.06	171.75	136.72	85.88	25.37
20.0	7.13	111.74	73.00	184.74	148.24	92.37	25.92
21.0	7.48	122.21	79.58	201.79	162.00	100.90	26.96
22.0	7.84	133.08	86.75	219.83	176.45	109.91	28.04
23.0	8.20	144.33	94.52	238.85	191.59	119.42	29.14
24.0	8.55	155.95	102.00	257.95	206.95	128.97	30.16
25.0	8.91	167.92	108.26	276.18	222.05	138.09	31.00
26.0	9.27	180.24	113.24	293.48	236.86	146.74	31.67
27.0	9.62	192.89	116.91	309.80	251.34	154.90	32.20
28.0	9.98	205.86	120.57	326.43	266.14	163.22	32.71
29.0	10.34	219.15	123.59	342.74	280.95	171.37	33.16
30.0	10.69	232.75	125.87	358.62	295.69	179.31	33.54
31.0	11.05	246.65	127.34	373.99	310.32	186.99	33.85
32.0	11.40	260.81	128.07	388.88	324.85	194.44	34.10
33.0	11.76	275.20	128.31	403.52	339.36	201.76	34.31
34.0	12.12	289.81	128.31	418.13	353.97	209.06	34.51
35.0	12.47	304.63	128.31	432.94	368.79	216.47	34.71
36.0	12.83	319.65	128.31	447.97	383.81	223.98	34.92
37.0	13.19	334.88	123.75	458.63	396.76	229.32	34.78
38.0	13.54	350.30	118.62	468.92	409.61	234.46	34.63
39.0	13.90	365.91	112.92	478.82	422.37	239.41	34.45
40.0	14.26	381.68	107.78	489.47	435.58	244.73	34.34
41.0	14.61	397.62	104.36	501.98	449.80	250.99	34.35
42.0	14.97	413.70	102.65	516.36	465.03	258.18	34.50
43.0	15.32	429.93	102.65	532.58	481.26	266.29	34.75
44.0	15.68	446.27	102.65	548.92	497.59	274.46	35.01
45.0	16.04	462.69	102.65	565.34	514.02	282.67	35.25
46.0	16.39	479.19	102.65	581.84	530.52	290.92	35.49
47.0	16.75	495.76	102.65	598.41	547.08	299.20	35.73
48.0	17.11	512.38	102.65	615.04	563.71	307.52	35.95
49.0	17.46	529.06	122.89	651.95	590.51	325.98	37.33
50.0	17.82	545.78	145.66	691.44	618.61	345.72	38.80
51.0	18.18	562.53	170.96	733.50	648.01	366.75	40.36
52.0	18.53	579.31	193.73	773.04	676.18	386.52	41.71
53.0	18.89	596.10	208.91	805.02	700.56	402.51	42.62
54.0	19.24	612.90	216.50	829.41	721.15	414.70	43.10
55.0	19.60	629.70	216.50	846.20	737.95	423.10	43.17
56.0	19.96	642.45	216.50	858.96	750.70	429.48	43.04
57.0	20.31	655.20	216.50	871.71	763.45	435.85	42.91
58.0	20.67	667.95	216.50	884.46	776.21	442.23	42.79
59.0	21.03	680.70	216.50	897.21	788.96	448.60	42.67
60.0	21.38	693.46	216.50	909.96	801.71	454.98	42.56

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.7769E-01	0.2333E-04	0.4072E-02	0.1000E-04
0.3885E+00	0.1166E-03	0.2036E-01	0.5000E-04
0.7769E+00	0.2333E-03	0.4072E-01	0.1000E-03
0.3885E+02	0.1166E-01	0.2036E+01	0.5000E-02
0.5842E+02	0.1751E-01	0.3054E+01	0.7500E-02
0.7802E+02	0.2336E-01	0.4072E+01	0.1000E-01
0.1944E+03	0.5844E-01	0.1018E+02	0.2500E-01
0.3482E+03	0.1112E+00	0.2036E+02	0.5000E-01
0.4567E+03	0.1568E+00	0.3054E+02	0.7500E-01
0.5291E+03	0.1963E+00	0.4072E+02	0.1000E+00
0.7296E+03	0.3885E+00	0.9232E+02	0.2500E+00
0.7923E+03	0.6544E+00	0.1328E+03	0.5000E+00
0.8072E+03	0.7839E+00	0.1508E+03	0.6250E+00
0.8385E+03	0.1218E+01	0.1873E+03	0.1050E+01
0.8593E+03	0.2274E+01	0.2100E+03	0.2100E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1153E+00	0.2935E-04	0.6083E-02	0.1000E-04
0.5764E+00	0.1468E-03	0.3041E-01	0.5000E-04
0.1153E+01	0.2935E-03	0.6083E-01	0.1000E-03
0.5782E+02	0.1469E-01	0.3041E+01	0.5000E-02
0.8699E+02	0.2207E-01	0.4562E+01	0.7500E-02
0.1161E+03	0.2945E-01	0.6083E+01	0.1000E-01
0.2852E+03	0.7339E-01	0.1521E+02	0.2500E-01
0.4874E+03	0.1356E+00	0.3041E+02	0.5000E-01
0.6078E+03	0.1848E+00	0.4562E+02	0.7500E-01
0.6743E+03	0.2242E+00	0.6083E+02	0.1000E+00
0.8221E+03	0.4101E+00	0.1343E+03	0.2500E+00
0.8581E+03	0.6705E+00	0.1715E+03	0.5000E+00
0.8705E+03	0.7991E+00	0.1856E+03	0.6250E+00
0.8898E+03	0.1230E+01	0.2078E+03	0.1050E+01
0.8974E+03	0.2282E+01	0.2154E+03	0.2100E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.4541E-01	0.1791E-04	0.2062E-02	0.1000E-04
0.2270E+00	0.8956E-04	0.1031E-01	0.5000E-04
0.4541E+00	0.1791E-03	0.2062E-01	0.1000E-03
0.2270E+02	0.8956E-02	0.1031E+01	0.5000E-02
0.3406E+02	0.1343E-01	0.1546E+01	0.7500E-02
0.4543E+02	0.1791E-01	0.2062E+01	0.1000E-01
0.1139E+03	0.4483E-01	0.5155E+01	0.2500E-01
0.2156E+03	0.8794E-01	0.1031E+02	0.5000E-01
0.3029E+03	0.1288E+00	0.1546E+02	0.7500E-01
0.3741E+03	0.1670E+00	0.2062E+02	0.1000E+00
0.6333E+03	0.3664E+00	0.5031E+02	0.2500E+00
0.7268E+03	0.6383E+00	0.9413E+02	0.5000E+00

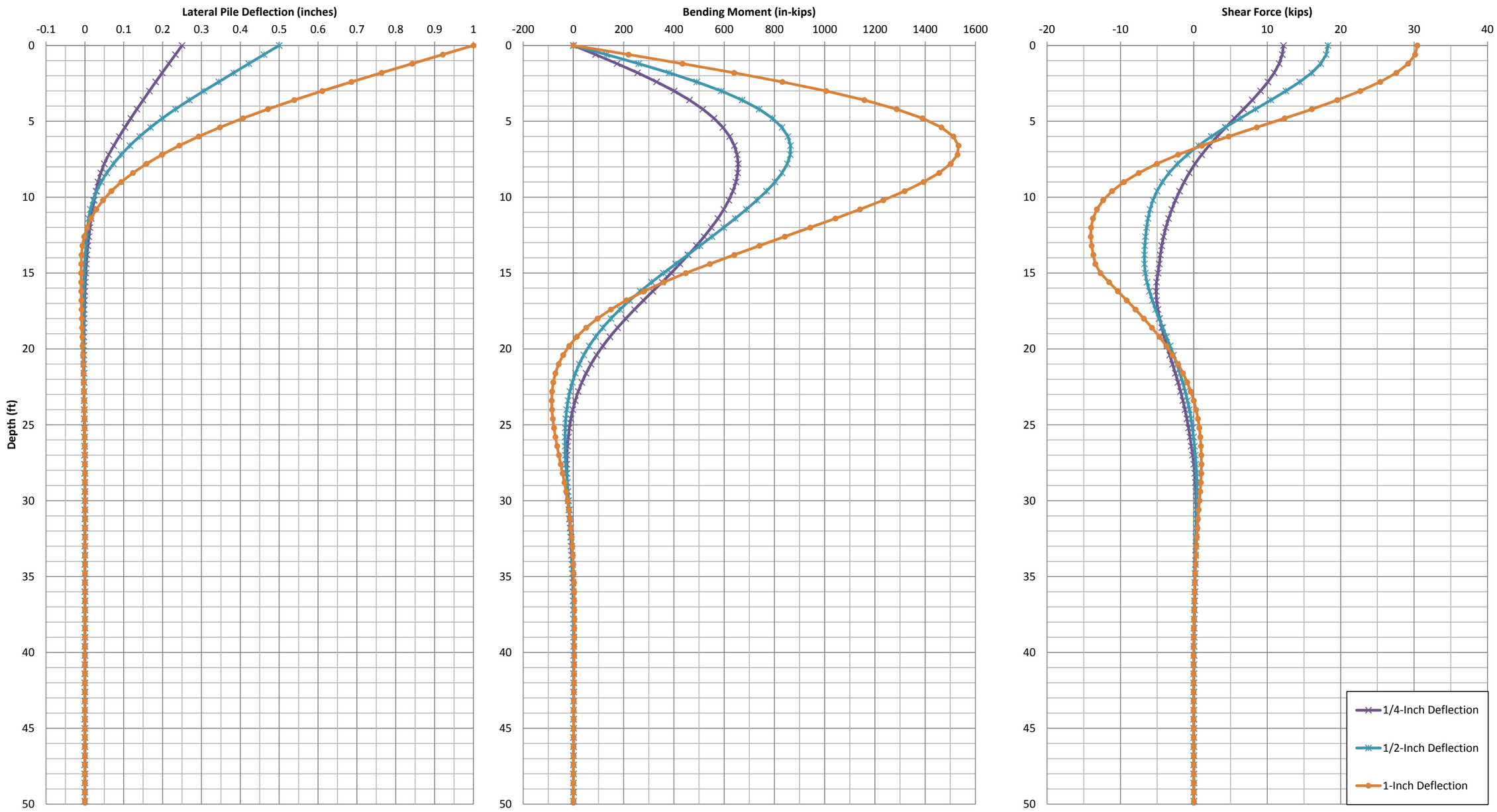
Ground Level - CIDH 42-inch

0.7422E+03	0.7683E+00	0.1160E+03	0.6250E+00
0.7871E+03	0.1206E+01	0.1667E+03	0.1050E+01
0.8202E+03	0.2266E+01	0.2035E+03	0.2100E+01

A P P E N D I X

D.5

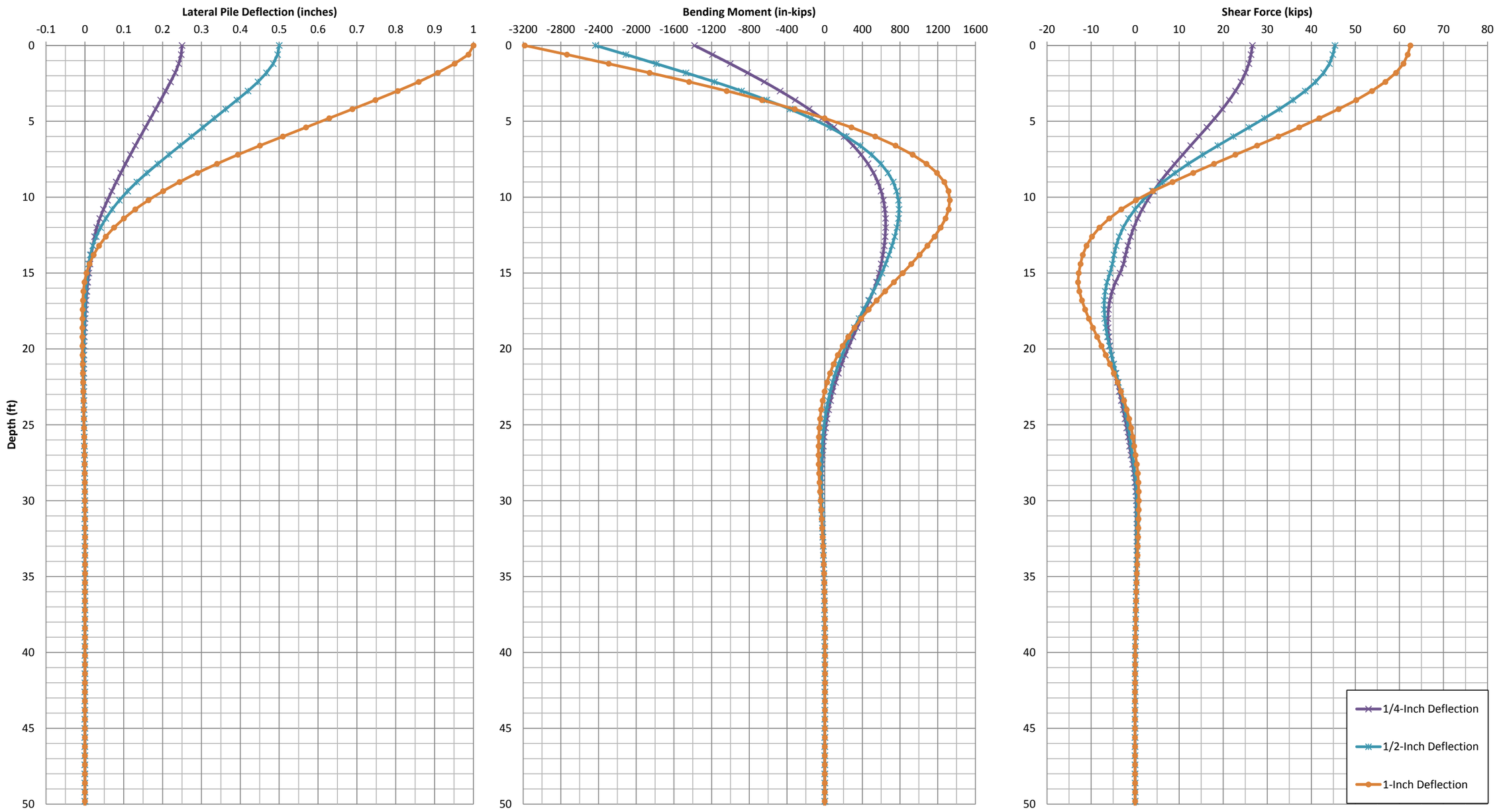
Pile Lateral Load Analysis



LATERAL LOAD CAPACITIES - FREE HEAD CONDITION
24-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILE

PROJECT NAME: Eastside Parking Structure
PROJECT NUMBER: 11922002
DESIGNED/CHECKED BY: CD/JEH
DATE: 7/23/2018

Figure D.5-1



LATERAL LOAD CAPACITIES - FIXED HEAD CONDITION
24-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILE

PROJECT NAME: Eastside Parking Structure
PROJECT NUMBER: 11922002
DESIGNED/CHECKED BY: CD/JEH
DATE: 7/23/2018

Figure D.5-2

LPile for Windows, Version 2018-10.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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This copy of LPile is being used by:

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is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:
\INFOCUS PROJECTS\11501-12000\11922 CSU Fullerton\002 Eastside
Parking\Analyses\Lpile\

Name of input data file:
24-inch CIDH.lp10

Name of output report file:
24-inch CIDH.lp10

Name of plot output file:
24-inch CIDH.lp10

Name of runtime message file:
24-inch CIDH.lp10

Date and Time of Analysis

Date: July 23, 2018 Time: 17:48:48

Problem Title

Project Name: CSUF Eastside Parking Structure

Job Number: 11922.002

Client:

Engineer: CD

Description: 24-INCH CIDH PILE

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	60.000 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	60.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile

Length of section	=	60.000000 ft
Shaft Diameter	=	24.000000 in
Shear capacity of section	=	0.0000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	15.000000 ft
Effective unit weight at top of layer	=	100.000000 pcf
Effective unit weight at bottom of layer	=	100.000000 pcf
Friction angle at top of layer	=	30.000000 deg.
Friction angle at bottom of layer	=	30.000000 deg.
Subgrade k at top of layer	=	25.000000 pci
Subgrade k at bottom of layer	=	25.000000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	15.000000 ft
Distance from top of pile to bottom of layer	=	27.000000 ft
Effective unit weight at top of layer	=	120.000000 pcf
Effective unit weight at bottom of layer	=	120.000000 pcf

Friction angle at top of layer	=	34.000000 deg.
Friction angle at bottom of layer	=	34.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	27.000000 ft
Distance from top of pile to bottom of layer	=	31.000000 ft
Effective unit weight at top of layer	=	125.000000 pcf
Effective unit weight at bottom of layer	=	125.000000 pcf
Friction angle at top of layer	=	35.000000 deg.
Friction angle at bottom of layer	=	35.000000 deg.
Subgrade k at top of layer	=	150.000000 pci
Subgrade k at bottom of layer	=	150.000000 pci

Layer 4 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	31.000000 ft
Distance from top of pile to bottom of layer	=	35.000000 ft
Effective unit weight at top of layer	=	115.000000 pcf
Effective unit weight at bottom of layer	=	115.000000 pcf
Friction angle at top of layer	=	35.000000 deg.
Friction angle at bottom of layer	=	35.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	35.000000 ft
Distance from top of pile to bottom of layer	=	43.000000 ft
Effective unit weight at top of layer	=	120.000000 pcf
Effective unit weight at bottom of layer	=	120.000000 pcf
Friction angle at top of layer	=	35.000000 deg.
Friction angle at bottom of layer	=	35.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	43.000000 ft
Distance from top of pile to bottom of layer	=	55.000000 ft
Effective unit weight at top of layer	=	110.000000 pcf
Effective unit weight at bottom of layer	=	110.000000 pcf
Friction angle at top of layer	=	34.000000 deg.
Friction angle at bottom of layer	=	34.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer	=	55.000000 ft
Distance from top of pile to bottom of layer	=	70.000000 ft
Effective unit weight at top of layer	=	125.000000 pcf
Effective unit weight at bottom of layer	=	125.000000 pcf
Undrained cohesion at top of layer	=	5000. psf
Undrained cohesion at bottom of layer	=	5000. psf
Epsilon-50 at top of layer	=	0.050000

Epsilon-50 at bottom of layer = 0.050000

(Depth of the lowest soil layer extends 10.000 ft below the pile tip)

Summary of Input Soil Properties

Layer No.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or kpy krm pci
1	Sand (Reese, et al.)	0.00	100.0000	--	30.0000	--
		15.0000	100.0000	--	30.0000	--
2	Sand (Reese, et al.)	15.0000	120.0000	--	34.0000	--
		27.0000	120.0000	--	34.0000	--
3	Sand (Reese, et al.)	27.0000	125.0000	--	35.0000	--
		31.0000	125.0000	--	35.0000	--
4	Sand (Reese, et al.)	31.0000	115.0000	--	35.0000	--
		35.0000	115.0000	--	35.0000	--
5	Sand (Reese, et al.)	35.0000	120.0000	--	35.0000	--
		43.0000	120.0000	--	35.0000	--
6	Sand (Reese, et al.)	43.0000	110.0000	--	34.0000	--
		55.0000	110.0000	--	34.0000	--
7	Stiff Clay w/o Free Water	55.0000	125.0000	5000.	--	0.05000 --
		70.0000	125.0000	5000.	--	0.05000 --

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 6

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.
2	5	y = 0.500000 in	S = 0.0000 in/in	0.0000000	N.A.
3	5	y = 1.000000 in	S = 0.0000 in/in	0.0000000	N.A.
4	4	y = 0.250000 in	M = 0.0000 in-lbs	0.0000000	N.A.
5	4	y = 0.500000 in	M = 0.0000 in-lbs	0.0000000	N.A.
6	4	y = 1.000000 in	M = 0.0000 in-lbs	0.0000000	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	60.000000	ft
Shaft Diameter	=	24.000000	in
Concrete Cover Thickness	=	3.000000	in
Number of Reinforcing Bars	=	8	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	452.389342	sq. in.
Total Area of Reinforcing Steel	=	6.320000	sq. in.
Area Ratio of Steel Reinforcement	=	1.40	percent
Edge-to-Edge Bar Spacing	=	5.505618	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	7.34	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	1895.836	kips
Tensile Load for Cracking of Concrete	=	-206.670	kips

Nominal Axial Tensile Capacity = -379.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.000000	0.790000	8.500000	0.00000
2	1.000000	0.790000	6.010408	6.010408
3	1.000000	0.790000	0.00000	8.500000
4	1.000000	0.790000	-6.010408	6.010408
5	1.000000	0.790000	-8.500000	0.00000
6	1.000000	0.790000	-6.010408	-6.010408
7	1.000000	0.790000	0.00000	-8.500000
8	1.000000	0.790000	6.010408	-6.010408

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.506 inches
between bars 6 and 7.

Ratio of bar spacing to maximum aggregate size = 7.34

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.341649 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Run Msg
0.00000125	93.1984913	74558793.	12.0001121	0.00001500	-0.00001500	
0.0627341	0.4306541					
0.00000250	185.9364856	74374594.	12.0001125	0.00003000	-0.00003000	
0.1249723	0.8613081					
0.00000375	278.2139827	74190395.	12.0001129	0.00004500	-0.00004500	
0.1867147	1.2919622					
0.00000500	370.0309828	74006197.	12.0001133	0.00006000	-0.00006000	
0.2479613	1.7226164					
0.00000625	461.3874859	73821998.	12.0001137	0.00007500	-0.00007500	
0.3087120	2.1532706					
0.00000750	552.2834918	73637799.	12.0001142	0.00009000	-0.00009000	
0.3689669	2.5839248					
0.00000875	642.7190007	73453600.	12.0001146	0.0001050	-0.0001050	
0.4287260	3.0145790					
0.00001000	642.7190007	64271900.	6.3475434	0.00006348	-0.0001765	
0.2597609	-5.0844124					C
0.00001125	642.7190007	57130578.	6.3498127	0.00007144	-0.0001986	
0.2917221	-5.7192236					C
0.00001250	642.7190007	51417520.	6.3520876	0.00007940	-0.0002206	
0.3235695	-6.3538682					C
0.00001375	642.7190007	46743200.	6.3543681	0.00008737	-0.0002426	
0.3553030	-6.9883457					C
0.00001500	642.7190007	42847933.	6.3566542	0.00009535	-0.0002647	
0.3869222	-7.6226554					C
0.00001625	642.7190007	39551939.	6.3589461	0.0001033	-0.0002867	
0.4184270	-8.2567966					C
0.00001750	642.7190007	36726800.	6.3612003	0.0001113	-0.0003087	
0.4498140	-8.8907908					C
0.00001875	642.7190007	34278347.	6.3634233	0.0001193	-0.0003307	
0.4810830	-9.5246386					C
0.00002000	642.7190007	32135950.	6.3656516	0.0001273	-0.0003527	
0.5122362	-10.1583220					C
0.00002125	642.7190007	30245600.	6.3678853	0.0001353	-0.0003747	
0.5432732	-10.7918406					C
0.00002250	642.7190007	28565289.	6.3701245	0.0001433	-0.0003967	
0.5741939	-11.4251937					C
0.00002375	642.7190007	27061853.	6.3723691	0.0001513	-0.0004187	
0.6049981	-12.0583807					C
0.00002500	642.7190007	25708760.	6.3746192	0.0001594	-0.0004406	
0.6356856	-12.6914010					C
0.00002625	642.7190007	24484533.	6.3768748	0.0001674	-0.0004626	
0.6662560	-13.3242540					C
0.00002750	642.7190007	23371600.	6.3791360	0.0001754	-0.0004846	
0.6967093	-13.9569390					C
0.00002875	642.7190007	22355444.	6.3814027	0.0001835	-0.0005065	
0.7270451	-14.5894554					C
0.00003000	642.7190007	21423967.	6.3836751	0.0001915	-0.0005285	
0.7572632	-15.2218026					C
0.00003125	642.7190007	20567008.	6.3859531	0.0001996	-0.0005504	
0.7873635	-15.8539800					C
0.00003250	642.7190007	19775969.	6.3882367	0.0002076	-0.0005724	
0.8173457	-16.4859868					C
0.00003375	642.7190007	19043526.	6.3905260	0.0002157	-0.0005943	
0.8472095	-17.1178226					C

0.00003500	642.7190007	18363400.	6.3928211	0.0002237	-0.0006163	
0.8769547	-17.7494866 C					
0.00003625	642.7190007	17730179.	6.3951218	0.0002318	-0.0006382	
0.9065812	-18.3809781 C					
0.00003750	642.7190007	17139173.	6.3974284	0.0002399	-0.0006601	
0.9360886	-19.0122966 C					
0.00003875	642.7190007	16586297.	6.3997407	0.0002480	-0.0006820	
0.9654767	-19.6434413 C					
0.00004000	647.1944804	16179862.	6.4020589	0.0002561	-0.0007039	
0.9947453	-20.2744116 C					
0.00004125	667.1799047	16174058.	6.4043830	0.0002642	-0.0007258	
1.0238942	-20.9052068 C					
0.00004250	687.1502808	16168242.	6.4067129	0.0002723	-0.0007477	
1.0529230	-21.5358262 C					
0.00004375	707.1055583	16162413.	6.4090488	0.0002804	-0.0007696	
1.0818317	-22.1662692 C					
0.00004500	727.0456868	16156571.	6.4113906	0.0002885	-0.0007915	
1.1106198	-22.7965351 C					
0.00004625	746.9706154	16150716.	6.4137385	0.0002966	-0.0008134	
1.1392873	-23.4266232 C					
0.00004750	766.8802929	16144848.	6.4160923	0.0003048	-0.0008352	
1.1678338	-24.0565328 C					
0.00004875	786.7746677	16138968.	6.4184522	0.0003129	-0.0008571	
1.1962591	-24.6862632 C					
0.00005125	826.5172754	16127166.	6.4231902	0.0003292	-0.0009008	
1.2527451	-25.9451837 C					
0.00005375	866.1980690	16115313.	6.4279528	0.0003455	-0.0009445	
1.3087433	-27.2033788 C					
0.00005625	905.8166002	16103406.	6.4327403	0.0003618	-0.0009882	
1.3642517	-28.4608427 C					
0.00005875	945.3724388	16091446.	6.4375528	0.0003782	-0.0010318	
1.4192682	-29.7175696 C					
0.00006125	984.8651487	16079431.	6.4423908	0.0003946	-0.0010754	
1.4737908	-30.9735537 C					
0.00006375	1024.	16067361.	6.4472544	0.0004110	-0.0011190	
1.5278174	-32.2287888 C					
0.00006625	1064.	16055236.	6.4521439	0.0004275	-0.0011625	
1.5813460	-33.4832689 C					
0.00006875	1103.	16043055.	6.4570597	0.0004439	-0.0012061	
1.6343742	-34.7369877 C					
0.00007125	1142.	16030818.	6.4620019	0.0004604	-0.0012496	
1.6869000	-35.9899391 C					
0.00007375	1181.	16018523.	6.4669710	0.0004769	-0.0012931	
1.7389213	-37.2421164 C					
0.00007625	1220.	16006171.	6.4719671	0.0004935	-0.0013365	
1.7904357	-38.4935134 C					
0.00007875	1260.	15993760.	6.4769906	0.0005101	-0.0013799	
1.8414411	-39.7441233 C					
0.00008125	1298.	15981291.	6.4820419	0.0005267	-0.0014233	
1.8919351	-40.9939396 C					
0.00008375	1337.	15968762.	6.4871211	0.0005433	-0.0014667	
1.9419155	-42.2429554 C					
0.00008625	1376.	15956172.	6.4922287	0.0005600	-0.0015100	
1.9913799	-43.4911638 C					
0.00008875	1415.	15943522.	6.4973650	0.0005766	-0.0015534	
2.0403261	-44.7385579 C					
0.00009125	1454.	15930811.	6.5025302	0.0005934	-0.0015966	
2.0887515	-45.9851305 C					
0.00009375	1492.	15918037.	6.5077248	0.0006101	-0.0016399	
2.1366539	-47.2308744 C					
0.00009625	1531.	15905201.	6.5129490	0.0006269	-0.0016831	
2.1840306	-48.4757823 C					
0.00009875	1569.	15892301.	6.5182032	0.0006437	-0.0017263	

2.2308794	-49.7198468 C					
0.0001013	1608.	15879337.	6.5234879	0.0006605	-0.0017695	
2.2771976	-50.9630602 C					
0.0001038	1646.	15866308.	6.5288032	0.0006774	-0.0018126	
2.3229827	-52.2054149 C					
0.0001063	1684.	15853213.	6.5341496	0.0006943	-0.0018557	
2.3682321	-53.4469030 C					
0.0001088	1723.	15840053.	6.5395275	0.0007112	-0.0018988	
2.4129432	-54.6875167 C					
0.0001113	1761.	15826825.	6.5449373	0.0007281	-0.0019419	
2.4571135	-55.9272479 C					
0.0001138	1799.	15813529.	6.5503793	0.0007451	-0.0019849	
2.5007401	-57.1660884 C					
0.0001163	1837.	15800165.	6.5558539	0.0007621	-0.0020279	
2.5438203	-58.4040297 C					
0.0001188	1875.	15786731.	6.5613615	0.0007792	-0.0020708	
2.5863515	-59.6410635 C					
0.0001213	1913.	15773227.	6.5669026	0.0007962	-0.0021138	
2.6283308	-60.0000000 CY					
0.0001238	1950.	15759652.	6.5724775	0.0008133	-0.0021567	
2.6697554	-60.0000000 CY					
0.0001263	1988.	15746005.	6.5780867	0.0008305	-0.0021995	
2.7106223	-60.0000000 CY					
0.0001288	2026.	15732286.	6.5837306	0.0008477	-0.0022423	
2.7509288	-60.0000000 CY					
0.0001313	2063.	15718493.	6.5894097	0.0008649	-0.0022851	
2.7906718	-60.0000000 CY					
0.0001338	2100.	15704625.	6.5951244	0.0008821	-0.0023279	
2.8298483	-60.0000000 CY					
0.0001363	2138.	15690690.	6.6008391	0.0008994	-0.0023706	
2.8684445	-60.0000000 CY					
0.0001388	2175.	15676709.	6.6063875	0.0009166	-0.0024134	
2.9064051	-60.0000000 CY					
0.0001413	2212.	15662656.	6.6119699	0.0009339	-0.0024561	
2.9437892	-60.0000000 CY					
0.0001438	2249.	15648529.	6.6175867	0.0009513	-0.0024987	
2.9805936	-60.0000000 CY					
0.0001463	2286.	15629123.	6.6225302	0.0009685	-0.0025415	
3.0165973	-60.0000000 CY					
0.0001488	2319.	15591242.	6.6249450	0.0009855	-0.0025845	
3.0512281	-60.0000000 CY					
0.0001588	2428.	15296697.	6.6140399	0.0010500	-0.0027600	
3.1775084	-60.0000000 CY					
0.0001688	2531.	14997214.	6.6019506	0.0011141	-0.0029359	
3.2940296	-60.0000000 CY					
0.0001788	2628.	14700999.	6.5888109	0.0011777	-0.0031123	
3.4009501	-60.0000000 CY					
0.0001888	2681.	14204456.	6.5363323	0.0012337	-0.0032963	
3.4874910	-60.0000000 CY					
0.0001988	2714.	13653986.	6.4708336	0.0012861	-0.0034839	
3.5621952	-60.0000000 CY					
0.0002088	2746.	13154387.	6.4128799	0.0013387	-0.0036713	
3.6313592	-60.0000000 CY					
0.0002188	2778.	12698715.	6.3614807	0.0013916	-0.0038584	
3.6949023	-60.0000000 CY					
0.0002288	2809.	12280195.	6.3134243	0.0014442	-0.0040458	
3.7521611	-60.0000000 CY					
0.0002388	2840.	11895095.	6.2705401	0.0014971	-0.0042329	
3.8037318	-60.0000000 CY					
0.0002488	2870.	11539374.	6.2323056	0.0015503	-0.0044197	
3.8495397	-60.0000000 CY					
0.0002588	2900.	11209585.	6.1982142	0.0016038	-0.0046062	
3.8894858	-60.0000000 CY					

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 0.0002688          2930.     10902794.     6.1678364     0.0016576    -0.0047924
3.9234669   -60.0000000 CY
 0.0002788          2959.     10616486.     6.1408063     0.0017117    -0.0049783
3.9513752   -60.0000000 CY
 0.0002888          2988.     10348449.     6.1166273     0.0017662    -0.0051638
3.9730795   -60.0000000 CY
 0.0002988          3016.     10096619.     6.0941571     0.0018206    -0.0053494
3.9884199   -60.0000000 CY
 0.0003088          3044.      9859644.     6.0743363     0.0018755    -0.0055345
3.9974239   -60.0000000 CY
 0.0003188          3071.      9635958.     6.0569273     0.0019306    -0.0057194
3.9980798   -60.0000000 CY
 0.0003288          3098.      9422360.     6.0409810     0.0019860    -0.0059040
3.9996090   -60.0000000 CY
 0.0003388          3119.      9208476.     6.0219236     0.0020399    -0.0060901
3.9972349   -60.0000000 CY
 0.0003488          3135.      8988594.     5.9966071     0.0020913    -0.0062787
3.9999801   -60.0000000 CY
 0.0003588          3145.      8765925.     5.9665180     0.0021405    -0.0064695
3.9975026    60.0000000 CY
 0.0003688          3151.      8544426.     5.9332410     0.0021879    -0.0066621
3.9999255    60.0000000 CY
 0.0003788          3154.      8328261.     5.8993619     0.0022344    -0.0068556
3.9958253    60.0000000 CY
 0.0003888          3158.      8122339.     5.8666918     0.0022807    -0.0070493
3.9992722    60.0000000 CY
 0.0003988          3160.      7925937.     5.8347793     0.0023266    -0.0072434
3.9969596    60.0000000 CY
 0.0004088          3163.      7738734.     5.8050656     0.0023728    -0.0074372
3.9968420    60.0000000 CY
 0.0004188          3166.      7560240.     5.7771940     0.0024192    -0.0076308
3.9995583    60.0000000 CY
 0.0004288          3168.      7389758.     5.7511503     0.0024658    -0.0078242
3.9957408    60.0000000 CY
 0.0004388          3171.      7226731.     5.7268240     0.0025126    -0.0080174
3.9962081    60.0000000 CY
 0.0004488          3173.      7070785.     5.7039402     0.0025596    -0.0082104
3.9991999    60.0000000 CY
 0.0004588          3175.      6921425.     5.6824526     0.0026068    -0.0084032
3.9984624    60.0000000 CY
 0.0004688          3177.      6778119.     5.6624257     0.0026543    -0.0085957
3.9935477    60.0000000 CY
 0.0004788          3179.      6640657.     5.6435354     0.0027018    -0.0087882
3.9976027    60.0000000 CY
 0.0004888          3181.      6508416.     5.6243599     0.0027489    -0.0089811
3.9996707    60.0000000 CY
 0.0004988          3183.      6381223.     5.6060383     0.0027960    -0.0091740
3.9962406    60.0000000 CY
 0.0005088          3184.      6258834.     5.5888489     0.0028433    -0.0093667
3.9926615    60.0000000 CY
 0.0005188          3186.      6141065.     5.5725662     0.0028908    -0.0095592
3.9967518    60.0000000 CY
 0.0005288          3187.      6027654.     5.5571432     0.0029383    -0.0097517
3.9992057    60.0000000 CY
 0.0005388          3189.      5918352.     5.5425434     0.0029860    -0.0099440
3.9997729    60.0000000 CY
 0.0005488          3190.      5812814.     5.5289453     0.0030340    -0.0101360
3.9911311    60.0000000 CYT
 0.0006088          3196.      5250779.     5.4610410     0.0033244    -0.0112856
3.9896581    60.0000000 CYT
 0.0006688          3201.      4787119.     5.4120895     0.0036193    -0.0124307
3.9857245    60.0000000 CYT
 0.0007288          3201.      4392982.     5.3968051     0.0039329    -0.0135571
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   3.9889323    60.0000000 CYT
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Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	3188.881	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	3189.	0.0000	2073.	15714892.
1	0.70	3189.	0.0000	2232.	15655097.
1	0.75	3189.	0.0000	2392.	15395702.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	256664.
2	15.0000	13.2875	Yes	No	256664.	1311272.
3	27.0000	24.2508	Yes	No	1567935.	863725.
4	31.0000	28.1005	Yes	No	2431660.	1135754.
5	35.0000	32.0624	Yes	No	3567414.	3196494.
6	43.0000	41.9208	Yes	No	6763909.	5520893.
7	55.0000	143.8380	No	No	1.23E+07	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays,

non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.250000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Distrib. Lat. Load lb/inch	p lb/inch
0.00	0.2500	-1381688.	26624.	0.00	0.00	1.60E+10	0.00	0.00	0.00
0.6000	0.2478	-1191152.	26303.	-5.81E-04	0.00	1.60E+10	-44.5959	1296.	0.00
1.2000	0.2416	-1002929.	25829.	-0.00107	0.00	1.61E+10	-86.9905	2592.	0.00
1.8000	0.2323	-819215.	25064.	-0.00148	0.00	1.61E+10	-125.4369	3888.	0.00
2.4000	0.2203	-642003.	24042.	-0.00170	0.00	6.88E+10	-158.6216	5184.	0.00
3.0000	0.2078	-473015.	22797.	-0.00175	0.00	7.38E+10	-187.0570	6480.	0.00
3.6000	0.1950	-313723.	21365.	-0.00179	0.00	7.41E+10	-210.6454	7776.	0.00
4.2000	0.1820	-165351.	19782.	-0.00182	0.00	7.44E+10	-229.3497	9072.	0.00
4.8000	0.1689	-28869.	18080.	-0.00183	0.00	7.46E+10	-243.2014	10368.	0.00
5.4000	0.1557	95005.	16297.	-0.00182	0.00	7.46E+10	-252.2925	11664.	0.00
6.0000	0.1426	205801.	14464.	-0.00181	0.00	7.43E+10	-256.7671	12960.	0.00
6.6000	0.1297	303286.	12615.	-0.00178	0.00	7.41E+10	-256.8144	14256.	0.00
7.2000	0.1170	387458.	10781.	-0.00175	0.00	7.40E+10	-252.6598	15552.	0.00
7.8000	0.1045	458531.	8991.	-0.00171	0.00	7.38E+10	-244.5572	16848.	0.00
8.4000	0.09237	516927.	7273.	-0.00166	0.00	7.37E+10	-232.7802	18144.	0.00
9.0000	0.08060	563256.	5651.	-0.00161	0.00	7.36E+10	-217.6151	19440.	0.00
9.6000	0.06922	598303.	4150.	-0.00155	0.00	7.35E+10	-199.3533	20736.	0.00
10.2000	0.05826	623016.	2791.	-0.00149	0.00	7.35E+10	-178.2860	22032.	0.00
10.8000	0.04775	638487.	1592.	-0.00140	0.00	3.63E+10	-154.6982	23328.	0.00
11.4000	0.03814	645938.	565.2822	-0.00120	0.00	1.73E+10	-130.4412	24624.	0.00

12.0000	0.03047	646627.	-299.2261	-9.23E-04	0.00	1.64E+10	-109.7000	25920.	0.00
12.6000	0.02485	641629.	-1032.	-6.94E-04	0.00	2.68E+10	-93.9410	27216.	0.00
13.2000	0.02047	631761.	-1662.	-5.77E-04	0.00	7.28E+10	-81.0768	28512.	0.00
13.8000	0.01655	617691.	-2201.	-5.15E-04	0.00	7.35E+10	-68.5001	29808.	0.00
14.4000	0.01305	600069.	-2650.	-4.56E-04	0.00	7.35E+10	-56.3915	31104.	0.00
15.0000	0.00998	579524.	-3436.	-3.98E-04	0.00	7.36E+10	-161.7452	116640.	0.00
15.6000	0.00732	550594.	-4462.	-3.43E-04	0.00	7.36E+10	-123.3827	121306.	0.00
16.2000	0.00505	515267.	-5224.	-2.91E-04	0.00	7.37E+10	-88.3528	125971.	0.00
16.8000	0.00314	475361.	-5748.	-2.42E-04	0.00	7.38E+10	-56.9522	130637.	0.00
17.4000	0.00156	432502.	-6058.	-1.98E-04	0.00	7.39E+10	-29.3508	135302.	0.00
18.0000	2.88E-04	388122.	-6184.	-1.58E-04	0.00	7.40E+10	-5.6057	139968.	0.00
18.6000	-7.13E-04	343451.	-6153.	-1.22E-04	0.00	7.40E+10	14.3253	144634.	0.00
19.2000	-0.00147	299523.	-5991.	-9.12E-05	0.00	7.41E+10	30.5684	149299.	0.00
19.8000	-0.00203	257179.	-5725.	-6.41E-05	0.00	7.42E+10	43.3192	153965.	0.00
20.4000	-0.00240	217081.	-5379.	-4.11E-05	0.00	7.43E+10	52.8273	158630.	0.00
21.0000	-0.00262	179722.	-4975.	-2.19E-05	0.00	7.44E+10	59.3822	163296.	0.00
21.6000	-0.00271	145441.	-4533.	-6.19E-06	0.00	7.44E+10	63.3009	167962.	0.00
22.2000	-0.00271	114441.	-4072.	6.37E-06	0.00	7.45E+10	64.9141	172627.	0.00
22.8000	-0.00262	86807.	-3606.	1.61E-05	0.00	7.46E+10	64.5584	177293.	0.00
23.4000	-0.00248	62519.	-3148.	2.33E-05	0.00	7.46E+10	62.5663	181958.	0.00
24.0000	-0.00229	41475.	-2709.	2.83E-05	0.00	7.46E+10	59.2582	186624.	0.00
24.6000	-0.00207	23502.	-2298.	3.15E-05	0.00	7.46E+10	54.9384	191290.	0.00
25.2000	-0.00183	8378.	-1921.	3.30E-05	0.00	7.46E+10	49.8908	195955.	0.00
25.8000	-0.00159	-4160.	-1582.	3.32E-05	0.00	7.46E+10	44.3768	200621.	0.00
26.4000	-0.00135	-14397.	-1283.	3.23E-05	0.00	7.46E+10	38.6334	205286.	0.00
27.0000	-0.00113	-22632.	-946.4632	3.05E-05	0.00	7.46E+10	54.7901	349920.	0.00
27.6000	-9.15E-04	-28026.	-585.4863	2.81E-05	0.00	7.46E+10	45.4813	357696.	0.00
28.2000	-7.23E-04	-31063.	-289.6199	2.52E-05	0.00	7.46E+10	36.7039	365472.	0.00
28.8000	-5.52E-04	-32197.	-54.4162	2.22E-05	0.00	7.46E+10	28.6305	373248.	0.00
29.4000	-4.04E-04	-31847.	125.5960	1.91E-05	0.00	7.46E+10	21.3729	381024.	0.00
30.0000	-2.78E-04	-30388.	256.5039	1.61E-05	0.00	7.46E+10	14.9904	388800.	0.00
30.6000	-1.72E-04	-28153.	344.6656	1.32E-05	0.00	7.46E+10			

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9.4990    396576.       0.00
   31.2000  -8.69E-05    -25425.   389.4020   1.07E-05       0.00   7.46E+10
2.9278    242611.       0.00
   31.8000  -1.90E-05    -22546.   402.2910   8.34E-06       0.00   7.46E+10
0.6525    247277.       0.00
   32.4000   3.32E-05    -19632.   400.4556   6.30E-06       0.00   7.46E+10
-1.1623    251942.       0.00
   33.0000   7.18E-05    -16779.   387.0615   4.55E-06       0.00   7.46E+10
-2.5583    256608.       0.00
   33.6000   9.87E-05    -14058.   364.9605   3.06E-06       0.00   7.46E+10
-3.5809    261274.       0.00
   34.2000   1.16E-04    -11524.   336.6708   1.82E-06       0.00   7.46E+10
-4.2773    265939.       0.00
   34.8000   1.25E-04     -9210.   304.3711   8.21E-07       0.00   7.46E+10
-4.6948    270605.       0.00
   35.4000   1.28E-04     -7141.   269.9042   3.13E-08       0.00   7.46E+10
-4.8793    275270.       0.00
   36.0000   1.25E-04     -5324.   234.7915  -5.71E-07       0.00   7.46E+10
-4.8742    279936.       0.00
   36.6000   1.19E-04     -3760.   200.2523  -1.01E-06       0.00   7.46E+10
-4.7200    284602.       0.00
   37.2000   1.11E-04     -2440.   167.2300  -1.31E-06       0.00   7.46E+10
-4.4529    289267.       0.00
   37.8000   1.01E-04     -1351.   136.4196  -1.49E-06       0.00   7.46E+10
-4.1055    293933.       0.00
   38.4000   8.94E-05  -475.6733   108.2987  -1.58E-06       0.00   7.46E+10
-3.7058    298598.       0.00
   39.0000   7.78E-05   208.0216    83.1579  -1.59E-06       0.00   7.46E+10
-3.2777    303264.       0.00
   39.6000   6.64E-05   721.8006    61.1313  -1.55E-06       0.00   7.46E+10
-2.8408    307930.       0.00
   40.2000   5.55E-05      1088.    42.2252  -1.46E-06       0.00   7.46E+10
-2.4109    312595.       0.00
   40.8000   4.54E-05      1330.    26.3451  -1.34E-06       0.00   7.46E+10
-2.0002    317261.       0.00
   41.4000   3.62E-05      1468.    13.3202  -1.21E-06       0.00   7.46E+10
-1.6178    321926.       0.00
   42.0000   2.80E-05      1522.     2.9253  -1.06E-06       0.00   7.46E+10
-1.2697    326592.       0.00
   42.6000   2.09E-05      1510.    -5.1002  -9.18E-07       0.00   7.46E+10
-0.9596    331258.       0.00
   43.2000   1.48E-05      1448.   -11.0364  -7.75E-07       0.00   7.46E+10
-0.6893    335923.       0.00
   43.8000   9.70E-06      1351.   -15.1695  -6.40E-07       0.00   7.46E+10
-0.4588    340589.       0.00
   44.4000   5.56E-06      1230.   -17.7809  -5.15E-07       0.00   7.46E+10
-0.2666    345254.       0.00
   45.0000   2.28E-06      1095.   -19.1395  -4.03E-07       0.00   7.46E+10
-0.1107    349920.       0.00
   45.6000  -2.43E-07   954.1639   -19.4951  -3.04E-07       0.00   7.46E+10
0.01194    354586.       0.00
   46.2000  -2.10E-06   814.1087   -19.0749  -2.19E-07       0.00   7.46E+10
0.1048    359251.       0.00
   46.8000  -3.39E-06   679.4857   -18.0805  -1.47E-07       0.00   7.46E+10
0.1714    363917.       0.00
   47.4000  -4.21E-06   553.7495   -16.6874  -8.70E-08       0.00   7.46E+10
0.2156    368582.       0.00
   48.0000  -4.64E-06   439.1876   -15.0445  -3.91E-08       0.00   7.46E+10
0.2408    373248.       0.00
   48.6000  -4.77E-06   337.1080   -13.2757  -1.60E-09       0.00   7.46E+10
0.2506    377914.       0.00
   49.2000  -4.67E-06   248.0171   -11.4808   2.67E-08       0.00   7.46E+10
0.2480    382579.       0.00
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   49.8000  -4.39E-06   171.7840    -9.7380   4.69E-08       0.00   7.46E+10
0.2361    387245.       0.00
   50.4000  -3.99E-06   107.7901    -8.1058   6.04E-08       0.00   7.46E+10
0.2173    391910.       0.00
   51.0000  -3.52E-06    55.0611    -6.6256   6.83E-08       0.00   7.46E+10
0.1939    396576.       0.00
   51.6000  -3.01E-06    12.3819    -5.3240   7.15E-08       0.00   7.46E+10
0.1677    401242.       0.00
   52.2000  -2.49E-06   -21.6050    -4.2152   7.11E-08       0.00   7.46E+10
0.1403    405907.       0.00
   52.8000  -1.99E-06   -48.3164    -3.3024   6.77E-08       0.00   7.46E+10
0.1132    410573.       0.00
   53.4000  -1.51E-06   -69.1597    -2.5805   6.20E-08       0.00   7.46E+10
0.08733    415238.       0.00
   54.0000  -1.09E-06   -85.4756    -2.0369   5.46E-08       0.00   7.46E+10
0.06366    419904.       0.00
   54.6000  -7.28E-07   -98.4914    -1.6531   4.57E-08       0.00   7.46E+10
0.04295    424570.       0.00
   55.2000  -4.34E-07  -109.2807    -0.1272   3.57E-08       0.00   7.46E+10
0.3809   6326340.       0.00
   55.8000  -2.15E-07  -100.3226     1.9234   2.55E-08       0.00   7.46E+10
0.1887   6326340.       0.00
   56.4000  -6.57E-08   -81.5835     2.8104   1.68E-08       0.00   7.46E+10
0.05771   6326340.       0.00
   57.0000   2.66E-08   -59.8526     2.9339   9.93E-09       0.00   7.46E+10
-0.02341   6326340.       0.00
   57.6000   7.74E-08   -39.3354     2.6049   5.14E-09       0.00   7.46E+10
-0.06797   6326340.       0.00
   58.2000   1.01E-07   -22.3419     2.0416   2.17E-09       0.00   7.46E+10
-0.08850   6326340.       0.00
   58.8000   1.09E-07    -9.9362     1.3797   6.08E-10       0.00   7.46E+10
-0.09538   6326340.       0.00
   59.4000   1.09E-07    -2.4749     0.6900   8.31E-12       0.00   7.46E+10
-0.09619   6326340.       0.00
   60.0000   1.09E-07       0.00       0.00  -1.11E-10       0.00   7.46E+10
-0.09548   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -1381688. inch-lbs
Maximum shear force              =         26624. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             63
Number of zero deflection points =              4
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 0.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. Es*h	Soil Spr. Lat. Load	Distrib. p
feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	lb/inch	lb/inch	lb/inch
0.00	0.5000	-2433726.	45368.	0.00	0.00	1.53E+10	0.00	0.00	0.00
0.6000	0.4959	-2108822.	44883.	-0.00107	0.00	1.53E+10	-67.4508	979.3779	0.00
1.2000	0.4846	-1787414.	44124.	-0.00197	0.00	1.58E+10	-143.3381	2130.	0.00
1.8000	0.4674	-1473437.	42813.	-0.00271	0.00	1.59E+10	-220.7262	3400.	0.00
2.4000	0.4455	-1170902.	40961.	-0.00331	0.00	1.60E+10	-293.8658	4749.	0.00
3.0000	0.4198	-883602.	38618.	-0.00377	0.00	1.61E+10	-356.7872	6119.	0.00
3.6000	0.3912	-614797.	35843.	-0.00400	0.00	7.35E+10	-414.0893	7621.	0.00
4.2000	0.3622	-367459.	32710.	-0.00405	0.00	7.40E+10	-456.3881	9072.	0.00
4.8000	0.3330	-143779.	29341.	-0.00407	0.00	7.44E+10	-479.4516	10368.	0.00
5.4000	0.3036	55045.	25844.	-0.00408	0.00	7.46E+10	-491.8192	11664.	0.00
6.0000	0.2743	228374.	22296.	-0.00406	0.00	7.43E+10	-493.6859	12960.	0.00
6.6000	0.2451	376109.	18772.	-0.00403	0.00	7.40E+10	-485.3123	14256.	0.00
7.2000	0.2162	498687.	15343.	-0.00399	0.00	7.37E+10	-467.0092	15552.	0.00
7.8000	0.1877	597054.	12081.	-0.00394	0.00	7.35E+10	-439.1228	16848.	0.00
8.4000	0.1595	672658.	9053.	-0.00376	0.00	1.62E+10	-402.0195	18144.	0.00
9.0000	0.1336	727420.	6308.	-0.00345	0.00	1.62E+10	-360.6119	19440.	0.00
9.6000	0.1099	763489.	3870.	-0.00311	0.00	1.61E+10	-316.5765	20736.	0.00
10.2000	0.08874	783146.	1753.	-0.00277	0.00	1.61E+10	-271.5327	22032.	0.00
10.8000	0.07007	788727.	-42.1051	-0.00242	0.00	1.61E+10	-227.0118	23328.	0.00
11.4000	0.05393	782540.	-1523.	-0.00207	0.00	1.61E+10	-184.4341	24624.	0.00
12.0000	0.04030	766791.	-2710.	-0.00172	0.00	1.61E+10	-145.0952	25920.	0.00
12.6000	0.02914	743521.	-3629.	-0.00138	0.00	1.62E+10	-110.1585	27216.	0.00
13.2000	0.02037	714541.	-4315.	-0.00106	0.00	1.62E+10	-80.6537	28512.	0.00
13.8000	0.01388	681379.	-4813.	-7.49E-04	0.00	1.62E+10	-57.4793	29808.	0.00
14.4000	0.00959	645237.	-5169.	-4.93E-04	0.00	2.23E+10	-41.4078	31104.	0.00

15.0000	0.00679	606949.	-5714.	-3.59E-04	0.00	7.35E+10	-109.9912	116640.	0.00
15.6000	0.00442	562959.	-6378.	-3.01E-04	0.00	7.36E+10	-74.5037	121306.	0.00
16.2000	0.00245	515107.	-6801.	-2.49E-04	0.00	7.37E+10	-42.8843	125971.	0.00
16.8000	8.42E-04	465031.	-7010.	-2.01E-04	0.00	7.38E+10	-15.2839	130637.	0.00
17.4000	-4.40E-04	414164.	-7035.	-1.58E-04	0.00	7.39E+10	8.2640	135302.	0.00
18.0000	-0.00143	363724.	-6905.	-1.20E-04	0.00	7.40E+10	27.8262	139968.	0.00
18.6000	-0.00217	314727.	-6648.	-8.71E-05	0.00	7.41E+10	43.5561	144634.	0.00
19.2000	-0.00268	267988.	-6291.	-5.88E-05	0.00	7.42E+10	55.6756	149299.	0.00
19.8000	-0.00301	224136.	-5859.	-3.49E-05	0.00	7.43E+10	64.4612	153965.	0.00
20.4000	-0.00319	183625.	-5374.	-1.51E-05	0.00	7.44E+10	70.2275	158630.	0.00
21.0000	-0.00323	146754.	-4857.	8.38E-07	0.00	7.44E+10	73.3155	163296.	0.00
21.6000	-0.00318	113685.	-4326.	1.34E-05	0.00	7.45E+10	74.0772	167962.	0.00
22.2000	-0.00304	84455.	-3797.	2.30E-05	0.00	7.46E+10	72.8680	172627.	0.00
22.8000	-0.00284	59003.	-3283.	2.99E-05	0.00	7.46E+10	70.0363	177293.	0.00
23.4000	-0.00261	37181.	-2793.	3.46E-05	0.00	7.46E+10	65.9152	181958.	0.00
24.0000	-0.00235	18777.	-2337.	3.73E-05	0.00	7.46E+10	60.8181	186624.	0.00
24.6000	-0.00207	3525.	-1920.	3.84E-05	0.00	7.46E+10	55.0347	191290.	0.00
25.2000	-0.00179	-8873.	-1546.	3.81E-05	0.00	7.46E+10	48.8284	195955.	0.00
25.8000	-0.00152	-18740.	-1218.	3.68E-05	0.00	7.46E+10	42.4346	200621.	0.00
26.4000	-0.00126	-26408.	-935.1115	3.46E-05	0.00	7.46E+10	36.0608	205286.	0.00
27.0000	-0.00102	-32206.	-625.9659	3.18E-05	0.00	7.46E+10	49.8130	349920.	0.00
27.6000	-8.08E-04	-35422.	-302.2099	2.85E-05	0.00	7.46E+10	40.1192	357696.	0.00
28.2000	-6.15E-04	-36558.	-45.4393	2.50E-05	0.00	7.46E+10	31.2060	365472.	0.00
28.8000	-4.47E-04	-36076.	150.4005	2.15E-05	0.00	7.46E+10	23.1940	373248.	0.00
29.4000	-3.05E-04	-34392.	292.0314	1.81E-05	0.00	7.46E+10	16.1479	381024.	0.00
30.0000	-1.87E-04	-31871.	386.4730	1.49E-05	0.00	7.46E+10	10.0858	388800.	0.00
30.6000	-9.06E-05	-28827.	440.7411	1.20E-05	0.00	7.46E+10	4.9886	396576.	0.00
31.2000	-1.44E-05	-25524.	460.4481	9.35E-06	0.00	7.46E+10	0.4855	242611.	0.00
31.8000	4.40E-05	-22196.	456.7553	7.04E-06	0.00	7.46E+10	-1.5113	247277.	0.00
32.4000	8.70E-05	-18947.	440.3567	5.05E-06	0.00	7.46E+10	-3.0438	251942.	0.00
33.0000	1.17E-04	-15855.	414.4136	3.37E-06	0.00	7.46E+10	-4.1626	256608.	0.00
33.6000	1.36E-04	-12979.	381.7168	1.98E-06	0.00	7.46E+10			

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-4.9199    261274.       0.00
   34.2000   1.45E-04    -10359.   344.6796   8.55E-07       0.00   7.46E+10
-5.3682    265939.       0.00
   34.8000   1.48E-04     -8016.   305.3434  -3.19E-08       0.00   7.46E+10
-5.5585    270605.       0.00
   35.4000   1.45E-04     -5962.   265.3923  -7.07E-07       0.00   7.46E+10
-5.5390    275270.       0.00
   36.0000   1.38E-04     -4194.   226.1756  -1.20E-06       0.00   7.46E+10
-5.3545    279936.       0.00
   36.6000   1.28E-04     -2705.   188.7361  -1.53E-06       0.00   7.46E+10
-5.0454    284602.       0.00
   37.2000   1.16E-04     -1477.   153.8410  -1.73E-06       0.00   7.46E+10
-4.6477    289267.       0.00
   37.8000   1.03E-04  -489.3586   122.0162  -1.83E-06       0.00   7.46E+10
-4.1926    293933.       0.00
   38.4000   8.94E-05   280.4870    93.5796  -1.84E-06       0.00   7.46E+10
-3.7065    298598.       0.00
   39.0000   7.62E-05   858.1878    68.6753  -1.78E-06       0.00   7.46E+10
-3.2114    303264.       0.00
   39.6000   6.37E-05      1269.    47.3051  -1.68E-06       0.00   7.46E+10
-2.7248    307930.       0.00
   40.2000   5.21E-05      1539.    29.3591  -1.54E-06       0.00   7.46E+10
-2.2602    312595.       0.00
   40.8000   4.15E-05      1692.    14.6423  -1.39E-06       0.00   7.46E+10
-1.8278    317261.       0.00
   41.4000   3.21E-05      1750.     2.8993  -1.22E-06       0.00   7.46E+10
-1.4342    321926.       0.00
   42.0000   2.39E-05      1734.    -6.1648  -1.05E-06       0.00   7.46E+10
-1.0836    326592.       0.00
   42.6000   1.69E-05      1661.   -12.8663  -8.89E-07       0.00   7.46E+10
-0.7779    331258.       0.00
   43.2000   1.11E-05      1549.   -17.5281  -7.34E-07       0.00   7.46E+10
-0.5171    335923.       0.00
   43.8000   6.33E-06      1409.   -20.4680  -5.92E-07       0.00   7.46E+10
-0.2996    340589.       0.00
   44.4000   2.56E-06      1254.   -21.9890  -4.63E-07       0.00   7.46E+10
-0.1229    345254.       0.00
   45.0000  -3.34E-07      1092.   -22.3731  -3.50E-07       0.00   7.46E+10
0.01624    349920.       0.00
   45.6000  -2.47E-06   931.7467   -21.8763  -2.52E-07       0.00   7.46E+10
0.1218    354586.       0.00
   46.2000  -3.96E-06   777.3933   -20.7262  -1.69E-07       0.00   7.46E+10
0.1977    359251.       0.00
   46.8000  -4.91E-06   633.2894   -19.1206  -1.01E-07       0.00   7.46E+10
0.2483    363917.       0.00
   47.4000  -5.42E-06   502.0568   -17.2276  -4.65E-08       0.00   7.46E+10
0.2775    368582.       0.00
   48.0000  -5.58E-06   385.2123   -15.1866  -3.67E-09       0.00   7.46E+10
0.2894    373248.       0.00
   48.6000  -5.47E-06   283.3691   -13.1104   2.86E-08       0.00   7.46E+10
0.2874    377914.       0.00
   49.2000  -5.17E-06   196.4223   -11.0869   5.18E-08       0.00   7.46E+10
0.2747    382579.       0.00
   49.8000  -4.73E-06   123.7171    -9.1823   6.72E-08       0.00   7.46E+10
0.2543    387245.       0.00
   50.4000  -4.20E-06    64.1973    -7.4432   7.63E-08       0.00   7.46E+10
0.2287    391910.       0.00
   51.0000  -3.63E-06    16.5346    -5.9000   8.02E-08       0.00   7.46E+10
0.2000    396576.       0.00
   51.6000  -3.05E-06   -20.7624    -4.5688   8.00E-08       0.00   7.46E+10
0.1698    401242.       0.00
   52.2000  -2.48E-06   -49.2565    -3.4545   7.66E-08       0.00   7.46E+10
0.1397    405907.       0.00
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   52.8000  -1.94E-06   -70.5077    -2.5525   7.08E-08       0.00   7.46E+10
0.1108    410573.       0.00
   53.4000  -1.46E-06   -86.0128    -1.8507   6.33E-08       0.00   7.46E+10
0.08410    415238.       0.00
   54.0000  -1.03E-06   -97.1581    -1.3312   5.44E-08       0.00   7.46E+10
0.06022    419904.       0.00
   54.6000  -6.74E-07  -105.1816    -0.9712   4.47E-08       0.00   7.46E+10
0.03977    424570.       0.00
   55.2000  -3.89E-07  -111.1435     0.4037   3.42E-08       0.00   7.46E+10
0.3422   6326340.       0.00
   55.8000  -1.82E-07   -99.3679     2.2101   2.41E-08       0.00   7.46E+10
0.1596   6326340.       0.00
   56.4000  -4.30E-08   -79.3173     2.9209   1.54E-08       0.00   7.46E+10
0.03780   6326340.       0.00
   57.0000   4.05E-08   -57.3073     2.9289   8.83E-09       0.00   7.46E+10
-0.03557   6326340.       0.00
   57.6000   8.41E-08   -37.1413     2.5347   4.27E-09       0.00   7.46E+10
-0.07393   6326340.       0.00
   58.2000   1.02E-07   -20.8077     1.9460   1.47E-09       0.00   7.46E+10
-0.08960   6326340.       0.00
   58.8000   1.05E-07    -9.1189     1.2902   2.71E-11       0.00   7.46E+10
-0.09255   6326340.       0.00
   59.4000   1.02E-07    -2.2282     0.6333  -5.21E-10       0.00   7.46E+10
-0.08994   6326340.       0.00
   60.0000   9.78E-08       0.00       0.00  -6.28E-10       0.00   7.46E+10
-0.08597   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

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Output Summary for Load Case No. 2:

Pile-head deflection              =     0.50000000 inches
Computed slope at pile head       =       0.000000 radians
Maximum bending moment            =      -2433726. inch-lbs
Maximum shear force               =         45368. lbs
Depth of maximum bending moment   =       0.000000 feet below pile head
Depth of maximum shear force      =       0.000000 feet below pile head
Number of iterations              =             20
Number of zero deflection points  =              4


--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 3
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X        y        Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
```

lb/inch	lb/inch	lb/inch						
0.00	1.0000	-3183625.	62485.	0.00	0.00	6.31E+09	0.00	0.00
0.6000	0.9869	-2735935.	61874.	-0.00338	0.00	6.31E+09	-84.8926	619.3275
1.2000	0.9514	-2292645.	60907.	-0.00547	0.00	1.56E+10	-183.5145	1389.
1.8000	0.9082	-1858869.	59212.	-0.00642	0.00	1.58E+10	-287.4487	2279.
2.4000	0.8589	-1439994.	56801.	-0.00717	0.00	1.59E+10	-382.1327	3203.
3.0000	0.8050	-1040929.	53765.	-0.00773	0.00	1.61E+10	-461.2395	4126.
3.6000	0.7477	-665774.	50187.	-0.00811	0.00	1.62E+10	-532.7153	5130.
4.2000	0.6882	-318236.	46160.	-0.00827	0.00	7.41E+10	-585.9806	6131.
4.8000	0.6285	-1074.	41809.	-0.00829	0.00	7.46E+10	-622.5122	7131.
5.4000	0.5689	283816.	37229.	-0.00827	0.00	7.42E+10	-649.7652	8224.
6.0000	0.5094	535022.	32511.	-0.00823	0.00	7.37E+10	-660.8544	9341.
6.6000	0.4503	751970.	27673.	-0.00804	0.00	1.61E+10	-683.0017	10921.
7.2000	0.3936	933511.	22750.	-0.00766	0.00	1.61E+10	-684.4720	12521.
7.8000	0.3399	1079569.	17907.	-0.00721	0.00	1.61E+10	-660.7433	13995.
8.4000	0.2897	1191374.	13177.	-0.00670	0.00	1.60E+10	-653.3228	16235.
9.0000	0.2434	1269311.	8478.	-0.00615	0.00	1.60E+10	-651.8154	19281.
9.6000	0.2012	1313457.	4046.	-0.00557	0.00	1.60E+10	-579.4266	20736.
10.2000	0.1632	1327567.	161.4237	-0.00497	0.00	1.60E+10	-499.4947	22032.
10.8000	0.1296	1315782.	-3148.	-0.00438	0.00	1.60E+10	-419.8593	23328.
11.4000	0.1002	1282232.	-5894.	-0.00379	0.00	1.60E+10	-342.7130	24624.
12.0000	0.07499	1230915.	-8099.	-0.00323	0.00	1.60E+10	-269.9594	25920.
12.6000	0.05376	1165604.	-9803.	-0.00269	0.00	1.60E+10	-203.1994	27216.
13.2000	0.03630	1089759.	-11051.	-0.00218	0.00	1.60E+10	-143.7290	28512.
13.8000	0.02235	1006463.	-11902.	-0.00171	0.00	1.61E+10	-92.5473	29808.
14.4000	0.01166	918370.	-12417.	-0.00128	0.00	1.61E+10	-50.3704	31104.
15.0000	0.00392	827665.	-12827.	-8.90E-04	0.00	1.61E+10	-63.5420	116640.
15.6000	-0.00115	733666.	-12985.	-5.42E-04	0.00	1.62E+10	19.4525	121306.
16.2000	-0.00388	640676.	-12671.	-2.72E-04	0.00	2.18E+10	67.8354	125971.
16.8000	-0.00508	551202.	-12095.	-1.40E-04	0.00	7.36E+10	92.1090	130637.
17.4000	-0.00589	466504.	-11365.	-8.99E-05	0.00	7.38E+10	110.6451	135302.

18.0000	-0.00637	387541.	-10521.	-4.83E-05	0.00	7.40E+10	123.8632	139968.
18.6000	-0.00658	314999.	-9599.	-1.42E-05	0.00	7.41E+10	132.2519	144634.
19.2000	-0.00658	249313.	-8632.	1.32E-05	0.00	7.42E+10	136.3461	149299.
19.8000	-0.00639	190695.	-7649.	3.46E-05	0.00	7.44E+10	136.7065	153965.
20.4000	-0.00608	139164.	-6675.	5.05E-05	0.00	7.44E+10	133.9015	158630.
21.0000	-0.00567	94575.	-5730.	6.18E-05	0.00	7.46E+10	128.4898	163296.
21.6000	-0.00519	56646.	-4832.	6.91E-05	0.00	7.46E+10	121.0097	167962.
22.2000	-0.00467	24991.	-3994.	7.31E-05	0.00	7.46E+10	111.9658	172627.
22.8000	-0.00414	-860.3974	-3224.	7.42E-05	0.00	7.46E+10	101.8235	177293.
23.4000	-0.00360	-21433.	-2530.	7.32E-05	0.00	7.46E+10	91.0032	181958.
24.0000	-0.00308	-37288.	-1915.	7.03E-05	0.00	7.46E+10	79.8768	186624.
24.6000	-0.00259	-49002.	-1379.	6.62E-05	0.00	7.46E+10	68.7663	191290.
25.2000	-0.00213	-57151.	-923.2504	6.10E-05	0.00	7.46E+10	57.9437	195955.
25.8000	-0.00171	-62297.	-543.1741	5.53E-05	0.00	7.46E+10	47.6331	200621.
26.4000	-0.00133	-64973.	-234.8458	4.91E-05	0.00	7.46E+10	38.0137	205286.
27.0000	-0.00100	-65679.	77.3474	4.28E-05	0.00	7.46E+10	48.7067	349920.
27.6000	-7.17E-04	-63859.	380.8902	3.66E-05	0.00	7.46E+10	35.6108	357696.
28.2000	-4.76E-04	-60194.	596.0372	3.06E-05	0.00	7.46E+10	24.1523	365472.
28.8000	-2.77E-04	-55276.	734.6194	2.50E-05	0.00	7.46E+10	14.3428	373248.
29.4000	-1.16E-04	-49615.	808.3470	1.99E-05	0.00	7.46E+10	6.1371	381024.
30.0000	1.02E-05	-43636.	828.4500	1.54E-05	0.00	7.46E+10	-0.5529	388800.
30.6000	1.06E-04	-37686.	805.4197	1.15E-05	0.00	7.46E+10	-5.8444	396576.
31.2000	1.76E-04	-32038.	763.0575	8.13E-06	0.00	7.46E+10	-5.9229	242611.
31.8000	2.23E-04	-26698.	714.1436	5.29E-06	0.00	7.46E+10	-7.6643	247277.
32.4000	2.52E-04	-21754.	654.8083	2.95E-06	0.00	7.46E+10	-8.8177	251942.
33.0000	2.66E-04	-17268.	588.9751	1.07E-06	0.00	7.46E+10	-9.4693	256608.
33.6000	2.67E-04	-13273.	519.9548	-4.05E-07	0.00	7.46E+10	-9.7030	261274.
34.2000	2.60E-04	-9781.	450.4711	-1.52E-06	0.00	7.46E+10	-9.5980	265939.
34.8000	2.46E-04	-6786.	382.6986	-2.32E-06	0.00	7.46E+10	-9.2277	270605.
35.4000	2.26E-04	-4270.	318.3089	-2.85E-06	0.00	7.46E+10	-8.6584	275270.
36.0000	2.04E-04	-2203.	258.5227	-3.16E-06	0.00	7.46E+10	-7.9489	279936.
36.6000	1.81E-04	-547.4465	204.1652	-3.30E-06	0.00	7.46E+10		

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-7.1504    284602.       0.00
   37.2000   1.57E-04   737.2049   155.7220  -3.29E-06       0.00   7.46E+10
-6.3060    289267.       0.00
   37.8000   1.34E-04     1695.   113.3944  -3.17E-06       0.00   7.46E+10
-5.4516    293933.       0.00
   38.4000   1.11E-04     2370.    77.1521  -2.97E-06       0.00   7.46E+10
-4.6157    298598.       0.00
   39.0000   9.07E-05     2806.    46.7823  -2.72E-06       0.00   7.46E+10
-3.8204    303264.       0.00
   39.6000   7.21E-05     3044.    21.9345  -2.44E-06       0.00   7.46E+10
-3.0818    307930.       0.00
   40.2000   5.55E-05     3122.     2.1608  -2.14E-06       0.00   7.46E+10
-2.4109    312595.       0.00
   40.8000   4.12E-05     3075.   -13.0499  -1.85E-06       0.00   7.46E+10
-1.8143    317261.       0.00
   41.4000   2.90E-05     2934.   -24.2419  -1.56E-06       0.00   7.46E+10
-1.2946    321926.       0.00
   42.0000   1.88E-05     2726.   -31.9684  -1.28E-06       0.00   7.46E+10
-0.8517    326592.       0.00
   42.6000   1.05E-05     2474.   -36.7721  -1.03E-06       0.00   7.46E+10
-0.4827    331258.       0.00
   43.2000   3.93E-06     2196.   -39.1694  -8.06E-07       0.00   7.46E+10
-0.1832    335923.       0.00
   43.8000  -1.11E-06     1909.   -39.6401  -6.07E-07       0.00   7.46E+10
0.05250    340589.       0.00
   44.4000  -4.82E-06     1625.   -38.6191  -4.37E-07       0.00   7.46E+10
0.2311     345254.       0.00
   45.0000  -7.40E-06     1353.   -36.4928  -2.93E-07       0.00   7.46E+10
0.3596     349920.       0.00
   45.6000  -9.04E-06     1100.   -33.5962  -1.74E-07       0.00   7.46E+10
0.4450     354586.       0.00
   46.2000  -9.91E-06   869.5942   -30.2139  -7.93E-08       0.00   7.46E+10
0.4945     359251.       0.00
   46.8000  -1.02E-05   664.8710   -26.5816  -5.24E-09       0.00   7.46E+10
0.5145     363917.       0.00
   47.4000  -9.99E-06   486.8192   -22.8891   5.04E-08       0.00   7.46E+10
0.5112     368582.       0.00
   48.0000  -9.45E-06   335.2675   -19.2845   9.01E-08       0.00   7.46E+10
0.4901     373248.       0.00
   48.6000  -8.69E-06   209.1220   -15.8784   1.16E-07       0.00   7.46E+10
0.4561     377914.       0.00
   49.2000  -7.78E-06   106.6187   -12.7486   1.32E-07       0.00   7.46E+10
0.4133     382579.       0.00
   49.8000  -6.79E-06    25.5418    -9.9452   1.38E-07       0.00   7.46E+10
0.3654     387245.       0.00
   50.4000  -5.79E-06   -36.5925    -7.4948   1.37E-07       0.00   7.46E+10
0.3153     391910.       0.00
   51.0000  -4.81E-06   -82.3840    -5.4052   1.32E-07       0.00   7.46E+10
0.2652     396576.       0.00
   51.6000  -3.90E-06  -114.4275    -3.6690   1.22E-07       0.00   7.46E+10
0.2171     401242.       0.00
   52.2000  -3.06E-06  -135.2177    -2.2674   1.10E-07       0.00   7.46E+10
0.1722     405907.       0.00
   52.8000  -2.31E-06  -147.0787    -1.1733   9.65E-08       0.00   7.46E+10
0.1317     410573.       0.00
   53.4000  -1.67E-06  -152.1131    -0.3534   8.21E-08       0.00   7.46E+10
0.09606    415238.       0.00
   54.0000  -1.13E-06  -152.1678     0.2292   6.74E-08       0.00   7.46E+10
0.06576    419904.       0.00
   54.6000  -6.95E-07  -148.8133     0.6135   5.28E-08       0.00   7.46E+10
0.04101    424570.       0.00
   55.2000  -3.67E-07  -143.3328     1.9215   3.87E-08       0.00   7.46E+10
0.3223    6326340.       0.00
```



```
   55.8000  -1.38E-07  -121.1443     3.5176   2.60E-08       0.00   7.46E+10
0.1211    6326340.       0.00
   56.4000   7.02E-09   -92.6799     3.9312   1.56E-08       0.00   7.46E+10
-0.00617   6326340.       0.00
   57.0000   8.74E-08   -64.5352     3.6326   8.04E-09       0.00   7.46E+10
-0.07677   6326340.       0.00
   57.6000   1.23E-07   -40.3704     2.9676   2.98E-09       0.00   7.46E+10
-0.1080    6326340.       0.00
   58.2000   1.30E-07   -21.8018     2.1669  -2.25E-11       0.00   7.46E+10
-0.1145    6326340.       0.00
   58.8000   1.23E-07    -9.1673     1.3672  -1.52E-09       0.00   7.46E+10
-0.1077    6326340.       0.00
   59.4000   1.08E-07    -2.1143     0.6366  -2.06E-09       0.00   7.46E+10
-0.09527   6326340.       0.00
   60.0000   9.28E-08       0.00       0.00  -2.16E-09       0.00   7.46E+10
-0.08157   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

```
Output Summary for Load Case No. 3:

Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -3183625. inch-lbs
Maximum shear force              =         62485. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             35
Number of zero deflection points =              4


--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 4
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     0.250000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y        Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     0.2500       0.00     12196.   -0.00237       0.00   7.46E+10
0.00       0.00       0.00
    0.6000     0.2329     87812.     12045.   -0.00237       0.00   7.46E+10
-41.9276      1296.       0.00
    1.2000     0.2159    173450.     11614.   -0.00235       0.00   7.44E+10
-77.7322      2592.       0.00
    1.8000     0.1990    255059.     10948.   -0.00233       0.00   7.42E+10
```

-107.4792	3888.	0.00				
2.4000	0.1823	331096.	10088.	-0.00230	0.00	7.41E+10
-131.2750	5184.	0.00				
3.0000	0.1658	400328.	9078.	-0.00227	0.00	7.39E+10
-149.2641	6480.	0.00				
3.6000	0.1497	461822.	7959.	-0.00223	0.00	7.38E+10
-161.6246	7776.	0.00				
4.2000	0.1338	514937.	6770.	-0.00218	0.00	7.37E+10
-168.5628	9072.	0.00				
4.8000	0.1183	559314.	5550.	-0.00213	0.00	7.36E+10
-170.3085	10368.	0.00				
5.4000	0.1032	594862.	4336.	-0.00207	0.00	7.35E+10
-167.1086	11664.	0.00				
6.0000	0.08846	621748.	3161.	-0.00201	0.00	7.35E+10
-159.2215	12960.	0.00				
6.6000	0.07420	640379.	2059.	-0.00191	0.00	3.22E+10
-146.9119	14256.	0.00				
7.2000	0.06097	651394.	1056.	-0.00169	0.00	1.62E+10
-131.6990	15552.	0.00				
7.8000	0.04983	655582.	161.8851	-0.00140	0.00	1.62E+10
-116.6089	16848.	0.00				
8.4000	0.04079	653726.	-627.9966	-0.00111	0.00	1.62E+10
-102.8027	18144.	0.00				
9.0000	0.03385	646539.	-1327.	-8.46E-04	0.00	1.96E+10
-91.3987	19440.	0.00				
9.6000	0.02862	634615.	-1953.	-6.77E-04	0.00	4.58E+10
-82.4122	20736.	0.00				
10.2000	0.02410	618418.	-2515.	-5.97E-04	0.00	7.35E+10
-73.7401	22032.	0.00				
10.8000	0.02002	598399.	-3014.	-5.38E-04	0.00	7.35E+10
-64.8552	23328.	0.00				
11.4000	0.01636	575018.	-3449.	-4.80E-04	0.00	7.36E+10
-55.9437	24624.	0.00				
12.0000	0.01310	548736.	-3820.	-4.25E-04	0.00	7.36E+10
-47.1732	25920.	0.00				
12.6000	0.01024	520009.	-4129.	-3.73E-04	0.00	7.37E+10
-38.6914	27216.	0.00				
13.2000	0.00773	489277.	-4379.	-3.24E-04	0.00	7.38E+10
-30.6256	28512.	0.00				
13.8000	0.00558	456956.	-4572.	-2.77E-04	0.00	7.38E+10
-23.0828	29808.	0.00				
14.4000	0.00374	423439.	-4713.	-2.35E-04	0.00	7.39E+10
-16.1491	31104.	0.00				
15.0000	0.00220	389085.	-4900.	-1.95E-04	0.00	7.40E+10
-35.6071	116640.	0.00				
15.6000	9.30E-04	352885.	-5084.	-1.59E-04	0.00	7.40E+10
-15.6760	121306.	0.00				
16.2000	-9.00E-05	315873.	-5135.	-1.26E-04	0.00	7.41E+10
1.5747	125971.	0.00				
16.8000	-8.89E-04	278942.	-5071.	-9.75E-05	0.00	7.42E+10
16.1384	130637.	0.00				
17.4000	-0.00149	242847.	-4912.	-7.22E-05	0.00	7.42E+10
28.0754	135302.	0.00				
18.0000	-0.00193	208208.	-4676.	-5.03E-05	0.00	7.43E+10
37.4995	139968.	0.00				
18.6000	-0.00222	175513.	-4381.	-3.17E-05	0.00	7.44E+10
44.5699	144634.	0.00				
19.2000	-0.00239	145129.	-4042.	-1.62E-05	0.00	7.44E+10
49.4793	149299.	0.00				
19.8000	-0.00245	117309.	-3675.	-3.54E-06	0.00	7.45E+10
52.4442	153965.	0.00				
20.4000	-0.00244	92209.	-3293.	6.58E-06	0.00	7.46E+10
53.6961	158630.	0.00				

21.0000	-0.00236	69891.	-2907.	1.44E-05	0.00	7.46E+10
53.4742	163296.	0.00				
21.6000	-0.00223	50346.	-2527.	2.02E-05	0.00	7.46E+10
52.0157	167962.	0.00				
22.2000	-0.00207	33498.	-2162.	2.43E-05	0.00	7.46E+10
49.5520	172627.	0.00				
22.8000	-0.00188	19218.	-1817.	2.68E-05	0.00	7.46E+10
46.3036	177293.	0.00				
23.4000	-0.00168	7339.	-1497.	2.81E-05	0.00	7.46E+10
42.4760	181958.	0.00				
24.0000	-0.00148	-2339.	-1206.	2.83E-05	0.00	7.46E+10
38.2573	186624.	0.00				
24.6000	-0.00127	-10033.	-946.8990	2.77E-05	0.00	7.46E+10
33.8165	191290.	0.00				
25.2000	-0.00108	-15974.	-719.6717	2.65E-05	0.00	7.46E+10
29.3022	195955.	0.00				
25.8000	-8.92E-04	-20396.	-524.7481	2.47E-05	0.00	7.46E+10
24.8432	200621.	0.00				
26.4000	-7.21E-04	-23531.	-361.3372	2.26E-05	0.00	7.46E+10
20.5487	205286.	0.00				
27.0000	-5.66E-04	-25600.	-188.3034	2.02E-05	0.00	7.46E+10
27.5163	349920.	0.00				
27.6000	-4.29E-04	-26242.	-12.4380	1.77E-05	0.00	7.46E+10
21.3352	357696.	0.00				
28.2000	-3.11E-04	-25779.	121.1949	1.52E-05	0.00	7.46E+10
15.7850	365472.	0.00				
28.8000	-2.10E-04	-24497.	217.2899	1.28E-05	0.00	7.46E+10
10.9080	373248.	0.00				
29.4000	-1.27E-04	-22650.	280.7337	1.05E-05	0.00	7.46E+10
6.7152	381024.	0.00				
30.0000	-5.91E-05	-20454.	316.4012	8.43E-06	0.00	7.46E+10
3.1924	388800.	0.00				
30.6000	-5.56E-06	-18093.	328.9972	6.56E-06	0.00	7.46E+10
0.3065	396576.	0.00				
31.2000	3.54E-05	-15717.	325.8054	4.93E-06	0.00	7.46E+10
-1.1931	242611.	0.00				
31.8000	6.55E-05	-13402.	313.4174	3.53E-06	0.00	7.46E+10
-2.2480	247277.	0.00				
32.4000	8.62E-05	-11204.	294.4682	2.34E-06	0.00	7.46E+10
-3.0157	251942.	0.00				
33.0000	9.91E-05	-9162.	270.8942	1.35E-06	0.00	7.46E+10
-3.5326	256608.	0.00				
33.6000	1.06E-04	-7303.	244.3698	5.60E-07	0.00	7.46E+10
-3.8352	261274.	0.00				
34.2000	1.07E-04	-5643.	216.3115	-6.54E-08	0.00	7.46E+10
-3.9588	265939.	0.00				
34.8000	1.05E-04	-4188.	187.8876	-5.40E-07	0.00	7.46E+10
-3.9368	270605.	0.00				
35.4000	9.94E-05	-2937.	160.0340	-8.84E-07	0.00	7.46E+10
-3.8003	275270.	0.00				
36.0000	9.20E-05	-1883.	133.4736	-1.12E-06	0.00	7.46E+10
-3.5776	279936.	0.00				
36.6000	8.33E-05	-1015.	108.7380	-1.26E-06	0.00	7.46E+10
-3.2934	284602.	0.00				
37.2000	7.39E-05	-317.4584	86.1906	-1.32E-06	0.00	7.46E+10
-2.9697	289267.	0.00				
37.8000	6.43E-05	226.1386	66.0503	-1.33E-06	0.00	7.46E+10
-2.6248	293933.	0.00				
38.4000	5.48E-05	633.6663	48.4150	-1.28E-06	0.00	7.46E+10
-2.2739	298598.	0.00				
39.0000	4.58E-05	923.3140	33.2832	-1.21E-06	0.00	7.46E+10
-1.9293	303264.	0.00				
39.6000	3.74E-05	1113.	20.5758	-1.11E-06	0.00	7.46E+10

```
-1.6005    307930.       0.00
   40.2000   2.98E-05      1220.    10.1540  -9.98E-07       0.00   7.46E+10
-1.2944    312595.       0.00
   40.8000   2.31E-05      1259.     1.8371  -8.78E-07       0.00   7.46E+10
-1.0158    317261.       0.00
   41.4000   1.72E-05      1246.    -4.5833  -7.57E-07       0.00   7.46E+10
-0.7676    321926.       0.00
   42.0000   1.21E-05      1193.    -9.3307  -6.39E-07       0.00   7.46E+10
-0.5511    326592.       0.00
   42.6000   7.96E-06      1112.   -12.6330  -5.28E-07       0.00   7.46E+10
-0.3662    331258.       0.00
   43.2000   4.54E-06      1011.   -14.7146  -4.26E-07       0.00   7.46E+10
-0.2120    335923.       0.00
   43.8000   1.83E-06    899.8080  -15.7895  -3.33E-07       0.00   7.46E+10
-0.08658    340589.       0.00
   44.4000  -2.57E-07    783.8797  -16.0567  -2.52E-07       0.00   7.46E+10
0.01234    345254.       0.00
   45.0000  -1.80E-06    668.5910  -15.6974  -1.82E-07       0.00   7.46E+10
0.08748    349920.       0.00
   45.6000  -2.88E-06    557.8370  -14.8723  -1.23E-07       0.00   7.46E+10
0.1417    354586.       0.00
   46.2000  -3.57E-06    454.4297  -13.7213  -7.39E-08       0.00   7.46E+10
0.1780    359251.       0.00
   46.8000  -3.94E-06    360.2503  -12.3633  -3.45E-08       0.00   7.46E+10
0.1992    363917.       0.00
   47.4000  -4.06E-06    276.3983  -10.8970  -3.80E-09       0.00   7.46E+10
0.2081    368582.       0.00
   48.0000  -4.00E-06    203.3339   -9.4021   1.94E-08       0.00   7.46E+10
0.2072    373248.       0.00
   48.6000  -3.79E-06    141.0088   -7.9409   3.60E-08       0.00   7.46E+10
0.1987    377914.       0.00
   49.2000  -3.48E-06     88.9856   -6.5601   4.71E-08       0.00   7.46E+10
0.1848    382579.       0.00
   49.8000  -3.11E-06     46.5427   -5.2931   5.36E-08       0.00   7.46E+10
0.1672    387245.       0.00
   50.4000  -2.71E-06     12.7654   -4.1611   5.65E-08       0.00   7.46E+10
0.1473    391910.       0.00
   51.0000  -2.29E-06    -13.3775   -3.1760   5.65E-08       0.00   7.46E+10
0.1264    396576.       0.00
   51.6000  -1.89E-06    -32.9692   -2.3414   5.42E-08       0.00   7.46E+10
0.1055    401242.       0.00
   52.2000  -1.51E-06    -47.0940   -1.6546   5.04E-08       0.00   7.46E+10
0.08532    405907.       0.00
   52.8000  -1.17E-06    -56.7959   -1.1079   4.54E-08       0.00   7.46E+10
0.06655    410573.       0.00
   53.4000  -8.60E-07    -63.0477   -0.6897   3.96E-08       0.00   7.46E+10
0.04961    415238.       0.00
   54.0000  -5.97E-07    -66.7275   -0.3857   3.33E-08       0.00   7.46E+10
0.03484    419904.       0.00
   54.6000  -3.81E-07    -68.6014   -0.1794   2.68E-08       0.00   7.46E+10
0.02245    424570.       0.00
   55.2000  -2.12E-07    -69.3112    0.5717   2.01E-08       0.00   7.46E+10
0.1862   6326340.       0.00
   55.8000  -9.12E-08    -60.3682    1.5307   1.38E-08       0.00   7.46E+10
0.08018   6326340.       0.00
   56.4000  -1.26E-08    -47.2689    1.8591   8.65E-09       0.00   7.46E+10
0.01103   6326340.       0.00
   57.0000   3.33E-08    -33.5978    1.7935   4.74E-09       0.00   7.46E+10
-0.02924   6326340.       0.00
   57.6000   5.57E-08    -21.4425    1.5119   2.09E-09       0.00   7.46E+10
-0.04898   6326340.       0.00
   58.2000   6.33E-08    -11.8266    1.1353   4.79E-10       0.00   7.46E+10
-0.05563   6326340.       0.00
```



```
   58.8000   6.27E-08    -5.0945     0.7368  -3.38E-10       0.00   7.46E+10
-0.05505   6326340.       0.00
   59.4000   5.84E-08    -1.2161     0.3538  -6.42E-10       0.00   7.46E+10
-0.05136   6326340.       0.00
   60.0000   5.34E-08       0.00       0.00  -7.01E-10       0.00   7.46E+10
-0.04692   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

```
Output Summary for Load Case No. 4:

Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =    -0.00237072 radians
Maximum bending moment           =        655582. inch-lbs
Maximum shear force              =         12196. lbs
Depth of maximum bending moment  =     7.80000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             46
Number of zero deflection points =              4


--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     0.500000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
       0.00     0.5000       0.00     18262.   -0.00543       0.00   7.46E+10
0.00       0.00       0.00
    0.6000     0.4609    131486.     18025.   -0.00542       0.00   7.46E+10
-65.9425      1030.       0.00
    1.2000     0.4219    259553.     17293.   -0.00540       0.00   7.42E+10
-137.2789      2343.       0.00
    1.8000     0.3831    380504.     16054.   -0.00537       0.00   7.40E+10
-206.8906      3888.       0.00
    2.4000     0.3446    490729.     14416.   -0.00533       0.00   7.38E+10
-248.1065      5184.       0.00
    3.0000     0.3064    588093.     12530.   -0.00528       0.00   7.36E+10
-275.7590      6480.       0.00
    3.6000     0.2686    671161.     10493.   -0.00510       0.00   1.62E+10
-290.1094      7776.       0.00
    4.2000     0.2330    739190.      8392.   -0.00478       0.00   1.62E+10
-293.5700      9072.       0.00
    4.8000     0.1997    792000.      6299.   -0.00444       0.00   1.61E+10
```

-287.6208	10368.	0.00				
5.4000	0.1690	829900.	4278.	-0.00408	0.00	1.61E+10
-273.8213	11664.	0.00				
6.0000	0.1410	853605.	2379.	-0.00370	0.00	1.61E+10
-253.7678	12960.	0.00				
6.6000	0.1157	864155.	640.6594	-0.00332	0.00	1.61E+10
-229.0544	14256.	0.00				
7.2000	0.09317	862831.	-908.3932	-0.00293	0.00	1.61E+10
-201.2380	15552.	0.00				
7.8000	0.07342	851074.	-2251.	-0.00255	0.00	1.61E+10
-171.8093	16848.	0.00				
8.4000	0.05642	830411.	-3382.	-0.00218	0.00	1.61E+10
-142.1705	18144.	0.00				
9.0000	0.04208	802378.	-4303.	-0.00181	0.00	1.61E+10
-113.6173	19440.	0.00				
9.6000	0.03032	768455.	-5026.	-0.00146	0.00	1.61E+10
-87.3278	20736.	0.00				
10.2000	0.02103	730005.	-5572.	-0.00113	0.00	1.62E+10
-64.3560	22032.	0.00				
10.8000	0.01408	688218.	-5968.	-8.12E-04	0.00	1.62E+10
-45.6290	23328.	0.00				
11.4000	0.00934	644066.	-6247.	-5.22E-04	0.00	1.69E+10
-31.9475	24624.	0.00				
12.0000	0.00657	598258.	-6447.	-3.55E-04	0.00	7.35E+10
-23.6610	25920.	0.00				
12.6000	0.00423	551224.	-6590.	-2.99E-04	0.00	7.36E+10
-15.9720	27216.	0.00				
13.2000	0.00227	503361.	-6680.	-2.48E-04	0.00	7.37E+10
-8.9747	28512.	0.00				
13.8000	6.61E-04	455033.	-6722.	-2.01E-04	0.00	7.38E+10
-2.7374	29808.	0.00				
14.4000	-6.24E-04	406564.	-6722.	-1.59E-04	0.00	7.39E+10
2.6975	31104.	0.00				
15.0000	-0.00162	358234.	-6618.	-1.22E-04	0.00	7.40E+10
26.3244	116640.	0.00				
15.6000	-0.00237	311268.	-6379.	-8.90E-05	0.00	7.41E+10
40.0075	121306.	0.00				
16.2000	-0.00291	266377.	-6052.	-6.10E-05	0.00	7.42E+10
50.8528	125971.	0.00				
16.8000	-0.00325	224122.	-5656.	-3.72E-05	0.00	7.43E+10
59.0111	130637.	0.00				
17.4000	-0.00344	184926.	-5211.	-1.74E-05	0.00	7.44E+10
64.6782	135302.	0.00				
18.0000	-0.00350	149083.	-4733.	-1.19E-06	0.00	7.44E+10
68.0851	139968.	0.00				
18.6000	-0.00346	116770.	-4238.	1.17E-05	0.00	7.45E+10
69.4844	144634.	0.00				
19.2000	-0.00333	88058.	-3739.	2.16E-05	0.00	7.46E+10
69.1422	149299.	0.00				
19.8000	-0.00315	62931.	-3247.	2.88E-05	0.00	7.46E+10
67.3293	153965.	0.00				
20.4000	-0.00292	41294.	-2774.	3.39E-05	0.00	7.46E+10
64.3116	158630.	0.00				
21.0000	-0.00266	22992.	-2325.	3.70E-05	0.00	7.46E+10
60.3452	163296.	0.00				
21.6000	-0.00239	7817.	-1907.	3.85E-05	0.00	7.46E+10
55.6711	167962.	0.00				
22.2000	-0.00211	-4471.	-1525.	3.86E-05	0.00	7.46E+10
50.5113	172627.	0.00				
22.8000	-0.00183	-14141.	-1181.	3.77E-05	0.00	7.46E+10
45.0655	177293.	0.00				
23.4000	-0.00156	-21475.	-876.3497	3.60E-05	0.00	7.46E+10
39.5097	181958.	0.00				

24.0000	-0.00131	-26761.	-611.7319	3.37E-05	0.00	7.46E+10
33.9952	186624.	0.00				
24.6000	-0.00108	-30284.	-386.2137	3.09E-05	0.00	7.46E+10
28.6487	191290.	0.00				
25.2000	-8.66E-04	-32322.	-198.2156	2.79E-05	0.00	7.46E+10
23.5730	195955.	0.00				
25.8000	-6.76E-04	-33138.	-45.4984	2.47E-05	0.00	7.46E+10
18.8485	200621.	0.00				
26.4000	-5.10E-04	-32977.	74.6824	2.16E-05	0.00	7.46E+10
14.5351	205286.	0.00				
27.0000	-3.66E-04	-32063.	191.0542	1.84E-05	0.00	7.46E+10
17.7904	349920.	0.00				
27.6000	-2.45E-04	-30226.	298.8501	1.54E-05	0.00	7.46E+10
12.1529	357696.	0.00				
28.2000	-1.44E-04	-27760.	368.9514	1.26E-05	0.00	7.46E+10
7.3197	365472.	0.00				
28.8000	-6.31E-05	-24913.	407.0755	1.01E-05	0.00	7.46E+10
3.2703	373248.	0.00				
29.4000	7.13E-07	-21898.	418.7126	7.80E-06	0.00	7.46E+10
-0.03773	381024.	0.00				
30.0000	4.93E-05	-18884.	408.9958	5.83E-06	0.00	7.46E+10
-2.6614	388800.	0.00				
30.6000	8.47E-05	-16008.	382.6146	4.15E-06	0.00	7.46E+10
-4.6667	396576.	0.00				
31.2000	1.09E-04	-13374.	352.5874	2.73E-06	0.00	7.46E+10
-3.6741	242611.	0.00				
31.8000	1.24E-04	-10931.	324.0231	1.56E-06	0.00	7.46E+10
-4.2604	247277.	0.00				
32.4000	1.31E-04	-8708.	292.1251	6.09E-07	0.00	7.46E+10
-4.6002	251942.	0.00				
33.0000	1.33E-04	-6724.	258.5230	-1.36E-07	0.00	7.46E+10
-4.7337	256608.	0.00				
33.6000	1.30E-04	-4986.	224.5637	-7.02E-07	0.00	7.46E+10
-4.6994	261274.	0.00				
34.2000	1.23E-04	-3491.	191.3279	-1.11E-06	0.00	7.46E+10
-4.5328	265939.	0.00				
34.8000	1.14E-04	-2230.	159.6520	-1.39E-06	0.00	7.46E+10
-4.2661	270605.	0.00				
35.4000	1.03E-04	-1192.	130.1526	-1.55E-06	0.00	7.46E+10
-3.9282	275270.	0.00				
36.0000	9.12E-05	-356.2727	103.2521	-1.63E-06	0.00	7.46E+10
-3.5441	279936.	0.00				
36.6000	7.93E-05	295.2785	79.2062	-1.63E-06	0.00	7.46E+10
-3.1353	284602.	0.00				
37.2000	6.77E-05	784.2965	58.1296	-1.58E-06	0.00	7.46E+10
-2.7193	289267.	0.00				
37.8000	5.66E-05	1132.	40.0221	-1.49E-06	0.00	7.46E+10
-2.3106	293933.	0.00				
38.4000	4.63E-05	1361.	24.7918	-1.36E-06	0.00	7.46E+10
-1.9201	298598.	0.00				
39.0000	3.69E-05	1489.	12.2778	-1.23E-06	0.00	7.46E+10
-1.5561	303264.	0.00				
39.6000	2.86E-05	1537.	2.2687	-1.08E-06	0.00	7.46E+10
-1.2242	307930.	0.00				
40.2000	2.14E-05	1522.	-5.4796	-9.33E-07	0.00	7.46E+10
-0.9280	312595.	0.00				
40.8000	1.52E-05	1459.	-11.2292	-7.89E-07	0.00	7.46E+10
-0.6691	317261.	0.00				
41.4000	1.00E-05	1360.	-15.2486	-6.53E-07	0.00	7.46E+10
-0.4474	321926.	0.00				
42.0000	5.78E-06	1239.	-17.8025	-5.28E-07	0.00	7.46E+10
-0.2620	326592.	0.00				
42.6000	2.41E-06	1104.	-19.1440	-4.15E-07	0.00	7.46E+10

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-0.1107    331258.       0.00
   43.2000  -1.97E-07   963.2538   -19.5094  -3.15E-07       0.00   7.46E+10
0.00919    335923.       0.00
   43.8000  -2.13E-06   823.0246   -19.1136  -2.29E-07       0.00   7.46E+10
0.1007     340589.       0.00
   44.4000  -3.49E-06   688.0180   -18.1484  -1.56E-07       0.00   7.46E+10
0.1674     345254.       0.00
   45.0000  -4.37E-06   561.6875   -16.7809  -9.54E-08       0.00   7.46E+10
0.2125     349920.       0.00
   45.6000  -4.86E-06   446.3728   -15.1536  -4.67E-08       0.00   7.46E+10
0.2395     354586.       0.00
   46.2000  -5.05E-06   343.4756   -13.3850  -8.58E-09       0.00   7.46E+10
0.2517     359251.       0.00
   46.8000  -4.99E-06   253.6281   -11.5713   2.02E-08       0.00   7.46E+10
0.2521     363917.       0.00
   47.4000  -4.75E-06   176.8490    -9.7877   4.10E-08       0.00   7.46E+10
0.2433     368582.       0.00
   48.0000  -4.40E-06   112.6848    -8.0912   5.50E-08       0.00   7.46E+10
0.2279     373248.       0.00
   48.6000  -3.96E-06    60.3362    -6.5221   6.34E-08       0.00   7.46E+10
0.2079     377914.       0.00
   49.2000  -3.48E-06    18.7665    -5.1071   6.72E-08       0.00   7.46E+10
0.1851     382579.       0.00
   49.8000  -2.99E-06   -13.2057    -3.8609   6.75E-08       0.00   7.46E+10
0.1610     387245.       0.00
   50.4000  -2.51E-06   -36.8302    -2.7888   6.50E-08       0.00   7.46E+10
0.1368     391910.       0.00
   51.0000  -2.06E-06   -53.3640    -1.8884   6.07E-08       0.00   7.46E+10
0.1133     396576.       0.00
   51.6000  -1.64E-06   -64.0231    -1.1516   5.50E-08       0.00   7.46E+10
0.09134    401242.       0.00
   52.2000  -1.27E-06   -69.9471    -0.5660   4.85E-08       0.00   7.46E+10
0.07133    405907.       0.00
   52.8000  -9.40E-07   -72.1734    -0.1162   4.17E-08       0.00   7.46E+10
0.05360    410573.       0.00
   53.4000  -6.65E-07   -71.6209     0.2148   3.47E-08       0.00   7.46E+10
0.03835    415238.       0.00
   54.0000  -4.40E-07   -69.0803     0.4452   2.79E-08       0.00   7.46E+10
0.02565    419904.       0.00
   54.6000  -2.63E-07   -65.2103     0.5932   2.15E-08       0.00   7.46E+10
0.01548    424570.       0.00
   55.2000  -1.31E-07   -60.5376     1.0624   1.54E-08       0.00   7.46E+10
0.1148    6326340.       0.00
   55.8000  -4.09E-08   -49.9124     1.6051   1.01E-08       0.00   7.46E+10
0.03595   6326340.       0.00
   56.4000   1.42E-08   -37.4235     1.6898   5.84E-09       0.00   7.46E+10
-0.01244   6326340.       0.00
   57.0000   4.32E-08   -25.5794     1.5084   2.80E-09       0.00   7.46E+10
-0.03796   6326340.       0.00
   57.6000   5.45E-08   -15.7029     1.1995   8.06E-10       0.00   7.46E+10
-0.04785   6326340.       0.00
   58.2000   5.48E-08    -8.3071     0.8538  -3.53E-10       0.00   7.46E+10
-0.04815   6326340.       0.00
   58.8000   4.94E-08    -3.4077     0.5243  -9.19E-10       0.00   7.46E+10
-0.04338   6326340.       0.00
   59.4000   4.16E-08    -0.7571     0.2366  -1.12E-09       0.00   7.46E+10
-0.03653   6326340.       0.00
   60.0000   3.32E-08       0.00       0.00  -1.16E-09       0.00   7.46E+10
-0.02921   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual

stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

```
Output Summary for Load Case No. 5:

Pile-head deflection             =     0.50000000 inches
Computed slope at pile head      =    -0.00542747 radians
Maximum bending moment           =        864155. inch-lbs
Maximum shear force              =         18262. lbs
Depth of maximum bending moment  =     6.60000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             40
Number of zero deflection points =              4


--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     1.000000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0000       0.00     30439.   -0.01097       0.00   7.46E+10
0.00       0.00       0.00
    0.6000     0.9210    219161.     30133.   -0.01096       0.00   7.46E+10
-84.8929   663.6695       0.00
    1.2000     0.8421    433922.     29187.   -0.01093       0.00   7.39E+10
-177.9173     1521.       0.00
    1.8000     0.7636    639459.     27588.   -0.01086       0.00   4.20E+10
-266.4041     2512.       0.00
    2.4000     0.6858    831186.     25386.   -0.01062       0.00   1.61E+10
-345.1696     3624.       0.00
    3.0000     0.6107   1005019.     22673.   -0.01021       0.00   1.61E+10
-408.5592     4817.       0.00
    3.6000     0.5388   1157673.     19534.   -0.00972       0.00   1.60E+10
-463.2344     6190.       0.00
    4.2000     0.4707   1286313.     16063.   -0.00917       0.00   1.60E+10
-500.9516     7662.       0.00
    4.8000     0.4068   1388983.     12373.   -0.00857       0.00   1.60E+10
-524.1888     9278.       0.00
    5.4000     0.3474   1464479.      8558.   -0.00792       0.00   1.59E+10
-535.5647    11101.       0.00
    6.0000     0.2927   1512212.      4733.   -0.00725       0.00   1.59E+10
-526.8599    12960.       0.00
    6.6000     0.2430   1532632.      1104.   -0.00656       0.00   1.59E+10
-481.0757    14256.       0.00
    7.2000     0.1982   1528113.     -2169.   -0.00587       0.00   1.59E+10
-428.1781    15552.       0.00
    7.8000     0.1585   1501397.     -5045.   -0.00518       0.00   1.59E+10
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-370.8291	16848.	0.00					
8.4000	0.1236	1455458.	-7502.	-0.00451	0.00	1.59E+10	
-311.4919	18144.	0.00					
9.0000	0.09348	1393371.	-9532.	-0.00387	0.00	1.60E+10	
-252.3909	19440.	0.00					
9.6000	0.06788	1318200.	-11144.	-0.00326	0.00	1.60E+10	
-195.4854	20736.	0.00					
10.2000	0.04655	1232895.	-12361.	-0.00268	0.00	1.60E+10	
-142.4532	22032.	0.00					
10.8000	0.02922	1140205.	-13214.	-0.00215	0.00	1.60E+10	
-94.6851	23328.	0.00					
11.4000	0.01558	1042607.	-13747.	-0.00166	0.00	1.61E+10	
-53.2881	24624.	0.00					
12.0000	0.00530	942246.	-14008.	-0.00122	0.00	1.61E+10	
-19.0940	25920.	0.00					
12.6000	-0.00194	840896.	-14050.	-8.18E-04	0.00	1.61E+10	
7.3264	27216.	0.00					
13.2000	-0.00648	739925.	-13931.	-4.65E-04	0.00	1.62E+10	
25.6470	28512.	0.00					
13.8000	-0.00864	640284.	-13710.	-2.02E-04	0.00	2.35E+10	
35.7702	29808.	0.00					
14.4000	-0.00939	542497.	-13435.	-7.75E-05	0.00	7.37E+10	
40.5593	31104.	0.00					
15.0000	-0.00976	446813.	-12721.	-2.92E-05	0.00	7.38E+10	
158.0387	116640.	0.00					
15.6000	-0.00981	359321.	-11557.	1.01E-05	0.00	7.40E+10	
165.2546	121306.	0.00					
16.2000	-0.00961	280396.	-10356.	4.12E-05	0.00	7.42E+10	
168.1367	125971.	0.00					
16.8000	-0.00922	210188.	-9149.	6.50E-05	0.00	7.43E+10	
167.2063	130637.	0.00					
17.4000	-0.00867	148647.	-7960.	8.23E-05	0.00	7.44E+10	
163.0093	135302.	0.00					
18.0000	-0.00803	95557.	-6812.	9.42E-05	0.00	7.46E+10	
156.0980	139968.	0.00					
18.6000	-0.00732	50559.	-5720.	1.01E-04	0.00	7.46E+10	
147.0164	144634.	0.00					
19.2000	-0.00657	13183.	-4701.	1.04E-04	0.00	7.46E+10	
136.2843	149299.	0.00					
19.8000	-0.00582	-17129.	-3762.	1.04E-04	0.00	7.46E+10	
124.3890	153965.	0.00					
20.4000	-0.00507	-40993.	-2912.	1.01E-04	0.00	7.46E+10	
111.7771	158630.	0.00					
21.0000	-0.00436	-59061.	-2154.	9.65E-05	0.00	7.46E+10	
98.8480	163296.	0.00					
21.6000	-0.00368	-72006.	-1488.	9.01E-05	0.00	7.46E+10	
85.9502	167962.	0.00					
22.2000	-0.00306	-80495.	-914.8515	8.28E-05	0.00	7.46E+10	
73.3794	172627.	0.00					
22.8000	-0.00249	-85180.	-429.7248	7.48E-05	0.00	7.46E+10	
61.3781	177293.	0.00					
23.4000	-0.00198	-86683.	-28.2690	6.65E-05	0.00	7.46E+10	
50.1375	181958.	0.00					
24.0000	-0.00154	-85587.	295.5050	5.81E-05	0.00	7.46E+10	
39.7998	186624.	0.00					
24.6000	-0.00115	-82428.	548.4471	5.00E-05	0.00	7.46E+10	
30.4619	191290.	0.00					
25.2000	-8.15E-04	-77689.	737.9575	4.23E-05	0.00	7.46E+10	
22.1798	195955.	0.00					
25.8000	-5.37E-04	-71801.	871.7079	3.51E-05	0.00	7.46E+10	
14.9731	200621.	0.00					
26.4000	-3.10E-04	-65137.	957.3989	2.85E-05	0.00	7.46E+10	
8.8300	205286.	0.00					

27.0000	-1.27E-04	-58015.	1011.	2.25E-05	0.00	7.46E+10	
6.1874	349920.	0.00					
27.6000	1.47E-05	-50572.	1031.	1.73E-05	0.00	7.46E+10	
-0.7319	357696.	0.00					
28.2000	1.22E-04	-43167.	1006.	1.28E-05	0.00	7.46E+10	
-6.1731	365472.	0.00					
28.8000	1.98E-04	-36082.	946.9783	8.93E-06	0.00	7.46E+10	
-10.2893	373248.	0.00					
29.4000	2.50E-04	-29530.	862.2585	5.77E-06	0.00	7.46E+10	
-13.2440	381024.	0.00					
30.0000	2.82E-04	-23665.	759.8541	3.20E-06	0.00	7.46E+10	
-15.2017	388800.	0.00					
30.6000	2.96E-04	-18588.	646.3738	1.16E-06	0.00	7.46E+10	
-16.3206	396576.	0.00					
31.2000	2.98E-04	-14357.	551.4489	-4.33E-07	0.00	7.46E+10	
-10.0474	242611.	0.00					
31.8000	2.90E-04	-10647.	479.4148	-1.64E-06	0.00	7.46E+10	
-9.9620	247277.	0.00					
32.4000	2.75E-04	-7454.	408.9660	-2.51E-06	0.00	7.46E+10	
-9.6071	251942.	0.00					
33.0000	2.54E-04	-4758.	341.8100	-3.10E-06	0.00	7.46E+10	
-9.0473	256608.	0.00					
33.6000	2.30E-04	-2532.	279.2131	-3.46E-06	0.00	7.46E+10	
-8.3407	261274.	0.00					
34.2000	2.04E-04	-737.7132	222.0501	-3.61E-06	0.00	7.46E+10	
-7.5379	265939.	0.00					
34.8000	1.78E-04	665.6649	170.8567	-3.62E-06	0.00	7.46E+10	
-6.6825	270605.	0.00					
35.4000	1.52E-04	1723.	125.8814	-3.50E-06	0.00	7.46E+10	
-5.8107	275270.	0.00					
36.0000	1.27E-04	2478.	87.1360	-3.30E-06	0.00	7.46E+10	
-4.9520	279936.	0.00					
36.6000	1.04E-04	2977.	54.4428	-3.04E-06	0.00	7.46E+10	
-4.1295	284602.	0.00					
37.2000	8.36E-05	3262.	27.4790	-2.73E-06	0.00	7.46E+10	
-3.3605	289267.	0.00					
37.8000	6.51E-05	3373.	5.8157	-2.41E-06	0.00	7.46E+10	
-2.6571	293933.	0.00					
38.4000	4.89E-05	3346.	-11.0467	-2.09E-06	0.00	7.46E+10	
-2.0269	298598.	0.00					
39.0000	3.50E-05	3214.	-23.6491	-1.77E-06	0.00	7.46E+10	
-1.4737	303264.	0.00					
39.6000	2.33E-05	3006.	-32.5477	-1.47E-06	0.00	7.46E+10	
-0.9981	307930.	0.00					
40.2000	1.38E-05	2745.	-38.2942	-1.20E-06	0.00	7.46E+10	
-0.5981	312595.	0.00					
40.8000	6.12E-06	2454.	-41.4189	-9.44E-07	0.00	7.46E+10	
-0.2699	317261.	0.00					
41.4000	1.78E-07	2149.	-42.4191	-7.22E-07	0.00	7.46E+10	
-0.00796	321926.	0.00					
42.0000	-4.27E-06	1843.	-41.7498	-5.29E-07	0.00	7.46E+10	
0.1939	326592.	0.00					
42.6000	-7.44E-06	1548.	-39.8189	-3.66E-07	0.00	7.46E+10	
0.3425	331258.	0.00					
43.2000	-9.54E-06	1270.	-36.9837	-2.30E-07	0.00	7.46E+10	
0.4450	335923.	0.00					
43.8000	-1.08E-05	1015.	-33.5509	-1.19E-07	0.00	7.46E+10	
0.5085	340589.	0.00					
44.4000	-1.13E-05	786.7369	-29.7772	-3.22E-08	0.00	7.46E+10	
0.5397	345254.	0.00					
45.0000	-1.12E-05	586.3310	-25.8721	3.41E-08	0.00	7.46E+10	
0.5450	349920.	0.00					
45.6000	-1.08E-05	414.1786	-22.0015	8.24E-08	0.00	7.46E+10	

```
0.5302    354586.       0.00
   46.2000  -1.00E-05   269.5101   -18.2915   1.15E-07       0.00   7.46E+10
0.5004    359251.       0.00
   46.8000  -9.10E-06   150.7804   -14.8337   1.36E-07       0.00   7.46E+10
0.4601    363917.       0.00
   47.4000  -8.07E-06    55.9044   -11.6892   1.46E-07       0.00   7.46E+10
0.4133    368582.       0.00
   48.0000  -7.01E-06   -17.5438    -8.8936   1.48E-07       0.00   7.46E+10
0.3632    373248.       0.00
   48.6000  -5.95E-06   -72.1633    -6.4617   1.43E-07       0.00   7.46E+10
0.3123    377914.       0.00
   49.2000  -4.94E-06  -110.5921    -4.3915   1.34E-07       0.00   7.46E+10
0.2627    382579.       0.00
   49.8000  -4.02E-06  -135.4008    -2.6681   1.22E-07       0.00   7.46E+10
0.2160    387245.       0.00
   50.4000  -3.18E-06  -149.0130    -1.2673   1.09E-07       0.00   7.46E+10
0.1731    391910.       0.00
   51.0000  -2.45E-06  -153.6495    -0.1582   9.41E-08       0.00   7.46E+10
0.1349    396576.       0.00
   51.6000  -1.83E-06  -151.2909     0.6938   7.94E-08       0.00   7.46E+10
0.1017    401242.       0.00
   52.2000  -1.31E-06  -143.6585     1.3252   6.52E-08       0.00   7.46E+10
0.07365    405907.       0.00
   52.8000  -8.87E-07  -132.2081     1.7725   5.18E-08       0.00   7.46E+10
0.05059    410573.       0.00
   53.4000  -5.60E-07  -118.1352     2.0708   3.98E-08       0.00   7.46E+10
0.03229    415238.       0.00
   54.0000  -3.15E-07  -102.3884     2.2531   2.91E-08       0.00   7.46E+10
0.01835    419904.       0.00
   54.6000  -1.41E-07   -85.6902     2.3491   2.00E-08       0.00   7.46E+10
0.00830    424570.       0.00
   55.2000  -2.63E-08   -68.5619     2.4622   1.26E-08       0.00   7.46E+10
0.02313   6326340.       0.00
   55.8000   4.04E-08   -50.2344     2.4177   6.84E-09       0.00   7.46E+10
-0.03550   6326340.       0.00
   56.4000   7.22E-08   -33.7472     2.0615   2.79E-09       0.00   7.46E+10
-0.06344   6326340.       0.00
   57.0000   8.05E-08   -20.5487     1.5784   1.65E-10       0.00   7.46E+10
-0.07076   6326340.       0.00
   57.6000   7.46E-08   -11.0184     1.0877  -1.36E-09       0.00   7.46E+10
-0.06553   6326340.       0.00
   58.2000   6.10E-08    -4.8852     0.6590  -2.13E-09       0.00   7.46E+10
-0.05357   6326340.       0.00
   58.8000   4.40E-08    -1.5290     0.3271  -2.44E-09       0.00   7.46E+10
-0.03862   6326340.       0.00
   59.4000   2.59E-08    -0.1751     0.1062  -2.52E-09       0.00   7.46E+10
-0.02274   6326340.       0.00
   60.0000   7.69E-09       0.00       0.00  -2.53E-09       0.00   7.46E+10
-0.00675   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =    -0.01097453 radians
Maximum bending moment           =       1532632. inch-lbs
```



```
Maximum shear force              =         30439. lbs
Depth of maximum bending moment  =     6.60000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             19
Number of zero deflection points =              5
```

Summary of Pile-head Responses for Conventional Analyses

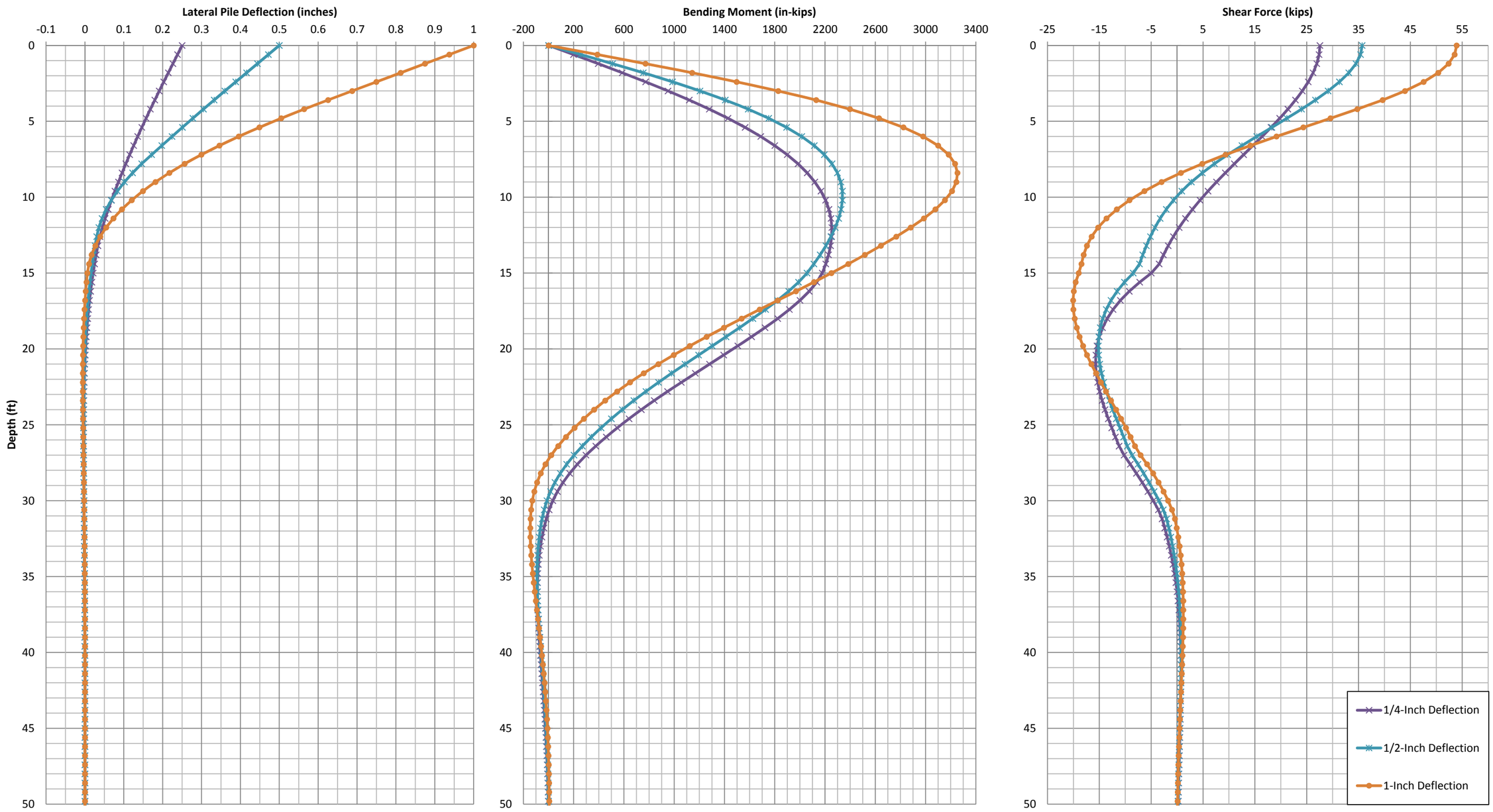
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

```
Load Load                Load                  Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  y, in     0.2500   S, rad         0.00       0.00     0.2500       0.00
26624.  -1381688.
  2  y, in     0.5000   S, rad         0.00       0.00     0.5000       0.00
45368.  -2433726.
  3  y, in     1.0000   S, rad         0.00       0.00     1.0000       0.00
62485.  -3183625.
  4  y, in     0.2500  M, in-lb        0.00       0.00     0.2500   -0.00237
12196.    655582.
  5  y, in     0.5000  M, in-lb        0.00       0.00     0.5000   -0.00543
18262.    864155.
  6  y, in     1.0000  M, in-lb        0.00       0.00     1.0000   -0.01097
30439.   1532632.
```

Maximum pile-head deflection = 1.0000000000 inches
Maximum pile-head rotation   = -0.0109745311 radians = -0.628794 deg.

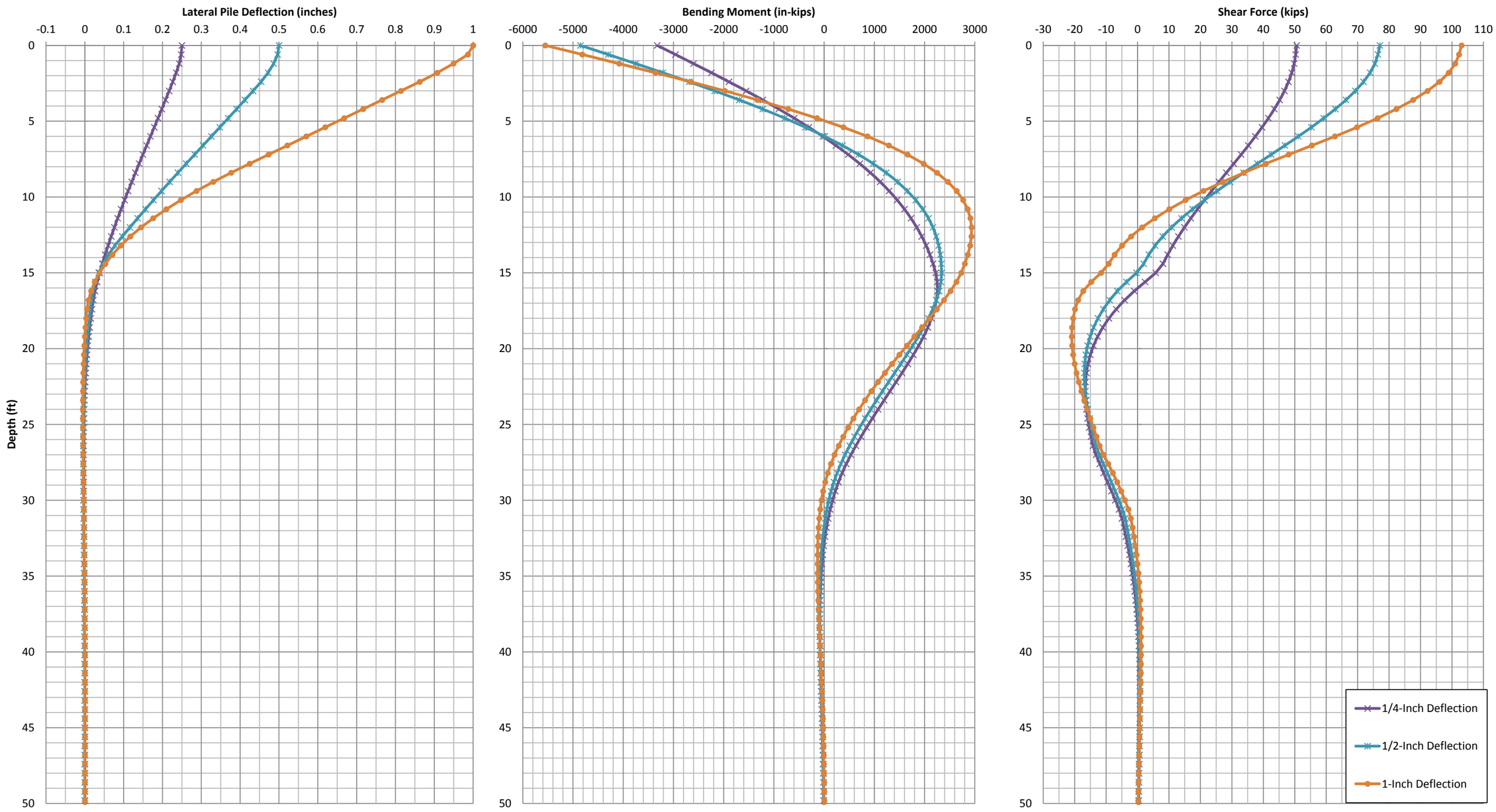
The analysis ended normally.



LATERAL LOAD CAPACITIES - FREE HEAD CONDITION
36-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILE

PROJECT NAME: Eastside Parking Structure
PROJECT NUMBER: 11922002
DESIGNED/CHECKED BY: CD/JEH
DATE: 7/23/2018

Figure D.5-3



LATERAL LOAD CAPACITIES - FIXED HEAD CONDITION
36-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILE

PROJECT NAME: Eastside Parking Structure
PROJECT NUMBER: 11922002
DESIGNED/CHECKED BY: CD/JEH
DATE: 7/23/2018

Figure D.5-4

==========

LPile for Windows, Version 2018-10.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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==========

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Files Used for Analysis

Path to file locations:
\INFOCUS PROJECTS\11501-12000\11922 CSU Fullerton\002 Eastside
Parking\Analyses\Lpile\

Name of input data file:
36-inch CIDH.lp10

Name of output report file:
36-inch CIDH.lp10

Name of plot output file:
36-inch CIDH.lp10

Name of runtime message file:
36-inch CIDH.lp10

Date and Time of Analysis

Date: July 23, 2018 Time: 18:03:33

Problem Title

Project Name: CSUF Eastside Parking Structure

Job Number: 11922.002

Client:

Engineer: CD

Description: 36-INCH CIDH PILE

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	60.000 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	36.0000
2	60.000	36.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile
Length of section = 60.000000 ft
Shaft Diameter = 36.000000 in
Shear capacity of section = 0.0000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 0.0000 ft
Distance from top of pile to bottom of layer = 15.000000 ft
Effective unit weight at top of layer = 100.000000 pcf
Effective unit weight at bottom of layer = 100.000000 pcf
Friction angle at top of layer = 30.000000 deg.
Friction angle at bottom of layer = 30.000000 deg.
Subgrade k at top of layer = 25.000000 pci
Subgrade k at bottom of layer = 25.000000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 15.000000 ft
Distance from top of pile to bottom of layer = 27.000000 ft
Effective unit weight at top of layer = 120.000000 pcf
Effective unit weight at bottom of layer = 120.000000 pcf

Friction angle at top of layer = 34.000000 deg.
Friction angle at bottom of layer = 34.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 27.000000 ft
Distance from top of pile to bottom of layer = 31.000000 ft
Effective unit weight at top of layer = 125.000000 pcf
Effective unit weight at bottom of layer = 125.000000 pcf
Friction angle at top of layer = 35.000000 deg.
Friction angle at bottom of layer = 35.000000 deg.
Subgrade k at top of layer = 150.000000 pci
Subgrade k at bottom of layer = 150.000000 pci

Layer 4 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 31.000000 ft
Distance from top of pile to bottom of layer = 35.000000 ft
Effective unit weight at top of layer = 115.000000 pcf
Effective unit weight at bottom of layer = 115.000000 pcf
Friction angle at top of layer = 35.000000 deg.
Friction angle at bottom of layer = 35.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 35.000000 ft
Distance from top of pile to bottom of layer = 43.000000 ft
Effective unit weight at top of layer = 120.000000 pcf
Effective unit weight at bottom of layer = 120.000000 pcf
Friction angle at top of layer = 35.000000 deg.
Friction angle at bottom of layer = 35.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 43.000000 ft
Distance from top of pile to bottom of layer = 55.000000 ft
Effective unit weight at top of layer = 110.000000 pcf
Effective unit weight at bottom of layer = 110.000000 pcf
Friction angle at top of layer = 34.000000 deg.
Friction angle at bottom of layer = 34.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.000000 ft
Distance from top of pile to bottom of layer = 70.000000 ft
Effective unit weight at top of layer = 125.000000 pcf
Effective unit weight at bottom of layer = 125.000000 pcf
Undrained cohesion at top of layer = 5000. psf
Undrained cohesion at bottom of layer = 5000. psf
Epsilon-50 at top of layer = 0.050000

Epsilon-50 at bottom of layer = 0.050000

(Depth of the lowest soil layer extends 10.000 ft below the pile tip)

Summary of Input Soil Properties

Layer No.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or kpy krm pci
1	Sand (Reese, et al.)	0.00	100.0000	--	30.0000	--
		15.0000	100.0000	--	30.0000	--
2	Sand (Reese, et al.)	15.0000	120.0000	--	34.0000	--
		27.0000	120.0000	--	34.0000	--
3	Sand (Reese, et al.)	27.0000	125.0000	--	35.0000	--
		31.0000	125.0000	--	35.0000	--
4	Sand (Reese, et al.)	31.0000	115.0000	--	35.0000	--
		35.0000	115.0000	--	35.0000	--
5	Sand (Reese, et al.)	35.0000	120.0000	--	35.0000	--
		43.0000	120.0000	--	35.0000	--
6	Sand (Reese, et al.)	43.0000	110.0000	--	34.0000	--
		55.0000	110.0000	--	34.0000	--
7	Stiff Clay w/o Free Water	55.0000	125.0000	5000.	--	0.05000 --
		70.0000	125.0000	5000.	--	0.05000 --

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 6

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.
2	5	y = 0.500000 in	S = 0.0000 in/in	0.0000000	N.A.
3	5	y = 1.000000 in	S = 0.0000 in/in	0.0000000	N.A.
4	4	y = 0.250000 in	M = 0.0000 in-lbs	0.0000000	N.A.
5	4	y = 0.500000 in	M = 0.0000 in-lbs	0.0000000	N.A.
6	4	y = 1.000000 in	M = 0.0000 in-lbs	0.0000000	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	60.000000	ft
Shaft Diameter	=	36.000000	in
Concrete Cover Thickness	=	3.000000	in
Number of Reinforcing Bars	=	8	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1018.	sq. in.
Total Area of Reinforcing Steel	=	6.320000	sq. in.
Area Ratio of Steel Reinforcement	=	0.62	percent
Edge-to-Edge Bar Spacing	=	10.097820	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	13.46	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	3818.490	kips
Tensile Load for Cracking of Concrete	=	-441.861	kips

Nominal Axial Tensile Capacity = -379.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.000000	0.790000	14.500000	0.00000
2	1.000000	0.790000	10.253048	10.253048
3	1.000000	0.790000	0.00000	14.500000
4	1.000000	0.790000	-10.253048	10.253048
5	1.000000	0.790000	-14.500000	0.00000
6	1.000000	0.790000	-10.253048	-10.253048
7	1.000000	0.790000	0.00000	-14.500000
8	1.000000	0.790000	10.253048	-10.253048

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 10.098 inches
between bars 3 and 4.

Ratio of bar spacing to maximum aggregate size = 13.46

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.341649 psi
Compression Strain at Peak Stress = 0.001886
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Run Msg	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	228.4286932		365485909.	18.0000490	0.00001125	-0.00001125
0.0470967	0.3229884					
0.00000125	455.9793102		364783448.	18.0000491	0.00002250	-0.00002250
0.0939146	0.6459768					
0.00000188	682.6518512		364080987.	18.0000493	0.00003375	-0.00003375
0.1404535	0.9689652					
0.00000250	908.4463160		363378526.	18.0000494	0.00004500	-0.00004500
0.1867135	1.2919536					
0.00000313	1133.		362676065.	18.0000496	0.00005625	-0.00005625
0.2326946	1.6149420					
0.00000375	1357.		361973605.	18.0000497	0.00006750	-0.00006750
0.2783968	1.9379304					
0.00000438	1581.		361271144.	18.0000499	0.00007875	-0.00007875
0.3238201	2.2609188					
0.00000500	1803.		360568683.	18.0000500	0.00009000	-0.00009000
0.3689645	2.5839072					
0.00000563	2024.		359866222.	18.0000502	0.0001013	-0.0001012
0.4138300	2.9068957					
0.00000625	2245.		359163761.	18.0000503	0.0001125	-0.0001125
0.4584165	3.2298841					
0.00000688	2245.		326512510.	7.4499802	0.00005122	-0.0001963
0.2091701	-5.6562727	C				
0.00000750	2245.		299303134.	7.4516574	0.00005589	-0.0002141
0.2279588	-6.1701145	C				
0.00000813	2245.		276279816.	7.4533371	0.00006056	-0.0002319
0.2467096	-6.6838949	C				
0.00000875	2245.		256545544.	7.4550195	0.00006523	-0.0002498
0.2654224	-7.1976138	C				
0.00000938	2245.		239442507.	7.4567046	0.00006991	-0.0002676
0.2840970	-7.7112709	C				
0.00001000	2245.		224477351.	7.4583923	0.00007458	-0.0002854
0.3027336	-8.2248662	C				
0.00001063	2245.		211272801.	7.4600826	0.00007926	-0.0003032
0.3213320	-8.7383995	C				
0.00001125	2245.		199535423.	7.4617756	0.00008394	-0.0003211
0.3398922	-9.2518707	C				
0.00001188	2245.		189033558.	7.4634713	0.00008863	-0.0003389
0.3584142	-9.7652795	C				
0.00001250	2245.		179581880.	7.4651697	0.00009331	-0.0003567
0.3768979	-10.2786260	C				
0.00001313	2245.		171030362.	7.4668707	0.00009800	-0.0003745
0.3953432	-10.7919098	C				
0.00001375	2245.		163256255.	7.4685745	0.0001027	-0.0003923
0.4137501	-11.3051309	C				
0.00001438	2245.		156158157.	7.4702810	0.0001074	-0.0004101
0.4321186	-11.8182891	C				
0.00001500	2245.		149651567.	7.4719902	0.0001121	-0.0004279
0.4504487	-12.3313842	C				
0.00001563	2245.		143665504.	7.4737021	0.0001168	-0.0004457
0.4687402	-12.8444162	C				
0.00001625	2245.		138139908.	7.4754168	0.0001215	-0.0004635
0.4869931	-13.3573848	C				
0.00001688	2245.		133023615.	7.4771342	0.0001262	-0.0004813
0.5052075	-13.8702899	C				

0.00001750	2245.	128272772.	7.4788543	0.0001309	-0.0004991	
0.5233831	-14.3831314 C					
0.00001813	2245.	123849573.	7.4805772	0.0001356	-0.0005169	
0.5415201	-14.8959090 C					
0.00001875	2245.	119721254.	7.4823029	0.0001403	-0.0005347	
0.5596183	-15.4086227 C					
0.00001938	2245.	115859278.	7.4840314	0.0001450	-0.0005525	
0.5776777	-15.9212723 C					
0.00002000	2245.	112238675.	7.4857627	0.0001497	-0.0005703	
0.5956982	-16.4338576 C					
0.00002063	2245.	108837503.	7.4874968	0.0001544	-0.0005881	
0.6136799	-16.9463784 C					
0.00002125	2245.	105636400.	7.4892336	0.0001591	-0.0006059	
0.6316226	-17.4588347 C					
0.00002188	2245.	102618217.	7.4909733	0.0001639	-0.0006236	
0.6495263	-17.9712262 C					
0.00002250	2245.	99767711.	7.4927159	0.0001686	-0.0006414	
0.6673909	-18.4835528 C					
0.00002313	2245.	97071287.	7.4944612	0.0001733	-0.0006592	
0.6852165	-18.9958144 C					
0.00002375	2245.	94516779.	7.4962094	0.0001780	-0.0006770	
0.7030029	-19.5080107 C					
0.00002438	2245.	92093272.	7.4979605	0.0001828	-0.0006947	
0.7207502	-20.0201416 C					
0.00002563	2245.	87600917.	7.5014712	0.0001922	-0.0007303	
0.7561269	-21.0442067 C					
0.00002688	2245.	83526456.	7.5049935	0.0002017	-0.0007658	
0.7913462	-22.0680081 C					
0.00002813	2245.	79814169.	7.5085274	0.0002112	-0.0008013	
0.8264079	-23.0915448 C					
0.00002938	2245.	76417821.	7.5120730	0.0002207	-0.0008368	
0.8613114	-24.1148153 C					
0.00003063	2245.	73298727.	7.5156304	0.0002302	-0.0008723	
0.8960563	-25.1378182 C					
0.00003188	2245.	70424267.	7.5191996	0.0002397	-0.0009078	
0.9306424	-26.1605523 C					
0.00003313	2245.	67766747.	7.5227808	0.0002492	-0.0009433	
0.9650691	-27.1830162 C					
0.00003438	2245.	65302502.	7.5263740	0.0002587	-0.0009788	
0.9993360	-28.2052084 C					
0.00003563	2245.	63011186.	7.5299793	0.0002683	-0.0010142	
1.0334428	-29.2271276 C					
0.00003688	2245.	60875214.	7.5335968	0.0002778	-0.0010497	
1.0673889	-30.2487724 C					
0.00003813	2245.	58879305.	7.5372265	0.0002874	-0.0010851	
1.1011741	-31.2701414 C					
0.00003938	2245.	57010121.	7.5408686	0.0002969	-0.0011206	
1.1347979	-32.2912331 C					
0.00004063	2245.	55255963.	7.5445232	0.0003065	-0.0011560	
1.1682598	-33.3120461 C					
0.00004188	2245.	53606531.	7.5481903	0.0003161	-0.0011914	
1.2015594	-34.3325790 C					
0.00004313	2245.	52052719.	7.5518700	0.0003257	-0.0012268	
1.2346964	-35.3528302 C					
0.00004438	2245.	50586445.	7.5555624	0.0003353	-0.0012622	
1.2676701	-36.3727982 C					
0.00004563	2245.	49200515.	7.5592676	0.0003449	-0.0012976	
1.3004804	-37.3924817 C					
0.00004688	2245.	47888501.	7.5629856	0.0003545	-0.0013330	
1.3331266	-38.4118790 C					
0.00004813	2288.	47533360.	7.5667167	0.0003641	-0.0013684	
1.3656083	-39.4309886 C					
0.00004938	2346.	47517976.	7.5704608	0.0003738	-0.0014037	

1.3979251	-40.4498090 C					
0.00005063	2405.	47502547.	7.5742181	0.0003834	-0.0014391	
1.4300766	-41.4683386 C					
0.00005188	2463.	47487071.	7.5779887	0.0003931	-0.0014744	
1.4620623	-42.4865759 C					
0.00005313	2522.	47471547.	7.5817726	0.0004028	-0.0015097	
1.4938817	-43.5045192 C					
0.00005438	2580.	47455977.	7.5855699	0.0004125	-0.0015450	
1.5255343	-44.5221670 C					
0.00005563	2639.	47440358.	7.5893808	0.0004222	-0.0015803	
1.5570198	-45.5395177 C					
0.00005688	2697.	47424692.	7.5932054	0.0004319	-0.0016156	
1.5883376	-46.5565695 C					
0.00005813	2756.	47408978.	7.5970437	0.0004416	-0.0016509	
1.6194872	-47.5733209 C					
0.00005938	2814.	47393214.	7.6008958	0.0004513	-0.0016862	
1.6504683	-48.5897701 C					
0.00006063	2872.	47377402.	7.6047620	0.0004610	-0.0017215	
1.6812802	-49.6059156 C					
0.00006188	2930.	47361541.	7.6086421	0.0004708	-0.0017567	
1.7119226	-50.6217555 C					
0.00006313	2989.	47345630.	7.6125364	0.0004805	-0.0017920	
1.7423949	-51.6372882 C					
0.00006438	3047.	47329669.	7.6164450	0.0004903	-0.0018272	
1.7726966	-52.6525119 C					
0.00006563	3105.	47313657.	7.6203680	0.0005001	-0.0018624	
1.8028273	-53.6674249 C					
0.00006688	3163.	47297595.	7.6243054	0.0005099	-0.0018976	
1.8327865	-54.6820254 C					
0.00006813	3221.	47281482.	7.6282575	0.0005197	-0.0019328	
1.8625736	-55.6963116 C					
0.00006938	3279.	47265317.	7.6322242	0.0005295	-0.0019680	
1.8921881	-56.7102818 C					
0.00007063	3337.	47249101.	7.6362057	0.0005393	-0.0020032	
1.9216295	-57.7239339 C					
0.00007188	3395.	47232832.	7.6402022	0.0005491	-0.0020384	
1.9508974	-58.7372664 C					
0.00007313	3453.	47216511.	7.6442137	0.0005590	-0.0020735	
1.9799911	-59.7502771 C					
0.00007438	3511.	47200138.	7.6482404	0.0005688	-0.0021087	
2.0089102	-60.0000000 CY					
0.00007938	3741.	47134108.	7.6645010	0.0006084	-0.0022491	
2.1228296	-60.0000000 CY					
0.00008438	3956.	46885190.	7.6711273	0.0006473	-0.0023902	
2.2315598	-60.0000000 CY					
0.00008938	4114.	46034760.	7.6445527	0.0006832	-0.0025343	
2.3291041	-60.0000000 CY					
0.00009438	4272.	45267096.	7.6221372	0.0007193	-0.0026782	
2.4242186	-60.0000000 CY					
0.00009938	4424.	44518828.	7.5998923	0.0007552	-0.0028223	
2.5160108	-60.0000000 CY					
0.0001044	4495.	43066516.	7.5288781	0.0007858	-0.0029717	
2.5917107	-60.0000000 CY					
0.0001094	4544.	41543347.	7.4512823	0.0008150	-0.0031225	
2.6619234	-60.0000000 CY					
0.0001144	4592.	40151739.	7.3811451	0.0008442	-0.0032733	
2.7305251	-60.0000000 CY					
0.0001194	4640.	38870826.	7.3131513	0.0008730	-0.0034245	
2.7962852	-60.0000000 CY					
0.0001244	4688.	37691424.	7.2511768	0.0009019	-0.0035756	
2.8604524	-60.0000000 CY					
0.0001294	4735.	36601805.	7.1946016	0.0009308	-0.0037267	
2.9230354	-60.0000000 CY					

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 0.0001344          4783.     35591932.     7.1428302     0.0009598    -0.0038777
2.9840214   -60.0000000 CY
 0.0001394          4830.     34653206.     7.0953528     0.0009889    -0.0040286
3.0433975   -60.0000000 CY
 0.0001444          4877.     33778220.     7.0517303     0.0010181    -0.0041794
3.1011504   -60.0000000 CY
 0.0001494          4923.     32960097.     7.0109152     0.0010473    -0.0043302
3.1570724   -60.0000000 CY
 0.0001544          4970.     32192182.     6.9709543     0.0010761    -0.0044814
3.2106780   -60.0000000 CY
 0.0001594          5016.     31471322.     6.9340399     0.0011051    -0.0046324
3.2626792   -60.0000000 CY
 0.0001644          5062.     30793207.     6.8999016     0.0011342    -0.0047833
3.3130617   -60.0000000 CY
 0.0001694          5107.     30154036.     6.8683011     0.0011633    -0.0049342
3.3618114   -60.0000000 CY
 0.0001744          5153.     29550445.     6.8390277     0.0011926    -0.0050849
3.4089133   -60.0000000 CY
 0.0001794          5196.     28969549.     6.8104299     0.0012216    -0.0052359
3.4539410   -60.0000000 CY
 0.0001844          5230.     28368359.     6.7761244     0.0012493    -0.0053882
3.4951706   -60.0000000 CY
 0.0001894          5250.     27721714.     6.7321226     0.0012749    -0.0055426
3.5316246   -60.0000000 CY
 0.0001944          5260.     27060060.     6.6831105     0.0012990    -0.0056985
3.5647367   -60.0000000 CY
 0.0001994          5267.     26419830.     6.6329460     0.0013224    -0.0058551
3.5956649   -60.0000000 CY
 0.0002044          5275.     25808695.     6.5833775     0.0013455    -0.0060120
3.6249605   -60.0000000 CY
 0.0002094          5282.     25226456.     6.5364427     0.0013686    -0.0061689
3.6532240   -60.0000000 CY
 0.0002144          5289.     24671089.     6.4919594     0.0013917    -0.0063258
3.6804478   -60.0000000 CY
 0.0002194          5296.     24140751.     6.4497616     0.0014149    -0.0064826
3.7066238   -60.0000000 CY
 0.0002244          5303.     23633767.     6.4096988     0.0014382    -0.0066393
3.7317441   -60.0000000 CY
 0.0002294          5310.     23148605.     6.3716330     0.0014615    -0.0067960
3.7558004   -60.0000000 CY
 0.0002344          5317.     22683864.     6.3354386     0.0014849    -0.0069526
3.7787846   -60.0000000 CY
 0.0002394          5323.     22238263.     6.3010001     0.0015083    -0.0071092
3.8006884   -60.0000000 CY
 0.0002444          5329.     21808263.     6.2647739     0.0015310    -0.0072665
3.8207496   -60.0000000 CY
 0.0002494          5335.     21395211.     6.2301235     0.0015536    -0.0074239
3.8397733   -60.0000000 CY
 0.0002544          5341.     20998160.     6.1970592     0.0015764    -0.0075811
3.8577756   -60.0000000 CY
 0.0002594          5347.     20616187.     6.1654913     0.0015992    -0.0077383
3.8747485   -60.0000000 CY
 0.0002644          5353.     20248433.     6.1353370     0.0016220    -0.0078955
3.8906840   -60.0000000 CY
 0.0002694          5359.     19894104.     6.1065196     0.0016449    -0.0080526
3.9055738   -60.0000000 CY
 0.0002744          5365.     19552463.     6.0789680     0.0016679    -0.0082096
3.9194096   -60.0000000 CY
 0.0003044          5398.     17733708.     5.9364705     0.0018069    -0.0091506
3.9797697   -60.0000000 CY
 0.0003344          5426.     16228070.     5.8126783     0.0019436    -0.0100939
3.9999909   -60.0000000 CY
 0.0003644          5452.     14963580.     5.7162202     0.0020828    -0.0110347
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   4.0000000   -60.0000000 CY
    0.0003944          5476.     13885182.     5.6410792     0.0022247    -0.0119728
   3.9996936    60.0000000 CY
    0.0004244          5497.     12954006.     5.5824751     0.0023691    -0.0129084
   3.9969694    60.0000000 CY
    0.0004544          5516.     12140279.     5.5297445     0.0025126    -0.0138449
   3.9864511    60.0000000 CY
    0.0004844          5534.     11424343.     5.4877002     0.0026581    -0.0147794
   3.9998143    60.0000000 CY
    0.0005144          5550.     10788958.     5.4552320     0.0028060    -0.0157115
   3.9890485    60.0000000 CY
    0.0005444          5565.     10221818.     5.4295813     0.0029557    -0.0166418
   3.9999206    60.0000000 CY
    0.0005744          5578.      9711648.     5.4106259     0.0031077    -0.0175698
   3.9831076    60.0000000 CYT
    0.0006044          5591.      9250882.     5.3961268     0.0032613    -0.0184962
   3.9982703    60.0000000 CYT
    0.0006344          5603.      8832160.     5.3861192     0.0034168    -0.0194207
   3.9855431    60.0000000 CYT
    0.0006644          5614.      8450079.     5.3795806     0.0035741    -0.0203434
   3.9873624    60.0000000 CYT
    0.0006944          5625.      8100204.     5.3755968     0.0037327    -0.0212648
   3.9990930    60.0000000 CYT
    0.0007244          5634.      7778148.     5.3746576     0.0038933    -0.0221842
   3.9839526    60.0000000 CYT


-------------------------------------------------------------------------------
   Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1
-------------------------------------------------------------------------------

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

 Load           Axial Thrust        Nominal Mom. Cap.      Max. Comp.
  No.               kips                in-kip               Strain
 ----         ----------------     ------------------     ------------
   1                 0.000              5568.471           0.00300000

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial     Resist.       Nominal     Ult. (Fac)    Ult. (Fac)   Bend. Stiff.
Load      Factor      Moment Cap    Ax. Thrust    Moment Cap    at Ult Mom
 No.    for Moment      in-kips        kips         in-kips      kip-in^2
-----  ------------  ------------  ------------  ------------  ------------
   1       0.65             5568.        0.0000         3620.     47168949.

   1       0.70             5568.        0.0000         3898.     46952454.

   1       0.75             5568.        0.0000         4176.     45733019.
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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	316808.
2	15.0000	13.0979	Yes	No	316808.	1357183.
3	27.0000	24.0250	Yes	No	1673991.	884007.
4	31.0000	27.8693	Yes	No	2557997.	1158993.
5	35.0000	31.8301	Yes	No	3716990.	3318503.
6	43.0000	40.8606	Yes	No	7035493.	7659104.
7	55.0000	119.4231	No	No	1.47E+07	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.250000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.2500	-3325436.	50605.	0.00	0.00	4.73E+10	0.00	0.00	0.00
0.6000	0.2482	-2962238.	50283.	-4.79E-04	0.00	4.73E+10	-44.6717	1296.	0.00
1.2000	0.2431	-2601355.	49808.	-9.02E-04	0.00	4.75E+10	-87.5167	2592.	0.00
1.8000	0.2352	-2245009.	49035.	-0.00117	0.00	1.21E+11	-127.0004	3888.	0.00
2.4000	0.2263	-1895247.	47992.	-0.00125	0.00	3.60E+11	-162.9416	5184.	0.00
3.0000	0.2172	-1553931.	46701.	-0.00129	0.00	3.61E+11	-195.4413	6480.	0.00
3.6000	0.2078	-1222747.	45190.	-0.00131	0.00	3.62E+11	-224.4059	7776.	0.00
4.2000	0.1982	-903197.	43483.	-0.00134	0.00	3.63E+11	-249.7755	9072.	0.00

4.8000	0.1886	-596595.	41606.	-0.00135	0.00	3.64E+11	-271.5221	10368.	0.00
5.4000	0.1788	-304068.	39586.	-0.00136	0.00	3.65E+11	-289.6473	11664.	0.00
6.0000	0.1690	-26557.	37448.	-0.00136	0.00	3.65E+11	-304.1803	12960.	0.00
6.6000	0.1592	235185.	35218.	-0.00136	0.00	3.65E+11	-315.1758	14256.	0.00
7.2000	0.1494	480589.	32922.	-0.00135	0.00	3.65E+11	-322.7120	15552.	0.00
7.8000	0.1397	709263.	30584.	-0.00134	0.00	3.64E+11	-326.8887	16848.	0.00
8.4000	0.1301	920992.	28227.	-0.00133	0.00	3.63E+11	-327.8252	18144.	0.00
9.0000	0.1206	1115726.	25874.	-0.00130	0.00	3.63E+11	-325.6582	19440.	0.00
9.6000	0.1113	1293578.	23548.	-0.00128	0.00	3.62E+11	-320.5392	20736.	0.00
10.2000	0.1022	1454813.	21268.	-0.00125	0.00	3.62E+11	-312.6333	22032.	0.00
10.8000	0.09325	1599841.	19055.	-0.00122	0.00	3.61E+11	-302.1160	23328.	0.00
11.4000	0.08455	1729208.	16927.	-0.00119	0.00	3.61E+11	-289.1720	24624.	0.00
12.0000	0.07611	1843583.	14899.	-0.00115	0.00	3.60E+11	-273.9932	25920.	0.00
12.6000	0.06793	1943755.	12988.	-0.00112	0.00	3.60E+11	-256.7768	27216.	0.00
13.2000	0.06003	2030616.	11208.	-0.00108	0.00	3.60E+11	-237.7242	28512.	0.00
13.8000	0.05242	2105153.	9571.	-0.00104	0.00	3.60E+11	-217.0391	29808.	0.00
14.4000	0.04512	2168439.	8088.	-9.93E-04	0.00	3.59E+11	-194.9267	31104.	0.00
15.0000	0.03813	2221620.	5771.	-9.38E-04	0.00	2.45E+11	-448.5745	84699.	0.00
15.6000	0.03161	2251547.	2375.	-8.33E-04	0.00	1.11E+11	-494.7797	112691.	0.00
16.2000	0.02614	2255824.	-1052.	-6.76E-04	0.00	9.63E+10	-457.3354	125971.	0.00
16.8000	0.02188	2236393.	-4128.	-5.38E-04	0.00	1.50E+11	-397.0149	130637.	0.00
17.4000	0.01840	2196381.	-6802.	-4.62E-04	0.00	3.59E+11	-345.7004	135302.	0.00
18.0000	0.01523	2138447.	-9112.	-4.19E-04	0.00	3.59E+11	-296.0294	139968.	0.00
18.6000	0.01237	2065168.	-11072.	-3.77E-04	0.00	3.60E+11	-248.4470	144634.	0.00
19.2000	0.00981	1979009.	-12699.	-3.36E-04	0.00	3.60E+11	-203.3295	149299.	0.00
19.8000	0.00753	1882309.	-14010.	-2.97E-04	0.00	3.60E+11	-160.9853	153965.	0.00
20.4000	0.00552	1777264.	-15028.	-2.61E-04	0.00	3.61E+11	-121.6565	158630.	0.00
21.0000	0.00377	1665913.	-15773.	-2.27E-04	0.00	3.61E+11	-85.5215	163296.	0.00
21.6000	0.00226	1550127.	-16271.	-1.95E-04	0.00	3.61E+11	-52.6982	167962.	0.00
22.2000	9.70E-04	1431610.	-16544.	-1.65E-04	0.00	3.62E+11	-23.2475	172627.	0.00
22.8000	-1.15E-04	1311888.	-16618.	-1.38E-04	0.00	3.62E+11	2.8221	177293.	0.00
23.4000	-0.00101	1192312.	-16516.	-1.13E-04	0.00	3.62E+11			

25.5503	181958.	0.00					
24.0000	-0.00174	1074061.	-16262.	-9.02E-05	0.00	3.63E+11	
45.0202	186624.	0.00					
24.6000	-0.00231	958143.	-15879.	-7.00E-05	0.00	3.63E+11	
61.3537	191290.	0.00					
25.2000	-0.00274	845407.	-15389.	-5.21E-05	0.00	3.64E+11	
74.7071	195955.	0.00					
25.8000	-0.00306	736542.	-14813.	-3.65E-05	0.00	3.64E+11	
85.2660	200621.	0.00					
26.4000	-0.00327	632098.	-14170.	-2.29E-05	0.00	3.64E+11	
93.2414	205286.	0.00					
27.0000	-0.00339	532488.	-13242.	-1.14E-05	0.00	3.64E+11	
164.7759	349920.	0.00					
27.6000	-0.00343	441420.	-12034.	-1.82E-06	0.00	3.65E+11	
170.6465	357696.	0.00					
28.2000	-0.00342	359198.	-10795.	6.08E-06	0.00	3.65E+11	
173.4291	365472.	0.00					
28.8000	-0.00335	285966.	-9546.	1.24E-05	0.00	3.65E+11	
173.5275	373248.	0.00					
29.4000	-0.00324	221731.	-8305.	1.74E-05	0.00	3.65E+11	
171.3280	381024.	0.00					
30.0000	-0.00310	166377.	-7086.	2.13E-05	0.00	3.65E+11	
167.1929	388800.	0.00					
30.6000	-0.00293	119690.	-5903.	2.41E-05	0.00	3.65E+11	
161.4527	396576.	0.00					
31.2000	-0.00275	81373.	-4988.	2.61E-05	0.00	3.65E+11	
92.6417	242611.	0.00					
31.8000	-0.00256	47858.	-4339.	2.73E-05	0.00	3.65E+11	
87.7797	247277.	0.00					
32.4000	-0.00236	18894.	-3726.	2.80E-05	0.00	3.65E+11	
82.4294	251942.	0.00					
33.0000	-0.00215	-5797.	-3153.	2.81E-05	0.00	3.65E+11	
76.7241	256608.	0.00					
33.6000	-0.00195	-26511.	-2622.	2.78E-05	0.00	3.65E+11	
70.7857	261274.	0.00					
34.2000	-0.00175	-43555.	-2134.	2.71E-05	0.00	3.65E+11	
64.7243	265939.	0.00					
34.8000	-0.00156	-57243.	-1690.	2.61E-05	0.00	3.65E+11	
58.6380	270605.	0.00					
35.4000	-0.00138	-67892.	-1290.	2.49E-05	0.00	3.65E+11	
52.6131	275270.	0.00					
36.0000	-0.00120	-75814.	-931.9972	2.35E-05	0.00	3.65E+11	
46.7241	279936.	0.00					
36.6000	-0.00104	-81313.	-616.0673	2.19E-05	0.00	3.65E+11	
41.0342	284602.	0.00					
37.2000	-8.86E-04	-84685.	-340.2005	2.03E-05	0.00	3.65E+11	
35.5955	289267.	0.00					
37.8000	-7.46E-04	-86212.	-102.4366	1.86E-05	0.00	3.65E+11	
30.4500	293933.	0.00					
38.4000	-6.18E-04	-86160.	99.4520	1.69E-05	0.00	3.65E+11	
25.6301	298598.	0.00					
39.0000	-5.02E-04	-84780.	267.8937	1.52E-05	0.00	3.65E+11	
21.1592	303264.	0.00					
39.6000	-3.99E-04	-82303.	405.4568	1.36E-05	0.00	3.65E+11	
17.0527	307930.	0.00					
40.2000	-3.07E-04	-78941.	514.7942	1.20E-05	0.00	3.65E+11	
13.3188	312595.	0.00					
40.8000	-2.26E-04	-74890.	598.5941	1.05E-05	0.00	3.65E+11	
9.9590	317261.	0.00					
41.4000	-1.56E-04	-70322.	659.5368	9.05E-06	0.00	3.65E+11	
6.9695	321926.	0.00					
42.0000	-9.57E-05	-65392.	700.2566	7.71E-06	0.00	3.65E+11	
4.3416	326592.	0.00					

42.6000	-4.48E-05	-60238.	723.3107	6.47E-06	0.00	3.65E+11	
2.0624	331258.	0.00					
43.2000	-2.48E-06	-54977.	731.1523	5.34E-06	0.00	3.65E+11	
0.1159	335923.	0.00					
43.8000	3.21E-05	-49709.	726.1094	4.31E-06	0.00	3.65E+11	
-1.5167	340589.	0.00					
44.4000	5.96E-05	-44521.	710.3683	3.38E-06	0.00	3.65E+11	
-2.8559	345254.	0.00					
45.0000	8.07E-05	-39480.	685.9616	2.55E-06	0.00	3.65E+11	
-3.9238	349920.	0.00					
45.6000	9.63E-05	-34643.	654.7597	1.82E-06	0.00	3.65E+11	
-4.7434	354586.	0.00					
46.2000	1.07E-04	-30051.	618.4666	1.19E-06	0.00	3.65E+11	
-5.3380	359251.	0.00					
46.8000	1.13E-04	-25737.	578.6180	6.36E-07	0.00	3.65E+11	
-5.7310	363917.	0.00					
47.4000	1.16E-04	-21719.	536.5827	1.68E-07	0.00	3.65E+11	
-5.9455	368582.	0.00					
48.0000	1.16E-04	-18010.	493.5655	-2.23E-07	0.00	3.65E+11	
-6.0038	373248.	0.00					
48.6000	1.13E-04	-14612.	450.6128	-5.44E-07	0.00	3.65E+11	
-5.9275	377914.	0.00					
49.2000	1.08E-04	-11521.	408.6187	-8.02E-07	0.00	3.65E+11	
-5.7375	382579.	0.00					
49.8000	1.01E-04	-8728.	368.3326	-1.00E-06	0.00	3.65E+11	
-5.4531	387245.	0.00					
50.4000	9.36E-05	-6217.	330.3673	-1.15E-06	0.00	3.65E+11	
-5.0928	391910.	0.00					
51.0000	8.49E-05	-3971.	295.2076	-1.25E-06	0.00	3.65E+11	
-4.6738	396576.	0.00					
51.6000	7.56E-05	-1966.	263.2184	-1.31E-06	0.00	3.65E+11	
-4.2121	401242.	0.00					
52.2000	6.60E-05	-180.1987	234.6532	-1.33E-06	0.00	3.65E+11	
-3.7227	405907.	0.00					
52.8000	5.65E-05	1413.	209.6616	-1.32E-06	0.00	3.65E+11	
-3.2194	410573.	0.00					
53.4000	4.71E-05	2839.	188.2966	-1.27E-06	0.00	3.65E+11	
-2.7153	415238.	0.00					
54.0000	3.81E-05	4124.	170.5204	-1.21E-06	0.00	3.65E+11	
-2.2225	419904.	0.00					
54.6000	2.97E-05	5294.	156.2098	-1.11E-06	0.00	3.65E+11	
-1.7526	424570.	0.00					
55.2000	2.21E-05	6374.	80.0424	-9.98E-07	0.00	3.65E+11	
-19.4050	6326340.	0.00					
55.8000	1.54E-05	6447.	-38.3767	-8.72E-07	0.00	3.65E+11	
-13.4892	6326340.	0.00					
56.4000	9.53E-06	5821.	-117.0950	-7.51E-07	0.00	3.65E+11	
-8.3770	6326340.	0.00					
57.0000	4.54E-06	4761.	-161.6165	-6.47E-07	0.00	3.65E+11	
-3.9901	6326340.	0.00					
57.6000	2.24E-07	3494.	-176.6890	-5.65E-07	0.00	3.65E+11	
-0.1967	6326340.	0.00					
58.2000	-3.60E-06	2217.	-166.0161	-5.09E-07	0.00	3.65E+11	
3.1614	6326340.	0.00					
58.8000	-7.11E-06	1103.	-132.1596	-4.76E-07	0.00	3.65E+11	
6.2432	6326340.	0.00					
59.4000	-1.05E-05	313.4447	-76.6090	-4.62E-07	0.00	3.65E+11	
9.1875	6326340.	0.00					
60.0000	-1.38E-05	0.00	0.00	-4.59E-07	0.00	3.65E+11	
12.0928	3163170.	0.00					

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses

are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -3325436. inch-lbs
Maximum shear force              =         50605. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             56
Number of zero deflection points =              3
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.5000	-4853470.	77075.	0.00	0.00	3.42E+10	0.00	0.00	0.00
0.6000	0.4963	-4300800.	76444.	-9.63E-04	0.00	3.42E+10	-87.6405	1271.	0.00
1.2000	0.4861	-3752674.	75499.	-0.00170	0.00	4.71E+10	-175.0054	2592.	0.00
1.8000	0.4718	-3213620.	73951.	-0.00223	0.00	4.73E+10	-254.7728	3888.	0.00
2.4000	0.4540	-2687773.	71858.	-0.00268	0.00	4.74E+10	-326.8465	5184.	0.00
3.0000	0.4332	-2178871.	69277.	-0.00291	0.00	3.59E+11	-389.8509	6480.	0.00
3.6000	0.4121	-1690178.	66272.	-0.00295	0.00	3.61E+11	-445.0329	7776.	0.00
4.2000	0.3907	-1224555.	62897.	-0.00298	0.00	3.62E+11	-492.3130	9072.	0.00
4.8000	0.3692	-784454.	59211.	-0.00300	0.00	3.64E+11	-531.6574	10368.	0.00
5.4000	0.3476	-371914.	55270.	-0.00301	0.00	3.65E+11	-563.0741	11664.	0.00
6.0000	0.3259	11436.	51131.	-0.00301	0.00	3.65E+11	-586.6090	12960.	0.00
6.6000	0.3042	364376.	46851.	-0.00301	0.00	3.65E+11	-602.3413	14256.	0.00
7.2000	0.2826	686091.	42485.	-0.00300	0.00	3.64E+11	-610.3803	15552.	0.00

7.8000	0.2611	976164.	38089.	-0.00298	0.00	3.63E+11	-610.8612	16848.	0.00
8.4000	0.2397	1234569.	33715.	-0.00296	0.00	3.62E+11	-603.9419	18144.	0.00
9.0000	0.2184	1461667.	29418.	-0.00293	0.00	3.62E+11	-589.7984	19440.	0.00
9.6000	0.1974	1658189.	25248.	-0.00290	0.00	3.61E+11	-568.6206	20736.	0.00
10.2000	0.1767	1825234.	21254.	-0.00287	0.00	3.60E+11	-540.6093	22032.	0.00
10.8000	0.1562	1964254.	17487.	-0.00283	0.00	3.60E+11	-505.9719	23328.	0.00
11.4000	0.1359	2077044.	13992.	-0.00279	0.00	3.60E+11	-464.9197	24624.	0.00
12.0000	0.1160	2165732.	10814.	-0.00275	0.00	3.59E+11	-417.6651	25920.	0.00
12.6000	0.09641	2232769.	7999.	-0.00268	0.00	1.69E+11	-364.4188	27216.	0.00
13.2000	0.07748	2280915.	5582.	-0.00246	0.00	4.76E+10	-306.8264	28512.	0.00
13.8000	0.06104	2313154.	3568.	-0.00211	0.00	4.75E+10	-252.7062	29808.	0.00
14.4000	0.04712	2332294.	1925.	-0.00176	0.00	4.75E+10	-203.5668	31104.	0.00
15.0000	0.03575	2340880.	-363.4916	-0.00140	0.00	4.75E+10	-432.2365	87057.	0.00
15.6000	0.02693	2327060.	-3541.	-0.00105	0.00	4.75E+10	-450.4902	120453.	0.00
16.2000	0.02065	2289885.	-6463.	-6.99E-04	0.00	4.75E+10	-361.2205	125971.	0.00
16.8000	0.01686	2233986.	-8865.	-4.77E-04	0.00	1.64E+11	-305.9342	130637.	0.00
17.4000	0.01378	2162226.	-10899.	-4.06E-04	0.00	3.59E+11	-259.0023	135302.	0.00
18.0000	0.01102	2077040.	-12602.	-3.64E-04	0.00	3.60E+11	-214.1430	139968.	0.00
18.6000	0.00855	1980753.	-13991.	-3.23E-04	0.00	3.60E+11	-171.7111	144634.	0.00
19.2000	0.00637	1875564.	-15085.	-2.84E-04	0.00	3.60E+11	-131.9958	149299.	0.00
19.8000	0.00445	1763533.	-15903.	-2.48E-04	0.00	3.61E+11	-95.2223	153965.	0.00
20.4000	0.00279	1646565.	-16467.	-2.14E-04	0.00	3.61E+11	-61.5545	158630.	0.00
21.0000	0.00137	1526406.	-16801.	-1.82E-04	0.00	3.61E+11	-31.0986	163296.	0.00
21.6000	1.67E-04	1404635.	-16927.	-1.53E-04	0.00	3.62E+11	-3.9061	167962.	0.00
22.2000	-8.35E-04	1282662.	-16869.	-1.26E-04	0.00	3.62E+11	20.0210	172627.	0.00
22.8000	-0.00165	1161726.	-16650.	-1.02E-04	0.00	3.63E+11	40.7266	177293.	0.00
23.4000	-0.00231	1042902.	-16294.	-8.03E-05	0.00	3.63E+11	58.2958	181958.	0.00
24.0000	-0.00281	927100.	-15821.	-6.08E-05	0.00	3.63E+11	72.8498	186624.	0.00
24.6000	-0.00318	815074.	-15255.	-4.35E-05	0.00	3.64E+11	84.5421	191290.	0.00
25.2000	-0.00344	707431.	-14614.	-2.85E-05	0.00	3.64E+11	93.5534	195955.	0.00
25.8000	-0.00359	604638.	-13917.	-1.55E-05	0.00	3.64E+11	100.0882	200621.	0.00
26.4000	-0.00366	507034.	-13180.	-4.51E-06	0.00	3.65E+11			

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104.3699    205286.       0.00
   27.0000   -0.00366    414839.    -12165.   4.59E-06       0.00   3.65E+11
177.7302    349920.       0.00
   27.6000   -0.00359    331859.    -10882.   1.20E-05       0.00   3.65E+11
178.5745    357696.       0.00
   28.2000   -0.00348    258136.     -9603.   1.78E-05       0.00   3.65E+11
176.8917    365472.       0.00
   28.8000   -0.00334    193583.     -8343.   2.22E-05       0.00   3.65E+11
173.0732    373248.       0.00
   29.4000   -0.00316    138001.     -7117.   2.55E-05       0.00   3.65E+11
167.4857    381024.       0.00
   30.0000   -0.00297     91103.     -5936.   2.77E-05       0.00   3.65E+11
160.4660    388800.       0.00
   30.6000   -0.00277     52523.     -4810.   2.92E-05       0.00   3.65E+11
152.3170    396576.       0.00
   31.2000   -0.00255     21839.     -3952.   2.99E-05       0.00   3.65E+11
85.9825    242611.       0.00
   31.8000   -0.00233     -4388.     -3354.   3.01E-05       0.00   3.65E+11
80.1916    247277.       0.00
   32.4000   -0.00212    -26457.     -2798.   2.98E-05       0.00   3.65E+11
74.1415    251942.       0.00
   33.0000   -0.00191    -44683.     -2287.   2.91E-05       0.00   3.65E+11
67.9450    256608.       0.00
   33.6000   -0.00170    -59387.     -1820.   2.80E-05       0.00   3.65E+11
61.7033    261274.       0.00
   34.2000   -0.00150    -70892.     -1398.   2.67E-05       0.00   3.65E+11
55.5056    265939.       0.00
   34.8000   -0.00132    -79519.     -1020.   2.53E-05       0.00   3.65E+11
49.4297    270605.       0.00
   35.4000   -0.00114    -85584.  -685.6295   2.36E-05       0.00   3.65E+11
43.5420    275270.       0.00
   36.0000  -9.75E-04    -89392.  -392.4464   2.19E-05       0.00   3.65E+11
37.8978    279936.       0.00
   36.6000  -8.23E-04    -91236.  -138.8635   2.01E-05       0.00   3.65E+11
32.5420    284602.       0.00
   37.2000  -6.85E-04    -91392.    77.3226   1.83E-05       0.00   3.65E+11
27.5097    289267.       0.00
   37.8000  -5.59E-04    -90122.   258.5357   1.66E-05       0.00   3.65E+11
22.8272    293933.       0.00
   38.4000  -4.46E-04    -87669.   407.3570   1.48E-05       0.00   3.65E+11
18.5121    298598.       0.00
   39.0000  -3.46E-04    -84256.   526.4685   1.31E-05       0.00   3.65E+11
14.5745    303264.       0.00
   39.6000  -2.58E-04    -80088.   618.6014   1.15E-05       0.00   3.65E+11
11.0180    307930.       0.00
   40.2000  -1.81E-04    -75348.   686.4904   9.96E-06       0.00   3.65E+11
7.8401    312595.       0.00
   40.8000  -1.14E-04    -70202.   732.8344   8.52E-06       0.00   3.65E+11
5.0333    317261.       0.00
   41.4000  -5.78E-05    -64796.   760.2626   7.19E-06       0.00   3.65E+11
2.5857    321926.       0.00
   42.0000  -1.06E-05    -59255.   771.3057   5.97E-06       0.00   3.65E+11
0.4819    326592.       0.00
   42.6000   2.82E-05    -53689.   768.3733   4.86E-06       0.00   3.65E+11
-1.2964    331258.       0.00
   43.2000   5.94E-05    -48190.   753.7351   3.86E-06       0.00   3.65E+11
-2.7697    335923.       0.00
   43.8000   8.37E-05    -42835.   729.5077   2.96E-06       0.00   3.65E+11
-3.9601    340589.       0.00
   44.4000   1.02E-04    -37685.   697.6447   2.17E-06       0.00   3.65E+11
-4.8907    345254.       0.00
   45.0000   1.15E-04    -32789.   659.9313   1.47E-06       0.00   3.65E+11
-5.5852    349920.       0.00
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   45.6000   1.23E-04    -28182.   617.9817   8.72E-07       0.00   3.65E+11
-6.0674    354586.       0.00
   46.2000   1.27E-04    -23890.   573.2395   3.59E-07       0.00   3.65E+11
-6.3610    359251.       0.00
   46.8000   1.28E-04    -19928.   526.9805  -7.21E-08       0.00   3.65E+11
-6.4887    363917.       0.00
   47.4000   1.26E-04    -16301.   480.3183  -4.29E-07       0.00   3.65E+11
-6.4730    368582.       0.00
   48.0000   1.22E-04    -13011.   434.2099  -7.18E-07       0.00   3.65E+11
-6.3349    373248.       0.00
   48.6000   1.16E-04    -10049.   389.4645  -9.45E-07       0.00   3.65E+11
-6.0944    377914.       0.00
   49.2000   1.09E-04     -7403.   346.7516  -1.12E-06       0.00   3.65E+11
-5.7703    382579.       0.00
   49.8000   1.00E-04     -5056.   306.6107  -1.24E-06       0.00   3.65E+11
-5.3800    387245.       0.00
   50.4000   9.07E-05     -2987.   269.4606  -1.32E-06       0.00   3.65E+11
-4.9395    391910.       0.00
   51.0000   8.10E-05     -1175.   235.6090  -1.36E-06       0.00   3.65E+11
-4.4637    396576.       0.00
   51.6000   7.12E-05   405.2985   205.2622  -1.37E-06       0.00   3.65E+11
-3.9660    401242.       0.00
   52.2000   6.14E-05      1780.   178.5332  -1.35E-06       0.00   3.65E+11
-3.4587    405907.       0.00
   52.8000   5.18E-05      2976.   155.4503  -1.30E-06       0.00   3.65E+11
-2.9532    410573.       0.00
   53.4000   4.26E-05      4019.   135.9645  -1.23E-06       0.00   3.65E+11
-2.4596    415238.       0.00
   54.0000   3.41E-05      4934.   119.9557  -1.14E-06       0.00   3.65E+11
-1.9873    419904.       0.00
   54.6000   2.62E-05      5746.   107.2383  -1.04E-06       0.00   3.65E+11
-1.5453    424570.       0.00
   55.2000   1.91E-05      6478.    41.1034  -9.16E-07       0.00   3.65E+11
-16.8256   6326340.       0.00
   55.8000   1.30E-05      6338.   -60.6276  -7.90E-07       0.00   3.65E+11
-11.4331   6326340.       0.00
   56.4000   7.77E-06      5605.  -126.3764  -6.72E-07       0.00   3.65E+11
-6.8305   6326340.       0.00
   57.0000   3.33E-06      4518.  -161.5013  -5.73E-07       0.00   3.65E+11
-2.9265   6326340.       0.00
   57.6000  -4.72E-07      3280.  -170.5445  -4.96E-07       0.00   3.65E+11
0.4145   6326340.       0.00
   58.2000  -3.81E-06      2062.  -157.0046  -4.43E-07       0.00   3.65E+11
3.3466   6326340.       0.00
   58.8000  -6.85E-06      1019.  -123.2783  -4.13E-07       0.00   3.65E+11
6.0218   6326340.       0.00
   59.4000  -9.75E-06   287.2536   -70.7481  -4.00E-07       0.00   3.65E+11
8.5699   6326340.       0.00
   60.0000  -1.26E-05      0.00       0.00  -3.97E-07       0.00   3.65E+11
11.0823   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.50000000 inches
Computed slope at pile head = 0.000000 radians

```
Maximum bending moment           =      -4853470. inch-lbs
Maximum shear force              =         77075. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             66
Number of zero deflection points =              3


--------------------------------------------------------------------------------
                 Computed Values of Pile Loading and Deflection
                   for Lateral Loading for Load Case Number 3
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     1.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0000  -5554287.    103027.       0.00       0.00   1.06E+10
0.00       0.00       0.00
    0.6000     0.9864  -4815290.    102249.   -0.00352       0.00   1.06E+10
-108.0843   788.9155       0.00
    1.2000     0.9493  -4081897.    101045.   -0.00547       0.00   4.62E+10
-226.3112      1716.       0.00
    1.8000     0.9076  -3360236.     98975.   -0.00605       0.00   4.72E+10
-348.7319      2766.       0.00
    2.4000     0.8623  -2656653.     96028.   -0.00650       0.00   4.74E+10
-469.9134      3924.       0.00
    3.0000     0.8140  -1977431.     92232.   -0.00673       0.00   3.60E+11
-584.6411      5171.       0.00
    3.6000     0.7654  -1328516.     87635.   -0.00676       0.00   3.62E+11
-692.3098      6512.       0.00
    4.2000     0.7167   -715491.     82309.   -0.00678       0.00   3.64E+11
-786.9433      7906.       0.00
    4.8000     0.6678   -143261.     76337.   -0.00679       0.00   3.65E+11
-872.0045      9402.       0.00
    5.4000     0.6189    383765.     69786.   -0.00678       0.00   3.65E+11
-947.7716     11025.       0.00
    6.0000     0.5701    861658.     62755.   -0.00677       0.00   3.63E+11
-1005.     12695.       0.00
    6.6000     0.5214   1287441.     55420.   -0.00675       0.00   3.62E+11
-1032.     14256.       0.00
    7.2000     0.4729   1659706.     48026.   -0.00672       0.00   3.61E+11
-1021.     15552.       0.00
    7.8000     0.4246   1979018.     40772.   -0.00669       0.00   3.60E+11
-993.6004     16848.       0.00
    8.4000     0.3766   2246823.     33778.   -0.00652       0.00   5.58E+10
-949.0937     18144.       0.00
    9.0000     0.3307   2465426.     27147.   -0.00619       0.00   4.75E+10
-892.9500     19440.       0.00
    9.6000     0.2875   2637739.     20951.   -0.00580       0.00   4.74E+10
-828.0329     20736.       0.00
   10.2000     0.2472   2767127.     15248.   -0.00539       0.00   4.74E+10
-756.3799     22032.       0.00
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   10.8000     0.2099   2857304.     10077.   -0.00496       0.00   4.74E+10
-680.0127     23328.       0.00
   11.4000     0.1757   2912229.      5465.   -0.00453       0.00   4.74E+10
-600.9082     24624.       0.00
   12.0000     0.1447   2936003.      1426.   -0.00408       0.00   4.74E+10
-520.9744     25920.       0.00
   12.6000     0.1169   2932769.     -2040.   -0.00363       0.00   4.74E+10
-442.0324     27216.       0.00
   13.2000    0.09237   2906621.     -4949.   -0.00319       0.00   4.74E+10
-365.8035     28512.       0.00
   13.8000    0.07099   2861509.     -7324.   -0.00275       0.00   4.74E+10
-293.9006     29808.       0.00
   14.4000    0.05274   2801162.     -9202.   -0.00232       0.00   4.74E+10
-227.8246     31104.       0.00
   15.0000    0.03755   2729004.    -11623.   -0.00190       0.00   4.74E+10
-444.6087     85257.       0.00
   15.6000    0.02534   2633798.    -14760.   -0.00150       0.00   4.74E+10
-426.9581    121306.       0.00
   16.2000    0.01601   2516458.    -17306.   -0.00110       0.00   4.75E+10
-280.1783    125971.       0.00
   16.8000    0.00943   2384594.    -18931.  -7.33E-04       0.00   4.75E+10
-171.1682    130637.       0.00
   17.4000    0.00546   2243856.    -19916.  -4.26E-04       0.00   6.38E+10
-102.5281    135302.       0.00
   18.0000    0.00330   2097804.    -20516.  -2.78E-04       0.00   3.60E+11
-64.1937    139968.       0.00
   18.6000    0.00145   1948423.    -20852.  -2.38E-04       0.00   3.60E+11
-29.1427    144634.       0.00
   19.2000   -1.20E-04  1797532.    -20948.  -2.00E-04       0.00   3.61E+11
2.4912    149299.       0.00
   19.8000   -0.00143   1646770.    -20829.  -1.66E-04       0.00   3.61E+11
30.6348    153965.       0.00
   20.4000   -0.00251   1497596.    -20520.  -1.35E-04       0.00   3.62E+11
55.2699    158630.       0.00
   21.0000   -0.00337   1351287.    -20046.  -1.06E-04       0.00   3.62E+11
76.4288    163296.       0.00
   21.6000   -0.00404   1208941.    -19431.  -8.07E-05       0.00   3.62E+11
94.1896    167962.       0.00
   22.2000   -0.00453   1071477.    -18701.  -5.81E-05       0.00   3.63E+11
108.6696    172627.       0.00
   22.8000   -0.00487    939646.    -17878.  -3.82E-05       0.00   3.63E+11
120.0214    177293.       0.00
   23.4000   -0.00508    814038.    -16983.  -2.08E-05       0.00   3.64E+11
128.4272    181958.       0.00
   24.0000   -0.00517    695087.    -16038.  -5.85E-06       0.00   3.64E+11
134.0939    186624.       0.00
   24.6000   -0.00517    583087.    -15061.   6.79E-06       0.00   3.64E+11
137.2496    191290.       0.00
   25.2000   -0.00508    478203.    -14070.   1.73E-05       0.00   3.65E+11
138.1376    195955.       0.00
   25.8000   -0.00492    380479.    -13079.   2.57E-05       0.00   3.65E+11
137.0144    200621.       0.00
   26.4000   -0.00470    289859.    -12103.   3.24E-05       0.00   3.65E+11
134.1449    205286.       0.00
   27.0000   -0.00445    206192.    -10842.   3.72E-05       0.00   3.65E+11
216.3338    349920.       0.00
   27.6000   -0.00417    133741.     -9317.   4.06E-05       0.00   3.65E+11
207.0921    357696.       0.00
   28.2000   -0.00387     72025.     -7865.   4.26E-05       0.00   3.65E+11
196.2768    365472.       0.00
   28.8000   -0.00355     20483.     -6495.   4.35E-05       0.00   3.65E+11
184.2800    373248.       0.00
   29.4000   -0.00324    -21505.     -5214.   4.35E-05       0.00   3.65E+11
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171.4557    381024.       0.00
   30.0000   -0.00293    -54604.     -4028.   4.28E-05       0.00   3.65E+11
158.1159    388800.       0.00
   30.6000   -0.00262    -79507.     -2938.   4.15E-05       0.00   3.65E+11
144.5291    396576.       0.00
   31.2000   -0.00233    -96918.     -2135.   3.97E-05       0.00   3.65E+11
78.5513    242611.       0.00
   31.8000   -0.00205   -110257.     -1599.   3.77E-05       0.00   3.65E+11
70.4778    247277.       0.00
   32.4000   -0.00179   -119942.     -1120.   3.54E-05       0.00   3.65E+11
62.5898    251942.       0.00
   33.0000   -0.00154   -126382.  -696.6111   3.30E-05       0.00   3.65E+11
54.9668    256608.       0.00
   33.6000   -0.00131   -129973.  -327.1010   3.05E-05       0.00   3.65E+11
47.6749    261274.       0.00
   34.2000   -0.00110   -131092.    -8.7072   2.79E-05       0.00   3.65E+11
40.7678    265939.       0.00
   34.8000  -9.12E-04   -130098.   261.4915   2.53E-05       0.00   3.65E+11
34.2874    270605.       0.00
   35.4000  -7.39E-04   -127327.   486.6772   2.28E-05       0.00   3.65E+11
28.2642    275270.       0.00
   36.0000  -5.84E-04   -123090.   670.2172   2.03E-05       0.00   3.65E+11
22.7191    279936.       0.00
   36.6000  -4.47E-04   -117676.   815.5936   1.79E-05       0.00   3.65E+11
17.6632    284602.       0.00
   37.2000  -3.26E-04   -111346.   926.3406   1.57E-05       0.00   3.65E+11
13.0998    289267.       0.00
   37.8000  -2.21E-04   -104336.      1006.   1.36E-05       0.00   3.65E+11
9.0245    293933.       0.00
   38.4000  -1.31E-04    -96859.      1058.   1.16E-05       0.00   3.65E+11
5.4269    298598.       0.00
   39.0000  -5.44E-05    -89101.      1086.   9.74E-06       0.00   3.65E+11
2.2911    303264.       0.00
   39.6000   9.43E-06    -81224.      1093.   8.06E-06       0.00   3.65E+11
-0.4033    307930.       0.00
   40.2000   6.17E-05    -73368.      1081.   6.54E-06       0.00   3.65E+11
-2.6803    312595.       0.00
   40.8000   1.04E-04    -65650.      1055.   5.17E-06       0.00   3.65E+11
-4.5665    317261.       0.00
   41.4000   1.36E-04    -58170.      1017.   3.95E-06       0.00   3.65E+11
-6.0907    321926.       0.00
   42.0000   1.61E-04    -51005.   968.8940   2.88E-06       0.00   3.65E+11
-7.2828    326592.       0.00
   42.6000   1.78E-04    -44218.   913.2506   1.94E-06       0.00   3.65E+11
-8.1737    331258.       0.00
   43.2000   1.88E-04    -37854.   852.1667   1.13E-06       0.00   3.65E+11
-8.7941    335923.       0.00
   43.8000   1.94E-04    -31947.   787.4799   4.44E-07       0.00   3.65E+11
-9.1745    340589.       0.00
   44.4000   1.95E-04    -26514.   720.8106  -1.32E-07       0.00   3.65E+11
-9.3447    345254.       0.00
   45.0000   1.92E-04    -21567.   653.5694  -6.06E-07       0.00   3.65E+11
-9.3334    349920.       0.00
   45.6000   1.86E-04    -17103.   586.9653  -9.87E-07       0.00   3.65E+11
-9.1677    354586.       0.00
   46.2000   1.78E-04    -13115.   522.0171  -1.28E-06       0.00   3.65E+11
-8.8734    359251.       0.00
   46.8000   1.68E-04     -9586.   459.5655  -1.51E-06       0.00   3.65E+11
-8.4743    363917.       0.00
   47.4000   1.56E-04     -6497.   400.2856  -1.67E-06       0.00   3.65E+11
-7.9924    368582.       0.00
   48.0000   1.44E-04     -3822.   344.7014  -1.77E-06       0.00   3.65E+11
-7.4477    373248.       0.00
```



```
   48.6000   1.31E-04     -1533.   293.1991  -1.82E-06       0.00   3.65E+11
-6.8585    377914.       0.00
   49.2000   1.17E-04   400.1353   246.0417  -1.83E-06       0.00   3.65E+11
-6.2408    382579.       0.00
   49.8000   1.04E-04      2010.   203.3820  -1.81E-06       0.00   3.65E+11
-5.6091    387245.       0.00
   50.4000   9.14E-05      3329.   165.2763  -1.76E-06       0.00   3.65E+11
-4.9758    391910.       0.00
   51.0000   7.90E-05      4390.   131.6965  -1.68E-06       0.00   3.65E+11
-4.3519    396576.       0.00
   51.6000   6.72E-05      5225.   102.5421  -1.58E-06       0.00   3.65E+11
-3.7466    401242.       0.00
   52.2000   5.62E-05      5866.    77.6505  -1.48E-06       0.00   3.65E+11
-3.1678    405907.       0.00
   52.8000   4.60E-05      6343.    56.8069  -1.36E-06       0.00   3.65E+11
-2.6221    410573.       0.00
   53.4000   3.67E-05      6684.    39.7530  -1.23E-06       0.00   3.65E+11
-2.1151    415238.       0.00
   54.0000   2.83E-05      6916.    26.1939  -1.09E-06       0.00   3.65E+11
-1.6513    419904.       0.00
   54.6000   2.09E-05      7062.    15.8046  -9.55E-07       0.00   3.65E+11
-1.2346    424570.       0.00
   55.2000   1.46E-05      7143.   -34.6931  -8.15E-07       0.00   3.65E+11
-12.7926   6326340.       0.00
   55.8000   9.20E-06      6562.  -109.8327  -6.80E-07       0.00   3.65E+11
-8.0795   6326340.       0.00
   56.4000   4.76E-06      5562.  -153.9826  -5.61E-07       0.00   3.65E+11
-4.1843   6326340.       0.00
   57.0000   1.12E-06      4345.  -172.5826  -4.63E-07       0.00   3.65E+11
-0.9823   6326340.       0.00
   57.6000  -1.91E-06      3077.  -170.0771  -3.90E-07       0.00   3.65E+11
1.6783   6326340.       0.00
   58.2000  -4.50E-06      1896.  -149.7960  -3.41E-07       0.00   3.65E+11
3.9554   6326340.       0.00
   58.8000  -6.82E-06   919.6207  -113.9701  -3.14E-07       0.00   3.65E+11
5.9963   6326340.       0.00
   59.4000  -9.02E-06   254.4586   -63.8625  -3.02E-07       0.00   3.65E+11
7.9225   6326340.       0.00
   60.0000  -1.12E-05       0.00       0.00  -2.99E-07       0.00   3.65E+11
9.8171   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -5554287. inch-lbs
Maximum shear force              =        103027. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =            131
Number of zero deflection points =              3
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head = 0.250000 inches
Moment at pile head = 0.0 in-lbs
Axial load at pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.2500	0.00	27544.	-0.00165	0.00	3.65E+11	0.00	0.00	0.00
0.6000	0.2381	198316.	27390.	-0.00165	0.00	3.65E+11	-42.8615	1296.	0.00
1.2000	0.2263	394410.	26942.	-0.00164	0.00	3.65E+11	-81.4561	2592.	0.00
1.8000	0.2145	586281.	26232.	-0.00163	0.00	3.64E+11	-115.8140	3888.	0.00
2.4000	0.2028	772149.	25289.	-0.00162	0.00	3.64E+11	-145.9852	5184.	0.00
3.0000	0.1912	950449.	24145.	-0.00160	0.00	3.63E+11	-172.0388	6480.	0.00
3.6000	0.1797	1119830.	22827.	-0.00158	0.00	3.63E+11	-194.0618	7776.	0.00
4.2000	0.1684	1279151.	21364.	-0.00156	0.00	3.62E+11	-212.1582	9072.	0.00
4.8000	0.1573	1427474.	19785.	-0.00153	0.00	3.62E+11	-226.4476	10368.	0.00
5.4000	0.1463	1564058.	18117.	-0.00150	0.00	3.61E+11	-237.0636	11664.	0.00
6.0000	0.1356	1688352.	16384.	-0.00147	0.00	3.61E+11	-244.1525	12960.	0.00
6.6000	0.1252	1799990.	14613.	-0.00143	0.00	3.61E+11	-247.8713	14256.	0.00
7.2000	0.1150	1898777.	12826.	-0.00140	0.00	3.60E+11	-248.3861	15552.	0.00
7.8000	0.1051	1984689.	11047.	-0.00136	0.00	3.60E+11	-245.8704	16848.	0.00
8.4000	0.09544	2057854.	9296.	-0.00132	0.00	3.60E+11	-240.5035	18144.	0.00
9.0000	0.08610	2118552.	7593.	-0.00128	0.00	3.60E+11	-232.4687	19440.	0.00
9.6000	0.07707	2167199.	5957.	-0.00123	0.00	3.59E+11	-221.9518	20736.	0.00
10.2000	0.06835	2204340.	4406.	-0.00119	0.00	3.59E+11	-209.1396	22032.	0.00
10.8000	0.05994	2230639.	2953.	-0.00113	0.00	2.33E+11	-194.2186	23328.	0.00
11.4000	0.05204	2246869.	1614.	-0.00104	0.00	1.50E+11	-177.9681	24624.	0.00
12.0000	0.04491	2253874.	390.9014	-9.25E-04	0.00	1.23E+11	-161.6620	25920.	0.00
12.6000	0.03872	2252498.	-718.0125	-7.95E-04	0.00	1.26E+11	-146.3696	27216.	0.00
13.2000	0.03346	2243535.	-1722.	-6.79E-04	0.00	1.57E+11	-132.5190	28512.	0.00

13.8000	0.02895	2227701.	-2630.	-5.93E-04	0.00	2.35E+11	-119.8370	29808.	0.00
14.4000	0.02492	2205656.	-3449.	-5.37E-04	0.00	3.59E+11	-107.6471	31104.	0.00
15.0000	0.02121	2178030.	-4989.	-4.93E-04	0.00	3.59E+11	-319.9676	108623.	0.00
15.6000	0.01781	2133816.	-7221.	-4.50E-04	0.00	3.59E+11	-300.1202	121306.	0.00
16.2000	0.01473	2074045.	-9229.	-4.08E-04	0.00	3.60E+11	-257.6415	125971.	0.00
16.8000	0.01194	2000917.	-10936.	-3.67E-04	0.00	3.60E+11	-216.5848	130637.	0.00
17.4000	0.00944	1916562.	-12354.	-3.28E-04	0.00	3.60E+11	-177.3294	135302.	0.00
18.0000	0.00721	1823014.	-13498.	-2.91E-04	0.00	3.60E+11	-140.1957	139968.	0.00
18.6000	0.00525	1722198.	-14382.	-2.55E-04	0.00	3.61E+11	-105.4448	144634.	0.00
19.2000	0.00353	1615915.	-15025.	-2.22E-04	0.00	3.61E+11	-73.2815	149299.	0.00
19.8000	0.00205	1505834.	-15447.	-1.91E-04	0.00	3.61E+11	-43.8554	153965.	0.00
20.4000	7.84E-04	1393480.	-15667.	-1.62E-04	0.00	3.62E+11	-17.2650	158630.	0.00
21.0000	-2.84E-04	1280230.	-15706.	-1.36E-04	0.00	3.62E+11	6.4399	163296.	0.00
21.6000	-0.00117	1167315.	-15585.	-1.11E-04	0.00	3.63E+11	27.2538	167962.	0.00
22.2000	-0.00189	1055812.	-15324.	-8.92E-05	0.00	3.63E+11	45.2120	172627.	0.00
22.8000	-0.00245	946653.	-14944.	-6.93E-05	0.00	3.63E+11	60.3859	177293.	0.00
23.4000	-0.00288	840624.	-14464.	-5.16E-05	0.00	3.64E+11	72.8798	181958.	0.00
24.0000	-0.00320	738373.	-13903.	-3.60E-05	0.00	3.64E+11	82.8260	186624.	0.00
24.6000	-0.00340	640417.	-13280.	-2.23E-05	0.00	3.64E+11	90.3812	191290.	0.00
25.2000	-0.00352	547145.	-12610.	-1.06E-05	0.00	3.64E+11	95.7228	195955.	0.00
25.8000	-0.00355	458836.	-11909.	-6.72E-07	0.00	3.65E+11	99.0452	200621.	0.00
26.4000	-0.00353	375661.	-11190.	7.56E-06	0.00	3.65E+11	100.5569	205286.	0.00
27.0000	-0.00345	297699.	-10225.	1.42E-05	0.00	3.65E+11	167.4607	349920.	0.00
27.6000	-0.00332	228418.	-9028.	1.94E-05	0.00	3.65E+11	165.0518	357696.	0.00
28.2000	-0.00317	167694.	-7855.	2.33E-05	0.00	3.65E+11	160.7318	365472.	0.00
28.8000	-0.00299	115302.	-6719.	2.61E-05	0.00	3.65E+11	154.8423	373248.	0.00
29.4000	-0.00279	70937.	-5630.	2.79E-05	0.00	3.65E+11	147.6994	381024.	0.00
30.0000	-0.00258	34228.	-4596.	2.89E-05	0.00	3.65E+11	139.5900	388800.	0.00
30.6000	-0.00237	4756.	-3623.	2.93E-05	0.00	3.65E+11	130.7682	396576.	0.00
31.2000	-0.00216	-17937.	-2889.	2.92E-05	0.00	3.65E+11	72.8718	242611.	0.00
31.8000	-0.00195	-36852.	-2386.	2.87E-05	0.00	3.65E+11	67.0960	247277.	0.00
32.4000	-0.00175	-52289.	-1924.	2.78E-05	0.00	3.65E+11			

```
61.2322    251942.       0.00
   33.0000   -0.00155    -64552.     -1504.   2.66E-05       0.00   3.65E+11
55.3687    256608.       0.00
   33.6000   -0.00137    -73944.     -1126.   2.53E-05       0.00   3.65E+11
49.5830    261274.       0.00
   34.2000   -0.00119    -80766.  -789.3170   2.37E-05       0.00   3.65E+11
43.9421    265939.       0.00
   34.8000   -0.00102    -85310.  -492.5155   2.21E-05       0.00   3.65E+11
38.5028    270605.       0.00
   35.4000  -8.71E-04    -87858.  -233.9827   2.04E-05       0.00   3.65E+11
33.3119    275270.       0.00
   36.0000  -7.31E-04    -88680.   -11.7945   1.87E-05       0.00   3.65E+11
28.4071    279936.       0.00
   36.6000  -6.03E-04    -88028.   176.2125   1.69E-05       0.00   3.65E+11
23.8171    284602.       0.00
   37.2000  -4.87E-04    -86142.   332.3801   1.52E-05       0.00   3.65E+11
19.5628    289267.       0.00
   37.8000  -3.84E-04    -83242.   459.1728   1.35E-05       0.00   3.65E+11
15.6574    293933.       0.00
   38.4000  -2.92E-04    -79530.   559.1272   1.19E-05       0.00   3.65E+11
12.1077    298598.       0.00
   39.0000  -2.12E-04    -75190.   634.8068   1.04E-05       0.00   3.65E+11
8.9144    303264.       0.00
   39.6000  -1.42E-04    -70389.   688.7622   8.98E-06       0.00   3.65E+11
6.0732    307930.       0.00
   40.2000  -8.23E-05    -65272.   723.4964   7.64E-06       0.00   3.65E+11
3.5752    312595.       0.00
   40.8000  -3.19E-05    -59970.   741.4350   6.41E-06       0.00   3.65E+11
1.4078    317261.       0.00
   41.4000   9.94E-06    -54596.   744.9024   5.28E-06       0.00   3.65E+11
-0.4446    321926.       0.00
   42.0000   4.41E-05    -49244.   736.1018   4.26E-06       0.00   3.65E+11
-2.0000    326592.       0.00
   42.6000   7.13E-05    -43996.   717.0997   3.34E-06       0.00   3.65E+11
-3.2783    331258.       0.00
   43.2000   9.22E-05    -38918.   689.8151   2.52E-06       0.00   3.65E+11
-4.3007    335923.       0.00
   43.8000   1.08E-04    -34062.   656.0117   1.80E-06       0.00   3.65E+11
-5.0891    340589.       0.00
   44.4000   1.18E-04    -29471.   617.2943   1.18E-06       0.00   3.65E+11
-5.6658    345254.       0.00
   45.0000   1.25E-04    -25173.   575.1068   6.40E-07       0.00   3.65E+11
-6.0530    349920.       0.00
   45.6000   1.27E-04    -21190.   530.7347   1.83E-07       0.00   3.65E+11
-6.2726    354586.       0.00
   46.2000   1.27E-04    -17531.   485.3077  -1.98E-07       0.00   3.65E+11
-6.3460    359251.       0.00
   46.8000   1.25E-04    -14201.   439.8060  -5.11E-07       0.00   3.65E+11
-6.2934    363917.       0.00
   47.4000   1.20E-04    -11198.   395.0664  -7.61E-07       0.00   3.65E+11
-6.1343    368582.       0.00
   48.0000   1.14E-04     -8512.   351.7910  -9.55E-07       0.00   3.65E+11
-5.8867    373248.       0.00
   48.6000   1.06E-04     -6132.   310.5553  -1.10E-06       0.00   3.65E+11
-5.5676    377914.       0.00
   49.2000   9.77E-05     -4040.   271.8181  -1.20E-06       0.00   3.65E+11
-5.1927    382579.       0.00
   49.8000   8.88E-05     -2218.   235.9306  -1.26E-06       0.00   3.65E+11
-4.7761    387245.       0.00
   50.4000   7.96E-05  -642.7352   203.1459  -1.29E-06       0.00   3.65E+11
-4.3308    391910.       0.00
   51.0000   7.02E-05   707.6612   173.6285  -1.29E-06       0.00   3.65E+11
-3.8685    396576.       0.00
```



```
   51.6000   6.10E-05      1858.   147.4629  -1.26E-06       0.00   3.65E+11
-3.3997    401242.       0.00
   52.2000   5.20E-05      2831.   124.6621  -1.22E-06       0.00   3.65E+11
-2.9338    405907.       0.00
   52.8000   4.35E-05      3653.   105.1751  -1.15E-06       0.00   3.65E+11
-2.4792    410573.       0.00
   53.4000   3.54E-05      4346.    88.8937  -1.07E-06       0.00   3.65E+11
-2.0434    415238.       0.00
   54.0000   2.80E-05      4933.    75.6584  -9.83E-07       0.00   3.65E+11
-1.6331    419904.       0.00
   54.6000   2.13E-05      5435.    65.2635  -8.81E-07       0.00   3.65E+11
-1.2544    424570.       0.00
   55.2000   1.53E-05      5873.    12.3068  -7.70E-07       0.00   3.65E+11
-13.4558   6326340.       0.00
   55.8000   1.02E-05      5612.   -68.3615  -6.57E-07       0.00   3.65E+11
-8.9521   6326340.       0.00
   56.4000   5.86E-06      4888.  -119.1214  -5.53E-07       0.00   3.65E+11
-5.1479   6326340.       0.00
   57.0000   2.22E-06      3897.  -144.6839  -4.67E-07       0.00   3.65E+11
-1.9528   6326340.       0.00
   57.6000  -8.61E-07      2805.  -148.9905  -4.01E-07       0.00   3.65E+11
0.7565   6326340.       0.00
   58.2000  -3.55E-06      1752.  -135.0480  -3.56E-07       0.00   3.65E+11
3.1164   6326340.       0.00
   58.8000  -5.98E-06    859.9671  -104.9006  -3.30E-07       0.00   3.65E+11
5.2579   6326340.       0.00
   59.4000  -8.30E-06    240.9679   -59.7199  -3.19E-07       0.00   3.65E+11
7.2923   6326340.       0.00
   60.0000  -1.06E-05       0.00       0.00  -3.17E-07       0.00   3.65E+11
9.2966   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =    -0.00165009 radians
Maximum bending moment           =       2253874. inch-lbs
Maximum shear force              =         27544. lbs
Depth of maximum bending moment  =    12.00000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             59
Number of zero deflection points =              3
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

```
Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     0.500000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs
```

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil

Res. Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch	X feet	y inches	Moment in-lbs	Force lbs	S radians	Stress psi*	Stiffness in-lb^2	p
0.00	0.00	0.00	0.5000	0.00	35687.	-0.00391	0.00	3.65E+11	
		0.6000	0.4718	256949.	35382.	-0.00391	0.00	3.65E+11	
		1.2000	0.4437	509495.	34501.	-0.00390	0.00	3.65E+11	
		1.8000	0.4157	753760.	33118.	-0.00389	0.00	3.64E+11	
		2.4000	0.3877	986388.	31305.	-0.00387	0.00	3.63E+11	
		3.0000	0.3599	1204545.	29133.	-0.00385	0.00	3.62E+11	
		3.6000	0.3323	1405908.	26675.	-0.00382	0.00	3.62E+11	
		4.2000	0.3049	1588667.	24000.	-0.00379	0.00	3.61E+11	
		4.8000	0.2777	1751511.	21178.	-0.00376	0.00	3.61E+11	
		5.4000	0.2507	1893626.	18276.	-0.00372	0.00	3.60E+11	
		6.0000	0.2241	2014684.	15362.	-0.00368	0.00	3.60E+11	
		6.6000	0.1977	2114834.	12501.	-0.00364	0.00	3.60E+11	
		7.2000	0.1716	2194694.	9757.	-0.00360	0.00	3.59E+11	
		7.8000	0.1458	2255338.	7194.	-0.00341	0.00	4.78E+10	
		8.4000	0.1225	2298292.	4854.	-0.00306	0.00	4.75E+10	
		9.0000	0.1017	2325239.	2754.	-0.00271	0.00	4.75E+10	
		9.6000	0.08344	2337950.	900.2558	-0.00236	0.00	4.75E+10	
		10.2000	0.06772	2338203.	-710.8488	-0.00201	0.00	4.75E+10	
		10.8000	0.05455	2327714.	-2093.	-0.00165	0.00	4.75E+10	
		11.4000	0.04391	2308063.	-3270.	-0.00130	0.00	4.75E+10	
		12.0000	0.03580	2280626.	-4275.	-9.55E-04	0.00	4.76E+10	
		12.6000	0.03017	2246508.	-5149.	-6.75E-04	0.00	7.58E+10	
		13.2000	0.02607	2206479.	-5931.	-5.46E-04	0.00	3.59E+11	
		13.8000	0.02230	2161097.	-6635.	-5.03E-04	0.00	3.59E+11	
		14.4000	0.01884	2110929.	-7261.	-4.60E-04	0.00	3.60E+11	
		15.0000	0.01568	2056543.	-8468.	-4.18E-04	0.00	3.60E+11	
		15.6000	0.01281	1988992.	-10159.	-3.78E-04	0.00	3.60E+11	
		16.2000	0.01024	1910251.	-11581.	-3.39E-04	0.00	3.60E+11	

		16.8000	0.00793	1822224.	-12744.	-3.01E-04	0.00	3.61E+11	
		17.4000	0.00590	1726735.	-13661.	-2.66E-04	0.00	3.61E+11	
		18.0000	0.00410	1625502.	-14347.	-2.33E-04	0.00	3.61E+11	
		18.6000	0.00255	1520135.	-14819.	-2.01E-04	0.00	3.61E+11	
		19.2000	0.00121	1412116.	-15093.	-1.72E-04	0.00	3.62E+11	
		19.8000	6.75E-05	1302802.	-15188.	-1.45E-04	0.00	3.62E+11	
		20.4000	-8.84E-04	1193413.	-15123.	-1.20E-04	0.00	3.62E+11	
		21.0000	-0.00166	1085033.	-14917.	-9.77E-05	0.00	3.63E+11	
		21.6000	-0.00229	978610.	-14589.	-7.72E-05	0.00	3.63E+11	
		22.2000	-0.00278	874957.	-14157.	-5.88E-05	0.00	3.63E+11	
		22.8000	-0.00314	774753.	-13639.	-4.25E-05	0.00	3.64E+11	
		23.4000	-0.00339	678554.	-13053.	-2.81E-05	0.00	3.64E+11	
		24.0000	-0.00354	586794.	-12414.	-1.56E-05	0.00	3.64E+11	
		24.6000	-0.00361	499792.	-11738.	-4.86E-06	0.00	3.65E+11	
		25.2000	-0.00361	417765.	-11039.	4.19E-06	0.00	3.65E+11	
		25.8000	-0.00355	340834.	-10329.	1.17E-05	0.00	3.65E+11	
		26.4000	-0.00344	269033.	-9619.	1.77E-05	0.00	3.65E+11	
		27.0000	-0.00330	202322.	-8689.	2.23E-05	0.00	3.65E+11	
		27.6000	-0.00312	143917.	-7553.	2.57E-05	0.00	3.65E+11	
		28.2000	-0.00293	93553.	-6460.	2.81E-05	0.00	3.65E+11	
		28.8000	-0.00272	50889.	-5418.	2.95E-05	0.00	3.65E+11	
		29.4000	-0.00250	15528.	-4435.	3.02E-05	0.00	3.65E+11	
		30.0000	-0.00228	-12970.	-3514.	3.02E-05	0.00	3.65E+11	
		30.6000	-0.00207	-35078.	-2661.	2.97E-05	0.00	3.65E+11	
		31.2000	-0.00186	-51283.	-2026.	2.89E-05	0.00	3.65E+11	
		31.8000	-0.00165	-64248.	-1597.	2.77E-05	0.00	3.65E+11	
		32.4000	-0.00146	-74274.	-1209.	2.64E-05	0.00	3.65E+11	
		33.0000	-0.00127	-81658.	-862.4222	2.48E-05	0.00	3.65E+11	
		33.6000	-0.00110	-86693.	-555.7594	2.32E-05	0.00	3.65E+11	
		34.2000	-9.38E-04	-89661.	-287.5211	2.14E-05	0.00	3.65E+11	
		34.8000	-7.90E-04	-90833.	-55.9079	1.97E-05	0.00	3.65E+11	
		35.4000	-6.55E-04	-90466.	141.1343	1.79E-05	0.00	3.65E+11	

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25.0414    275270.       0.00
   36.0000  -5.33E-04    -88801.   305.8547   1.61E-05       0.00   3.65E+11
20.7142    279936.       0.00
   36.6000  -4.23E-04    -86062.   440.6412   1.44E-05       0.00   3.65E+11
16.7265    284602.       0.00
   37.2000  -3.26E-04    -82455.   547.9702   1.27E-05       0.00   3.65E+11
13.0871    289267.       0.00
   37.8000  -2.40E-04    -78171.   630.3600   1.11E-05       0.00   3.65E+11
9.7989    293933.       0.00
   38.4000  -1.65E-04    -73378.   690.3304   9.64E-06       0.00   3.65E+11
6.8595    298598.       0.00
   39.0000  -1.01E-04    -68230.   730.3670   8.25E-06       0.00   3.65E+11
4.2617    303264.       0.00
   39.6000  -4.66E-05    -62861.   752.8900   6.96E-06       0.00   3.65E+11
1.9946    307930.       0.00
   40.2000  -1.01E-06    -57388.   760.2290   5.77E-06       0.00   3.65E+11
0.04396    312595.       0.00
   40.8000   3.65E-05    -51914.   754.6014   4.70E-06       0.00   3.65E+11
-1.6072    317261.       0.00
   41.4000   6.66E-05    -46522.   738.0959   3.73E-06       0.00   3.65E+11
-2.9777    321926.       0.00
   42.0000   9.01E-05    -41285.   712.6599   2.86E-06       0.00   3.65E+11
-4.0879    326592.       0.00
   42.6000   1.08E-04    -36260.   680.0904   2.10E-06       0.00   3.65E+11
-4.9592    331258.       0.00
   43.2000   1.20E-04    -31492.   642.0290   1.43E-06       0.00   3.65E+11
-5.6134    335923.       0.00
   43.8000   1.28E-04    -27015.   599.9593   8.53E-07       0.00   3.65E+11
-6.0726    340589.       0.00
   44.4000   1.33E-04    -22852.   555.2075   3.62E-07       0.00   3.65E+11
-6.3585    345254.       0.00
   45.0000   1.34E-04    -19020.   508.9447  -5.04E-08       0.00   3.65E+11
-6.4923    349920.       0.00
   45.6000   1.32E-04    -15524.   462.1921  -3.91E-07       0.00   3.65E+11
-6.4945    354586.       0.00
   46.2000   1.28E-04    -12364.   415.8268  -6.65E-07       0.00   3.65E+11
-6.3847    359251.       0.00
   46.8000   1.22E-04     -9536.   370.5896  -8.81E-07       0.00   3.65E+11
-6.1812    363917.       0.00
   47.4000   1.15E-04     -7028.   327.0937  -1.04E-06       0.00   3.65E+11
-5.9010    368582.       0.00
   48.0000   1.07E-04     -4826.   285.8336  -1.16E-06       0.00   3.65E+11
-5.5601    373248.       0.00
   48.6000   9.86E-05     -2912.   247.1947  -1.24E-06       0.00   3.65E+11
-5.1729    377914.       0.00
   49.2000   8.94E-05     -1266.   211.4633  -1.28E-06       0.00   3.65E+11
-4.7525    382579.       0.00
   49.8000   8.01E-05    133.4211   178.8365  -1.29E-06       0.00   3.65E+11
-4.3106    387245.       0.00
   50.4000   7.09E-05      1309.   149.4310  -1.28E-06       0.00   3.65E+11
-3.8576    391910.       0.00
   51.0000   6.18E-05      2285.   123.2930  -1.24E-06       0.00   3.65E+11
-3.4029    396576.       0.00
   51.6000   5.30E-05      3085.   100.4064  -1.19E-06       0.00   3.65E+11
-2.9545    401242.       0.00
   52.2000   4.47E-05      3731.    80.7006  -1.12E-06       0.00   3.65E+11
-2.5194    405907.       0.00
   52.8000   3.69E-05      4247.    64.0579  -1.04E-06       0.00   3.65E+11
-2.1036    410573.       0.00
   53.4000   2.97E-05      4654.    50.3198  -9.54E-07       0.00   3.65E+11
-1.7125    415238.       0.00
   54.0000   2.32E-05      4971.    39.2928  -8.59E-07       0.00   3.65E+11
-1.3506    419904.       0.00
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   54.6000   1.73E-05      5219.    30.7525  -7.58E-07       0.00   3.65E+11
-1.0217    424570.       0.00
   55.2000   1.22E-05      5414.   -11.6314  -6.54E-07       0.00   3.65E+11
-10.7516   6326340.       0.00
   55.8000   7.91E-06      5052.   -75.3694  -5.51E-07       0.00   3.65E+11
-6.9534   6326340.       0.00
   56.4000   4.31E-06      4329.  -114.0273  -4.58E-07       0.00   3.65E+11
-3.7849   6326340.       0.00
   57.0000   1.32E-06      3410.  -131.8141  -3.82E-07       0.00   3.65E+11
-1.1559   6326340.       0.00
   57.6000  -1.19E-06      2431.  -132.2016  -3.24E-07       0.00   3.65E+11
1.0482   6326340.       0.00
   58.2000  -3.36E-06      1506.  -117.8105  -2.86E-07       0.00   3.65E+11
2.9493   6326340.       0.00
   58.8000  -5.31E-06   734.3502   -90.4071  -2.64E-07       0.00   3.65E+11
4.6627   6326340.       0.00
   59.4000  -7.15E-06   204.2774   -50.9965  -2.54E-07       0.00   3.65E+11
6.2846   6326340.       0.00
   60.0000  -8.97E-06       0.00       0.00  -2.52E-07       0.00   3.65E+11
7.8811   3163170.       0.00

* This analysis computed pile response using nonlinear moment-curvature rela-
  tionships. Values of total stress due to combined axial and bending stresses
  are computed only for elastic sections only and do not equal the actual
  stresses in concrete and steel. Stresses in concrete and steel may be inter-
  polated from the output for nonlinear bending properties relative to the
  magnitude of bending moment developed in the pile.


Output Summary for Load Case No. 5:

Pile-head deflection             =     0.50000000 inches
Computed slope at pile head      =    -0.00391066 radians
Maximum bending moment           =       2338203. inch-lbs
Maximum shear force              =         35687. lbs
Depth of maximum bending moment  =    10.20000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             84
Number of zero deflection points =              3


--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     1.000000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0000       0.00     53916.   -0.00871       0.00   3.65E+11
0.00       0.00       0.00
    0.6000     0.9373    388197.     53534.   -0.00871       0.00   3.65E+11
```

-106.0634	814.7803	0.00					
1.2000	0.8746	770895.	52362.	-0.00870	0.00	3.64E+11	
-219.5604	1808.	0.00					
1.8000	0.8120	1142212.	50366.	-0.00868	0.00	3.63E+11	
-334.8575	2969.	0.00					
2.4000	0.7496	1496169.	47551.	-0.00865	0.00	3.62E+11	
-447.1438	4295.	0.00					
3.0000	0.6874	1826947.	43956.	-0.00862	0.00	3.60E+11	
-551.6039	5778.	0.00					
3.6000	0.6254	2129129.	39639.	-0.00858	0.00	3.60E+11	
-647.4835	7454.	0.00					
4.2000	0.5638	2397746.	34751.	-0.00838	0.00	4.75E+10	
-710.3786	9072.	0.00					
4.8000	0.5048	2629536.	29576.	-0.00800	0.00	4.74E+10	
-726.8780	10368.	0.00					
5.4000	0.4486	2823646.	24343.	-0.00758	0.00	4.74E+10	
-726.7863	11664.	0.00					
6.0000	0.3956	2980079.	19163.	-0.00714	0.00	4.73E+10	
-712.0430	12960.	0.00					
6.6000	0.3458	3099599.	14135.	-0.00668	0.00	4.73E+10	
-684.6605	14256.	0.00					
7.2000	0.2994	3183627.	9342.	-0.00620	0.00	4.73E+10	
-646.6886	15552.	0.00					
7.8000	0.2565	3234130.	4854.	-0.00571	0.00	4.73E+10	
-600.1805	16848.	0.00					
8.4000	0.2171	3253520.	723.2690	-0.00522	0.00	4.73E+10	
-547.1629	18144.	0.00					
9.0000	0.1813	3244545.	-3009.	-0.00472	0.00	4.73E+10	
-489.6094	19440.	0.00					
9.6000	0.1491	3210189.	-6318.	-0.00423	0.00	4.73E+10	
-429.4175	20736.	0.00					
10.2000	0.1204	3153572.	-9190.	-0.00375	0.00	4.73E+10	
-368.3912	22032.	0.00					
10.8000	0.09513	3077857.	-11626.	-0.00327	0.00	4.73E+10	
-308.2262	23328.	0.00					
11.4000	0.07325	2986164.	-13637.	-0.00281	0.00	4.73E+10	
-250.4998	24624.	0.00					
12.0000	0.05463	2881485.	-15247.	-0.00237	0.00	4.74E+10	
-196.6650	25920.	0.00					
12.6000	0.03917	2766611.	-16488.	-0.00194	0.00	4.74E+10	
-148.0469	27216.	0.00					
13.2000	0.02673	2644062.	-17402.	-0.00153	0.00	4.74E+10	
-105.8426	28512.	0.00					
13.8000	0.01718	2516026.	-18039.	-0.00114	0.00	4.75E+10	
-71.1226	29808.	0.00					
14.4000	0.01038	2384303.	-18456.	-7.64E-04	0.00	4.75E+10	
-44.8342	31104.	0.00					
15.0000	0.00618	2250256.	-18978.	-4.50E-04	0.00	6.06E+10	
-100.0986	116640.	0.00					
15.6000	0.00391	2111020.	-19575.	-2.95E-04	0.00	3.60E+11	
-65.7986	121306.	0.00					
16.2000	0.00194	1968373.	-19934.	-2.54E-04	0.00	3.60E+11	
-33.8769	125971.	0.00					
16.8000	2.51E-04	1823970.	-20072.	-2.16E-04	0.00	3.60E+11	
-4.5457	130637.	0.00					
17.4000	-0.00117	1679331.	-20009.	-1.81E-04	0.00	3.61E+11	
22.0412	135302.	0.00					
18.0000	-0.00236	1535835.	-19765.	-1.49E-04	0.00	3.61E+11	
45.7840	139968.	0.00					
18.6000	-0.00332	1394712.	-19361.	-1.20E-04	0.00	3.62E+11	
66.6335	144634.	0.00					
19.2000	-0.00408	1257043.	-18816.	-9.34E-05	0.00	3.62E+11	
84.5862	149299.	0.00					

19.8000	-0.00466	1123760.	-18153.	-6.97E-05	0.00	3.63E+11	
99.6799	153965.	0.00					
20.4000	-0.00508	995643.	-17391.	-4.87E-05	0.00	3.63E+11	
111.9895	158630.	0.00					
21.0000	-0.00536	873333.	-16550.	-3.02E-05	0.00	3.63E+11	
121.6212	163296.	0.00					
21.6000	-0.00552	757327.	-15649.	-1.40E-05	0.00	3.64E+11	
128.7094	167962.	0.00					
22.2000	-0.00556	647993.	-14705.	-1.18E-07	0.00	3.64E+11	
133.4108	172627.	0.00					
22.8000	-0.00552	545576.	-13735.	1.17E-05	0.00	3.64E+11	
135.9017	177293.	0.00					
23.4000	-0.00540	450203.	-12755.	2.15E-05	0.00	3.65E+11	
136.3727	181958.	0.00					
24.0000	-0.00521	361900.	-11778.	2.95E-05	0.00	3.65E+11	
135.0261	186624.	0.00					
24.6000	-0.00497	280597.	-10817.	3.59E-05	0.00	3.65E+11	
132.0715	191290.	0.00					
25.2000	-0.00469	206141.	-9881.	4.07E-05	0.00	3.65E+11	
127.7243	195955.	0.00					
25.8000	-0.00439	138306.	-8982.	4.40E-05	0.00	3.65E+11	
122.2019	200621.	0.00					
26.4000	-0.00406	76805.	-8125.	4.62E-05	0.00	3.65E+11	
115.7219	205286.	0.00					
27.0000	-0.00372	21304.	-7058.	4.71E-05	0.00	3.65E+11	
180.8342	349920.	0.00					
27.6000	-0.00338	-24823.	-5802.	4.71E-05	0.00	3.65E+11	
167.9188	357696.	0.00					
28.2000	-0.00304	-62245.	-4641.	4.62E-05	0.00	3.65E+11	
154.4457	365472.	0.00					
28.8000	-0.00271	-91660.	-3579.	4.47E-05	0.00	3.65E+11	
140.7017	373248.	0.00					
29.4000	-0.00240	-113782.	-2615.	4.27E-05	0.00	3.65E+11	
126.9361	381024.	0.00					
30.0000	-0.00210	-129323.	-1750.	4.03E-05	0.00	3.65E+11	
113.3605	388800.	0.00					
30.6000	-0.00182	-138987.	-981.7582	3.77E-05	0.00	3.65E+11	
100.1486	396576.	0.00					
31.2000	-0.00156	-143460.	-432.3599	3.49E-05	0.00	3.65E+11	
52.4621	242611.	0.00					
31.8000	-0.00132	-145213.	-80.7939	3.20E-05	0.00	3.65E+11	
45.1951	247277.	0.00					
32.4000	-0.00110	-144624.	219.9205	2.92E-05	0.00	3.65E+11	
38.3367	251942.	0.00					
33.0000	-8.96E-04	-142046.	472.8576	2.64E-05	0.00	3.65E+11	
31.9237	256608.	0.00					
33.6000	-7.16E-04	-137814.	681.3207	2.36E-05	0.00	3.65E+11	
25.9828	261274.	0.00					
34.2000	-5.56E-04	-132235.	848.7700	2.09E-05	0.00	3.65E+11	
20.5310	265939.	0.00					
34.8000	-4.14E-04	-125592.	978.7568	1.84E-05	0.00	3.65E+11	
15.5765	270605.	0.00					
35.4000	-2.91E-04	-118141.	1075.	1.60E-05	0.00	3.65E+11	
11.1199	275270.	0.00					
36.0000	-1.84E-04	-110114.	1141.	1.38E-05	0.00	3.65E+11	
7.1545	279936.	0.00					
36.6000	-9.28E-05	-101716.	1180.	1.17E-05	0.00	3.65E+11	
3.6681	284602.	0.00					
37.2000	-1.60E-05	-93128.	1195.	9.75E-06	0.00	3.65E+11	
0.6431	289267.	0.00					
37.8000	4.76E-05	-84506.	1190.	8.00E-06	0.00	3.65E+11	
-1.9421	293933.	0.00					
38.4000	9.92E-05	-75985.	1169.	6.42E-06	0.00	3.65E+11	

```
-4.1127    298598.       0.00
   39.0000   1.40E-04    -67677.      1133.   5.00E-06       0.00   3.65E+11
-5.8962    303264.       0.00
   39.6000   1.71E-04    -59675.      1085.   3.75E-06       0.00   3.65E+11
-7.3221    307930.       0.00
   40.2000   1.94E-04    -52053.      1028.   2.65E-06       0.00   3.65E+11
-8.4209    312595.       0.00
   40.8000   2.09E-04    -44867.   964.8467   1.69E-06       0.00   3.65E+11
-9.2239    317261.       0.00
   41.4000   2.18E-04    -38159.   896.4967   8.75E-07       0.00   3.65E+11
-9.7622    321926.       0.00
   42.0000   2.22E-04    -31957.   825.1123   1.84E-07       0.00   3.65E+11
-10.0668    326592.       0.00
   42.6000   2.21E-04    -26277.   752.2693  -3.89E-07       0.00   3.65E+11
-10.1674    331258.       0.00
   43.2000   2.16E-04    -21125.   679.3319  -8.56E-07       0.00   3.65E+11
-10.0930    335923.       0.00
   43.8000   2.09E-04    -16495.   607.4627  -1.23E-06       0.00   3.65E+11
-9.8707    340589.       0.00
   44.4000   1.99E-04    -12377.   537.6332  -1.51E-06       0.00   3.65E+11
-9.5264    345254.       0.00
   45.0000   1.87E-04     -8753.   470.6370  -1.72E-06       0.00   3.65E+11
-9.0837    349920.       0.00
   45.6000   1.74E-04     -5600.   407.1027  -1.86E-06       0.00   3.65E+11
-8.5647    354586.       0.00
   46.2000   1.60E-04     -2891.   347.5087  -1.94E-06       0.00   3.65E+11
-7.9892    359251.       0.00
   46.8000   1.46E-04  -595.7417   292.1972  -1.98E-06       0.00   3.65E+11
-7.3751    363917.       0.00
   47.4000   1.32E-04      1317.   241.3890  -1.97E-06       0.00   3.65E+11
-6.7383    368582.       0.00
   48.0000   1.18E-04      2880.   195.1978  -1.93E-06       0.00   3.65E+11
-6.0926    373248.       0.00
   48.6000   1.04E-04      4128.   153.6439  -1.86E-06       0.00   3.65E+11
-5.4501    377914.       0.00
   49.2000   9.07E-05      5093.   116.6678  -1.77E-06       0.00   3.65E+11
-4.8210    382579.       0.00
   49.8000   7.83E-05      5808.    84.1428  -1.66E-06       0.00   3.65E+11
-4.2137    387245.       0.00
   50.4000   6.68E-05      6304.    55.8863  -1.54E-06       0.00   3.65E+11
-3.6353    391910.       0.00
   51.0000   5.61E-05      6613.    31.6715  -1.42E-06       0.00   3.65E+11
-3.0911    396576.       0.00
   51.6000   4.64E-05      6760.    11.2365  -1.28E-06       0.00   3.65E+11
-2.5853    401242.       0.00
   52.2000   3.76E-05      6774.    -5.7063  -1.15E-06       0.00   3.65E+11
-2.1210    405907.       0.00
   52.8000   2.98E-05      6678.   -19.4624  -1.02E-06       0.00   3.65E+11
-1.7001    410573.       0.00
   53.4000   2.30E-05      6494.   -30.3485  -8.89E-07       0.00   3.65E+11
-1.3238    415238.       0.00
   54.0000   1.70E-05      6241.   -38.6861  -7.64E-07       0.00   3.65E+11
-0.9922    419904.       0.00
   54.6000   1.20E-05      5937.   -44.7968  -6.44E-07       0.00   3.65E+11
-0.7052    424570.       0.00
   55.2000   7.75E-06      5596.   -71.8390  -5.30E-07       0.00   3.65E+11
-6.8065   6326340.       0.00
   55.8000   4.33E-06      4903.  -110.0318  -4.27E-07       0.00   3.65E+11
-3.8026   6326340.       0.00
   56.4000   1.60E-06      4012.  -128.7959  -3.39E-07       0.00   3.65E+11
-1.4097   6326340.       0.00
   57.0000  -5.50E-07      3048.  -132.1310  -2.69E-07       0.00   3.65E+11
0.4833   6326340.       0.00
```



```
   57.6000  -2.27E-06      2109.  -123.2043  -2.18E-07       0.00   3.65E+11
1.9964   6326340.       0.00
   58.2000  -3.69E-06      1274.  -104.3295  -1.85E-07       0.00   3.65E+11
3.2466   6326340.       0.00
   58.8000  -4.94E-06   606.7076   -77.0243  -1.67E-07       0.00   3.65E+11
4.3381   6326340.       0.00
   59.4000  -6.09E-06   164.5771   -42.1325  -1.59E-07       0.00   3.65E+11
5.3540   6326340.       0.00
   60.0000  -7.23E-06       0.00       0.00  -1.57E-07       0.00   3.65E+11
6.3494   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =    -0.00871461 radians
Maximum bending moment           =       3253520. inch-lbs
Maximum shear force              =         53916. lbs
Depth of maximum bending moment  =     8.40000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             46
Number of zero deflection points =              3
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

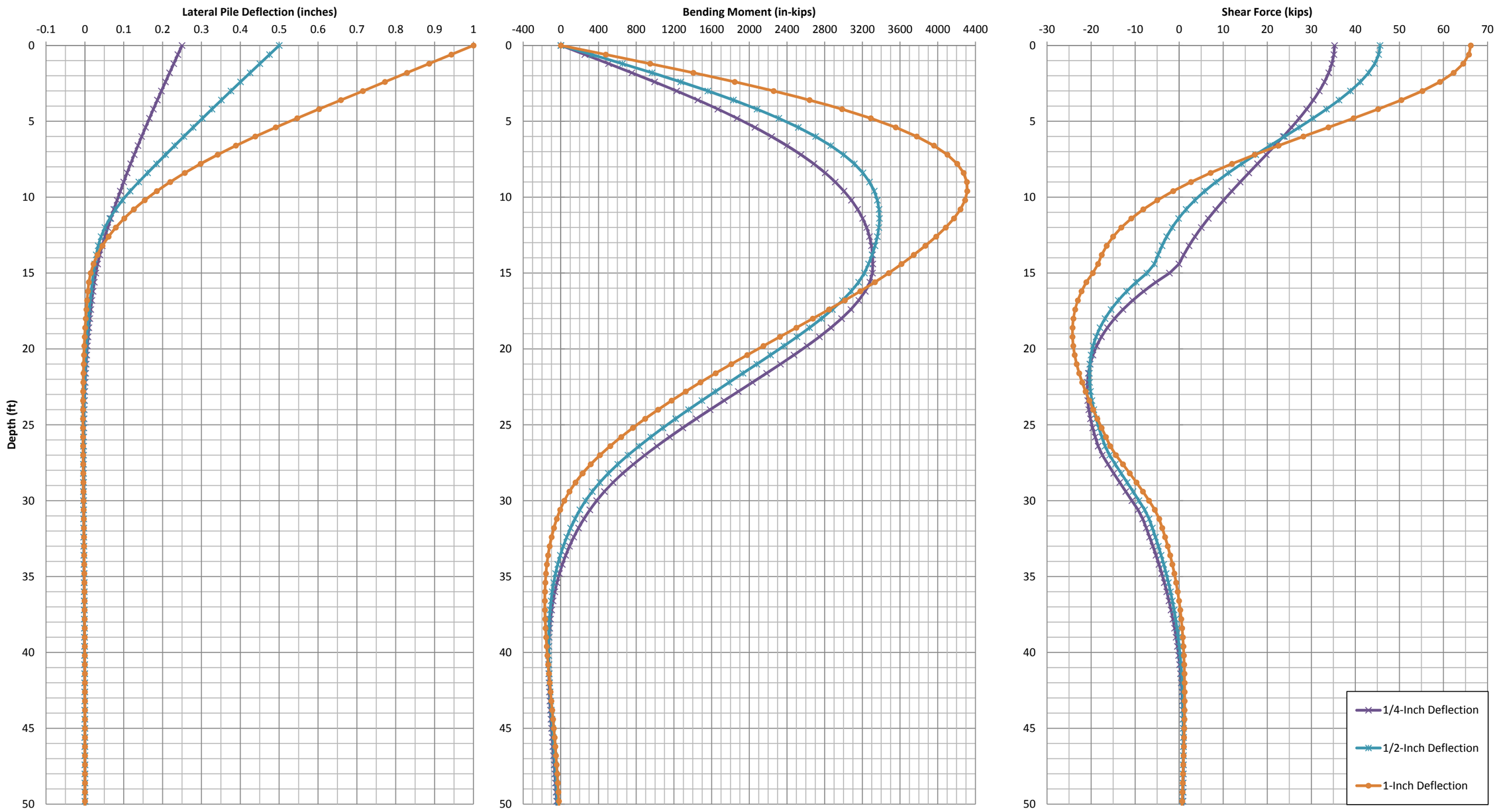
```
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians
```

```
Load Load                Load                  Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  y, in     0.2500   S, rad         0.00       0.00     0.2500       0.00
50605.  -3325436.
  2  y, in     0.5000   S, rad         0.00       0.00     0.5000       0.00
77075.  -4853470.
  3  y, in     1.0000   S, rad         0.00       0.00     1.0000       0.00
103027.  -5554287.
  4  y, in     0.2500  M, in-lb        0.00       0.00     0.2500   -0.00165
27544.   2253874.
  5  y, in     0.5000  M, in-lb        0.00       0.00     0.5000   -0.00391
35687.   2338203.
  6  y, in     1.0000  M, in-lb        0.00       0.00     1.0000   -0.00871
```

53916. 3253520.

Maximum pile-head deflection = 1.0000000000 inches
Maximum pile-head rotation = -0.0087146104 radians = -0.499310 deg.

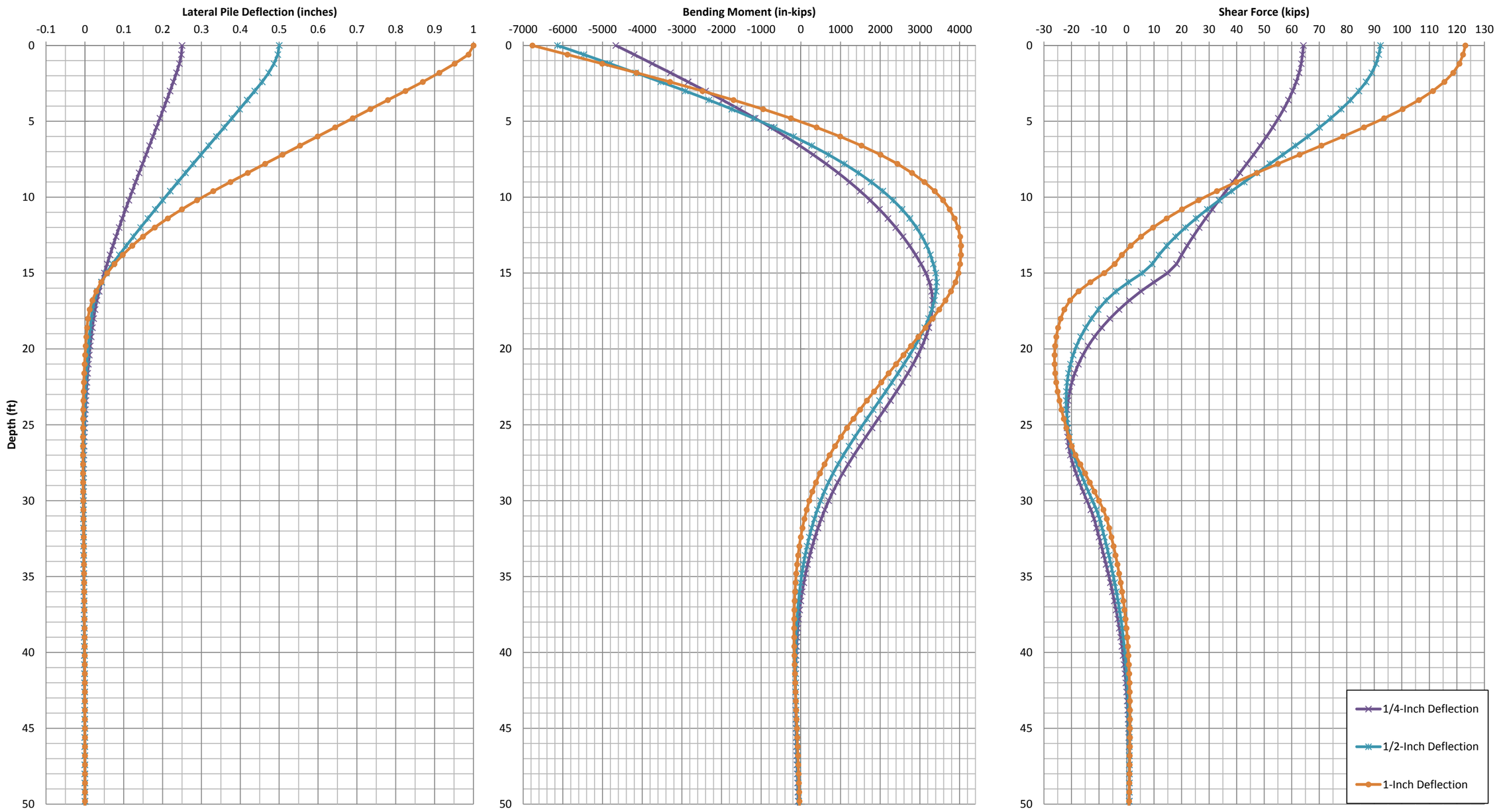
The analysis ended normally.



LATERAL LOAD CAPACITIES - FREE HEAD CONDITION
42-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILE

PROJECT NAME: Eastside Parking Structure
PROJECT NUMBER: 11922.002
DESIGNED/CHECKED BY: CD/JEH
DATE: 7/23/2018

Figure D.5-5



LATERAL LOAD CAPACITIES - FIXED HEAD CONDITION
42-INCH DIAMETER CAST-IN-DRILLED HOLE (CIDH) PILE

PROJECT NAME: Eastside Parking Structure
PROJECT NUMBER: 11922.002
DESIGNED/CHECKED BY: CD/JEH
DATE: 7/23/2018

Figure D.5-6

==========

LPile for Windows, Version 2018-10.001

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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==========

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Files Used for Analysis

Path to file locations:
\INFOCUS PROJECTS\11501-12000\11922 CSU Fullerton\002 Eastside
Parking\Analyses\Lpile\

Name of input data file:
42-inch CIDH.lp10

Name of output report file:
42-inch CIDH.lp10

Name of plot output file:
42-inch CIDH.lp10

Name of runtime message file:
42-inch CIDH.lp10

Date and Time of Analysis

Date: July 23, 2018 Time: 18:04:52

Problem Title

Project Name: CSUF Eastside Parking Structure

Job Number: 11922.002

Client:

Engineer: CD

Description: 42-INCH CIDH PILE

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	60.000 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	42.0000
2	60.000	42.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile
Length of section = 60.000000 ft
Shaft Diameter = 42.000000 in
Shear capacity of section = 0.0000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 0.0000 ft
Distance from top of pile to bottom of layer = 15.000000 ft
Effective unit weight at top of layer = 100.000000 pcf
Effective unit weight at bottom of layer = 100.000000 pcf
Friction angle at top of layer = 30.000000 deg.
Friction angle at bottom of layer = 30.000000 deg.
Subgrade k at top of layer = 25.000000 pci
Subgrade k at bottom of layer = 25.000000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 15.000000 ft
Distance from top of pile to bottom of layer = 27.000000 ft
Effective unit weight at top of layer = 120.000000 pcf
Effective unit weight at bottom of layer = 120.000000 pcf

Friction angle at top of layer = 34.000000 deg.
Friction angle at bottom of layer = 34.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 27.000000 ft
Distance from top of pile to bottom of layer = 31.000000 ft
Effective unit weight at top of layer = 125.000000 pcf
Effective unit weight at bottom of layer = 125.000000 pcf
Friction angle at top of layer = 35.000000 deg.
Friction angle at bottom of layer = 35.000000 deg.
Subgrade k at top of layer = 150.000000 pci
Subgrade k at bottom of layer = 150.000000 pci

Layer 4 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 31.000000 ft
Distance from top of pile to bottom of layer = 35.000000 ft
Effective unit weight at top of layer = 115.000000 pcf
Effective unit weight at bottom of layer = 115.000000 pcf
Friction angle at top of layer = 35.000000 deg.
Friction angle at bottom of layer = 35.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 35.000000 ft
Distance from top of pile to bottom of layer = 43.000000 ft
Effective unit weight at top of layer = 120.000000 pcf
Effective unit weight at bottom of layer = 120.000000 pcf
Friction angle at top of layer = 35.000000 deg.
Friction angle at bottom of layer = 35.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 43.000000 ft
Distance from top of pile to bottom of layer = 55.000000 ft
Effective unit weight at top of layer = 110.000000 pcf
Effective unit weight at bottom of layer = 110.000000 pcf
Friction angle at top of layer = 34.000000 deg.
Friction angle at bottom of layer = 34.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.000000 ft
Distance from top of pile to bottom of layer = 70.000000 ft
Effective unit weight at top of layer = 125.000000 pcf
Effective unit weight at bottom of layer = 125.000000 pcf
Undrained cohesion at top of layer = 5000. psf
Undrained cohesion at bottom of layer = 5000. psf
Epsilon-50 at top of layer = 0.050000

Epsilon-50 at bottom of layer = 0.050000

(Depth of the lowest soil layer extends 10.000 ft below the pile tip)

Summary of Input Soil Properties

Layer No.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or kpy krm pci
1	Sand (Reese, et al.)	0.00	100.0000	--	30.0000	--
		15.0000	100.0000	--	30.0000	--
2	Sand (Reese, et al.)	15.0000	120.0000	--	34.0000	--
		27.0000	120.0000	--	34.0000	--
3	Sand (Reese, et al.)	27.0000	125.0000	--	35.0000	--
		31.0000	125.0000	--	35.0000	--
4	Sand (Reese, et al.)	31.0000	115.0000	--	35.0000	--
		35.0000	115.0000	--	35.0000	--
5	Sand (Reese, et al.)	35.0000	120.0000	--	35.0000	--
		43.0000	120.0000	--	35.0000	--
6	Sand (Reese, et al.)	43.0000	110.0000	--	34.0000	--
		55.0000	110.0000	--	34.0000	--
7	Stiff Clay w/o Free Water	55.0000	125.0000	5000.	--	0.05000 --
		70.0000	125.0000	5000.	--	0.05000 --

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 6

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.
2	5	y = 0.500000 in	S = 0.0000 in/in	0.0000000	N.A.
3	5	y = 1.000000 in	S = 0.0000 in/in	0.0000000	N.A.
4	4	y = 0.250000 in	M = 0.0000 in-lbs	0.0000000	N.A.
5	4	y = 0.500000 in	M = 0.0000 in-lbs	0.0000000	N.A.
6	4	y = 1.000000 in	M = 0.0000 in-lbs	0.0000000	N.A.

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	60.000000	ft
Shaft Diameter	=	42.000000	in
Concrete Cover Thickness	=	3.000000	in
Number of Reinforcing Bars	=	8	bars
Yield Stress of Reinforcing Bars	=	60000.	psi
Modulus of Elasticity of Reinforcing Bars	=	29000000.	psi
Gross Area of Shaft	=	1385.	sq. in.
Total Area of Reinforcing Steel	=	6.320000	sq. in.
Area Ratio of Steel Reinforcement	=	0.46	percent
Edge-to-Edge Bar Spacing	=	12.393920	in
Maximum Concrete Aggregate Size	=	0.750000	in
Ratio of Bar Spacing to Aggregate Size	=	16.53	
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	5068.216	kips
Tensile Load for Cracking of Concrete	=	-594.735	kips

Nominal Axial Tensile Capacity = -379.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.000000	0.790000	17.500000	0.00000
2	1.000000	0.790000	12.374369	12.374369
3	1.000000	0.790000	0.00000	17.500000
4	1.000000	0.790000	-12.374369	12.374369
5	1.000000	0.790000	-17.500000	0.00000
6	1.000000	0.790000	-12.374369	-12.374369
7	1.000000	0.790000	0.00000	-17.500000
8	1.000000	0.790000	12.374369	-12.374369

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 12.394 inches
between bars 1 and 2.

Ratio of bar spacing to maximum aggregate size = 16.53

Concrete Properties:

Compressive Strength of Concrete	=	4000. psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.341649 psi
Compression Strain at Peak Stress	=	0.001886
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Stiffness kip-in2	Run Msg	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	418.9657020	670345123.		21.0000381	0.00001313	-0.00001312
0.0549190	0.3768194					
0.00000125	836.0305959	668824477.		21.0000383	0.00002625	-0.00002625
0.1094584	0.7536389					
0.00000188	1251.	667303830.		21.0000384	0.00003938	-0.00003937
0.1636182	1.1304583					
0.00000250	1664.	665783184.		21.0000385	0.00005250	-0.00005250
0.2173984	1.5072778					
0.00000313	2076.	664262537.		21.0000387	0.00006563	-0.00006562
0.2707989	1.8840973					
0.00000375	2485.	662741891.		21.0000388	0.00007875	-0.00007875
0.3238198	2.2609167					
0.00000438	2893.	661221244.		21.0000389	0.00009188	-0.00009187
0.3764611	2.6377362					
0.00000500	3299.	659700598.		21.0000391	0.0001050	-0.0001050
0.4287228	3.0145557					
0.00000563	3299.	586400532.		7.8644421	0.00004424	-0.0001920
0.1805248	-5.5341066	C				
0.00000625	3299.	527760478.		7.8663632	0.00004916	-0.0002133
0.2003754	-6.1486592	C				
0.00000688	3299.	479782253.		7.8682876	0.00005409	-0.0002347
0.2201844	-6.7631414	C				
0.00000750	3299.	439800399.		7.8702152	0.00005903	-0.0002560
0.2399515	-7.3775532	C				
0.00000813	3299.	405969599.		7.8721462	0.00006396	-0.0002773
0.2596768	-7.9918943	C				
0.00000875	3299.	376971770.		7.8740805	0.00006890	-0.0002986
0.2793602	-8.6061646	C				
0.00000938	3299.	351840319.		7.8760180	0.00007384	-0.0003199
0.2990017	-9.2203638	C				
0.00001000	3299.	329850299.		7.8779589	0.00007878	-0.0003412
0.3186012	-9.8344919	C				
0.00001063	3299.	310447340.		7.8799031	0.00008372	-0.0003625
0.3381587	-10.4485486	C				
0.00001125	3299.	293200266.		7.8818507	0.00008867	-0.0003838
0.3576740	-11.0625337	C				
0.00001188	3299.	277768673.		7.8838016	0.00009362	-0.0004051
0.3771472	-11.6764470	C				
0.00001250	3299.	263880239.		7.8857559	0.00009857	-0.0004264
0.3965782	-12.2902884	C				
0.00001313	3299.	251314514.		7.8877136	0.0001035	-0.0004477
0.4159669	-12.9040577	C				
0.00001375	3299.	239891127.		7.8896747	0.0001085	-0.0004690
0.4353133	-13.5177547	C				
0.00001438	3299.	229461078.		7.8916392	0.0001134	-0.0004903
0.4546173	-14.1313791	C				
0.00001500	3299.	219900199.		7.8936071	0.0001184	-0.0005116
0.4738789	-14.7449309	C				
0.00001563	3299.	211104191.		7.8955784	0.0001234	-0.0005329
0.4930980	-15.3584097	C				
0.00001625	3299.	202984799.		7.8975532	0.0001283	-0.0005542
0.5122746	-15.9718155	C				
0.00001688	3299.	195466844.		7.8995314	0.0001333	-0.0005754
0.5314086	-16.5851480	C				

0.00001750	3299.	188485885.	7.9015131	0.0001383	-0.0005967
0.5504999	-17.1984070 C				
0.00001813	3299.	181986372.	7.9034983	0.0001433	-0.0006180
0.5695486	-17.8115924 C				
0.00001875	3299.	175920159.	7.9054870	0.0001482	-0.0006393
0.5885544	-18.4247039 C				
0.00001938	3299.	170245316.	7.9074792	0.0001532	-0.0006605
0.6075175	-19.0377413 C				
0.00002000	3299.	164925150.	7.9094749	0.0001582	-0.0006818
0.6264376	-19.6507045 C				
0.00002063	3299.	159927418.	7.9114741	0.0001632	-0.0007031
0.6453148	-20.2635933 C				
0.00002125	3299.	155223670.	7.9134769	0.0001682	-0.0007243
0.6641491	-20.8764073 C				
0.00002188	3299.	150788708.	7.9154832	0.0001732	-0.0007456
0.6829402	-21.4891466 C				
0.00002250	3299.	146600133.	7.9174931	0.0001781	-0.0007669
0.7016883	-22.1018107 C				
0.00002313	3299.	142637967.	7.9195066	0.0001831	-0.0007881
0.7203932	-22.7143996 C				
0.00002375	3299.	138884336.	7.9215236	0.0001881	-0.0008094
0.7390549	-23.3269130 C				
0.00002438	3299.	135323200.	7.9235443	0.0001931	-0.0008306
0.7576733	-23.9393508 C				
0.00002563	3299.	128722068.	7.9275966	0.0002031	-0.0008731
0.7947800	-25.1639985 C				
0.00002688	3299.	122734995.	7.9316634	0.0002132	-0.0009156
0.8317129	-26.3883411 C				
0.00002813	3299.	117280106.	7.9357449	0.0002232	-0.0009581
0.8684714	-27.6123768 C				
0.00002938	3299.	112289463.	7.9398413	0.0002332	-0.0010005
0.9050552	-28.8361040 C				
0.00003063	3299.	107706220.	7.9439526	0.0002433	-0.0010430
0.9414637	-30.0595209 C				
0.00003188	3299.	103482447.	7.9480789	0.0002533	-0.0010854
0.9776964	-31.2826259 C				
0.00003313	3299.	99577449.	7.9522203	0.0002634	-0.0011278
1.0137529	-32.5054171 C				
0.00003438	3299.	95956451.	7.9563770	0.0002735	-0.0011702
1.0496326	-33.7278930 C				
0.00003563	3299.	92589558.	7.9605491	0.0002836	-0.0012127
1.0853351	-34.9500515 C				
0.00003688	3299.	89450929.	7.9647366	0.0002937	-0.0012551
1.1208599	-36.1718910 C				
0.00003813	3299.	86518111.	7.9689398	0.0003038	-0.0012974
1.1562063	-37.3934097 C				
0.00003938	3299.	83771505.	7.9731587	0.0003139	-0.0013398
1.1913740	-38.6146057 C				
0.00004063	3299.	81193920.	7.9773935	0.0003241	-0.0013822
1.2263625	-39.8354771 C				
0.00004188	3299.	78770221.	7.9816442	0.0003342	-0.0014245
1.2611711	-41.0560222 C				
0.00004313	3299.	76487026.	7.9859110	0.0003444	-0.0014669
1.2957994	-42.2762389 C				
0.00004438	3299.	74332462.	7.9901940	0.0003546	-0.0015092
1.3302468	-43.4961254 C				
0.00004563	3299.	72295956.	7.9944934	0.0003647	-0.0015515
1.3645129	-44.7156798 C				
0.00004688	3299.	70368064.	7.9988093	0.0003749	-0.0015938
1.3985970	-45.9349001 C				
0.00004813	3366.	69935297.	8.0031417	0.0003852	-0.0016361
1.4324987	-47.1537843 C				
0.00004938	3452.	69913780.	8.0074909	0.0003954	-0.0016784

1.4662174	-48.3723304 C				
0.00005063	3538.	69892192.	8.0118569	0.0004056	-0.0017206
1.4997525	-49.5905365 C				
0.00005188	3625.	69870531.	8.0162400	0.0004158	-0.0017629
1.5331035	-50.8084004 C				
0.00005313	3711.	69848798.	8.0206401	0.0004261	-0.0018052
1.5662698	-52.0259202 C				
0.00005438	3797.	69826991.	8.0250576	0.0004364	-0.0018474
1.5992509	-53.2430938 C				
0.00005563	3883.	69805111.	8.0294925	0.0004466	-0.0018896
1.6320462	-54.4599190 C				
0.00005688	3969.	69783157.	8.0339449	0.0004569	-0.0019318
1.6646552	-55.6763937 C				
0.00005813	4055.	69761128.	8.0384150	0.0004672	-0.0019740
1.6970771	-56.8925158 C				
0.00005938	4141.	69739024.	8.0429029	0.0004775	-0.0020162
1.7293115	-58.1082831 C				
0.00006063	4227.	69716844.	8.0474088	0.0004879	-0.0020584
1.7613578	-59.3236934 C				
0.00006188	4312.	69694587.	8.0519329	0.0004982	-0.0021005
1.7932154	-60.0000000 CY				
0.00006313	4398.	69672253.	8.0564752	0.0005086	-0.0021427
1.8248837	-60.0000000 CY				
0.00006438	4484.	69649842.	8.0610360	0.0005189	-0.0021848
1.8563620	-60.0000000 CY				
0.00006563	4569.	69627352.	8.0656154	0.0005293	-0.0022269
1.8876497	-60.0000000 CY				
0.00006688	4655.	69604784.	8.0702135	0.0005397	-0.0022691
1.9187464	-60.0000000 CY				
0.00006813	4734.	69488888.	8.0712939	0.0005499	-0.0023114
1.9489196	-60.0000000 CY				
0.00006938	4796.	69134123.	8.0631850	0.0005594	-0.0023544
1.9769583	-60.0000000 CY				
0.00007063	4855.	68740122.	8.0534992	0.0005688	-0.0023975
2.0044096	-60.0000000 CY				
0.00007188	4913.	68359277.	8.0442799	0.0005782	-0.0024406
2.0317011	-60.0000000 CY				
0.00007313	4972.	67990910.	8.0355039	0.0005876	-0.0024837
2.0588324	-60.0000000 CY				
0.00007438	5030.	67634391.	8.0271495	0.0005970	-0.0025267
2.0858031	-60.0000000 CY				
0.00007938	5264.	66315545.	7.9975616	0.0006348	-0.0026989
2.1920701	-60.0000000 CY				
0.00008438	5403.	64038447.	7.9213216	0.0006684	-0.0028754
2.2835647	-60.0000000 CY				
0.00008938	5475.	61253340.	7.8187595	0.0006988	-0.0030549
2.3642464	-60.0000000 CY				
0.00009438	5545.	58756398.	7.7245202	0.0007290	-0.0032347
2.4423504	-60.0000000 CY				
0.00009938	5615.	56503871.	7.6370430	0.0007589	-0.0034148
2.5178459	-60.0000000 CY				
0.0001044	5685.	54464982.	7.5587435	0.0007889	-0.0035948
2.5916753	-60.0000000 CY				
0.0001094	5754.	52610406.	7.4883721	0.0008190	-0.0037747
2.6638249	-60.0000000 CY				
0.0001144	5824.	50915946.	7.4248984	0.0008492	-0.0039545
2.7342808	-60.0000000 CY				
0.0001194	5893.	49361454.	7.3674646	0.0008795	-0.0041343
2.8030286	-60.0000000 CY				
0.0001244	5961.	47927296.	7.3122696	0.0009095	-0.0043143
2.8691897	-60.0000000 CY				
0.0001294	6029.	46600983.	7.2606045	0.0009393	-0.0044944
2.9332615	-60.0000000 CY				

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 0.0001344          6097.     45371682.     7.2134557     0.0009693    -0.0046744
2.9956564   -60.0000000 CY
 0.0001394          6164.     44228933.     7.1703467     0.0009994    -0.0048544
3.0563598   -60.0000000 CY
 0.0001444          6231.     43158966.     7.1303813     0.0010294    -0.0050343
3.1152166   -60.0000000 CY
 0.0001494          6283.     42060109.     7.0832965     0.0010581    -0.0052157
3.1693528   -60.0000000 CY
 0.0001544          6304.     40833870.     7.0185233     0.0010835    -0.0054003
3.2157796   -60.0000000 CY
 0.0001594          6316.     39627267.     6.9519944     0.0011080    -0.0055858
3.2591794   -60.0000000 CY
 0.0001644          6326.     38487293.     6.8854290     0.0011318    -0.0057720
3.3001532   -60.0000000 CY
 0.0001694          6337.     37411645.     6.8209197     0.0011553    -0.0059585
3.3394150   -60.0000000 CY
 0.0001744          6347.     36397269.     6.7604317     0.0011789    -0.0061449
3.3776371   -60.0000000 CY
 0.0001794          6357.     35439042.     6.7036308     0.0012025    -0.0063313
3.4148119   -60.0000000 CY
 0.0001844          6367.     34532392.     6.6502191     0.0012261    -0.0065176
3.4509314   -60.0000000 CY
 0.0001894          6377.     33673227.     6.5999304     0.0012499    -0.0067039
3.4859875   -60.0000000 CY
 0.0001944          6387.     32857878.     6.5525256     0.0012736    -0.0068901
3.5199720   -60.0000000 CY
 0.0001994          6397.     32082811.     6.5075282     0.0012974    -0.0070763
3.5528027   -60.0000000 CY
 0.0002044          6405.     31341085.     6.4602379     0.0013203    -0.0072634
3.5832140   -60.0000000 CY
 0.0002094          6414.     30634474.     6.4154693     0.0013432    -0.0074505
3.6126272   -60.0000000 CY
 0.0002144          6423.     29960515.     6.3730480     0.0013662    -0.0076375
3.6410347   -60.0000000 CY
 0.0002194          6431.     29316972.     6.3328157     0.0013893    -0.0078245
3.6684290   -60.0000000 CY
 0.0002244          6440.     28701808.     6.2946281     0.0014124    -0.0080114
3.6948022   -60.0000000 CY
 0.0002294          6448.     28113163.     6.2583536     0.0014355    -0.0081982
3.7201465   -60.0000000 CY
 0.0002344          6457.     27549336.     6.2238718     0.0014587    -0.0083850
3.7444540   -60.0000000 CY
 0.0002394          6465.     27008769.     6.1910726     0.0014820    -0.0085718
3.7677165   -60.0000000 CY
 0.0002444          6474.     26490029.     6.1598547     0.0015053    -0.0087584
3.7899260   -60.0000000 CY
 0.0002494          6482.     25991801.     6.1301251     0.0015287    -0.0089451
3.8110740   -60.0000000 CY
 0.0002544          6490.     25512871.     6.1017983     0.0015521    -0.0091316
3.8311522   -60.0000000 CY
 0.0002594          6498.     25050857.     6.0727350     0.0015751    -0.0093186
3.8497130   -60.0000000 CY
 0.0002644          6505.     24605138.     6.0434620     0.0015977    -0.0095060
3.8669260   -60.0000000 CY
 0.0002694          6512.     24175723.     6.0154943     0.0016204    -0.0096933
3.8831350   -60.0000000 CY
 0.0002744          6520.     23761722.     5.9887631     0.0016432    -0.0098806
3.8983320   -60.0000000 CY
 0.0003044          6562.     21558695.     5.8510503     0.0017809    -0.0110028
3.9677860   -60.0000000 CY
 0.0003344          6602.     19743297.     5.7449947     0.0019210    -0.0121228
3.9985826   -60.0000000 CY
 0.0003644          6638.     18218261.     5.6625735     0.0020633    -0.0132404
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3.9968982   -60.0000000 CY
 0.0003944          6671.     16914954.     5.5896578     0.0022044    -0.0143593
3.9896514    60.0000000 CY
 0.0004244          6701.     15790477.     5.5333205     0.0023482    -0.0154755
3.9948776    60.0000000 CY
 0.0004544          6729.     14809425.     5.4905081     0.0024947    -0.0165890
3.9960263    60.0000000 CY
 0.0004844          6755.     13946044.     5.4581173     0.0026438    -0.0177000
3.9857430    60.0000000 CY
 0.0005144          6779.     13180072.     5.4341259     0.0027952    -0.0188086
3.9955009    60.0000000 CY
 0.0005444          6802.     12495755.     5.4169717     0.0029489    -0.0199149
3.9894266    60.0000000 CY
 0.0005744          6823.     11879269.     5.4045095     0.0031042    -0.0210195
3.9866769    60.0000000 CYT
 0.0006044          6838.     11314548.     5.3872680     0.0032559    -0.0221278
3.9992137    60.0000000 CYT
 0.0006344          6852.     10801443.     5.3751152     0.0034098    -0.0232339
3.9817649    60.0000000 CYT
 0.0006644          6858.     10321815.     5.3501304     0.0035545    -0.0243493
3.9761929    60.0000000 CYT
 0.0006944          6861.      9881023.     5.3256078     0.0036980    -0.0254658
3.9920777    60.0000000 CYT
 0.0007244          6864.      9475289.     5.3026845     0.0038411    -0.0265826
3.9994216    60.0000000 CYT


-------------------------------------------------------------------------------
   Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1
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Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

 Load           Axial Thrust        Nominal Mom. Cap.      Max. Comp.
  No.               kips                in-kip               Strain
 ----         ----------------     ------------------     ------------
   1                 0.000              6809.216           0.00300000

Note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial     Resist.       Nominal     Ult. (Fac)    Ult. (Fac)   Bend. Stiff.
Load      Factor      Moment Cap    Ax. Thrust    Moment Cap    at Ult Mom
 No.    for Moment      in-kips        kips         in-kips      kip-in^2
-----  ------------  ------------  ------------  ------------  ------------
   1       0.65             6809.        0.0000         4426.     69664945.

   1       0.70             6809.        0.0000         4766.     69303548.

   1       0.75             6809.        0.0000         5107.     67201695.
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Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	358329.
2	15.0000	12.9385	Yes	No	358329.	1371131.
3	27.0000	23.8376	Yes	No	1729460.	889189.
4	31.0000	27.6785	Yes	No	2618648.	1164873.
5	35.0000	31.6387	Yes	No	3783521.	3332985.
6	43.0000	40.6660	Yes	No	7116507.	7718625.
7	55.0000	106.2883	No	No	1.48E+07	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.250000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.2500	-4665856.	64249.	0.00	0.00	6.96E+10	0.00	0.00	0.00
0.6000	0.2483	-4204421.	63927.	-4.59E-04	0.00	6.96E+10	-44.6872	1296.	0.00
1.2000	0.2434	-3745303.	63451.	-8.69E-04	0.00	6.98E+10	-87.6212	2592.	0.00
1.8000	0.2357	-3290727.	62677.	-0.00110	0.00	3.50E+11	-127.3007	3888.	0.00
2.4000	0.2276	-2842750.	61629.	-0.00115	0.00	6.61E+11	-163.8758	5184.	0.00
3.0000	0.2192	-2403268.	60329.	-0.00117	0.00	6.63E+11	-197.3211	6480.	0.00
3.6000	0.2107	-1974016.	58799.	-0.00120	0.00	6.65E+11	-227.5539	7776.	0.00
4.2000	0.2020	-1556560.	57064.	-0.00122	0.00	6.66E+11	-254.5156	9072.	0.00

4.8000	0.1932	-1152298.	55146.	-0.00123	0.00	6.68E+11	-278.1703	10368.	0.00
5.4000	0.1843	-762457.	53070.	-0.00124	0.00	6.69E+11	-298.5039	11664.	0.00
6.0000	0.1753	-388090.	50860.	-0.00125	0.00	6.70E+11	-315.5227	12960.	0.00
6.6000	0.1663	-30079.	48538.	-0.00125	0.00	6.70E+11	-329.2525	14256.	0.00
7.2000	0.1573	310863.	46130.	-0.00125	0.00	6.70E+11	-339.7367	15552.	0.00
7.8000	0.1483	634193.	43658.	-0.00124	0.00	6.69E+11	-347.0360	16848.	0.00
8.4000	0.1394	939532.	41144.	-0.00124	0.00	6.68E+11	-351.2264	18144.	0.00
9.0000	0.1305	1226665.	38611.	-0.00122	0.00	6.67E+11	-352.3986	19440.	0.00
9.6000	0.1218	1495528.	36080.	-0.00121	0.00	6.66E+11	-350.6565	20736.	0.00
10.2000	0.1131	1746214.	33571.	-0.00119	0.00	6.65E+11	-346.1160	22032.	0.00
10.8000	0.1046	1978957.	31105.	-0.00117	0.00	6.65E+11	-338.9038	23328.	0.00
11.4000	0.09624	2194131.	28700.	-0.00115	0.00	6.64E+11	-329.1559	24624.	0.00
12.0000	0.08806	2392242.	26374.	-0.00112	0.00	6.63E+11	-317.0170	25920.	0.00
12.6000	0.08006	2573919.	24143.	-0.00110	0.00	6.62E+11	-302.6388	27216.	0.00
13.2000	0.07227	2739907.	22024.	-0.00107	0.00	6.62E+11	-286.1794	28512.	0.00
13.8000	0.06469	2891059.	20029.	-0.00104	0.00	6.61E+11	-267.8022	29808.	0.00
14.4000	0.05733	3028328.	18174.	-0.00100	0.00	6.61E+11	-247.6749	31104.	0.00
15.0000	0.05022	3152758.	14848.	-9.71E-04	0.00	6.60E+11	-675.9583	96920.	0.00
15.6000	0.04335	3242147.	9918.	-9.35E-04	0.00	6.01E+11	-693.4878	115191.	0.00
16.2000	0.03676	3295585.	5245.	-8.65E-04	0.00	2.34E+11	-604.6079	118432.	0.00
16.8000	0.03090	3317680.	1051.	-7.37E-04	0.00	1.56E+11	-560.5944	130637.	0.00
17.4000	0.02614	3310714.	-2736.	-5.91E-04	0.00	1.70E+11	-491.2029	135302.	0.00
18.0000	0.02239	3278284.	-6071.	-4.80E-04	0.00	2.88E+11	-435.2225	139968.	0.00
18.6000	0.01923	3223291.	-9028.	-4.21E-04	0.00	6.60E+11	-386.2350	144634.	0.00
19.2000	0.01632	3148277.	-11637.	-3.87E-04	0.00	6.60E+11	-338.4012	149299.	0.00
19.8000	0.01366	3055720.	-13907.	-3.53E-04	0.00	6.61E+11	-292.0854	153965.	0.00
20.4000	0.01124	2948021.	-15850.	-3.20E-04	0.00	6.61E+11	-247.6050	158630.	0.00
21.0000	0.00905	2827486.	-17480.	-2.89E-04	0.00	6.61E+11	-205.2314	163296.	0.00
21.6000	0.00708	2696312.	-18813.	-2.59E-04	0.00	6.62E+11	-165.1898	167962.	0.00
22.2000	0.00532	2556575.	-19868.	-2.30E-04	0.00	6.62E+11	-127.6611	172627.	0.00
22.8000	0.00377	2410219.	-20661.	-2.03E-04	0.00	6.63E+11	-92.7823	177293.	0.00
23.4000	0.00240	2259054.	-21213.	-1.78E-04	0.00	6.64E+11			

-60.6490	181958.	0.00						
24.0000	0.00121	2104745.	-21545.	-1.54E-04	0.00	6.64E+11		
-31.3174	186624.	0.00						
24.6000	1.81E-04	1948812.	-21675.	-1.32E-04	0.00	6.65E+11		
-4.8064	191290.	0.00						
25.2000	-6.94E-04	1792630.	-21624.	-1.12E-04	0.00	6.65E+11		
18.8993	195955.	0.00						
25.8000	-0.00143	1637428.	-21412.	-9.33E-05	0.00	6.66E+11		
39.8470	200621.	0.00						
26.4000	-0.00204	1484292.	-21060.	-7.64E-05	0.00	6.66E+11		
58.1133	205286.	0.00						
27.0000	-0.00253	1334168.	-20408.	-6.12E-05	0.00	6.67E+11		
123.0009	349920.	0.00						
27.6000	-0.00292	1190421.	-19443.	-4.76E-05	0.00	6.67E+11		
145.0584	357696.	0.00						
28.2000	-0.00322	1054193.	-18333.	-3.55E-05	0.00	6.68E+11		
163.2629	365472.	0.00						
28.8000	-0.00343	926429.	-17105.	-2.48E-05	0.00	6.68E+11		
177.8661	373248.	0.00						
29.4000	-0.00357	807885.	-15784.	-1.55E-05	0.00	6.69E+11		
189.1304	381024.	0.00						
30.0000	-0.00365	699146.	-14392.	-7.38E-06	0.00	6.69E+11		
197.3221	388800.	0.00						
30.6000	-0.00368	600636.	-12952.	-3.89E-07	0.00	6.69E+11		
202.7037	396576.	0.00						
31.2000	-0.00366	512635.	-11779.	5.60E-06	0.00	6.70E+11		
123.3176	242611.	0.00						
31.8000	-0.00360	431026.	-10890.	1.07E-05	0.00	6.70E+11		
123.6238	247277.	0.00						
32.4000	-0.00351	355825.	-10003.	1.49E-05	0.00	6.70E+11		
122.6855	251942.	0.00						
33.0000	-0.00339	286985.	-9127.	1.83E-05	0.00	6.70E+11		
120.6454	256608.	0.00						
33.6000	-0.00324	224399.	-8269.	2.11E-05	0.00	6.70E+11		
117.6431	261274.	0.00						
34.2000	-0.00308	167912.	-7436.	2.32E-05	0.00	6.70E+11		
113.8143	265939.	0.00						
34.8000	-0.00291	117325.	-6633.	2.47E-05	0.00	6.70E+11		
109.2894	270605.	0.00						
35.4000	-0.00273	72403.	-5864.	2.57E-05	0.00	6.70E+11		
104.1927	275270.	0.00						
36.0000	-0.00254	32883.	-5134.	2.63E-05	0.00	6.70E+11		
98.6417	279936.	0.00						
36.6000	-0.00235	-1524.	-4445.	2.65E-05	0.00	6.70E+11		
92.7463	284602.	0.00						
37.2000	-0.00216	-31123.	-3799.	2.63E-05	0.00	6.70E+11		
86.6084	289267.	0.00						
37.8000	-0.00197	-56232.	-3198.	2.58E-05	0.00	6.70E+11		
80.3217	293933.	0.00						
38.4000	-0.00178	-77177.	-2643.	2.51E-05	0.00	6.70E+11		
73.9715	298598.	0.00						
39.0000	-0.00161	-94287.	-2133.	2.42E-05	0.00	6.70E+11		
67.6343	303264.	0.00						
39.6000	-0.00144	-107892.	-1669.	2.31E-05	0.00	6.70E+11		
61.3785	307930.	0.00						
40.2000	-0.00127	-118314.	-1249.	2.19E-05	0.00	6.70E+11		
55.2638	312595.	0.00						
40.8000	-0.00112	-125871.	-872.0246	2.06E-05	0.00	6.70E+11		
49.3419	317261.	0.00						
41.4000	-9.76E-04	-130871.	-537.2289	1.92E-05	0.00	6.70E+11		
43.6569	321926.	0.00						
42.0000	-8.43E-04	-133608.	-242.3818	1.78E-05	0.00	6.70E+11		
38.2451	326592.	0.00						

42.6000	-7.20E-04	-134361.	14.5902	1.64E-05	0.00	6.70E+11		
33.1360	331258.	0.00						
43.2000	-6.08E-04	-133397.	235.9482	1.49E-05	0.00	6.70E+11		
28.3524	335923.	0.00						
43.8000	-5.05E-04	-130964.	424.0958	1.35E-05	0.00	6.70E+11		
23.9109	340589.	0.00						
44.4000	-4.13E-04	-127290.	581.5361	1.21E-05	0.00	6.70E+11		
19.8226	345254.	0.00						
45.0000	-3.31E-04	-122590.	710.8332	1.08E-05	0.00	6.70E+11		
16.0933	349920.	0.00						
45.6000	-2.58E-04	-117054.	814.5767	9.48E-06	0.00	6.70E+11		
12.7243	354586.	0.00						
46.2000	-1.95E-04	-110860.	895.3503	8.25E-06	0.00	6.70E+11		
9.7128	359251.	0.00						
46.8000	-1.40E-04	-104161.	955.7031	7.10E-06	0.00	6.70E+11		
7.0519	363917.	0.00						
47.4000	-9.24E-05	-97098.	998.1251	6.02E-06	0.00	6.70E+11		
4.7320	368582.	0.00						
48.0000	-5.29E-05	-89788.	1025.	5.01E-06	0.00	6.70E+11		
2.7403	373248.	0.00						
48.6000	-2.02E-05	-82337.	1039.	4.09E-06	0.00	6.70E+11		
1.0617	377914.	0.00						
49.2000	6.04E-06	-74831.	1041.	3.25E-06	0.00	6.70E+11		
-0.3208	382579.	0.00						
49.8000	2.65E-05	-67341.	1035.	2.48E-06	0.00	6.70E+11		
-1.4260	387245.	0.00						
50.4000	4.18E-05	-59926.	1022.	1.80E-06	0.00	6.70E+11		
-2.2744	391910.	0.00						
51.0000	5.24E-05	-52628.	1003.	1.19E-06	0.00	6.70E+11		
-2.8873	396576.	0.00						
51.6000	5.90E-05	-45480.	980.9596	6.68E-07	0.00	6.70E+11		
-3.2872	401242.	0.00						
52.2000	6.20E-05	-38502.	956.5356	2.17E-07	0.00	6.70E+11		
-3.4973	405907.	0.00						
52.8000	6.21E-05	-31706.	931.1959	-1.60E-07	0.00	6.70E+11		
-3.5415	410573.	0.00						
53.4000	5.97E-05	-25093.	906.0463	-4.65E-07	0.00	6.70E+11		
-3.4445	415238.	0.00						
54.0000	5.54E-05	-18659.	882.0139	-7.00E-07	0.00	6.70E+11		
-3.2312	419904.	0.00						
54.6000	4.96E-05	-12392.	859.8439	-8.67E-07	0.00	6.70E+11		
-2.9272	424570.	0.00						
55.2000	4.29E-05	-6277.	713.5497	-9.67E-07	0.00	6.70E+11		
-37.7101	6326340.	0.00						
55.8000	3.57E-05	-2117.	464.8365	-1.01E-06	0.00	6.70E+11		
-31.3769	6326340.	0.00						
56.4000	2.83E-05	416.8560	262.2397	-1.02E-06	0.00	6.70E+11		
-24.8999	6326340.	0.00						
57.0000	2.10E-05	1660.	106.1753	-1.01E-06	0.00	6.70E+11		
-18.4513	6326340.	0.00						
57.6000	1.38E-05	1946.	-3.8647	-9.91E-07	0.00	6.70E+11		
-12.1154	6326340.	0.00						
58.2000	6.73E-06	1604.	-68.7623	-9.72E-07	0.00	6.70E+11		
-5.9117	6326340.	0.00						
58.8000	-2.08E-07	955.6027	-89.3858	-9.58E-07	0.00	6.70E+11		
0.1830	6326340.	0.00						
59.4000	-7.07E-06	316.7674	-66.3613	-9.51E-07	0.00	6.70E+11		
6.2127	6326340.	0.00						
60.0000	-1.39E-05	0.00	0.00	-9.50E-07	0.00	6.70E+11		
12.2210	3163170.	0.00						

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses

are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -4665856. inch-lbs
Maximum shear force              =         64249. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             56
Number of zero deflection points =              3
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.5000	-6135552.	92261.	0.00	0.00	4.47E+10	0.00	0.00	0.00
0.6000	0.4964	-5473590.	91617.	-9.35E-04	0.00	4.47E+10	-89.3597	1296.	0.00
1.2000	0.4865	-4816260.	90665.	-0.00163	0.00	6.90E+10	-175.1536	2592.	0.00
1.8000	0.4730	-4168011.	89115.	-0.00209	0.00	6.97E+10	-255.4278	3888.	0.00
2.4000	0.4564	-3533002.	87013.	-0.00249	0.00	6.99E+10	-328.6026	5184.	0.00
3.0000	0.4372	-2915029.	84413.	-0.00269	0.00	6.61E+11	-393.4351	6480.	0.00
3.6000	0.4177	-2317451.	81373.	-0.00272	0.00	6.63E+11	-451.0936	7776.	0.00
4.2000	0.3980	-1743258.	77944.	-0.00274	0.00	6.65E+11	-501.5142	9072.	0.00
4.8000	0.3782	-1195064.	74177.	-0.00275	0.00	6.67E+11	-544.6646	10368.	0.00
5.4000	0.3584	-675104.	70127.	-0.00276	0.00	6.69E+11	-580.5410	11664.	0.00
6.0000	0.3384	-185240.	65844.	-0.00277	0.00	6.70E+11	-609.1661	12960.	0.00
6.6000	0.3185	273044.	61381.	-0.00277	0.00	6.70E+11	-630.5871	14256.	0.00
7.2000	0.2986	698639.	56789.	-0.00276	0.00	6.69E+11	-644.8726	15552.	0.00

7.8000	0.2787	1090804.	52120.	-0.00275	0.00	6.68E+11	-652.1114	16848.	0.00
8.4000	0.2589	1449164.	47423.	-0.00274	0.00	6.66E+11	-652.4096	18144.	0.00
9.0000	0.2392	1773702.	42750.	-0.00272	0.00	6.65E+11	-645.8887	19440.	0.00
9.6000	0.2197	2064758.	38147.	-0.00270	0.00	6.64E+11	-632.6830	20736.	0.00
10.2000	0.2003	2323015.	33663.	-0.00268	0.00	6.63E+11	-612.9372	22032.	0.00
10.8000	0.1811	2549498.	29343.	-0.00265	0.00	6.62E+11	-586.8045	23328.	0.00
11.4000	0.1621	2745561.	25235.	-0.00262	0.00	6.62E+11	-554.4444	24624.	0.00
12.0000	0.1433	2912881.	21381.	-0.00259	0.00	6.61E+11	-516.0206	25920.	0.00
12.6000	0.1248	3053451.	17825.	-0.00256	0.00	6.61E+11	-471.6998	27216.	0.00
13.2000	0.1065	3169568.	14609.	-0.00253	0.00	6.60E+11	-421.6495	28512.	0.00
13.8000	0.08841	3263827.	11774.	-0.00249	0.00	6.60E+11	-366.0377	29808.	0.00
14.4000	0.07061	3339110.	9358.	-0.00230	0.00	7.01E+10	-305.0314	31104.	0.00
15.0000	0.05527	3398581.	5707.	-0.00196	0.00	6.99E+10	-709.0520	92364.	0.00
15.6000	0.04246	3421294.	685.4102	-0.00160	0.00	6.99E+10	-685.8884	116319.	0.00
16.2000	0.03218	3408450.	-3804.	-0.00125	0.00	6.99E+10	-561.1713	125577.	0.00
16.8000	0.02442	3366516.	-7419.	-9.04E-04	0.00	6.99E+10	-443.1042	130637.	0.00
17.4000	0.01916	3301611.	-10311.	-5.70E-04	0.00	7.39E+10	-360.1195	135302.	0.00
18.0000	0.01622	3218038.	-12743.	-3.91E-04	0.00	6.60E+11	-315.3292	139968.	0.00
18.6000	0.01353	3118117.	-14856.	-3.57E-04	0.00	6.60E+11	-271.8026	144634.	0.00
19.2000	0.01109	3004107.	-16662.	-3.23E-04	0.00	6.61E+11	-229.8658	149299.	0.00
19.8000	0.00888	2878180.	-18173.	-2.91E-04	0.00	6.61E+11	-189.7999	153965.	0.00
20.4000	0.00689	2742415.	-19403.	-2.61E-04	0.00	6.62E+11	-151.8415	158630.	0.00
21.0000	0.00512	2598777.	-20368.	-2.32E-04	0.00	6.62E+11	-116.1846	163296.	0.00
21.6000	0.00356	2449117.	-21085.	-2.04E-04	0.00	6.63E+11	-82.9804	167962.	0.00
22.2000	0.00218	2295155.	-21572.	-1.78E-04	0.00	6.63E+11	-52.3395	172627.	0.00
22.8000	9.88E-04	2138479.	-21848.	-1.54E-04	0.00	6.64E+11	-24.3341	177293.	0.00
23.4000	-3.96E-05	1980543.	-21932.	-1.32E-04	0.00	6.65E+11	1.0003	181958.	0.00
24.0000	-9.13E-04	1822658.	-21843.	-1.11E-04	0.00	6.65E+11	23.6622	186624.	0.00
24.6000	-0.00164	1665999.	-21601.	-9.26E-05	0.00	6.66E+11	43.6816	191290.	0.00
25.2000	-0.00225	1511605.	-21224.	-7.54E-05	0.00	6.66E+11	61.1183	195955.	0.00
25.8000	-0.00273	1360380.	-20730.	-5.99E-05	0.00	6.67E+11	76.0573	200621.	0.00
26.4000	-0.00311	1213097.	-20137.	-4.60E-05	0.00	6.67E+11			

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88.6080    205286.       0.00
   27.0000   -0.00339   1070408.    -19225.  -3.37E-05       0.00   6.68E+11
164.8352    349920.       0.00
   27.6000   -0.00359    936264.    -17989.  -2.29E-05       0.00   6.68E+11
178.4757    357696.       0.00
   28.2000   -0.00372    811372.    -16666.  -1.34E-05       0.00   6.69E+11
188.8637    365472.       0.00
   28.8000   -0.00379    696270.    -15280.  -5.33E-06       0.00   6.69E+11
196.2688    373248.       0.00
   29.4000   -0.00380    591344.    -13850.   1.60E-06       0.00   6.69E+11
200.9603    381024.       0.00
   30.0000   -0.00376    496835.    -12395.   7.45E-06       0.00   6.70E+11
203.2036    388800.       0.00
   30.6000   -0.00369    412860.    -10931.   1.23E-05       0.00   6.70E+11
203.2549    396576.       0.00
   31.2000   -0.00359    339422.     -9765.   1.64E-05       0.00   6.70E+11
120.8134    242611.       0.00
   31.8000   -0.00345    272246.     -8903.   1.97E-05       0.00   6.70E+11
118.6366    247277.       0.00
   32.4000   -0.00330    211221.     -8060.   2.23E-05       0.00   6.70E+11
115.5533    251942.       0.00
   33.0000   -0.00313    156187.     -7242.   2.42E-05       0.00   6.70E+11
111.6908    256608.       0.00
   33.6000   -0.00295    106942.     -6454.   2.56E-05       0.00   6.70E+11
107.1716    261274.       0.00
   34.2000   -0.00276     63253.     -5700.   2.66E-05       0.00   6.70E+11
102.1131    265939.       0.00
   34.8000   -0.00257     24858.     -4985.   2.70E-05       0.00   6.70E+11
96.6261    270605.       0.00
   35.4000   -0.00238     -8529.     -4310.   2.71E-05       0.00   6.70E+11
90.8146    275270.       0.00
   36.0000   -0.00218    -37207.     -3678.   2.69E-05       0.00   6.70E+11
84.7752    279936.       0.00
   36.6000   -0.00199    -61491.     -3090.   2.63E-05       0.00   6.70E+11
78.5970    284602.       0.00
   37.2000   -0.00180    -81700.     -2546.   2.56E-05       0.00   6.70E+11
72.3610    289267.       0.00
   37.8000   -0.00162    -98158.     -2048.   2.46E-05       0.00   6.70E+11
66.1401    293933.       0.00
   38.4000   -0.00145   -111188.     -1594.   2.35E-05       0.00   6.70E+11
59.9995    298598.       0.00
   39.0000   -0.00128   -121107.     -1183.   2.22E-05       0.00   6.70E+11
53.9964    303264.       0.00
   39.6000   -0.00113   -128226.  -815.4148   2.09E-05       0.00   6.70E+11
48.1803    307930.       0.00
   40.2000  -9.81E-04   -132849.  -488.6298   1.95E-05       0.00   6.70E+11
42.5933    312595.       0.00
   40.8000  -8.46E-04   -135263.  -201.1205   1.81E-05       0.00   6.70E+11
37.2704    317261.       0.00
   41.4000  -7.21E-04   -135745.    49.1169   1.66E-05       0.00   6.70E+11
32.2400    321926.       0.00
   42.0000  -6.07E-04   -134555.   264.2673   1.51E-05       0.00   6.70E+11
27.5240    326592.       0.00
   42.6000  -5.03E-04   -131939.   446.6530   1.37E-05       0.00   6.70E+11
23.1387    331258.       0.00
   43.2000  -4.09E-04   -128124.   598.6937   1.23E-05       0.00   6.70E+11
19.0948    335923.       0.00
   43.8000  -3.26E-04   -123318.   722.8688   1.10E-05       0.00   6.70E+11
15.3983    340589.       0.00
   44.4000  -2.51E-04   -117714.   821.6842   9.68E-06       0.00   6.70E+11
12.0505    345254.       0.00
   45.0000  -1.86E-04   -111486.   897.6419   8.44E-06       0.00   6.70E+11
9.0489    349920.       0.00
```



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   45.6000  -1.30E-04   -104788.   953.2131   7.28E-06       0.00   6.70E+11
6.3875    354586.       0.00
   46.2000  -8.13E-05    -97760.   990.8146   6.20E-06       0.00   6.70E+11
4.0573    359251.       0.00
   46.8000  -4.05E-05    -90521.      1013.   5.18E-06       0.00   6.70E+11
2.0465    363917.       0.00
   47.4000  -6.66E-06    -83175.      1021.   4.25E-06       0.00   6.70E+11
0.3411    368582.       0.00
   48.0000   2.07E-05    -75813.      1019.   3.40E-06       0.00   6.70E+11
-1.0746    373248.       0.00
   48.6000   4.23E-05    -68506.      1007.   2.62E-06       0.00   6.70E+11
-2.2182    377914.       0.00
   49.2000   5.85E-05    -61313.   987.7144   1.93E-06       0.00   6.70E+11
-3.1081    382579.       0.00
   49.8000   7.00E-05    -54282.   962.9745   1.30E-06       0.00   6.70E+11
-3.7641    387245.       0.00
   50.4000   7.73E-05    -47447.   934.2808   7.58E-07       0.00   6.70E+11
-4.2064    391910.       0.00
   51.0000   8.09E-05    -40829.   903.0957   2.84E-07       0.00   6.70E+11
-4.4561    396576.       0.00
   51.6000   8.14E-05    -34442.   870.7292  -1.20E-07       0.00   6.70E+11
-4.5346    401242.       0.00
   52.2000   7.92E-05    -28290.   838.3364  -4.57E-07       0.00   6.70E+11
-4.4635    405907.       0.00
   52.8000   7.48E-05    -22370.   806.9149  -7.29E-07       0.00   6.70E+11
-4.2647    410573.       0.00
   53.4000   6.87E-05    -16671.   777.3037  -9.39E-07       0.00   6.70E+11
-3.9606    415238.       0.00
   54.0000   6.13E-05    -11177.   750.1818  -1.09E-06       0.00   6.70E+11
-3.5733    419904.       0.00
   54.6000   5.30E-05     -5868.   726.0663  -1.18E-06       0.00   6.70E+11
-3.1255    424570.       0.00
   55.2000   4.43E-05  -721.4895   574.7466  -1.22E-06       0.00   6.70E+11
-38.9078   6326340.       0.00
   55.8000   3.55E-05      2408.   322.3753  -1.21E-06       0.00   6.70E+11
-31.1953   6326340.       0.00
   56.4000   2.69E-05      3921.   124.9445  -1.17E-06       0.00   6.70E+11
-23.6465   6326340.       0.00
   57.0000   1.86E-05      4207.   -19.0939  -1.13E-06       0.00   6.70E+11
-16.3641   6326340.       0.00
   57.6000   1.07E-05      3646.  -111.7284  -1.09E-06       0.00   6.70E+11
-9.3676   6326340.       0.00
   58.2000   2.98E-06      2599.  -154.8799  -1.05E-06       0.00   6.70E+11
-2.6189   6326340.       0.00
   58.8000  -4.50E-06      1415.  -150.0758  -1.03E-06       0.00   6.70E+11
3.9533   6326340.       0.00
   59.4000  -1.19E-05   437.4172   -98.2981  -1.02E-06       0.00   6.70E+11
10.4294   6326340.       0.00
   60.0000  -1.92E-05       0.00       0.00  -1.02E-06       0.00   6.70E+11
16.8757   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.50000000 inches
Computed slope at pile head      =       0.000000 radians
```

```
Maximum bending moment           =      -6135552. inch-lbs
Maximum shear force              =         92261. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =            141
Number of zero deflection points =              3


--------------------------------------------------------------------------------
                 Computed Values of Pile Loading and Deflection
                   for Lateral Loading for Load Case Number 3
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     1.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0000  -6768902.    123072.       0.00       0.00   1.35E+10
0.00       0.00       0.00
    0.6000     0.9870  -5885849.    122221.   -0.00337       0.00   1.35E+10
-118.1943   862.2031       0.00
    1.2000     0.9514  -5008923.    120909.   -0.00521       0.00   6.78E+10
-246.2451      1864.       0.00
    1.8000     0.9120  -4144762.    118657.   -0.00569       0.00   6.97E+10
-379.1385      2993.       0.00
    2.4000     0.8695  -3300256.    115446.   -0.00607       0.00   7.33E+10
-512.9852      4248.       0.00
    3.0000     0.8246  -2482343.    111284.   -0.00624       0.00   6.63E+11
-643.1613      5616.       0.00
    3.6000     0.7796  -1697771.    106208.   -0.00626       0.00   6.66E+11
-766.6723      7081.       0.00
    4.2000     0.7344   -952944.    100269.   -0.00628       0.00   6.68E+11
-883.0732      8657.       0.00
    4.8000     0.6892   -253895.     93537.   -0.00628       0.00   6.70E+11
-986.9906     10311.       0.00
    5.4000     0.6439    393988.     86228.   -0.00628       0.00   6.70E+11
-1043.     11664.       0.00
    6.0000     0.5987    987793.     78593.   -0.00628       0.00   6.68E+11
-1078.     12960.       0.00
    6.6000     0.5535   1525733.     70768.   -0.00626       0.00   6.66E+11
-1096.     14256.       0.00
    7.2000     0.5085   2006854.     62868.   -0.00624       0.00   6.64E+11
-1098.     15552.       0.00
    7.8000     0.4636   2431036.     55009.   -0.00622       0.00   6.63E+11
-1085.     16848.       0.00
    8.4000     0.4189   2798977.     47302.   -0.00619       0.00   6.62E+11
-1056.     18144.       0.00
    9.0000     0.3745   3112189.     39862.   -0.00616       0.00   6.60E+11
-1011.     19440.       0.00
    9.6000     0.3302   3372986.     32798.   -0.00597       0.00   6.99E+10
-951.1087     20736.       0.00
   10.2000     0.2885   3584479.     26196.   -0.00561       0.00   6.99E+10
-882.8742     22032.       0.00
```



```
   10.8000     0.2495   3750203.     20108.   -0.00523       0.00   6.98E+10
-808.2341     23328.       0.00
   11.4000     0.2132   3874028.     14573.   -0.00484       0.00   6.98E+10
-729.0506     24624.       0.00
   12.0000     0.1798   3960059.      9619.   -0.00444       0.00   6.98E+10
-647.1623     25920.       0.00
   12.6000     0.1493   4012541.      5257.   -0.00402       0.00   6.98E+10
-564.3678     27216.       0.00
   13.2000     0.1218   4035767.      1489.   -0.00361       0.00   6.98E+10
-482.4123     28512.       0.00
   13.8000    0.09734   4033984.     -1698.   -0.00319       0.00   6.98E+10
-402.9781     29808.       0.00
   14.4000    0.07585   4011311.     -4329.   -0.00278       0.00   6.98E+10
-327.6789     31104.       0.00
   15.0000    0.05735   3971651.     -8108.   -0.00237       0.00   6.98E+10
-722.1212     90665.       0.00
   15.6000    0.04179   3894556.    -13156.   -0.00196       0.00   6.98E+10
-680.1185    117176.       0.00
   16.2000    0.02913   3782204.    -17439.   -0.00156       0.00   6.98E+10
-509.6167    125971.       0.00
   16.8000    0.01927   3643433.    -20533.   -0.00118       0.00   6.99E+10
-349.6796    130637.       0.00
   17.4000    0.01212   3486535.    -22611.  -8.14E-04       0.00   6.99E+10
-227.7728    135302.       0.00
   18.0000    0.00755   3317829.    -23960.  -4.64E-04       0.00   7.02E+10
-146.8600    139968.       0.00
   18.6000    0.00544   3141510.    -24882.  -2.77E-04       0.00   6.60E+11
-109.2145    144634.       0.00
   19.2000    0.00357   2959529.    -25541.  -2.44E-04       0.00   6.61E+11
-73.9401    149299.       0.00
   19.8000    0.00193   2773715.    -25956.  -2.13E-04       0.00   6.62E+11
-41.2046    153965.       0.00
   20.4000   5.05E-04   2585766.    -26144.  -1.83E-04       0.00   6.62E+11
-11.1333    158630.       0.00
   21.0000  -7.14E-04   2397239.    -26126.  -1.56E-04       0.00   6.63E+11
16.1902    163296.       0.00
   21.6000   -0.00175   2209551.    -25921.  -1.31E-04       0.00   6.64E+11
40.7212    167962.       0.00
   22.2000   -0.00260   2023974.    -25550.  -1.08E-04       0.00   6.64E+11
62.4516    172627.       0.00
   22.8000   -0.00331   1841635.    -25032.  -8.74E-05       0.00   6.65E+11
81.4070    177293.       0.00
   23.4000   -0.00386   1663516.    -24387.  -6.85E-05       0.00   6.66E+11
97.6432    181958.       0.00
   24.0000   -0.00429   1490459.    -23635.  -5.14E-05       0.00   6.66E+11
111.2449    186624.       0.00
   24.6000   -0.00460   1323168.    -22794.  -3.62E-05       0.00   6.67E+11
122.3208    191290.       0.00
   25.2000   -0.00481   1162219.    -21882.  -2.28E-05       0.00   6.68E+11
131.0023    195955.       0.00
   25.8000   -0.00493   1008061.    -20916.  -1.11E-05       0.00   6.68E+11
137.4402    200621.       0.00
   26.4000   -0.00497    861028.    -19911.  -1.04E-06       0.00   6.69E+11
141.8021    205286.       0.00
   27.0000   -0.00495    721346.    -18535.   7.47E-06       0.00   6.69E+11
240.4509    349920.       0.00
   27.6000   -0.00487    594129.    -16799.   1.46E-05       0.00   6.69E+11
241.7325    357696.       0.00
   28.2000   -0.00474    479443.    -15063.   2.03E-05       0.00   6.70E+11
240.5021    365472.       0.00
   28.8000   -0.00457    377225.    -13343.   2.49E-05       0.00   6.70E+11
237.0726    373248.       0.00
   29.4000   -0.00438    287297.    -11656.   2.85E-05       0.00   6.70E+11
```

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231.7432    381024.       0.00
   30.0000   -0.00416    209382.    -10012.   3.12E-05       0.00   6.70E+11
224.7949    388800.       0.00
   30.6000   -0.00393    143121.     -8424.   3.31E-05       0.00   6.70E+11
216.4877    396576.       0.00
   31.2000   -0.00369     88082.     -7197.   3.43E-05       0.00   6.70E+11
124.2340    242611.       0.00
   31.8000   -0.00344     39484.     -6325.   3.50E-05       0.00   6.70E+11
118.0260    247277.       0.00
   32.4000   -0.00318     -2996.     -5499.   3.52E-05       0.00   6.70E+11
111.3866    251942.       0.00
   33.0000   -0.00293    -39701.     -4722.   3.49E-05       0.00   6.70E+11
104.4271    256608.       0.00
   33.6000   -0.00268    -70993.     -3996.   3.44E-05       0.00   6.70E+11
97.2510    261274.       0.00
   34.2000   -0.00244    -97244.     -3322.   3.34E-05       0.00   6.70E+11
89.9535    265939.       0.00
   34.8000   -0.00220   -118831.     -2701.   3.23E-05       0.00   6.70E+11
82.6217    270605.       0.00
   35.4000   -0.00197   -136136.     -2132.   3.09E-05       0.00   6.70E+11
75.3340    275270.       0.00
   36.0000   -0.00175   -149535.     -1616.   2.94E-05       0.00   6.70E+11
68.1603    279936.       0.00
   36.6000   -0.00155   -159400.     -1150.   2.77E-05       0.00   6.70E+11
61.1620    284602.       0.00
   37.2000   -0.00135   -166095.  -734.0322   2.60E-05       0.00   6.70E+11
54.3922    289267.       0.00
   37.8000   -0.00117   -169970.  -365.7943   2.42E-05       0.00   6.70E+11
47.8961    293933.       0.00
   38.4000   -0.00101   -171362.   -43.2085   2.23E-05       0.00   6.70E+11
41.7111    298598.       0.00
   39.0000  -8.52E-04   -170592.   236.0729   2.05E-05       0.00   6.70E+11
35.8671    303264.       0.00
   39.6000  -7.11E-04   -167963.   474.5898   1.87E-05       0.00   6.70E+11
30.3875    307930.       0.00
   40.2000  -5.82E-04   -163758.   675.0259   1.69E-05       0.00   6.70E+11
25.2891    312595.       0.00
   40.8000  -4.67E-04   -158243.   840.1649   1.52E-05       0.00   6.70E+11
20.5828    317261.       0.00
   41.4000  -3.64E-04   -151660.   972.8500   1.35E-05       0.00   6.70E+11
16.2741    321926.       0.00
   42.0000  -2.73E-04   -144234.      1076.   1.19E-05       0.00   6.70E+11
12.3638    326592.       0.00
   42.6000  -1.92E-04   -136166.      1152.   1.04E-05       0.00   6.70E+11
8.8482    331258.       0.00
   43.2000  -1.23E-04   -127640.      1205.   9.00E-06       0.00   6.70E+11
5.7198    335923.       0.00
   43.8000  -6.27E-05   -118818.      1236.   7.67E-06       0.00   6.70E+11
2.9680    340589.       0.00
   44.4000  -1.21E-05   -109841.      1249.   6.45E-06       0.00   6.70E+11
0.5793    345254.       0.00
   45.0000   3.01E-05   -100835.      1246.   5.32E-06       0.00   6.70E+11
-1.4622    349920.       0.00
   45.6000   6.45E-05    -91905.      1229.   4.28E-06       0.00   6.70E+11
-3.1744    354586.       0.00
   46.2000   9.17E-05    -83138.      1201.   3.34E-06       0.00   6.70E+11
-4.5765    359251.       0.00
   46.8000   1.13E-04    -74610.      1164.   2.49E-06       0.00   6.70E+11
-5.6890    363917.       0.00
   47.4000   1.28E-04    -66376.      1120.   1.74E-06       0.00   6.70E+11
-6.5331    368582.       0.00
   48.0000   1.38E-04    -58481.      1071.   1.07E-06       0.00   6.70E+11
-7.1306    373248.       0.00
```



```
   48.6000   1.43E-04    -50955.      1018.   4.78E-07       0.00   6.70E+11
-7.5036    377914.       0.00
   49.2000   1.44E-04    -43819.   963.5585  -3.14E-08       0.00   6.70E+11
-7.6743    382579.       0.00
   49.8000   1.43E-04    -37080.   908.3387  -4.66E-07       0.00   6.70E+11
-7.6646    387245.       0.00
   50.4000   1.38E-04    -30739.   853.7596  -8.30E-07       0.00   6.70E+11
-7.4963    391910.       0.00
   51.0000   1.31E-04    -24786.   800.8858  -1.13E-06       0.00   6.70E+11
-7.1909    396576.       0.00
   51.6000   1.21E-04    -19206.   750.6290  -1.36E-06       0.00   6.70E+11
-6.7693    401242.       0.00
   52.2000   1.11E-04    -13977.   703.7510  -1.54E-06       0.00   6.70E+11
-6.2523    405907.       0.00
   52.8000   9.93E-05     -9072.   660.8668  -1.67E-06       0.00   6.70E+11
-5.6600    410573.       0.00
   53.4000   8.69E-05     -4460.   622.4475  -1.74E-06       0.00   6.70E+11
-5.0121    415238.       0.00
   54.0000   7.42E-05  -108.5325   588.8232  -1.76E-06       0.00   6.70E+11
-4.3280    419904.       0.00
   54.6000   6.15E-05      4019.   560.1850  -1.74E-06       0.00   6.70E+11
-3.6270    424570.       0.00
   55.2000   4.91E-05      7958.   391.7639  -1.68E-06       0.00   6.70E+11
-43.1566   6326340.       0.00
   55.8000   3.73E-05      9660.   118.2882  -1.58E-06       0.00   6.70E+11
-32.8089   6326340.       0.00
   56.4000   2.63E-05      9661.   -83.0467  -1.48E-06       0.00   6.70E+11
-23.1175   6326340.       0.00
   57.0000   1.60E-05      8464.  -216.9674  -1.38E-06       0.00   6.70E+11
-14.0827   6326340.       0.00
   57.6000   6.40E-06      6537.  -287.9078  -1.30E-06       0.00   6.70E+11
-5.6230   6326340.       0.00
   58.2000  -2.72E-06      4318.  -299.5374  -1.24E-06       0.00   6.70E+11
2.3925   6326340.       0.00
   58.8000  -1.15E-05      2224.  -254.5118  -1.21E-06       0.00   6.70E+11
10.1146   6326340.       0.00
   59.4000  -2.01E-05   653.4972  -154.4314  -1.19E-06       0.00   6.70E+11
17.6855   6326340.       0.00
   60.0000  -2.87E-05      0.00       0.00  -1.19E-06       0.00   6.70E+11
25.2121   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =       0.000000 radians
Maximum bending moment           =      -6768902. inch-lbs
Maximum shear force              =        123072. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             44
Number of zero deflection points =              3
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head = 0.250000 inches
Moment at pile head = 0.0 in-lbs
Axial load at pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. Es*h lb/inch	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.2500	0.00	35274.	-0.00149	0.00	6.70E+11	0.00	0.00	0.00
0.6000	0.2393	253974.	35119.	-0.00148	0.00	6.70E+11	-43.0743	1296.	0.00
1.2000	0.2286	505716.	34668.	-0.00148	0.00	6.70E+11	-82.3044	2592.	0.00
1.8000	0.2180	753191.	33948.	-0.00147	0.00	6.69E+11	-117.7113	3888.	0.00
2.4000	0.2074	994563.	32986.	-0.00146	0.00	6.68E+11	-149.3300	5184.	0.00
3.0000	0.1969	1228195.	31811.	-0.00145	0.00	6.67E+11	-177.2091	6480.	0.00
3.6000	0.1865	1452640.	30448.	-0.00144	0.00	6.66E+11	-201.4097	7776.	0.00
4.2000	0.1762	1666643.	28924.	-0.00142	0.00	6.66E+11	-222.0057	9072.	0.00
4.8000	0.1660	1869138.	27264.	-0.00140	0.00	6.65E+11	-239.0822	10368.	0.00
5.4000	0.1560	2059239.	25493.	-0.00138	0.00	6.64E+11	-252.7351	11664.	0.00
6.0000	0.1462	2236239.	23636.	-0.00136	0.00	6.64E+11	-263.0701	12960.	0.00
6.6000	0.1365	2399600.	21716.	-0.00133	0.00	6.63E+11	-270.2016	14256.	0.00
7.2000	0.1270	2548955.	19756.	-0.00131	0.00	6.62E+11	-274.2519	15552.	0.00
7.8000	0.1177	2684092.	17778.	-0.00128	0.00	6.62E+11	-275.3501	16848.	0.00
8.4000	0.1086	2804955.	15801.	-0.00125	0.00	6.62E+11	-273.6309	18144.	0.00
9.0000	0.09972	2911633.	13847.	-0.00122	0.00	6.61E+11	-269.2337	19440.	0.00
9.6000	0.09108	3004354.	11934.	-0.00118	0.00	6.61E+11	-262.3018	20736.	0.00
10.2000	0.08267	3083477.	10079.	-0.00115	0.00	6.60E+11	-252.9810	22032.	0.00
10.8000	0.07451	3149485.	8299.	-0.00112	0.00	6.60E+11	-241.4191	23328.	0.00
11.4000	0.06660	3202979.	6610.	-0.00108	0.00	6.60E+11	-227.7649	24624.	0.00
12.0000	0.05894	3244665.	5026.	-0.00105	0.00	6.60E+11	-212.1672	25920.	0.00
12.6000	0.05153	3275352.	3561.	-9.99E-04	0.00	3.95E+11	-194.7745	27216.	0.00
13.2000	0.04455	3295943.	2225.	-9.25E-04	0.00	2.67E+11	-176.4177	28512.	0.00

13.8000	0.03821	3307388.	1020.	-8.24E-04	0.00	2.12E+11	-158.2018	29808.	0.00
14.4000	0.03268	3310631.	-57.8100	-7.07E-04	0.00	1.95E+11	-141.1982	31104.	0.00
15.0000	0.02804	3306555.	-2201.	-5.87E-04	0.00	2.05E+11	-454.1891	116640.	0.00
15.6000	0.02423	3278934.	-5306.	-4.93E-04	0.00	3.27E+11	-408.1620	121306.	0.00
16.2000	0.02094	3230154.	-8094.	-4.39E-04	0.00	6.60E+11	-366.2922	125971.	0.00
16.8000	0.01790	3162385.	-10581.	-4.05E-04	0.00	6.60E+11	-324.7619	130637.	0.00
17.4000	0.01511	3077780.	-12773.	-3.70E-04	0.00	6.60E+11	-283.9627	135302.	0.00
18.0000	0.01256	2978455.	-14674.	-3.37E-04	0.00	6.61E+11	-244.2461	139968.	0.00
18.6000	0.01025	2866468.	-16295.	-3.06E-04	0.00	6.61E+11	-205.9222	144634.	0.00
19.2000	0.00816	2743806.	-17646.	-2.75E-04	0.00	6.62E+11	-169.2600	149299.	0.00
19.8000	0.00629	2612369.	-18739.	-2.46E-04	0.00	6.62E+11	-134.4879	153965.	0.00
20.4000	0.00462	2473961.	-19590.	-2.18E-04	0.00	6.63E+11	-101.7933	158630.	0.00
21.0000	0.00314	2330276.	-20213.	-1.92E-04	0.00	6.63E+11	-71.3245	163296.	0.00
21.6000	0.00185	2182893.	-20625.	-1.68E-04	0.00	6.64E+11	-43.1924	167962.	0.00
22.2000	7.29E-04	2033271.	-20844.	-1.45E-04	0.00	6.64E+11	-17.4714	172627.	0.00
22.8000	-2.35E-04	1882744.	-20886.	-1.24E-04	0.00	6.65E+11	5.7981	177293.	0.00
23.4000	-0.00105	1732517.	-20769.	-1.04E-04	0.00	6.65E+11	26.6075	181958.	0.00
24.0000	-0.00174	1583669.	-20511.	-8.62E-05	0.00	6.66E+11	44.9780	186624.	0.00
24.6000	-0.00229	1437153.	-20130.	-6.99E-05	0.00	6.67E+11	60.9580	191290.	0.00
25.2000	-0.00274	1293798.	-19642.	-5.52E-05	0.00	6.67E+11	74.6205	195955.	0.00
25.8000	-0.00309	1154310.	-19063.	-4.19E-05	0.00	6.68E+11	86.0613	200621.	0.00
26.4000	-0.00335	1019284.	-18410.	-3.02E-05	0.00	6.68E+11	95.3958	205286.	0.00
27.0000	-0.00352	889203.	-17450.	-1.99E-05	0.00	6.69E+11	171.2617	349920.	0.00
27.6000	-0.00363	768001.	-16184.	-1.10E-05	0.00	6.69E+11	180.4897	357696.	0.00
28.2000	-0.00368	656155.	-14861.	-3.36E-06	0.00	6.69E+11	186.9324	365472.	0.00
28.8000	-0.00368	553999.	-13501.	3.15E-06	0.00	6.70E+11	190.8475	373248.	0.00
29.4000	-0.00364	461737.	-12121.	8.60E-06	0.00	6.70E+11	192.4903	381024.	0.00
30.0000	-0.00356	379454.	-10737.	1.31E-05	0.00	6.70E+11	192.1088	388800.	0.00
30.6000	-0.00345	307130.	-9361.	1.68E-05	0.00	6.70E+11	189.9386	396576.	0.00
31.2000	-0.00332	244652.	-8275.	1.98E-05	0.00	6.70E+11	111.7193	242611.	0.00
31.8000	-0.00316	187965.	-7482.	2.21E-05	0.00	6.70E+11	108.6533	247277.	0.00
32.4000	-0.00300	136912.	-6713.	2.38E-05	0.00	6.70E+11			

```
104.8820    251942.       0.00
   33.0000   -0.00282     91295.     -5974.   2.51E-05       0.00   6.70E+11
100.5177    256608.       0.00
   33.6000   -0.00264     50889.     -5268.   2.58E-05       0.00   6.70E+11
95.6679    261274.       0.00
   34.2000   -0.00245     15443.     -4598.   2.62E-05       0.00   6.70E+11
90.4342    265939.       0.00
   34.8000   -0.00226    -15316.     -3966.   2.62E-05       0.00   6.70E+11
84.9121    270605.       0.00
   35.4000   -0.00207    -41672.     -3376.   2.59E-05       0.00   6.70E+11
79.1901    275270.       0.00
   36.0000   -0.00189    -63923.     -2826.   2.53E-05       0.00   6.70E+11
73.3498    279936.       0.00
   36.6000   -0.00171    -82372.     -2319.   2.45E-05       0.00   6.70E+11
67.4655    284602.       0.00
   37.2000   -0.00153    -97323.     -1855.   2.36E-05       0.00   6.70E+11
61.6041    289267.       0.00
   37.8000   -0.00137   -109081.     -1432.   2.25E-05       0.00   6.70E+11
55.8253    293933.       0.00
   38.4000   -0.00121   -117945.     -1050.   2.12E-05       0.00   6.70E+11
50.1812    298598.       0.00
   39.0000   -0.00106   -124208.  -708.8026   1.99E-05       0.00   6.70E+11
44.7173    303264.       0.00
   39.6000  -9.23E-04   -128152.  -405.7212   1.86E-05       0.00   6.70E+11
39.4720    307930.       0.00
   40.2000  -7.94E-04   -130050.  -139.5047   1.72E-05       0.00   6.70E+11
34.4771    312595.       0.00
   40.8000  -6.75E-04   -130161.    91.7430   1.58E-05       0.00   6.70E+11
29.7584    317261.       0.00
   41.4000  -5.67E-04   -128729.   290.0823   1.44E-05       0.00   6.70E+11
25.3359    321926.       0.00
   42.0000  -4.68E-04   -125984.   457.6978   1.30E-05       0.00   6.70E+11
21.2240    326592.       0.00
   42.6000  -3.79E-04   -122138.   596.8610   1.17E-05       0.00   6.70E+11
17.4324    331258.       0.00
   43.2000  -2.99E-04   -117389.   709.8959   1.04E-05       0.00   6.70E+11
13.9662    335923.       0.00
   43.8000  -2.29E-04   -111916.   799.1486   9.19E-06       0.00   6.70E+11
10.8263    340589.       0.00
   44.4000  -1.67E-04   -105881.   866.9591   8.02E-06       0.00   6.70E+11
8.0100    345254.       0.00
   45.0000  -1.13E-04    -99431.   915.6368   6.92E-06       0.00   6.70E+11
5.5116    349920.       0.00
   45.6000  -6.75E-05    -92696.   947.4389   5.88E-06       0.00   6.70E+11
3.3223    354586.       0.00
   46.2000  -2.87E-05    -85788.   964.5515   4.93E-06       0.00   6.70E+11
1.4312    359251.       0.00
   46.8000   3.46E-06    -78806.   969.0744   4.04E-06       0.00   6.70E+11
-0.1749    363917.       0.00
   47.4000   2.95E-05    -71833.   963.0068   3.23E-06       0.00   6.70E+11
-1.5106    368582.       0.00
   48.0000   5.00E-05    -64939.   948.2371   2.50E-06       0.00   6.70E+11
-2.5921    373248.       0.00
   48.6000   6.55E-05    -58179.   926.5339   1.84E-06       0.00   6.70E+11
-3.4366    377914.       0.00
   49.2000   7.64E-05    -51597.   899.5389   1.25E-06       0.00   6.70E+11
-4.0620    382579.       0.00
   49.8000   8.34E-05    -45226.   868.7619   7.27E-07       0.00   6.70E+11
-4.4871    387245.       0.00
   50.4000   8.69E-05    -39087.   835.5772   2.74E-07       0.00   6.70E+11
-4.7309    391910.       0.00
   51.0000   8.74E-05    -33193.   801.2205  -1.14E-07       0.00   6.70E+11
-4.8126    396576.       0.00
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   51.6000   8.53E-05    -27549.   766.7879  -4.40E-07       0.00   6.70E+11
-4.7520    401242.       0.00
   52.2000   8.10E-05    -22151.   733.2343  -7.07E-07       0.00   6.70E+11
-4.5685    405907.       0.00
   52.8000   7.51E-05    -16991.   701.3734  -9.17E-07       0.00   6.70E+11
-4.2818    410573.       0.00
   53.4000   6.78E-05    -12052.   671.8772  -1.07E-06       0.00   6.70E+11
-3.9116    415238.       0.00
   54.0000   5.96E-05     -7316.   645.2757  -1.18E-06       0.00   6.70E+11
-3.4777    419904.       0.00
   54.6000   5.09E-05     -2760.   621.9569  -1.23E-06       0.00   6.70E+11
-2.9998    424570.       0.00
   55.2000   4.19E-05      1641.   478.6278  -1.24E-06       0.00   6.70E+11
-36.8139   6326340.       0.00
   55.8000   3.31E-05      4133.   241.5509  -1.21E-06       0.00   6.70E+11
-29.0408   6326340.       0.00
   56.4000   2.45E-05      5119.    59.4288  -1.16E-06       0.00   6.70E+11
-21.5486   6326340.       0.00
   57.0000   1.64E-05      4988.   -70.0016  -1.10E-06       0.00   6.70E+11
-14.4043   6326340.       0.00
   57.6000   8.65E-06      4111.  -149.2127  -1.05E-06       0.00   6.70E+11
-7.5988   6326340.       0.00
   58.2000   1.22E-06      2840.  -180.4303  -1.02E-06       0.00   6.70E+11
-1.0727   6326340.       0.00
   58.8000  -5.99E-06      1513.  -165.3547  -9.93E-07       0.00   6.70E+11
5.2604   6326340.       0.00
   59.4000  -1.31E-05   458.5235  -105.0505  -9.82E-07       0.00   6.70E+11
11.4908   6326340.       0.00
   60.0000  -2.01E-05      0.00       0.00  -9.80E-07       0.00   6.70E+11
17.6900   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =    -0.00148586 radians
Maximum bending moment           =       3310631. inch-lbs
Maximum shear force              =         35274. lbs
Depth of maximum bending moment  =    14.40000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             59
Number of zero deflection points =              3
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

```
Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     0.500000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs
```

Depth	Deflect.	Bending	Shear	Slope	Total	Bending	Soil

Res. Soil Spr. Es*h	Distrib. Lat. Load						
X	y	Moment	Force	S	Stress	Stiffness	p
feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	lb/inch
0.00	0.5000	0.00	45602.	-0.00346	0.00	6.70E+11	0.00
0.6000	0.4751	328335.	45294.	-0.00346	0.00	6.70E+11	-85.5126
1.2000	0.4502	652236.	44403.	-0.00346	0.00	6.69E+11	-162.0597
1.8000	0.4253	967737.	42993.	-0.00345	0.00	6.68E+11	-229.6684
2.4000	0.4005	1271332.	41128.	-0.00343	0.00	6.67E+11	-288.3837
3.0000	0.3759	1559976.	38872.	-0.00342	0.00	6.66E+11	-338.2676
3.6000	0.3513	1831085.	36288.	-0.00340	0.00	6.65E+11	-379.3977
4.2000	0.3269	2082526.	33440.	-0.00338	0.00	6.64E+11	-411.8666
4.8000	0.3026	2312616.	30388.	-0.00336	0.00	6.63E+11	-435.7798
5.4000	0.2786	2520115.	27195.	-0.00333	0.00	6.63E+11	-451.2545
6.0000	0.2547	2704221.	23920.	-0.00330	0.00	6.62E+11	-458.4180
6.6000	0.2310	2864563.	20623.	-0.00327	0.00	6.61E+11	-457.4057
7.2000	0.2076	3001192.	17362.	-0.00324	0.00	6.61E+11	-448.3594
7.8000	0.1844	3114579.	14195.	-0.00321	0.00	6.60E+11	-431.4261
8.4000	0.1614	3205601.	11178.	-0.00317	0.00	6.60E+11	-406.7556
9.0000	0.1387	3275536.	8365.	-0.00313	0.00	5.55E+11	-374.4995
9.6000	0.1163	3326057.	5811.	-0.00294	0.00	7.02E+10	-334.9507
10.2000	0.09636	3359215.	3544.	-0.00260	0.00	7.00E+10	-294.8545
10.8000	0.07890	3377087.	1562.	-0.00225	0.00	6.99E+10	-255.6414
11.4000	0.06395	3381707.	-145.7054	-0.00190	0.00	6.99E+10	-218.7057
12.0000	0.05150	3374989.	-1601.	-0.00155	0.00	6.99E+10	-185.4118
12.6000	0.04156	3358659.	-2834.	-0.00121	0.00	7.00E+10	-157.0942
13.2000	0.03410	3334186.	-3885.	-8.64E-04	0.00	7.01E+10	-135.0497
13.8000	0.02911	3302711.	-4805.	-5.99E-04	0.00	1.26E+11	-120.5238
14.4000	0.02548	3264989.	-5636.	-4.86E-04	0.00	6.60E+11	-110.0927
15.0000	0.02211	3221559.	-7322.	-4.51E-04	0.00	6.60E+11	-358.2357
15.6000	0.01900	3159559.	-9763.	-4.16E-04	0.00	6.60E+11	-320.0324
16.2000	0.01613	3080968.	-11931.	-3.82E-04	0.00	6.60E+11	-282.1288

16.8000	0.01350	2987751.	-13828.	-3.49E-04	0.00	6.61E+11	-244.8936
17.4000	0.01110	2881840.	-15461.	-3.17E-04	0.00	6.61E+11	-208.6568
18.0000	0.00894	2765111.	-16838.	-2.86E-04	0.00	6.62E+11	-173.7096
18.6000	0.00698	2639377.	-17968.	-2.57E-04	0.00	6.62E+11	-140.3050
19.2000	0.00524	2506370.	-18864.	-2.29E-04	0.00	6.63E+11	-108.6568
19.8000	0.00369	2367730.	-19540.	-2.02E-04	0.00	6.63E+11	-78.9406
20.4000	0.00233	2224998.	-20009.	-1.77E-04	0.00	6.64E+11	-51.2957
21.0000	0.00114	2079607.	-20286.	-1.54E-04	0.00	6.64E+11	-25.8259
21.6000	1.11E-04	1932877.	-20389.	-1.32E-04	0.00	6.65E+11	-2.6005
22.2000	-7.65E-04	1786012.	-20332.	-1.12E-04	0.00	6.65E+11	18.3420
22.8000	-0.00150	1640097.	-20133.	-9.35E-05	0.00	6.66E+11	36.9935
23.4000	-0.00211	1496101.	-19807.	-7.66E-05	0.00	6.66E+11	53.3735
24.0000	-0.00261	1354872.	-19372.	-6.12E-05	0.00	6.67E+11	67.5264
24.6000	-0.00299	1217143.	-18843.	-4.73E-05	0.00	6.67E+11	79.5202
25.2000	-0.00329	1083536.	-18234.	-3.49E-05	0.00	6.68E+11	89.4437
25.8000	-0.00350	954566.	-17562.	-2.39E-05	0.00	6.68E+11	97.4036
26.4000	-0.00363	830646.	-16838.	-1.43E-05	0.00	6.69E+11	103.5233
27.0000	-0.00370	712092.	-15818.	-6.00E-06	0.00	6.69E+11	179.9013
27.6000	-0.00372	602864.	-14506.	1.07E-06	0.00	6.69E+11	184.6759
28.2000	-0.00369	503210.	-13167.	7.02E-06	0.00	6.70E+11	187.1144
28.8000	-0.00362	413256.	-11819.	1.19E-05	0.00	6.70E+11	187.4670
29.4000	-0.00351	333020.	-10474.	1.59E-05	0.00	6.70E+11	185.9771
30.0000	-0.00339	262426.	-9146.	1.91E-05	0.00	6.70E+11	182.8763
30.6000	-0.00324	201311.	-7846.	2.16E-05	0.00	6.70E+11	178.3819
31.2000	-0.00308	149444.	-6831.	2.35E-05	0.00	6.70E+11	103.6161
31.8000	-0.00290	102948.	-6099.	2.49E-05	0.00	6.70E+11	99.5941
32.4000	-0.00272	61616.	-5398.	2.58E-05	0.00	6.70E+11	95.0666
33.0000	-0.00253	25211.	-4732.	2.62E-05	0.00	6.70E+11	90.1320
33.6000	-0.00234	-6521.	-4102.	2.63E-05	0.00	6.70E+11	84.8832
34.2000	-0.00215	-33852.	-3510.	2.61E-05	0.00	6.70E+11	79.4071
34.8000	-0.00196	-57068.	-2959.	2.56E-05	0.00	6.70E+11	73.7839
35.4000	-0.00178	-76458.	-2448.	2.49E-05	0.00	6.70E+11	

```
68.0876    275270.       0.00
   36.0000   -0.00160    -92318.     -1978.   2.40E-05       0.00   6.70E+11
62.3850    279936.       0.00
   36.6000   -0.00144   -104945.     -1549.   2.29E-05       0.00   6.70E+11
56.7360    284602.       0.00
   37.2000   -0.00127   -114630.     -1161.   2.18E-05       0.00   6.70E+11
51.1937    289267.       0.00
   37.8000   -0.00112   -121662.  -811.6957   2.05E-05       0.00   6.70E+11
45.8046    293933.       0.00
   38.4000  -9.79E-04   -126319.  -500.6094   1.92E-05       0.00   6.70E+11
40.6083    298598.       0.00
   39.0000  -8.46E-04   -128871.  -226.1213   1.78E-05       0.00   6.70E+11
35.6384    303264.       0.00
   39.6000  -7.23E-04   -129575.    13.4971   1.64E-05       0.00   6.70E+11
30.9223    307930.       0.00
   40.2000  -6.10E-04   -128676.   220.1514   1.50E-05       0.00   6.70E+11
26.4817    312595.       0.00
   40.8000  -5.07E-04   -126405.   395.8843   1.36E-05       0.00   6.70E+11
22.3330    317261.       0.00
   41.4000  -4.13E-04   -122975.   542.8392   1.23E-05       0.00   6.70E+11
18.4878    321926.       0.00
   42.0000  -3.30E-04   -118588.   663.2259   1.10E-05       0.00   6.70E+11
14.9530    326592.       0.00
   42.6000  -2.55E-04   -113425.   759.2896   9.76E-06       0.00   6.70E+11
11.7314    331258.       0.00
   43.2000  -1.89E-04   -107654.   833.2831   8.57E-06       0.00   6.70E+11
8.8223    335923.       0.00
   43.8000  -1.32E-04   -101426.   887.4415   7.45E-06       0.00   6.70E+11
6.2217    340589.       0.00
   44.4000  -8.18E-05    -94875.   923.9607   6.40E-06       0.00   6.70E+11
3.9225    345254.       0.00
   45.0000  -3.94E-05    -88121.   944.9778   5.41E-06       0.00   6.70E+11
1.9155    349920.       0.00
   45.6000  -3.84E-06    -81267.   952.5548   4.50E-06       0.00   6.70E+11
0.1892    354586.       0.00
   46.2000   2.54E-05    -74404.   948.6651   3.67E-06       0.00   6.70E+11
-1.2697    359251.       0.00
   46.8000   4.90E-05    -67606.   935.1820   2.91E-06       0.00   6.70E+11
-2.4757    363917.       0.00
   47.4000   6.73E-05    -60937.   913.8694   2.22E-06       0.00   6.70E+11
-3.4445    368582.       0.00
   48.0000   8.09E-05    -54447.   886.3752   1.60E-06       0.00   6.70E+11
-4.1928    373248.       0.00
   48.6000   9.03E-05    -48173.   854.2257   1.04E-06       0.00   6.70E+11
-4.7377    377914.       0.00
   49.2000   9.59E-05    -42146.   818.8218   5.59E-07       0.00   6.70E+11
-5.0968    382579.       0.00
   49.8000   9.83E-05    -36382.   781.4371   1.38E-07       0.00   6.70E+11
-5.2879    387245.       0.00
   50.4000   9.79E-05    -30893.   743.2164  -2.24E-07       0.00   6.70E+11
-5.3290    391910.       0.00
   51.0000   9.51E-05    -25680.   705.1755  -5.27E-07       0.00   6.70E+11
-5.2379    396576.       0.00
   51.6000   9.03E-05    -20739.   668.2016  -7.77E-07       0.00   6.70E+11
-5.0326    401242.       0.00
   52.2000   8.39E-05    -16058.   633.0541  -9.74E-07       0.00   6.70E+11
-4.7306    405907.       0.00
   52.8000   7.63E-05    -11623.   600.3655  -1.12E-06       0.00   6.70E+11
-4.3495    410573.       0.00
   53.4000   6.77E-05     -7413.   570.6428  -1.23E-06       0.00   6.70E+11
-3.9067    415238.       0.00
   54.0000   5.86E-05     -3405.   544.2685  -1.28E-06       0.00   6.70E+11
-3.4194    419904.       0.00
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   54.6000   4.93E-05   424.7092   521.5012  -1.30E-06       0.00   6.70E+11
-2.9048    424570.       0.00
   55.2000   3.99E-05      4104.   384.7633  -1.28E-06       0.00   6.70E+11
-35.0779   6326340.       0.00
   55.8000   3.09E-05      5965.   160.7382  -1.22E-06       0.00   6.70E+11
-27.1512   6326340.       0.00
   56.4000   2.23E-05      6419.    -7.6739  -1.15E-06       0.00   6.70E+11
-19.6299   6326340.       0.00
   57.0000   1.43E-05      5855.  -123.5025  -1.09E-06       0.00   6.70E+11
-12.5447   6326340.       0.00
   57.6000   6.67E-06      4640.  -189.7498  -1.03E-06       0.00   6.70E+11
-5.8573   6326340.       0.00
   58.2000  -5.86E-07      3122.  -208.9833  -9.90E-07       0.00   6.70E+11
0.5147   6326340.       0.00
   58.8000  -7.60E-06      1631.  -183.1018  -9.65E-07       0.00   6.70E+11
6.6746   6326340.       0.00
   59.4000  -1.45E-05   485.7330  -113.2681  -9.54E-07       0.00   6.70E+11
12.7237   6326340.       0.00
   60.0000  -2.13E-05       0.00       0.00  -9.51E-07       0.00   6.70E+11
18.7397   3163170.       0.00
```

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

```
Output Summary for Load Case No. 5:

Pile-head deflection             =     0.50000000 inches
Computed slope at pile head      =    -0.00346248 radians
Maximum bending moment           =       3381707. inch-lbs
Maximum shear force              =         45602. lbs
Depth of maximum bending moment  =    11.40000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =            180
Number of zero deflection points =              3


--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                                =     1.000000 inches
Moment at pile head                                      =          0.0 in-lbs
Axial load at pile head                                  =          0.0 lbs

   Depth    Deflect.    Bending     Shear      Slope      Total     Bending   Soil
Res.  Soil Spr.  Distrib.
     X          y       Moment      Force        S       Stress    Stiffness      p
      Es*h     Lat. Load
   feet      inches     in-lbs       lbs      radians     psi*      in-lb^2
lb/inch    lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     1.0000       0.00     66193.   -0.00793       0.00   6.70E+11
0.00       0.00       0.00
    0.6000     0.9429    476592.     65774.   -0.00793       0.00   6.70E+11
```

-116.4088	888.8830	0.00					
1.2000	0.8859	947149.	64489.	-0.00792	0.00	6.68E+11	
-240.4751	1954.	0.00					
1.8000	0.8289	1405240.	62301.	-0.00791	0.00	6.67E+11	
-367.3543	3191.	0.00					
2.4000	0.7720	1844287.	59201.	-0.00789	0.00	6.65E+11	
-493.7541	4605.	0.00					
3.0000	0.7153	2257738.	55209.	-0.00787	0.00	6.64E+11	
-615.2620	6193.	0.00					
3.6000	0.6588	2639294.	50433.	-0.00784	0.00	6.62E+11	
-711.4778	7776.	0.00					
4.2000	0.6024	2983966.	45139.	-0.00781	0.00	6.61E+11	
-759.0742	9072.	0.00					
4.8000	0.5463	3289289.	39574.	-0.00774	0.00	2.13E+11	
-786.7266	10368.	0.00					
5.4000	0.4910	3553827.	33878.	-0.00750	0.00	6.99E+10	
-795.4795	11664.	0.00					
6.0000	0.4384	3777128.	28173.	-0.00712	0.00	6.98E+10	
-789.0689	12960.	0.00					
6.6000	0.3885	3959524.	22563.	-0.00672	0.00	6.98E+10	
-769.2507	14256.	0.00					
7.2000	0.3416	4102041.	17138.	-0.00630	0.00	6.97E+10	
-737.8357	15552.	0.00					
7.8000	0.2977	4206309.	11974.	-0.00588	0.00	6.97E+10	
-696.6638	16848.	0.00					
8.4000	0.2570	4274462.	7134.	-0.00544	0.00	6.97E+10	
-647.5796	18144.	0.00					
9.0000	0.2194	4309045.	2670.	-0.00499	0.00	6.97E+10	
-592.4109	19440.	0.00					
9.6000	0.1851	4312917.	-1381.	-0.00455	0.00	6.97E+10	
-532.9496	20736.	0.00					
10.2000	0.1539	4289161.	-4995.	-0.00411	0.00	6.97E+10	
-470.9355	22032.	0.00					
10.8000	0.1259	4240991.	-8159.	-0.00366	0.00	6.97E+10	
-408.0428	23328.	0.00					
11.4000	0.1011	4171669.	-10873.	-0.00323	0.00	6.97E+10	
-345.8695	24624.	0.00					
12.0000	0.07943	4084417.	-13148.	-0.00280	0.00	6.98E+10	
-285.9303	25920.	0.00					
12.6000	0.06075	3982342.	-15004.	-0.00239	0.00	6.98E+10	
-229.6509	27216.	0.00					
13.2000	0.04504	3868362.	-16473.	-0.00198	0.00	6.98E+10	
-178.3658	28512.	0.00					
13.8000	0.03220	3745136.	-17595.	-0.00159	0.00	6.98E+10	
-133.3170	29808.	0.00					
14.4000	0.02214	3614998.	-18419.	-0.00121	0.00	6.99E+10	
-95.6551	31104.	0.00					
15.0000	0.01476	3479902.	-19624.	-8.45E-04	0.00	6.99E+10	
-239.1869	116640.	0.00					
15.6000	0.00997	3332406.	-21090.	-4.95E-04	0.00	7.01E+10	
-167.9311	121306.	0.00					
16.2000	0.00763	3176204.	-22175.	-3.07E-04	0.00	6.60E+11	
-133.5455	125971.	0.00					
16.8000	0.00555	3013080.	-23019.	-2.73E-04	0.00	6.61E+11	
-100.6602	130637.	0.00					
17.4000	0.00370	2844737.	-23631.	-2.41E-04	0.00	6.61E+11	
-69.5151	135302.	0.00					
18.0000	0.00207	2672791.	-24027.	-2.11E-04	0.00	6.62E+11	
-40.3088	139968.	0.00					
18.6000	6.57E-04	2498755.	-24219.	-1.83E-04	0.00	6.63E+11	
-13.2001	144634.	0.00					
19.2000	-5.64E-04	2324035.	-24225.	-1.57E-04	0.00	6.63E+11	
11.6909	149299.	0.00					

19.8000	-0.00160	2149921.	-24059.	-1.33E-04	0.00	6.64E+11	
34.2800	153965.	0.00					
20.4000	-0.00247	1977584.	-23739.	-1.10E-04	0.00	6.65E+11	
54.5177	158630.	0.00					
21.0000	-0.00319	1808073.	-23283.	-8.98E-05	0.00	6.65E+11	
72.3860	163296.	0.00					
21.6000	-0.00377	1642315.	-22706.	-7.12E-05	0.00	6.66E+11	
87.8965	167962.	0.00					
22.2000	-0.00422	1481113.	-22025.	-5.43E-05	0.00	6.66E+11	
101.0882	172627.	0.00					
22.8000	-0.00455	1325152.	-21258.	-3.91E-05	0.00	6.67E+11	
112.0236	177293.	0.00					
23.4000	-0.00478	1174998.	-20420.	-2.56E-05	0.00	6.68E+11	
120.7878	181958.	0.00					
24.0000	-0.00492	1031105.	-19526.	-1.37E-05	0.00	6.68E+11	
127.4850	186624.	0.00					
24.6000	-0.00498	893822.	-18591.	-3.36E-06	0.00	6.69E+11	
132.2362	191290.	0.00					
25.2000	-0.00497	763393.	-17628.	5.56E-06	0.00	6.69E+11	
135.1773	195955.	0.00					
25.8000	-0.00490	639972.	-16651.	1.31E-05	0.00	6.69E+11	
136.4565	200621.	0.00					
26.4000	-0.00478	523626.	-15669.	1.94E-05	0.00	6.70E+11	
136.2321	205286.	0.00					
27.0000	-0.00462	414341.	-14370.	2.44E-05	0.00	6.70E+11	
224.4525	349920.	0.00					
27.6000	-0.00443	316692.	-12771.	2.83E-05	0.00	6.70E+11	
219.9146	357696.	0.00					
28.2000	-0.00421	230443.	-11210.	3.13E-05	0.00	6.70E+11	
213.7194	365472.	0.00					
28.8000	-0.00398	155274.	-9698.	3.33E-05	0.00	6.70E+11	
206.1333	373248.	0.00					
29.4000	-0.00373	90790.	-8245.	3.47E-05	0.00	6.70E+11	
197.4063	381024.	0.00					
30.0000	-0.00348	36540.	-6859.	3.53E-05	0.00	6.70E+11	
187.7685	388800.	0.00					
30.6000	-0.00322	-7976.	-5544.	3.55E-05	0.00	6.70E+11	
177.4285	396576.	0.00					
31.2000	-0.00297	-43294.	-4546.	3.52E-05	0.00	6.70E+11	
99.9422	242611.	0.00					
31.8000	-0.00271	-73431.	-3850.	3.46E-05	0.00	6.70E+11	
93.2115	247277.	0.00					
32.4000	-0.00247	-98737.	-3204.	3.37E-05	0.00	6.70E+11	
86.3529	251942.	0.00					
33.0000	-0.00223	-119565.	-2607.	3.25E-05	0.00	6.70E+11	
79.4473	256608.	0.00					
33.6000	-0.00200	-136275.	-2060.	3.11E-05	0.00	6.70E+11	
72.5680	261274.	0.00					
34.2000	-0.00178	-149223.	-1562.	2.96E-05	0.00	6.70E+11	
65.7806	265939.	0.00					
34.8000	-0.00157	-158761.	-1112.	2.79E-05	0.00	6.70E+11	
59.1434	270605.	0.00					
35.4000	-0.00138	-165233.	-709.1480	2.62E-05	0.00	6.70E+11	
52.7069	275270.	0.00					
36.0000	-0.00120	-168973.	-351.9513	2.44E-05	0.00	6.70E+11	
46.5144	279936.	0.00					
36.6000	-0.00103	-170301.	-38.3312	2.26E-05	0.00	6.70E+11	
40.6023	284602.	0.00					
37.2000	-8.71E-04	-169525.	233.8370	2.08E-05	0.00	6.70E+11	
35.0000	289267.	0.00					
37.8000	-7.28E-04	-166934.	466.8677	1.90E-05	0.00	6.70E+11	
29.7307	293933.	0.00					
38.4000	-5.98E-04	-162802.	663.2203	1.72E-05	0.00	6.70E+11	

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24.8117    298598.       0.00
   39.0000  -4.81E-04   -157384.   825.4581   1.55E-05       0.00   6.70E+11
20.2544    303264.       0.00
   39.6000  -3.76E-04   -150915.   956.2098   1.38E-05       0.00   6.70E+11
16.0655    307930.       0.00
   40.2000  -2.82E-04   -143614.      1058.   1.22E-05       0.00   6.70E+11
12.2470    312595.       0.00
   40.8000  -2.00E-04   -135678.      1134.   1.07E-05       0.00   6.70E+11
8.7965    317261.       0.00
   41.4000  -1.28E-04   -127286.      1186.   9.31E-06       0.00   6.70E+11
5.7084    321926.       0.00
   42.0000  -6.56E-05   -118598.      1217.   7.99E-06       0.00   6.70E+11
2.9735    326592.       0.00
   42.6000  -1.26E-05   -109756.      1230.   6.76E-06       0.00   6.70E+11
0.5800    331258.       0.00
   43.2000   3.19E-05   -100884.      1227.   5.63E-06       0.00   6.70E+11
-1.4861    335923.       0.00
   43.8000   6.85E-05    -92089.      1210.   4.60E-06       0.00   6.70E+11
-3.2407    340589.       0.00
   44.4000   9.80E-05    -83462.      1181.   3.65E-06       0.00   6.70E+11
-4.7013    345254.       0.00
   45.0000   1.21E-04    -75078.      1143.   2.80E-06       0.00   6.70E+11
-5.8866    349920.       0.00
   45.6000   1.38E-04    -67000.      1097.   2.04E-06       0.00   6.70E+11
-6.8158    354586.       0.00
   46.2000   1.50E-04    -59275.      1046.   1.36E-06       0.00   6.70E+11
-7.5088    359251.       0.00
   46.8000   1.58E-04    -51940.   990.0925   7.64E-07       0.00   6.70E+11
-7.9859    363917.       0.00
   47.4000   1.61E-04    -45018.   931.5819   2.43E-07       0.00   6.70E+11
-8.2670    368582.       0.00
   48.0000   1.62E-04    -38525.   871.6804  -2.05E-07       0.00   6.70E+11
-8.3723    373248.       0.00
   48.6000   1.59E-04    -32466.   811.5843  -5.87E-07       0.00   6.70E+11
-8.3211    377914.       0.00
   49.2000   1.53E-04    -26838.   752.3506  -9.05E-07       0.00   6.70E+11
-8.1327    382579.       0.00
   49.8000   1.45E-04    -21632.   694.9009  -1.17E-06       0.00   6.70E+11
-7.8256    387245.       0.00
   50.4000   1.36E-04    -16831.   640.0255  -1.37E-06       0.00   6.70E+11
-7.4176    391910.       0.00
   51.0000   1.26E-04    -12416.   588.3887  -1.53E-06       0.00   6.70E+11
-6.9260    396576.       0.00
   51.6000   1.14E-04     -8359.   540.5335  -1.64E-06       0.00   6.70E+11
-6.3672    401242.       0.00
   52.2000   1.02E-04     -4632.   496.8863  -1.71E-06       0.00   6.70E+11
-5.7571    405907.       0.00
   52.8000   8.96E-05     -1204.   457.7620  -1.74E-06       0.00   6.70E+11
-5.1108    410573.       0.00
   53.4000   7.70E-05      1960.   423.3686  -1.74E-06       0.00   6.70E+11
-4.4430    415238.       0.00
   54.0000   6.46E-05      4893.   393.8104  -1.70E-06       0.00   6.70E+11
-3.7677    419904.       0.00
   54.6000   5.25E-05      7631.   369.0921  -1.63E-06       0.00   6.70E+11
-3.0985    424570.       0.00
   55.2000   4.11E-05     10208.   227.9959  -1.54E-06       0.00   6.70E+11
-36.0948   6326340.       0.00
   55.8000   3.04E-05     10914.     1.8873  -1.42E-06       0.00   6.70E+11
-26.7131   6326340.       0.00
   56.4000   2.06E-05     10235.  -159.3426  -1.31E-06       0.00   6.70E+11
-18.0730   6326340.       0.00
   57.0000   1.15E-05      8619.  -260.8673  -1.21E-06       0.00   6.70E+11
-10.1283   6326340.       0.00
```



```
   57.6000   3.15E-06      6479.  -307.2990  -1.13E-06       0.00   6.70E+11
-2.7694   6326340.       0.00
   58.2000  -4.72E-06      4194.  -302.3308  -1.07E-06       0.00   6.70E+11
4.1494   6326340.       0.00
   58.8000  -1.23E-05      2125.  -248.5737  -1.04E-06       0.00   6.70E+11
10.7831   6326340.       0.00
   59.4000  -1.97E-05   614.8246  -147.5733  -1.02E-06       0.00   6.70E+11
17.2725   6326340.       0.00
   60.0000  -2.70E-05       0.00       0.00  -1.02E-06       0.00   6.70E+11
23.7201   3163170.       0.00

* This analysis computed pile response using nonlinear moment-curvature rela-
  tionships. Values of total stress due to combined axial and bending stresses
  are computed only for elastic sections only and do not equal the actual
  stresses in concrete and steel. Stresses in concrete and steel may be inter-
  polated from the output for nonlinear bending properties relative to the
  magnitude of bending moment developed in the pile.


Output Summary for Load Case No. 6:

Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =    -0.00792811 radians
Maximum bending moment           =       4312917. inch-lbs
Maximum shear force              =         66193. lbs
Depth of maximum bending moment  =     9.60000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             71
Number of zero deflection points =              3


--------------------------------------------------------------------------------
            Summary of Pile-head Responses for Conventional Analyses
--------------------------------------------------------------------------------

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians


Load Load                Load                  Axial    Pile-head  Pile-head  Max
Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in
Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs
     in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ----------
---------- ----------
  1  y, in     0.2500   S, rad         0.00       0.00     0.2500       0.00
64249.  -4665856.
  2  y, in     0.5000   S, rad         0.00       0.00     0.5000       0.00
92261.  -6135552.
  3  y, in     1.0000   S, rad         0.00       0.00     1.0000       0.00
123072.  -6768902.
  4  y, in     0.2500  M, in-lb        0.00       0.00     0.2500   -0.00149
35274.   3310631.
  5  y, in     0.5000  M, in-lb        0.00       0.00     0.5000   -0.00346
45602.   3381707.
  6  y, in     1.0000  M, in-lb        0.00       0.00     1.0000   -0.00793
```

66193. 4312917.

Maximum pile-head deflection = 1.0000000000 inches
Maximum pile-head rotation = -0.0079281056 radians = -0.454247 deg.

The analysis ended normally.

APPENDIX E

GENERAL EARTHWORK AND

GRADING GUIDELINE SPECIFICATIONS

APPENDIX E

LEIGHTON CONSULTING, INC.
EARTHWORK AND GRADING GUIDE SPECIFICATIONS

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Leighton

E-1.0 GENERAL

E-1.1 Intent

These Earthwork and Grading Guide Specifications are for grading and earthwork shown on the current, approved grading plan(s) and/or indicated in the Leighton Consulting, Inc. geotechnical report(s). These Guide Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the project-specific recommendations in the geotechnical report shall supersede these Guide Specifications. Leighton Consulting, Inc. shall provide geotechnical observation and testing during earthwork and grading. Based on these observations and tests, Leighton Consulting, Inc. may provide new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

E-1.2 Role of Leighton Consulting, Inc.

Prior to commencement of earthwork and grading, Leighton Consulting, Inc. shall meet with the earthwork contractor to review the earthwork contractor's work plan, to schedule sufficient personnel to perform the appropriate level of observation, mapping and compaction testing. During earthwork and grading, Leighton Consulting, Inc. shall observe, map, and document subsurface exposures to verify geotechnical design assumptions. If observed conditions are found to be significantly different than the interpreted assumptions during the design phase, Leighton Consulting, Inc. shall inform the owner, recommend appropriate changes in design to accommodate these observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include (1) natural ground after clearing to receiving fill but before fill is placed, (2) bottoms of all "remedial removal" areas, (3) all key bottoms, and (4) benches made on sloping ground to receive fill.

Leighton Consulting, Inc. shall observe moisture-conditioning and processing of the subgrade and fill materials, and perform relative compaction testing of fill to determine the attained relative compaction. Leighton Consulting, Inc. shall provide *Daily Field Reports* to the owner and the Contractor on a routine and frequent basis.

E-1.3 The Earthwork Contractor

The earthwork contractor (Contractor) shall be qualified, experienced and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Guide

Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing grading and backfilling in accordance with the current, approved plans and specifications.

The Contractor shall inform the owner and Leighton Consulting, Inc. of changes in work schedules at least one working day in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that Leighton Consulting, Inc. is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish earthwork and grading in accordance with the applicable grading codes and agency ordinances, these Guide Specifications, and recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of Leighton Consulting, Inc., unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Leighton Consulting, Inc. shall reject the work and may recommend to the owner that earthwork and grading be stopped until unsatisfactory condition(s) are rectified.

E-2.0 PREPARATION OF AREAS TO BE FILLED

E-2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies and Leighton Consulting, Inc.. Care should be taken not to encroach upon or otherwise damage native and/or historic trees designated by the Owner or appropriate agencies to remain. Pavements, flatwork or other construction should not extend under the “drip line” of designated trees to remain.

Leighton Consulting, Inc. shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 3 percent of organic materials (by dry weight: ASTM D 2974). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that

are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

E-2.2 Processing

Existing ground that has been declared satisfactory for support of fill, by Leighton Consulting, Inc., shall be scarified to a minimum depth of 6 inches (15 cm). Existing ground that is not satisfactory shall be over-excavated as specified in the following Section E-2.3. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

E-2.3 Overexcavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by Leighton Consulting, Inc. during grading. All undocumented fill soils under proposed structure footprints should be excavated

E-2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), (>20 percent grade) the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet (4.5 m) wide and at least 2 feet (0.6 m) deep, into competent material as evaluated by Leighton Consulting, Inc.. Other benches shall be excavated a minimum height of 4 feet (1.2 m) into competent material or as otherwise recommended by Leighton Consulting, Inc.. Fill placed on ground sloping flatter than 5:1 (horizontal to vertical units), (<20 percent grade) shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

E-2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by Leighton Consulting, Inc. as suitable to receive fill. The Contractor shall obtain a written acceptance (*Daily Field Report*) from Leighton Consulting, Inc. prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys and benches.

E-3.0 FILL MATERIAL

E-3.1 Fill Quality

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by Leighton Consulting, Inc. prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to Leighton Consulting, Inc. or mixed with other soils to achieve satisfactory fill material.

E-3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 6 inches (15 cm), shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by Leighton Consulting, Inc.. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet (3 m) measured vertically from finish grade, or within 2 feet (0.61 m) of future utilities or underground construction.

E-3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section E-3.1, and be free of hazardous materials ("contaminants") and rock larger than 3-inches (8 cm) in largest dimension. All import soils shall have an Expansion Index (EI) of 20 or less and a sulfate content no greater than (≤) 500 parts-per-million (ppm). A representative sample of a potential import source shall be given to Leighton Consulting, Inc. at least four full working days before importing begins, so that suitability of this import material can be determined and appropriate tests performed.

E-4.0 FILL PLACEMENT AND COMPACTION

E-4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill, as described in Section E-2.0, above, in near-horizontal layers not exceeding 8 inches (20 cm) in loose thickness. Leighton Consulting, Inc. may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers, and only if the building officials with the appropriate jurisdiction approve. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

E-4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM) Test Method D 1557.

E-4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, each layer shall be uniformly compacted to not-less-than (≥) 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. In some cases, structural fill may be specified (see project-specific geotechnical report) to be uniformly compacted to at-least (≥) 95 percent of the ASTM D 1557 modified Proctor laboratory maximum dry density. For fills thicker than (>) 15 feet (4.5 m), the portion of fill deeper than 15 feet below proposed finish grade shall be compacted to 95 percent of the ASTM D 1557 laboratory maximum density. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

E-4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by back rolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet (1 to 1.2 m) in fill elevation, or by other methods producing satisfactory results acceptable to Leighton Consulting, Inc.. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of the ASTM D 1557 laboratory maximum density.

E-4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by Leighton Consulting, Inc.. Location and frequency of tests shall be at our field representative(s) discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

E-4.6 Compaction Test Locations

Leighton Consulting, Inc. shall document the approximate elevation and horizontal coordinates of each density test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that Leighton

Consulting, Inc. can determine the test locations with sufficient accuracy. Adequate grade stakes shall be provided.

E-5.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by Leighton Consulting, Inc. during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by Leighton Consulting, Inc. based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, then observed and reviewed by Leighton Consulting, Inc. prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by Leighton Consulting, Inc..

E-6.0 TRENCH BACKFILLS

E-6.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations. Work should be performed in accordance with Article 6 of the *California Construction Safety Orders*, 2009 Edition or more current (see also: http://www.dir.ca.gov/title8/sb4a6.html).

E-6.2 Bedding and Backfill

All utility trench bedding and backfill shall be performed in accordance with applicable provisions of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Bedding material shall have a Sand Equivalent greater than 30 (SE>30). Bedding shall be placed to 1-foot (0.3 m) over the top of the conduit, and densified by jetting in areas of granular soils, if allowed by the permitting agency. Otherwise, the pipe-bedding zone should be backfilled with Controlled Low Strength Material (CLSM) consisting of at least one sack of Portland cement per cubic-yard of sand, and conforming to Section 201-6 of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Backfill over the bedding zone shall be placed and densified mechanically to a minimum of 90 percent of relative compaction (ASTM D 1557) from 1 foot (0.3 m) above the top of the conduit to the surface. Backfill above the pipe zone shall **not** be jetted. Jetting of the bedding around the conduits shall be observed by Leighton Consulting, Inc. and backfill above the pipe zone (bedding) shall be observed and tested by Leighton Consulting, Inc..

E-6.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to Leighton Consulting, Inc. that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method, and only if the building officials with the appropriate jurisdiction approve.

Appendix C

Geotechnical Investigation

Resource List

CSU Fullerton Parking

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-30-157295		Resource Name - Mahr House; Other - zip 92834	Building	Historic	HP02 (Single family property); HP15 (Educational building)	1979 (J. Woodard, Fullerton Historical Building Survey); 1983 (Glenn M. Lemon, CSUF)	OR-04060, OR-04145, OR-04227
P-30-157296		Resource Name - Hetebrink (Henry T) House; Other - zip 92834	Building	Historic	HP02 (Single family property); HP15 (Educational building)	1983 (G. Lemon, CSUF)	OR-04060, OR-04145, OR-04227
P-30-157297		OHP Property Number - 036660; Resource Name - Dr George Clark Home - Heritage House; Other - zip 92834; Other - PHI-ORA-004	Building	Historic	HP02 (Single family property)	1976 (Jorice Moag and JoAnn Woodard, Arboretum Society); 1976 (Clement W. Meighan, Historical Resources Commission); 1983 (G. Lemon, Office of Facility Planning, California State University)	OR-03822, OR-04060
P-30-177093		OHP Property Number - 143584; Resource Name - Lewis Lemke House; Other - zip 92870	Building	Historic	HP02 (Single family property)	2002 (Marie Antram, City of Placentia)	OR-04104
P-30-177117		Resource Name - Hope International University; Other - Pacific Christian College; Other - zip 92831	Building	Historic	HP03 (Multiple family property); HP06 (1-3 story commercial building); HP15 (Educational building)	2011 (Jeanette A. McKenna, McKenna et al)	OR-04145, OR-04227
P-30-177118		Resource Name - LDS Student Center; Other - zip 92831	Building	Historic	HP06 (1-3 story commercial building)	2011 (Jeanette A. McKenna, McKenna et al)	OR-04145, OR-04227
P-30-177119		Resource Name - Commercial Shopping Center; Other - zip 92831	Building	Historic	HP06 (1-3 story commercial building)	2011 (Jeanette A. McKenna, McKenna et al)	OR-04145, OR-04227
P-30-177446		Resource Name - Pollak Library at California State University, Fullerton; Other - CSUF Pollak Library	Building	Historic	HP15 (Educational building)	2012 (Kim Apel, CSUF)	OR-04284

Report List

CSU Fullerton Parking

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
OR-00678		1976	Tadlock, Lewis W.	Archaeological Element of an Environment Impact Report for a Portion of California State University Fullerton Campus.	Public Antiquities Salvage Team, CSUF	
OR-02256		1999	Demcak, Carol R.	Cultural Resources Assessments for Orange County Sanitation Districts	Archaeological Resource Management Corp.	30-000083, 30-000084, 30-000085, 30-000086, 30-000087, 30-000144, 30-000277, 30-000288, 30-000289, 30-000300, 30-000352, 30-000353, 30-000381, 30-001352
OR-02280		2000	Duke, Curt	Cultural Resource Assessment for At&t Fixed Wireless Services Facility Number Oc_420_a, County of Orange, Ca	LSA Associates, Inc.	
OR-02538		2002	Duke, Curt	Cultural Resource Assessment Cingular Wireless Facility No. Sm 195-01	LSA Associates, Inc.	
OR-02795		2002	Harper, Caprice D.	Cultural Resource Assessment Cingular Wireless Facility No. Sc 046-02 Orange County, California	LSA Associates, Inc.	
OR-02799		2002	Duke, Curt	Cultural Resource Assessment Cingular Wireless Facility No. Sc 046-01 Orange County, California	LSA Associates, Inc.	
OR-03393		2006	Wlodarski, Robert J.	Record Search and Field Survey for the Proposed Bechtel Corporation Wireless Telecommunications Site Lsancac420 (57 Freeway/yorba Linda) Located at 1535 Deerpark Drive, Fullerton, Orange County, California 92831	Cellular, Archaeological Resource, Evaluations	
OR-03733		1999	Duke, Curt	Cultural Resources Assessment for Pacific Bell Mobile Services Facility CM-423-01, County of Orange, California	LSA	
OR-03822		2006	Harper, Caprice	Historic Property Survey Report and Archaeological Survey Report for the State Route 57 Northbound Widening Project 0.3 km (02 mi) South of Orangethorpe Avenue to 0.2 km (0.1 mi) North of Lambert Road in the Cities of Placentia, Fullerton, and Brea, Orange County, CA.	Bonterra Counsulting	30-001010, 30-100012, 30-100013, 30-150063, 30-157297, 30-176590, 30-176663, 30-176705, 30-176706, 30-176707, 30-176749

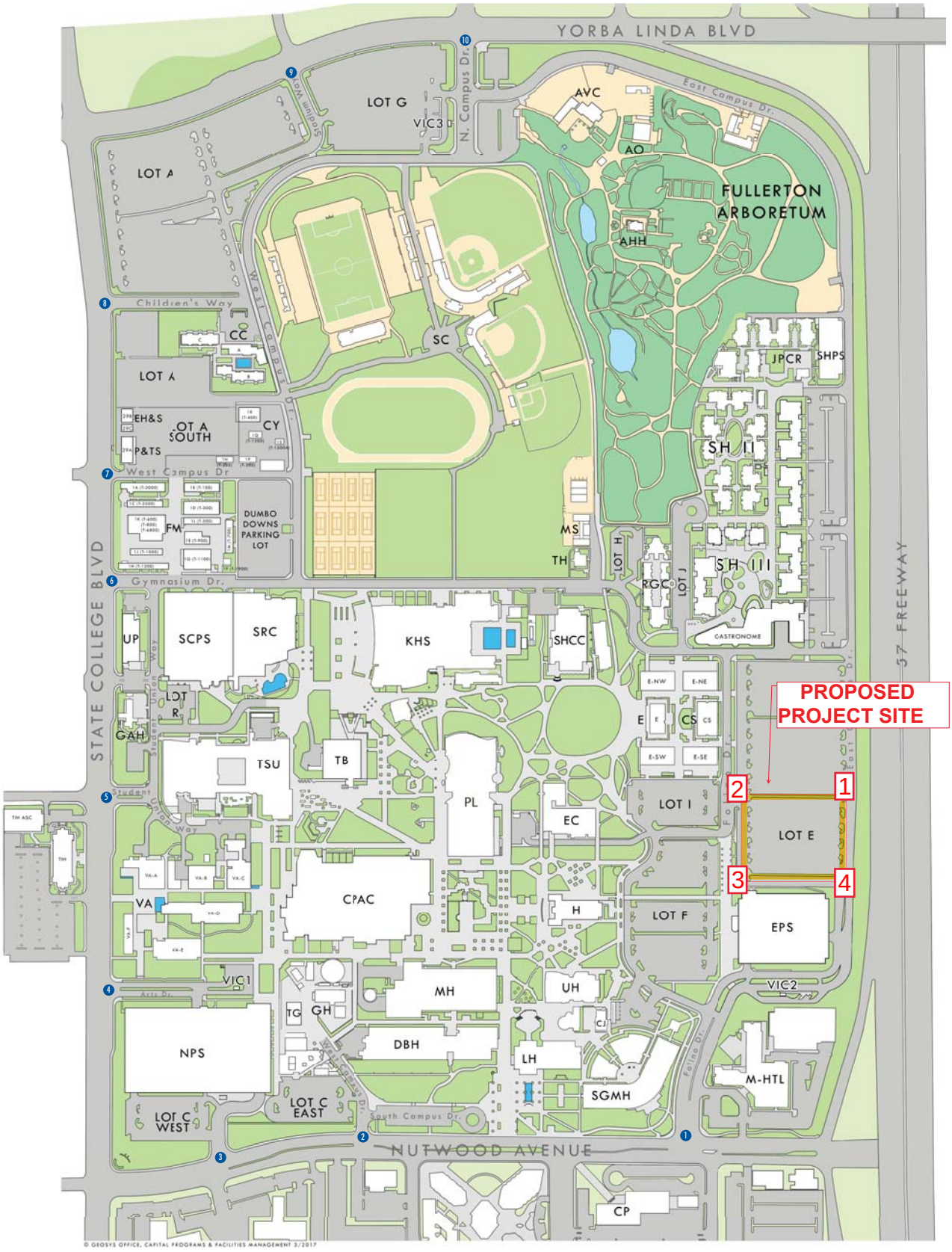
Report List

CSU Fullerton Parking

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
OR-04104		2002	Antram, Marie, Orr, Shannon, Vasquez, Liliana, L. de Graf, and Jertberg, Pat	Historic Resource Inventory for the City of Placentia: Update 2002	City of Placentia and Placentia Historical Committee	30-157208, 30-160084, 30-160085, 30-162291, 30-162555, 30-176705, 30-176707, 30-176749, 30-177066, 30-177080, 30-177081, 30-177082, 30-177083, 30-177084, 30-177085, 30-177086, 30-177087, 30-177088, 30-177089, 30-177090, 30-177091, 30-177092, 30-177093, 30-177094, 30-177095, 30-177096, 30-177097, 30-177098, 30-177099, 30-177100, 30-177101, 30-177102, 30-177103, 30-177104, 30-177105, 30-177106, 30-177107, 30-177108, 30-177109, 30-177110, 30-177111, 30-177112
OR-04145		2011	McKenna, Jeanette A.	A Cultural Resources Investigation for the College Town @ Cal State Fullerton Specific Plan Project Area in the City of Fullerton, Orange County, California	McKenna et al.	30-157295, 30-157296, 30-177117, 30-177118, 30-177119
OR-04284		2012	Mendoza, Theresa	Center for Oral and Public History (COPH), relocation and expansion of the COPH	Center for Oral and Public History (COPH)	30-177446

Appendix D

Sound Level Measurement Data



AHH (1) ARBORETUM HERITAGE HOUSE
AO (2) ARBORETUM OFFICE
AVC (3) ARBORETUM VISITOR CENTER
BG BIOLOGY GREENHOUSE
CJ (4) CARL'S JR.
HAZW CHEMICAL STORAGE
CC (5) CHILDREN'S CENTER
CP (6) COLLEGE PARK
CPW COLLEGE PARK WEST
CPAC (7) CLAYES PERFORMING ARTS CENTER
CS (8) COMPUTER SCIENCE
CT COOLING TOWERS
CY (9) CORPORATION YARD
DBH (10) DAN BLACK HALL
EPS (11) EASTSIDE PARKING STRUCTURE
EC (12) EDUCATION CLASSROOM BUILDING
ES ELECTRICAL SUBSTATION
ENG (13) ENGINEERING
EHS (14) ENVIRONMENTAL HEALTH & SAFETY
FM FACILITIES MANAGEMENT
GAH (15) GOLLEHER ALUMNI HOUSE
GH (16) GREENHOUSE
H (17) HUMANITIES
SG HV SWITCH GEAR BUILDING
JPCR (18) JEWEL PLUMMER COBB RES. HALLS
KHS (19) KINESIOLOGY & HEALTH SCIENCE
LH (20) LANGSDORF HALL
LOF LANDSCAPE OPERATIONS FACILITY
MH (21) McCARTHY HALL
M-HTL (22) MARRIOTT HOTEL
MS (23) MILITARY SCIENCE
MDC-A MODULAR DATA CENTER
NPS (24) NUTWOOD PARKING STRUCTURE
OCSD OC SANITATION DISTRICT PUMPING STATION
PL (25) POLLAK LIBRARY
P&T-EIC PARKING & TRANSPORTATION/EH/IS - CONFERENCE
P&TS (26) PARKING & TRANSPORTATION SERVICES
RGC (27) RUBY GERONTOLOGY CENTER
SC (28) SPORTS CENTER
TITAN STADIUM PRESSBOX
TITAN STADIUM CONCESSION - EAST
FIELD HOUSE
GOODWIN FIELD PRESSBOX
BASEBALL/SOFTBALL CLUBHOUSE
ANDERSON FAMILY FIELD PRESSBOX
SOUTH SOFTBALL RESTROOMS
ATHLETICS TICKET BOOTH
SCPS (29) STATE COLLEGE PARKING STRUCTURE
SGMH (30) STEVEN G. MIHAYLO HALL
SH (31) STUDENT HOUSING II
ACACIA
BIRCH
MANZANITA
OAK
WILLOW
ACADEMIC RESOURCE CENTER
(32) STUDENT HOUSING III
ELM
FIG
HOLLY
JUNIPER
PINE
THE GASTRONOME
SH-C (33) **JEWEL PLUMMER COBB RESIDENCE HALLS**
SH-S CYPRESS
SYCAMORE
VALENCIA
SHPS STUDENT HOUSING PARKING STRUCTURE
SHCC-E (34) STUDENT HLTH & COUNSELING CTR. EAST
SHCC-W (35) STUDENT HLTH & COUNSELING CTR. WEST
SRC (36) STUDENT RECREATION CENTER
TES-CW THERMAL ENERGY STORAGE TANKS (COOL)
TES-HW THERMAL ENERGY STORAGE TANKS (HOT)
TB (37) TITAN BOOKSTORE
TH (38) TITAN HOUSE
TSU (39) TITAN STUDENT UNION
TG (40) TRIGENERATION FACILITY
UH (41) UNIVERSITY HALL
UP (42) UNIVERSITY POLICE
VA (43) VISUAL ARTS CENTER
VIC1 (44) VIC - ARTS DRIVE
VIC2 (45) VIC - EASTSIDE
VIC3 (46) VIC - ASSOCIATED RD

CAL STATE UNIVERSITY FULLERTON MAP

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 78.0 - 2018/09/06 16:27:27
- Level Range : 40-100
- SEL : 97.4
- Leq : 67.9
-

No.s	Date Time	(dB)
1	2018/09/06 16:13:24	65.6
2	2018/09/06 16:13:25	65.3
3	2018/09/06 16:13:26	64.7
4	2018/09/06 16:13:27	64.3
5	2018/09/06 16:13:28	64.1
6	2018/09/06 16:13:29	68.4
7	2018/09/06 16:13:30	64.1
8	2018/09/06 16:13:31	63.0
9	2018/09/06 16:13:32	63.6
10	2018/09/06 16:13:33	64.2
11	2018/09/06 16:13:34	64.6
12	2018/09/06 16:13:35	67.0
13	2018/09/06 16:13:36	67.2
14	2018/09/06 16:13:37	68.5
15	2018/09/06 16:13:38	67.7
16	2018/09/06 16:13:39	66.9
17	2018/09/06 16:13:40	66.9
18	2018/09/06 16:13:41	67.3
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24	2018/09/06 16:13:47	68.4
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868	2018/09/06	16:27:51	68.3
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870	2018/09/06	16:27:53	67.7
871	2018/09/06	16:27:54	67.7
872	2018/09/06	16:27:55	66.9
873	2018/09/06	16:27:56	66.8
874	2018/09/06	16:27:57	66.5
875	2018/09/06	16:27:58	66.3
876	2018/09/06	16:27:59	66.0
877	2018/09/06	16:28:00	65.9

878	2018/09/06	16:28:01	66.8
879	2018/09/06	16:28:02	66.7
880	2018/09/06	16:28:03	67.6
881	2018/09/06	16:28:04	67.8
882	2018/09/06	16:28:05	69.3
883	2018/09/06	16:28:06	70.8
884	2018/09/06	16:28:07	70.7
885	2018/09/06	16:28:08	70.2
886	2018/09/06	16:28:09	70.9
887	2018/09/06	16:28:10	71.1
888	2018/09/06	16:28:11	71.3
889	2018/09/06	16:28:12	70.1
890	2018/09/06	16:28:13	70.2
891	2018/09/06	16:28:14	70.7
892	2018/09/06	16:28:15	70.5
893	2018/09/06	16:28:16	68.2
894	2018/09/06	16:28:17	67.7
895	2018/09/06	16:28:18	66.9
896	2018/09/06	16:28:19	67.7
897	2018/09/06	16:28:20	67.4
898	2018/09/06	16:28:21	71.8
899	2018/09/06	16:28:22	69.9
900	2018/09/06	16:28:23	70.7

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 75.6 - 2018/09/06 16:41:33
- Level Range : 40-100
- SEL : 87.6
- Leq : 58.1
-

No.s	Date Time	(dB)
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2	2018/09/06 16:30:50	56.6
3	2018/09/06 16:30:51	56.4
4	2018/09/06 16:30:52	56.2
5	2018/09/06 16:30:53	60.8
6	2018/09/06 16:30:54	58.2
7	2018/09/06 16:30:55	56.2
8	2018/09/06 16:30:56	55.9
9	2018/09/06 16:30:57	56.5
10	2018/09/06 16:30:58	56.6
11	2018/09/06 16:30:59	56.6
12	2018/09/06 16:31:00	56.0
13	2018/09/06 16:31:01	56.4
14	2018/09/06 16:31:02	56.0
15	2018/09/06 16:31:03	59.7
16	2018/09/06 16:31:04	57.1
17	2018/09/06 16:31:05	57.7
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22	2018/09/06 16:31:10	57.3
23	2018/09/06 16:31:11	57.5
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37	2018/09/06 16:31:25	57.0
38	2018/09/06 16:31:26	57.2
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40	2018/09/06 16:31:28	56.8
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43	2018/09/06 16:31:31	57.8
44	2018/09/06 16:31:32	57.0
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65	2018/09/06 16:31:53	57.7
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413	2018/09/06 16:37:41	57.1
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865	2018/09/06 16:45:13	57.6
866	2018/09/06 16:45:14	57.3
867	2018/09/06 16:45:15	59.2
868	2018/09/06 16:45:16	59.8
869	2018/09/06 16:45:17	58.9
870	2018/09/06 16:45:18	61.7
871	2018/09/06 16:45:19	58.5
872	2018/09/06 16:45:20	57.1
873	2018/09/06 16:45:21	57.4
874	2018/09/06 16:45:22	56.4
875	2018/09/06 16:45:23	57.2
876	2018/09/06 16:45:24	56.3
877	2018/09/06 16:45:25	57.1

878	2018/09/06 16:45:26	57.4
879	2018/09/06 16:45:27	57.6
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890	2018/09/06 16:45:38	58.1
891	2018/09/06 16:45:39	57.5
892	2018/09/06 16:45:40	57.4
893	2018/09/06 16:45:41	58.0
894	2018/09/06 16:45:42	60.0
895	2018/09/06 16:45:43	58.9
896	2018/09/06 16:45:44	57.7
897	2018/09/06 16:45:45	57.7
898	2018/09/06 16:45:46	57.7
899	2018/09/06 16:45:47	57.6
900	2018/09/06 16:45:48	57.2

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 67.5 - 2018/09/06 17:07:12
- Level Range : 40-100
- SEL : 89.2
- Leq : 59.7
-

No.s	Date Time	(dB)
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2	2018/09/06 16:52:37	60.6
3	2018/09/06 16:52:38	59.7
4	2018/09/06 16:52:39	60.3
5	2018/09/06 16:52:40	59.1
6	2018/09/06 16:52:41	59.3
7	2018/09/06 16:52:42	59.7
8	2018/09/06 16:52:43	58.7
9	2018/09/06 16:52:44	60.2
10	2018/09/06 16:52:45	59.6
11	2018/09/06 16:52:46	59.8
12	2018/09/06 16:52:47	60.4
13	2018/09/06 16:52:48	60.1
14	2018/09/06 16:52:49	60.4
15	2018/09/06 16:52:50	61.2
16	2018/09/06 16:52:51	60.1
17	2018/09/06 16:52:52	59.1
18	2018/09/06 16:52:53	58.9
19	2018/09/06 16:52:54	59.2
20	2018/09/06 16:52:55	59.9
21	2018/09/06 16:52:56	59.1
22	2018/09/06 16:52:57	59.5
23	2018/09/06 16:52:58	59.5
24	2018/09/06 16:52:59	59.0
25	2018/09/06 16:53:00	59.5
26	2018/09/06 16:53:01	59.6
27	2018/09/06 16:53:02	59.1
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61	2018/09/06 16:53:36	60.0
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82	2018/09/06 16:53:57	59.4
83	2018/09/06 16:53:58	59.8
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85	2018/09/06 16:54:00	59.8

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145	2018/09/06 16:55:00	59.5
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861	2018/09/06 17:06:56	60.2
862	2018/09/06 17:06:57	58.7
863	2018/09/06 17:06:58	59.5
864	2018/09/06 17:06:59	58.8
865	2018/09/06 17:07:00	62.9
866	2018/09/06 17:07:01	59.6
867	2018/09/06 17:07:02	60.3
868	2018/09/06 17:07:03	60.5
869	2018/09/06 17:07:04	61.2
870	2018/09/06 17:07:05	59.9
871	2018/09/06 17:07:06	59.6
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873	2018/09/06 17:07:08	59.7
874	2018/09/06 17:07:09	60.1
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876	2018/09/06 17:07:11	59.6
877	2018/09/06 17:07:12	59.5

878	2018/09/06	17:07:13	59.3
879	2018/09/06	17:07:14	59.4
880	2018/09/06	17:07:15	59.2
881	2018/09/06	17:07:16	60.6
882	2018/09/06	17:07:17	59.9
883	2018/09/06	17:07:18	59.4
884	2018/09/06	17:07:19	59.4
885	2018/09/06	17:07:20	59.4
886	2018/09/06	17:07:21	59.6
887	2018/09/06	17:07:22	59.8
888	2018/09/06	17:07:23	60.2
889	2018/09/06	17:07:24	60.2
890	2018/09/06	17:07:25	60.7
891	2018/09/06	17:07:26	61.1
892	2018/09/06	17:07:27	60.1
893	2018/09/06	17:07:28	59.7
894	2018/09/06	17:07:29	60.2
895	2018/09/06	17:07:30	60.1
896	2018/09/06	17:07:31	60.0
897	2018/09/06	17:07:32	60.0
898	2018/09/06	17:07:33	59.9
899	2018/09/06	17:07:34	61.8
900	2018/09/06	17:07:35	61.5

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 85.2 - 2018/09/06 17:18:37
- Level Range : 40-100
- SEL : 96.6
- Leq : 67.1
-

No.s	Date Time	(dB)
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3	2018/09/06 17:09:56	68.1
4	2018/09/06 17:09:57	67.6
5	2018/09/06 17:09:58	67.4
6	2018/09/06 17:09:59	67.7
7	2018/09/06 17:10:00	67.4
8	2018/09/06 17:10:01	67.5
9	2018/09/06 17:10:02	67.4
10	2018/09/06 17:10:03	66.7
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854	2018/09/06 17:24:07	66.4
855	2018/09/06 17:24:08	66.6
856	2018/09/06 17:24:09	65.2
857	2018/09/06 17:24:10	65.2
858	2018/09/06 17:24:11	67.1
859	2018/09/06 17:24:12	67.0
860	2018/09/06 17:24:13	66.7
861	2018/09/06 17:24:14	66.6
862	2018/09/06 17:24:15	67.7
863	2018/09/06 17:24:16	67.1
864	2018/09/06 17:24:17	64.6
865	2018/09/06 17:24:18	65.4
866	2018/09/06 17:24:19	65.9
867	2018/09/06 17:24:20	65.0
868	2018/09/06 17:24:21	66.5
869	2018/09/06 17:24:22	65.8
870	2018/09/06 17:24:23	64.7
871	2018/09/06 17:24:24	64.3
872	2018/09/06 17:24:25	64.8
873	2018/09/06 17:24:26	66.6
874	2018/09/06 17:24:27	66.9
875	2018/09/06 17:24:28	67.6
876	2018/09/06 17:24:29	67.4
877	2018/09/06 17:24:30	65.1

878	2018/09/06	17:24:31	65.1
879	2018/09/06	17:24:32	65.1
880	2018/09/06	17:24:33	65.1
881	2018/09/06	17:24:34	64.6
882	2018/09/06	17:24:35	66.2
883	2018/09/06	17:24:36	65.1
884	2018/09/06	17:24:37	66.1
885	2018/09/06	17:24:38	66.8
886	2018/09/06	17:24:39	67.8
887	2018/09/06	17:24:40	70.8
888	2018/09/06	17:24:41	67.6
889	2018/09/06	17:24:42	66.7
890	2018/09/06	17:24:43	67.1
891	2018/09/06	17:24:44	65.2
892	2018/09/06	17:24:45	66.3
893	2018/09/06	17:24:46	66.3
894	2018/09/06	17:24:47	65.6
895	2018/09/06	17:24:48	65.3
896	2018/09/06	17:24:49	67.1
897	2018/09/06	17:24:50	65.3
898	2018/09/06	17:24:51	65.5
899	2018/09/06	17:24:52	65.7
900	2018/09/06	17:24:53	67.7

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Ambient Noise Survey Data Sheet

Instructions: Document noise measurement locations with a photo of the site, including the noise meter. Additionally, take notes on general and secondary noise sources, including the instantaneous noise level if possible. As a reminder, A/C weighting should be set to "A" and generally response time should be set to "fast." For additional information, please review the *Noise Measurement Protocol* in the pelican case.

Project Name: CSU Fullerton lot F **Job Number:**

Date: 9/6/18 **Operator Name:** Meghna Munali

Measurement #1

Location: A - facing highway - northeast point **Begin time:** 4:14 **Finish time:** 4:29

Measurement No.: 1 **Wind (mph):** 7 **Direction:**

Cloud Cover Class: Overcast (>80%) ○ Light (20-80%) ○ Sunny (<20%) ✓

Calibration (dB): Start: 94 End:

Primary Noise Sources: traffic from highway **Distance:** 50 - 60 ft from MM

Secondary Noise Sources: traffic on campus through parking lot

Notes:

Traffic Count: Passenger Cars: 44

within campus lot Medium to Heavy Duty Trucks (3 axles): N/A Heavy Duty Trucks (4+ axles):

Instantaneous Noise Sources/Levels (e.g., airplane, bus airbrake, etc.):

Leq: 67.9 **SEL:** 97.4 **Lmax:** 75.0 **Lmin:** 62.6 **PK:** 94.5

L(05): 70.2 **L(10):** 69.7 **L(50):** 67.4 **L(90):** 65.1 **L(95):** 64.5

Response: Slow ○ Fast ✓ Peak ○ Impulse ○

Measurement #2

Location: B - campus facing - northwest point **Begin time:** 4:34 **Finish time:** 4:49

Measurement No.: 2 **Wind (mph):** >7 **Direction:**

Cloud Cover Class: Overcast (>80%) ○ Light (20-80%) ○ Sunny (<20%) ✓

Calibration (dB): Start: 94 End:

Primary Noise Sources: campus parking traffic **Distance:**

Secondary Noise Sources: highway traffic

Notes:

Traffic Count: Passenger Cars: 19

Medium to Heavy Duty Trucks (3 axles): N/A Heavy Duty Trucks (4+ axles):

Instantaneous Noise Sources/Levels (e.g., airplane, bus airbrake, etc.):

Leq: 58.1 **SEL:** 87.6 **Lmax:** 75.6 **Lmin:** 54.1 **PK:** 91.7

L(05): 61.0 **L(10):** 60.1 **L(50):** 57.3 **L(90):** 55.5 **L(95):** 55.2

Response: Slow ○ Fast ✓ Peak ○ Impulse ○

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Ambient Noise Survey Data Sheet

Instructions: Document noise measurement locations with a photo of the site, including the noise meter. Additionally, take notes on general and secondary noise sources, including the instantaneous noise level if possible. As a reminder, A/C weighting should be set to "A" and generally response time should be set to "fast." For additional information, please review the *Noise Measurement Protocol* in the pelican case.

Project Name: CSU Fullerton **Job Number:**

Date: 9/10/18 **Operator Name:** Meghna Mund

Measurement #1

Location: C - campus side **Begin time:** 4:53 **Finish time:** 5:08

Measurement No.: 3 **Wind (mph):** >7 **Direction:**

Cloud Cover Class: Overcast (>80%) ○ Light (20-80%) ○ Sunny (<20%) ✓

Calibration (dB): Start: 94 End:

Primary Noise Sources: students student **Distance:**

Secondary Noise Sources: highway traffic, parking, birds

Notes: car siren went off in parking garage only

Traffic Count: Passenger Cars: 8

Medium to Heavy Duty Trucks (3 axles): Heavy Duty Trucks (4+ axles):

Instantaneous Noise Sources/Levels (e.g., airplane, bus airbrake, etc.):

Leq: 59.7 **SEL:** 89.2 **Lmax:** 67.5 **Lmin:** 57.8 **PK:** 83.8

L(05): 61.0 **L(10):** 60.6 **L(50):** 59.5 **L(90):** 58.8 **L(95):** 58.6

Response: Slow ○ Fast ✓ Peak ○ Impulse ○

Measurement #2

Location: D - highway side **Begin time:** 5:10 **Finish time:** 5:25

Measurement No.: 4 **Wind (mph):** **Direction:**

Cloud Cover Class: Overcast (>80%) ○ Light (20-80%) ○ Sunny (<20%) ✓

Calibration (dB): Start: 94 End:

Primary Noise Sources: highway traffic **Distance:**

Secondary Noise Sources:

Notes:

Traffic Count: Passenger Cars: 87

Medium to Heavy Duty Trucks (3 axles): Heavy Duty Trucks (4+ axles):

Instantaneous Noise Sources/Levels (e.g., airplane, bus airbrake, etc.):

Leq: 67.1 **SEL:** 96.6 **Lmax:** 85.2 **Lmin:** 61.9 **PK:** 98.9

L(05): 70.4 **L(10):** 68.9 **L(50):** 65.7 **L(90):** 63.9 **L(95):** 63.5

Response: Slow ○ Fast ✓ Peak ○ Impulse ○

Appendix E

Roadway Construction Noise Model Data

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 10/02/2018
Case Description: CSU Fullerton Parking Structure - Site Prep

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Classroom - 120 ft	Commercial	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85.0		120.0	0.0
Scraper	No	40		83.6	120.0	0.0
Backhoe	No	40		77.6	120.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	77.4	73.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	76.0	72.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	70.0	66.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	77.4	76.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Student Housing - 620 ft	Residential	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)

Grader	No	40	85.0	620.0	0.0
Scraper	No	40	83.6	620.0	0.0
Backhoe	No	40	77.6	620.0	0.0

Results

		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	63.1	59.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	61.7	57.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.7	51.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	63.1	61.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 10/02/2018
Case Description: CSU Fullerton Parking Structure - Site Prep

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Classroom - 120 ft	Commercial	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85.0		120.0	0.0
Dozer	No	40		81.7	120.0	0.0
Backhoe	No	40		77.6	120.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	77.4	73.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	74.1	70.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	70.0	66.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	77.4	75.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Student Housing - 620 ft	Residential	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)

Grader	No	40	85.0	620.0	0.0
Dozer	No	40	81.7	620.0	0.0
Backhoe	No	40	77.6	620.0	0.0

Results

		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	63.1	59.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	61.7	57.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.7	51.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	63.1	61.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 10/02/2018
Case Description: CSU Fullerton Parking Structure - Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Classroom - 120 ft	Commercial	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	120.0	0.0
Man Lift	No	20		74.7	120.0	0.0
Generator	No	50		80.6	120.0	0.0
Backhoe	No	40		77.6	120.0	0.0
Welder / Torch	No	40		74.0	120.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	72.9	65.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	67.1	60.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	73.0	70.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	70.0	66.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	66.4	62.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	73.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Student Housing - 620 ft	Residential	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	620.0	0.0
Man Lift	No	20		74.7	620.0	0.0
Generator	No	50		80.6	620.0	0.0
Backhoe	No	40		77.6	620.0	0.0
Welder / Torch	No	40		74.0	620.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	58.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	52.8	45.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	58.8	55.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.7	51.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	52.1	48.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	58.8	58.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 10/02/2018
Case Description: CSU Fullerton Parking Structure - Paving

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Classroom - 120 ft	Commercial	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	120.0	0.0
Paver	No	50		77.2	120.0	0.0
Roller	No	20		80.0	120.0	0.0
Backhoe	No	40		77.6	120.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	71.2	67.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	69.6	66.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	72.4	65.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	70.0	66.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	72.4	72.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Student Housing - 620 ft	Residential	58.1	58.1	45.0

Equipment

Spec Actual Receptor Estimated

Description	Impact Device	Usage (%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	620.0	0.0
Paver	No	50		77.2	620.0	0.0
Roller	No	20		80.0	620.0	0.0
Backhoe	No	40		77.6	620.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	56.9	53.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	55.4	52.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	58.1	51.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	55.7	51.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	58.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 10/02/2018
Case Description: CSU Fullerton Parking Structure - Architectural Coating

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Classroom - 120 ft	Commercial	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	120.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	70.1	66.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	70.1	66.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Student Housing - 620 ft	Residential	58.1	58.1	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	620.0	0.0

Results

Noise Limits (dBA) Noise Limit Exceedance (dBA)

	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	55.8	51.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	55.8	51.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix F

Vibration Model Data

Vibration Analysis - CSU Fullerton Parking Structure

PPV (in/sec) = PPV {ref} * (25/D)^1.5
Where PPV = Peak Particle Velocity
{ref} = PPV at the reference distance of 25 feet
D = distance to the receptor

Equipment =	**Loaded truck**	
PPV{ref} =	0.076	in/sec
D =	120	feet
PPV at receptor =	***0.007***	***in/sec***

PPV is 1.7x to 6x larger than RMS velocity

Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.002***	***in/sec***
Receptor Lv =	***65***	***VdB***

Equipment =	**Large buldozer**	
PPV{ref} =	0.089	in/sec
D =	120	feet
PPV at receptor =	***0.008***	***in/sec***

PPV is 1.7x to 6x larger than RMS velocity

Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.002***	***in/sec***
Receptor Lv =	***67***	***VdB***

Source: Chapter 12 Noise and Vibration During Construction in *Transit Noise and Vibration Assessment, May 2006*
Harris Miller Miller & Hanson, Inc.
Prepared For: USDOT Federal Transit Administration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of ~4

Criterion

US Bureau of Mines, 1971

PPV, in/sec	Degree of Damage
<2	Safe
2 - 4	Plaster Cracking
4 - 7	Minor Damage
>7	Major Damage

Canmet, Bauer, and Calder, 1977

Equipment	PPV Threshold, in/sec	Type of Damage
Rigid Mercury Switches	0.5	Trip Out
House	2	Cracked Plaster
Concrete Block	8	Crack in Block
Cased Drill Holes	15	Horizontol Offset
Pumps, Compressors	40	Shaft Misalignment

Human Response Criteria

Level, Lv in VdB	Equivalent Noise Level, dBA Low freq (30Hz)	Hi Freq (60 Hz)	Human Response
65	25	40	Approximate threshold of perception, low-freq inaudible, but mid-freq excessive for sleeping
75	35	50	Approx. dividing line between barely perceptible and clearly perceptible. Annoying vibration for most
85	45	60	Vibration acceptable only if no more than 2 events/day for residential uses. Low-freq annoying in
90	50	65	Difficulty with tasks such as reading computer screens. Generally annoying for commercial uses.

Impact Criteria

Land Use	Lv in VdB Frequent Events (70+/day)	Occasional Events (30-70)	Infrequent (<30 events/day)
Category 1: Vibration Sensitive	65	65	65
Concert Halls	65	65	65
TV Studios	65	65	65
Recording Studios	65	65	65
Category 2: Residences, hotels, sleeping areas	72	75	80
Auditoriums	72	80	80
Theaters	72	80	80
Category 3: Institutional with primarily daytime use only	75	78	83

Vibration Source Levels For Construction Equipment

Equipment		PPV at 25 ft (in/sec)	Approximate Lv at 25 feet *
Impact Pile Driver	upper range	1.518	112
	typical	0.644	104
Sonic Pile Driver	upper range	0.734	105
	typical	0.17	93
Clam shovel drop (slurry wall construction)		0.202	94
	in soil	0.008	66
Hydromill (slurry wall construction)	in rock	0.017	75
Vibratory Roller		0.21	94
Hoe Ram		0.089	87
	large	0.089	87
Bulldozer	small	0.003	58
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79

Vibration Analysis - CSU Fullerton Parking Structure

PPV (in/sec) = PPV {ref} * (25/D)^1.5
Where PPV = Peak Particle Velocity
{ref} = PPV at the reference distance of 25 feet
D = distance to the receptor

Equipment =	**Loaded truck**	
PPV{ref} =	0.076	in/sec
D =	620	feet
PPV at receptor =	***0.001***	***in/sec***

PPV is 1.7x to 6x larger than RMS velocity

Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.000***	***in/sec***
Residential Receptor Lv =	***44***	***VdB***

Equipment =	**Large Bulldozer**	
PPV{ref} =	0.089	in/sec
D =	620	feet
PPV at receptor =	***0.001***	***in/sec***

PPV is 1.7x to 6x larger than RMS velocity

Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.000***	***in/sec***
Residential Receptor Lv =	***45***	***VdB***

Source: Chapter 12 Noise and Vibration During Construction in
Transit Noise and Vibration Assessment, May 2006
Harris Miller Miller & Hanson, Inc
Prepared For: USDOT Federal Transit Administration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of ~4

Criterion

US Bureau of Mines, 1971

PPV, in/sec	Degree of Damage
<2	Safe
2 - 4	Plaster Cracking
4 - 7	Minor Damage
>7	Major Damage

Canmet, Bauer, and Calder, 1977

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Appendix G

Transportation Assessment Memorandum

FEHR PEERS

MEMORANDUM

Date: January 18, 2019

To: Brenna Weatherby – Rincon Consultants, Inc.

From: Jason D. Pack, P.E.
Jessica Johnson

Subject: California State University – Fullerton Parking Structure Transportation Assessment

OC19-0613

Fehr & Peers is assisting California State University – Fullerton (CSU-Fullerton) by conducting a transportation assessment of the potential transportation impacts associated with the proposed parking structure implementation project in Fullerton, California. CSU-Fullerton plans to replace at-grade parking on the east side of the campus with a new parking structure. Additionally, the project will eliminate 48 parking spaces located along West Campus Drive and 59 spaces along East Campus Drive which will be accommodated in the proposed structure.

The development of the parking structure, which is generally located in same geographic location of the at-grade parking, is not anticipated to alter travel patterns around the campus. It is anticipated that the parking structure would not potentially to result in transportation impacts. However, the 107 relocated parking spaces from the northern part of the campus, along Campus Drive, may have the potential to change travel patterns around the university, such that additional transportation assessment would be needed. To determine the potential of transportation impacts, Fehr & Peers conducted trip surveys at these 107 spaces to determine if a potential impact would occur.

Data Collection

Fehr & Peers conducted vehicle trip surveys at the future displaced parking spaces along Campus Drive in the northern part of the campus on Wednesday, December 12, 2018 during the AM (7:00 – 9:00 AM) and PM (4:00 – 6:00 PM) peak periods. **Table 1** summarizes the total peak hour trips generated. During the AM peak hour, a total of 20 peak hour trips (16 inbound and 4 outbound) from the relocated parking spaces were observed. In the PM peak hour, a total of 22 peak hour trips (6 inbound and 16 outbound trips) were observed. The trip generation survey summary is included as an attachment.

Table 1 - Campus Drive Peak Hour Trips

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Campus Drive Parking Areas	16	4	20	6	16	22

Source: Fehr & Peers, 2019

Conclusions

Observations indicate that the maximum number of displaced trips would be 20 - 22 trips during the AM and PM peak hours. These trips are relatively small and will not potentially change operations at surrounding intersections such that additional assessment would be required.

Attachments:

Trip Generation Surveys

East Campus Drive Parking Area Survey

AM Peak Period								
Trips	***7:00 - 7:15 AM***	***7:15 - 7:30 AM***	***7:30 -7:45 AM***	***7:45 - 8:00 AM***	***7:00 - 7:15 AM***	***7:15 - 7:30 AM***	***7:30 -7:45 AM***	***7:45 - 8:00 AM***
In	0	0	0	0	0	0	0	0
Out	0	0	0	0	0	0	0	0
Total	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
PM Peak Hour								
Trips	***4:00 - 4:15 PM***	***4:15 - 4:30 PM***	***4:30 -4:45 PM***	***4:45 - 5:00 PM***	***5:00 - 5:15 PM***	***5:15 - 5:30 PM***	***5:30 -5:45 PM***	***5:45 - 6:00 PM***
In	0	0	1	1	0	0	1	0
Out	0	0	1	1	1	2	2	1
Total	***0***	***0***	***2***	***2***	***1***	***2***	***3***	***1***

Source: Fehr & Peers, 2019

West Campus Drive Parking Area Survey

AM Peak Hour								
Trips	***7:00 - 7:15 AM***	***7:15 - 7:30 AM***	***7:30 -7:45 AM***	***7:45 - 8:00 AM***	***7:00 - 7:15 AM***	***7:15 - 7:30 AM***	***7:30 -7:45 AM***	***7:45 - 8:00 AM***
In	2	4	1	2	2	3	2	9
Out	0	0	0	1	2	0	0	2
Total	***2***	***4***	***1***	***3***	***4***	***3***	***2***	***11***
PM Peak Hour								
Trips	***4:00 - 4:15 PM***	***4:15 - 4:30 PM***	***4:30 -4:45 PM***	***4:45 - 5:00 PM***	***5:00 - 5:15 PM***	***5:15 - 5:30 PM***	***5:30 -5:45 PM***	***5:45 - 6:00 PM***
In	0	0	1	1	0	0	1	0
Out	0	0	1	1	1	2	2	1
Total	***0***	***0***	***2***	***2***	***1***	***2***	***3***	***1***

Source: Fehr & Peers, 2019

Total Campus Drive Peak Hour Trips

AM Peak Hour	**7:00 - 8:00 AM**	**7:15 - 8:15 AM**	**7:30 - 8:30 AM**	**7:45 - 8:45 AM**	**8:00 - 9:00 AM**
In	9	9	8	9	16
Out	1	3	3	3	4
Total	***10***	***12***	***11***	***12***	***20***
PM Peak Hour	**4:00 - 5:00 PM**	**4:15 -5:15 PM**	**4:30 - 5:30 PM**	**4:45 - 5:45 PM**	**5:00 - 6:00 PM**
In	7	5	5	6	3
Out	10	10	14	16	17
Total	***17***	***15***	***19***	***22***	***20***

Source: Fehr & Peers, 2019