Appendix A: Peer Review of Visual Simulations

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Peer Review

of

The Submitted Photo Simulations of the Proposed Water Tank

Dated November 7, 2018

at

Station #115

2783 Melendy Drive

San Carlos, CA

By

OASIS ASSOCIATES
LANDSCAPE ARCHITECTURE + PLANNING

OASIS ASSOCIATES, INC.
3427 MIGUELITO COURT
SAN LUIS OBISPO, CA 93401

December 6, 2018

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1. Project Details

On November 7, 2018, Square One Productions submitted photo simulations of the proposed second Water Tank at Station #115, 2783 Melendy Drive, San Carlos, CA. The files submitted were (see Appendix, pages 11-22):

- View 1A - Existing
- View 1B – Year 1
- View 1C – Year 12
- View 1D – Year 12, Outline
- View 2A – Existing
- View 2B – Year 1
- View 2C – Year 12
- View 2D – Year 12, Outline
- View 3A – Existing
- View 3B – Year 1
- View 3C – Year 12
- View 3D – Year 12, Outline

The submitted simulations were photographed at three different perspectives looking towards the project area (see Appendix, page 8). The first perspective (View 1, elev. 457 feet) is approximately 180 feet from the proposed Water Tank. The second perspective (View 2, elev. 503 feet) is across from the access drive of the project area at Melendy Drive and approximately 100 feet from the proposed Water Tank. View 3, at an elevation of 545 feet, is approximately 300 feet from the proposed Water Tank. For each perspective, four files were submitted – a photo without a simulated Water Tank (Existing), one with a simulated Water Tank at installation (Year 1), one with a simulated Water Tank at 12 years of vegetative growth (Year 12), and one with an outline of the simulated Water Tank at Year 12. Requested by the City of San Carlos, a peer review of the submitted material was to assess the methodology used to develop the simulated photos as well as the accuracy of the photo simulations. Our findings at each perspective are outlined in this report.

2. Methodology Review

Square One Productions visited the site at 2783 Melendy Drive to take photographs; a 55 mm camera lens was used to capture the "cone of vision" of the project area at three specified locations. Next, they digitally-rendered a 3-dimensional model of the project area and the surrounding site. The photographed perspectives were then aligned with the digital 3D model. Lastly, proposed site features including the Tank, fencing, driveway and vegetation were scaled and inserted into the 3D model according to the Landscape and Grading Plans (see Appendix, pages 9-10). This type of 3D-modeling software is a commonly-used tool for the creation of photo simulations due to its accuracy, speed and quality of renderings.

3. Photo Simulation Review

The Station #115 Water Tank photo simulations were completed using photographs of the site and a 3D-modeling software program as outlined in the 'Methodology Review' section above. In order to review the accuracy of the photo simulations, we have used a method known as photogrammetry. It has paved the way for more advanced software technologies commonly used today, but it remains a practical and reliable method for the review and development of photo simulations. This technique involves making measurements from photographs to find the exact positions of points.[1] For example, if a bike is photographed without any other objects nearby, the observer of the photo cannot infer the actual size of the bike. However, if a light pole and a bike are photographed together, the observer can obtain a scale and approximate the size of the bike based on the addition of the 'scaling object.' If the scaling object has known dimensions, the bike's size may be more precisely calculated. In our assessment of the photo simulations, we have noted a variety of primary and secondary scaling objects to test the placement accuracy of the simulated Water Tank structure, including a cell tower pole, a power pole, the existing water tank on site and a chain link fence. The location and dimensions of the scaling objects are also indicated on the Grading Plan (see Appendix, page 9).

3.1 Scaling objects

In order to accurately scale a photographed object, a 'scaling object,' as outlined above, is needed. Numerous scaling objects with exact dimensions were used to accurately assess the size and location of the Water Tank in the provided photo simulations. They are defined as follows:

3.1.1 Cell tower pole as a primary scaling object

The indicated height of the cell tower pole is 44 feet and it measures 25 feet to the east of the proposed Water Tank. Both the tank and the pole sit at a pad elevation of 516.5. The cell tower pole is the tallest feature at the site and is visible at every perspective point.

3.1.2 Power pole as a primary scaling object

The existing power pole at the north side of the project area measures 25 feet tall and 14 feet away from the proposed Water Tank. The pole sits lower than the Water Tank by .36 feet, or 4.32 inches. The difference in elevation, however, is indiscernible from the perspective points.

3.1.3 Existing water tank as a primary scaling object

The existing water tank at the south side of the project site is 30 feet tall with a diameter of 36 feet. The pad elevation is 516.35 – a 1.8-inch difference from the

[1] Aber, James S, et al. *Small-Format Aerial Photography*. Elsevier, 2010. *ScienceDirect* www.sciencedirect.com/science/article/pii/B9780444532602100031

proposed Water Tank. The plan shows 25 feet between the existing and proposed water tanks.

3.1.4 Chain link fence as a secondary scaling object

The fence around the site is labeled on the Landscape and Grading plans at 6 feet tall. Due to the uneven nature of a chain link fence despite the known height, it is not the most accurate scaling object. It does, however, provide the outline of the project area along different elevations and may be used for estimated locational references.

3.2 Application of Scale

The combination of scaling objects from each set of photographs has provided us with enough information to analyze the location and scale of the simulated Water Tank at each perspective.

3.2.1 View 1B – Year 1 (see Appendix, page 12)

Using a 10-scale ruler and an 8.5x11-inch hard copy, full-bleed print of the photo simulation, we found that the cell tower pole peaks above the Water Tank by 10 units and the existing and proposed water tanks are 14 units apart. According to the plans, we know that the tower is 6.3 feet taller than the proposed Water Tank, and the horizontal distance between the two tanks is 25 feet. We found that the ratio of vertical distances: (6.3:10) is .63 and the ratio of horizontal distances: (14:25) is .56. The cell tower pole appears bigger because it is 25' closer to the photographer's point of view, thus a .07-unit discrepancy. **Since the horizontal and vertical distances are consistent with each other, we can infer that the simulated Water Tank has been accurately placed in the project site.**

3.2.2 View 1C – Year 12 (see Appendix, page 13)

We reviewed the growth rates of the proposed Deodar Cedar (*Cedrus deodara*) and Coast Live Oak (*Quercus agrifolia)* trees within the viewshed. The estimated growth rate of a Deodar Cedar is 18 inches - 3 feet each year.[2] Coast Live Oaks grow rapidly at an average of up to 2 feet per year but slow down once mature.[3] If planted as 6-foot-tall 15-gallon trees in Year 1, we can expect the trees to be at the simulated height in 12 years. **Based on our observations and calculations – utilizing the existing tank as a scaling object – it appears that the Cedar and Oak trees have been accurately scaled over a 12-year period in the simulation.**

3.2.3 View 2B – Year 1 (see Appendix, page 16)

We used the existing power pole at the north side of the project area as the scaling object at this perspective. The pole, measuring 25 feet tall, sits 14 feet to the left of the simulated Water Tank. At a pad elevation of 516.14, it is 4.32 inches lower than the Tank (an indiscernible amount). Drawing a line from the top of the pole to

[2] SelecTree. "*Cedrus deodara* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/cedrus-deodara>

[3] SelecTree. "*Quercus agrifolia* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/quercus-agrifolia>

intersect the Tank, we found that there is an additional 12.7 feet of Tank above the line. In total, the height of the simulated tower is approximately 37.7 feet which matches the proposed plan height. To measure the width of the Tank, we took the same pole dimensions and used a 10-scale ruler to horizontally measure 25 feet. The simulated Tank's horizontal distance, measured from the edge of the Tank (in line with the pole) to the ladder, came out to be 41 feet across. This matched the plan's width from the same two points. **The Tank is properly sized in the project area. However, its placement is inaccurate; the photo simulation shows the cell tower pole and the existing building in front of the Tank. The Landscape and Grading plans indicate that the cell tower pole and existing building should be behind the Tank, with a portion of the building sticking out on the left and the pole completely hidden from view.**

3.2.4 View 2C – Year 12 (see Appendix, page 17)

From our earlier observations regarding the estimated growth rate of the vegetation on site, we can conclude that the Pines and Cedars will reach the heights shown in the View 2C 12-year simulation. Toyon (*Heteromeles arbutifolia*) also exhibited growth in the photo simulation. This red-berried tree has an estimated growth rate of 1-2 feet each year.[4] The simulation shows a 12-year Toyon at 15-20 feet tall which reflects the annual rate of growth. We noticed, however, that the existing power pole that we used as a scaling object in 'Year 1' has disappeared behind an existing Pine. **The power pole, indicated on the Landscape plan, should be in front of the existing Pine and behind the simulated Cedar and Oak growth with part of the top visible at this perspective.**

3.2.5 View 3B – Year 1 (see Appendix, page 20)

We utilized the height of the existing power pole, the distance between the Tank and the pole, and the height and width of the proposed Water Tank from the Grading plan to test the accuracy of the Water Tank's placement in this perspective. Size of the Tank was calculated as follows (units represent the measurements we gathered from the 8.5x11-inch photograph): (16.5 units ÷ 14 units = 1.18) and (45 feet ÷ 37.7 feet = 1.19). The results show that the horizontal and vertical dimensions of the simulated Water Tank are accurate at this view. Location of the Tank was determined in a similar manner, this time using the distance from the power pole to Tank and the height of pole, respectively: (5.5 units ÷ 9.5 units = .57) and (14 feet ÷ 25 feet = .56). **The calculations show that the Tank is properly sized in the project area. The photo simulation, however, shows the Tank's improper placement behind the cell tower pole. As indicated on the Landscape and Grading Plans, the cell tower pole is 25 feet behind the Tank. At this view, the observer should only see 5-6 feet of the cell tower pole above the Tank.**

[4] SelecTree. "*Heteromeles arbutifolia* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/heteromeles-arbutifolia>

3.2.6 View 3C – Year 12 (see Appendix, page 21)

The 6-foot chain link fence allowed us to gauge the growth of nearby vegetation. Cedars are shown at 15-20 feet tall, Toyon is shown at 15-20 feet tall and Coast Live Oak trees are shown at 15-20 feet tall – all exhibiting accurate growth rate patterns. Purple Hopbush (*Dodonaea viscosa* 'Purpurea'), is shown at this view closest to the chain link fence on the left side of the driveway. It can grow quickly – about 2 feet per year.[5] The simulation shows it at 8-10 feet tall, **However, an existing Pine closest to Melendy Drive and on the left side of the project site driveway did not display any simulated growth from the Year 1 to Year 12 view. Additionally, the cell tower pole is still prominently displayed in front of the Tank and should be moved to the back.**

4. Conclusions

Based upon our review of the three photo simulations at Station #115 – 2783 Melendy Drive, Square One Productions used 3D modeling software to accurately place the proposed Water Tank within the project area. Due to the unpredictability of plant growth, survival and applied maintenance, plant growth may have size uncertainties between 5-10 feet. Proposed understory planting shown in the photo simulations does not contribute to the visual screen of the Tank and, therefore, was not reviewed for growth rate accuracy. However, we observed that the proposed understory planting was simulated for growth while most of the existing vegetation in the foreground of Views 1, 2 and 3 did not exhibit any growth at all. One prominent example of this takes place in View 3, where an existing Pine closest to Melendy Drive and on the left side of the access drive did not display any simulated growth from Year 1 to Year 12.

Additionally, the slight difference in color tone between the proposed and existing tank is a result of aging materials and the sun direction at each view. It is recommended, at time of installation (Year 1), that the existing tank is painted to match the color of the proposed Water Tank.

The photo simulations inaccurately display several surrounding site features in Views 2 and 3. Views 2B and 2C display the cell tower pole and existing building in front of the Tank when it should be behind it, with a portion of the building showing on the left and the cell tower pole completely hidden. Also, in View 2, the existing power pole (left of the Tank) and its wires have disappeared entirely from site in the simulated photographs. Views 3B and 3C show the same cell tower pole improperly placed in front of the Tank; the Landscape and Grading plans indicate that the pole is 25’ feet behind the Tank and only 5-6 feet of the pole’s top should be visible by the observer. Despite minor placement errors of surrounding site features, the photo simulations accurately represent the size and location of the proposed Water Tank.

[5] SelecTree. “*Dodonaea viscosa* 'Purpurea' Tree Record.” 1995-2018. Nov 28, 2018. < https://selectree.calpoly.edu/tree-detail/dodonaea-viscosa-purpurea>

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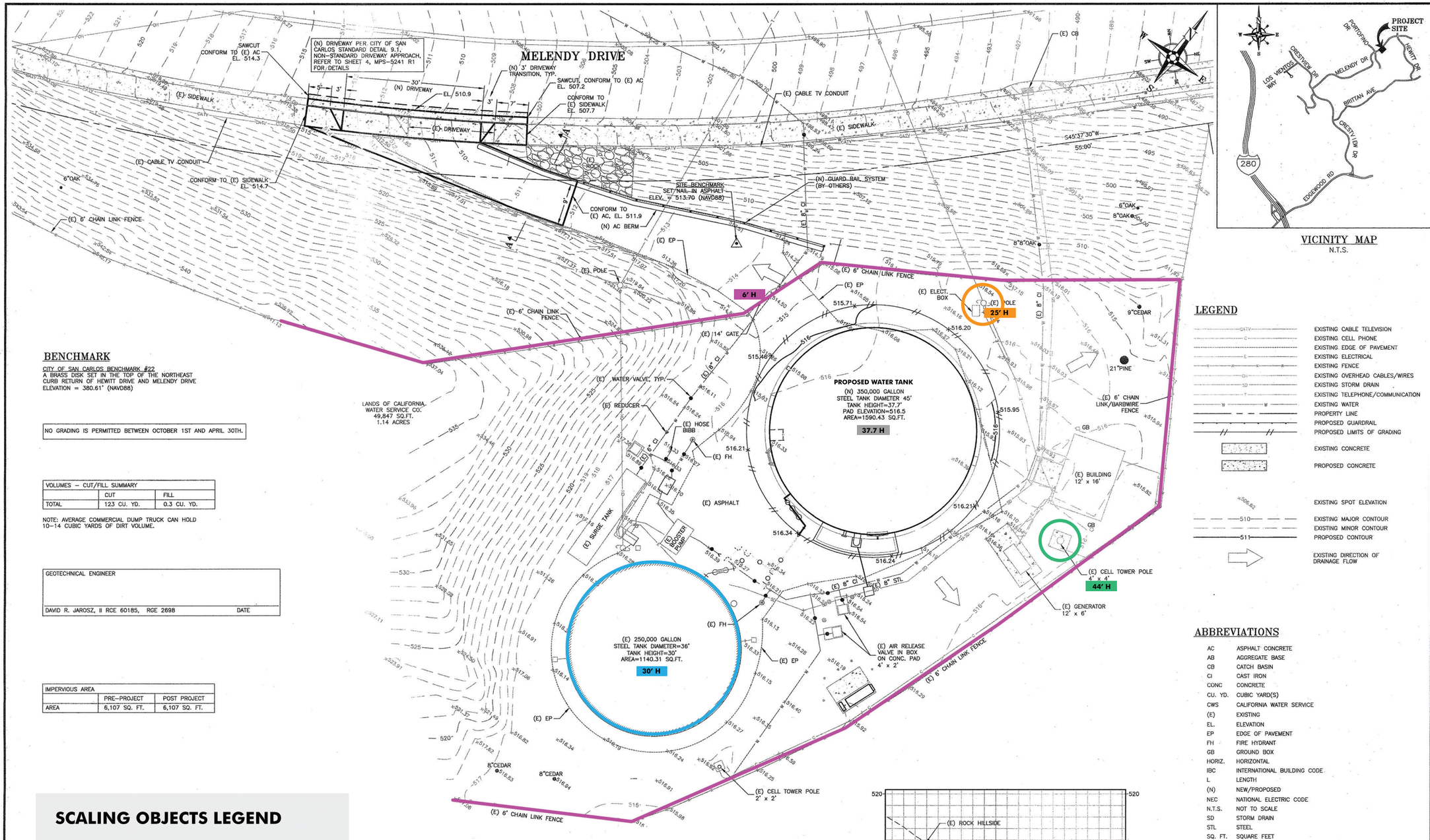
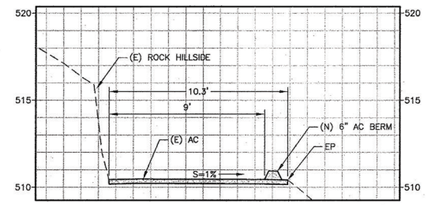
N

200 FT.

5.1 AERIAL WITH VIEWS



SITE PLAN
SCALE: 1" = 10'



DRIVEWAY SECTION A-A
SCALE: 1" = 4' (HORIZ. & VERT.)

VICINITY MAP
N.T.S.

BENCHMARK

CITY OF SAN CARLOS BENCHMARK #22
A BRASS DISK SET IN THE TOP OF THE NORTHEAST CURB RETURN OF HEWITT DRIVE AND MELENDY DRIVE
ELEVATION = 380.61' (NAVD88)

NO GRADING IS PERMITTED BETWEEN OCTOBER 1ST AND APRIL 30TH.

VOLUMES – CUT/FILL SUMMARY		
	CUT	FILL
TOTAL	123 CU. YD.	0.3 CU. YD.

NOTE: AVERAGE COMMERCIAL DUMP TRUCK CAN HOLD 10-14 CUBIC YARDS OF DIRT VOLUME.

GEOTECHNICAL ENGINEER	
DAVID R. JAROSZ, II RCE 60185, RGE 2698	DATE

IMPERVIOUS AREA		
	PRE-PROJECT	POST PROJECT
AREA	6,107 SQ. FT.	6,107 SQ. FT.

SCALING OBJECTS LEGEND

- CELL TOWER POLE
- POWER POLE
- EXISTING WATER TANK
- CHAIN LINK FENCE

LEGEND

- EXISTING CABLE TELEVISION
- EXISTING CELL PHONE
- EXISTING EDGE OF PAVEMENT
- EXISTING ELECTRICAL
- EXISTING FENCE
- EXISTING OVERHEAD CABLES/WIRES
- EXISTING STORM DRAIN
- EXISTING TELEPHONE/COMMUNICATION
- EXISTING WATER
- PROPERTY LINE
- PROPOSED GUARDRAIL
- PROPOSED LIMITS OF GRADING
- EXISTING CONCRETE
- PROPOSED CONCRETE
- EXISTING SPOT ELEVATION
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED CONTOUR
- EXISTING DIRECTION OF DRAINAGE FLOW

ABBREVIATIONS

AC	ASPHALT CONCRETE
AB	AGGREGATE BASE
CB	CATCH BASIN
CI	CAST IRON
CONC	CONCRETE
CU. YD.	CUBIC YARD(S)
CWS	CALIFORNIA WATER SERVICE
(E)	EXISTING
EL.	ELEVATION
EP	EDGE OF PAVEMENT
FH	FIRE HYDRANT
GB	GROUND BOX
HORIZ.	HORIZONTAL
IBC	INTERNATIONAL BUILDING CODE
L	LENGTH
(N)	NEW/PROPOSED
NEC	NATIONAL ELECTRIC CODE
N.T.S.	NOT TO SCALE
SD	STORM DRAIN
STL	STEEL
SQ. FT.	SQUARE FEET
TYP.	TYPICAL
UMC	UNIFORM MECHANICAL CODE
UPC	UNIFORM PLUMBING CODE
W	WIDTH
VERT.	VERTICAL
VOL.	VOLUME

5.2 GRADING PLAN

ENGINEERING

CALIFORNIA WATER SERVICE

DEPARTMENT

REVISIONS:

R1 3/28/2017 CITY OF SAN CARLOS PLANNING DIVISION, BUILDING DIVISION, FIRE DEPARTMENT & PUBLIC WORKS COMMENTS P.R. AUGUST 2016
R2 REVISED PIPING & TIE IN TO EXISTING TANK PER CITY OF SAN CARLOS PUBLIC WORKS COMMENTS APRIL 2017 4/18/2017 W.R.

	DATE:	INIT.
DISTRIBUTION MAP		
PLAT SHEET		
SYSTEM SCHEMATIC	X	
STATION SCHEMATIC	X	

PLAT SHEET NO.: SC 26-24
SCALE: 1" = 10'
DRAWN BY: P. ROMO
DESIGNED BY: M. FRANCIS
CHECKED BY: DATE: 6/16/2017
APPROVED BY: DATE: 6/16/17

REGISTERED PROFESSIONAL ENGINEER ERIN MAUREEN MCCAULEY No. C68004 CIVIL STATE OF CALIFORNIA

TITLE:
MID PENINSULA STATION 115
PROPOSED 350,000 GAL. STORAGE TANK
GRADING PLAN

DISTRICT: MID PENINSULA
SAN CARLOS
DATE: 7/21/2016
PROJECT ID.: 00060861
DRAWING NO.: MPS-5241 R2
SHT 1 OF 3

Stephanie O'Rourke
Landscape Reflections
1345 Howard Ave. #203
Burlingame, Calif. 94010
(650) 347-2499
C27 777808

SCOPE OF WORK

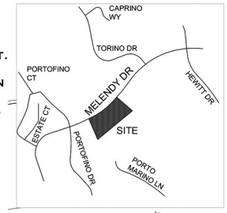
1. PLANT NEW TREES TO SCREEN THE NEW WATER STORAGE TANK
2. NEW IRRIGATION FOR NEW PLANTS
3. NEW MULCH
4. NEW SOIL

ALL DISTANCES AND DIMENSIONS ARE IN FEET AND DECIMALS OF A FOOT.

UNDERGROUND UTILITY LOCATION IS BASED ON SURFACE EVIDENCE.

BUILDING FOOTPRINTS ARE SHOWN AT GROUND LEVEL.

FINISH FLOOR ELEVATIONS ARE TAKEN AT DOOR THRESHOLD (EXTERIOR)



EASEMENT NOTE

A CURRENT TITLE REPORT FOR THE SUBJECT PROPERTY HAS NOT BEEN EXAMINED BY LEA & BRAZE ENGINEERING, INC. EASEMENTS OF RECORD MAY EXIST THAT ARE NOT SHOWN ON THIS MAP. EASEMENTS SHOWN ARE PER (53 MAPS 26), (66 MAPS 23) & (47 MAPS 1).

PLANT LEGEND

SHRUBS

INTIAL SIZE	WUCOL ITEM	HEIGHT	WATER	QT.	SYMBOLS
8"	1.GCN-ARCTOSTAPHYLOS UVA URSI 'POINT REYES'	3'	LOW	5 GAL-5	
12"	2.SNA-CEANOTHUS MARITIMUS 'JOYCE COULTER	2'	LOW	5 GAL-11	
16"	3.SA- CALLISTEMON VIMINALIS BOTTLE BRUSH	15'	LOW	5 GAL-3	
18"	4.S-CISTUS X BENNETT WHITE	4-6'	LOW	5 GAL-6	
3'	5.S-DODONAEA VISCOSA 'PURPUREA'	8-10'	LOW	5 GAL-10	
2'	6.S-OLEANDER PINK FIRE RESIST	6-19'	LOW	5 GAL-5	
2'	7.S-PLUMBAGO AURICULATA CAPE PLUMBAGO	6- 10'	LOW	1 GAL-3	
6"	8.GCS ROSEMARINUS OFFICINALIS 'HUNTINGTON CARPET 'ROSEMARY	12"	LOW	1 GAL-14	

TREES

6'	9.SNA-TOYON HETEROMELES ARBUTIFOLIA	10'-20'	LOW	15 GAL -4	
6'	10.T-DEODARA CEDAR 'CEDRUS MONKINN'	40'	LOW	15 GAL -13	
7'	11. TN-QUERCUS AGRIFOLIA COAST OAK	35-70'	LOW	15 GAL-10	

TREE TOTAL -27

NOTES

1. DIG EACH HOLE AS CLOSE AS POSSIBLE TO THE LOCATION MARKED ON PLANS WHERE SOIL OR ROCKS WILL ALLOW .
2. NEW IRRIGATION FOR NEW PLANTS- SEE IRRIGATION NOTES.
3. NEW MULCH - ADD GORILLA HAIR MULCH 2"
4. NEW SOIL- USE ESSENTIAL SOIL
5. ADD DRAIN ROCK UNDER EACH NEW TREE.
6. DIG EACH HOLE TWICE AS WIDE AND DEEP AS PLANT.
7. REMOVE STUMPS PER ARBORIST RECOMMENDATION.

MELENDY WATER STORAGE TANK
SAN CARLOS,CA.

5.3 LANDSCAPE PLAN

Oct. 13, 2018
PAPER SIZE 24X36
SCALE 1/16"=1'

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5.4.1 : View 1A – Existing

5.4.2: View 1B – Year 1

5.4.3: View 1C – Year 12

5.4.4: View 1D – Year 12 with Outline

5.4.5: View 2A – Existing

5.4.6: View 2B – Year 1

5.4.7: View 2C – Year 12

5.4.8: View 2D – Year 12 with Outline

5.4.9: View 3A – Existing

5.4.10: View 3B – Year 1

5.4.11: View 3C – Year 12

5.4.12: View 3D – Year 12 with Outline

Sources

Aber, James S, et al. *Small-Format Aerial Photography*. Elsevier, 2010. *ScienceDirect*, <www.sciencedirect.com/science/article/pii/B9780444532602100031>

SelecTree. "*Cedrus deodara* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/cedrus-deodara>

SelecTree. "*Heteromeles arbutifolia* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/heteromeles-arbutifolia>

SelecTree. "*Prunus ilicifolia* subsp. *lyonii* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/prunus-ilicifolia-lyonii>

SelecTree. "*Quercus agrifolia* Tree Record." 1995-2018. Nov 28, 2018. <https://selectree.calpoly.edu/tree-detail/quercus-agrifolia>

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Appendix B: Biological Resources Species Tables

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Table 1. Special-Status Plant Species That Occur within a 5-Mile Radius of the Project Site Potential to Occur on the Site

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
Arcuate bush-mallow (*Malacothamnus arcuatus*)	1B.2	Endemic to California. Found in Santa Clara, Santa Cruz, and San Mateo counties.	Arcuate bush-mallow is found growing in gravelly alluvium substrates in chaparral and cismontane woodland habitats. It occurs at elevations between 50 and 1,160 feet.	April – September	**None.** Six CNDDB occurrences for arcuate bush mallow have been documented within 5 miles of the project site. There is no suitable habitat for this species on the site, and it was not observed during the June, 2017 site visit.
Bent-flowered fiddleneck (*Amsinckia lunaris*)	1B.2	Endemic to California. Found in Alameda, Contra Costa, Colusa, Lake, Marin, Napa, San Benito, Santa Clara, Santa Cruz, San Mateo, Sonoma, and Yolo counties.	Bent-flowered fiddleneck occurs in coastal bluff scrub, cismontane woodland, and valley and foothill grassland habitats. It occurs at elevations from near sea level to 1,640 feet.	March – June	**Low.** One CNDDB occurrence for bent-flowered fiddleneck has been documented within 5 miles of the project site. The valley and foothill grassland on the project site is degraded by fill soils, invasive plants and urban development.
Choris' popcorn-flower (*Plagiobothrys chorisianus var. chorisianus*)	1B.2	Endemic to California. Found in Alameda, Monterey, Santa Clara, Santa Cruz, San Francisco, and San Mateo counties.	Choris' popcorn-flower grows in mesic chaparral, coastal prairie, and coastal scrub habitats. It occurs at elevations between 50 and 520 feet.	March – June	**None.** One CNDDB occurrence for Choris' popcorn-flower has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Coastal marsh milk-vetch (*Astragalus pyncostachyus var. pynchostachyus*)	1B.2	Endemic to California. Found in Humboldt, Marin, and San Mateo counties.	Coastal marsh milk-vetch is found in mesic coastal dune, and in coastal scrub, and coastal marsh and swamp habitats. It occurs at elevations from sea level to approximately 100 feet.	April – October	**None.** One CNDDB occurrence for coastal marsh milk-vetch has been documented within 5 miles of the project site. No suitable habitat for this species is present on the site and the site is outside of this species known elevation range.

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
Crystal Springs lessingia (*Lessingia arachnoidea*)	1B.2	Endemic to California. Known only near the Crystal Springs Reservoir in San Mateo County. May occur in Sonoma County, but these occurrences need taxonomic verification.	Crystal Springs lessingia grows in cismontane woodland, coastal scrub, and valley and foothill grassland habitat. It often occurs in serpentinite soils and along roadsides. It occurs at elevations between 20 and 650 feet.	July – October	**None.** Four CNDDB occurrences for crystal springs lessingia have been documented within 5 miles of the project site. There is no suitable habitat for this species on the site.
Crystal Springs fountain thistle (*Cirsium fontinale* var. *fontinale*)	FE CE 1B.1	Endemic to California. Known only near the Crystal Springs Reservoir in San Mateo County.	Crystal Springs fountain thistle is found in serpentinite seeps in openings in chaparral, cismontane woodland, and valley and foothill grassland habitats. It occurs at elevations from 150 to 570 feet.	May – October	**None.** Five CNDDB occurrences for crystal springs fountain thistle have been documented within 5 miles of the project site. There are no serpentinite seeps on the project site.
Fragrant fritillary (*Fritillaria liliacea*)	1B.2	Endemic to California. Found in Alameda, Contra Costa, Monterey, Marin, San Benito, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma counties.	Fragrant fritillary is often found on serpentine in cismontane woodland, coastal scrub, valley and foothill grassland, and coastal prairie habitats. It occurs at elevations below 1,350 feet, usually on clay soils.	February – April	**None.** Five CNDDB occurrences for fragrant fritillary have been documented within 5 miles of the project site. There is no suitable habitat for this species on the site.
Franciscan onion (*Allium peninsulare* var. *franciscanum*)	1B.2	Endemic to California. Found in Mendocino, Santa Clara, San Mateo, and Sonoma counties.	Franciscan onion is found in clay, volcanic or serpentinite soils in cismontane woodland and valley and foothill grassland habitats. It occurs at elevations from approximately 170 to 980 feet.	May – June	**None.** Nine CNDDB occurrences for Franciscan onion have been documented within 5 miles of the project site. Marginally suitable habitat for this species is present at the site. There is no suitable habitat for this species on the site.

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
Kings Mountain manzanita (*Arctostaphylos regismontana*)	1B.2	Endemic to California. Found in Santa Clara, Santa Cruz, and San Mateo counties.	Kings Mountain manzanita occurs in granitic or sandstone soils in broad-leafed upland forest, chaparral, and north coast coniferous forest habitats. It occurs at elevations from approximately 1,000 to 2,400 feet.	January – April	**None.** Five CNDDB occurrences for Kings Mountain manzanita have been documented within 5 miles of the project site. No suitable habitat for this species is present on the site and it was not observed during the June, 2017 site survey.
Marin western flax (*Hesperolinon congestum*)	FT CT 1B.1	Endemic to California. Found in Marin, San Francisco, and San Mateo counties.	Marin western flax occurs in serpentine soils in chaparral and valley and foothill grassland habitats. It occurs at elevations below 1,213 feet.	April – July	**None.** Eight CNDDB occurrences for Marin western flax have been documented within 5 miles of the project site. There is no suitable habitat for this species on the site.
Point Reyes salty bird's-beak (*Chloropyron maritimum* ssp. *Palustre*)	1B.2	Endemic to California. Found in Humboldt, Marin, San Francisco, and Sonoma counties.	Point Reyes bird's-beak is found in coastal salt marshes and swamps. It occurs at elevations below 30 feet.	June – October	**None.** Two CNDDB occurrences for Point Reyes salty bird's beak have been documented within 5 miles of the project site, however they are "possibly extirpated". No suitable habitat for this species is present on the project site. In addition, the site is outside this species known elevation range.
Saline clover (*Trifolium hydrophilum*)	1B.2	Endemic to California. Found in Alameda, Colusa, Monterey, Napa, San Benito, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma counties.	Saline clover occurs in marshes and swamps, mesic and alkaline valley and foothill grassland, and in vernal pool habitats. Many previously extant sites are thought likely to be extirpated. It occurs at elevations below 1,000 feet.	April – June	**None.** One CNDDB occurrence for saline clover has been documented within 5 miles of the project site. No suitable habitat for this species is present on the site.

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
San Francisco campion (*Silene verecunda* ssp. *Verecunda*)	1B.2	Endemic to California. Found in Santa Cruz, San Francisco, San Mateo, and Sutter counties.	San Francisco campion is found in sandy soils in coastal bluff scrub, chaparral, coastal prairie, coastal scrub, and valley and foothill grassland habitats. It occurs at elevations between 100 and 2,100 feet.	March – August	**None.** One CNDDB occurrence for San Francisco campion has been documented within 5 miles of the project site but it is "possibly extirpated". There is no suitable habitat for this species on the project site.
San Francisco collinsia (*Collinsia multicolor*)	1B.2	Endemic to California. Found in Monterey, Marin, Santa Clara, Santa Cruz, San Francisco, and San Mateo counties.	San Francisco collinsia is found in closed-cone coniferous forest and coastal scrub habitats, sometimes in serpentinite soils. It occurs at elevations from approximately 100 to 820 feet.	March – May	**Low.** Two CNDDB occurrences for San Francisco collinsia have been documented within 5 miles of the project site. The coastal scrub habitat near the project site is degraded by fill soils, invasive plants and urban development.
San Francisco owl's clover. (*Triphysaria floribunda*)	1B.2	Endemic to California. Found in Marin, San Mateo, and San Francisco counties.	San Francisco owl's clover usually occurs in serpentinite soils in coastal prairie, coastal scrub, and valley and foothill grassland habitat. It occurs at elevations from approximately 30 to 520 feet.	April – June	**None.** Two CNDDB occurrence for San Francisco owl's clover have been documented within 5 miles of the project site; however one has been extirpated and the other was last seen in 1903. There is no suitable habitat for this species on the project site.
San Mateo thorn-mint (*Acanthomintha duttonii*)	FE SE 1B.1	Endemic to San Mateo County.	San Mateo thorn-mint grows in serpentinite soils in valley and foothill grassland and chaparral habitats. It occurs at elevations between 160 and 980 feet.	April – June	**None.** Five CNDDB occurrences for San Mateo thorn-mint have been documented within 5 miles of the project site, although two these are "extirpated" or "possibly extirpated". There is no suitable habitat for this species on the project site.

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
San Mateo woolly sunflower (*Eriophyllum latilobum*)	FE CE 1B.1	Endemic to San Mateo County.	San Mateo woolly sunflower is found growing in cismontane woodland habitats often on serpentinite soils and on roadcuts. It is known from two extant occurrences. It occurs at elevations between 150 and 500 feet.	May – June	**None.** One CNDDB occurrences for San Mateo thorn-mint has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Western leatherwood (*Dirca occidentalis*)	1B.2	Endemic to California. Found in Alameda, Contra Costa, Marin, Santa Clara, San Mateo, and Sonoma counties.	Western leatherwood is found in mesic habitats including broad-leafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, north coast coniferous forest, and riparian forest and woodland. It occurs at elevations from approximately 80 to 1,400 feet.	January – April	**None.** Seven CNDDB occurrences for western leatherwood have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
White-rayed pentachaeta (*Pentachaeta bellidiflora*)	FE CE 1B.1	Endemic to California. Found in San Mateo County. Thought to be extirpated from Marin and Santa Cruz counties.	White-rayed pentachaeta grows in cismontane woodland and valley and foothill grassland habitats and is often in serpentinite soils. It occurs at elevations between 100 to 2,000 feet.	March – May	**None.** Two CNDDB occurrences for white-rayed pentachaeta have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
Woodland woolythreads (*Monolopia gracilens*)	1B.2	Endemic to California. Found in Alameda, Contra Costa, Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo, and San Mateo counties.	Woodland woolythreads grows in serpentine soils in openings in broad-leafed upland forests, openings in chaparral, cismontane woodlands, north coast coniferous forests, and valley foothill grassland habitats. It occurs at elevations between 330 and 4,000 feet.	February – July	**None.** Three CNDDB occurrences for woodland woolythreads have been documented within 5 miles of the project site. There is no suitable habitat for this species on the site.

Species Name	Federal, State, and CNPS Listing Status[1]	Geographic Distribution	Habitat Preferences and Elevation Range	Blooming Period	Potential to Occur[2]
[1] Status explanations: **Federal:** FE = Listed as endangered under the Federal Endangered Species Act. FT = Listed as threatened under the Federal Endangered Species Act. **State:** CE = Listed as endangered under the California Endangered Species Act. CT = Listed as threatened under the California Endangered Species Act. CR = Listed as rare in California. **Calfornia Rare Plant Rank:** Rank 1A = Presumed extinct in California; Rank 1B = Rare, threatened, or endangered in California and elsewhere; Rank 2A = Plants presumed extirpated in California, but more common elsewhere; Rank 2B: Rare, threatened, or endangered in California, but more common elsewhere; .1 = Seriously endangered in California .2 = Fairly endangered in California .3 = Not very endangered in California			[2] Potential Occurrence explanations: **Present:** Species was observed on the project site, or recent species records (within five years) from literature are known within the project area. **High:** The CNDDB or other reputable documents record the occurrence of the species off-site, but within a 5-mile radius of the project area and within the last 10 years. Highly suitable habitat is present within the project area. **Moderate:** Species does not meet all terms of High or Low category. For example, CNDDB or other reputable documents may record the occurrence of the species near but beyond a 5-mile radius of the project area, or some of the components representing suitable habitat are present within or adjacent to the project area, but the habitat is substantially degraded or fragmented. **Low:** The CNDDB or other documents may not record or may record few occurrences of the species within a 5-mile radius of the project area. Few components of suitable habitat are present within or adjacent to the project area. **None:** CNDDB or other documents do not record the occurrence of the species within or reasonably near the project area and within the last 10 years, and no or extremely few components of suitable habitat are present within or adjacent to the project area; or the project area is outside of specie's known geographic and/or elevation range.		

<u>Plant Species that Don't meet the Definition for Special-status Species</u>

Methuselah's beard lichen, *Usnea longissima,* CRPR 4.2

Table 2. Special-Status Wildlife Species within a 5-Mile Radius of the Project Site Potential to Occur on the Site

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
Invertebrates				
Bay checkerspot butterfly (*Euphydryas editha bayensis*)	FT	Restricted to native grasslands on outcrops of serpentine soil Santa Clara and San Mateo Counties, California.	Bay checkerspot butterfly is found in shallow, serpentine-derived soils in native grasslands supporting larval host plants, including dwarf plantain (*Plantago erecta*) or purple owl's clover (*Castilleja densiflora* or *Castilleja exserta*).	**None.** There are four CNDDB occurrences for Bay checkerspot butterfly within 5 miles of the project site, but only one is "presumed extant". There is no suitable habitat for this species on the project site.
Myrtle's silverspot (*Speyeria zerene myrtleae*)	FE	Currently only found in northwestern Marin County, including Point Reyes National Seashore, and southwestern Sonoma County.	Myrtle's silverspot is coastal dune or prairie habitat. Females lay their eggs on the debris and dried stemps of hooked spur violet (*Viola adunca*). Adult butterflies are typically found in areas that are sheltered from wind below 810 feet in elevation and within 3 miles of the coast. Adult flight season ranges from late June to early September. Adults feed on nectar from flowers, including hairy gumweed (*Grindelia hirsutula*), coastal sand verbena (*Abronia latifolia*), mints (*Monardella* spp.), bull thistle (*Cirsium vulgare*), and seaside fleabane (*Erigeron glaucus*).	**None.** One CNDDB occurrence for Myrtle's silverspot has been documented within 5 miles of the project site, but it is listed as "extirpated". There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
Fish				
Longfin smelt (*Spirinchus thaleichthys*)	FC CT CSSC	Found in nearshore coastal environments from San Francisco Bay north to Lake Earl, near the Oregon Border. Specifically, found in the Sacramento-San Joaquin Delta, San Pablo Bay, San Francisco Bay, the Gulf of Farallones, the Humboldt Bay, and the Eel River estuary.	Longfin smelt is found in open waters of estuaries, mostly in the middle or bottom of the water column. It prefers salinities of 15 to 30 parts per thousand, but it can be found in completely freshwater to almost pure saltwater.	**None.** One CNDDB occurrence for longfin smelt has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Amphibians				
California giant salamander (*Dicamptodon ensatus*)	CSSC	Known from wet coastal forests near streams and seeps from Mendocino County south to Monterey County and east to Napa County.	Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.	**None.** One CNDDB occurrence for California giant salamander has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
California red-legged frog (*Rana draytonii*)	FT CSSC	Found from Riverside County to Mendocino County along the Coast Range, from Calaveras County to Butte County in the Sierra Nevada, and in Baja California.	California red-legged frog is found in lowlands and foothills in or near permanent sources of deep water. It prefers shorelines with extensive vegetation since it disperses far during and after rain. Larvae require 11-12 weeks of permanent water for development.	**None** There are 14 CNDDB occurrences for California red-legged frog within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
California tiger salamander (*Ambystoma californiense*)	FT CT CSSC	Found in the Coast Range and Sierra Nevada foothills of California. In the Coast Range, it occurs from southern San Mateo County south to central San Luis Obispo County, and also in the vicinity of northwestern Santa Barbara County. In the Sierra Nevada foothills, it occurs from northern Yolo County to northwestern Kern County and northern Tulare County.	California tiger salamander are found in grasslands and open oak woodlands. Necessary habitat components for this species include California ground squirrel (*Otospermophilus beecheyi*) or gopher burrows for underground retreats and breeding ponds, such as seasonal wetlands, vernal pools, or slow moving streams that do not support predatory fish or frog populations.	**None.** One CNDDB occurrences for California tiger salamander has been documented within 5 miles of the project site, but it is "possibly extirpated". There is no suitable habitat for this species on the project site.
Santa Cruz black salamander (*Aneides niger*)	CSSC	Found in mixed deciduous and coniferous woodlands and coastal grasslands in San Mateo, Santa Cruz, and Santa Clara counties.	Adults found under rocks, talus, and damp woody debris.	**None.** One CNDDB occurrences for Santa Cruz black salamander has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Reptiles				
Western pond turtle (*Emys marmorata*)	CSSC	Found from Baja California, Mexico north through Klickitat County, Washington. In California, found west of the Sierra-Cascade crest. Absent from desert regions, except the Mojave Desert along the Mojave River and its tributaries.	Western pond turtle requires permanent or nearly permanent bodies of water including ponds, marshes, rivers, streams, and irrigation ditches. It requires basking sites, such as submerged rocks, logs, open mud banks, or floating vegetation mats. This species also requires sandy banks or grassy open fields up to 0.5 kilometers from the water's edge for egg laying.	**None.** There are six CNDDB occurrences for western pond turtle within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
San Francisco garter snake (*Thamnophlis sirtalis tetrataenia*)	FE CE	Historically, occurred in scattered wetland areas on the San Francisco Peninsula from approximately the San Francisco County line south along the eastern and western bases of the Santa Cruz Mountains. Found at least from the Upper Crystal Springs Reservoir in San Mateo County south to Año Nuevo State Reserve in Santa Cruz County. Currently, although the geographical distribution may remain the same, reliable information regarding specific locations and population status is not available. Much of the remaining suitable habitat is located on private property that has not been surveyed for the presence of the snake.	San Francisco garter snake is a highly aquatic species that is found in or near densely vegetated freshwater ponds with adjacent open hillsides where they can bask, feed, and find cover in rodent burrows.	**None.** There are six CNDDB occurrences for San Francisco garter snake within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
Birds				
Alameda song sparrow (*Melospiza melodia pusillula*)	CSSC	Restricted to the tidal marshes on the fringes of the south San Francisco Bay.	Alameda song sparrow is a resident of salt marshes bordering the south arm of the San Francisco Bay. It prefers tidally influenced habitats. This species is found in all relatively large marshes (e.g., Dumbarton Marsh, Palo Alto Baylands) and in most remnant patches of marsh vegetation along sloughs, dikes, and levees, including some highly disturbed and urbanized sites. Vegetation is required for nesting sites, song perches, and concealment from predators. In addition, Alameda song sparrow requires some upper marsh vegetation for nesting in order to ensure the nests remain dry during high tide.	**None.** Seven CNDDB occurrences for Alameda song sparrow have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
American peregrine falcon (*Falco peregrinus anatum*)	CFP	Occurs throughout the Central Valley, coastal areas, and northern mountains of California.	American peregrine falcon uses steep cliffs and buildings for nesting. It forages over a variety of habitats, especially wetlands.	**None.** One CNDDB occurrence for American peregrine falcon has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
California black rail (*Laterallus jamaicensis coturniculus*)	ST CFP	The majority found in the tidal salt marshes of the northern San Francisco Bay region, primarily in San Pablo and Suisun Bays. Smaller populations occur in San Francisco Bay, the Outer Coast of Marin County, freshwater marshes in the foothills of the Sierra Nevada, and in the Colorado River Area.	California black rail is found in marshlands with unrestricted tidal influence (estuarine, intertidal, emergent, or regularly flooded). It prefers areas dominated by pickleweed (*Salicornia virginica*), bulrushes (*Scirpus* sp.), matted salt grass (*Distichilis spicata*), and other marsh vegetation.	**None.** One CNDDB occurrence for California black rail has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
California least tern (*Sternula antillarum browni*)	FE CE	Nests along the coast from San Francisco Bay south to Northern Baja California.	California least tern forages primarily in shallow estuaries or lagoons where small fish are abundant. It nests in loose colonies in areas relatively free of human or predatory disturbance on bare or sparsely vegetated, flat substrates in sand beach, alkali flat, or landfill habitats near shallow-water feeding areas.	**None.** Two CNDDB occurrence for California least tern have been documented within 5 miles of the project site, although one occurrence is "extirpated". There is no suitable habitat for this species on the project site.
California ridgeway's rail (*Rallus obsoletus obsoletus*)	FE SE	This California endemic inhabits salt water and brackish marshes traversed by tidal sloughs in the vicinity of the San Francisco Bay.	Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	**None.** Four CNDDB occurrences for California ridgeway's rail have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Northern harrier (*Circus cyaneus*)	CSSC	Breed from sea level near the coast to at least 9,000 feet in the Glass Mountain region of Mono County.	Northern harrier is predominantly found in grassland and wetland communities; however, it uses various habitats. It nests on the ground in shrubby vegetation, usually at marsh edges.	**Low.** One CNDDB occurrences for northern harrier has been documented within 5 miles of the project site. The grassland in the project area is probably too small, hilly and urban to support this species.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
Saltmarsh common yellowthroat (*Geothylpis trichas sinuosa*)	CSSC	Found year-round in the vicinity of San Francisco Bay, from Tomales Bay in Marin County and Napa Sloughs in southern Sonoma County on the north, east to Carquinez Straight, and south to vicinity of San Jose in Santa Clara County. Historic locations of confirmed breeding include Lake Merced in San Francisco County, and Coyote Creek, Alviso, and Milpitas in Santa Clara County	Saltmarsh common yellowthroat nests and forages in fresh and saltwater marshes and seasonal wetlands. It breeds on the ground or up to 8 centimeters off the ground under the cover of dense shrubs and emergent aquatic vegetation.	**None.** Three CNDDB occurrences for saltmarsh common yellowthroat have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Short-eared owl (*Asio flammeus*)	CSSC	Found year-round in certain parts of California. Small resident populations remain in the Great Basin region and locally in the Sacramento–San Joaquin River Delta. Most recent breeding from coastal central California and the San Joaquin Valley has been episodic. Breeding in mainland southern California is exceptional and limited to years of unusual incursions.	Short-eared owl forages in open, treeless areas, such as marshes and grasslands, with elevated sites for perches and dense vegetation for roosting and nesting.	**None.** There is one CNDDB occurrence for short-eared owl within 5 miles of the project site. There is no suitable habitat for this species on the project site.
Western snowy plover (*Charadrius alexandrines nivosus*)	FT CSSC	Occurs along the entire coastline of California.	Western snowy plover is found on sandy beaches, salt pond levees, and shores of large alkali lakes. It needs sandy, gravelly, or friable soils for nesting.	**None.** Three CNDDB occurrences for western snowy plover have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
White-tailed kite (*Elanus leucurus*)	CFP	Found year-round in nearly all areas of California up to the western Sierra Nevada foothills and southeast deserts. Common in the Central Valley of California and along the entire length of the coast, possibly breeding in more arid regions east of the Sierra Nevada and Transverse Range (Inyo and eastern Kern Counties). Documented breeding in Imperial County, western Riverside County, and eastern San Diego County. In the Sacramento Valley, populations have predominantly increased in irrigated agricultural areas where the California vole (*Microtus californicus*) often occurs.	White-tailed kite nests in rolling foothills or valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. It forages in open grasslands, meadows, or marshes with perching sites.	**Low.** Three CNDDB occurrences for white-tailed kite have been documented within 5 miles of the project site. Habitat for this species is marginal in the project area because there is no open habitat and it is fairly urban.
Mammals				
Pallid bat (*Antrozous pallidus*)	CSSC	Common throughout low elevations of California. Not found in the high Sierra from Shasta to Kern counties and the northwestern corner of the State from Del Norte and western Siskiyou counties to northern Mendocino County.	Pallid bat is uncommon, especially in urban areas. This species roosts in caves and large trees and forages in grasslands and oak savannah. It is most common in open, dry habitats with rocky areas for roosting.	**Low.** Two CNDDB occurrences for pallid bat have been documented within 5 miles of the project site. Trees are present in the project area that could provide roosting habitat for pallid bat; however, this habitat is marginal since it is fairly urban.
Saltmarsh harvest mouse (*Reithrodontomys raviventris*)	FE CE CFP	Occurs only in the saline emergent wetlands of the San Francisco Bay and its tributaries.	Saltmarsh harvest mouse is only found in saline emergent wetlands in the San Francisco Bay and its tributaries. It uses pickleweed as its primary cover. It also uses non-submerged, salt-tolerant vegetation for escape during extremely high tides.	**None.** Four CNDDB occurrence for saltmarsh harvest mouse have been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]
Saltmarsh wandering shrew (*Sorex vagrans halicoetes*)	CSSC	Endemic to the salt marshes of the south arm of the San Francisco Bay in San Mateo, Santa Clara, Alameda, and Contra Costa counties.	Saltmarsh wandering shrew is most frequently found in salt marshes that provide dense cover and have abundant sources of invertebrates for food and continuous ground moisture.	**None.** One CNDDB occurrence for saltmarsh wandering shrew has been documented within 5 miles of the project site. There is no suitable habitat for this species on the project site.
San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*)	CSSC	Found throughout the San Francisco Bay area in grasslands, scrub and wooded areas.	San Francisco dusky-footed woodrat is found in forest and scrub habitats of moderate canopy and moderate dense understory.	**Low.** Three CNDDB occurrences for San Francisco dusky-footed woodrat have been documented within 5 miles of the project site. Habitat for this species is marginal in the project area since it is fairly urban and there are no creeks nearby. No woodrat houses were observed during the June, 2017 site visit.
Townsend's big-eared bat (*Corynorhinus townsendii*)	CPT CSSC	Found throughout California, but details of its distribution are not well known. Found in all but subalpine and alpine habitats.	Townsend's big-eared bat roosts in caves, mines, and large trees. It forages within woodlands and along stream edges. This species is extremely sensitive to human disturbance.	**Low.** One CNDDB occurrences for Townsend's big-eared bat has been documented within 5 miles of the project site. Some low-quality roosting habitat for this species is present in the project area. This habitat is considered low-quality due to the urban nature of the area.

Species Name	Federal and State Listing Status[1]	Geographic Distribution	Habitat Requirements	Potential to Occur[2]

[1] Status explanations:

Federal:

FE = Listed as endangered under the Federal Endangered Species Act.

FT = Listed as threatened under the Federal Endangered Species Act.

FC = Candidate species to be listed under the Federal Endangered Species Act.

State:

CE = Listed as endangered under the California Endangered Species Act.

CT = Listed as threatened under the California Endangered Species Act.

CPT = Proposed as threatened under the California Endangered Species Act.

CSSC = Species of Special Concern designated by California Department of Fish and Wildlife.

CFP = Fully Protected Species under California Fish and Game Code.

[2] Potential Occurrence explanations (also see Section 3.2.2):

Present: Species was observed on the project site, or recent species records (within five years) from literature are known within the project area.

High: The CNDDB or other reputable documents record the occurrence of the species off-site, but within a 5-mile radius of the project area and within the last 10 years. Highly suitable habitat is present within the project area.

Moderate: Species does not meet all terms of High or Low category. For example, CNDDB or other reputable documents may record the occurrence of the species near but beyond a 5-mile radius of the project area, or some of the components representing suitable habitat are present within or adjacent to the project area, but the habitat is substantially degraded or fragmented.

Low: The CNDDB or other documents may not record or may record few occurrences of the species within a 5-mile radius of the project area. Few components of suitable habitat are present within or adjacent to the project area.

None: CNDDB or other documents do not record the occurrence of the species within or reasonably near the project area and within the last 10 years, and no or extremely few components of suitable habitat are present within or adjacent to the project area; or the project area is outside of specie's known geographic and/or elevation range.

Species listed in the CNDDB that don't meet the definition for special-status species

Obscure bumblebee, *Bombus caliginosus*
Western bumblebee, *Bombus occidentalis*
Stage's dufourine bee, *Dufourea stagei*
Rickseeker's water scavenger beetle, *Hydrochara rickseckeri*
Edgewood blind harvestan, *Calicina minor*
Edgewood Park micro-blind harvestman, *Microcina edgewoodensis*
Mimic tryonia, *Tryonia imitator*
Great blue heron, *Ardea herodias*
Double-crested cormorant, *Phalacrocorax auritus*
Santa Cruz kangaroo rat, *Dipodomys venustus venustus*
Hoary bat, *Lasiurus cinereus*

Appendix C: Cultural Tribal Correspondence

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CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

ALAMEDA
COLUSA
CONTRA COSTA
DEL NORTE
HUMBOLDT
LAKE
MARIN
MENDOCINO
MONTEREY
NAPA
SAN BENITO
SAN FRANCISCO
SAN MATEO
SANTA CLATA
SANTA CRUZ
SOLANO
SONOMA
YOLO

Northwest Information Center
Sonoma State University
150 Professional Center Drive, Suite E
Rohnert Park, California 94928-3609
Tel: 707.588.8455
nwic@sonoma.edu
http://www.sonoma.edu/nwic

6/22/2017 NWIC File No.: 16-2020

Robert Templar
MIG
2635 North 1st Street, Suite 149
San Jose, CA 95134

re: Melendy Water Tank Project 16103

The Northwest Information Center received your record search request for the project area referenced above, located on the Woodside USGS 7.5' quad. The following reflects the results of the records search for the project area and a 0.5 mile radius:

Resources within project area:	None
Resources within 0.5 mile radius:	None
Reports within project area:	S-36205.
Reports within 0.5 mile radius:	S-37276, 3050, & 3097.
Other Reports within records search radius:	S-848, 3054, 9462, 9580, 9583, 17773, 18217, 30204, 32596, & 33600. These reports are classified as Other Reports; reports with little or no field work or missing maps. The electronic maps do not depict study areas for these reports, however a list of these reports has been provided. In addition, you have not been charged any fees associated with these studies.

Resource Database Printout (list): ☐ enclosed ☒ not requested ☐ nothing listed

Resource Database Printout (details): ☐ enclosed ☒ not requested ☐ nothing listed

Resource Digital Database Records: ☐ enclosed ☐ not requested ☒ nothing listed

Report Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (details): ☐ enclosed ☒ not requested ☐ nothing listed

Report Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Resource Record Copies: ☐ enclosed ☐ not requested ☒ nothing listed

Report Copies: ☒ enclosed ☐ not requested ☐ nothing listed

OHP Historic Properties Directory: ☒ enclosed ☐ not requested ☐ nothing listed

Archaeological Determinations of Eligibility: ☐ enclosed ☐ not requested ☒ nothing listed

CA Inventory of Historic Resources (1976):	☒ enclosed	☐ not requested	☐ nothing listed
Caltrans Bridge Survey:	☐ enclosed	☒ not requested	☐ nothing listed
Ethnographic Information:	☐ enclosed	☒ not requested	☐ nothing listed
Historical Literature:	☐ enclosed	☒ not requested	☐ nothing listed
Historical Maps:	☐ enclosed	☒ not requested	☐ nothing listed
Local Inventories:	☐ enclosed	☒ not requested	☐ nothing listed
GLO and/or Rancho Plat Maps:	☐ enclosed	☒ not requested	☐ nothing listed
Shipwreck Inventory:	☐ enclosed	☒ not requested	☐ nothing listed

*Notes:

** Current versions of these resources are available on-line:

Caltrans Bridge Survey: http://www.dot.ca.gov/hq/structur/strmaint/historic.htm

Soil Survey: http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=CA

Please forward a copy of any resulting reports from this project to the office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you do not include resource location maps and resource location descriptions in your report if the report is for public distribution. If you have any questions regarding the results presented herein, please contact the office at the phone number listed above.

The provision of CHRIS Data via this records search response does not in any way constitute public disclosure of records otherwise exempt from disclosure under the California Public Records Act or any other law, including, but not limited to, records related to archeological site information maintained by or on behalf of, or in the possession of, the State of California, Department of Parks and Recreation, State Historic Preservation Officer, Office of Historic Preservation, or the State Historical Resources Commission.

Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the CHRIS Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

Should you require any additional information for the above referenced project, reference the record search number listed above when making inquiries. Requests made after initial invoicing will result in the preparation of a separate invoice.

Thank you for using the California Historical Resources Information System (CHRIS).

Sincerely,

Lisa C. Hagel
Researcher

STATE OF CALIFORNIA Edmund G. Brown, Jr., Governor

NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
(916) 373-3710
(916) 373-5471 Fax

March 27, 2017

Robert Templar
MIG, Inc.

Sent by: rtemplar@migcom.com

RE: 2783 Melendy Drive Water Tank, San Mateo County

Dear Mr. Templar,

Attached is a list of tribes that have cultural and traditional affiliation to the area of potential project effect (APE) referenced above. I suggest you contact all of those listed, if they cannot supply information, they might recommend others with specific knowledge. The list should provide a starting place to locate areas of potential adverse impact within the APE. By contacting all those on the list, your organization will be better able to respond to claims of failure to consult, as may be required under particular state statutes. If a response has not been received within two weeks of notification, the Native American Heritage Commission (NAHC) requests that you follow-up with a telephone call to ensure that the project information has been received.

The NAHC also recommends that project proponents conduct a record search of the NAHC Sacred Lands File (SLF) at the appropriate regional archaeological Information Center of the California Historic Resources Information System (CHRIS) (http://ohp.parks.ca.gov/?page_id=1068) to determine if any tribal cultural resources are located within the area(s) affected by the proposed action. The SFL, established under Public Resources Code section 5094, are sites submitted for listing to the NAHC by California Native American tribes. The SFL, established under Public Resources Code section 5094, are sites submitted for listing to the NAHC by California Native American tribes. A record search of the SLF was completed for the APE referenced above with negative results. Please note records maintained by the NAHC and CHRIS is not exhaustive, and a negative response to these searches does not preclude the existence of tribal cultural resources. A tribe may be the only source of information regarding the existence of tribal cultural resources.

If you receive notification of change of addresses and phone numbers from any of these tribes, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact via email: frank.lienert@nahc.ca.gov

Sincerely,

Frank Lienert
Associate Governmental Program Analyst

Native American Heritage Commission
Native American Contacts
3/27/2017

Coastanoan Rumsen Carmel Tribe
Tony Cerda, Chairperson
244 E. 1st Street — Ohlone/Costanoan
Pomona , CA 91766
rumsen@aol.com
(909) 524-8041 Cell
(909) 629-6081

Amah MutsunTribal Band of Mission San Juan Bautista
Irenne Zwierlein, Chairperson
789 Canada Road — Ohlone/Costanoan
Woodside , CA 94062
amahmutsuntribal@gmail.com
(650) 851-7489 Cell
(650) 851-7747 Office
(650) 332-1526 Fax

Muwekma Ohlone Indian Tribe of the SF Bay Area
Rosemary Cambra, Chairperson
P.O. Box 360791 — Ohlone / Costanoan
Milpitas , CA 95036
muwekma@muwekma.org
(408) 314-1898
(510) 581-5194

The Ohlone Indian Tribe
Andrew Galvan
P.O. Box 3152 — Ohlone/Costanoan
Fremont , CA 94539 — Bay Miwok
chochenyo@AOL.com — Plains Miwok
(510) 882-0527 Cell — Patwin

(510) 687-9393 Fax

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
P.O. Box 28 — Ohlone/Costanoan
Hollister , CA 95024
ams@indiancanyon.org
(831) 637-4238

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code

This list is only applicable for contacting local Native Americans with regard to cultural resources assessments for the updated contact list for 2783 Melendy Drive Water Tank, San Mateo County

Example Letter

March 27, 2017

Native American Tribe
Name, Positioon
Address 1
Address 2

Subject: Melendy Drive Water Tank Construction Project.

Dear Mr/Ms. Name

I am writing to inform you of a proposed project in San Mateo County, in the City of San Carlos. A CHRIS search has been requested from the NWIC, and I am awaiting its results currently. The NAHC has been informed of this project and have completed a Sacred Lands File search with negative results.

The project site is located in the RS-6 (Single-Family Residential) Zoning District at 2783 Melendy Drive (see USGS topo map attached, showing project location and a ½ mile Area of Potential Effect). The property is contiguous to residential neighborhoods and an elementary school. There are two existing wireless facilities onsite. The site is currently developed with one existing water tank, and smaller equipment to help facilitate pumping of the water to and from the site. The proposed project is primarily comprised of the construction of a new, 350,000-gallon water tank. The project would also require site modifications; including fencing, tree removal and expansion of the curb cut. The applicant is also proposing grading to install a new electrical panel which will involve some grading onsite.

Best Management Practices (BMPs) and/or mitigation measures will be enacted to protect any unknown buried cultural and/or archaeological resources.

The project occupies portions of Township 5 South, Range 4 West. The project location is depicted on USGS Woodside 7.5 Minute Quadrangle (Attached)

If you know of any Native American tribal cultural resources in the vicinity of this project which could be affected by the implementation of the project, please do not hesitate to contact me by telephone at (650) 327-0429 x554, or by email at rtemplar@migcom.com. Thank you for your assistance in this matter. I look forward to hearing from you.
Sincerely,

Robert Templar, M.A.
Archaeologist

Attachment: USGS 7.5 Minute Quadrangle

San Carlos Melendy Water Tank 16103

Native American Proof of Postage

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REDWOOD CITY, CA 94062

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Return Receipt Fee (Endorsement Required)	$0.00
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$0.49
	$3.84

0210
15

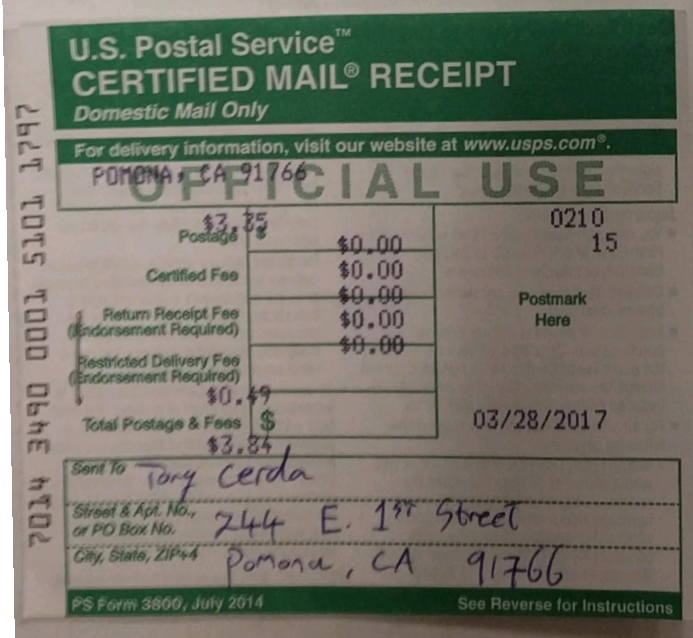
Postmark Here

03/28/2017

Sent To: Irene Zwierlein
Street & Apt. No., or PO Box No.: 789 Canada Road
City, State, ZIP+4: Woodside, CA, 94062

PS Form 3800, July 2014 — See Reverse for Instructions

7014 3490 0001 5101 1827



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Return Receipt Fee (Endorsement Required)	$0.00
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$0.49
	$3.84

0210
15

Postmark Here

03/28/2017

Sent To: Tory Cerda
Street & Apt. No., or PO Box No.: 744 E. 1st Street
City, State, ZIP+4: Pomona, CA 91766

PS Form 3800, July 2014 — See Reverse for Instructions

7014 3490 0001 5101 1797

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MILPITAS, CA 95036

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Return Receipt Fee (Endorsement Required)	$0.00
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$0.49
	$3.84

0210
15

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03/28/2017

Sent To: Rosemary Cambra
Street & Apt. No., or PO Box No.: P.O. Box 360791
City, State, ZIP+4: Milpitas, CA 95036

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7014 3490 0001 5101 1810

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HOLLISTER, CA 95024

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Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$0.49
	$3.84

0210
15

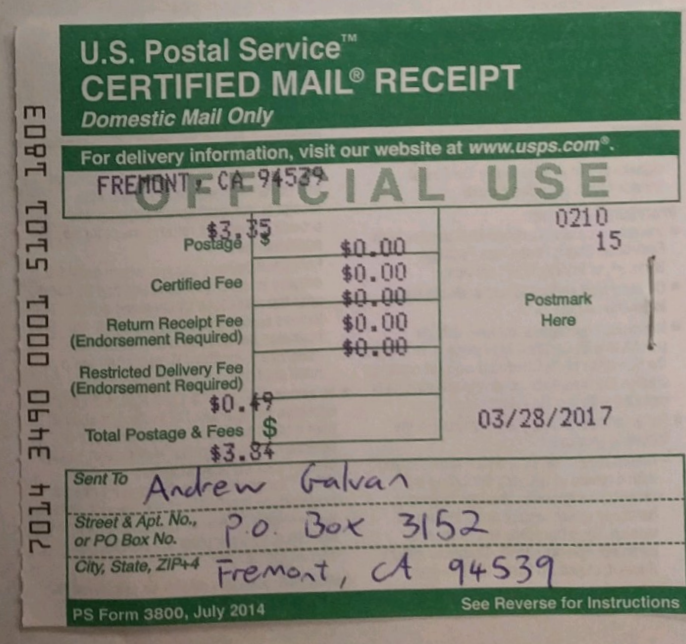
Postmark Here

03/28/2017

Sent To: Ann Marie Sayers
Street & Apt. No., or PO Box No.: P.O. Box 28
City, State, ZIP+4: Hollister, CA 95024

PS Form 3800, July 2014 — See Reverse for Instructions

7014 3490 0001 5101 1827



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FREMONT, CA 94539

OFFICIAL USE

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Return Receipt Fee (Endorsement Required)	$0.00
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$0.49
	$3.84

0210
15

Postmark Here

03/28/2017

Sent To: Andrew Galvan
Street & Apt. No., or PO Box No.: P.O. Box 3152
City, State, ZIP+4: Fremont, CA 94539

PS Form 3800, July 2014 — See Reverse for Instructions

7014 3490 0001 5101 1803

Source: ESRI 2017; USGS 2017; San Mateo County Planning 2017; MIG 2017

Project Area

0.5 Mile Area of Potential Effect

Woodside 7.5 Minute USGS Quadrangle
Township 5S Range 4W
UTM: 10S; 563983.46 Mn. East; 4149689.69 Mn. North
Scale 1:24,000

Figure 1 Project Location and APE

16103 Melendy Water Tank Project

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Appendix D: Geotechnical Reports

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Krazan & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

January 27, 2015
Revised January 24, 2017

KA Project No. 042-14011

Mr. Maurice Francis
California Water Service Co.
1720 North First Street
San Jose, California 95112

Re: Revised Seismic Requirements Addendum
Proposed Water Storage Tank
Mid Peninsula Station 115
2783 Melendy Road
San Carlos, California

Gentlemen:

In accordance with your request, we are providing this Addendum to our Geotechnical Engineering Investigation Report (KA Project No. 042-14011) dated June 17, 2014 for the above-referenced project site. This addendum provides additional information to conform with the seismic design requirements of the 2013 California Building Code (2013 CBC).

The Site Class per Section 1613 of the 2013 California Building Code (2013 CBC) and Table 20.3-1 of ASCE 7-10 is based upon the site soil conditions. Assuming that any loose surface soil and fill materials on the site are removed and compacted as recommended in our Geotechnical Engineering Investigation Report, the geologic subgrade of the site can be conservatively classified as very dense soil and soft rock, with N-values greater than 50. It is our opinion that a Site Class C is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2013 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	C	Section 1613.3.2
Site Coefficient F_a	1.000	Table 1613.3.3 (1)
S_s	2.082	Section 1613.3.1
S_{MS}	2.082	Section 1613.3.3
S_{DS}	1.388	Section 1613.3.4
Site Coefficient F_v	1.300	Table 1613.3.3 (2)

S_1	0.985	Section 1613.3.1
S_{M1}	1.281	Section 1613.3.3
S_{D1}	0.854	Section 1613.3.4

The recommendations and limitations provided in our Geotechnical Engineering Investigation Report (KA Project No. 042-14011) dated June 17, 2014 apply to this letter.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (925) 307-1160.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60485

REGISTERED PROFESSIONAL ENGINEER
DAVID R. JAROSZ II
No. 2698
EXP. JUNE 30 2018
GEOTECHNICAL
STATE OF CALIFORNIA

DRJ:ht

UPDATED
GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED WATER STORAGE TANK
MID PENINSULA STATION 115
2783 MELENDY ROAD
SAN CARLOS, CALIFORNIA

PROJECT NO. 042-14011
JUNE 17, 2014
UPDATED JANUARY 24, 2017

PREPARED FOR:

MR. ROBERT GODWIN
CALIFORNIA WATER SERVICE CO
1720 NORTH FIRST STREET
SAN JOSE, CALIFORNIA 95112

PREPARED BY:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
1061 SERPENTINE LANE, SUITE F
PLEASANTON, CALIFORNIA 94566
(925) 307-1160

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

June 17, 2014
Updated January 24, 2017

Project No. 042-14011

California Water Service Co
1720 North First Street
San Jose, California 95112

RE: Updated Geotechnical Engineering Investigation
Proposed Water Storage Tank
Mid Peninsula Station 115
2783 Melendy Road
San Carlos, California

Gentlemen:

In accordance with your request, we have completed an Updated Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions or if we may be of further assistance, please do not hesitate to contact our office at (925) 307-1160.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

David R. Jarosz, II
Managing Engineer
RCE No. 60185/RGE No. 2698

REGISTERED PROFESSIONAL ENGINEER
DAVID R. JAROSZ II
No. 2698
EXP JUNE 30 2018
GEOTECHNICAL
STATE OF CALIFORNIA

DRJ:ht

TABLE OF CONTENTS

Krazan & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

June 17, 2014
Updated January 24, 2017

Project No. 042-14011

Comment #1

UPDATED GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED WATER STORAGE TANK
MID PENINSULA STATION 115
2783 MELENDY ROAD
SAN CARLOS, CALIFORNIA

INTRODUCTION

This report presents the results of our Updated Geotechnical Engineering Investigation for the proposed Water Storage Tank Mid Peninsula Station 115 to be located at 2783 Melendy Road in San Carlos, San Mateo County, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, retaining walls, and soil cement reactivity.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A also contains a description of the laboratory testing phase of this study, along with the laboratory test results. Appendix B contains a guide to earthwork specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make Geotechnical Engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our revised proposal dated March 21, 2014 (KA Proposal No. P167-14) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling 2 borings to depths of approximately 8 and 12½ feet for evaluation of the subsurface conditions at the project site.
- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.

- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structures are unavailable. On a preliminary basis, it is understood that the proposed construction will include one 350,000 gallon steel water tank measuring approximately 45 feet in diameter by 37.7 feet tall. A pump, shelter, and related piping may be associated with the development. Footing loads are anticipated to be light to moderately heavy.

In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

The site is roughly rectangular in shape and encompasses approximately 1 acre. The site is located approximately 300 feet east of Portofino Drive just south of Melendy Road in San Carlos, California. The site is associated with the street address 2783 Melendy Road. A school is located east of the site. The remainder of the site is predominately surrounded by residential developments and vacant land.

Presently, the project site is occupied by an existing 36 foot diameter water tank with associated pipelines and utility lines within the southern portion of the site. A cellular communication tower is located in the northeastern portion of the site. The site is situated within a hillside with cut slopes approximately 16 to 18 feet high along the southwestern edge of the site. Fill and native slopes ranging from 9 to 10 feet high are located along the northern, southern and eastern edges of the site. The slopes within the project site are predominately 1.3:1 (horizontal to vertical) or flatter with approximately 10 to 100 feet of relief. The slopes are covered by a sparse to dense weed growth and the surface soils have a loose consistency. Several mature trees are located throughout the site. A guardrail and chain-link fencing surround the majority of the site. The site is relatively level with access along the northern roadway. The area of proposed development is presently covered with asphaltic concrete pavement.

Comment #2

GEOLOGIC SETTING

The subject site is located in the San Francisco Bay Region of the Coast Range Geologic Province. The Coast Range Geologic Province Borders the Coast of California and generally consists of northwesterly/southeasterly trending ridges of granitic, metavolcanic, and metasedimentary rocks. Numerous northwest to southeast trending faults parallel the trend of the Coast Ranges.

San Francisco Bay is a broad shallow depression within the Coast Ranges that has been subsequently filled with sedimentary deposits. In the vicinity of the subject site, these deposits consist of unconsolidated sediments comprised of gravel, sand, silt, and clay that underlie broad valleys and

flatlands. The sedimentary deposits vary in thickness from a few feet to about 600 feet east and west of the San Francisco Bay. More specifically, the site is underlain by the Jurassic-Cretaceous Franciscan Formation consisting of silty sands, and weathered sandstone. Three major faults are located near the site -- the San Andreas Fault Zone, the Hayward Fault Zone, and the Calaveras Fault Zone. The San Andreas Fault is located approximately 2.4 miles west of the site, and was the source of the 1906 San Francisco Earthquake. A southern extension of the Hayward Fault Zone is located approximately 16 miles east of the site. The Hayward Fault Zone is considered capable of producing an upper bound earthquake event of Richter magnitude 7.5. The last recorded movement of the Hayward Fault was in 1868. The Calaveras Fault is located approximately 23 miles east of the site, and is also considered capable of producing large earthquakes.

There are no active fault traces in the project vicinity. Accordingly, the project area is not within an Earthquake Fault Zone (Special Study Zone).

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 2 borings to depths of approximately 8 and 12½ feet below existing site grade, using a truck-mounted drill rig. The borings were terminated due to auger refusal in very dense weathered rock. The approximate boring locations are shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsoils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, expansion potential, atterberg limits, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, portions of the site were covered with pavement consisting of approximately 2½ inches of asphaltic concrete underlain by approximately 2½ inches of aggregate base. Areas not covered by pavement consisted of 6 to 12 inches of very loose gravelly silty sand. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated.

Beneath the pavement section and loose surface soils, approximately 12 inches of fill material was encountered within the borings drilled throughout the site. In addition, fill material was noted along the edges of the site. The fill material predominately consisted of silty sand and gravelly silty sand. The

thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill material during the time of our field and laboratory investigations. The limited testing indicates that the fill soils had varying strength characteristics ranging from loosely placed to compacted.

Beneath the loose surface soils and fill material, approximately 2 to 3 feet of very dense highly weathered sandstone was encountered. Field and laboratory tests suggest that these soils/rock are moderately strong and slightly compressible. Penetration resistance was on the order of 50 blows per 6 inches. A representative soil sample had an expansion index of 13.

Below approximately 3½ to 4 feet, predominately very dense weathered sandstone was encountered. Field and laboratory tests suggest that these soils/rock are moderately strong and slightly compressible. Penetration resistance was greater than 50 blows per 6 inches. These soils/rock were slightly stronger than the upper soils and extended to the termination depth of our borings.

For additional information about the soils encountered, please refer to the logs of borings in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was not encountered.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous Geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the loose surface soils, fill material, and existing development, appear to be conducive to the development of the project. The surface soils have a very loose consistency. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated. Accordingly, it is recommended that the surface soils be recompacted. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Approximately 1 to 1½ feet of fill material was encountered within the project site. The fill material predominately consisted of gravelly silty sand and silty sand. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill material during the time of our field and laboratory investigations. The limited testing indicates the fill soils had varying strength characteristics ranging from loosely placed to compacted. Therefore, it is recommended that the fill soils in the area of structures to be supported on shallow foundations be excavated and stockpiled so that the native soils can be prepared properly. Over excavation should extend to a minimum of 5 feet beyond proposed footing lines. Krazan & Associates, Inc. should be on-site during this excavation to verify no additional removal is required.

The site is presently occupied by a tank, communication tower and related structures. In addition, several structures, including existing residential dwellings, equipment, pipelines and utility lines are located within the project site vicinity. Any surface or buried structures encountered during construction should be properly removed and/or relocated. It is suspected that demolition activities of the existing structures will disturb the upper soils. Areas disturbed by demolition activities should be excavated to firm native ground. The resulting excavations should be backfilled with Engineered Fill, compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

The site is located on gently to moderately sloping terrain and underlain with varying thickness of loose and very dense soils. In order to reduce the potential for excessive total and differential settlement and provide uniform support for the planned storage tank, it is recommended that the upper 4 feet of native soils beneath the proposed tank pad area, be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that the proposed foundations be supported by a minimum of 24 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. The base width of the over-excavation should be established on the basis of a 60-degree upward projection from the bottom of the footings. Krazan & Associates should be on-site during this excavation to verify the stability of the excavation. Prior to fill placement, the exposed subgrade soils should be scarified to a depth of 6 inches, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

If a ring wall foundation is used, it is recommended that the upper 12 inches of soil beneath the tank consist of Class II aggregate base material, compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557. If a concrete slab is not utilized a 3-inch thick leveling sand or oil sand should be placed on the prepared pad for the final contact support of the flexible steel tank base. Furthermore, the tank pad should be graded to ultimately maintain floor slopes for cleaning and emptying of the tank.

For other light structures or equipment, following demolition activities, stripping operations, and fill removal, the exposed native soil beneath structural areas should be excavated to a depth of at least 24 inches, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent

above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to backfilling, the exposed subgrade should be proof-rolled to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Any buried structures, such as utilities or loosely backfilled excavations, encountered during construction should be properly removed. The resulting excavations should be cleaned to firm native soil and backfilled with Engineered Fill.

Trees and bushes are located throughout the site. Any tree and bush to be removed during construction should include roots greater than 1 inch in diameter. The resulting excavations should be cleaned to firm native ground and backfilled with Engineered Fill compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

The proposed tank site is located adjacent to gently to moderately sloping terrain. It is recommended that cut and fill slopes within the site be constructed 2:1 (horizontal to vertical) or flatter. In lieu of these slopes, retaining walls may be used. In addition, it is recommended the proposed structures be located a minimum horizontal distance of 10 feet or ⅓ the slope height away from the edge of the fill slope, whichever is greater. Permanent cut and fill slopes inclined at 2:1 (horizontal to vertical) should be grossly stable. Cut and fill slopes may be revised as recommended by the Soils Engineer upon review of a more definitive site plan.

In order to weatherize the maintenance area of the site, it is recommended the subgrade be excavated/scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned as necessary and compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. The compacted subgrade should be overlain by a minimum of 4 inches of Class 2 aggregate base compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Comment #4

An existing near vertical exposed rock face approximately 2 to 5 feet high is located on the uphill side of the driveway. Our visual inspection indicates this slope is relatively stable. If any cracking, distress in the rock is noted following a seismic event, etc., our office should be contacted for supplemental recommendations. Any erosion of the soil above the rock should be repaired as soon as possible.

Comment #3

Sandy soil conditions were encountered throughout the site. These cohesionless soils have a tendency to cave in trench excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing a conventional or a mat foundation with allowable bearing pressures of 3,500 and 2,200 psf respectively, for dead-plus-live loads. Continuous ring-wall footings, if utilized, should have a minimum embedment of 18 inches. Recommendations regarding conventional foundations and mat foundations are provided in the foundation section of this report.

Groundwater Influence on Structures/Construction

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, pump, or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of vegetation; existing utilities; structures including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish, and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Approximately 1 to 1½ feet of fill material was encountered within portions of the site. The fill material predominately consisted of silty sand and gravelly silty sand. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill material during the time of our field and laboratory investigations. The limited testing indicates the fill soils had varying strength characteristics ranging from loosely placed to compacted. Therefore, it is recommended that the fill soils in the area of structures to be supported on shallow foundations be excavated and stockpiled so that the native soils can be prepared properly. Over excavation should extend to a minimum of 5 feet beyond proposed footing lines. Krazan & Associates, Inc. should be on-site during this excavation to verify no additional removal is required.

Existing structures are located within the project site and vicinity. Any surface or buried structures encountered during construction should be properly removed and/or relocated. It is suspected that demolition activities of the existing structures will disturb the upper soils. Areas disturbed by demolition activities should be excavated to firm native soil ground. The resulting excavations should be backfilled with Engineered Fill. Excavations, depressions, or soft and pliant areas extending below planned finish subgrade level should be cleaned to firm undisturbed soil, and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

Several trees and bushes are located within the site. Any tree or bush to be removed during construction should include roots greater than 1 inch in diameter. The resulting excavations should be cleaned to firm native ground and backfilled with Engineered Fill compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

The site is located on gently to moderately sloping terrain and underlain with varying thickness of fill material, medium dense to very dense native soils and rock. In order to reduce the potential for excessive total and differential settlement and provide uniform support for the planned storage tank, it is recommended that the upper 4 feet of native soil beneath the proposed tank pad area be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that the proposed tank be supported by a minimum of 24 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. The base width of the over-excavation should be established on the basis of a 60-degree upward projection from the bottom of the footings. Krazan & Associates should be on-site during this excavation to verify the stability of the excavation. Prior to fill placement, the exposed subgrade soils should be scarified to a depth of 6 inches, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

For light structures or equipment, following stripping operations, the exposed native soil within structural areas should be excavated to a depth of at least 24 inches, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to backfilling, the exposed subgrade should be proof-rolled to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

The proposed tank site is located adjacent to gently to moderately sloping terrain. It is recommended that cut and fill slopes within the site should be constructed 2:1 (horizontal to vertical) or flatter. In lieu of these slopes, retaining walls may be used. In addition, it is recommended the proposed structures should be located a minimum horizontal distance of 10 feet or ⅓ the slope height away from the edge of the fill slope, whichever is greater. Permanent cut and fill slopes inclined at 2:1 (horizontal to vertical) should be grossly stable. Cut and fill slopes may be revised as recommended by the Soils Engineer upon review of a more definitive site plan.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Slope Construction/Reconstruction

Slopes can be constructed/reconstructed by placement of Engineered Fill utilizing a keying and benching procedure as described below. Reconstructed slopes should be constructed at an inclination not exceeding 2:1 (horizontal to vertical) slopes or flatter. Krazan and Associates, Inc. should be retained to review all slope reconstruction plans and specifications prior to initiating the repair work.

Temporary construction slopes, in the natural soil, should be constructed in accordance with Occupational Safety and Health Administration (OSHA) standards. However, in all cases, appropriate safety precautions should be provided. Construction dewatering is not expected to present problems during late summer or early fall. During these months, subsurface flow will be minimal. Although unlikely, if water is encountered it may be handled either singularly or with a combination of discing, diverting, and pumping. This office will be in a position to assist the Contractor in designing dewatering systems if the conditions at the time of construction warrant it.

General site clearing should include removal of vegetation, any loose and/or saturated materials. Excavations or depressions extending below subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill, placed and recompacted in accordance with the recommendations stated herein.

Where fills greater than 8 feet are to be constructed on original ground that slopes at inclinations steeper than 6:1 (horizontal to vertical), benches should be cut into the existing slope as the filling operations proceed. Each bench should consist of a level terrace a minimum of 8 feet wide, with the rise to the next bench held to 4 feet or less. Where fills of comparable height will be constructed on ground that slopes at an inclination steeper than 4:1 (horizontal to vertical), a keyway should be provided in addition to the benches. Each keyway should consist of a level trench at least 8 feet wide and at least 2 feet deep, with side slopes not exceeding 1:1 (horizontal to vertical), cut into the existing slope. Where fills of comparable height will be constructed on ground that slopes at an inclination steeper than 2:1 (horizontal to vertical), geotextile fabric and retaining structures should be utilized in slope construction where subsequent specific building site investigations warrant.

Permanent cut-and-fill slopes inclined at 2:1 (horizontal to vertical) should be grossly stable. If static surcharge loading is located within a horizontal distance from the brow of the slope, equal to ⅓ the slope height (H/3) or 30 feet, whichever is less, a stability analysis should be performed. Fill slopes should be constructed by over-tilling and trimming back to provide a firm, well-compacted slope face.

Slope Protection

Site grading near slopes and the embankments, including retaining walls and wing walls, should be accomplished such that excessive sheet run-off is prevented. The completed slopes should be seeded or otherwise vegetated to protect from erosion. Well-vegetated slopes, at the recommended configuration, should be reasonably protected from typical erosional effects. However, vegetated slopes may not be protected from unusual flow conditions, such as a flood event. If erosion control from unusual flow conditions is desired, more substantial erosion protection measures, such as grouted cobble slope facing or manufactured slope protection products, should be considered.

Within the side of embankments facing water flow, it is recommended that rock rip rap or concrete paving be used to prevent erosion. Rip rap or paving should be inspected regularly, to be sure that they are not dislodged or damaged. Eroded areas should be promptly repaired and reseeded or protected by rip rap or paving. As an alternative to the rip rap or paving, an erosion control geotextile material may be installed for erosion control. The geotextile protection used to guard against erosion should be approved in writing by the Soils Engineer, prior to use.

Engineered Fill

The organic-free on-site, upper native soils and fill material are predominantly silty sand, gravelly silty sand, weathered sandstone and aggregate base. These soils will be suitable for re-use as Engineered Fill provided they are cleansed of excessive organics, debris and fragments larger than 4 inches in maximum dimension.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor since he has complete control of the project site at that time.

Imported non-expansive Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and compacted to achieve at least 90 percent of maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804 of the 2013 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 1 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Grade the site to prevent water/run-off flow over the face of cut and fill slopes. To accomplish this, use asphalt berms, brow ditches, or other measures to intercept and slowly redirect flow. Plant all disturbed areas with erosion-resistant vegetation suited to the area. As an alternative, jute netting or geotextile erosion control mats may be considered for control of erosion. Slopes should be inspected periodically for erosion and repaired immediately if erosion is detected. Brow ditches and drainage terraces should be cleaned before the start of each rainy season and, if necessary, after each rainstorm.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

Utility trench backfill placed in or adjacent to structures and exterior slabs should be compacted to at least 90 percent of the maximum density based on ASTM Test Method D1557. The utility trench backfill placed in pavement areas should be compacted to at least 90 percent of the maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations - Conventional

After completion of the recommended site preparation and over-excavation, the site should be suitable for shallow footing support. The proposed tank and equipment may be supported on a shallow foundation system bearing on a minimum of 24 inches of Engineered Fill. Spread and continuous ring wall footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,625 psf
Dead-Plus-Live Load	3,500 psf
Total Load, Including Wind or Seismic Loads	4,650 psf

Footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load. Ultimate design of foundations and reinforcement should be performed by the project's Structural Engineer.

If a ring wall foundation is utilized, the tank foundation pad should consist of Class II aggregate base material, compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557. A 3-inch thick sand leveling course or oil sand should be placed on the prepared granular fill pad for the final contract support of the flexible steel Tank Foundation base. (The sand should be free from organics and other deleterious matter, and should meet the following gradation: 100 percent passing the #4 sieve, and not more than 4 percent passing the #200 sieve). Furthermore, the tank foundation pad should be graded to ultimately maintain floor slopes for cleaning and emptying the tank.

The total settlement is not expected to exceed 1 inch. Differential settlement should be less than 1 inch. Most of the settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.4 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 350 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the value above may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Foundations - Mat Foundations

After completion of the recommended site preparation and over-excavation, the site should be suitable for shallow footing support. The proposed storage tank may be supported on a thick mat foundation system, bearing on a minimum of 24 inches of Engineered Fill. The mat foundations may be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,650 psf
Dead-Plus-Live Load	2,200 psf
Total Load, including wind or seismic loads	2,900 psf

The total settlement of the mat is not expected to exceed 2 inches. The differential settlement should be less than 1 inch. The mat should have a minimum thickness of 12 inches. The mat should be reinforced at a minimum with No. 4 reinforcement bars at 18 inches, on-center. Ultimate design of foundations and reinforcement should be performed by the project's Structural Engineer.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.4 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 350 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Excavation Stability

Temporary excavations planned for the construction of the tank structures may be excavated, according to the accepted engineering practices following Occupational Safety and Health Administration (OSHA) standards by a Contractor experienced in such work. Open, unbraced excavations in undisturbed soils should be made according to the table below.

Recommended Excavation Slopes	
Depth of Excavation (ft)	Slope (Horizontal:Vertical)
	Temporary
0-5	1:1
5-10	1½:1
10-15	1¾:1
15-20	2:1

If, due to space limitation, excavation near existing structures or roads is performed in a vertical position, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavation and installation. A specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction. The lateral pressures provided below may be used in the design of a braced-type shoring system.

Recommended Lateral Earth Pressure for Braced Shoring	
Depth of Excavation Below Ground Surface (feet)	**Lateral Soil Pressure (psf)**
0	0
0.25 H	40 H
H	40 H
Where H is the total depth of the excavation in feet.	

The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given above.

Since the Contractor has the ultimate responsibility for excavation stability, he may design a different shoring system for the excavation.

The excavation/shoring recommendations provided herein are based on soil characteristics derived from limited test borings drilled within the site. Variations in soil conditions will likely be encountered during the excavations. Krazan & Associates, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 40 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 60 pounds per square foot per foot per depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide, should extend upward to within 12 inches of the top of the wall, and should be encapsulated by a geotextile filter fabric, such as Mirafi 140N or equivalent. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete or other suitable backfill to reduce

surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2010). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall in the centerline of the drainage blanket and should have a minimum diameter of 4 inches. Collector pipes may be either slotted or perforated. Slots should be no wider than ⅛ inch, while perforations should be no more than ¼ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

Seismic Parameters – 2013 California Building Code

The Site Class per Section 1613 of the 2013 California Building Code (2013 CBC) and Table 20.3-1 of ASCE 7-10 is based upon the site soil conditions. It is our opinion that a Site Class C is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2013 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	C	Section 1613.3.2
Site Coefficient F_a	1.000	Table 1613.3.3 (1)
S_s	2.082	Section 1613.3.1
S_{MS}	2.082	Section 1613.3.3
S_{DS}	1.388	Section 1613.3.4
Site Coefficient F_v	1.300	Table 1613.3.3 (2)
S_1	0.985	Section 1613.3.1
S_{M1}	1.281	Section 1613.3.3
S_{D1}	0.854	Section 1613.3.4

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentrations detected from these soil samples were greater than 150 ppm and are below the maximum allowable values established by HUD/FHA and CBC. Therefore, no special mitigation measures are required to compensate for sulfate reactivity with the cement.

Chemical tests were performed on a near-surface soil sample. The test results indicate that the soils are moderately corrosive to buried metal objects. Therefore, buried metal should be protected using either non-corrosive backfill, protective coatings, wrappings, sacrificial anodes, or a combination of these methods in accordance with the manufacturer's recommendations.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the

Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is an Updated Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions or if we may be of further assistance, please do not hesitate to contact our office at (925) 307-1160.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

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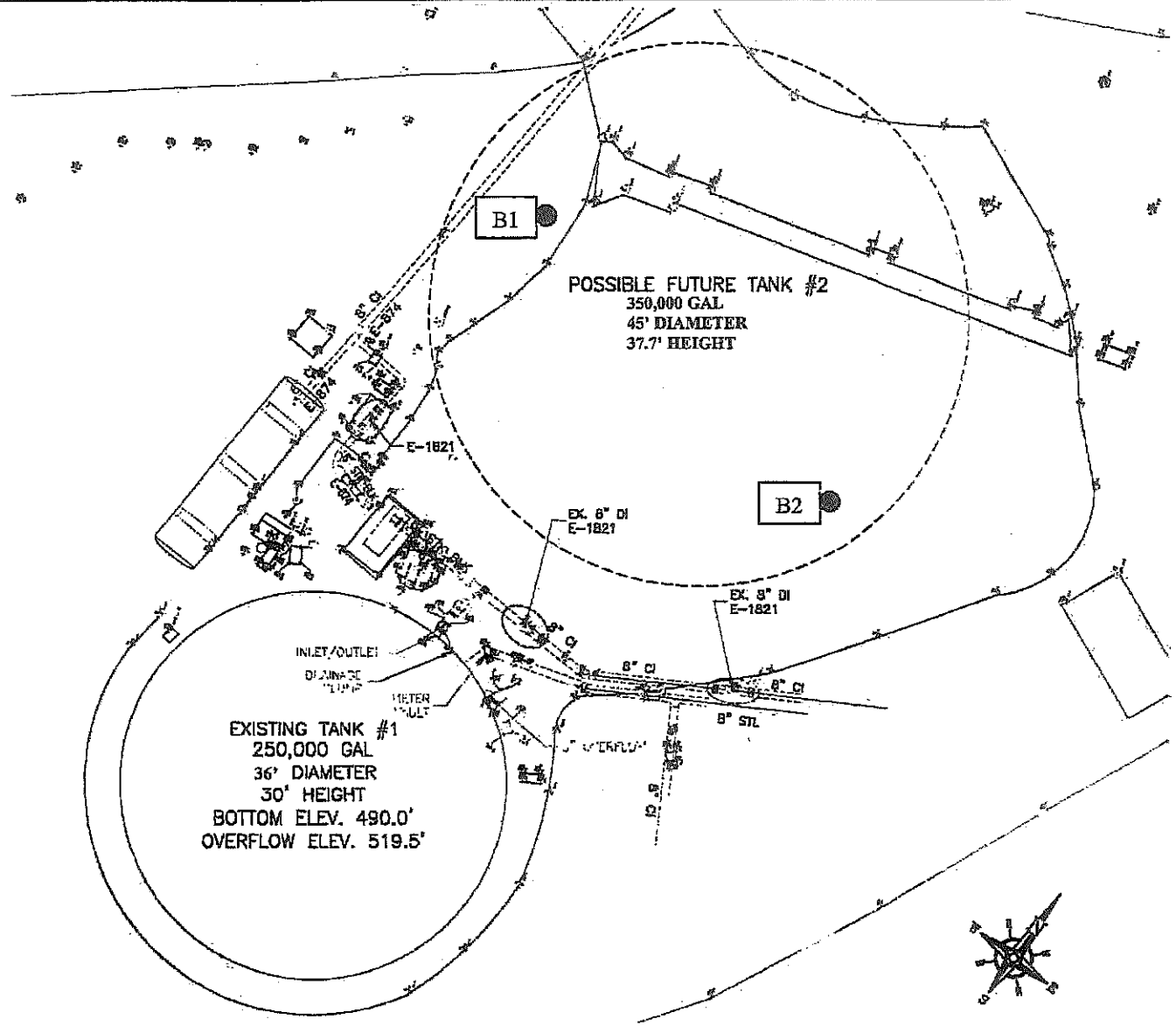


● APPROXIMATE BORING LOCATION

SITE MAP	**Scale:** NTS	**Date:** June 2014	Krazan GEOTECHNICAL ENGINEERING
Water Storage Tank **Bayshore District Station 115** **San Carlos, California**	**Drawn by:** HT	**Approved by:** DJ	
	Project No. 042-14011	**Figure No.** 1	

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Two 4½-inch diameter exploratory borings were advanced. The boring locations are shown on the site plan.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified and standard penetration tests were performed at selected depths. These tests represent the resistance to driving a 2½ inch diameter split barrel sampler. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. All samples were returned to our Clovis laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

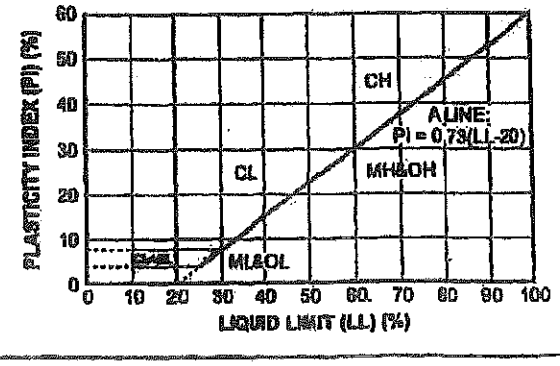
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	3 to 12 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Boring B1

Project: Water Storage Tank Bayshore District Station 115 | **Project No:** 042-14011

Client: California Water Service Co | **Figure No.:** A-1

Location: 2790 Melendy Road, San Carlos, CA | **Logged By:** Wayne Andrade

Depth to Water> | **Initial:** None | **At Completion:** None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
		Ground Surface				
0		***GRAVELLY SILTY SAND (SM)*** FILL, fine- to coarse-grained; light brown, damp, drills easily				
2		***SANDSTONE (WH)*** Very dense, highly weathered; light brown, damp, drills hard				50+
4		***SANDSTONE (WM)*** Very dense, moderately weathered; light brown, damp, drills hard				
6						50+
8						
10						50+
12		Auger refusal at 12½ feet				
		End of Borehole				
14						
16						
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Solid Flight | **Drill Date:** 6-5-14

Drill Rig: CME 55-2 | **Krazan and Associates** | **Hole Size:** 4½ Inches

Driller: Chris Wyneken | **Elevation:** 12½ Feet

Sheet: 1 of 1

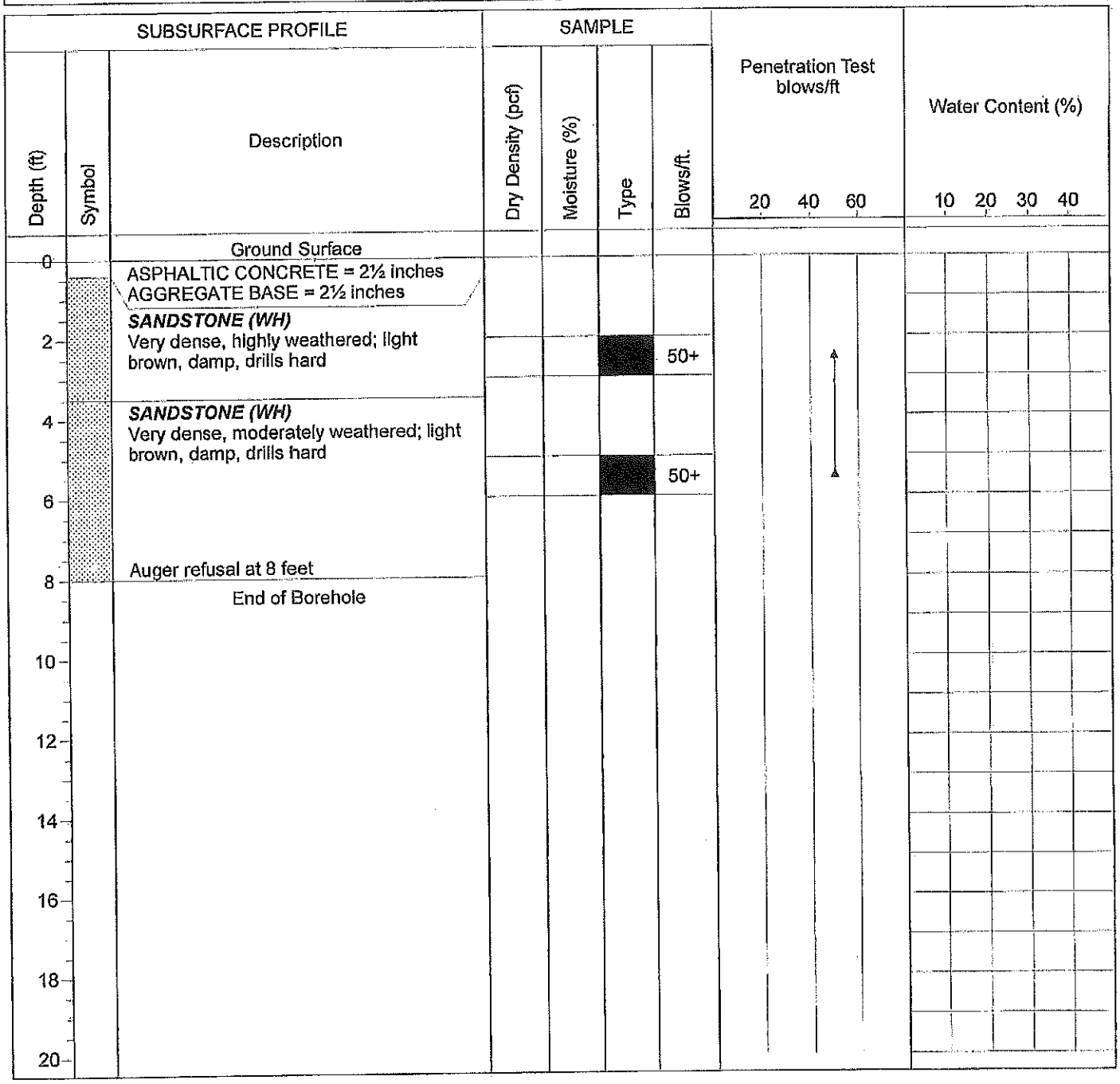
Log of Boring B2

Project: Water Storage Tank Bayshore District Station 115 | **Project No:** 042-14011

Client: California Water Service Co | **Figure No.:** A-2

Location: 2790 Melendy Road, San Carlos, CA | **Logged By:** Wayne Andrade

Depth to Water> | **Initial:** None | **At Completion:** None



Drill Method: Solid Flight

Drill Rig: CME 55-2

Driller: Chris Wyneken

Krazan and Associates

Drill Date: 6-5-14

Hole Size: 4½ Inches

Elevation: 8 Feet

Sheet: 1 of 1

Expansion Index Test

ASTM D - 4829/ UBC Std. 18-2

Project Number : 4214011
Project Name : Water Storage Tank Bayshore District
Date : 6/26/2014
Sample location/ Depth : 1-5'
Sample Number : Bulk #1
Soil Classification : SM w/ trace of clay

Trial #	1	2	3
Weight of Soil & Mold, gms	615.4		
Weight of Mold, gms	183.4		
Weight of Soil, gms	432.0		
Wet Density, Lbs/cu.ft.	130.3		
Weight of Moisture Sample (Wet), gms	300.0		
Weight of Moisture Sample (Dry), gms	279.3		
Moisture Content, %	7.4		
Dry Density, Lbs/cu.ft.	121.3		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	51.4		

Time	Inital	30 min	1 hr	6hrs	12 hrs	24 hrs
Dial Reading	0	--	--	--	--	0.013

Expansion Index $_{measured}$ = 13

Expansion Index = 13

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

Krazan Testing Laboratory

Atterberg Limits Determination
ASTM D-4318

Project Number : *04214011*
Project Name: *Water Storage Tank Bayshore*
Date: *6/26/2014*
Sample Number: *Bulk #1 @ 1-4'*

Plastic Limit	Liquid Limit	Plasticity Index
N.A.	*N.A.*	*Non-Plastic*

Krazan Testing Laboratory

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 90 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 90 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 90 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

January 27, 2015

KA Project No. 042-14011

California Water Service Co.
1720 North First Street
San Jose, California 95112

Re: Seismic Requirements Addendum
Proposed Water Storage Tank
Bayshore District Station 115
2790 Melendy Road
San Carlos, California

Gentlemen:

In accordance with your request, we are providing this Addendum to our Geotechnical Engineering Investigation Report (KA Project No. 042-14011) dated June 17, 2014 for the above-referenced project site. This addendum provides additional information to conform with the seismic design requirements of the 2013 California Building Code (2013 CBC).

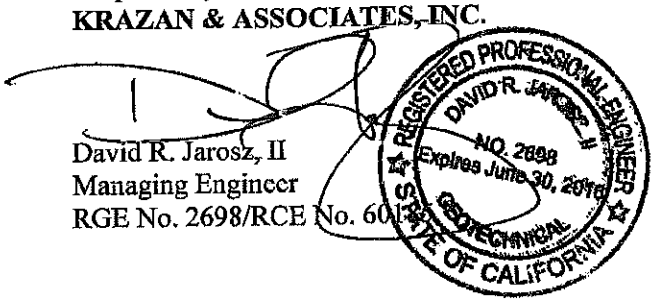
The Site Class per Section 1613 of the 2013 California Building Code (2013 CBC) and Table 20.3-1 of ASCE 7-10 is based upon the site soil conditions. Assuming that any loose surface soil and fill materials on the site are removed and compacted as recommended in our Geotechnical Engineering Investigation Report, the geologic subgrade of the site can be conservatively classified as very dense soil and soft rock, with N-values greater than 50. It is our opinion that a Site Class C is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2013 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	C	Section 1613.3.2
Site Coefficient F_a	1.000	Table 1613.3.3 (1)
S_s	2.082	Section 1613.3.1
S_{MS}	2.082	Section 1613.3.3
S_{DS}	1.388	Section 1613.3.4
Site Coefficient F_v	1.300	Table 1613.3.3 (2)
S_1	0.985	Section 1613.3.1
S_{M1}	1.281	Section 1613.3.3
S_{D1}	0.854	Section 1613.3.4

The recommendations and limitations provided in our Geotechnical Engineering Investigation Report (KA Project No. 042-14011) dated June 17, 2014 apply to this letter.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office at (925) 307-1160.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.



David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60[illegible]

DRJ:ht

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

August 18, 2017
E5447

TO: Christina Lau
Project Manager
MIG Inc.
2635 N. First Street, Suite 149
San Jose, California 94710

SUBJECT: **Geologic and Geotechnical Review**
Proposed Water Storage Tank
Station 115, 2783 Melendy Drive
San Carlos, California

At your request, we have completed a geologic and geotechnical review of proposed water tank construction using:

- Updated Geotechnical Engineering Investigation (report), prepared by Krazan & Associates, Inc., updated January 24, 2017;
- Revised Seismic Requirements Addendum (letter), prepared by Krazan & Associates, Inc., updated January 24, 2017; and
- Mid Peninsula Station 115 Storage Tank Plans (15 sheets), prepared by Erin M. McCauley, latest revision dated March 28, 2017.

In addition, we have reviewed pertinent technical maps and aerial photographs covering the property and completed a site reconnaissance.

DISCUSSION

We understand that construction of a 350,000 gallon steel tank (45-foot diameter) is proposed at the subject property. This new tank is to be located approximately 20 feet north of an existing smaller steel tank. An existing relatively level pad is present at the

proposed tank site and we understand that project grading will be relatively minimal. Access is to be provided by an existing driveway extending up from Melendy Drive.

SITE CONDITIONS

The proposed tank site is located along the crest of a bedrock supported spur ridge. Previous site grading has resulted in a relatively flat pad at the proposed tank site. The tank site appears to be located entirely within an area of cut ground. Exploratory boring logs from the referenced report identified very dense sandstone bedrock at depths of 0.5 to 1.0 feet below the ground surface. Apparent shallow competent Franciscan greenstone bedrock was observed in cut slopes for the existing access driveway as well as on steep slopes to the north and southwest of tank site. Serpentinite bedrock was observed in the northeastern corner of the property. The San Andreas Fault is mapped approximately 2.5 miles southwest of the site.

CONCLUSIONS

The proposed tank site is characterized by apparent shallow competent bedrock conditions. The tank should be designed to address anticipated strong to violent seismic ground shaking conditions. With appropriate design measures to address ground shaking, site conditions are favorable from a geologic and geotechnical perspective for tank construction. The referenced geotechnical engineering report satisfactorily characterizes site conditions and generally presents appropriate geotechnical recommendations for project design and construction. We note that the Consultant recommends that 4 feet of native earth material be excavated at the tank pad. Based on provided subsurface data, it is likely that hard bedrock will be encountered within 0.5 to 2 feet of the ground surface. It is not clear why 4 feet of excavation is recommended for the tank pad.

LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology and geotechnical engineering principles and practices. No warranty, expressed or implied, or merchantability of

fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by furnishing of oral or written reports or findings.

Respectfully submitted,

COTTON, SHIRES AND ASSOCIATES, INC.

Ted Sayre
Associate Engineering Geologist
CEG 1795

David T. Schrier
Associate Geotechnical Engineer
GE 2334

DTS:TS:tms

Appendix E: Greenhouse Gases

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Melendy Water Tank IS/MND
Appendix: E
GHG Calculations
Prepared by MIG, Inc.

Table E.1 - Global Warming Potentials

Global Warming Potentials GWP		
CO2	CH4	N2O
1	25	298

Source: IPCC 4th Assessment Report

Table E.2 - Known Information / Standard Conversion Metrics

HP of Pump	Horsepower --> kW	Days per year	lbs / Metric Ton	PG&E GHG Intensity Factor (MT / MWh)		
				CO2	CH4	N2O
30	0.746	365	2204.62	427	0.029	0.006

Table E.3 - Existing CO2e Emission Calculations

Existing							
Runtime (hrs)	Electricity Used (kWh)	Electricity Used (MWh)	Emissions (lbs)				MTCO2e
			CO2	CH4	C2O	CO2e	
9	73518.3	73.5183	31392.31	2.1320307	0.4411098	31577.066	14.32313305

Table E.4 - Proposed CO2e Emission Calculations

Proposed							
Runtime (hrs)	Electricity Used (kWh)	Electricity Used (MWh)	Emissions (lbs)				MTCO2e
			CO2	CH4	C2O	CO2e	
22	179711.4	179.7114	76736.77	5.2116306	1.0782684	77188.383	35.01210301

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Appendix F: Noise

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Melendy Water Tank IS/MND
Appendix: F
Summary of Ambient Noise Monitoring Data
Prepared by MIG, Inc.

Table F.1: LT-1

Meter 1 - Long-term meter located next to the water tank property fence, approximately 50 feet from Melendy Drive.

Date	*Hour*	*Leq*	*L(5)*	*L(10)*	*L(25)*	*L(50)*	*L(90)*	*Lmin*	*Lmax*
7-Sep-17	7 AM	60.2	66.4	64.3	60.2	55.1	46.0	34.7	81.1
7-Sep-17	8 AM	58.6	63.7	62.6	60.1	56.0	49.1	38.7	69.5
7-Sep-17	9 AM	60.2	67.1	64.7	59.6	52.3	44.0	36.6	79.1
7-Sep-17	10 AM	57.7	64.3	61.7	56.7	50.1	44.0	37.6	77.6
7-Sep-17	11 AM	56.5	63.3	61.4	56.6	50.4	42.2	31.8	69.1
7-Sep-17	12 PM	58.3	64.4	62.2	58.1	51.2	43.7	36.2	78.2
7-Sep-17	1 PM	57.1	63.9	61.8	57.1	50.7	43.4	36.2	70.9
7-Sep-17	2 PM	58.4	64.2	62.3	58.8	54.3	46.2	35.9	73.9
7-Sep-17	3 PM	60.1	66.2	64.4	61.0	55.3	45.9	36.5	76.4
7-Sep-17	4 PM	58.8	64.9	63.4	60.0	54.4	45.6	39.0	70.2
7-Sep-17	5 PM	60.1	65.6	64.4	61.5	57.3	48.4	38.0	73.4
7-Sep-17	6 PM	60.2	65.9	64.5	61.3	56.6	46.9	38.2	71.4
7-Sep-17	7 PM	57.7	64.2	62.7	58.3	51.8	42.3	35.2	69.3
7-Sep-17	8 PM	55.2	62.4	60.1	54.8	48.5	43.1	41.0	70.3
7-Sep-17	9 PM	53.9	61.4	58.2	51.9	45.3	41.7	39.4	69.9
7-Sep-17	10 PM	51.1	58.0	53.5	47.8	42.6	39.6	37.7	67.4
7-Sep-17	11 PM	50.0	56.6	51.4	44.2	41.2	38.7	36.6	72.0
8-Sep-17	12 AM	46.0	50.9	45.2	40.7	38.9	37.2	35.9	69.5
8-Sep-17	1 AM	42.6	43.4	40.5	38.1	37.6	36.8	35.5	67.5
8-Sep-17	2 AM	41.6	44.6	40.6	39.0	38.4	36.1	34.4	65.6
8-Sep-17	3 AM	37.6	40.2	39.6	37.3	36.5	35.8	34.2	52.7
8-Sep-17	4 AM	47.0	50.7	46.2	41.4	39.0	37.1	33.8	69.4
8-Sep-17	5 AM	46.6	52.8	47.4	42.1	39.2	37.1	34.0	67.3
8-Sep-17	6 AM	52.2	59.5	56.2	49.4	43.1	37.0	34.6	68.1
Meter 1 Average:		56.8	63.0	61.0	57.1	51.8	43.8	31.8	81.1

Table F.2: ST-1

Meter 2 - Near the shared fence with Heather Elementary School

Date	*Hour*	*Leq*	*L(5)*	*L(10)*	*L(25)*	*L(50)*	*L(90)*	*Lmin*	*Lmax*
7-Sep-17	12:25 PM	55.9	61.9	57.4	49.8	44.5	36.4	34.6	74.3
7-Sep-17	12:31 PM	59.3	67.0	64.1	57.4	48.9	41.7	37.7	73.0

Table F.3: ST-2

Meter 2 - In front of the apartment building at 2780 Melendy Drive

Date	*Hour*	*Leq*	*L(5)*	*L(10)*	*L(25)*	*L(50)*	*L(90)*	*Lmin*	*Lmax*
7-Sep-17	2:40 PM	58.2	65.1	61.7	53.6	43.7	37.2	33.5	76.1
7-Sep-17	2:50 PM	58.0	64.7	61.3	55.7	47.4	37.9	34.4	73.9

Table F.4: ST-3									
Meter 2 - Approximately 150 feet west of ST-2 along Melendy Drive; closer to Portofino Drive									
Date	*Hour*	*Leq*	*L(5)*	*L(10)*	*L(25)*	*L(50)*	*L(90)*	*Lmin*	*Lmax*
7-Sep-17	2:40 PM	64.8	68.0	65.1	58.5	46.4	36.2	34.6	84.5
7-Sep-17	2:50 PM	60.8	66.9	64.6	60.6	52.2	38.0	33.5	77.1