APPENDIX E

South County Infrastructure Project Updated Preliminary Geotechnical Basis of Design Report

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

April 2021

Prepared for:



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Blackburn File No. 3842.X April 30, 2021

Mr. Steve DeCou Vice President and Principal Project Manager Jacobs Engineering Group, Inc. 2485 Natomas Park Drive, Suite 600 Sacramento, CA 95833

Subject: UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project Olivehurst, California

Dear Mr. DeCou,

Blackburn Consulting (Blackburn) is pleased to submit this Updated Draft Preliminary Geotechnical Basis of Design Report for the Olivehurst Public Utilities District (OPUD) South Yuba County Sewer and Water Infrastructure project in Olivehurst, California. Blackburn prepared this report in accordance with our May 14, 2020 Proposal and August 21, 2020 Agreement. This updated report includes responses to Jacobs review comments. It does not include information on borings completed since our original report, because laboratory tests are pending.

Thank you for selecting Blackburn to be on your design team. Please call if you have questions or require additional information.

Sincerely,

BLACKBURN CONSULTING Prepared by:

Reviewed by:

Rob Pickard, C.E.G. Senior Engineering Geologist Bob Lokteff, G.E., P.E. Principal Geotechnical Engineer





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1 INTRODUCTION

1.1 Purpose

Blackburn Consulting (Blackburn) prepared this Updated Draft Preliminary Geotechnical Basis of Design Report (Draft Preliminary GBODR) for the Olivehurst Public Utility District (OPUD) South Yuba Sewer and Water Infrastructure Project (Project) in Olivehurst, California. This report includes the responses to Jacobs' review comments. It does not include information on borings completed since our original report, because laboratory tests are pending. This report contains descriptions of the surface and subsurface conditions, site geology, and preliminary geotechnical design considerations.

Blackburn prepared this report for Jacobs Engineering Group (Jacobs) and the project design team to use during preliminary design. This report shall not be used for final design or relied upon by others, or for different locations or improvements without the written consent of Blackburn. The design considerations in this report are based on limited information and knowledge of the project alignment and structure locations. Blackburn will perform additional subsurface exploration, laboratory testing, engineering analysis and prepare a Final GBODR for final design.

This report contains separate sections for Sewer and Water Pipelines, Trenchless Pipeline Crossings, Pump Stations and Lift Stations, WWTP Improvements, and Water Tank and Booster Station. Each section contains subsections on subsurface conditions, laboratory test results, site geology and seismicity, ground water, and design considerations (except for trenchless crossings). Jacobs Engineering Group, Inc. is providing geotechnical design recommendations for the trenchless crossings separate from this report. Geotechnical information pertinent to each project component is repeated in each report section as necessary to facilitate ease of preliminary design by different companies that are using this report.

1.2 Scope of Services

To prepare this report, Blackburn:

- Discussed the proposed improvements with Mr. Steve DeCou and Ms. Myra Au (Jacobs); Mr. Sean Minard (MHM); Joe Domenichelli, Sara Rogers, and Daryl Heigher (Domenichelli and Associates); and Jim Carson (Affinity Engineering).
- Reviewed the Draft Preliminary Plan and Profile sheets provided by MHM.
- Reviewed available geotechnical information for the Olivehurst WWTP and Caltrans Log of Test Borings for bridge structures near the project alignment.
- Observed the subsurface conditions in forty-three borings drilled along the project alignment in August and September 2020 and in five test pits excavated at the Olivehurst Wastewater Treatment Plant on October 19, 2020.
- Performed laboratory tests on representative soil samples obtained from the exploratory borings.
- Performed preliminary engineering analysis and calculations to develop our preliminary design considerations.
- Reviewed and responded to Jacobs' comments on our December 11, 2020 Draft Preliminary Geotechnical Basis of Design Report.





1.3 Project Description and Location

The proposed project components include:

- About 8½ miles of 8" to 24" diameter sewer gravity and force main,
- About 9 miles of 24" diameter water force water main,
- One Highway 70 water line trenchless crossing,
- One Highway 70 sewer line trenchless crossing,
- Two Highway 65 sewer line trenchless crossings,
- Six to eight sewer and/or water line creek/canal crossings,
- Eight new sewer pump/lift stations.
- Olivehurst WWTP improvements consisting of a new secondary clarifier, concrete-lined equalization basin, and on-site piping.
- A new water well site including a 1 MG steel storage tank, booster station and on-site piping near the Hard Rock Hotel and Casino.

Figure 1 shows the general location of the proposed improvements and Figure 2 shows the site location.

2 PROJECT GEOLOGY AND SOIL SURVEY

2.1 Geology and Soil Survey

We reviewed geology maps and the United States Department of Agriculture's (USDA) Web Soil Survey (<u>https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm</u>). The "Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California" (Helley and Harwood, 1985) shows the project is underlain by:

- Holocene Alluvium unweathered gravel, sand, and silt deposited by present-day stream and river systems.
- Holocene Basin Deposits Undivided as silt and clay derived from the same sources as modern alluvium. Thickness in the valley varies from 3 to 6 ft. along the perimeter up to 200 ft. in the center.
- Upper Member, Modesto Formation unconsolidated, unweathered gravel, sand, silt, and clay. Deposits belonging to the upper member of the Modesto are only a few meters thick and generally form a thin veneer deposited on older alluvial deposits.
- Upper Member, Riverbank Formation Unconsolidated but compact, dark-brown to red alluvium composed of gravel, sand, silt and clay.

Figure 3 shows the geologic formations within the project area.

The Fault Activity Map of California¹ does not identify Historic or Holocene age faults (displacement within the last 11,700 years) within or adjacent to the project site. The nearest mapped fault is the Late

¹ Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.





Quaternary Foothills Fault System, Spenceville fault, located about 12 miles to the east. The nearest active mapped fault is the Cleveland Hill Fault located approximately 25 miles north of the site. The USDA web soil survey indicates that the site is underlain by mostly San Joaquin loam (Map Unit 214, 217) and also Hollenbeck silty clay loam (Map Unit 131, 134), Conejo Loam (Map Units 141, 142, 143), and Oakdale Sandy loam (Map Unit 197, 198). Table 2.1 presents classification properties of these soil units according to the USDA soil survey.

Table 2.1: USDA Soil Properties											
Map Unit Name/Symbol	Depth (in)	USCS Classification	Percent fines	Liquid Limit	Plasticity Index						
San Joaquin Ioam/214, 217	0 to 25	Silt, Silty Clay, Lean Clay	50 to 70	15 to 50	0 to 35						
Hollenbeck silty clay loam/131, 134	0 to 43	Lean Clay, Fat Clay	85 to 95	40 to 60	20 to 35						
Conejo loam/141,142,143	0 to 65	Lean Clay	58 to 79	31 to 49	13 to 25						
Oakdale Sandy loam/197, 198	0 to 70	Silty Sand, Clayey Sand	15 to 50	20 to 30	0 to 10						

Figure 4 shows where these USDA soil units underlie the project site.

3 SEWER AND WATER PIPELINES

3.1 Site Location and Description

The proposed Project sewer and water pipeline alignments extend along the following streets in and near Olivehurst in South Yuba County, California:

- Olivehurst Avenue between 11th Avenue and 14th Avenue.
- Mary Avenue.
- McGowan Parkway between Mary Avenue and Rancho Road.
- Olive Avenue from McGowan Parkway approximately 500 ft north, where it crosses Highway 65 to the cul de sac at the north end of Rancho Road.
- Rancho Road, from the northern cul de sac south to where it crosses Highway 65 to Morrison Road.
- Forty Mile Road from the Toyota Amphitheater to Rancho Road.
- Rossler Road from Forty Mile Road approximately 1250 ft north, where it crosses Highway 65 to the cul de sac at the south end of Shimer Road.
- Shimer Road.



Pipeline depths will generally range from 5 to 18 feet below the ground surface (bgs) based on input from design team members. However, final pipe sizes and depths have not been determined.

The pipeline alignment is generally level, with ground surface elevations ranging from about 60 to 70 feet and up to about 76 feet in the south.

The western portion of the pipeline along Olivehurst Ave, Mary Ave, McGowan Pkwy, and Olive Ave extends predominantly through residential portions of Olivehurst. Photos 1 through 3 show the conditions along these streets.







Looking west along Project alignment near Station 206+60.

The eastern and southern pipeline alignments extend along rural roads (Rancho Rd, Morrison Rd, Forty Mile Rd, and Shimer Rd). The roads in these portions of the alignment are generally flanked by a drainage ditch on one or both sides. Photos 4 through 8 show the conditions along these streets.

















Appendix A1 shows the proposed pipeline alignments and Figure 2 shows the pipeline alignments, our approximate subsurface exploratory boring locations (all pipeline boring locations have been drilled and laboratory testing is ongoing) and the proposed improvements.

3.2 Geology, Soil Survey, Faulting

See Section 2.1 for a discussion of geology and faulting along the pipeline alignment. Figure 3 shows the mapped geologic units within the project site. Figure 4 shows the USDA soil types mapped within the project area. Figure 2.1 shows the mapped geologic formations and USDA soil types within each pipeline segment.

3.3 Field Work and Laboratory Testing

3.3.1 Exploratory Borings

Blackburn drilled, logged and sampled 43 borings along the pipeline alignments to characterize the site subsurface conditions. Our subcontractor, Taber Drilling, drilled the borings to depths ranging from about 15 to 50 feet below the existing ground elevation. Appendix A1 shows the proposed site improvements and approximate boring locations. The borings logs are included in Appendix A2 (does not include borings where laboratory testing is ongoing).

Taber drilled the borings using a combination of 4-inch diameter solid-stem auger and mud-rotary. Soil samples were obtained by Taber at various intervals using a 3.0-inch O.D. Modified California (MC) sampler (equipped with 2.4-inch diameter steel liners) or 2–inch O.D. Standard Penetration (SPT) sampler. Samples were driven with an automatic hammer, weighing 140-pounds and falling approximately 30-inches per blow. We also collected bulk samples at various depths within the borings.



Blackburn's project engineers/geologists Daniel Contreras, Luke Morrell, and Sophie Stuart logged the borings and retained samples for laboratory testing.

3.3.2 Laboratory Testing

We performed the following laboratory tests on representative soil samples from the exploratory borings:

- Unit weight and moisture content tests for in-situ soil property characterization.
- Sieve analysis and Plasticity index for soil classification.
- Direct shear and unconfined compression tests for soil strength analysis.
- Soil corrosivity (pH, resistivity, sulfate and chlorides) for corrosion considerations.

Refer to Section 3.5.8 for a description and evaluation of the corrosivity test results.

The boring logs in Appendix A2 show unit weight and moisture content results. Appendix A3 presents the other laboratory test results.

3.4 Subsurface Findings

3.4.1 General Subsurface Soil Conditions

We predominantly encountered very stiff to hard clay and sandy clay in borings drilled along the proposed alignment. We encountered medium dense to very dense sand and clayey sand lenses in scattered areas throughout the alignment. Some of the soil layers contained gravel.

Table 3.1 summarizes the subsurface soil conditions we encountered along the pipeline alignment.

							Table 3.1: Subsu	rface Soil Con	ditions	
Street	Reach ID (Approximate Station)*	Boring ID	Boring Depth	Approximate Boring Station	Appro AC (in)	oximate Existing Pavement AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurfac
		P-1	21.5	102+00	6.5	Not Encountered	Not Encountered		214	
Mary Ave	Reach 1 (100+00 - 139+81)	P-2	21.5	118+00	4	3	Not Encountered	Riverbank Formation	217	Very stiff to hard lean clay and sandy lea clayey sand and very stiff sandy clay.
		P-3	21.5	132+70	1	6	Not Encountered		217	
		LS-2	-	lab pending	-	-	-		-	
	Depek 2	P-4	15.0	206+60	6	15	Not Encountered	Diverbert	217	
	(200+00 - 222+00)	TC-1A	-	planned future boring	-	-	-	Formation	-	Hard sandy lean clay in upper 5 ft., unde
		TC-1C	-	planned future boring	-	-	-		-	
McGowan	Reach 3 (222+00 - 232+00)	LS-3	-	planned future boring	-	-	-	Holocene	-	
Pkwy		P-5	21.5	229+60	3	3	Not Encountered	Alluvium 198	198	Hard sitt and lean clay in upper 9 it., und
	Reach 4 (232+00 - 264+36)	P-6	16.5	237+30	4	6	Not Encountered	Riverbank	217	
		P-7	16.5	245+50	3	4	Not Encountered	Formation and Basin Deposits	prmation nd Basin peposits 217	Lean clay to sandy lean clay.
Olive Ave	Reach 5 (10+00 - 16+20)	TC- 2AA	51.5	19+60	6	Not Encountered	29	Basin Deposits	134	Very stiff to hard lean clay and sandy lea
	Deceh (TC-2C	51.5	300+10	2.5	12	27.5	Diverbank	134	
	(300+00 - 318+00)	P-8	15.0	309+90	NA	NA	Not Encountered	Formation	214	Hard lean clay, lean clay with sand, and
	Reach 7	TC-7A	51.5	321+30	9	12	23	Modesto	214	Stiff to hard lean clay and lean clay with
	(318+00 - 326+50)	TC-7B	51.5	323+30	8.5	16	15	Formation	142	and lean clay.
Rancho Rd		TC-8A	51.5	329+60	9	9	14		142	
		TC-8B	51.5	331+10	8	16	15	Riverbank Formation	142	Very stiff to hard lean clay and lean clay
	Reach 8 (326+50 - 396+00)	P-9	15.0	340+60	NA	NA	Not Encountered	and	214	approximately 1 to 6 ft. of medium dens
		TC-9A	51.5	349+70	8	16	25	Formation	142	
		TC-9B	51.5	351+20	6	12	25	10	142	



ce Soil Conditions within upper 20 feet**

an clay within the upper 15 ft., underlain by medium dense

erlain by hard lean clay with sand and medium stiff lean clay.

derlain by hard lean clay.

an clay.

silt.

n sand within the upper 15 ft., underlain by hard silt to sandy silt

with sand within the upper 10 to 15 ft., underlain by se to dense sand to clayey sand and stiff to very stiff sandy lean

							Table 3.1: Subsu	rface Soil Con	ditions	
Street	Reach ID (Approximate Station)*	Boring ID	Boring Depth	Approximate Boring Station	Appro AC (in)	oximate Existing Pavement AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurfa
	,	P-10	15.0	357+60	NA	NA	Not Encountered		214	
		LS-4	-	lab pending	-	-	-		214	
		P-11	21.5	376+10	NA	NA	Not Encountered		214	
		P-12	14.5	388+10	9	15	Not Encountered		214	
	Reach 9 (396+00 - 401+00)	TC- 10A	51.5	400+00	7	10	24	Riverbank Formation	214	Very stiff to hard silt and clay with varyi
		TC- 10B	51.5	402+60	NA	NA	24		214	
		LS-5	-	lab pending	-	-	-		214	
	Reach 10 (401+00 - 448+00)	P-13	21.5	410+00	NA	NA	Not Encountered	Riverbank Formation	214	sand to clayey sand (depth to sand gene
		TC-14	41.5	427+90	8	12	28	_	214	
		P-14	21.0	442+30	3	10	Not Encountered		214	
		P-15	16.5	450+10	NA	NA	Not Encountered		131	
	Reach 11 (448+00 – 484+00)	LS-6	-	planned future boring	-	-	-	Riverbank	131	Hard lean clay within the upper 5 ft, und
		P-16	21.5	468+40	4	32	Not Encountered	Formation	131	and hard sandy clay over hard lean clay
		P-17	21.5	483+80	NA	NA	Not Encountered		214	
	Reach 12 (***)	P-18	15.0	***	NA	NA	Not Encountered	Riverbank Formation	214	Hard lean clay.
		P-24	15.0	70+00	7	10	Not Encountered		214	
		P-25	20.0	78+30	7	10	Not Encountered	Basin Deposits	214	
	Reach 14 (70+00 - 125+00)	TC-13	51.4	85+80	6.5	12	26	and	214	Very stiff to hard lean clay, lean clay wit
40 Mile Rd	(70.00 125.00)	P-26	21.5	94+60	6.5	14	Not Encountered	Riverbank Formation	131	
		P-27	21.0	119+90	6	12	Not Encountered		214	
	Reach 15 (125+00 - 155+00)	P-28	21.5	139+00	6	12	Not Encountered	Riverbank Formation	214	Very stiff to hard lean clay to sandy lean stiff to hard silt with sand which is approximately appro
								11		



ce Soil Conditions within upper 20 feet**

ing amounts of sand.

y in upper 12 to 16 ft., underlain by medium dense to dense erally decreases up station). Very dense clayey gravel present

derlain by approximately 10 ft of medium dense clayey sand

th sand, silt, silt with sand within the upper 20 ft. (Very dense t. in Boring P-26)

n clay within the upper 8 to 10 ft., underlain by a layer of very oximately 13 ft. thick in boring TC-12B and pinches out to the

			Table 3.1: Subsurface Soil Conditions							
Street	Reach ID (Approximate Station)*	Boring ID	Boring Depth	Approximate Boring Station	Appro AC (in)	oximate Existing Pavement AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurfa
		TC- 12A	51.5	147+50	3	4	24	and Modesto	142	south (by boring P-28). Underlain by app sand over medium dense poorly-graded
		TC- 12B	51.5	149+80	7	12	17	Formation	142	
		LS-8	-	planned future boring	-	-	-		-	
	Reach 16 (155+00 - 188+00)	P-29	16.5	163+50	6	12	Not Encountered	Riverbank	214	Hard sandy lean clay and gravelly lean c
		P-30	14.5	180+10	NA	NA	Not Encountered	Formation	214	dense clayey sand and stiff sandy lean c
	Reach 17 (188+00 - 203+00)	P-32	15.0	196+90	NA	NA	Not Encountered	Riverbank Formation	214	Very stiff silt with sand within the upper depth of 15 ft.
Rossler Rd	Reach 18 (550+00 - 562+70)	TC-4A	-	planned future boring	-	-	-	Riverbank Formation	-	
		TC-4B	-	planned future boring	-	-	-	Riverbank Formation	-	
Olivehurst	***	OS-1	21.5	***	6	6	Not Encountered	Riverbank Formation	217	Very stiff to hard lean clay and sandy leaving very dense clayey sand over very stiff le surface.
Ave	***	OS-2	21.5	***	9	Not Encountered	Not Encountered	Riverbank	217	Very stiff to hard lean clay and sandy lea
		LS-1		lab pending	-	-	-	Formation	-	

*Refer to Section 2.1 for description of geologic formation and USDA mapped soil type.

**Depths are approximate.

***Stationing not available at time of this report.





ce Soil Conditions within upper 20 feet**

-

-

proximately 3 to 6 ft. of medium dense to very dense clayey d sand to poorly-graded sand with clay.

lay within the upper 4 to 5 ft., underlain by medium dense to lay to approximately 14 to 15 ft. deep.

3 ft., underlain by hard lean clay and lean clay with sand to

an clay within the upper 9 ft., underlain by approximately 6 ft of an clay. Hard sandy silt greater than 20 ft. below ground

an clay.



3.4.2 Groundwater

We generally observed groundwater at depths of 23 to 29 feet below the ground surface in borings drilled August through September 2020. In three borings near Reeds Creek on Rancho Road, we observed groundwater at depths of 14 to 15 feet. We encountered groundwater 17 feet below the ground surface in one boring on Forty Mile Road just north of Kimball Creek.

Table 3.2 lists the borings and depths where we encountered groundwater.

Table 3.2: Groundwater Summary										
Boring	Approximate Station	Boring Depth (ft)	Approximate Depth to Water (ft)							
TC-2AA	19+60	51.5	29							
TC-2C	300+10	51.5	27.5							
TC-7A	321+30	51.5	23							
TC-7B	323+30	51.5	15							
TC-8A	329+60	51.5	14							
TC-8B	331+10	51.5	15							
TC-9A	349+70	51.5	25							
TC-9B	351+20	51.5	25							
TC-10A	400+00	51.5	24							
TC-10B	402+60	51.5	24							
TC-12A	147+50	51.5	24							
TC-12B	149+80	51.5	17							
TC-13	85+80	51.4	26							
TC-14	427+90	41.5	28							

We reviewed groundwater level data for nearby wells available at the California Department of Water Resources website (<u>http://www.water.ca.gov/waterdatalibrary/</u>) and using the Sustainable Groundwater Management Act (SGMA) data viewer

(<u>https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels</u>). Based on this information, the depth to groundwater across the site typically ranges from 20 to 30 feet, although it occasionally is measured above 20 feet or below 30 feet. Relatively shallow perched water may occur within the near-surface soils during the winter and spring months, and adjacent to the existing canals and streams.

Groundwater and perched water levels can fluctuate due to changes in precipitation, creek levels, canal levels, irrigation, pumping of wells, and other factors.

3.4.3 Existing Pavement Sections

We drilled 30 of the 43 borings in the paved roadway.





- Along Olivehurst Ave, the pavement section consisted of about 6 to 9 inches of AC over 0 to 6 inches of AB.
- Along Mary Ave, the pavement section consisted of about 1 to 6½ inches of Asphalt Concrete (AC) over 0 to 3 inches of Aggregate Base (AB).
- Along McGowan Ave west of Highway 70, the pavement section consisted of about 6 inches of AC over 15 inches of AB.
- Along McGowan Ave east of Highway 70, the pavement section consisted of about 3 to 6 inches of AC over 3 to 6 inches of AB.
- Along Rancho Rd, the pavement section consisted of about 2½ to 9 inches of AC over 9 to 16 inches of AB (Boring P-16 had approximately 32 inches of AB).
- Along Forty Mile Rd, the pavement section generally consisted of about 6 to 7 inches of AC over 10 to 14 inches of AB (boring log TC-12A indicates 3 inches of AC over 4 inches of AB).

Table 3.1 includes approximate pavement section thickness encountered in each boring.

3.5 Preliminary Design Considerations – Sewer and Gravity Force Main

3.5.1 Alignment Ground Suitability

The ground conditions along the proposed pipeline alignment will be suitable for the planned improvements when constructed in accordance with the project plans, industry standards, and our geotechnical recommendations.

3.5.2 Geologic Hazards

- Faulting—The potential for surface rupture or creep due to faulting at the site is very low. The
 Fault Activity Map of California² and the Geologic Map of the Sacramento Quadrangle³ does not
 identify Historic or Holocene age faults (displacement within the last 11,700 years) within or
 immediately adjacent to the site. The site does not lie within or adjacent to an Alquist–Priolo
 Earthquake Fault Zone⁴.
- Ground Shaking—For the Maximum Considered Earthquake, a peak horizontal ground acceleration (PGA) of approximately 0.21g could be expected.
- Liquefaction—Our investigation shows a soil profile that consists of stiff to hard clays and medium dense to dense silty and clayey sands that are not liquefiable. Therefore, the potential for damaging liquefaction at the site is very low.
- Landslides and Slope Stability—Due to the relatively low topographic relief and existing slope gradients we do not expect landslides or natural slope failure.

⁴ Bryant, W.A., and Hart, E.W., 2007 (Interim Revision), <u>Fault-Rupture Hazard Zones in California</u>: California Department of Conservation, Division of Mines and Geology, Special Publication 42.



² Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.

³ Saucedo, G.J. and Wagner, D.L., et al, 1992, Geologic map of the Chico quadrangle, California, 1: 250,000: California Division of Mines and Geology, Regional Geologic Map 7A, scale 1: 250,000.



• Seismically Induced Settlement—During a seismic event, ground shaking can cause densification of granular soil that can result in settlement of the ground surface. Considering the cohesive soils and medium dense to very dense sandy soils observed in the borings, we consider the potential for significant seismically induced settlement to be very low.

3.5.3 Seismic Design

Based on the mapped geology and our subsurface exploration, most of the preliminary pipeline alignment is underlain by stiff soil and a Site Class "D" (California Building Code, 2019).

Table 3.3 presents the California Building Code⁵ (CBC) design parameters for the alignment. These values are based on Blackburn's review of design parameters at the approximate midpoint of the pipeline alignment.

Table 3.3: 2019 CBC Seismic Design Parameters (Site Class D)	
S_s – MCE _R ground motion (0.2 second period)	0.496 g
S_1 – MCE _R ground motion (1.0 second period)	0.241 g
Fa – Site Coefficient	1.403
F _v – Site Coefficient	2.12 ¹
S _{MS} – Adjusted MCE* Spectral Response Acceleration Parameter	0.696 g
S _{M1} – Adjusted MCE* Spectral Response Acceleration Parameter	0.511 g ¹
S _{DS} – Design Spectral Acceleration Parameter	0.464 g
S _{D1} – Design Spectral Acceleration Parameter	0.341 g ¹
Seismic Design Category	D1
**T _L – Long Period Transition Period	12 sec
PGA	0.21

* Maximum Considered Earthquake

** Figure 22-14, ASCE 7-16

1 – We assume that the seismic response coefficient, Cs, is determined by ASCE 7-16 Eq. (12.8-2) for values of T \leq 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either ASCE 7-16 Eq. (12.8-3) for TL \geq T > 1.5Ts or Eq. (12.8-4) for T > TL. Contact Blackburn to re-evaluate the above parameters if this assumption is not valid.

If the proposed design does not meet the exception noted above (note 1) a site-specific response analysis will be required for final design.

3.5.4 Soil Excavatability and Trench Stability

We anticipate that the site soil will be excavatable with a medium to large size excavator (such as a CAT 320 or similar).

⁵ California Building Code, 2016, California Code of Regulations, Title 24, Part 2 (Volume 2); published by International Conference of Building Officials and the California Building Standards Commission (CBSC).





Open excavations 5 feet or deeper will require sloping and/or shoring in accordance with Section 8.4 of the Yuba County Standard Specifications and Cal OSHA requirements. For planning and preliminary design, anticipate sloping/shoring requirements within the soil along the alignment for Type A soil. Excavations near waterway crossings or where perched groundwater/seepage or a sand layer is encountered will require shoring/sloping requirements for a Type C soil (shoring or sloping at a gradient of 1.5:1).

The contractor is responsible for the safety of all temporary excavations and must provide trench sloping and shoring in accordance with current Cal OSHA requirements based on exposed soil and groundwater/seepage conditions. The contractor is also responsible for the protection of existing facilities and improvements. The Contractor must retain an engineer to evaluate the impact of construction traffic vibrations, actual soil conditions exposed in the open excavations, seepage and/or groundwater conditions, surcharges adjacent to excavations, proximity of excavations to existing structures, and other factors that may promote excavation wall instability or cause excavation related damage to existing facilities and improvements and adjust excavation sloping/shoring methods accordingly.

3.5.5 Trench Dewatering

We did not encounter groundwater in our pipeline borings at anticipated trench depths. We anticipate that groundwater/seepage could be encountered at/near trenchless crossings or perched at shallower depths along the project alignment. Section 3.4.2 shows the depth of groundwater encountered in our borings. Groundwater levels may be higher during the late fall through late spring months, resulting from higher water levels in creeks and precipitation infiltrating the shallow surficial soil and ponding above the hard clay layers. Similarly, landscape irrigation along the project alignment could infiltrate and pond above the hard clay layer.

Sump pumps should be adequate to dewater excavations if groundwater/seepage is encountered. during excavation. The contractor is solely responsible for design and performance of dewatering systems.

We strongly recommend scheduling the project excavations and backfill during the summer through early fall months to reduce potential groundwater/seepage impacts.

Dewatering needs may differ near creak crossings. Refer to Jacobs' trenchless crossing design for dewatering recommendations for trenches near creek crossings.

3.5.6 Trench Backfill and Compaction

3.5.6.1 Pipe Bedding and Pipe Zone Material

Support pipe on a minimum of 4-inches of granular bedding and in accordance with the pipe manufacturer's recommendations. Although we do not anticipate soft, unsuitable pipe subgrade at any particular location, it can occur where shallow perched groundwater conditions or sandy soils are encountered. If unsuitable subgrade conditions exist, notify the project engineer and Blackburn for review and mitigation recommendations. Typical mitigation, to achieve a stable and non-yielding subgrade suitable for pipe placement and backfilling, may include replacement of unsuitable subgrade with ³/₄-inch





minus crushed rock (minimum of 6 inches), enclosed in geotextile filtration fabric such as Mirafi 140N (or equivalent). A granular pipe zone material may also be used.

Native soils will contain a significant amount of fines (passing #200 sieve) and will not be suitable for bedding or pipe zone backfill. For pipe zone backfill material (which extends a minimum 12 inches above the top of pipe), Yuba County, Department of Public Works, Standard Plans and Specifications specifies the following:

- 1. ¾-inch crushed rock or clean sand compacted to 95% or
- 2. 2 sack slurry

Use a modulus of soil reaction (E') of:

- 2,000 psi for granular pipe zone backfill outlined above (or another approved granular material) if compacted to >85% relative compaction (ASTM D 1557) or 4,000 psi at >90%.
- 3,000 psi for native soils that consist of stiff to hard clays.

3.5.6.2 Trench Backfill

Yuba County Department of Public Works Trench Details show backfill within existing roadways is to be ³/₄-inch Class 2 AB compacted to 95% relative compaction (based on ASTM 1557) unless recommended by an engineer and approved by the County. Intermediate trench backfill above the pipe zone material may consist of native excavated soil provided the following recommendations are followed. Fill should be free of debris and concentrations of vegetation.

If import fill is required for trench backfill, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- Minimum 12% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.

Use ¾-inch Class 2 AB in the upper 12-inches of the trench within roadways.

3.5.6.3 Trench Backfill Compaction

It is important to achieve compaction of Pipe Bedding and Pipe Zone materials at the pipe haunches and spring line; compaction below the pipe spring line will be a difficult task for the contractor. Follow the pipe manufacturer's requirements for initial backfill to avoid damage to the pipe. To facilitate compaction in the pipe zone area (top of bedding up to 12 inches above pipe), use a trench width that provides a minimum clearance of 12 inches between the pipe and trench wall. We recommend a compaction demonstration section to test placement and compaction means and methods for each material type that will be used.

Moisture condition trench backfill above the Pipe Zone material to within 2% of optimum moisture content. Compact pipe backfill:

• To a minimum 92% relative compaction (based on ASTM 1557) below depths of 10 feet.





- To a maximum of 90% relative compaction (based on ASTM 1557) above depths of 10 feet
- In roadways, compact upper 12-inches of AB subgrade to 95% relative compaction (based on ASTM 1557).

To protect the pipe, use a maximum loose lift thickness of 12 inches for the first lift of fill placed above the top of the pipe. Use a maximum loose lift thickness of 8 inches for subsequent lifts. . Jetting is not acceptable for compaction.

Test all trench backfill (bedding, pipe zone backfill, trench zone, etc.) at vertical increments of not more than 1 foot and at final grade or pavement subgrade. For horizontal testing frequency consider a frequency of at least one test for every 200 linear feet of pipe (both sides of pipe in pipe zone). Complete at least one compaction curve (Proctor) for each material type, source location (for import), and as changes in native materials occur. Material changes include a change in material designation based on the Unified Soil Classification System. Testing frequency can be adjusted based on contractor performance, ease of compaction, and material variability.

Soil excavated during pipe installation can have moisture contents well over optimum, especially during the winter and spring months or if perched water is encountered. In this case, it will be necessary to dry back the soil to within 2% of optimum moisture content prior to use as backfill.

3.5.6.4 Trench Backfill Settlement

The magnitude of potential trench backfill settlement will be largely dependent on the degree and uniformity of compaction; therefore, it is important that backfill materials and compaction are checked at frequent intervals to limit potential settlement.

3.5.7 Pipeline Thrust Blocks

We expect thrust blocks to be installed at depths greater than 10 feet. For design of thrust blocks, use a lateral bearing of 200 psf per foot of depth below the surface, up to a maximum of 3,000 psf.

3.5.8 Soil Corrosivity

Our sulfate and chloride content tests indicate that Type II or V Portland cement can be used for concrete mix design. Our pH and resistivity tests generally indicate that the onsite soil exhibits a corrosive to extremely corrosive potential to metal pipes. We are not corrosion consultants and cannot evaluate the potential corrosion impacts to metallic elements embedded in, or in contact with, the ground. A corrosion consultant should provide specific corrosion protection recommendations for buried metallic elements used at the site. Table 3.4 presents the soil corrosivity test results.



Table 3.4: Soil Corrosivity Test Results										
Sample No.	Depth (ft.)	рН	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)					
P-2-3C	16-16.5	6.02	2,040	4.1	15.4					
P-4-4C	14.5-15	6.03	3,220	0.2	6.7					
P-7-3B	10-10.5	6.33	1,420	5.0	9.1					
P-8-3B	10.5-11	6.24	1,150	19.8	3.1					
P-11-3B	10.5-11	7.09	1,230	40.7	17.4					
P-16-3C	15.5-16	7.26	1,630	7.5	2.2					
P-18-4B	14-14.5	7.25	910	31.5	10.9					
P-24-2B	5.5-6	7.18	1,020	40.6	1.3					
P-28-1C	3-3.5	6.58	1,070	30.0	2.5					
P-32-3B	10.5-11	7.33	1,630	8.0	1.5					

4 TRENCHLESS PIPELINE CROSSINGS

4.1 Site Location and Description

The sewer and water pipelines described in Sections 1.3 and 3.1 will use trenchless technologies to cross various waterways and Caltrans freeways. The final size, depths, and trenchless methods have not been determined at this time. Table 4.1 summarizes the location of each trenchless Caltrans crossing and Table 4.2 summarizes the location of each waterway crossing.

Table 4.1: Caltrans Crossing Locations										
Pipeline(s)	Freeway Crossed	Upstream Road	Downstream Road							
Water & Sewer	Hwy 70	McGowan Pkwy	McGowan Pkwy							
Sewer	Hwy 65	Rancho Rd	Olive Ave							
Sewer	Hwy 65	Rossler Rd	Shimer Rd							

The Highway 70 grade at the McGowan Pkwy crossing and the Highway 65 grade at the Rancho Rd to Olive Ave crossing are approximately 15 to 20 feet lower than the adjacent roadway grades. At the Highway 65 Rossler Rd to Shimer Rd crossing, the Highway 65 grade is at a similar elevation to the surrounding area.



Table 4.2: Waterway Crossing Locations									
Pipeline(s)	Waterway Crossed	Alignment Road	Approximate station of waterway						
Water & Sewer	Reeds Creek	Rancho Rd	322+00						
Water & Sewer	Reeds Creek	Rancho Rd	330+00						
Water & Sewer	Hutchinson Creek	Rancho Rd	350+00						
Water & Sewer	Kimball Creek	Rancho Rd	401+00						
Water & Sewer	Culvert	Rancho Rd	428+00						
Water	Unnamed creek	Morrison Rd	879+50						
Water & Sewer	Culvert	McGowan Pkwy	83+50						
Water & Sewer	Kimball Creek	McGowan Pkwy	149+00						

The depths of the waterways vary from crossing to crossing. Near the waterway crossings, the roadway is generally lined with trees, bushes and other vegetation.

4.2 Geology

4.2.1 Geology

Tables 4.3 and 4.4 show the mapped geologic formation and USDA soil type within each proposed trenchless crossing area.

4.3 Field Work and Laboratory Testing

4.3.1 Exploratory Borings

To characterize the site subsurface conditions, Blackburn drilled, logged and sampled 17 borings near proposed sending and receiving shaft locations. Jacobs reviewed and approved of the boring locations. Our subcontractor, Taber Drilling, drilled the borings to depths ranging from <u>+</u> 40 to 50 feet below existing site grades. Appendix B1 shows the proposed site improvements and approximate boring locations. We include the borings logs of borings drilled as of November 10, 2020 in Appendix B2.

Taber drilled the borings using 4-inch diameter solid-stem auger. Soil samples were obtained by Taber at various intervals using a 3.0-inch O.D. Modified California (MC) sampler (equipped with 2.4-inch diameter steel liners) or 2–inch O.D. Standard Penetration (SPT) sampler. Samples were driven with an automatic hammer, weighing 140-pounds and falling approximately 30-inches per blow. We also





collected bulk samples at various depths within the borings. Blackburn's project engineers/geologist Daniel Contreras, Luke Morrell, and Sophie Stuart logged the borings and retained samples for laboratory testing.

4.3.2 Laboratory Testing

Jacobs assigned laboratory tests for trenchless crossing borings. We performed the following laboratory tests on representative soil samples from the exploratory borings as requested:

- Sieve analysis and Plasticity index
- Unconfined compressive strength tests.

Appendix B3 presents the laboratory test results (as of November 10, 2020).

4.4 Subsurface Findings

4.4.1 General Subsurface Soil Conditions

Table 4.3 and 4.4 summarize subsurface soil conditions at the trenchless crossing alignments (based on borings drilled as of November 10th, 2020).



Table 4.3: Subsurface Soil Conditions at Caltrans Trenchless Crossings									
Crossing	B oring I D	Boring Depth (ft)	Approximate Boring Station	Approx Exis Pave AC (in)	(imate ting ment AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurface Soil Conditions**
McGowan Pkwy	T C - 1 A	-	planned future boring	-	-	-	Riverbank		
under Hwy 70	T C - 1 C	-	planned future boring	-	-	-	Formation	214, 217	-
Olive Ave to Rancho Rd under Hwy 65	T C - 2 A A	51.5	19+60	6	N A	2 9	Basin Deposits	134, 214	Very stiff to hard lean clay and sandy lean clay.
	T C - 2 C	51.5	300+10	2.5	12	27.5			Hard silt and lean clay in upper 27 ft., underlain by 11 ft. of dense silty sand. Hard lean clay and sandy silt to depth of 50 ft.
Rossler Rd to Shimer Rd under Hwy 65	T C - 4 A	-	planned future boring	-	-	-	Riverbank Formation	214	
	T C - 4 B	-	planned future boring	-	-	-			-

*Refer to Section 2.1 for description of geologic formation and USDA mapped soil type.

**Depths are approximate

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT OPUD – South Yuba Sewer and Water Infrastructure Project, Olivehurst, CA April 30, 2021



Table 4.4: Subsurface Soil Conditions										
Crossing	B oring ID	Boring Depth (ft)	Approximate Boring Station	Appros Exis Pave AC (in)	ximate ting ment AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurface Soil Conditions**	
	T C - 7 A	51.5	321+30	9	1 2	2 3	Modesto	214	Stiff to hard lean clay and lean clay with sand within the upper 15 ft., underlain by hard silt to	
	Т С - 7 В	51.5	3 2 3 + 3 0	8.5	16	15	Formatio n	142	sandy silt and lean clay to depth of 26 to 29 ft. Medium dense to very dense sand and clayey sand to maximum depth explored.	
Rancho Rdunder	T C - 8 A	51.5	3 2 9 + 6 0	9	9	14	Modesto		Very stiff to hard lean clay and lean clay with sand within the upper 14 ft., underlain by	
Reeds Creek	T C - 8 B	51.5	331+10	8	16	15	Formatio n and Riverban k Formatio n	142, 214	approximately 10 (TC-8A) to 20 ft (TC-8B) of thickly bedded medium dense to dense sand with varying amounts of fines with thick interbeds of stiff to hard sandy lean clay. stiff to hard lean clay in TC-8A from approximately 24 to 38 ft deep. Both borings indicate dense clean sand to maximum depth explored.	
Rancho Rd under Hutchins on Creek	T C - 9 A	51.5	349+70	8	16	2 5	Modesto Formatio n	142	Stiff to hard lean clay to sandy lean clay within the upper 30 ft. (layer of medium dense clayey sand from approximately 10.5 to 14 ft.) underlain by approximately 5 ft. of medium dense silty sand. Lean clay to sandy lean clay to maximum depth explored.	

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT OPUD – South Yuba Sewer and Water Infrastructure Project, Olivehurst, CA April 30, 2021



	Table 4.4: Subsurface Soil Conditions										
Crossing	Boring ID	Boring Depth (ft)	Approximate Boring Station	Appro Exis Pave AC (in)	ximate ting ment AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurface Soil Conditions**		
	Т С - 9 В	51.5	351+20	6	12	2 5			Stiff to hard lean clay, silty clay, and sandy lean clay within the upper 29 ft. (layer of medium dense clayey sand from approximately 23 to 25.5 ft.) underlain by 5 ft. of medium dense silty sand and very stiff silt. Very stiff sandy lean clay and loose to medium dense clayey sand to maximum depth explored.		
Rancho Rdunder	T C - 1 0 A	51.5	400+00	7	10	2 4	Riverban k	214	Very stiff to hard lean clay and sandy lean clay within the upper 9 ft. underlain by 5 ft. of medium dense clayey sand. Very stiff sandy silt from approximately 15 to 19 ft. above 7 feet of medium dense sand and sand with silt underlain by 3 ft. of very stiff sandy silt. Medium dense to dense sand and silty sand from 29 ft. deep to maximum depth explored.		
Kimball Creek	T C - 1 0 B	51.5	402+60	NA	NA	2 4	Formatio n		Stiff to hard lean clay within the upper 24 ft. (layer of very dense gravel with clay and sand from approximately 14 to 17 ft.) underlain by approximately 5 ft. of medium dense silty sand. Stiff to hard lean clay and sandy lean clay from 29 to 38 ft. deep underlain by dense sand and silty sand to maximum depth explored.		

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT OPUD – South Yuba Sewer and Water Infrastructure Project, Olivehurst, CA April 30, 2021



Table 4.4: Subsurface Soil Conditions										
Crossing	B o r i n g I D	Boring Depth (ft)	Approximate Boring Station	Appro Exis Pave AC (in)	ximate ting ment AB (in)	Approximate Depth to GW (ft)	Mapped Geologic Unit*	USDA Soil Type*	General Subsurface Soil Conditions**	
Rancho Rd culvert	T C - 1 4	41.5	4 2 7 + 9 0	8	12	2 8	Riverban k Formatio n	214	Hard lean clay to lean clay with sand in upper 13 ft., underlain by medium dense to very dense sand, silty sand, and clayey sand to depth of 38 ft. (layer of very dense clayey gravel from 24 ft. to 29 ft.). Stiff lean clay below 38 ft depth to maximum depth explored.	
40 Mile Rd culvert	T C - 1 3	51.4	85+80	6.5	1 2	2 6	Basin Deposits	131, 214	Stiff to hard lean clay and silt within the upper 35 ft. underlain by 11 ft. of hard sandy silt and dense silty sand. Very stiff silt from approximately 46 to 50 ft. deep underlain by very dense sand with silt.	
40 Mile	T C - 1 2 A	51.5	147+50	3	4	2 4	Basin Deposits underlain		Stiff to very stiff lean clay and silt with sand within the upper 15 ft. underlain by approximately 15 ft. of medium dense clayey sand and sand with silt. Hard silt from 30 ft. to 40 ft. underlain by very dense sand with silt to maximum depth explored.	
Kd under Kimball Creek	ТС-12В	51.5	149+80	7	12	17	by Riverban k Formatio n	214	Hard lean clay and silt with sand within the upper 33 ft. (layer of medium dense clayey sand from 22 to 25.5 ft.) underlain by dense to very dense silty sand and sand to maximum depth explored (lens of very stiff sandy silt at approximately 40 ft. deep).	

*Refer to Section 2.1 for description of geologic formation and USDA mapped soil type.

**Depths are approximate



4.4.2 Groundwater

We generally observed groundwater at depths of 23 to 29 feet below the ground surface in our borings drilled August through September 2020. In three (3) borings near Reeds Creek on Rancho Road, we observed groundwater at depths of 14 to 15 feet. We encountered groundwater 17 feet below ground surface in our boring on Forty Mile Road just north of Kimball Creek.

Table 4.5 lists the borings where we encountered groundwater and depth to groundwater.

Table 4.5: Groundwater Summary								
Boring	Approximate Station	Approximate Depth to Water (ft.)						
TC-2AA	19+60	29						
TC-2C	300+10	27.5						
TC-7A	321+30	23						
TC-7B	323+30	15						
TC-8A	329+60	14						
TC-8B	331+10	15						
TC-9A	349+70	25						
TC-9B	351+20	25						
TC-10A	400+00	24						
TC-10B	402+60	24						
TC-12A	147+50	24						
TC-12B	149+80	17						
TC-13	85+80	26						
TC-14	427+90	28						

We reviewed groundwater level data for nearby wells available at the California Department of Water Resources website (<u>http://www.water.ca.gov/waterdatalibrary/</u>) and using the Sustainable Groundwater Management Act (SGMA) data viewer

(<u>https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels</u>). Based on this information, the depth to groundwater at the site typically ranges from 20 to 30 feet, although it occasionally is measured above 20 feet. Relatively shallow perched water may occur within the near-surface soils during the winter and spring months, and adjacent to the existing canals and streams.

Groundwater and perched water levels can fluctuate due to changes in precipitation, creek and canal levels, irrigation, pumping of wells, and other factors.

4.4.3 Existing Pavement Sections

Table 4.6 shows approximate pavement conditions encountered in borings for the trenchless crossings.





Table 4.6: Pavement Conditions								
Boring	Approximate Station	Approximate AC Thickness (in)	Approximate AB Thickness (in)					
TC-2AA	19+60	6	NA					
TC-2C	300+10	2.5	12					
TC-7A	321+30	9	12					
TC-7B	323+30	8.5	16					
TC-8A	329+60	9	9					
TC-8B	331+10	8	16					
TC-9A	349+70	8	16					
TC-9B	351+20	6	12					
TC-10A	400+00	7	10					
TC-10B	402+60	NA	NA					
TC-12A	147+50	3	4					
TC-12B	149+80	7	12					
TC-13	85+80	6.5	12					
TC-14	427+90	8	12					

5 PUMP STATIONS & LIFT STATIONS

5.1 Site Location and Description

Final pump station and lift station locations and wet well depths were not determined at the time of this report. Table 5.1 presents proposed lift and pump station locations based on available information from the design team.

Table 5.1: Lift/Pump Station Locations									
Lift/Pump Station	Street	Approximate Station							
LS 1	Olivehurst Ave	11 th Ave	*						
PS 26	Mary Ave	McGowan Pkwy	139+10						
PS 2	McGowan Pkwy	Dan Ave	226+30						
PS 21	Rancho Rd	Ostrom Rd Or Shimer Rd	368+50 or 355+50						
LS 22	Rancho Rd	Kimball Creek	404+60						
LS 23	Rancho Rd	Virginia Rd	462+00						
LS 24	Forty Mile Rd	Morrison Rd	102+90						
PS 25	Forty Mile Rd	Kimball Creek	154+90						

*Stationing not available at time of this report.



The preliminary locations are generally flat and covered in grassy vegetation. Photos 9 through 12 represent typical proposed pump/lift station locations.



Looking northwest at proposed Lift Station #1 site on corner of Olivehurst Ave and 7^{th} Ave.



Looking west at proposed Pump Station #26 site on corner of Mary Ave and McGowan Pkwy.












5.2 Geology

Table 5.2 shows the geologic formation and USDA soil type mapped within each proposed lift/pump station location.

5.3 Field Work and Laboratory Testing

Field work or laboratory testing for pump or lift stations is ongoing at the time of this report. Blackburn will complete drilling borings and laboratory testing at each pump/lift station once the locations have been confirmed. The following subsurface sections are based on the exploratory borings Blackburn drilled, logged, and sampled for the pipeline and trenchless crossing preliminary design.

5.4 Subsurface Findings

5.4.1 General Subsurface Soil Conditions

Table 5.2 shows subsurface conditions in the borings drilled (as of November 10th, 2020) closest to the planned pump station/lift station location.

Table 5.2: Mapped Geology					
Lift/Pump Station	Approximate Station	Geologic Formation*	USDA Soil Type*	Nearest borings **	General Subsurface Soil Conditions***
LS 1	****	Riverbank Formation	217	OS-1	Very stiff to hard lean clay and sandy lean clay within the upper 9 ft., underlain by approximately 6 ft of very dense clayey sand over very stiff lean clay. Hard sandy silt greater than 20 ft. below ground surface.
PS 26	139+10	Riverbank Formation	217	P-3, P-4	Hard lean clay to sandy lean clay within the upper 7 to 10 ft. underlain by medium stiff to very stiff lean clay and lean clay with sand to approximately 18 ft. deep. Medium dense clayey sand to maximum depth explored.
PS 2	226+30	Riverbank Formation or Holocene Alluvium	198	Р-5	Very stiff to hard lean clay, sandy lean clay and silt.
PS 21	368+50 or 355+50	Riverbank Formation	214	TC-9B	Stiff to hard lean clay, silty clay, and sandy lean clay within the upper 29 ft. (layer of medium dense clayey sand from approximately 23 to 25.5 ft.) underlain by 5 ft. of medium dense silty sand and very stiff silt. Very stiff sandy lean clay and loose to medium dense clayey sand to maximum depth explored.



Table 5.2: Mapped Geology						
Lift/Pump Station	Approximate Station	Geologic Formation*	USDA Soil Type*	Nearest borings **	General Subsurface Soil Conditions***	
				P-10	Hard lean clay and lean clay with sand within the upper 9 ft. underlain by dense to very dense clayey sand and silty sand.	
LS 22	404+60	Riverbank Formation	214	TC-10B	Stiff to hard lean clay within the upper 24 ft. (layer of very dense gravel with clay and sand from approximately 14 to 17 ft.) underlain by approximately 5 ft. of medium dense silty sand. Stiff to hard lean clay and sandy lean clay from 29 to 38 ft. deep underlain by dense sand and silty sand to maximum depth explored.	
				P-13	Hard lean clay to sandy lean clay within the upper 15 ft. underlain by medium dense sand with silt.	
LS 23	462+00	Riverbank Formation	131	P-15, P-16	Stiff to hard lean clay within the upper 5 ft, underlain by 5 to 10 ft of medium dense clayey sand and hard sandy clay over hard lean clay and silt.	
LS 24	102+90	Riverbank Formation	214	P-26, P-27	Very stiff to hard lean clay, lean clay with sand, silt with sand, and sandy silt within the upper 20 ft. (Very dense poorly-graded sand with silt below 18 ft. in Boring P-26)	
PS 25	154+90	Riverbank Formation	214	TC-12B	Hard lean clay and silt with sand within the upper 33 ft. (layer of medium dense clayey sand from 22 to 25.5 ft.) underlain by dense to very dense silty sand and sand to maximum depth explored (lens of very stiff sandy silt at approximately 40 ft. deep).	

*Refer to Section 2.1 for description of geologic formation and USDA mapped soil type.

**Nearest boring drilled by Blackburn as of Nov. 10, 2020

***Depths are approximate

****Stationing not available at time of this report.

5.4.2 Groundwater

We generally observed groundwater at depths of 24 to 29 feet below ground surface in the borings drilled nearest the proposed pump/lift station locations in August through September 2020. In boring TC-12B (near proposed Pump Station #25) we measured groundwater at a depth of 17 feet below ground surface.





We reviewed groundwater level data for nearby wells available at the California Department of Water Resources website (<u>http://www.water.ca.gov/waterdatalibrary/</u>) and using the Sustainable Groundwater Management Act (SGMA) data viewer

(<u>https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels</u>). Based on this information, the depth to groundwater at the site typically ranges from 20 to 30 feet, although it occasionally is measured above 20 feet. Relatively shallow perched water may occur within the near-surface soils during the winter and spring months, and adjacent to the existing canals and streams.

Groundwater and perched water levels can fluctuate due to changes in precipitation, creek and canal levels, irrigation, pumping of wells, and other factors.

Table 5.3 lists groundwater depth in the 2 borings nearest to each pump station in which the driller encountered groundwater.

Table 5.3 Groundwater Summary					
Lift/Pump Station Proposed Location	Approximate Station	Nearest Borings	Approximate Distance from Lift/Pump Station (yd)	Approximate Depth to Water (ft.)**	
LS 1	* * *	TC-2AA	2,230	29	
		B8*	2,640	20.7	
PS 26	120+10	B8*	1,380	20.7	
	139+10	TC-2AA	1,620	29	
PS 2	226120	TC-2AA	870	29	
	220+50	Nearest BoringsApproximate Distance from Lift/Pump Station (yd)TC-2AA2,230B8*2,640B8*1,380TC-2AA1,620TC-2AA870TC-2AA870TC-2C1,030TC-9BPump station location notTC-10Adetermined at time of this reportTC-10B30TC-10A110TC-6A1,500TC-13540TC-12A1,520TC-12B160	1,030	27.5	
PS 21	368+50 or	TC-9B	Pump station location not	25	
	355+50	TC-10A	determined at time of this report	24	
LS 22	404+60	TC-10B	30	24	
	404+60	3 Groundwater SummaryNearest BoringsApproximate Distance from Lift/Pump Station (yd)TC-2AA2,230B8*2,640B8*1,380TC-2AA1,620TC-2AA870TC-2AA870TC-2C1,030TC-9BPump station location notTC-10Adetermined at time of this repoTC-10B30TC-10A110TC-6A1,500TC-13540TC-12A1,520TC-12B160TC-12A250	24		
LS 23	462+00	TC-6A	1,500	NA	
	462+00	TC-10B	1,960	24	
LS 24	LS 24 102,00		540	26	
	102+90	TC-12A	1,520	24	
PS 25	154.00	TC-12B	160	17	
	154+90	TC-12A	250	24	

*Drilled in 2004 for CH2M HILL WWTP Expansion and Upgrade Project Schematic Design – Preliminary Geotechnical Exploration Report

** Depth to groundwater measured from ground surface at boring location. Elevation of ground surface at pump/lift station may differ from elevation of ground surface at boring location.

***Stationing not available at time of this report.

5.5 Preliminary Design Considerations – Pump/Lift Stations

The final locations of the pump/lift stations have not been determined. Our subsurface investigation and laboratory testing will be completed once Jacobs determines the final locations and obtains the Rights-





of-Entry. Based on nearby borings completed for the pipeline and trenchless crossings, we anticipate the soil conditions within the proposed pump/lift station sites will be suitable for the planned facilities when constructed in accordance with the project plans, industry standards, and our final geotechnical recommendations. The recommendations below are for preliminary design only and will need to be finalized after we complete the site-specific borings, laboratory tests, and further analysis.

5.5.1 Geologic Hazards

- Faulting—The potential for surface rupture or creep due to faulting at the site is very low. The
 Fault Activity Map of California⁶ and the Geologic Map of the Sacramento Quadrangle⁷ does not
 identify Historic or Holocene age faults (displacement within the last 11,700 years) within or
 immediately adjacent to the site. The site does not lie within or adjacent to an Alquist—Priolo
 Earthquake Fault Zone⁸.
- Ground Shaking—For the Maximum Considered Earthquake, a peak horizontal ground acceleration (PGA) of approximately 0.21g could be expected.
- Liquefaction—Our investigation shows a soil profile that consists of stiff to hard clays and medium dense to dense silty and clayey sands that are not liquefiable. Therefore, the potential for damaging liquefaction at the site is very low.
- Landslides and Slope Stability—Due to the relatively low topographic relief and existing slope gradients, we do not expect landslides or natural slope failure.
- Seismically Induced Settlement—During a seismic event, ground shaking can cause densification of granular soil that can result in settlement of the ground surface. Considering the cohesive soils and medium dense soils observed in the borings, we consider the potential for significant seismically induced settlement to be very low.

5.5.2 Seismic Design

Based on the mapped geology and our boring data, use a Site Class "D" (stiff soil). Table 5.4 presents the 2019 *California Building Code* (Chapter 16) and ASCE 7-16 seismic design parameters for the site.

⁸ Bryant, W.A., and Hart, E.W., 2007 (Interim Revision), <u>Fault-Rupture Hazard Zones in California</u>: California Department of Conservation, Division of Mines and Geology, Special Publication 42.



⁶ Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.

⁷ Saucedo, G.J. and Wagner, D.L., et al, 1992, Geologic map of the Chico quadrangle, California, 1: 250,000: California Division of Mines and Geology, Regional Geologic Map 7A, scale 1: 250,000.



Table 5.4: 2019 CBC Seismic Design Parameters (Site Class D)			
S_s – MCE _R ground motion (0.2 second period)	0.496 g		
$S_1 - MCE_R$ ground motion (1.0 second period)	0.241 g		
F _a – Site Coefficient	1.403		
F _v – Site Coefficient	2.12 ¹		
S _{MS} – Adjusted MCE* Spectral Response Acceleration Parameter	0.696 g		
S _{M1} – Adjusted MCE* Spectral Response Acceleration Parameter	0.511 g ¹		
S _{DS} – Design Spectral Acceleration Parameter	0.464 g		
S_{D1} – Design Spectral Acceleration Parameter	0.341 g ¹		
Seismic Design Category			
**T∟ – Long Period Transition Period	12 sec		
PGA	0.21		

* Maximum Considered Earthquake

** Figure 22-14, ASCE 7-16

1 – We assume that the seismic response coefficient, Cs, is determined by ASCE 7-16 Eq. (12.8-2) for values of T \leq 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either ASCE 7-16 Eq. (12.8-3) for TL \geq T > 1.5Ts or Eq. (12.8-4) for T > TL. Contact Blackburn to re-evaluate the above parameters if this assumption is not valid.

If the proposed design does not meet the exception noted above (note 1) a site-specific response analysis will be required for final design.

5.5.3 General Grading Recommendations

5.5.3.1 Excavation Conditions

Based on the soil conditions and drilling performance for nearby explorations, excavation is likely possible with conventional equipment (common earthmoving equipment and large backhoe/excavator). The fine-grained and hard soil conditions can create slow excavation conditions.

5.5.3.2 Site Clearing

Prior to excavation or making any cuts and fills, remove existing underground utilities, foundations, vegetation (root balls and roots), debris, and other underground features in accordance with this Geotechnical Report. Remove loose and disturbed soil caused by the removal(s) and widen the excavation/depression so it is accessible to compaction equipment. Remove strippings from the site or use as landscape soil in designated areas.

5.5.3.3 Original Ground and Subgrade Preparation

After clearing, process and compact the exposed soil in at-grade, cut, and fill areas as follows:

- Scarify the exposed soil to a depth of approximately 8 inches.
- Moisture condition subgrade to within 3% of the optimum moisture content.
- Compact the subgrade soil to a minimum 90% relative compaction based on ASTM D1557





Where fill is placed on sloping ground, blade back slopes horizontally during placement of embankment fill to create a stepped (or benched) fill surface (such that a uniform, sloping fill surface is avoided). Benching must remove loose surficial soils and result in stepped benches, generally one to two feet in height and depth into the existing slope. The lower bench should be sloped a minimum of 2% into the slope. Where benching will interfere with existing structures, utilities, or vegetation, Blackburn can review modifications on a case-by-case basis.

5.5.3.4 General Fill Placement and Compaction

General Fill (not structure backfill) may consist of on-site soil. Fill should be free of debris and concentrations of vegetation.

If import fill is required, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- Minimum 12% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.
- Approval from Blackburn prior to placement

Place fill in maximum 8-inch thick loose lifts, moisture condition 1% to 2% above optimum, and compact to a minimum of 90% relative compaction based on ASTM D 1557 test procedure. Compact fill using a sheepsfoot or padded drum type roller.

Construct fill slopes no steeper than 2(H):1(V). To achieve adequate compaction on the face of fill slopes, over-build the slopes and then cut back to the design grade. Track-walking is not an adequate method to compact the face of slopes.

5.5.4 Dewatering

Dewatering may be required for installations greater than approximately 20 feet deep. Significant groundwater inflow may occur at the pump stations, particularly those located near water ways during winter and spring months.

Dewatering can consist of:

- Deep sumps within the excavation. Considering the presence of fine-grained soils and relatively flat lying bedding, sumps within the excavation are not likely to provide good drawdown.
- Well points. Well points will likely work better to cut off flow into the excavation and drawdown the water level over a larger area.

To facilitate work at the base of the excavation, groundwater should be drawn down at least 3 feet below the planned bottom of excavation. The need for dewatering can be reduced by planning excavations during the lowest anticipated seasonal water levels (expected during the late summer and fall months.





5.5.5 Temporary Excavations

Temporary excavations will require sloping and/or shoring in accordance with Cal OSHA requirements. Based on our subsurface exploration and laboratory testing, preliminary excavation and shoring design may be based on Type A soil to planned excavation depth that may be sloped at 3/4(H):1(V).

Where groundwater is present or cohesionless/uncemented granular soils are encountered, Type C soil conditions will apply and a 1.5(H):1(V) slope gradient is required.

The Contractor must retain an engineer to evaluate the impact of existing structures, traffic vibrations, actual soil conditions exposed in the open trenches, and other factors that may promote trench wall instability and adjust trench sloping/shoring accordingly. Surcharge loads such as trench spoils, equipment, etc. should not be placed adjacent to an open excavation (within a distance of ½ the height of the trench). *The above is guideline information only.* The contractor is responsible for the safety of all excavations and should provide appropriate excavation sloping and shoring in accordance with current Cal OSHA requirements and observe conditions observed during construction for necessary modification and safety.

5.5.6 Foundations

5.5.6.1 Below-Grade Foundations

5.5.6.1.1 Bearing Capacity

The pump/lift stations are below-grade structures and the net pressure exerted upon the subsurface will be similar to or less than the current soil pressure at the bottom of the pump station wet wells. Excavation for below-grade structures reduces the net pressure by removing soil that acts as a "preload" to the underlying soils, thus "unloading" the bearing materials before "loading" by placement of the structure.

We understand that below grade structures will use mat type foundations for support. For structures at depths greater than 15 feet:

- Use a maximum net contact pressure for mat foundation of 3,000 psf.
- Use a Modulus of Subgrade Reaction, k_s, equal to 25 pci.
- We expect settlement of mat foundations is expected to be less than 1 inch with differential settlement less than ½-inch across the pump station structure.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- For subgrade uniformity, Caltrans Class 2 aggregate baserock as underlayment (this is not geotechnically necessary provided a firm uniform subgrade is obtained). If an aggregate underlayment is used, place a minimum thickness of 6-inches and compact to a minimum of 95% relative compaction (per ASTM D 1557 test method).
- Crushed rock underlayment may also be used (and can benefit excavation dewatering). Underlay the crushed rock with a geotextile filter fabric (i.e., Mirafi 140N) and compact the rock with at least 6 passes of a static roller.





If isolated spread footings or piers are required for column support, Blackburn can provide additional recommendations when the planned design and approximate loading is available.

5.5.6.1.2 Structure Backfill

Native material encountered in our borings for the pipeline and trenchless crossings primarily consist of fine-grained soils and are <u>not</u> suitable for structure backfill.

Use the specifications in Table 5.5 for imported structure backfill for all below-grade structures:

Table 5.5: Import Structure Backfill Requirements				
Grad	ation	Test Procedures		
Sieve Size	Percent Passing	ASTM	Caltrans	
1 inch	100	D6913	202	
¾ inch	70-100	D6913	202	
No. 4	50-100	D6913	202	
No. 200	12-40	D6913	202	
Plasticity				
Plasticity Index	<12	D4318	204	

As shown below, the zone of placement for structure backfill should extend up from the base of the wall at a slope of 1(H):1(V) and at least 3 feet behind the wall.



- Moisture condition structure backfill to within 2% of optimum and place in maximum 8-inch thick, horizontal, loose lifts.
- Compact structure backfill to a minimum 92% relative compaction based on the ASTM D 1557 test method.

To minimize the residual lateral earth pressures on structure walls, restrict compaction equipment behind the walls (by load and distance from wall) so that wall design values are not exceeded. We





recommend compaction within a horizontal distance equal to one-half of the wall height (to a maximum distance of 5 feet), be completed with hand-operated equipment (i.e., jumping jack).

To minimize the potential for significant settlement around deep walls, controlled low strength material (CLSM) can be used to backfill to the surface or to a manageable depth (e.g., 10 feet below grade).

5.5.6.1.3 Lateral Earth Pressures

The pump/lift stations are below grade structures that will act as restrained retaining structures. Walls will retain compacted select native soils and/or imported soils meeting the requirement for structure backfill. For evaluation of lateral earth pressures, use the backfill equivalent fluid weights (EFW) for level ground conditions shown below in Table 5.6.

Table 5.6: LATERAL EARTH PRESSURES				
Condition	Seismic Equivalent Fluid Weight (pcf)			
At-Rest	85	6		
Passive	150	140*		

*Total passive EFW for passive condition

The above pressures assume structure backfill placed against the structure wall in accordance with our recommendations, a saturated (total) unit weight of approximately 135 pounds per cubic foot (pcf) and a minimum internal angle of friction of 32 degrees. Notify Blackburn if these assumptions are not valid so that we may assess the situation and provide additional recommendations, if necessary. Backfill with CLSM is an acceptable alternative.

For seismic loading, add the Seismic EFW to the at-rest EFW and apply the total force as a uniform load on the wall with a resultant located at 0.5H where H is the backfill height. We estimated the EFWs for seismic loading using the Mononobe-Okabe equation and a horizontal seismic acceleration coefficient, k_h , of approximately ½ the expected PGA (0.22). This k_h value assumes that the walls displace at least 1inch during the design seismic event.

Surface loads (footings, storage, vehicle traffic) applied near the wall will increase the lateral pressure on the wall. A uniform surface load of 240 psf to 300 psf is often used to approximate construction traffic loading on walls. In general, if surface loads are closer to the edge of the retaining wall than three-fourths of the retained height, increase the design wall pressure by 0.5q over the area of the retaining wall. In this expression, q is the surface surcharge load in psf. This is a conservative procedure and lower design pressures may be applicable upon evaluation of individual surface loads and setback distances.

5.5.6.1.4 Buoyancy Resistance

Based on nearby borings we estimate a groundwater depth of approximately 20 feet, as discussed in Section 5.4.2. In undrained conditions, structures below a depth of approximately 20 feet, may be subjected to an uplift load (buoyancy). The uplift force will be resisted by the weight of the structure and the weight of the backfill overlying foundation extensions (if any).



If Jacobs designs foundation extensions to resist buoyancy forces, calculate the resistance against uplift due to the weight of the soil. Use a backfill total unit weight of 130 pcf above groundwater and 67 pcf below groundwater, with a soil wedge extending vertically up from foundation extensions

5.5.6.1.5 Lateral Resistance

Lateral resistance for retaining structures can be achieved through friction and passive earth pressures acting on the foundation. For design, use a coefficient of friction of 0.40 (below or above groundwater) at the base of the concrete footing and a passive earth pressure of 150 psf per foot of embedment depth. Limit passive earth pressures to a maximum of 3,000 psf (additional passive pressure can be evaluated for specific locations if necessary). Do not include the upper 1-foot of soil in passive resistance calculations. Where passive pressure or friction alone is used against sliding, use a minimum factor of safety of 1.5 for lateral stability (1.1 if seismic loading is included). Where both passive pressure and friction are used to resist sliding, use a minimum factor of safety of 2.0.

5.5.6.2 Minor Structures

Provided that the recommendations in this report are followed, we anticipate minor structures (such as valve vaults, etc.) may be founded on concrete mat or strip footings, or a compacted granular base (minimum of 6 inches of Class 2 baserock) if appropriate.

- Embed the foundations a minimum of 18 inches below the lowest adjacent prepared subgrade into firm native soil or compacted fill/backfill.
- Footings must be a minimum of 12 inches wide and sized not to exceed an allowable bearing capacity of 2,000 psf. The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- If additional bearing capacity is required for specific minor structures, we can review and provide recommendations on a case-by-case basis.
- To resist lateral movement, use a coefficient of friction of 0.40 at the base of the foundation and an ultimate passive earth pressure of 150 psf (undrained condition) per foot of embedment depth up to a maximum of 2,000 psf. Ignore the upper one-foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.

5.5.7 Soil Corrosivity

Our sulfate and chloride content tests on pipeline samples indicate that Type II or V Portland cement can be used for concrete mix design. Our resistivity tests generally indicate that the onsite soils may exhibit corrosive to extremely corrosive conditions for metal pipes. We are not corrosion consultants and cannot evaluate the potential corrosion impacts to metallic elements embedded in or in contact with the ground. A corrosion consultant should provide specific corrosion protection recommendations for buried metallic elements used at the site.



6 WWTP IMPROVEMENTS

6.1 Site Location and Description

The proposed WWTP expansion will be constructed at the existing WWTP on Mary Ave in Olivehurst. The proposed secondary clarifier location is generally level and covered in gravel. The site for the proposed equalization basin is generally flat but depressed approximately 3 to 4 feet below the WWTP ground surface and is covered in seasonal grass and weeds. Photos 9 and 10 represent site conditions at the time of our October 19, 2020 site visit.



clarifier can be seen on the left in the background.





6.2 Project Description

The proposed WWTP improvements consist of an additional secondary clarifier, a 30.7 Acre-ft concretelined equalization basin, a 4.37 Acre-ft Stormwater Detention Basin, and a 16-inch-diameter force main.

6.3 Previous Studies

Geotechnical conclusions and recommendations for the proposed secondary clarifier presented in this report are primarily based on the CH2M HILL WWTP Expansion and Upgrade Project Schematic Design – Preliminary Geotechnical Exploration Report, February 2004 (CH2M Report).

6.4 Geology

We reviewed geology maps and the United States Department of Agriculture's (USDA) Web Soil Survey (<u>https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm</u>) to infer likely subsurface conditions at the site. The "Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California" (Helley and Harwood, 1985) generally maps Upper Member, Riverbank Formation under the site. Refer to Section 2.1 for a description of the Riverbank Formation.

The web soil survey indicates that the site is underlain by San Joaquin loam (214). The survey states this unit has the following relevant properties from 0 to 25 inches deep: Silt (ML), Silty Clay (CL-ML) and Clay (CL) with fines content ranging from 50 to 70 percent.





6.5 Field Work and Laboratory Testing

6.5.1 Exploratory Test Pits

Blackburn excavated, logged, and sampled 5 test pits to characterize the site subsurface conditions at the equalization basin site. Our subcontractor, Burke Construction, excavated the test pits to a depth of 8 feet below existing site grades. Appendix D1 shows the proposed site improvements and approximate test pit locations. The test pit logs are included in Appendix D2. Burke Construction excavated the test pits using a CAT 420 backhoe equipped with a 2-foot wide bucket. Blackburn's project engineer, Luke Morrell, logged the test pits, collected samples from various depths and retained samples for laboratory testing.

Blackburn drilled an exploratory boring for the clarifier but lab has not been completed at this time, so no recommendations in this report are based on conditions in Blackburn's boring.

6.5.2 Laboratory Testing

We have not completed laboratory tests on the samples collected from the equalization basin site.

6.6 Subsurface Findings

6.6.1 General Subsurface Soil Conditions

We generally encountered hard lean clay to sandy lean clay in the test pits, excavated October 19, 2020. In the southeast portion of the equalization basin (TP-5), we encountered dense clayey sand below a depth of approximately 2.5 feet.

The CH2M Report (2004) indicates that the subsurface soils in boring B8 near the proposed secondary clarifier location consist of:

- Approximately 3 feet of sandy clay over a lean clay with sand hardpan layer to approximately 8 feet below ground surface.
- Sandy clays and clayey sands from depths of about 8 to 23 feet,
- Sandy gravel from depths of 23 to 30 feet.
- Sandy clay and clayey sand to the maximum depth explored (41.5 ft).

6.6.2 Groundwater

We did not encounter groundwater in our test pits excavated October 19, 2020.

According to the CH2M Report (2004) and associated boring logs, perched groundwater was encountered in the sandy clay above the hardpan layer and groundwater was measured 20.7 feet below the ground surface near the proposed secondary clarifier location. The logs indicate that the groundwater elevation ranges from 29.8 to 33.3 feet across the WWTP site (CH2M Report does not specify datum used).

We reviewed groundwater level data for nearby wells available at the California Department of Water Resources website (<u>http://www.water.ca.gov/waterdatalibrary/</u>) and using the Sustainable Groundwater Management Act (SGMA) data viewer





(https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels). Based on this information, the groundwater elevation at the site typically ranges from 25 to 40 feet above mean sea level (NAVD88). Relatively shallow perched water may occur within the near-surface soils during the winter and spring months, and adjacent to the existing canals and streams.

Groundwater and perched water levels can fluctuate due to changes in precipitation, canal levels, irrigation, pumping of wells, and other factors.

6.7 Preliminary Design Considerations – WWTP Improvements

At the time of this report, basin design was not finalized. Blackburn will provide updated recommendations in the design-level geotechnical report based on final basin design.

6.7.1 Facility Ground Suitability

The soil conditions at the site are suitable for the planned facilities when constructed in accordance with the project plans, industry standards, and our geotechnical recommendations. Some of the more significant site limitations include the presence of clay soils that will not be suitable for structure backfill, and relatively shallow groundwater that may require dewatering for some structure installations.

6.7.2 Geologic Hazards

- Faulting—The potential for surface rupture or creep due to faulting at the site is very low. The Fault Activity Map of California⁹ and the Geologic Map of the Sacramento Quadrangle¹⁰ does not identify Historic or Holocene age faults (displacement within the last 11,700 years) within or immediately adjacent to the site. The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone¹¹.
- Ground Shaking— For the Maximum Considered Earthquake, a peak horizontal ground acceleration (PGA) of approximately 0.22g could be expected.
- Liquefaction—Our investigation shows a soil profile that consists of stiff to hard clays and medium dense to dense silty and clayey sands that are not liquefiable. Therefore, the potential for damaging liquefaction at the site is very low.
- Landslides and Slope Stability—Due to the relatively low topographic relief we do not expect landslides or natural slope failure.
- Seismically Induced Settlement—During a seismic event, ground shaking can cause densification of granular soil that can result in settlement of the ground surface. Considering the cohesive soils and medium dense soils observed in the borings, we consider the potential for significant seismically induced settlement to be very low.

¹¹ Bryant, W.A., and Hart, E.W., 2007 (Interim Revision), <u>Fault-Rupture Hazard Zones in California</u>: California Department of Conservation, Division of Mines and Geology, Special Publication 42.



⁹ Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.

¹⁰ Saucedo, G.J. and Wagner, D.L., et al, 1992, Geologic map of the Chico quadrangle, California, 1: 250,000: California Division of Mines and Geology, Regional Geologic Map 7A, scale 1: 250,000



6.7.3 Seismic Design

We assumed, based in part on our boring data, an average shear wave velocity, V_{S30}, of 850 ft/sec that corresponds to a site class "D" (Section 2.3). Per ASCE 7-16 a site-specific analysis is required for a site class "D" site unless one of the exceptions noted in ASCE7-16, Section 11.4.8, is used. We understand that for this project the exception will not be used. Therefore, we performed a site-specific analysis per ASCE 7-16, Chapter 21. We analyzed probabilistic and minimum code values to develop a site-specific spectra for 5% damping. A deterministic analysis is not required because the largest spectral response acceleration of the probabilistic ground motion response calculated in accordance with ASCE 7-16 21.2.1 is less than 1.2 F_a. The recommended spectra are presented in Graph 2 and digitized spectral values in Table 2. Appendix D4 presents details of our site specific response analysis.



Graph : Site-Specific Design Spectra

Use the S_{MS} , S_{M1} , S_{DS} , and S_{D1} values in Table 3. We calculated the values in accordance with ASCE 7-16, Section 21.4 and 21.5.





Table C-3: Comparison of Recommended and ASCE 7-16 Section 11.4.6 Spectra				
Period	Recommended Design Response Spectrum	ASCE 7-16 11.4.6 Response Spectrum	80% of ASCE 7-16 11.4.6 Response Spectrum	
0	0.223	0.189	0.151	
0.1	0.400	0.359	0.288	
0.166	0.507	0.472	0.378	
0.2	0.553	0.472	0.378	
0.3	0.604	0.472	0.378	
0.5	0.580	0.472	0.378	
0.75	0.481	0.472	0.378	
0.865	0.440	0.472	0.378	
1.0	0.402	0.408	0.327	
2.0	0.225	0.204	0.163	
3.0	0.156	0.136	0.109	
4.0	0.120	0.102	0.082	
5.0	0.098	0.082	0.065	

Table C-4: Design Spectral Acceleration Values and Peak Ground Acceleration			
Parameter	Acceleration Value (g's)		
S _{MS}	0.815 ¹		
S _{M1}	0.735 ²		
S _{DS}	0.544 ³		
S _{D1}	0.4904		
PGA _M	0.3175		

 $^1S_{\text{MS}}$ 1.5 times the S_{DS} value in Table C-4

 $^2S_{M1}$ 1.5 times the S_{D1} value in Table C-4

³S_{DS} 90% of the maximum spectral acceleration from the site-specific spectrum (0.399)

 $^{4}S_{D1}$ Maximum value of the product of TS_a (time multiplied by spectral acceleration value) for periods of 1 to 2 seconds for sites with V_{s30} of greater than 1,200 ft/s)

⁵The site-specific MCE_G peak ground acceleration (PGA_M) is the lesser of the probabilistic or deterministic mean peak ground acceleration.

6.7.4 General Grading Recommendations

6.7.4.1 Excavation Conditions

Based on the soil conditions and drilling performance, excavation is possible with conventional equipment (common earthmoving equipment and large backhoe/excavator). The fine-grained and hard soil conditions can create slow excavation conditions and is not suitable for structure backfill.





6.7.4.2 Site Clearing

Prior to trenching or making any cuts and fills, remove existing underground utilities, foundations, vegetation (root balls and roots), debris, and other underground features in accordance with this Geotechnical Report. Remove loose and disturbed soil caused by the removal(s) and widen the excavation/depression so it is accessible to compaction equipment. Remove strippings from the site or use as landscape soil in designated areas.

6.7.4.3 Original Ground and Subgrade Preparation

Process and compact the exposed soil in at-grade, cut, and fill areas as follows:

- Scarify the exposed soil to a depth of approximately 8 inches.
- Moisture condition subgrade to within 3% of the optimum moisture content.
- Compact the subgrade soil to a minimum 90% relative compaction based on ASTM D1557.

Where fill will be placed on or against slopes with a gradient of 5(H):1(V) or steeper, fill must be benched into the slope. Benching must remove loose surficial soils and result in stepped benches, generally one to two feet in height and depth into the existing slope. Where benching will interfere with existing structures, utilities, or vegetation, Blackburn can review modifications on a case-by-case basis.

For fills that are 5 feet or higher and placed on or against a slope with a gradient of 5:1 or steeper, provide a key at the toe of the fill slope. The key must be a minimum of 10 feet wide, one foot deep, sloped a minimum of 2% into the slope, and extend 2 feet beyond the fill toe. Where restricted access will not allow for a toe-bench 10 feet wide, the bench can be reduced to a minimum width of 6 feet provided the fill slope is less than 10 feet in height and the contractor can show that compaction equipment can achieve the specified compaction for the full width of the bench.

6.7.4.4 General Fill Placement and Compaction

General fill (**not trench or structure backfill**) may consist of on-site soil provided it contains no rocks larger than 4 inches in maximum dimension. Fill should be free of debris and concentrations of vegetation.

Table 6.4: General Backfill Import Requirements				
Gradat	tion	Test Procedures		
Sieve Size	Percent Passing	ASTM	Caltrans	
1 inch	100	D6913	202	
No. 4	75-100	D6913	202	
No. 200	12-100	D6913	202	
Plasticity Index				
Less than 20		D4318		

If import for general fill is required, it must be free of debris and meet the following requirements:

• Approved by Blackburn prior to site delivery.





Place and compact fill as follows:

- Place fill in maximum 8-inch-thick loose lifts,
- Moisture condition the soil within 3% of optimum
- Compact the soil to a minimum 90% relative compaction based on ASTM D1557.

Test all fill at vertical increments of not more than 1 foot and at final grade or pavement subgrade. For horizontal testing frequency, use the following minimums:

- One test for every 100 square feet around structures
- One test for every 500 square feet for structure pads

Complete at least one compaction curve (Proctor) for each material type, source location (for import), and as changes in native materials occur. Material changes include a change in material designation based on the Unified Soil Classification System.

6.7.4.5 Fill Slopes

Construct fill slopes no steeper than 2(H):1(V). To achieve adequate compaction on the face of fill slopes, over-build the slopes and then cut back to the design grade. Track-walking is not an adequate method to compact the face of slopes.

6.7.5 Dewatering

Dewatering may be required for installations greater than approximately 15 feet deep (see Section 6.6.2). Significant groundwater inflow should be anticipated at the deeper excavations for the clarifier.

Dewatering can consist of:

- Deep sumps within the excavation. Considering the presence of fine-grained soils and relatively flat lying bedding, sumps within the excavation are not likely to provide good drawdown.
- Well points. Well points will likely work better to cut off flow into the excavation and drawdown the water level over a larger area.

To facilitate work at the base of the excavation, groundwater should be drawn down at least 3 feet below the planned bottom of excavation. The need for dewatering can be reduced by planning excavations during the lowest anticipated seasonal water levels (expected during the late summer and fall months).

6.7.6 Temporary Excavations

Temporary excavations will require sloping and/or shoring in accordance with Cal OSHA requirements. Based on previous subsurface explorations by CH2M Hill, preliminary excavation and shoring design may be based on Type A soil to planned excavation depth. For Type A soil conditions, temporary excavations may be sloped at $\frac{3}{4}$ (H):1(V).

Where groundwater is present or cohesionless/uncemented granular soils are encountered, Type C soil conditions will apply and a 1.5(H):1(V) slope gradient is required.





The Contractor must retain an engineer to evaluate the impact of existing structures, traffic vibrations, actual soil conditions exposed in the open trenches, and other factors that may promote trench wall instability and adjust trench sloping/shoring accordingly. Surcharge loads such as trench spoils, equipment, etc. should not be placed adjacent to an open excavation (within a distance of ½ the height of the trench). *The above is guideline information only.* The contractor is responsible for the safety of all excavations and should provide appropriate excavation sloping and shoring in accordance with current Cal OSHA requirements and observe conditions observed during construction for necessary modification and safety.

6.7.7 Foundations

6.7.7.1 At-Grade Shallow Foundations

If the designers and contractors follow our grading and construction recommendations below, foundations for at grade structures can be supported on shallow strip footings and isolated spread footings. We expect footings for at-grade structures to be founded on compacted fill and/or firm native soils.

- Embed continuous strip and isolated footings a minimum of 18 inches into the lowest adjacent prepared subgrade.
- Both strip and isolated footings must be a minimum of 18 inches wide. Size strip and isolated footings not to exceed an allowable bearing capacity of 2,000 pounds per square foot (dead load plus live load). The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- Total settlement is expected to be less than ³/₄-inch and differential settlement less than ¹/₂-inch over a length of 50 feet.
- To resist lateral movement, use a coefficient of friction of 0.40 psf at the base of the foundation and a passive earth pressure of 200 psf per foot of embedment depth up to a maximum of 2,000 psf. Ignore the upper one-foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.
- Concrete slabs with crushed rock underlayment may be designed using a Modulus of Subgrade Reaction, k_s, of 25 pounds per cubic inch (pci) in cut or fill locations where engineered fill is placed as recommended in this report.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- Slope the ground surface away from foundations at a minimum of 2 percent for a distance of at least 5 feet.

6.7.7.2 Below-Grade Foundations

6.7.7.2.1 Bearing Capacity

The planned clarifier is a below-grade structure and the net pressure exerted upon the subsurface will be similar to or less than the existing soil pressure at the bottom of the clarifier. Excavation for below-





grade structures reduces the net pressure by removing soil that acts as a "preload" to the underlying soils, thus "unloading" the bearing materials before "loading" by placement of the structure.

Below grade structures will use mat type foundations for support. For structures at depths greater than 20 feet:

- Use a maximum net contact pressure of 3,000 psf.
- Use a Modulus of Subgrade Reaction, k_s, equal to 25 pci.
- We expect settlement of mat foundations is expected to be less than 1 inch with differential settlement less than ½-inch over a distance of approximately 100 feet.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- For ground preparation and subgrade uniformity, Class 2 aggregate baserock can be used as underlayment (this is not geotechnically necessary provided a firm uniform subgrade is obtained). If an aggregate underlayment is used, place a minimum thickness of 6-inches and compact to a minimum of 95% relative compaction (per ASTM D 1557 test method).
- Crushed rock underlayment may also be used (and can benefit excavation dewatering). Envelope the crushed rock with a geotextile filter fabric (ie. Mirafi 140N) and compact the rock with a static roller.

Blackburn can provide additional recommendations when the planned design and approximate loading is available if isolated spread footings or piers are required for column support.

6.7.7.2.2 <u>Structure Backfill</u>

Native soils in approximately the upper 23± feet consist of lean clay which will not be suitable for structure backfill.

Blackburn must approve import structure backfill prior to delivery. Use the specifications in Table 6.5 for import structure backfill for all below-grade structures:

Table 5.5: Import Structure Backfill Requirements					
Gradation Test Procedures					
Sieve Size Percent Passing		ASTM	Caltrans		
1 inch	100	D6913	202		
¾ inch	70-100	D6913	202		
No. 4	50-100	D6913	202		
No. 200	12-40	D6913	202		
Plasticity					
Plasticity Index	<12	D4318	204		

As shown below, the zone of placement for structure backfill should extend up from the base of the wall at a slope of 0.75(H):1(V) and at least 3 feet behind the wall. Native, engineered fill may be placed beyond the structure backfill zone.







- Moisture condition backfill to within 2% of optimum and place in maximum 8-inch thick, horizontal, loose lifts.
- Compact backfill to a minimum 92% relative compaction based on the ASTM D 1557 test method.

To minimize the residual lateral earth pressures on structure walls, compaction equipment used behind the walls must be restricted (by load and distance from wall) so that wall design values are not exceeded. We recommend compaction within a horizontal distance equal to one-half of the wall height (to a maximum distance of 5 feet), be completed with hand-operated equipment (i.e., jumping jack). To minimize the potential for significant settlement around deep walls, controlled low strength material (CLSM) can be used to backfill to the surface or to a manageable depth (e.g., 10 feet below grade).

6.7.7.2.3 Lateral Earth Pressures

The below grade structure will act as retaining structure. Walls will retain compacted select imported soils meeting the requirement for structure backfill. For evaluation of lateral earth pressures, use the backfill equivalent fluid weights (EFW) for level ground conditions shown below in Table 5.6.

Table 6.6: LATERAL EARTH PRESSURES				
Condition	Equivalent Fluid Weight (pcf)	Seismic Equivalent Fluid Weight (pcf)		
At-Rest	85	6		
Passive	150	140*		

*Total passive EFW for passive condition

The above pressures assume structure backfill placed against the structure wall in accordance with our recommendations, a saturated (total) unit weight of approximately 135 pounds per cubic foot (pcf) and a minimum internal angle of friction of 32 degrees. Notify Blackburn if these assumptions are not valid so that we may assess the situation and provide additional recommendations, if necessary. Backfill with CLSM is an acceptable alternative.





For seismic loading, add the Seismic EFW to the at-rest or active EFW and apply the total force as a uniform load on the wall with a resultant located at 0.5H where H is the backfill height. We estimated the EFWs for seismic loading using the Mononobe-Okabe equation and a horizontal seismic acceleration coefficient, k_h, of approximately ½ the expected PGA. This k_h value assumes that the walls displace at least 1-inch during the design seismic event.

Surface loads (footings, storage, vehicle traffic) applied near the wall will increase the lateral pressure on the wall. A uniform surface load of 200 psf to 300 psf is often used to approximate construction traffic loading on walls. In general, if surface loads are closer to the edge of the retaining wall than three-fourths of the retained height, increase the design wall pressure by 0.5q over the area of the retaining wall. In this expression, q is the surface surcharge load in psf. This is a conservative procedure and lower design pressures may be applicable upon evaluation of individual surface loads and setback distances.

For drained conditions, provide adequate drainage to avoid build-up of hydrostatic pressures. Positive drainage for retaining walls should consist of a vertical layer of permeable material, such as a graded sand and gravel (graded to meet Caltrans Standard Specifications for Class 1, Type A Permeable Material), pea gravel, or crushed rock, at least 6 inches thick, positioned between the retaining wall and the backfill.

If pea gravel or crushed rock is used, place a nonwoven filter fabric between it and the backfill to prevent the drain from becoming clogged. A synthetic drainage fabric, such as Enkadrain (Colbond Geosynthetics Co.), Miradrain (TC Mirafi) or an equivalent, may be substituted for the permeable layer. Use care during installation to assure that the filter part of the material faces the backfill. Remove collected water by installing weep holes along the bottom of the wall or by a perforated drainage pipe along the bottom of the permeable material or drainage fabric continuously sloped towards suitable drainage facilities (i.e., gravity drain or sump pump).

6.7.7.2.4 Buoyancy Resistance

As discussed in Section 6.6.2, groundwater may occur at depths as shallow as 15 feet bgs. In undrained conditions, below grade structures may be subjected to an uplift load (buoyancy). The uplift force will be resisted by the weight of the structure and the weight of the backfill overlying foundation extensions (if any).

If foundation extensions are used to resist buoyant forces, calculate the resistance against uplift due to the weight of the soil. Use a backfill unit weight of 130 pcf above groundwater and 73 pcf below groundwater, with a soil wedge extending vertically up from foundation extensions.

6.7.7.2.5 Lateral Resistance

Lateral resistance for retaining structures can be achieved through friction and passive earth pressures acting on the foundation. For design, use a coefficient of friction of 0.40 (below or above groundwater) at the base of the concrete footing and an ultimate passive earth pressure of 200 psf per foot of embedment depth. Limit passive earth pressures to a maximum of 2,000 psf (additional passive pressure can be evaluated for specific locations if necessary). Decrease the passive pressure to 75 psf per foot of depth when below design groundwater levels. Do not include the upper 1-foot of soil in passive resistance calculations. Where passive pressure or friction alone is used against sliding, use a minimum factor of safety of 1.5 for lateral stability (1.1 if seismic loading is included). Where both passive pressure and friction are used to resist sliding, use a minimum factor of safety of 2.0.





6.7.7.3 Minor Structures

Provided that the recommendations in this report are followed, minor structures (such as valve or blowoff vaults, access ways, etc.) may be founded on concrete mat or strip footings, or a compacted granular base (minimum of 6 inches of Class 2 baserock) if appropriate.

- Embed the foundations a minimum of 18 inches below the lowest adjacent prepared subgrade into firm native soil or compacted fill/backfill.
- Footings must be a minimum of 12 inches wide and sized not to exceed an allowable bearing capacity of 2,000 psf. The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- Concrete slabs with crushed rock underlayment may be designed using a Modulus of Subgrade Reaction, k_s, of 25 pci on structural fill placed as recommended in this report.
- If additional bearing capacity is required for specific minor structures, we can review and provide recommendations on a case-by-case basis.
- To resist lateral movement, use a coefficient of friction of 0.40 at the base of the foundation and a passive earth pressure of 200 psf per foot of embedment depth up to a maximum of 2,000 psf. Ignore the upper one-foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.

If necessary for evaluation of lateral loading on shallow vaults, use an At-Rest equivalent fluid weight of 65 pcf for the drained condition and 95 pcf for undrained. The drained condition assumes groundwater does not accumulate; the undrained condition would be applied below an assumed groundwater level.

We based these values on foundations bearing on native soil and native soil backfill compacted against vault walls.

6.7.8 Soil Corrosivity

We have not completed our subsurface explorations or laboratory testing for the proposed structures. Based on data from pipeline borings for similar materials (lean clays) we expect clay soils to be corrosive to extremely corrosive conditions to metal pipes. We are not corrosion consultants and cannot evaluate the potential corrosion impacts to metallic elements embedded in or in contact with the ground. A corrosion consultant should provide specific corrosion protection recommendations for buried metallic elements used at the site.

6.7.9 Concrete Slabs on Grade

6.7.9.1 Slab Underlayment

For minor structures, concrete slabs-on-grade may be used provided the contractor(s) prepares the structure pads in accordance with our grading recommendations and any addenda by Blackburn. Use a minimum slab thickness of 4 inches. Underlay the concrete slabs with a minimum of 4 inches of washed, crushed, and compacted rock to provide uniform support. Concrete reinforcement, doweling, curing, joint spacing, and mix design should conform to ACI guidelines. The above recommendations are not for

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slabs subject to equipment or forklift loads. Moderately expansive clay potentially underlay the site. To mitigate potential expansive soil, consider a slab thickness of 6-inches with 8-inches of crushed rock.

6.7.10 Trench Backfill and Compaction

6.7.10.1 Pipe Bedding and Pipe Zone Material

Support pipe on a minimum of 4 inches of granular bedding and in accordance with the pipe manufacturer's recommendations. Although we do not anticipate soft, unsuitable pipe subgrade at any particular location, it can occur with shallow groundwater conditions and sandy soils. Notify the project engineer and Blackburn for review and mitigation recommendations if encountered. To achieve a stable and non-yielding subgrade suitable for pipe placement and backfilling, typical mitigation may include:

- Replacement of unsuitable subgrade with ¾-inch minus crushed rock (minimum of 6 inches)
- Enclose rock in geotextile filtration fabric such as Mirafi 140N (or equivalent).

A granular pipe zone material may be used. Native soils will contain a significant amount of fines (passing #200 sieve) and will **not** be suitable for bedding or pipe zone backfill. For pipe bedding and initial backfill material (which extends to 1 foot above the top of pipe) use material that meet the specification in Table 6.7.

Table 6.7: Pipe Bedding and Initial Backfill Requirements				
Gradation		Test Procedures		
Sieve Size	Percent Passing	ASTM	Caltrans	
1 inch	100	D6913	202	
¾ inch	90-100	D6913	202	
No. 4	35-60	D6913	202	
No. 30	10-30	D6913	202	
No. 200	2-5	D6913	202	
Sand Equivalent				
Minimum 25		D2974		

Blackburn considers the following materials to be suitable as alternative pipe zone (bedding) backfill material:

- Controlled Low Strength Material (CLSM)
- Controlled Density Fill (CDF)

6.7.10.2 Trench Backfill

Trench backfill above the Pipe Zone material may consist of excavated soils. Fill should be free of debris and concentrations of vegetation or clay soils and meet the specifications in Table 6.8.





Table 6.8: Intermediate Trench Backfill Requirements			
Gradation		Test Procedures	
Sieve Size	Percent Passing	ASTM	Caltrans
3 inch	100	D6913	202
No. 200	20-70	D6913	202
Organic Content			
Less than 3%		D2974	
Expansion Index			
Less than 20		D4829	

If import fill is required for trench backfill, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- Minimum 12% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.

Use ¾-inch Class 2 AB in the upper 12-inches of the trench within roadways.

6.7.10.3 Trench Backfill Compaction

Follow the pipe manufacturer's requirements for initial backfill to avoid damage to the pipe. To facilitate compaction in the pipe zone area (top of bedding up to 12 inches above pipe), use a trench width that provides a minimum clearance of 12 inches between the pipe and trench wall.

- Moisture condition trench backfill to within 2% of optimum moisture content and compact to a minimum 92% relative compaction (based on ASTM 1557) below 10 feet and 90% relative compaction (based on ASTM 1557) above 10 feet.
- Use a maximum compacted lift thickness of 8 inches unless field performance testing can demonstrate adequate compaction of thicker lifts.
- Jetting is not acceptable for compaction.

Test all trench backfill (bedding, pipe zone backfill, trench zone, etc.):

- At vertical increments of not more than 1 foot and at final grade or pavement subgrade.
- At horizontal testing frequencies of at least one test for every 200 linear feet of pipe (both sides of pipe in pipe zone).
- Complete at least one compaction curve (Proctor) for each material type, source location (for import), and as changes in native materials occur. Material changes include a change in material designation based on the Unified Soil Classification System.
- Testing frequency can be adjusted based on contractor performance, ease of compaction, and material variability.





Soil excavated during pipe installation can have moisture contents well over optimum, especially during the winter and spring months or if perched water is encountered. In this case, it will be necessary to dry back the soil to within 2% of optimum moisture content prior to use as backfill.

It is important to achieve compaction of pipe zone materials at the pipe haunches and spring line; compaction below the pipe spring line will be a difficult task for the contractor. We recommend a compaction demonstration section to test placement and compaction means and methods for each material type that will be used.

6.7.11 Equalization Basin Concrete Lining

Concrete pavement is proposed to line the Equalization Basin. Prepare the subgrade as discussed in Section 6.7.4.2 and 6.7.4.3. We understand the pavement will not be subject to regular wheel loads.

Design concrete pavement in accordance with American Concrete Institute (ACI) Guide for the Design and Construction of Concrete Parking Lots (ACI 330R-08).

- Use a modulus of subgrade reaction of 100 pci.
- Use a minimum of 6 -inches of concrete over 8 inches of Class 2 AB.
- Concrete reinforcement, doweling, curing, joint spacing, and mix design should conform to ACI guidelines.

Aggregate base (AB) should conform to Caltrans Class 2 requirements. Moisture condition and compact AB to a minimum 95% relative compaction based on ASTM D1557. Prior to placing concrete, the aggregate base should be stable under the weight of a loaded water truck. Mitigate unstable areas as recommended by Blackburn.

Concrete pavement must meet the following requirements:

- Minimum 28-day compressive strength of 3,500 psi.
- Joint spacing will be determined by the structural engineer in accordance with ACI 350-06.

The Civil Engineer should design the final joint types/spacing and appropriate concrete mix design.

7 WATER TANK AND BOOSTER STATION

7.1 Site Location and Description

The OPUD South Yuba Sewer Infrastructure Project includes a 1 MG steel storage tank, water well, booster station, and on-site piping. Appendix E1 shows the proposed improvement location.

The proposed water tank and booster station will be constructed in a vacant lot northeast of the existing Casino water tank. Based on aerial photographs the lot appears to be free of vegetation and graded level.





7.2 Previous Studies

To prepare this section of the report, Blackburn reviewed Geocon Consultants, Inc.'s "Geotechnical Investigation – Enterprise Rancheria Casino, October 2014" (Geocon Investigation) and limited explorations from our pipeline exploration for the OPUD project. We will perform site-specific subsurface explorations, laboratory testing, and analysis to provide final design recommendations for the water tank and booster station.

7.3 Geology

We reviewed geology maps and the United States Department of Agriculture's (USDA) Web Soil Survey (<u>https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm</u>). The "Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California" (Helley and Harwood, 1985) shows the site underlain by the Upper Member, Riverbank Formation that consists of unconsolidated, but compact, dark brown to red, alluvium composed of gravel, sand, silt, and clay.

The web soil survey indicates that the site is underlain by San Joaquin loam (214). The survey states this unit has the following relevant properties from 0 to 25 inches deep: Silt (ML), Silty Clay (CL-ML) and Clay (CL) with fines content ranging from 50 to 70 percent.

7.4 Subsurface Findings

7.4.1 General Subsurface Soil Conditions

In Blackburn boring TC-12A, drilled on September 9, 2020 approximately 2,000 feet from the proposed tank site, we generally encountered stiff to very stiff lean clay and silt with sand within the upper 15 feet underlain by approximately 15 feet of medium dense clayey sand and sand with silt. Hard silt from 30 feet to 40 feet underlain by very dense sand with silt to maximum depth explored (51.5 feet).

The Geocon Investigation (2014) indicates that the subsurface soils across the Casino site consist of:

- Approximately 2.5 to 4 feet of moderately to highly expansive clay (the upper 1 to 1.5 feet of which is loose due to disturbance by agricultural operations), underlain by
- Very stiff to hard clays and silts with varying sand contents and sands with varying fines contents to the maximum depth explored (41.5 feet).
- Some zones of cementation encountered throughout the subsurface soil profile.

7.4.2 Groundwater

In our borings TC-12A and TC-12B, drilled September 9, 2020, we measured groundwater at depths of 24 and 17 feet (respectively) below ground surface.

Geocon's Investigation for the casino drilled only one boring deeper than 27 feet. That boring log (Boring B1) indicates groundwater at 29 ft below ground surface.

We reviewed groundwater level data for nearby wells available at the California Department of Water Resources website (<u>http://www.water.ca.gov/waterdatalibrary/</u>) and using the Sustainable Groundwater Management Act (SGMA) data viewer





(https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels). Based on this information, the depth to groundwater at the site typically ranges from 20 to 30 feet, although it occasionally is measured above 20 feet. Relatively shallow perched water may occur within the near-surface soils during the winter and spring months, and adjacent to the existing canals and streams.

Groundwater and perched water levels can fluctuate due to changes in precipitation, canal and creek levels, irrigation, pumping of wells, and other factors.

7.5 Preliminary Design Considerations – Water Tank and Booster Station

7.5.1 Facility Ground Suitability

The site will be suitable for the planned facilities when constructed in accordance with the project plans, industry standards, and our geotechnical recommendations.

7.5.2 Geologic Hazards

- Faulting—The potential for surface rupture or creep due to faulting at the site is very low. The Fault Activity Map of California¹² and the Geologic Map of the Sacramento Quadrangle¹³ does not identify Historic or Holocene age faults (displacement within the last 11,700 years) within or immediately adjacent to the site. The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone¹⁴.
- Ground Shaking— For the Maximum Considered Earthquake, a peak horizontal ground acceleration (PGA) of approximately 0.21g could be expected.
- Liquefaction—Our investigation shows a soil profile that consists of stiff to hard clays and medium dense to dense sands ad silty and clayey sands that are not liquefiable. Therefore, the potential for damaging liquefaction at the site is very low.
- Landslides and Slope Stability—Due to the relatively low topographic relief we do not expect landslides or natural slope failure.
- Seismically Induced Settlement—During a seismic event, ground shaking can cause densification of granular soil that can result in settlement of the ground surface. Considering the cohesive soils and medium dense to dense soils observed in the borings, we consider the potential for significant seismically induced settlement to be very low.

7.5.3 Seismic Design

Based on the mapped geology and nearby boring data, use a Site Class "D" (stiff soil). Table 7.1 presents the 2019 *California Building Code* (Chapter 16) and ASCE 7-16 seismic design parameters for the site.

¹⁴ Bryant, W.A., and Hart, E.W., 2007 (Interim Revision), <u>Fault-Rupture Hazard Zones in California</u>: California Department of Conservation, Division of Mines and Geology, Special Publication 42.



¹² Jennings, Charles W., and Bryant, William A., 2010 Fault Activity Map of California: California Geological Survey, Geologic Data Map No. 6.

¹³ Saucedo, G.J. and Wagner, D.L., et al, 1992, Geologic map of the Chico quadrangle, California, 1: 250,000: California Division of Mines and Geology, Regional Geologic Map 7A, scale 1: 250,000



Table 7.1: 2019 CBC Seismic Design Parameters (Site Class D)			
S_s – MCE _R ground motion (0.2 second period)	0.495 g		
S_1 – MCE _R ground motion (1.0 second period)	0.24 g		
F _a – Site Coefficient	1.404		
F _v – Site Coefficient	2.11 ¹		
S _{MS} – Adjusted MCE* Spectral Response Acceleration Parameter	0.695 g		
S_{M1} – Adjusted MCE* Spectral Response Acceleration Parameter	0.509 g ¹		
S _{DS} – Design Spectral Acceleration Parameter	0.464 g		
S_{D1} – Design Spectral Acceleration Parameter	0.339 g ¹		
Seismic Design Category	C1		
**T _L – Long Period Transition Period	12 sec		
PGA	0.213		

* Maximum Considered Earthquake

** Figure 22-14, ASCE 7-16

1 – We assume that the seismic response coefficient, Cs, is determined by ASCE 7-16 Eq. (12.8-2) for values of T \leq 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either ASCE 7-16 Eq. (12.8-3) for TL \geq T > 1.5Ts or Eq. (12.8-4) for T > TL. Contact Blackburn to re-evaluate the above parameters if this assumption is not valid.

If the proposed design does not meet the exception noted above (note 1) a site-specific response analysis will be required for final design.

7.5.4 General Grading Recommendations

7.5.4.1 Excavation Conditions

Based on the soil conditions and drilling performance, excavation is possible with conventional equipment (common earthmoving equipment and large backhoe/excavator). The fine-grained and hard soil conditions can create slow excavation conditions and is not suitable for structure backfill.

7.5.4.2 Site Clearing

Prior to making any cuts and fills, remove existing underground utilities, foundations, vegetation (root balls and roots), debris, and other underground features in accordance with this Geotechnical Report. Remove loose and disturbed soil caused by the removal(s) and widen the excavation/depression so it is accessible to compaction equipment. Remove strippings from the site or use as landscape soil in designated areas.

7.5.4.3 Original Ground and Subgrade Preparation

The site has historically been covered by agricultural fields. To avoid loose disturbed soils and adverse settlement, overexcavate the tank footprint and 5 feet beyond to a depth of 3 feet below existing grade. After overexcavation, compact the exposed soil at the bottom of the excavation as follows:

• Scarify the exposed soil to a depth of approximately 8 inches.





- Moisture condition subgrade to within 3% of the optimum moisture content.
- Compact the subgrade soil to a minimum 90% relative compaction based on ASTM D1557.
- Backfill the excavation with General Fill as recommended below.

7.5.4.4 General Fill Placement and Compaction

General fill (**not trench or structure backfill**) may consist of on-site soil provided it contains no rocks larger than 3 inches in maximum dimension. Fill should be free of debris and concentrations of vegetation.

If import for general fill is required, it must be free of debris and meet the following requirements:

Table 7.2: General Backfill Import Requirements			
Gradation		Test Procedures	
Sieve Size	Percent Passing	ASTM	Caltrans
1 inch	100	D6913	202
No. 4	75-100	D6913	202
No. 200	12-100	D6913	202
Plasticity Index			
Less than 20		D4318	

• Approved by Blackburn prior to site delivery.

Place and compact general fill as follows:

- Place fill in maximum 8-inch-thick loose lifts,
- Moisture condition the soil within 3% of optimum
- Compact the soil to a minimum 90% relative compaction based on ASTM D1557.

Test all fill at vertical increments of not more than 1 foot and at final grade or pavement subgrade. For horizontal testing frequency, use the following minimums:

- One test for every 100 square feet around structures
- One test for every 500 square feet for structure pads

Complete at least one compaction curve (Proctor) for each material type, source location (for import), and as changes in native materials occur. Material changes include a change in material designation based on the Unified Soil Classification System.

7.5.5 Dewatering

We do not expect deep excavations for the water tank construction. Dewatering may be required for installations greater than approximately 15 feet deep (see Section 7.4.2). Dewatering can consist of:





- Deep sumps within the excavation. Considering the presence of fine-grained soils and relatively flat lying bedding, sumps within the excavation are not likely to provide good drawdown.
- Well points. Well points will likely work better to cut off flow into the excavation and drawdown the water level over a larger area.

To facilitate work at the base of the excavation, groundwater should be drawn down at least 3 feet below the planned bottom of excavation. The need for dewatering can be reduced by planning excavations during the lowest anticipated seasonal water levels (expected during the late summer and fall months).

7.5.6 Temporary Excavations

Temporary excavations will require sloping and/or shoring in accordance with Cal OSHA requirements. Based on our subsurface explorations for other portions of the Project, preliminary excavation and shoring design may be based on Type A soil to planned excavation depth. For Type A soil conditions, temporary excavations may be sloped at $\frac{3}{(H)}$:1(V).

Where groundwater is present or cohesionless/uncemented granular soils are encountered, Type C soil conditions will apply and a 1.5(H):1(V) slope gradient is required.

The Contractor must retain an engineer to evaluate the impact of existing structures, traffic vibrations, actual soil conditions exposed in the open trenches, and other factors that may promote trench wall instability and adjust trench sloping/shoring accordingly. Surcharge loads such as trench spoils, equipment, etc. should not be placed adjacent to an open excavation (within a distance of ½ the height of the trench). *The above is guideline information only.* The contractor is responsible for the safety of all excavations and should provide appropriate excavation sloping and shoring in accordance with current Cal OSHA requirements and observe conditions observed during construction for necessary modification and safety.

7.5.7 Foundations

7.5.7.1 Shallow Foundations

We expect the tank foundation to consist of a perimeter (ring) footing, with a compacted baserock interior.

- Embed the footing a minimum of 18 inches into the lowest adjacent prepared subgrade.
- Footings must be a minimum of 18 inches wide.
- Size footings not to exceed an allowable bearing capacity of 3,000 pounds per square foot (dead load plus live load). The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- Clean footing excavations of debris and loose soil prior to placing concrete.
- Blackburn must observe all footing excavations prior to reinforcement placement to verify competent bearing materials.
- Slope the ground surface away from foundations at a minimum of 2 percent for a distance of at least 5 feet.





- To resist lateral movement, use a coefficient of friction of 0.35 psf at the base of the foundation and a passive earth pressure of 200 psf per foot of embedment depth up to a maximum of 3,000 psf. Ignore the upper one-foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.
- Based on typical Riverbank soils we anticipate total settlement to be less than 1-2 inches and differential settlement less than ½-inch over a length of 50 feet. We anticipate approximately half of the total settlement will occur during loading of the foundations and half will occur when the tank is filled.

7.5.7.2 Minor Structures

Provided that the recommendations in this report are followed, minor structures may be founded on concrete mat or strip footings, or a compacted granular base (minimum of 6 inches of Class 2 baserock) if appropriate.

- Embed the foundations a minimum of 18 inches below the lowest adjacent prepared subgrade into firm native soil or compacted fill/backfill.
- Footings must be a minimum of 12 inches wide and sized not to exceed an allowable bearing capacity of 2,000 psf. The allowable bearing capacity may be increased by one-third if seismic and/or wind loads are included.
- Concrete slabs with crushed rock underlayment may be designed using a Modulus of Subgrade Reaction, k_s, of 25 pounds per cubic inch (pci) in cut or fill locations where engineered fill is placed as recommended in this report.
- If additional bearing capacity is required for specific minor structures, we can review and provide recommendations on a case-by-case basis.
- To resist lateral movement, use a coefficient of friction of 0.40 at the base of the foundation and a passive earth pressure of 200 psf per foot of embedment depth up to a maximum of 2,000 psf. Ignore the upper one-foot of footing depth (below the lowest adjacent soil grade) in determination of the passive pressure. Both frictional resistance and passive earth pressure can be combined for lateral resistance; when combined, increase the safety factor against sliding from a minimum of 1.5 to 2.0.

If necessary for evaluation of lateral loading on shallow vaults, use an At-Rest equivalent fluid weight of 65 pcf for the drained condition and 95 pcf for undrained. The drained condition assumes groundwater does not accumulate; the undrained condition would be applied below an assumed groundwater level.

We based these values on foundations bearing on native soil and native soil backfill compacted against vault walls.

7.5.8 Soil Corrosivity

We have not completed our subsurface explorations or laboratory testing for the proposed structures. Based on data from pipeline borings for similar materials (lean clays) we expect clay soils to be corrosive to extremely corrosive conditions to metal pipes. We are not corrosion consultants and cannot evaluate





the potential corrosion impacts to metallic elements embedded in or in contact with the ground. A corrosion consultant should provide specific corrosion protection recommendations for buried metallic elements used at the site.

7.5.9 Concrete Slabs on Grade

7.5.9.1 Slab Underlayment

For minor structures, concrete slabs-on-grade may be used provided the contractor(s) prepares the structure pads in accordance with our grading recommendations and any addenda by Blackburn. Use a minimum slab thickness of 4 inches. Underlay the concrete slabs with a minimum of 4 inches of washed, crushed, and compacted rock to provide uniform support. Concrete reinforcement, doweling, curing, joint spacing, and mix design should conform to ACI guidelines. The above recommendations are not for slabs subject to equipment or forklift loads. Moderately expansive clay potentially underlay the site. To mitigate potential expansive soil, consider a slab thickness of 6 -inches with 8-inches of crushed rock.

7.5.10 Trench Backfill and Compaction

7.5.10.1 Pipe Bedding and Pipe Zone Material

Support pipe on a minimum of 4 inches of granular bedding and in accordance with the pipe manufacturer's recommendations. Although we do not anticipate soft, unsuitable pipe subgrade at any particular location, it can occur with shallow groundwater conditions and sandy soils. Notify the project engineer and Blackburn for review and mitigation recommendations if encountered. To achieve a stable and non-yielding subgrade suitable for pipe placement and backfilling, typical mitigation may include:

- Replacement of unsuitable subgrade with ³/₄-inch minus crushed rock (minimum of 6 inches)
- Enclose rock in geotextile filtration fabric such as Mirafi 140N (or equivalent).

A granular pipe zone material may be used. Native soils will contain a significant amount of fines (passing #200 sieve) and will **not** be suitable for bedding or pipe zone backfill. For pipe bedding and initial backfill material (which extends to 1 foot above the top of pipe) use material that meet the specification in Table 7.3.

Table 7.3: Pipe Bedding and Initial Backfill Requirements			
Gradation		Test Procedures	
Sieve Size	Percent Passing	ASTM	Caltrans
1 inch	100	D6913	202
¾ inch	90-100	D6913	202
No. 4	35-60	D6913	202
No. 30	10-30	D6913	202
No. 200	2-5	D6913	202
Sand Equivalent			
Minimum 25		D2974	



Blackburn considers the following materials to be suitable as alternative pipe zone (bedding) backfill material:

- Controlled Low Strength Material (CLSM)
- Controlled Density Fill (CDF)

7.5.10.2 Trench Backfill

Trench backfill about the Pipe Zone material may consist of excavated soils. Fill should be free of debris and concentrations of vegetation or clay soils and meet the specifications in Table 7.4.

Table 7.4: Intermediate Trench Backfill Requirements			
Gradation		Test Procedures	
Sieve Size	Percent Passing	ASTM	Caltrans
3 inch	100	D6913	202
No. 200	20-70	D6913	202
Organic Content			
Less than 3%		D2974	
Expansion Index			
Less than 20		D4829	

If import fill is required for trench backfill, it should be graded and have material properties as follows:

- 100% passing the 1-inch sieve
- 75% to 100% passing the #4 sieve
- Minimum 12% passing the #200 sieve
- Plasticity Index not greater than 20
- Free of debris and concentrations of vegetation.

Use ¾-inch Class 2 AB in the upper 12-inches of the trench within roadways.

7.5.10.3 Trench Backfill Compaction

Follow the pipe manufacturer's requirements for initial backfill to avoid damage to the pipe. To facilitate compaction in the pipe zone area (top of bedding up to 12 inches above pipe), use a trench width that provides a minimum clearance of 12 inches between the pipe and trench wall.

- Moisture condition trench backfill to within 2% of optimum moisture content and compact to a minimum 92% relative compaction (based on ASTM 1557) below 10 feet and 90% relative compaction (based on ASTM 1557) above 10 feet.
- Use a maximum compacted lift thickness of 8 inches unless field performance testing can demonstrate adequate compaction of thicker lifts.
- Jetting is not acceptable for compaction.

Test all trench backfill (bedding, pipe zone backfill, trench zone, etc.):

• At vertical increments of not more than 1 foot and at final grade or pavement subgrade.

DRAHI



- At horizontal testing frequencies of at least one test for every 200 linear feet of pipe (both sides of pipe in pipe zone).
- Complete at least one compaction curve (Proctor) for each material type, source location (for import), and as changes in native materials occur. Material changes include a change in material designation based on the Unified Soil Classification System.
- Testing frequency can be adjusted based on contractor performance, ease of compaction, and material variability.

Soil excavated during pipe installation can have moisture contents well over optimum, especially during the winter and spring months or if perched water is encountered. In this case, it will be necessary to dry back the soil to within 2% of optimum moisture content prior to use as backfill.

It is important to achieve compaction of pipe zone materials at the pipe haunches and spring line; compaction below the pipe spring line will be a difficult task for the contractor. We recommend a compaction demonstration section to test placement and compaction means and methods for each material type that will be used.

8 **RISK MANAGEMENT**

This report provides preliminary design considerations only. Blackburn has not completed the field work, lab testing, and analysis necessary to provide final design recommendations. Blackburn could not complete the necessary work because alignments were not finalized and rights of entry to properties were not obtained in time for Blackburn to plan, coordinate, and execute field investigations at the locations of proposed improvements.

Blackburn will submit a final report after all field work, lab testing, and analysis has been completed.

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services during design and construction. For this project, retain Blackburn to:

- Review and provide comments on the civil plans and specifications prior to construction.
- Attend a preconstruction meeting with the owner, general contractor, earthwork contractor, underground contractor and other parties associated with the management, oversite and process of demolition and earthwork prior to site clearing, grubbing and demolition of existing structures to review geotechnical recommendations, testing requirements and project schedule.
- Observe removal of underground utilities, foundations, vegetation (root balls and roots) and other underground features in accordance with the project plans, specifications and this Geotechnical Report including loose soil generated from the removal.
- Monitor construction to check and document our report assumptions. At a minimum, Blackburn should monitor grading, overexcavation and recompaction of building pad areas, trench backfill, pavement subgrade and aggregate base compaction, and footing excavations.

• Update this report as design changes occur, 2 years or more lapse between this report and construction, and/or site conditions have changed.



If we are not retained to perform the above applicable services, we are not responsible for any other party's interpretation of our report, and subsequent addendums, letters, and discussions.

9 LIMITATIONS

Blackburn performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. This report is for preliminary design only and shall not be used for final design. Where referenced, we used ASTM or Caltrans <u>standards</u> as a general (not strict) *guideline* only. We do not warranty our services.

Blackburn based this report on the current site conditions. We assumed the soil and ground water conditions encountered in our borings are representative of the subsurface conditions across the site. Actual conditions between these locations could be different.

Blackburn completed a Phase 1 Initial Site Assessment for the project. Refer to Blackburn's report dated October 15, 2020 for our evaluation of on-site hazardous material.

Appendices A2, B2, and D2 present our exploratory boring logs and test pit logs. The lines designating the interface between soil types are approximate. The transition between soil types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs, laboratory test results and general knowledge of the site and geological conditions.

Refer to Appendix G (Important Information about This Geotechnical Engineering Report, Geoprofessional Business Association, 2019) for additional limitations regarding this report.

Modern design and construction is complex, with many regulatory sources/restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.
UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

FIGURES

Vicinity Map Overall Project Map Regional Geologic Map USDA Soil Map Regional Fault Map





4/30/2021 3842.x Fig1 OPUD South Yuba Sewer.dwg





Approximate Pipeline Water Only

Approximate Pipeline Sewer Only

Approximate Pipeline Sewer and Water

Oliverhurst Sewer Boring Location

Pipeline Boring Location

- Trenchless Crossing Boring Location
- Planned Pump/Lift Station Boring Location
- Planned Waste Water Treatment Plant Test Pit Location
- т-х Planned Tank Boring Location
- Planned Olivehurst Sewer Boring Location тс-х

Planned Trenchless Crossing Boring Location

Planned WWTP Boring Location

Planned Pipeline Boring Location

OVERALL PROJECT MAP OPUD Yuba County Sewer and Water Infrastructure Project Olivehurst, California

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File No. 3842.x

April 2021

Figure 2



os-x ;

ww-x

P-X

-



GEOLOGIC UNITS

SURFICIAL DEPOSITS

Alluvial Deposits (Holocene) Qsc - Stream Channel Deposits Qa - Alluvium

Qo - Overbank Deposits Qao - Alluvium and Overbank Deposits, undivided Qal - Alluvial Deposits, undivided

Older Alluvium (Pleistocene)

Modesto Formation Qmu - Upper Member, Modesto Fm. Qml - Lower Member, Modesto Fm.

Riverbank Formation Qru - Upper Member, Riverbank Fm. Qrl - Lower Member, Riverbank Fm.

BASIN DEPOSITS

Qb - Basin Deposits, undivided (Holocene)

LANDSLIDE DEPOSITS

Qls - Landslides (Holocene and Pleistocene)

SEDIMENTARY ROCKS INCLUDING SOME VOLCANIC ROCKS

Tla - Laguna Formation (Pliocene)

LEGEND

Approximate Pipeline Water Only Approximate Pipeline Sewer Only Approximate Pipeline Sewer and Water SCALE 1:45,000 2,500 5,000 Feet 65 Qa

Infrastructure Project

Olivehurst, California

April 2021 Figure 3

File No. 3842.x



–Area of Interest



LEGEND	
	Approximate Pipeline Water Only
	Approximate Pipeline Sewer Only
	Approximate Pipeline Sewer and Water

Map Unit Symbol	Unit Name
131	Hollenbeck Silty Clay Loam
134	Hollenbeck-Urban Land Complex
141	Conejo Loam
142	Conejo Loam
143	Conejo-Urban Land Complex
185	Kimball Loam
197	Oakdale Sandy Loam
198	Oakdale - Urban Land Complex
208	Redding Gravelly Loam
214	San Joaquin Loam
217	San Joaquin - Urban Land Complex
254	Water

Source: USDA Web Soil Map - Yuba County, California, 1:45,000, printed 10/27/2020.

Olivehurst, California

File No. 3842.x

April 2021

Figure 4







LEGEND

LICCC Quet

aults	USGS Quaternary Fa
base	Quaternary Faults Data
-	Historic (< 150 years), well constrained location
•-•	Historic (< 150 years), moderately constrained location
	Historic (< 150 years), inferred location
-	Latest Quaternary (<15,000 years), well constrained location
-	Latest Quaternary (<15,000 years), moderately constrained location
••	atest Quaternary (<15,000 years), inferred location
-	Late Quaternary (< 130,000 years), well constrained location
	Late Quaternary (< 130,000 years), moderately contrained location
••	te Quaternary (< 130,000 years), inferred location
-	Middle and late Quaternary (< 750,000 years), well constrained location
	Middle and late Quaternary (< 750,000 years), moderately constrained location
••	Middle and late Quaternary (< 750,000 years), inferred location
-	Jndifferentiated Quaternary (< 1.6 million years), well constrained location
	Indifferentiated Quaternary (< 1.6 million years), moderately constrained location
••	Indifferentiated Quaternary (< 1.6 million years), inferred location
-	Inspecified age, well constrained location
	Unspecified age, moderately constrained location
	Unspecified age, inferred location
-	Class B (various age), well constrained location

- Class B (various age), moderately constrained location -
- Class B (various age), inferred location **

Class B Faults -

toothills tould system

L

Geologic evidence demonstrates the existence of a fault or suggests Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes, or (2) the currently available geologi evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A.

Source: U.S. Geological Survey and California Geological Survey Quaternary fault and fold database for the United States, accessed July 5, 2020, at:

https://www.usgs.gov/natural-hazards/earthquake-hazards/faul



0 1 2 4

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REGIONAL FAULT MAP OPUD Yuba County Sewer and Water Infrastructure Project Olivehurst, California

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Figure 5

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX A: Sewer and Water Pipelines

A1: Site Plan A2: Boring and Test Pit Logs Legend Boring and Test Pit Logs A3: Laboratory Test Results





	SCALE 1" = 2,500'	
	Approximate Pipeline Sewer Only	
	Approximate Pipeline Sewer and Water	
os-x		
P-X	Dipeline Boring Location	
тс-х	Transhlass Crossing Baring Location	
	Discussion Discussion Paring Location	
₩ TP-X _		
쀽	Planned Waste Water Treatment Plant Test Pit Location	
T-X	Planned Tank Boring Location	
os-x ↔	Planned Olivehurst Sewer Boring Location	
тс-х	Planned Trenchless Crossing Boring Location	
ww-x	Planned WWTP Boring Location	
P-X	Planned Pipeline Boring Location	
Source: South County Sewer and Water Project, Volume 2 plans created by Jacobs, dated October 2020. Alignment Package Admin Draft 10-12-2020.		

Olivehurst, California

File No. 3842.x

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Appendix A1a

































RANCHO RD P-14 JIRGINIA RD ALC: NOTE: CONTRACT OF all'ago già se The superior r mississi (E) SIG (E) 15 CULVERT NS INV # 71.10-SS INV = 70.68 RANCHO RD 4594 18 1 20 79 445












































		GROUP SYMBO	DLS AN	FIELD AND LABORATORY TESTS								
Graphic	/ Symbol	Group Names	Graphic	/ Symbol	Group Names	C Consolidatio	n (ASTM D 2435)					
	GW GP	Well-graded GRAVEL Well-graded GRAVEL with SAND Poorly graded GRAVEL Poorly graded GRAVEL With SAND		CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY	CL Collapse Po CP Compaction CR Corrosion, S CTM 417, C	tential (ASTM D 5333) Curve (ASTM D 698 & 1557, CTM 216) ulfates, Chlorides (CTM 643, TM 422)					
	GW-GM GW-GC	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		CL-ML	GRAVELLY lean CLAY with SAND SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND	CU Consolidater DS Direct Shear EI Expansion Ir M Moisture Co OC Organic Con	d Undrained Triaxial (ASTM D 4767) (ASTM D 3080) ndex (ASTM D 4829) ntent (ASTM D 2216) tent (ASTM D 2974)					
00000000000000000000000000000000000000	GP-GM GP-GC	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND	P Permeability PA Particle Size PI Liquid Limit, (ASTM D 43 PL Point Load In	(ASTM D 5084) Analysis (ASTM D 6913 & 7928) Plastic Limit, Plasticity Index 18) ndex (ASTM D 5731)					
	GM GC	SILTY GRAVEL SILTY GRAVEL with SAND CLAYEY GRAVEL CLAYEY GRAVEL with SAND		OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND	PM Pressure Me PP Pocket Pene R R-Value (CT SE Sand Equiva SG Specific Gra	ter trometer M 301) Ient (CTM 217) vity (AASHTO T100)					
	GC-GM SW	GM SILTY, CLAYEY GRAVEL ORGA SILTY, CLAYEY GRAVEL with SAND ORGA Well-graded SAND ORGA Well-graded SAND with GRAVEL ORGA		ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT SILT with SAND	SL Shrinkage Li SW Swell Potent TV Pocket Torva UC Unconfined (Unconfined (Shrinkage Limit (ASTM D 4943) Swell Potential (ASTM D 4546) Pocket Torvane Unconfined Compression - Soil (ASTM D 2166)						
å <mark>a a</mark>	SP SW-SM	Poorly graded SAND Poorly graded SAND with GRAVEL Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		СН	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND	UUUnconsolida (ASTM D 28)UWUnit WeightVSVane Shear	ted Undrained Triaxial 50) (ASTM D 7263) (AASHTO T223 / ASTM D 2573)					
	SW-SC SP-SM	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL	-	мн	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT GRAVELLY elastic SILT GRAVELLY elastic SILT	SAMPLE Standard	R GRAPHIC SYMBOLS Penetration Test (SPT)					
	SP-SC SM	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) SILTY SAND SILTY SAND with GRAVEL		он	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY ORGANIC fat CLAY ORGANIC fat CLAY	California S	Sampler (2" ID)					
	SC SC-SM	CLAYEY SAND CLAYEY SAND with GRAVEL SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		он	ORGANIC elastic SILT ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT ORGANIC elastic SILT	Shelby Tu	ibe Piston Sampler					
	РТ	PEAT			ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL	NX Rock	Core HQ Rock Core					
<u>9</u> 99		COBBLES COBBLES and BOULDERS BOULDERS		010H	SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND	Bulk Sam	ple Other (see remarks)					
		DRILLING MET	HOD	SYMB	OLS	WATE	R LEVEL SYMBOLS					
R	Auger	r Drilling Rotary Drilling)ynamic r Hand	Cone Diamond Core	 ✓ First Water ✓ Static Wate ✓ Static Wate ✓ Static Wate 	Level Reading (during drilling) r Level Reading (short-term) r Level Reading (long-term)					



BORING RECORD LEGEND

PAGE 1

	CO	NSISTENCY OF CO	HESIVE SOILS	•
Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Extrudes between fingers when squeezed
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS											
Descriptor	SPT N ₆₀ - Value (blows / foot)										
Very Loose	0 - 4										
Loose	5 - 10										
Medium Dense	11 - 30										
Dense	31 - 50										
Very Dense	> 50										

PERCENT	OR PROPORTION OF SOILS
Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%
	1

	MOISTURE											
Descriptor	Criteria											
Dry	Absence of moisture, dusty, dry to the touch											
Moist	Damp but no visible water											
Wet	Visible free water, usually soil is below water table											

	SOIL P/	ARTICLE SIZE
Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Crowel	Coarse	3/4 inch to 3 inches
Graver	Fine	No. 4 Sieve to 3/4 inch
	Coarse	No. 10 Sieve to No. 4 Sieve
Sand	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

	PLASTICITY OF FINE-GRAINED SOILS
Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION											
Descriptor	Criteria										
Weak	Crumbles or breaks with handling or little finger pressure.										
Moderate	Crumbles or breaks with considerable finger pressure.										
Strong	Will not crumble or break with finger pressure.										

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.



BORING RECORD LEGEND

	GED C	BY CT	DR	BEGIN DATE 9-10-20	COMPLETION DATE 9-10-20	LOCATION (Lat. 39.09495° / - LOCATION (Off	/Long - 121 set. S	g or N .551 Statio	North/B 1 68° In. Lin	East a e)	nd Dati	um)				HOLE ID OS-1 SURFACE ELEVATION							
Tab OPER	er RATO	DR'	S N/	AME HELPEF	R'S NAME	EQUIPMENT										ТО	TAL D	EPT	Н				
Ricl	к 		J MF	Nick/I	Mike	Diedrich D1	20 TYP	F AN		METE	FR / BI	ICKE	TWI	тн		2 '	1.5 ft REHC			FR			
Soli	d-S	Ster	n A																				
		d (2	2.4"	5) AND SIZE(5) (ID)		Safety semi	-aut	oma	atic c	lrop	(140#/	/ 30'	')										
BACK Top	FILL PO	_ an Dur	ID C Cei	COMPLETION ment Grout Backfill		GROUND WATER DURING AFTER (DATE) READINGS Not Encountered									CASING TYPE AND DIAMETER(in								
l (ft)							ation	ber		ot		(L.			Lab	orate	ory	Data		- D		
ELEVATION	DEPTH (ft)		Material Graphics			Sample Loca	Sample Num	Blows per 6	Blows per fo	N60 (ASTM)	Recovery (%	Pocket Penetromete	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Metho			
	-0-	E		ASPHALT CONCRETE	<u>(6")</u>		-																
	1	Ē		Lean CLAY (CL); very s	tiff; dark yellowish brown;	moist; few fine	1																
	2	E		0.110					5												ΙĒ		
	3	E	\square					1	8 11	19		85	3.75										
	4	E	\square																				
	5	Ħ	A	SANDY Lean CLAY (CL): hard: dark vellowish hr				10												┤╞		
	6	E		some fine to medium SA	AND	own, molet,	M	2	32	79		80	>4.5	18	111								
	7	Ē																					
	8																						
	0	Ē	\square																				
	9		//	CLAYEY SAND (SC); ve fine to medium SAND; s	ery dense; dark yellowish some fines; some modera	brown; moist; te to strong															ΙE		
	10		/./	cementation				3	30	50/3 5		100	>4 5					38					
	11		//					Ĵ	50/3.5) 		100	-4.5					50					
	12	Ē	//																				
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	16	Ē		Lean CLAY with SAND	(CL); very stiff; dark yello	wish brown;	H	4	24	52		65	3.5	19	107								
	17	E	\square	moist, intre inte to media					20												ΙE		
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	20	E						5	19	02/14		05	> 4 E										
	21	Ē	ſП	SANDY SILT (ML); hard	l; grayish green; moist; so	ome fine to	Δ	5	43 50/5"	93/11		00	>4.5										
	22	E		Bottom of exploration at	21.5 ft below ground surf	ace (bgs)	J																
	23	E		No groundwater encoun	itered																		
	24	E		Top Pour Cement Grout	t Backfill																=		
	-25	E																					
				~		PROJECT NAM	1E								FILE	E NO.		HO	LE ID				
						OPUD South	Yub	a Se	wer a	and W	Vater	R			38	42.X		PC	DS-1				
			4																				
			B	LACKBU	JRN	Jacobs Eng	jine	əring	g			1~			/								
			С	ONSULT	PREPARED BY CI								CHECKED BY					SHEET 1 of 1					

LOGO DW	GED BY C	BEGIN DATE 9-10-20	COMPLETION DATE 9-10-20	LOCATION (Lat/Long or North/East and Datum) 39.09024° / 121.55182°										HOLE ID OS-2							
CONT Tab	rractor er			LOCATION (Off	set, S	Statio	n, Lin	e)						SURFACE ELEVATION							
OPER Ric	RATOR'S NA	AME HELPEF Nick/I	R'S NAME Vike	EQUIPMENT Diedrich D1	20									TOTAL DEPTH 21.5 ft							
EXCA		ETHOD		DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH											BOREHOLE DIAMETER						
SAMF	PLER TYPE	(S) AND SIZE(S) (ID)		HAMMER TYPE Safety semi-automatic drop (1/0#/ 30")										HAMMER EFFICIENCY, ERI							
BACK	100 (2.4 Fill and C) COMPLETION		GROUND WATER DURING AFTER (DATE)									CASING TYPE AND DIAMETER(in								
Top ⊋	Pour Ce	ment Grout Backfill		READINGS	Ę	No	t End	coun	tered					Lah							
J) NC	()				catic	nmbe	6 in.	foot	Ω	(%)	eter	(9	۲ <u>ر</u>				Data		thod		
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ELEV	DEP Matel Grapl				Samp	Samp	Blow	Blows	N60 (Reco	Pock	Moist	Dry [Liquic	Plast	#> %	Shea Stren Test	Addit Lab T	Drillin		
		ASPHALT CONCRETE	(9")					-			<u> </u>										
		Lean CLAY (CL); hard; o SAND	dark yellowish brown; mo	oist; few fine	1																
	2																				
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						4	5 5	15		90	2 25	38	79			56					
		Detterne of combined in the		f (1)		Ĺ	10			00	2.20	00	10								
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	23	Bulk A obtained 1-5 ft bo	gs																		
	24	Top Pour Cement Grout	Backfill																Ξ		
	25																				
		_		PROJECT NAM	1E								FIL	E NO		НО	LE ID				
					OPUD South Yuba Sewer and Water							38	842.X OS-2								
	2			YUB							SOIE							-			
	В	LACKBU	IRN	Jacobs Eng	jinee	ərinç	3										_				
	С	ONSULT	PREPARED BY CHECKED BY SHEET LDM 1 of 1																		

BCI LOG FOR SOIL 3842.X FIELD EXPLORATIONS.GPJ LIBRARY_2019.GLB 10/21/20

LOGO	ged M	BY		BEGIN DATE 9-11-20	LOCATION (Lat/Long or North/East and Datum) 39.06729° / -121.54802°												HOLE ID P-01						
CON ^T	rra Ier	СТС	R			LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	E EL	EVATIO	N			
OPEF Cha	RATO ad	OR'S	S NA	ME HELPER Caleb	R'S NAME /Codv	EQUIPMENT CME 75										TOTAL DEPTH 21.5 ft							
EXCA				THOD		DRILLING ROD	TYPI	E AN	D DIA	METI	ER / BL	JCKE	TWI	отн		BO	REHC	DLE D	DIAMETI	ER			
SAMF	PLEF		PE(S) AND SIZE(S) (ID)							(4 40#	1 201	•			HAMMER EFFICIENCY, ERI							
BACK	FILL	_ AN	.4 DC	OMPLETION		GROUND WAT	ER	DU	RING	irop	AF	TER) (DAT	E)		CASING TYPE AND DIAMETER(in							
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VATI) HT		hics		DESCRIPTION		ple L	ple N	led s/	led s/	(AST	very	ket etrom	ture ent (Dens	σ	ticity	 <u></u> <u></u>	ar Jgth	tional Tests	ng Me		
ELE			Grap				Sam	Sam	Blow	Blow	N60	Reco	Pere	Mois Cont	Dry (pcf)	Liqui	Plas Inde	¢> %	She: Strei Test	Addi Lab	Drilli		
				ASPHALT CONCRETE Lean CLAY with SAND ((6.5") CL): (hard): dark brown:	moist: little fine	+																
		Đ	$\langle \rangle$	SAND hand auger first 5 feet																			
	2	Ē																					
	3	Ē	$\langle \rangle$																				
	4	E																					
	5	E		SILT (ML); hard; light gra dry; few very fine SAND	ayish brown with orangis	sh brown streaks;			22														
	6							1	50/5"	50/5"		83	>4.5										
	7																						
	8		\mathbb{Z}	Lean CLAY (CL); stiff; br	rown; moist; trace very fi	 ne SAND	+																
		E	$\langle \rangle$																				
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	10						\mathbf{V}	2	3	10		78	1 25	31	Q1								
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	21						$\boldsymbol{\Lambda}$	4	7	12		100	1.20										
	22	E		Bottom of exploration at 2	21.5 ft below ground sur	face (bgs)																	
	23			Bulk A obtained 0.5-4.5	ft bgs																		
	24			Top Pour Cement Grout	Backfill																		
	-25																				=		
				~		PROJECT NAM	IE								FILE	E NO.		HOL	LE ID				
						OPUD South	Yuba	a Se	wer a	and V	Vater	R	OUTF		38	842.X P-01 POSTMILE							
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			B	LACKBU	RN	Jacobs Eng	inee	ering]					ית חם	/			1663	-				
			С	ONSULT										ſ	1 of 1								

LOG	ged B M	Y	BEGIN DATE 9-11-20	COMPLETION DATE 9-11-20	LOCATION (Lat/Long or North/East and Datum) 39.07126° / -121.5474°											HOLE ID P-02						
	TRAC [®]	FOR			LOCATION (Offs	set, S	statio	n, Lin	e)						SURFACE ELEVATION							
OPE	RATO	R'S N	AME HELPER	R'S NAME	EQUIPMENT										TO	TAL C 1 5 ft	DEPT	Ή				
EXCA			ETHOD	o, oouy	DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH											BOREHOLE DIAMETER						
SAM	PLER	ETT PE	(S) AND SIZE(S) (ID)		HAMMER TYPE Safety somi automatic drop (140#/ 20")										4 IN HAMMER EFFICIENCY, ERi							
Cal BACk	Mod (Fill /	(2.4'' AND (') COMPLETION		GROUND WATER DURING AFTER (DATE)										CASING TYPE AND DIAMETER(in							
Top	<u>Pou</u>	r Ce	ment Grout Backfill		READINGS Not Encountered																	
JN (f	a					catio	aqmr	6 in.	foot	ŝ	(%)	ter		~		orat		Dala		pou		
ATIC	LH (fi	ial		DESCRIPTION		le Lo	le N	ber	ber	AST	/ery	st rome	ure nt (%	ensit		city	500	j i	onal ests	g Met		
ELEV	DEP.	Mater				Samp	Samp	Blows	Blows	N60 (Seco	Pocke	Moist Conte	Dry pcf)	imit	Plasti ndex	#> %	Sheal Stren Fest	Additi ab T	Orillin		
		2. j.	ASPHALT CONCRETE	E (4")			0,						20					0,0,1		TE		
	1		Lean CLAY with SAND	^{5"})																		
	2		hand auger first 5 feet																			
	3																					
	4																					
	5		increasing SAND conte	ent 																		
			Lean CLAY with SAND brown and grayish brow	(CL); very stiff; mottled d vn with reddish streaks; n	ark yellowish noist; little very	Μ	1	20 27	57		72	3.75										
			fine SAND					30												- E		
	8																					
	9																					
	10							6											<u> </u>			
	11		hard; dark brown			M	2	12 17	29		78	>4.5	23	99	32	12						
	12																					
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۲ <u>_</u> 20	19																					
IBRAF	20							7											<u> </u>			
	21		mottled dark yellowish b	brown and orangish brow	n and black	X	4	11 15	26		100	3.5	32	89								
ONS	22		Bottom of exploration at	t 21.5 ft below ground sur	face (bgs)				I	1	1	I	I	I	I		I	1	<u>.</u>			
ORAT	23		No groundwater encour Bulk A obtained 0.6-4.5	ntered 5 ft bgs																		
EXPLO	24		T D 0																			
			rop Pour Cement Grou	IL Dacktill																-		
342.XF	-25-																					
01L 38					PROJECT NAM	IE Yuba	a Se	wer a	and V	Vater				FILI	E NO. 842.X		HO F	LE ID 2-02				
OR SC					COUNTY ROUTE								POSTMILE									
-00 F		B	LACKBI	JRN	CLIENT Jacobs Fno	linee	erino	3														
BCIL	CONSULTING PRE							PREPARED BY CHECKED BY						ſ	SHEET							
		\sim	UNUVEI	LDM 1 of 1																		

	BED	BY	_	BEGIN DATE 9-11-20	COMPLETION DATE 9-11-20	LOCATION (Lat 39.07525° /	/Long - 121	or N . 547	North/E 2 35°	East a	Ind Datu	um)				но Р	LE ID -03				
	RA er						set, s		n, Line	e)						50				N	
					/Cody	CME 75	TYP			METI	FR / BL		TWI	тн		2'	1.5 ft			FR	
SAMP	d-S	Sten	n A	u ger S) AND SIZE(S) (ID)		HAMMER TYPE										4	in MMEF			Y. ERi	
Call BACK		d (2 AN	.4")			Safety semi	-aut	oma DU	atic d	lrop	(140# /	30' TFR	') (DAT	F)		CAS	SING				FR(in
Top	Po	bur	Cer	nent Grout Backfill		READINGS		No	t End	coun	tered		(27.1	_,					Dete		
JJ) NC	(†	-					catio	umbe	6 in.	foot	Ŕ	(%)	eter	(%)	2		orat	ory	Data		thod
VATIO	PTH (f		hics		DESCRIPTION		ple Lo	ple N	/s per	/s per	(AST	very	ket etrome	ture tent (9	Densi	σ	ticity	#200	ar Jgth	tional Tests	ng Me
ELE		Motor	Grap				Sam	Sam	Blow	Blow	NGO	Rec	Pere	Mois Cont	Dry (pcf)	Liqu	Plas	¢ %	She Strei Test	Addi Lab	Drilli
	1	E		ASPHALT CONCRETE AGGREGATE BASE (6"	(1") ')		-														
	2	E		Lean CLAY (CL); (hard);	; dark brown; moist; few v	very fine SAND															
	3	E																			
	4	E																			
	5	Ē	A																	ļ	
	6	Ē	\land	and light grayish brown fine SAND	(CL); hard; mottled dark y with orangish brown stre	ellowish brown aks; dry; very		1	28 50/6"	50/6"	•	75	>4.5							<u> </u>	
	7	F																			
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	11	E		very stiff; dark yellowish	brown; moist		M	2	0 14 22	36		89	3.75	30	120						
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	18	É																			
1	19			CLAYEY SAND (SC); mo	edium dense; mottled da n with black streaks; moi	ark yellowish ist; fine SAND;															
	20		./.	some lines					12												
	21						X	4	9 13	22		100	NA	33	86						
	22	E		Bottom of exploration at 2	21.5 ft below ground sur	face (bgs)													_		
	23	E		Bulk A obtained 0.6-5 ft l	bgs																
	24	E		Top Pour Cement Grout	Backfill																
	-25	E																			
					1.1	PROJECT NAM	1E Yuba	a Se	wer a	and V	Vater				FILE 38	E NO. 42.X		HO F	LE ID 2-03		
			-			COUNTY YUB						R	DUTE					PC	OSTMILE	Ē	
			B	LACKBU	IRN	CLIENT Jacobs Eng	jinee	ering	9												
			C	ONSULT	ING	PREPARED BY	,					CI	HECK	ED B	(Sł 1	HEET of	1		

CONTRACTOR LOCATION (Offset, Station, Line) SURFACE ELEVATION Taber OPERATOR'S NAME HELPER'S NAME EQUIPMENT TOTAL DEPTH Chad Caleb/Cody CME 75 TOTAL DEPTH 15.0 ft Solid-Stem Auger DREHOLE DIAMETER / BUCKET WIDTH BOREHOLE DIAMETER / BUCKET WIDTH BOREHOLE DIAMETER / BUCKET WIDTH BOREHOLE DIAMETER / BUCKET WIDTH HAMMER EFFICIENC SAMPLER TYPE(S) AND SIZE(S) (ID) HAMMER TYPE HAMMER TYPE HAMMER EFFICIENC Backfill native cuttings GROUND WATER DURING AFTER (DATE) CASING TYPE AND DI Backfill native cuttings DESCRIPTION GROUND WATER DURING AFTER (DATE) Laboratory Data U	In the second se
OPERATOR'S NAME HELPER'S NAME EQUIPMENT TOTAL DEPTH Chad Caleb/Cody CME 75 15.0 ft EXCAVATION METHOD DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH BOREHOLE DIAMETE SAMPLER TYPE(S) AND SIZE(S) (ID) HAMMER TYPE HAMMER EFFICIENC' Caleb/Cody Safety semi-automatic drop (140#/ 30") Addition of the constraints of the	ERi Dulling Method
EXCAVATION METHOD DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH BOREHOLE DIAMETE 4 in SAMPLER TYPE(S) AND SIZE(S) (ID) HAMMER TYPE HAMMER TYPE SAMPLER TYPE(S) AND SIZE(S) (ID) HAMMER TYPE HAMMER TYPE Backfill native cuttings GROUND WATER Not Encountered DURING AFTER (DATE) AFTER (DATE) CASING TYPE AND DI Backfill native cuttings DESCRIPTION GROUND WATER Not Encountered To the state of the stat	ERi Tab Tests Drilling Method
HAMMER TYPE CalMod (2.4") HAMMER FYPE CalMod (2.4") HAMMER FYPE Backfill native cuttings CalMod (2.4") Backfill native cuttings CalMod (2.4") CASING TYPE AND DI Backfill native cuttings DESCRIPTION Top 1 Top 1 Cased of the distribution of the distributicantering of the distribution of the distributicantering	ERI METER(in Duting Method
BACKFILL AND COMPLETION GROUND WATER READINGS DURING Not Encountered AFTER (DATE) CASING TYPE AND DI Laboratory Data (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Lab Tests Lab Tests Drilling Method
Image: Construction of the second	Drilling Method
NOLL DESCRIPTION BOUND IN THE PROPERTIES	Lab Transaction of the sets of
0 ASPHALT CONCRETE (6"). 1 AGGREGATE BASE (15") 2 SANDY Lean CLAY (CL); hard; dark reddish brown; moist; some fine SAND 3 1 7 4 5 5 Lean CLAY with SAND (CL); hard; light gravish brown with dark for endish brown streaks; dry; strong cementation 2 45 6 2 45 50/1" 100 >4.5	
SANDY Lean CLAY (CL); hard; dark reddish brown; moist; some 1 7 15 83 4.5 51 3 1 7 15 83 4.5 51 4 5 Lean CLAY with SAND (CL); hard; light grayish brown with dark for eddish brown streaks; dry; strong cementation 2 45 50/1" 100 >4.5	
5 Lean CLAY with SAND (CL); hard; light grayish brown with dark 2 45 50/1" 100 >4.5 6 reddish brown streaks; dry; strong cementation 50/1" 100 >4.5	
6 Lean CLAY with SAND (CL); hard; light grayish brown with dark 6 reddish brown streaks; dry; strong cementation	
7 Lean CLAY (CL); medium stiff to stiff; dark brown; moist 8 0	
	_ E
14 medum stiff; moist to wet 4 3 7 100 0.75 44 77	
Bottom of exploration at 15.0 ft below ground surface (bgs)	
No Groundwater Encountered	=
Backfill native cuttings	
	=
	=
	=
PROJECT NAME OPLID South Yuba Source and Water 51/2 NO. Hole ID OPLID South Yuba Source and Water 29/42 V D 0.4	
COUNTY ROUTE POSTMILE	
CONSULTING PREPARED BY CHECKED BY SHEET	

	GED	BY		BEGIN DATE 9-14-20	COMPLETION DATE 9-14-20	LOCATION (Lat	/Long	g or N	North/I	East a	ind Dat	um)				HO P	LE ID				
		СТС	DR	0 14 20	0 14 20	LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIC	N	
OPER		DR'S	S N/		R'S NAME	EQUIPMENT										ТО	TAL C	DEPT	Ή		
EXCA	VAT	101	N ME	Jett/ I ETHOD	anner	DRILLING ROD	TYP	E AN	ID DIA	MET	ER / BL	JCKE	TWI	отн		BO	1.5 π REHC	DLE [DIAMETI	ER	
SAMF	i d-S PLER	iter	n A ′PE(S) AND SIZE(S) (ID)		HAMMER TYPE										4	<u>in</u> MMEF	REFI		Y, ERi	
Call		<mark>d (2</mark>	2.4"			Safety semi	-aut			lrop	(140#	/ 30')	E)							ER/in
Тор	Po	ur	Ce	ment Grout Backfill		READINGS		00						L)		CA	51110	1 1 F L			
Z (ft)							ation	nber	. <u>-</u>	ot		(9	2			Lab	orat	ory	Data		g
TIO	H (ft)		_ %		DESCRIPTION		Loc	Nun	ber 6	ber fo	STM	ery (%	mete	e t (%)	nsity		τζ	Q	ء	sts	Meth
EVA			aphic				mple	mple	SWC P	swc	9 (A	COVE	cket	oistur	y Del	uid nit	astici dex	<#20	ear engt st	dition b Te	lling
Ξ	_0_		ΞŪ	ASPHALT CONCRETE	: (3")		s	Se	ă	ă	ž	Å	ሻ ሻ	ĕŏ	ਠਿਭ	בּבּ	플 프	%	ې بې بې ۳	La	ā
	1	F	\mathbb{Z}	AGGREGATE BASE (3	")		1														
	2	E		some fine to medium SA	_); nard; dark yellowish br AND	own; moist;															
	2	Ħ	Α	Lean CLAY (CL); very s	tiff to hard; mottled olive	gray and brown;	\mathbf{M}	1	9 19	52		90	2.75/								
	3	₽		moist; trace fine SAND;	moderate cementation		\square		33				24.5								łĒ
	4	É	TÍŤ	SILT (ML); Hard; mottle	d olive gray and brown; n	noist; fine SAND;	1														
	5	E		Some miles					15												
	6						Ň	2	28 44	72		65	>4.5	29	95			87			
	7	E																			
	8																				
	٩																				
	10	咠		Lean CLAY (CL); hard;	brown; moist; few fine to I	medium SAND															
	10	Đ						3	13	63		95	>4 5	23	104						
	11	Ē						Ŭ	40			35	- 4.0	20	104					 	
	12	Ē																			
	13	E	\square																		
	14	E	\square																		
	15	Þ																		<u> </u>	
	16	F		dark yellowish brown			Ν	4	14 34 8	 34/10.:	 5''	75	>4.5								
		É							50/4.5												
	17	Ē	\land																		
	18	B	\square																		
	19	Ħ																			
	20	E							14												
	21	É					M	5	29 38	67		85	>4.5								
	22	Ē		Bottom of exploration at	21.5 ft below ground sur	face (bgs)		· · ·													
	23			No Goundwater Encour	ntered																
	20			Top Pour Cement Grout	t Backfill																
	24																				
	-25-																				
				\sim	1.1	PROJECT NAM	1E Yub:	a Se	wer a	and V	Vater				FILE 39	E NO. 342 ¥		HO	LE ID 2-05		
						COUNTY						R	DUTE				•	PC	OSTMILE	=	
				LACKDI	IDN	CLIENT															
			D	CNCLUT		PREPARED BY	jinee	ering	9			CI	HECK	ED B	(Sł	HEET	Г		
			C	UNSULI	ING	LDM											1	l of	1		

BCI LOG FOR SOIL 3842.X FIELD EXPLORATIONS.GPJ LIBRARY_2019.GLB 10/21/20

LOGO	GED	BY	BEGIN DATE	COMPLETION DATE	LOCATION (La	t/Long	g or N	North/E	East a	and Dat	um)				HO					
CON	C FRA	CTOR	9-14-20	9-14-20	LOCATION (Of	fset, S	Static	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPEF	RATO	OR'S N	AME HELPER	R'S NAME	EQUIPMENT										ТО	TAL	DEPT	H		
EXCA	VAT	ION M	Jeff/ I ETHOD	anner	CME 75 DRILLING ROD	TYP	E AN	ID DIA	MET	ER / Bl	JCKE	TWI	DTH		1 0	6.5 ft REHO	: DLE D	DIAMET	ER	
SAMF	i d-S PLEF	Stem / R TYPE	Auger (S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	in Mmef	REFF	ICIENC	Y, ERi	
Cal BACK		d (2.4'	") COMPLETION		Safety sem GROUND WAT	i-aut ER	oma DU	atic d RING	lrop	(140#) AF	/ 30' TER	") . (DAT	E)		CAS	SING	TYPE			ER(in
Bac	kfil	l nativ	ve cuttings		READINGS			1		1	1		_/							
N (ft)						catior	mber	Ľ	oot	_	(%	er			Lab	orat	ory	Data		po
ATIO	Ц.			DESCRIPTION		e Loc	e Nu	per 6	perf	STN	ery (°	t omet	nt (%	ensity		ity	00	th	onal ests	Meth
ELEV		lateri				ampl	ampl	lows	lows	160 (/	lecov	ocke	loistu contei	of D	iquid	lastic	° <#2	hear trenç est	dditic ab T€	rilling
	-0-	≥c	ASPHALT CONCRETE	(4")		<u>ہ</u>	S			z	£		20	09		<u>م ہے</u>	%	νομ	۳	
	1		AGGREGATE BASE (6' Lean CLAY (CL): (stiff):	") dark vellowish brown: me		- {														
	2																			
	3																			
		Ē/	SANDY Lean CLAY (CL	.); soft; mottled dark yello		+														
			dark gray and brown; ve	ery moist; [FILL]																
	5					Ν	1	0			100	0.25	27	01			32			1 E
	6												21	- 34			52			1 E
	7		1																	
	8		Lean CLAY with SAND	(CL); hard; dark yellowisl	n brown; moist;	-														
	9		little fine SAND		, ,															
	10																			↓ E
	11		1			Ν	2	8 21	58		80	>4.5	24	102						
	10	¥/						37							-	-				┤╞
	12																			
	13																			ΙĒ
	14																			
	15							11												┤╞
	16					X	3	25 33	58		65	>4.5								
	17		Bottom of exploration at	16.5 ft below ground sur	face (bgs)		<u> </u>							1						
	18		No Goundwater Encoun Bulk A obtained 1-5 ft bo	tered gs																
	19		Dealefill native autting																	=
		Ħ	Backini nauve cuurigs																	
	20																			
	21																			=
	22																			
	23																			
	24																			_
	-25																			
		-	•	PROJECT NAM	ЛЕ								FIL	E NO.		HOL	LE ID			
				OPUD South	Yub	a Se	wer a	and V	Vater	R			38	342.X	ζ	P	-06			
		1		YUB												FC		-		
	Jacobs Eng	gine	erin	g					==					-						
		C	ONSULT	ING	PREPARED BY							HECK	ED B	Y		SI	HEET 1 of	1		

LOG	GED	BY	BEGIN DATE	COMPLETION DATE	LOCATION (Lat	:/Lonç	g or N	North/E	East a	ind Dat	um)				HO					
CON	TRA	CTOR	J-14-20	9-14-20	LOCATION (Off	íset, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIC	N	
OPE	RAT	OR'S N	IAME HELPER	R'S NAME	EQUIPMENT										ТО	TAL	DEPT	H		
Dav EXC/	/id		Jett/1	Fanner	CME 75 DRILLING ROD	TYP	'E AN	ID DIA	METE	ER / BL	JCKE	TWI	отн		16 BO	6.5 ft REHC	DLE D	DIAMET	ER	
SAM	id-S	Stem /													4	in MMEE			Y FRi	
Cal	Mo	<u>d (2.4</u>			Safety semi	i-aut	toma		lrop	(140#	/ 30'	')	-						I, L	
BACr Ba	الد دkfil	AND I	COMPLETION /e cuttings		READINGS	Εĸ	Du	RING		Ar	IER	(DA1	E)		CAS	SING	IYPE		IAMEI	EK(In
(#)						ation	ther	. <u></u>	t	Ţ				-	Lab	orat	ory	Data		Ţ
VOIL		<u> </u>	n l	DESCRIPTION		Loc	Num	er 6	er fo	STM)	ry (%	mete	э (%)	Isity		_ج	0		ial sts	Metho
EVA		terial				mple	mple	d sw	d sw	0 (A§	cove	cket	istur∉ ntent	/ Der	i niq	sticit	<#20	ength st	dition o Tes	ling n
EL		ນ ຊື່ອີຍັ		- (011)		Sa	Sa	B	BG	9N	Re	Ъõ	¥రి	Ęġ	L: L:	Pla Ind	. %	ų sr	Ad, Lat	
	1		AGGREGATE BASE (4	<u>: (3")</u> (")																
			SANDY Lean CLAY (CL to medium SAND; trace	∟); hard; reddish brown; n e coarse SAND	noist; some fine															
	2	Ē/					1	4 0	24		65	1 25	17	112			24			1
	3					\square	'	15	2-7		00	4.20		112			57	L		
	4		1																	
	5		Lean CLAY with SAND	(CL): hard: strong brown	<u> </u>	+		13			-			\mid				<u> </u>	<u> </u>	┤╞
	6	E/	little fine to medium SAN	ND; trace coarse SAND	, siigituy moios,	H	2	37	 87/10' 	 - 	60	>4.5			38	19				
	7							50/ 4												ΙĒ
	ľ																			
	8																			ΙĘ
	9	ŧ/	Lean CLAY (CL); hard;	dark yellowish brown; dry	y; strongly	+														
	10		cementea					3											<u> </u>	┤┣
	11						3	24 \$0/0.5	74/6.5	;" 	70	>4.5							<u> </u>	↓ E
	12	Ĭ/	1					<u> </u>												
	12	ľ/																		E
	15																			E
	14		Lean CLAY with SAND	(CL); hard; dark yellowish	h brown; dry;	1														
	15	ŧ/		Deratery Cemented				6					\vdash							┤╞
	16						4	31 50/4"	81/10 	" 	65	>4.5								
	17		Bottom of exploration at	16.5 ft below ground sur	face (bgs)			r	1								L		<u> </u>	
	18	Ħ	No Goundwater Encour	ntered																
	10	Ħ	Backfill native cuttings																	
	19																			
	20	Ħ																		Ξ
	21	Ħ																		
	22	Ħ																		=
	23	E																		
	24																			
		Ē																		Ξ
	-25																			
			1		PROJECT NAM	/E Yub	a Se	wer a	and V	Vater				FILE 38	E NO. 342.X	2	HOL P	_E ID 2-07		
											R	DUTE					PC	STMILE	Ξ	
			ACKPL	CLIENT																
		0	ONCLUT	PREPARED BY	jinee ⁄	erinç	g			Cł	HECK	ED B)	[Sł	HEET	-			
		C	UNSULI	ING	LDM											1	l of	1		

LO	gged DM	BY		BEGIN DATE 9-1-20	COMPLETION DATE 9-1-20	LOCATION (Lat/ 39.07897° / -	Long 121	or N	North/E	East ar	nd Datu	ım)				HO P	LE ID				
CC T	NTRA	СТС	R	• • • •		LOCATION (Offs	et, S	statio	n, Lin	e)						SU	RFAC	E EL	EVATIO	N	
OF	ERAT(DR'S	NA	ME HELPER												ТО		DEPT	Н		
EX	CAVAT	ION	ME	THOD	lo/Lawrence	DRILLING ROD	TYPE	E AN	ID DIA	METE	R / BU	CKE	TWI	DTH		BO	REHC	DLE D	DIAMETI	ĒR	
SA	olid-S MPLEF	ten TY	<u>η Αι</u> ΡΕ(S	AND SIZE(S) (ID)		HAMMER TYPE										4	in MMEF	REFF	ICIENC	Y, ERi	
C BA		<mark>1 (2</mark>	. 4")			Safety semi-	aut		atic d	lrop (140#/	30''	') (DAT	E)		CAS	SING				ER(in
B	ackfil	Ina	tive	cuttings		READINGS		No	t End	count	ered			_)		0/ 1					
							ation	nber	. <u>.</u>	ğ	0	()	۲.			Lab	orate	ory	Data		g
VATION	TH (ft)	loir	hics		DESCRIPTION		ole Loc	ole Nun	s per 6	s per fo	(ASTM)	very (%	et tromete	ture ent (%)	Density	5	icity	200	lr igth	ional Γests	ig Meth
Ш Ц	DEP	Mate	Grap				Sam	Sam	Blow	Blow	N60	Recc	Pock Pene	Mois	Dry [Liqui	Plast Indey	#> %	Shea Strer Test	Addit Lab ⁻	Drillir
	0	Þ		Lean CLAY (CL); hard; o	orangish brown; dry; few	very fine SAND															
	1	Ē																			
	2	E							21												
	3	E					X	1	50/2.5	50/2.5' 	'	50	>4.5								
	4																				
	5	É	$\langle \rangle$	Lean CLAY with SAND (CL); hard; dark brown; n	noist; little fine															
	6	ŧ		SAND; tew medium SAN	ND		М	2	8 13	26		100	>4.5								
	0	E/					\square		13					16	112	31	17				ΗĒ
	7	É.																			
	8	Ē	$\langle \rangle$																		
	9	E																			
	10	E							-												
	11	ŧ.		yellowish brown; dry; littl	e very fine SAND		М	3	38	 88/11''		100	>4.5								
	10	Ē							50/5"												
		Ē																			
	13	E																			
	14	ŧ,					М	4	4 33	83/9''		61	>4.5								
	15	₽		Bottom of exploration at	15.0 ft below around sur	face (bos)			50/3"												
0	16			No groundwater encoun	tered																
0/21/2	17			Bulk A obtained 0-5 ft bo	js																
ilb 1	18			Backfill native cuttings																	
2019.0		Ħ																			
4RY_	19																				
LIBR	20																				
.GPJ	21	E																			
SNOL	22																				
ORA	23																				
EXPL	24																				
-IELD	25	Ħ																			
342.X																					
OIL 3					5 A	PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	ater				FILE	= NO. 342.X		HOL P	e id 2-08		
OR S(1			COUNTY YUB						RC	DUTE					PC	STMILE		
0G F			R	ACKBU	IRN		inec	rin	r									1			
BCIL			~	ONSULT	ING	PREPARED BY			1			CH	IECKI	ED BN	(SI	HEET	4		
			\sim	UNUULI												1	UT UT				

LOG	ged e M	3Y	BEGIN DATE 9-1-20	COMPLETION DATE 9-1-20	LOCATION (Lat. 39.0734° / -1	/Long 21.5	or N	lorth/E 4°	East a	nd Datı	um)				HO P	LE ID				
	TRAC	TOR			LOCATION (Offs	set, S	itatio	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPER	RATO	R'S N	AME HELP	ER'S NAME											TO)EPT	Ή		
EXCA	AVATI	ON M	ETHOD	esto/Lawrence	DRILLING ROD	TYPE	E AN	d dia	METE	ER / BU	JCKE	TWI	DTH		BO	REHC	DLE D	DIAMETI	ER	
SAMF	id-St PLER	em A Type	Auger ((S) AND SIZE(S) (ID)		HAMMER TYPE										4	in Mmef	REFF	ICIENC	Y, ERi	
Cal	Mod	(2.4"			Safety semi	-auto	oma		rop	(140# /	/ 30')	<u> </u>		C 49					ED/in
Bac	ckfill	nativ	e cuttings		READINGS		No	t End	coun	tered			L)		CA					
7 (ft)						ation	lber	.Ľ	t		()	5			Lab	orate	ory	Data		g
OL	H (ft)	_ v	,	DESCRIPTION		Loc	Nun	er 6	er fo	STM)	ry (%	mete	e (%)	sity		Z	0	-	nal sts	Metho
EVA	L T L	iteria aphic				mple	mple	ws p	sws p	0 (À:	cove	cket	istur	Der	i niq	istici ex	<#20	ear engtl st	ditior o Tes	lling
Ш		Zaa				Sa	Sa	BIC	B	9N	Re	ЪЪ	≗ິ	50	E E	Pla	%	r Str Te	Ad Lat	ā
	1		Lean CLAY (CL); hard	l; reddish brown; moist																E
																				E
	2					∇		6			00									
	3						1	13	32		83	>4.5								
	4		Lean CLAY with SAN) (CI): hard: dark vellowis		+														
	5		grayish brown streaks	; moist; little fine SAND																
	6		1			Μ	2	11 13	46		89	4.5								
						\square		33					22	104						łE
	7																			ΙĒ
	8		1																	
	9		Poorly Graded SAND brown; moist	with CLAY (SP-SC); media	um dense; dark															
	10																			
	11					Μ	3	11 11	22		100	NA								
	''					\square		11					14	104						ΗĒ
	12					-														
	13		moist	n SAND (GP-GC); dense;	dark brown;															
	14					Μ	4	27 29	61		100	>4.5								
	15		Lean CLAY with SAN	D (CL); hard; yellowish bro	wn; moist; little to	-		32												
	16		Bottom of exploration	at 15.0 ft below ground sur	face (bgs)	J														Ξ
21/20	47	=	No groundwater enco	untered																=
B 10			Buik A obtained 0-5 ft	bgs																
19.GL	18		Backfill native cuttings	3																
۲_20	19																			=
BRAF	20																			-
PJ L	21																			_
ONS.G	22																			
RATIC																				
XPLC																				
ELDE	24																			
EX FIE	L ₂₅ L																			
3842			~~		PROJECT NAM	IE V. t				lat				FILE	E NO.		HOL			
s soil					COUNTY	TUDa	1 26	wer a		vater	R	DUTE		38	642.X	<u>.</u>	PC	-U9 DSTMILE	E	
G FOF		1			CLIENT															
CILO		B	LACKB		inee	ering]						<u></u>		0		-			
ă		С	ONSULT	ING								IECK	רח איז	ı		1	of	1		

	GED	BY		BEGIN DATE 8-31-20	COMPLETION DATE 8-31-20	LOCATION (Lat/	Long 121	or N 514	lorth/E	East a	nd Datu	ım)				HO P	LE ID				
	ITRA	СТС	DR			LOCATION (Offs	et, S	statio	n, Lin	e)						SU	RFAC	E EL	EVATIO	N	
OPE	RAT	OR'	S NA	ME HELPER	to/Lawronco											TO		DEPT	Ή		
EXC				THOD	lo/Lawrence	DRILLING ROD	TYPI	E AN	D DIA	METE	R / BU	ICKE	TWI	отн		BO	REHO	DLE [DIAMETI	ER	
SAM	1PLEF	R T \	<u>n А</u> ′РЕ(3	u ger S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	In MMEF	R EFF	ICIENC	Y, ERi	
BAC		d (2	. 4")	OMPLETION		Safety semi-	aut		atic d	lrop ((140# /	30') (DAT	F)		CAS	SING	TYPE			FR(in
Ba	ckfil	<u>I n</u> a	ative	cuttings		READINGS		Ňo	t End	count	tered		(27.1	_,		0, 1					
N (ft							atior	nber	.⊑	oot	<u> </u>	(%	e.			Lab	orat	ory	Data		g
ATIO) ŧ		ss =		DESCRIPTION		E Loc	e Nur	per 6	per fo	STM	5) ∕u∈	omet	re it (%)	nsity		ţ	8	÷	nal sts	Meth
LEV/	I d d	 	aterie				mple	ample	SMO	SWO	30 (A	SCOVE	ocket	oistu	of De	uit nit	astic	<#2(rengt sst	lditio b Te	illing
Ξ	-6		ĕ₫ ∕	Lean CLAY (CL): (hard):	brown: dry: few SAND		လိ	s	ă	ă	ž	Å	ፈፈ	žŏ	Ъē	בּבּ	ËĔ	%	ಸಭ⊨	Ac La	۵ –
	1	E		Hand auger first 5 feet	brown, dry, lew SAND																
	2	E	\land																		
		F	\square																		ΙE
	3	Ē	\land																		
	4	Ē	A				-														
	5	E		SAND	,,, ,	····, -·· j , · -· j ····-			10												
	6						М	1	18 39	89/12'		80	>4.5								
		B	\square				\square		50/6"									-			
	7	Ħ																			
	8	E																			
	9	E	A	CLAYEY SAND (SC): de	nse: dark vellowish brow		-														
	10		/./	SAND; some fines	nise, dank yellowish brov	vn, dry, mie															
	11	E	./.				М	2	5 18	53		70	NA								
	''						\square		35					10	116						ΙĒ
	12																				
	13	E		brown; moist; trace fines	se to very dense; dark br	own and grayish															
	14						М	3	10 26	56		80	NA					42			
	15			Pottom of ovaloration at	15.0 ft bolow ground our	face (has)	\square		30												
	16			No Goundwater Encount	tered	lace (bys)															
/21/20	17			Bulk A obtained 0-4 ft bo	js																=
B 10				Backfill native cuttings																	Ξ
19.GL	18	E																			Ξ
۲۲_20 20	19	E																			Ξ
BRAF	20	E																			=
PJ L	21	Ε																			
NS.G	1 22																				=
RATIC	22																				
(PLO)	23	E																			
Ω	24	E																			Ξ
X FIE	25	E																			_
3842				~~		PROJECT NAM	Ę.			• • • •					FILE	E NO.		HO	LE ID		
SOIL						COUNTY	ruba	a Se	wer a	and W	ater	R	OUTE		38	342.X		PC	'-10 DSTMILE		
5 FOR			4																		
ILOG			В	LACKBU	RN	Jacobs Engi	inee	erinç	3				15.0.1		,						
BC			С	ONSULT	ING	PREPARED BY							HECK	ED BI	r		SI	HEET <u> o</u> f	1		

LOGO	GED BY	BEGIN DATE 8-31-20	COMPLETION DATE 8-31-20	LOCATION (Lat 39.066925°	/Long	g or N 1.50	North/E 1914°	East a	nd Dati	um)				но Р	le ID -11				
	TRACTOR				set, S	Statio	n, Lin	e)						SU				N	
Tok	RATOR'S NA Dy	ME HELPER Ernes	to/Lawrence	CME 75										<u>2</u>	1 AL L		н		
EXCA Soli	Id-Stem A	ithod uger		DRILLING ROD	TYP	E AN		METE	ER / BL	JCKE	TWI	отн		во 4	REHC in		DIAMET	ER	
SAMF Cal	PLER TYPE(Mod (2.4"	S) AND SIZE(S) (ID)		HAMMER TYPE Safety semi	-aut	oma	atic d	Irop	(140#/	/ 30'	")			HA	MMEF	R EFI	FICIENC	Y, ERi	
BACK Bac	FILL AND C	OMPLETION e cuttings		GROUND WAT READINGS	ER	DU No	RING t En o	coun	AF tered	TER	(DAT	E)		CAS	SING	TYPE	E AND D	IAMET	ER(in
(ft)		• • • •			tion	ber	Ŀ	ot						Lab	orat	ory	Data		σ
ATION	TH (ft) ial		DESCRIPTION		le Loca	le Num	per 6 i	per foo	ASTM)	/ery (%	t romete	ure ht (%)	ensity		city	00	f	onal ests	g Metho
ELEV	DEP1 Mater Graph				Samp	Samp	Blows	Blows	N60 (Reco	Pocke	Moisti Conte	Dry D	Liquid	Plasti Index	;#> %	Shear Streng Test	Additi Lab T	Drilling
		Lean CLAY (CL); hard; y	ellowish red; dry; trace v	very fine SAND															
	2					1	14	02		70	>1 E								
	3					'	49	02		70	24.5	16	113						ĮĒ
	4																		
	5						10												╡╞
	6					2	20 24	44		90	>4.5								
	7																		
	8																		
	9																		
	10																		
		SANDY SILT (ML) intert	bedded with Lean CLAY	(CL). SANDY	H	3	4	34		50	>4.5	10	400						
	12	SILT (ML); hard; dark ye SAND. Lean CLAY (CL)	ellowish brown; moist; littl ; hard; orangish brown w אוס	e very fine /ith grayish			22					18	102						
		streaks, moist, lew line s	SAND																
						4	13 37	87/12		55	>4.5								1 E
						-	50/6"												
	18	Lean CLAY (CL); hard; o	dark brown; moist; trace	very fine SAND	-														
I	19																		
	20						8												
	21	CLAYEY SAND (SC): m	edium dense: orangish h		-	5	15 16	31		85	>4.5								
	22	some fines Bottom of exploration at	21.5 ft below around sur	face (bos)															Ξ
	23	No Goundwater Encoun	tered																Ξ
	24	Bulk A obtained 0-5 ft bo	js																-
	25	Backfill native cuttings																	
<u> </u>		~~		PROJECT NAM	1E	_							FILI	E NO.		НО	LE ID		
				OPUD South COUNTY	Yuba	a Se	wer a	and V	Vater	R	OUTE		38	342.X		PC	7-11 DSTMILI	E	
		LACKEL	CLIENT																
	B	LACKBU	PREPARED BY	jinee	erinç	9			C	HECK	ED B	Y		Sł	HEET	Г			
	C	UNSULL												1	lof	1			

LOGO	GED	BY		BEGIN DATE 9-2-20	COMPLETION DATE 9-2-20	LOCATION (Lat	Long	g or N	lorth/E	East a	ind Dat	um)				HO P	LE ID				
	rra or	СТС	DR			LOCATION (Offs	set, S	Statio	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPE	RATO	OR'	S N/	AME HELPER	R'S NAME											TO		DEPT	Ή		
EXCA	VAT		N ME	ETHOD	sto/Jason	DRILLING ROD	TYP	E AN	ID DIA	METI	ER / BL	JCKE	TWI	DTH		BO	REHC	DLE [DIAMET	ER	
SAMF	Id-S	Ster R T \	n A /PE(S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	in Mmef	REF	ICIENC	Y, ERi	
Cal BACk		d (2 _ AN	2.4" ND C) COMPLETION		Safety semi GROUND WAT	-aut ER	oma DU	atic d RING	lrop	(140#) AF	/ 30'	') (DAT	E)		CAS	SING	TYPE		IAMET	ER(in
Bac	:kfil	<u>l na</u>	ativ	e cuttings		READINGS			-				`	,		<u> </u>					ì
N (ft)							catior	mber	E	oot	_	(%	er		~	Lab	orat	ory	Data		ро
ATIO	H (Đ		cs al		DESCRIPTION		e Loc	e Nu	per 6	perf	STN	ery (°	t omet	re nt (%	ensity		ity	8	ц,	onal ests	Meth
ILEV	EPT		lateri				ampl	ampl	lows	lows	109	ecov	ocke	loistu	ر مر	iquid	lastic	.<#2	hear trenç est	dditic ab Te	rilling
ш	-0-		20	ASPHALT CONCRETE	(9")		S	S			z	£	ፈፈ	20	으면		<u>م ہے</u>	~	တတ⊢	Ľ۷	
	1	E		AGGREGATE BASE (1	5")		†														
	2								10												
	3	E	\square	to medium SAND; dry; f	(CL); hard; dark reddish i ew moderate cementation	orown; ווגנופ זוחפ ז	Μ	1	13	36		95	>4.5								
		Ħ	\square				\square		18					7	104						
	4	\square																			
	5	E		SANDY Lean CLAY (CL); hard; reddish brown; d	ry; some fine to	Ν	2	33	50/4"		100	>4.5								
	6	E	\square						00/4												
	7	E	\square																		
	8	E	\square																		
	9	F																			
	10																				
	10	E	/./	CLAYEY SAND (SC); ve to medium SAND; little f	ery dense; dark yellowish fines; little moderate ceme	brown; dry; fine entation		3	50/4"	50/4"		<u>100</u>	<u>NA</u>		105						1 =
			//																		
	12	Ħ	·/ ·/																		
	13																				
	14	Ħ	ΪΠ	SILT with SAND (ML); h	nard; yellowish brown; dry	/; little fine	X	4	13 50/6"	50/6"	•	100	>4.5								
	15	E		SAND; trace cementatio Bottom of exploration at	n 14.5 ft below ground sur	face (bgs)]														
,	16			No Goundwater Encoun	itered																=
	17			Bulk A obtained 2-5 it bo	ys																
	18			Backfill native cuttings																	
	10																				Ξ
	19																				Ξ
	20																				Ξ
	21																				
	22																				
	23	=																			=
	24																				
	25																				
						PROJECT NAM	E								FILF	E NO		НО	LE ID		
							Yuba	a Se	wer a	and V	Vater	R	דו ור		38	842.X		Pr	P-12	=	
			4			YUB														-	
			B	LACKBU	JRN	Jacobs Eng	inee	ering	9			1-					- I -		_		
			С	ONSULT	ING	PREPARED BY							HECK	ED BJ	ſ			⊣⊧⊧⊺ I of	1		

	GED	BY	R	BEGIN DATE 8-24-20	COMPLETION DATE 8-24-20	LOCATION (La 39.06067° /	t/Long -121	g or N .500	North/8 0 16°	East a	ind Dati	um)				HO P	LE ID -13	FFI	EVATIO		
Tak OPE	Der RATI	OR'S	NA	ME HELPEF	R'S NAME	EQUIPMENT			, LIII							то			H		
Dav EXC/	/id	ΓΙΟΝ	ME	Nick/	Tanner	CME 75 DRILLING ROD) TYP	E AN	ID DIA	METE	ER / BL	JCKE	TWI	отн		2 ' BO	1.5 ft REHC	DLE D	DIAMET	ER	
SAM	id-S	Sten R TY	n A PE(uger S) AND SIZE(S) (ID)		HAMMER TYPE										4	in MMEF	REFF	ICIENC	Y, ERi	
Cal BAC	Mo (Fili	d (2 _ AN	. 4" D C	OMPLETION		Safety sem GROUND WAT	i-aut ER	DU	atic c RING	rop	(140#) AF	/ 30' TER	') (DAT	E)		CAS	SING 1	TYPE	E AND D	IAMET	ER(in
Top ⊋	<u>Pc</u>	our (Cer	nent Grout Backfill		READINGS	L L	Nc To	ot Ene	coun	tered					l ah	orati	orv	Data		
ION (f	(#						ocatio	Iumbe	r 6 in.	r foot	Ω	(%)	leter	(%	ity				Data		ethod
EVAT	DTH /		phics		DESCRIPTION		nple L	nple N	ws pe	ws pe	(AST	overy	iket ietrom	sture itent (Dens	it lid	sticity	#200	ar ength t	litiona Tests	ing Me
EL			Gra		dark brown: maiat: faw m		Sar	Sar	Blo	Blo	N6C	Rec	Po Po Po Po	C Moi	D D D C D C	с та ш	Pla	> %	She Stre Tes	Adc Lab	D
	1	E		Lean CLAY (CL); hard; (dark brown; moist; iew m	ealum SAND															
	2	Ē							12												
	3	E					X	1	12	31		70	>4.5	20	105						
	4	E												20	100						1 E
	5		\square	Lean CLAY with SAND	(CL); hard; dark yellowish	n brown; dry;			25												
	6	E					K	2	25 27 24	51		80	>4.5								
	7	Ē																			
	8	Ē	$\langle \rangle$																		
	9	Ē	A); bard: dark vallowich br		-														
	10	E		some fine SAND	<i>.)</i> , hard, dark y c ilowish bi	own, moisi,			16												
	11	E					X	3	24 50/6"	 74/12' 	¦ 	70	>4.5	23	04						
	12	Ē							00/0						- 54						
	13	Ē																			
	14	E																			
	15								20												
	16			Poorly Graded SAND wi	ith SILT (SP-SM); mediu to medium SAND: lense	m dense; dark	┢	4	40 50/5"	 90/11' 	¦ 	70	>4.5	12	90			7			
	17			ŚAND	,									12	00			,			
	18																				
1	19																				
	20																				
	21																				
1	22	Ē	1111	Bottom of exploration at	21.5 ft below ground sur	face (bgs)		1	1	1		L			1	1			1		
	23			No Goundwater Encoun	itered																-
	24			Top Pour Cement Grout	t Backfill																
	-25																				
						PROJECT NAM	ME V	. 64			Voter				FILE	E NO.	,	HOL			
							TUD	a 50	wer a	ana v	vater	R	OUTE		38	42.X		PC	DSTMILE	=	
			R	ACKRI	IDN		aine	arin													
	CONSULTING DACAD								9			CI	HECK	ED B'	ſ		SH 1	HEET	1		
<u>ــــــــــــــــــــــــــــــــــــ</u>			~									1							•		

LOG	ged I C	BY		BEGIN DATE 8-25-20	COMPLETION DATE 8-25-20	LOCATION (Lat. 39.05473° / -	Long 121	g or N .49 1	lorth/l 71°	East a	nd Dati	um)				HO P	LE ID				
	TRA	СТС	DR			LOCATION (Offs	set, S	Statio	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPE	RAT(OR'S	S NA	ME HELPER	R'S NAME	EQUIPMENT										TO		DEPT	Ή		
EXC/				THOD		DRILLING ROD	TYP	E AN	ID DIA	METE	ER / BL	ICKE	TWI	ΤΗ		BO	REHC	DLE	DIAMETI	ER	
SAM	PLEF		PE(S) AND SIZE(S) (ID)		HAMMER TYPE										HA	MMEF	REF	FICIENC	Y, ERi	
BAC	KFILL	d (2 _ AN	. 4 ID C) COMPLETION		GROUND WAT	-aut ER	DU	RING	lrop	(140#/ AF	30 TER) (DAT	E)		CAS	SING ⁻	TYPE	E AND D	IAMET	ER(in
To _T	<u>) Pc</u>	our	<u>Cer</u>	nent Grout Backfill		READINGS	Ę	No	t Eng	coun	tered					Lah	orat	onv	Data		
JN (f	L =	-					catio	umbe	6 in.	foot	۶ آ	(%)	ster	(9	<u>ک</u>				Dala		thod
/ATI0	LH A		lics		DESCRIPTION		le Lo	ole Nu	s per	s per	ASTI	very	et trome	ure ent (%	ensit	-	city	200	gth	ional ests	g Me
ELEV			Graph				Samp	Samp	Blows	Blows	N60 (Reco	Docke	Vloist Cont∈	Dry pcf)	-induic	<u>Plasti</u> ndex	#> %	Sheal Stren Test	Additi _ab T	Drillin
	-0-	E		ASPHALT CONCRETE			-	0,			_								0,0,1		
	1	E		Lean CLAY (CL); (Stiff);	Dark Reddish Brown; M	oist	+														
	2	E	\square						9												
	3	E	\square	Lean CLAY with SAND (Little Fine SAND; Some	(CL); Hard; Dark Yellowis Moderate Cementation	sh Brown; Moist;	X	1	23 25	48		75	>4.5								
	4	E																			1 E
	5	E																			
	6	Ē					M	2	16 24	57		80	>4.5								
		目	\square	SANDY Lean CLAY (CL through Coarse SAND; I	.); Hard; Strong Brown; M Few Fine GRAVEL; Trac	loist; Some Fine e Coarse	\vdash		33					16	116			56		UC	┥╞
	[′]	F		GRAVEL																	
	8	E																			
	9	Ē																			
	10	E		Less GRAVEL					17												
	11	E	\square	Lean CLAY with SAND (Yellowish Brown; Moist;	(CL); Hard; Mottled Olive Little Medium SAND	and Dark	X	3	36 50/5"	86/11' 	"	70	>4.5	22	105						
	12		A																		
	13	E	//	Strongly Cemented	ery Dense, Dark fellowis	ai diowii, diy,															
	14	B	//																		
		Ē	/./																		
	15	B	///					4	50/5"	50/5''		100	>4.5								łE
	16	E	/./																		
	17	E	//																		
	18																				
1	19	E	//																		
	20	E							28												
	21	Ē	/.)	Moist	04.0.61.1	5 (1))		5	50/5"	50/5''			>4.5								
	22			Bottom of exploration at	21.0 π below ground sur	face (bgs)															
	22																				Ξ
	23	E		Top Pour Cement Grout	Backfill																Ξ
	24	E																			
	-25																				
					1 a a a a a a a a a a a a a a a a a a a	PROJECT NAM	E Yubi	a Se	wer a	and V	Vater				FILE 38	E NO. 42.X		HO F	LE ID 2-14		
												R	OUTE		1			PC	OSTMILE	Ξ	
BLACKBURN CLIENT Jacobs Engineering																					
1			C	ONSULT	PREPARED BY	nie		1			CI	HECK	ED B)	(SH	IEET	「 <u>」</u>			
			U.	UNJULI		33											1	OŤ	1		

LOGO	GED	BY	BEGIN DATE COMPLETION DATE	LOCATION (Lat	t/Long	g or N	North/I	East a	and Dat	um)				HO	LE ID				
CON		CTOR	0-24-20 0-24-20	LOCATION (Off	fset, S	.403 Static	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPEF	RAT	OR'S N	NAME HELPER'S NAME	EQUIPMENT										то	TAL C	DEPT	H		
Dav EXCA			Nick/Tanner	CME 75) TYP	E AN		MET	ER / Bl	JCKE	TWI	отн		1 0	6.5 ft REHC			ER	
Sol	id-S	Stem			_									4	in				
	Mo	d (2.4	=(S) AND SIZE(S) (ID) ")	Safety sem	= i-aut	oma	atic c	lrop	(140#	/ 30'	')			HA	MINE	K EFI	ICIENC	Y, ERI	
BACK	(FILI :kfi l	L AND	COMPLETION ve cuffings	GROUND WAT READINGS	ER	DU No	RING	coun	AF Itered	TER	(DAT	E)		CAS	SING	TYPE	E AND D	IAMET	ER(in
Ê				<u>_</u>	u	Ē								Lab	orat	ory	Data		
NO	ŧ				ocat	Jumb	r 6 ir	r foo	Ξ	(%)	neter	(%	ity						ethoc
VAT	L L	hial	g DESCRIPTION		ple L	ple N	s pe	s pe	(AST	very	etrom	ture ent (Dens	σ	ticity	#200	ar ngth	tiona	М BL
ELE		Mate			Sam	Sam	Blow	Blow	N60	Reco	Peck	Mois	Dry	Liqui	Plas	₽%	Shea Strei Test	Addi Lab	Drilli
	-0-	ŧ/	Lean CLAY (CL); hard; dark brown; dry; medium	ו plasticity															
	1	Ē/																	
	2	E/					12											<u> </u>	┤╞
	3		moist		М	1	13	31		70	>4.5	10							
	4	E/										10	114						1 E
		E/	SANDY Lean CLAY (CL); hard; strong brown; di		-														
	5	Ē/	SAND; medium plasticity	<i>,</i> ,			25	54											1 E
	6	Ē/				2	27	51		00	24.5	14	115					UC	
	7	E																	
	8																		
	۵																		
	9																		
	10						16												1 E
	11		SILT (ML); hard; yellowish brown; dry; few very t	fine SAND		3	24 50	74		70	>4.5	21	102						
	12] E
	13																		
	14																		
		目																	
	15	EII					28	00/11		70	~1 5								1 E
	16	Ē				4	50/5"	90/11		10	-4.5								
	17		Bottom of exploration at 16.5 ft below ground su	rface (bgs)															
	18		No Goundwater Encountered																=
	19		Backfill native cuttings																_
	20	Ħ																	=
	20																		
	21																		
	22																		Ξ
	23																		=
	24																		
	25	Ħ																	=
	-25																		
				PROJECT NAM OPUD South	ME Yuba	a Se	wer a	and V	Vater				FILE 38	E NO. 342.X		HO F	LE ID >-15		
										R	OUTE					PC	OSTMILE	Ξ	
			ACKRUDN	CLIENT						_									
			CNCLUTINC	PREPARED BY	yinee ′	erin	J			Cł	HECK	ED B	Y		SI	HEET	Г		
1			UNSULTING	LDM											1	l of	1		

LOG	ged B /C	Y	BEGIN DATE 8-25-20	COMPLETION DATE 8-25-20	LOCATION (Lat/	Long	or N	lorth/E	East a	nd Datı	um)				HO P	LE ID -16				
CON Tal	TRAC ⁻	TOR			LOCATION (Offs	et, S	statio	n, Line	e)						SU	RFAC	E EL	EVATIC	N	-
OPE Da	RATOF vid	R'S NA	AME HELPE Nick/	R'S NAME /Tanner	EQUIPMENT CMF 75										TO 21	TAL C 1.5 ft)EPT	H		
EXC/	AVATIO	DN ME	ETHOD Juger		DRILLING ROD	TYPI	E AN	d dia	METE	ER / BU	ICKE	TWI	DTH		BO 4	REHC in	DLE D	DIAMET	ER	
SAM Ca		TYPE((S) AND SIZE(S) (ID)		HAMMER TYPE Safety semi-	aut	oma	atic d	ron	(140#/	30'	'n			HA	MMEF	REFF	ICIENC	Y, ERi	
BAC	KFILL A	AND C	COMPLETION		GROUND WATE READINGS	R	DU	RING	coun	AF tered	TER	(DAT	E)		CAS	SING	ΓYPE	E AND D	IAMET	ER(ir
(#)					L	tion	ber	-	t		_				Lab	orate	ory	Data		
ELEVATION	DEPTH (ft)	Material Graphics		DESCRIPTION		Sample Loca	Sample Num	Blows per 6 i	Blows per foc	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Metho
		3 0, pa	ASPHALT CONCRETE	<u>= (4")</u> 32")																
	1 2 3 4 5		Lean CLAY with SAND medium SAND; odor CLAYEY SAND (SC); n fine to medium SAND; :	(CL); (stiff); dark reddish nedium dense; dark reddi some fines	brown; little 		1	9	28		85	3 75								
	6 7 8 9							15	20			0.70	16	116	30	16	41			
	10 11 12 13		little fines SANDY Lean CLAY (Cl olive brown; moist; som through coarse SAND	L); hard; mottled dark yell e moderate cementation;	owish brown and some fine	X	2	9 14 19	33		80	>4.5								
_2019.GLB 10/21/20	14 15 16 17 18 19		Lean CLAY with SAND and olive brown; moist; cementation	(CL); hard; mottled dark v little fine to medium SAN	vellowish brown D; some weak		3	25 50/6"	50/6"		90	>4.5	21	104						
NS.GPJ LIBRARY	20		mottled gray and dark y cementation	vellowish brown; some mc	derate to strong	X	4	18 25 30	55		95	>4.5								
XPLORATIO	22		No Goundwater Encour Bulk A obtained 3-5 ft b	ntered ogs	(3 -7															
X FIELD E)	24 25		Top Pour Cement Grou	ıt Backfill																
I LOG FOR SOIL 3842		B	LACKBL	PROJECT NAM OPUD South COUNTY YUB CLIENT Jacobs Eng	E Yuba inee	a Se erinç	wera	ind W	/ater	R	DUTE		FILE 38	E NO. 42.X		PC	P-16 DSTMILE	=		
BC		С	ONSULT	ING	PREPARED BY						C	HECK	ED BY	(SH 1	HEET	1		

	Ged /	BY		BEG 9-1	IN DATE - 20	COMPLETION DA 9-1-20	TE LOCATION (La 39.04718° /	it/Long -121	g or I I .48(North/I)8°	East a	nd Datu	m)				HO P	LE ID -17				
CONT Tab	rra er	сто	R				LOCATION (O	fset, S	Statio	on, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPER Tob	RATO V	OR'S	S NA	ME	HELPE Erne	R'S NAME sto/Lawrence	EQUIPMENT CME 75										TO 2'	TAL D 1.5 ft)EPT	Ή		
EXCA Soli	VAT	rion Sten	ME	THOD			DRILLING ROI) TYF	PE AN	ID DIA	METE	ER / BU	CKE	TWI	DTH		BO 4	REHC in	DLE	DIAMET	ER	
SAMF	LEF	RTY	PE(S	S) AND SIZE	E(S) (ID)		HAMMER TYP	E	tom	atic c	Iron	(140#/	20'	'n			HA	MMEF	REFI	FICIENC	Y, ERi	
BACK	FILI						GROUND WA	TER		RING		AFT AFT	TER	(DAT	E)		CAS	SING ⁻	TYPE	E AND D	IAMET	ER(in
(Ŧ)				nent Grou			T(E) (Dir(60	ы	ē								Lab	orate	orv	Data		
NOI	(Ħ)	(1)				DECODIDEION		-ocati	Jumb	r 6 in	r foot	Ω	(%) /	heter	(%)	sity					_ σ	ethod
EVAT	НТЧ	eria I	phics			DESCRIPTION		J ple L		ws pe	ws pe	(AS ⁻	oven	ket etron	sture itent (Dens	t e	sticity	#200	ar ingth t	itiona Test	M Bul
ELI	ц С -0-	N Mat	0 ga					San	San	Blo	Blo	N6C	Rec	Pec	Cor Cor	e D D	сі ф	Pla: Inde	× %	She Stre Tes	Adc Lab	D
	1			Lean CLAY	(CL); hard;	orangish brown; dry	few very fine SAND															
	ว	E																				
	2	E							1	14	50/5''		67	>4.5								1 E
	3	E								50/5"			-								<u> </u>	
	4																					
	5		//	CLAYEY S	AND (SC); n	nedium dense; dark i	eddish brown; moist			7												
	6	E		some line a	AND				2	9 10	19		83	3.0	18	110			36			
	7																					
	8																					
	9		//	CLAYEY SAND; little	AND (SC); d	ense; dark yellowish	brown; moist; fine															
	10		//							11										<u> </u>	<u> </u>	
	11							K	3	23	42		83	NA	13	117			31			
	12																			<u> </u>		
	13																					
	14																					
	15	E		Lean CLAY SAND	(CL); hard;	light grayish brown;	dry; few very fine															
	16	E						h	4	16 34	 84/12		89	>4.5								
	10									50/6"											<u> </u>	
	17	E																				
	18	E																				
I	19																					
	20	E		mottlad dar	k vollowich l	rown and graviab br	own: troop vorv fing		5	26	50/5"		100	►1 E								
	21		\square	SAND					5	50/5"	50/5		100	~4.3								
	22			Bottom of e	xpioration al	21.5 π below ground	a surrace (bgs)															
	23			Bulk A obta	ined 0-5 ft b	gs																
	24			Top Pour C	ement Grou	t Backfill																=
<u> </u>	-25	Ħ																				
							PROJECT NA	ME	2 60		and M	Vator				FILE	E NO.	,	HO			
				6		COUNTY	Tub	a 36	Wera	anu V	valei	R	DUTE		30	H2.Χ	<u> </u>	PC)STMILI	Ē		
					KPI	IDN	CLIENT															
CONSULTING							JACODS EN PREPARED B	yine Y	erin	g			Cł	HECK	ED B	(Sł	HEET	Γ		
	CONSULTING																	1	of	1		

LO	GGE	DB	Y	BEGIN DATE	COMPLETION DATE	LOCATION (Lat	/Long	or N	lorth/E	East a	nd Dati	um)				HO	LE ID				
CO		ACT	OR	9-1-20	9-1-20	LOCATION (Off	set, S	470 Statio	54 n, Lin	e)						SU	RFAC	EEL	EVATIC	N	
	abei Era	• TOF	R'S N	AME HELPER	R'S NAME	EQUIPMENT										то	TAL D	DEPT	Ή		
T	oby			Ernes	sto/Lawrence	CME 75										1	5.0 ft				
S	JAV/ Diid∙	-Ste	em A	LIHOD Luger		DRILLING ROD	TYPI	= AN	D DIA	MEIE	ER / BU	JCKE	IVVIL	ЛН		4	REHC in)LE L	JIAMET	≞R	
SA	MPLE	ER 1	YPE	(S) AND SIZE(S) (ID)							(4 40#	1 201	N			HA	MMEF	R EFF	ICIENC	Y, ERi	
BA	CKFI	Da (LL A	2.4 ND () COMPLETION		GROUND WAT	ER	DU	ring	rop	(1 40#/ AF	TER) (DAT	E)		CAS	SING	TYPE	E AND D	IAMET	ER(in
В	ack	ill ı	nativ	e cuttings		READINGS	-	No	t End	coun	tered										
(H)							atior	nber	. <u>-</u>	ot		()	Ŀ.		1	Lab	orat	ory	Data		g
Į Į		(Ħ	s		DESCRIPTION		Lo Lo	Nun	er 6	erfo	TM	ry (%	mete	(%)	sity		~		_	ts a	deth
EVA		ЦЦ	teria	_			nple	nple	d sw	d sw	(AS	sove	sket netro	sture	Der	it Fi	sticit	:#20	ear ength	dition Tes	Ing I
Ш			Mat Gra				Sar	Sar	Blo	Blo	N60	Rec	Poc	C Noi	Dry Dod	Li qi	Pla	> %	She Stre Tes	Add	Dril
		Ē		Lean CLAY (CL); hard; GRAVEL	orangish brown; dry; few	medium coarse															
	-																				
	2	2							1/												
		şΕ		No GRAVEL			Μ	1	15	31		61	>4.5								
		Ē							16												
	4	¹ E																			
	Ę	5							29												
	6	ŝĒ		dark yellowish brown wi	th grayish streaks; trace	very fine SAND	М	2	33	71		89	>4.5	18	111						
		. E							38												
	'	É	\mathbb{V}																		
	8	B																			
	ę	Þ																			
	1	۰É																			
	'	۴Ę						ç	13	82		61	>15								
	1	1	\vee					5	49	02		01	-4.0								
	1	2																			
	1	3 E	\checkmark																		
		Ē							5												
	1	4 E		dark yellowish brown; m	noist		М	4	19	47		100	>4.5	27	96						
	1	5	<u> </u>	Bottom of exploration at	15.0 ft below ground sur	face (bgs)			20												
	1	6		No groundwater encour	ntered	(0)															
121/20	1	- E		Bulk A obtained 0-5 ft b	gs																
B 10	'	Έ		Backfill native cuttings																	
19.GL	1	8		-																	Ξ
۲_20 ⁻	1	9																			
RAR	2	٥Ē																			
J LIE		Ę																			
S.GP		Ē																			
TION	2	2																			
-ORA	2	з 🗄																			
EXPI	2	٩Ē																			
IELD		Ē																			
12.XF	<u></u> 2	5	1																		
L 38				~	1.1	PROJECT NAM	lE Yub≤	s Ser	wer -	and W	lator				FILE	E NO.		HO	LE ID		
SOI					COUNTY						R	DUTE		00	·		PC	OSTMILE	Ξ		
10 LOL			2																		
ILOC			B	LACKBL	JRN	Jacobs Eng	ginee	erinç	3			1-	15.5		,				_		
BC			С	ONSULT	ING	PREPARED BY						C	HECK	FD B,	r		SI	⊣⊧E1 I of	1		

LOG	GED	BY	BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	LOCATION (Lat	/Long) or N	lorth/E	East a	nd Dati	um)				HO P	LE ID				
CON	TRAC	TOR	5-0-20	5-0-20	LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPE		R'S N	JAME HELPEI	R'S NAME											TO		DEPT	Н		
EXC			IETHOD		DRILLING ROD	TYP	E AN	D DIA	METE	ER / BL	JCKE	TWI	отн		BO	REHC	DLE D	DIAMET	ER	
SAM	PLER	TYPI	Auger E(S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	IN MMEF	REFF	ICIENC	Y, ERi	
Ca BAC	KFILL	AND	COMPLETION		GROUND WAT	ER	DU	atic d RING	lrop ((140# / AF	/ 30' TER	') (DAT	E)		CAS	SING -	TYPE	E AND D	IAMET	ER(in
Ba ⊋	ckfill	nati	ve cuttings		READINGS	Ę	No	t End	count	tered					l ah	orat	onv	Data		
ON (f	(t)					ocatio	nmb€	6 in.	foot	Σ	(%)	eter	(%	ţ				Dala		thod
VATI	TH (I	rial	5	DESCRIPTION		ple L(ple N	s per	s per	(AST	very	et	ture ent (⁹	Densi	0	icity	£200	ır ıgth	ional Fests	ng Me
ELE	DEP	Mate				Sam	Sam	Blow	Blow	N60	Recc	Pock	Mois	Dry [Liqui	Plast Indey	⊭> %	Shea Strer Test	Addit Lab ⁻	Drillir
		<u>کہ ا</u>	ASPHALT CONCRETE	(7")		-														
	1					-														
	2			sun, readistr brown, dry				6	4.0			0.05			10					
	3		moist				1	11	18		100	2.25	17	109	48	33				
	4																			
	5		hard: drv to moist: few fi	ine SAND: little moderate	cementation			11												
	6					X	2	18 38	56		90	>4.5								
	7																			
	8																			
	9																			
	10																			
	10	¥	dry Lean CLAY with SAND	(CL); hard; yellowish brow	wn; slightly	\mathbf{A}	3	3 6	53		80	>4.5	17	101						
			moist; little fine SAND; s	strong cementation				47												łE
	12																			
	13							0												
	14		moist		specks, slightly	M	4	9 16 23	39		100	>4.5								
	15		Bottom of exploration at	15.0 ft below ground sur	face (bgs)			25												
/20	16		No groundwater encour Bulk A obtained 1.4-5 ft	ntered bas																Ξ
10/21	17	-																		
9.GLB	18		Backnii hauve cuungs																	
Y_201	19	-																		
BRAR	20	_																		-
SPJ LI	21																			
ONS.O	22																			Ξ
DRATI	23																			
EXPL	24																			
FIELD	25																			
842.X	-20					45									- 110		1.0			
OIL 3				1.1	OPUD South	⁄iE Yuba	a Se	wer a	and W	/ater				FILE 38	= NO. 342.X		P	-24		
FOR S					COUNTY YUB						R	DUTE					PC	OSTMILE	=	
FOG		E	BLACKBL	JRN	CLIENT Jacobs Eng	ginee	erinç	3												
BCI		C	CONSULT	ING	PREPARED BY	, 					Cł	HECK	ED B	(SI 1	HEET	1		

LOG	GED	BY		BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	E LOCATION (La	t/Long	g or N	North/I	East a	ind Datu	ım)				HO P	LE ID				
CON	TRA	СТС	DR	00120	0020	LOCATION (Of	fset, S	Static	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPE	RAT	OR'	S N/	AME HELPE	R'S NAME											TO		DEPT	Н		
EXC/	N NA	TIOI	N ME	THOD		DRILLING ROD	TYP	E AN	ID DIA	METE	ER / BU	CKE	TWI	отн		BO	REHO	DLE	DIAMETI	ER	
SAM	I a-t	R T	n A /PE(S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	In MMEF	R EFI	FICIENC	Y, ERi	i
BAC	MO (FIL	d (2 L an	2.4" ND C) COMPLETION		GROUND WAT	i-aut ER	oma DU	atic c RING	lrop	(140#/ AF	30' TER	') (DAT	E)		CAS	SING	TYPE	E AND D	IAMET	ΓER(in
Top •	<u>) Po</u>	our	Cer	ment Grout Backfill		READINGS	Ę	No	t En	coun	tered					Lab	orat	oni	Data		T
ON (f	Í á	5					catic	umbe	6 in.	foot	Ω	(%)	eter	(%	۲ <u>ر</u>				Dala		thod
VATIO	E E		nal hics		DESCRIPTION		ole Lo	ole N	s per	s per	(AST	very	et	ture ent (%	Jensi	5	icity	200	gth	ional Fests	lg Me
ELE			Mate Grap				Sam	Saml	Blow	Blow	N60	Reco	Pock	Moist	Dry [Liqui	Plast Indey	#> %	Shea Strer Test	Addit Lab 7	Drillic
	<u>–</u> 0-	E	ы.	ASPHALT CONCRETE	E (7")																
	1	Ē		AGGREGATE BASE (10) 		_														ΙĒ
	2	Ē		to medium SAND; indu	irated slightly; trace cerr	ientation		1	22	50/6''		85	>4.5								1 E
	3	E							50/6"					13	114	31	10				┤╞
	4		\square																		
	5	E	\square						15												┤╞
	6		\square				Μ	2	26	66		85	>4.5								
	7		$\overline{/}$	Lean CLAY with SAND	(CL); hard; dark yellow	ish brown; moist;			40												╡╞
	8		\square	Indie inte to medium SA	IND, DIACK SPECKS																
		Ħ	\square																		
	9		\square																		
	10	E		grayish brown; dry; sor	ne white cementation			2	21	06		85	~15								1
	11							3	40 50	90		00	-4.5								
	12	Ē																			
	13																				
	14	E							14												┤╞
	15		\square					4	50/6"	50/6''		85	>4.5	25	91						
	16	E	\square																		
	17																				
	10	Ħ																			
	10	Ē	τif	SILT with SAND (ML):	hard: vellowish brown: r	noist: little fine			12												ΗĒ
	19	E		SAND; few cementation	n		Ν	5	18	43		100	>4.5								
	20	E		Bottom of exploration a	t 20.0 ft below ground s	urface (bgs)															<u> </u>
	21	E		No groundwater encou Bulk A obtained 1.4-5 f	ntered t bgs																Ξ
	22			T D 0 10																	Ξ
	23	E		Top Pour Cement Grou	JT BACKTIII																Ξ
	24																				=
	_25	Ε																			
						PROJECT NAM	ЛЕ								FILI	E NO.		НО	LE ID		
						OPUD South COUNTY	Yuba	a Se	wer a	and V	Vater	R	OUTE		38	342.X		PC	7-25 DSTMILE	E	
			1			YUB CLIENT															
BLACKBURN							ginee	erin	g				HECK	FD B'	Y		2		г		
CONSULTING																		lof	1		

LOG	ged M	BY		BEGIN DATE 9-10-20	COMPLETION DATE 9-10-20	LOCATION (Lat. 39.03908° / -	/Long - 121	g or N .515	lorth/1 503°	East a	nd Dati	um)				HO P	LE ID -26				
CON Tat	TRA Der	СТС	R			LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	E EL	EVATIO	N	
OPEI Ch	RAT(ad	OR'S	S NA	AME HELPER Caleb	R'S NAME //Cody	EQUIPMENT										TO 2'	TAL C 1.5 ft	EPT	Ή		
EXC/			IME	ETHOD	, eeu	DRILLING ROD	TYP	E AN	id dia	METE	ER / BL	JCKE	TWI	DTH		BO	REHC	DLE	DIAMETI	ER	
SAM	PLEF		PE(S) AND SIZE(S) (ID)					-	luen	(4 40#	1 201	n.			HA	MMEF	REFF	FICIENC	Y, ERi	
BAC	(FILL					GROUND WAT	-dui ER	DU	RING		AF	TER) (DAT	E)		CAS	SING ⁻	ΓYPE	E AND D	IAMET	ER(in
10 2		bur	Cer	ment Grout Backfill		READING5	Ы	ษ			terea					Lab	orate	orv	Data		
NO	(#						ocati	qun	r 6 in.	r foot	Σ	(%)	leter	(%	ity			.,			ethod
VAT	HTU		hics		DESCRIPTION		ple L	ple N	vs pe	vs pe	(AS1	overy	ket etrom	sture tent (Dens	.e	ticity	#200	ar ngth	tiona Tests	ng Me
ELE			Grap				Sam	Sam	Blow	Blov	N60	Rec	Peri	Mois	Dry (pcf)	Liqu	Plas Inde	t> %	She: Strei Test	Addi Lab	Drilli
				ASPHALT CONCRETE AGGREGATE BASE (14	<u>(6.5")</u> 4")		+														
				·	, 		1														
	2	E	\land	Lean CLAY (CL); hard; o cementation	dark grayish brown; mois	st; some weak		1	4	65/10		04	~1 5								
	3	E	\prod	SANDY SILT (ML); hard	l; orangish brown; dry; so	ome fine SAND	Δ	'	50/4"	05/10		94	24.5								
	4	目																			
	5	E		Lean CLAY (CL); hard; i yellowish brown with gra	mottled orangish brown a ayish brown streaks; moi	and dark st; few fine			13												
	6	E		SAND			X	2	27 34	61		89	>4.5	19	111						
	7	E	\square																		
	8	F																			
	g	Ē	\square																		
	10	Ē																			
		Ē	\land	gravish brown: trace fine	SAND			3	18 39	 89/12'		72	>4.5								
	11	Ē	\square	g. ay ion 210111, 2000					50/6"												
	12		\square																		
	13	昆																			
	14	E		SILT with SAND (ML); h brown streaks; moist; litt	ard; dark yellowish brow le very fine SAND	n with grayish															
	15								16												
	16						M	4	38	88/11'	¦ 	83	>4.5	25	100						
	17																				
	18																				
	10			Poorly Graded SAND wi	ith SILT (SP); very dense	e; dark yellowish	+														
		目		brown; moist; fine SAND)																
	20							5	21 37	76		100	NA					8			
	21	E		Pottom of overlaration at	21 E ft below ground our	face (bac)		Ľ	39									-			
	22			No Groundwater Encour	21.3 It below ground sur	lace (bgs)															
	23	E																			
	24			Top Pour Cement Grout	Backfill																
	25	H																			=
						PROJECT NAM	1E								FILE	E NO.	,	HO	LE ID		
				-		COUNTY	Yuba	a Se	wer a	and W	ater	R	OUTE		38	542.X		PC	7-26 DSTMILE	E	
			4	LACKEL		CLIENT															
			B	LACKBU	PREPARED BY	jine	ering	g			CI	HECK	ED B	ŕ		SF	IEET	Г			
			C	UNSULI	LDM											1	of	1			

	GGI DM	ED E			BEGIN DATE 9-10-20	COMPLETION DATE 9-10-20	LOCATION (Lat 39.04651° /	/Long - 121	g or N . 514	North/E 1 97°	East a	nd Dat	um)				HC P	DLE ID -27			N	
				JAN		R'S NAME		sei, c		'II, ∟III'	e)						то Т					
C EX(b/Cody	CME 75	TYP	F AN		METE	R / BI	ICKE	TWI	тн		2	1.0 ft			R	
SAN		I-St	em														4	in				
		lod	(2.4	<u>-(3</u>			Safety semi	-aut	oma		lrop ((140#	/ 30'	') (DAT								
To	or- op	Ροι	Ir Co	em	ent Grout Backfill		READINGS	ER	No	t End	count	tered	TER	(DAT	E)		CA	SING	ITPE	AND D	IAIVIET	ER(In
N (ft								ation	mber	Ľ	oot	<u> </u>	(%	er			Lab	orat	ory	Data		po
EVATIO		PTH (ft)	terial	billes		DESCRIPTION		nple Loc	nple Nui	ws per 6	ws per f) (ASTM	covery (sket netromet	isture ntent (%	Density	it d	sticity ex	<#200	ear ength st	ditional Tests	ling Meth
EL			Mag	5		= (6")		Sar	Sar	Blo	Bo	N6(Re	Po(Per	≗ö	Ęĝ	Li d	Pla	• %	⊤ She	Add Lab	
		1	3	/	AGGREGATE BASE (1	12")		1														
		2			ean CLAY (CL); (hard	I); mottled dark brown an	d dark grayish	-														
		3]																		
		4																				
		5																				
								Ν	1	7 15	 65/10'		100	>4.5								
		7			SILT with SAND (ML); I prown; dry; some weak	hard; mottled light brown cementation; little fine S	and orangish AND			50/4"												
		8																				ΙĒ
		9		ł	nard augering																	
		10		,	ight gravish brown with	n dark orangish brown st	reaks	Ν	2	44 50/6"	50/6''		100	>4.5	19	104						
		11		.	igni grayion brown ma		Carto															
		12																				
		13																				
		14																				
		15							3	28	50/5''		100	>4.5								1 E
/20		16			dark brown with blackis cementation	sh streaks; moist; some n	noderate			50/5					26	96						1 E
10/21		17																				
9.GLB		18																				
Y_201		19			ean CLAY with SAND	(CL); hard; dark yellowis ; little fine SAND; some v	sh brown with veak cementation															
.IBRAF	:	20								22	50/41		100	. 4 5								┤╞
GPJ L	:	21			Bottom of exploration at	t 21.0 ft below ground su	Irface (bos)		4	50/4"	50/4"		100	>4.5								
IONS.		22		ļ	No Groundwater Encou	untered																=
-ORAT		23		ł	Bulk A obtained 1.5-5 ft	t bgs																
) EXPI		24		-	Fop Pour Cement Grou	ut Backfill																
		25																				
3842.>			_	_	~		PROJECT NAM	1E								FIL	E NO.		HOL	E ID		
SOIL							OPUD South COUNTY	Yuba	a Se	wer a	and W	/ater	R	DUTE		38	842.X		PC	-27 DSTMILE		
G FOR							CLIENT															
CILO			E	5	LACKBL	JRN	Jacobs Eng	ginee ′	ering	3			CI	HECK	ED B	Y		SF	HEET	-		
ш			C)(JNSULL	ING	LDM							. 5.1				1	of	1		

	ged i I C	BY	BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	LOCATION (Lat/	/Long	or N	North/E	East ai	nd Dat	um)				HO P	LE ID				
	TRAC	TOF	R		LOCATION (Offs	set, S	itatio	n, Lin	e)						SU	RFAC	E EL	EVATIO	N	
OPER	RATO	R'S	NAME HELPE	ER'S NAME											TO)EPT	H		
EXCA			METHOD	bicody	DRILLING ROD	TYPE	E AN	id dia	METE	R / BL	JCKE	T WIE	DTH		BO	REHC	DLE D	DIAMET	ER	
SAM	PLER	TYP	PE(S) AND SIZE(S) (ID)		HAMMER TYPE										HA	IN MMEF	REFF	ICIENC	Y, ERi	
Cal BACH	Mod (Fill	(2.4 AND	4") COMPLETION		GROUND WATE	-auto ER	oma DU	atic d RING	rop (140# AF	30' TER	') (DAT	E)		CAS	SING ⁻	TYPE	AND D	IAMET	ER(in
Top	<u>Po</u>	ur C	ement Grout Backfill		READINGS	L C	No	t End	count	tered						orot	~ m (Data		
JN (f	- -					catio	admu	6 in.	foot	۶ آ	(%)	eter	()	~		orat		Dala		pour
ATIC	H (f	ial	lics	DESCRIPTION		le Lo	le N	ber	; per	ASTN	/ery (et rome	ure nt (%	ensit		city	500	gt .	onal ests	g Met
ELEV	DEP'	Mater				Samp	Samp	Blows	Blows	160 (Recov	^o ocke	Noist	Dry Dcf)	iquid	Plasti ndex	;#> %	Shear Streng Test	Additi ab T	Drillin
		2	ASPHALT CONCRET	E (6")		0,	05			~			20				0`		L L	ΪE
	1		P AGGREGATE BASE (12")																
	2		Lean CLAY (CL); very	stiff; dark grayish brown; r	noist			7												┤╞
	3					K	1	9 14	23		80	2.25	19	111						
	4		/					14												1 E
	5		SANDY Lean CLAY (C some fine SAND; mod	CL); hard; dark yellowish bi erate cementation	rown; moist;															
						X	2	53 50/4"	50/4''		80	>4.5								
	6																			
	7																			
	8		CLAYEY SAND (SC);	very dense; dark yellowish	brown; moist;	-														
	9		fine to medium SAND;	little fines; strongly cemer	nted															
	10						3	50/6"	50/6"		100	>4.5								┤╞
	11						U	00/0	00/0		100	1.0								1
	12																			
	13																			
	14		Poorly Graded SAND	with CLAY (SP-SC); mediu n; moist; fine to medium S	um dense to AND; few fines															
	15					∇	4	15	26		70	ΝΑ	10	104						1
/20	16						4	20	30		10		10	104						
10/21	17																			
9.GLB	18																			
7_201	19			(SP): medium dense to de	nse: olive grav:	-														
3RAR	20		very moist; fine to med	ium SAND	noo, onvo gray,			10												
E LIE	21					М	5	12	35		100	NA								
ONS.G	22		Bottom of exploration a	at 21.5 ft below ground sur	face (bgs)			19												
RATIC	22		No Groundwater Enco	untered																Ξ
XPLO	23		Top Pour Cement Gro	ut Backfill																Ξ
ELDE	24			Buokin																
2.X FIE	25																			
L 384:					PROJECT NAM	E Yuba	Se	wora	nd W	lator				FIL			HOL	E ID		
R SOI					COUNTY	1 0.00				a.ci	R	DUTE		30	/ ~ ∠.∧		PC	STMILE		
0G FO			ACKE	IDN	CLIENT															
3CI LC			DLACKBU	Jacobs Eng	inee	ering	9			Cł	HECK	ED B1	(SH	IEET				
<u> </u>		C	LONZULI	LDM											1	of	1			

	ged B'	Y	BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	LOCATION (Lat/	Long	or N	lorth/E	East a	nd Datı	um)				HO P	LE ID				
	TRACT	OR	<u> </u>	J-0-20	LOCATION (Offs	set, S	tatio	n, Lin	e)						SU	RFAC	E EL	EVATIC	N	
OPEF	RATOF	{'S N/		R'S NAME											TO		DEPT	H		
EXCA)N ME	THOD	D/COUy	DRILLING ROD	TYP	E AN	d dia	METE	ER / BU	ICKE	TWI	DTH		BO	REHC	DLE D	JAMET	ER	
SAMF	Id-Ste	YPE	S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	In MMEF	REFF		Y, ERi	
Call BACK	Mod (Kfill <i>P</i>	2.4") COMPLETION		GROUND WATE	∙auto ER	oma DUI	tic d Ring	rop	/ 140#/ AF	30' TER	') (DAT	E)		CAS	SING -	TYPE			ER(in
Bac	<mark>kfill r</mark>	<u>nativ</u>	e cuttings		READINGS	Ē	No	t End	coun	tered			·		l ab	- rot	~ ~ /	Data		
€) NC	- -					catio	lmbe	6 in.	foot	(F)	(%)	eter	(%)	<u>ج</u>	Lau			Dala		pou
/ATI(TH (f	ial lics		DESCRIPTION		le Lc	ole Nt	s per	s per	AST	very	∋t trom∈	ure ent (%	Jensit		city	200	gth	onal ests	g Met
ELE	DEP	Matei Grapi				Sam	Samp	Blow	Blow	N60 (Reco	Pock	Moist Cont [,]	Dry [pcf)	Liquic	Plasti Index	#> %	Shea Stren Test	Addit Lab T	Drillin
			ASPHALT CONCRETE	= (6")						_				_			-			Ē
	2		SANDY Lean CLAY (CI	L); stiff; brown; moist																
	3																			
	4	4																		ΙĘ
	5	[/]	brown; moist; fine SAN	D; some fines	Jark yenowish														<u> </u>	
		$\langle \rangle$				Μ	1	12 16	36		100	NA	21	100						
						Н	$\left - \right $	20											─	┨╞
		$\langle \rangle$																		ΙĒ
	8																			
	9																			
	10							8											<u> </u>	┤╞
	11	//	fine to coarse SAND			M	2	12 17	29		90	NA	20	102						
	12	$\langle \rangle$				Ħ														ΙĘ
	13																			
		$\langle \rangle$																		
	15		medium to coarse SAN	ID: little fines			3	10 16	36		95	NA								ΙE
1/20	16				(\square	Ľ	20				1.0.								
10/2	17		Bottom of exploration at	face (bgs)																
9.GLB	18		Bulk A obtained 1.5-5 ft	t bgs																=
Y_201	19		Backfill native cuttings																	
BRAR	20																			=
LI CI	21																			
DNS.G	22																			Ξ
IRATIC		-																		
XPLO		•																		=
ELDE	24																			=
12.X FI	-25-	1						_	_			_	_							
IL 38					PROJECT NAM	E Yuba	a Ser	wer a	Ind W	Vater				FILE 38	E NO. 342.X		HOL P	.e ID 9 -29		
JR SO		-			COUNTY YIJB						R	DUTE					PC	STMILE	Ξ	
OG FC		B	ACKBL	IDN		iner	rinc	1												
BCIL		C	ONSULT	ING	PREPARED BY		<u></u>	2			Cł	HECK	ED B	ſ		SI	HEET	. 1		

LOGO	GED	BY		BEGIN DATE 9-4-20	COMPLETION DATE 9-4-20	LOCATION (Lat	/Long	g or N	lorth/l	East a	nd Dat	um)				HO P	LE ID				
CONT	TRA	сто	R	5 7 20	5-4-20	LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIC	N	
OPEF	RAT	OR'S	NA	ME HELPER	R'S NAME	EQUIPMENT										то	TAL C	DEPT	Ή		
EXCA		FION	ME	THOD	sto/Jason	DRILLING ROD	TYP	E AN	D DIA	METE	ER / BL	JCKE	TWI	отн		BO	4.5 π REHC	DLE [DIAMETI	ER	
SAMF	i d-S PLEF	Sten R TY		uger S) AND SIZE(S) (ID)		HAMMER TYPE										4	<u>in</u> MMEF	REF	FICIENC	Y, ERi	
		d (2	4")			Safety semi	-aut			lrop	(140 #	/ 30'	')	<u> </u>		C 49					ED/in
Bac	:kfil	Ina	tive	e cuttings		READINGS		00						L)			51110	IIFL			
(H) Z							ation	nber	. <u>.</u>	ot		(9	5			Lab	orat	ory	Data		g
TIO	1		ŝ		DESCRIPTION		Loc	Nun	ber 6	ber fc	STM	%) Ku	mete	e t (%)	nsity		₹	Q	ے ا	sts	Meth
EV ^A			aphic				mple	mple	swc	swc p	9 (A	COVE	cket	oistur	y Del	nit	astici dex	<#20	ear engt st	dition b Te:	lling
Ξ		ĭ ≚	Ū): hard: dark vellowish h	own: dry: some	S	Sa	ă	ă	ž	Å	ዳ ዋ	žΰ	රි මී	ĔĔ	a E E	%	ਜੂ ਨੂੰ ਨੂੰ	Ac La	ā
	1	Ē		fine to medium SAND; t	race fine to coarse GRAV	EL															
	2	E																			
								1	9 20	41		80	>4 5								
	3	Ē	\overline{A}	GRAVELLY Lean CLAY	(CL); hard; mottled blac	k and dark		Ċ	21				- 4.0	10	117						
	4	E		few fine to coarse SANE); few ASPHALT CONCE	ETE debris															
	5	E	4						14												
	6			SANDY Lean CLAY (CL fine to medium SAND	.); stiff; dark yelowish bro	wn; dry; some	M	2	16	26		90	1.5								
	7								10												
		É.																			
	8	Ē																			
	9																				
	10			hard; trace fine to coars	e GRAVEL; trace COBBL	.ES			16												
	11	É.					M	3	45 50/4"	95/10	¦ 	100	>4.5	17	115			67			
	12	E																			
	12	E																			
		E							32	50/4		100									E
	14	É	ÍI	SILT with SAND (ML); h	nard; yellowish brown; dry	; little fine SAND		4	50/4"	50/4"		100	>4.5								
	15	E		Bottom of exploration at	14.5 π below ground sur	face (bgs)															
	16			Bulk A obtained 0-5 ft b	gs																Ξ
	17			Backfill native cuttings																	-
	18	E		Ũ																	
	10																				
1	19	E																			Ξ
	20	E																			Ξ
	21	Ħ																			Ξ
	22	Ħ																			=
	23																				
	24																				
	2.	Ħ																			
	-20																				
				~	1.1	PROJECT NAM OPUD South	1E Yuba	a Se	wer a	and W	/ater				FILE 38	E NO. 42.X		HOI	2-30		
			-			COUNTY YUB						R	OUTE					PC	OSTMILE	Ξ	
			R	ACKR		ine	rin	r									_1				
			~	ONSULT	ING	PREPARED BY	jii iCt	, i i i i	1			CI	HECK	ED B	1		SI	HEET			
1			-	UNJULI													1	i ot	1		

ſ	LOGG	ED B	ſ	BEGIN DATE	COMPLETION DATE	LOCATION (Lat/	Long	or N	lorth/E	East a	nd Dati	um)				HC	DLE ID					
	CONT	RACT	OR	9-4-20	9-4-20	LOCATION (Offs	et, S	itatio	n, Lin	e)						SU	RFAC	E EL	EVATIC	N		
ŀ	OPER	er Ator	'S N/	AME HELP	ER'S NAME	EQUIPMENT										то	TAL D	DEPT	н			
	Tob EXCA	y Vatic		Ern	esto/Jason	CME 75		= ΔΝ	מוח ח	METE	-R / BI			тн		1	5.0 ft			FR		
	Soli	d-Ste	m A													4	in					
		LER I /Iod (YPE(2.4"	(S) AND SIZE(S) (ID) ')		Safety semi-	auto	oma	tic d	lrop ((140#/	/ 30'	')			HA	MME	K EFF	-ICIENC	Y, ERi		
	BACK	FILL A	ND C	COMPLETION		GROUND WATE READINGS	R	DU	RING		AF	TER	(DAT	E)		CA	SING	TYPE	E AND D	IAMET	ER(ir	n
t	£						no	er								Lab	orat	orv	Data			
	NO	(t					ocati	qmn	.6 in	foot	Ω	(%)	eter	(%	ty			_			sthod	
	/ATI	TH (rial rics		DESCRIPTION		ole L	ole N	s per	s per	AST	very	et trom	ent ("	Jensi	-	icity	200	gt _	ional ests	g Me	
		DEP	Jate Srapl				Samp	Samp	3lows	Slow	160 (Reco	Pock	Aoist Conte	Dry pcf)	iquic	lasti ndex	#> %	Shea Stren Test	∖ddit ab T	lili	
ł	_	-0- 		SILT with SAND (ML)	; very stiff; yellowish brown	; dry; little fine	0,	0,			~			20				01	07 07 [-	<u> </u>		
		1		SAND																		
		2																				
		E					Μ	1	6 7	16		60	3.25									
		3		Lean CLAY (CL); hard	d; dark yellowish brown; dry	; few fine SAND	\square		9												ĮĒ	
		4																				
		5							5												┤╞	
		6					М	2	7	20		100	>4.5	23	97							
		Ē							13												╡╞	
		8																				
		9																				
		10																				
		Ē		Lean CLAY with SAN	D (CL); hard; dark yellowisł	n brown; dry;	М	3	20 35	73		90	>4.5	20	109							
							\square		38												↓ Ē	
		12																				
		13																				
		14					$\overline{\mathbf{A}}$		11												1 E	
		15		some cementation			Ń	4	18 45	63		100	>4.5									_
				Bottom of exploration	at 15.0 ft below ground sur	face (bgs)															_	
/20		16		No Goundwater Enco Bulk A obtained 0-5ft	untered bgs																Ξ	
10/21		17			-																-	
GLB		18		Backfill native cutting	5																-	
2019		19																			_	
ARY																					Ξ	
LIBR		²⁰																			-	
.GPJ		21																				
IONS		22																			-	
DRAT		23																			Ξ	
XPLO																					=	-
ELDE		²⁴																			Ξ	
2.X FI		25																			_	
. 384;						PROJECT NAM	E Zuula a	. 6-		nd 14	lata-				FILI	E NO.	,	HO				
SOIL					COUNTY	ruba	1 26	wer a	and W	vater	R	DUTE		38	542.X	<u> </u>	PC	2-32 DSTMILI	Ξ			
FOR			4									_										
1 LOG			В	LACKB	Jacobs Eng	inee	ering	J														
BC			C	ONSULT	FING	PREPARED BY						CH	HECK	ED B	Ý		SI	héet Iof	1			

LOGGED BY BEGIN DATE COMPLETION DAT DWC 9-10-20 9-10-20			COMPLETION DATE 9-10-20	LOCATION (Lat/Long or North/East and Datum) 39.07996° / -121.53077°										HOLE ID TC-02A									
						LOCATION (Offset, Station, Line)																	
	Αις (JAME HELPER Nick/	Diedrich D1	EQUIPMENT Diedrich D120										TOTAL DEPTH 51.5 ft								
EXCA Soli	d-S	ion n	IETHOD Auger		DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH											BOREHOLE DIAMETER							
SAMP Call	LER	≀ TYPE 1 (2.4	≟(S) AND SIZE(S) (ID) !'')	HAMMER TYPE	HAMMER TYPE Safety semi-automatic drop (140#/ 30")										HAMMER EFFICIENCY, ERI								
BACK	FILL mie	AND	COMPLETION Ient Grout Backfill	GROUND WAT READINGS	GROUND WATER DURING AFTER (I READINGS 29.0 ft							E)	CAS	CASING TYPE AND DIAMETER(i									
(ff)				ation	nber	Ľ	ot		()	5	L		Lab	orat	ory	Data	 	g					
VTION	(III) H		x		Loca	Num	oer 6 i	ber foc	STM)	%) (Yi		e t (%)	nsity		₹	8	£	nal sts	Meth				
LEV#	EPT	ateria				ample	ample	l swo	l swo	60 (A	ecove	ocket enetrc	oistur	of De	quid	astici dex	<#2(near trengt est	ddition ab Te	rilling			
ш	_0_		ASPHALT CONCRETE	E (6")		ŭ	ö			Ž	Ř	مّمّ	ΣŪ	<u>ā</u> 9	ככ	르드	%	<u>ب</u> م م	ĽΫ́				
	1	E	SANDY Lean CLAY (CI some fine to medium S.	L); very stiff; dark yellowis	sh brown; moist;	1																	
	2	E						1										<u> </u>	 				
	3	1				M	1	6	16		90	2.25											
	4	Ē/						10											$\left - \right $				
	5	E/	1																				
	0	Ē/	mottled dark yellowish	brown and black and brov	wn; strong		2	28 50/4"	50/4''		100	>4.5]{[
	o -	Ē/	cementation																	K			
	7	I																		K			
	8	E/	Lean CLAY with SAND	(CL); hard; dark yellowis	sh brown; moist;	+														R			
	9	ŧ/																		K			
	10	E/						8										<u> </u>					
	11	E/				M	3	12 15	27		90	4.25											
	12	E/																					
	13	E/																					
	14	¥/																					
	15 16 fine to medium SAND																						
						M	4	17 28	63		100	>4.5											
								35									\vdash	<u> </u>		-11			
	17 SANDY Lean CLAY (CL); hard; olive brown; mois medium SAND					1																	
I	19	Ē/																		ľ			
	20							9															
	21 Lean CLAY with SAND (CL); hard; mottled olive			e gray and brown		5	16 35	51		90	>4.5												
and black; moist; little fine SAND; some moderati					te cémentation																		
	23	E/																	K				
	24	Ē/																	K				
	-25	E/	SANDY Lean CLAY (CL brown; moist; some fine	L); hard; mottled dark oliv e to medium SAND; some	/e gray and e moderate															K			
				OPUD South	OPUD South Yuba Sewer and Water								38	± NO. 42.X	,	T							
					COUNTY YUB						R	JUIE			POSTMILE								
BLACKBURN CLIENT Jacobs Engineering																							
	CONSULTING PREPARED BY CHECKED BY											(SHEET										

(#)			DESCRIPTION	Sample Location	Sample Number	3lows per 6 in.	Blows per foot	V60 (ASTM)	Recovery (%)	^o ocket ^o enetrometer	Laboratory Data						7			
ELEVATION	DEPTH (ft)	Material									Moisture Content (%)	Dry Density (pcf)	_iquid _imit	Plasticity ndex	% <#200	Shear Strength Test	Additional _ab Tests	Drilling Method		
	-25-	Ē	cementation SANDY Lean CLAY (CL) (continued).	Ŵ	6	22 50/5"	50/5"		100	>4.5								Ī		
	26 27 28 29		SANDY Lean CLAY (CL); very stiff; olive gray; moist; some fine	7																
	30	ľ			7	7 13	34		85	2.25										
	31 32 33 34					21											,			
	35 36		hard; mottled olive brown and brown	X	8	12 16 27	43		100	>4.5										
	37 38 39		Lean CLAY with SAND (CL); hard; olive gray; moist; little fine to medium SAND; moderate cementation	_																
	40 41 42			X	9	24 38 50/4"	88/10		85	>4.5										
	43 44 45				10	17 34 8	34/10.5	5"	100	>4.5										
	46 47 48		some strong comentation			50/4.5	5*													
I	49																			
	50 51		dark reddish brown veins; moderate cementation	K	11	14 24 50/6"	74/12		100	>4.5										
	52		Bottom of exploration at 51.5 ft below ground surface (bgs) Groundwater Encountered at 29 ft bos		•															
	53 54		Tremie Cement Grout Backfill																	
	55														110					
	PROJECT NAME OPUD South Y COUNTY					uba Sewer and Water						3842.X				TC-02A POSTMILE				
		ĺ	BLACKBURN CLIENT Jacobs Eng	jinee	ərin	9														
	CONSULTING PREPARED BY						CHECKED BY SHEET DWC 2 of							IEET	2					
LOGO LDI CON	GED BY M TRACTO	DR	BEGIN DATE 8-31-20	COMPLETION DATE 8-31-20	LOCATION (Lat. 39.08058° / - LOCATION (Off	/Long -121 set, S	g or N . 529 Statio	lorth/E 1 31° n, Lin	East ar e)	nd Dati	um)				HO T SU	le ID C-02 RFAC	2 C E EL	EVATIC	DN N	
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Tak OPEF Tok EXCA Sol	Der Rator': Dy Avation id-Ster	S NAME N METHO M Auge i	HELPE Erne	R'S NAME sto/Lawrence	EQUIPMENT CME 75 DRILLING ROD	TYP	E AN	D DIA	METE	ER / BL	JCKE	T WIE	DTH		то 5' во 4	TAL D 1.5 ft REHC in			ER	
BACH	Mod (2 KFILL AN	2.4"), SF	PT (1.4") PLETION Frout Backfill		GROUND WATE READINGS	-aut ER	oma DU 27	atic d RING 5 ff	lrop ((140# AF	/ 30' TER	') (DAT	E)		CAS	SING ⁻			DIAMET	ER(in
(tt)			Joar Baonin		I	ation	ber	. <u>c</u>	ot			Ļ			Lab	orat	ory	Data		p
ELEVATION	DEPTH (ft)	Material Graphics		DESCRIPTION		Sample Loca	Sample Num	Blows per 6 i	Blows per fo	N60 (ASTM)	Recovery (%	Pocket Penetromete	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Metho
			HALT CONCRET	E (2.5")		-		_									-			Ī
	2	SILT brow	(ML); hard; mottle vn; dry; few very fir	d dark yellowish brown a se SAND		_														
	3					K	1	35 40 49	89		100	>4.5			29	4				
	4																			KE
						H	2	25 50/4.5	50/4.5	•	100	>4.5								
																				KE
																				KE
		 med	ium stiff to stiff; mo	bist; trace fine SAND		Ν	3	3 4	9		100	1.0								
			,					5 4											<u> </u>	
						X	4	6 8	14		90									
		Lear	n CLAY with SAND grayish brown with	(CL); hard; mottled dark blackish streaks; moist; l	yellowish brown ittle very fine															
		SAN	ID				5	8 19	43		100	>4.5								
21/20								24											<u> </u>	
-B 10/																				
019.GI																				
ARY_2	19																			
- LIBR		arav	ish brown with dar	k raddish brown straaks			6	17 37	87/10"		90	>4.5								
IS.GPJ		gray		R Teddisit brown streaks				50/4"												
RATION																				
XPLOF	23																			
ELDE	24																			
42.X FI	L ₂₅ 🗖	<u> </u>		(continued)																
DIL 38			1		PROJECT NAM	1E Yuba	a Se	wer a	and W	/ater				FILE 38	NO.		HOL T	C-02C	;	
FOR S(1			COUNTY YUB						R	DUTE					PC	DSTMIL	Ξ	
LOGI		BL	ACKBI	JRN	CLIENT Jacobs Eng	jinee	ərinq	3												
BC	CONSULTING PREPAR											HECKI	ED BY	(Sł 1	HEET	2		

(#)				tion	oer		t						Lab	orate	ory	Data		
EVATION	EPTH (ft)	iterial aphics	DESCRIPTION	mple Locat	mple Numl	ws per 6 ii	ws per foc	0 (ASTM)	covery (%)	cket netrometer	isture ntent (%)	/ Density :f)	luid nit	asticity lex	<#200	ear ength st	ditional o Tests	lling Metho
Ш	25 25	G G M a	Lean CLAY with SAND (CL) (continued).	Sa	Sa	요 전 15	B	N6	Re	Pe	ůğ	<u>ę</u> g	Lia Lia	Pla	%	T S S T	Ad Lat	<u>Б</u> DE
	26		grayish brown with orangish brown streaks; increasing SAND content		/	50/6"	50/6"		70	>4.5								
	27		$\overline{\lambda}$															
	28		SILTY SAND (SM); dense; dark yellowish brown; wet; fine to medium SAND															
	29																	
	30					11												
	31				8	20 23	43		100	NA			NP	NP	20			
	32																	<i>∦</i> ∃
	33																	
	34																	KE
	35		sand catcher		9	7 14	32		90	NA								
	30					18												
	38																	
	39		Lean CLAY (CL); hard; gravish brown with orangish brown	+														
	40		streaks, moist, lew very line SAIND			20												
	41			M	10	20 46 50/4"	 96/10' 		100	>4.5			44	19				
	42																	
	43																	
	44		SANDY SILT (ML); hard; grayish brown with orangish brown streaks; moist; very fine SAND															{₿
	45					20												
	46				11	26 22	48		100	>4.5								
	47																	
	48																	
	49																	
	50				12	16 19	40		100	NA								
	51		moist; fine SAND with CLAY (SP-SC); dense; dark brown; moist; fine SAND Bottom of exploration at 51.5 ft below ground surface (bas)			21												
	53		Groundwater Encountered at 27.5 ft bgs Bulk A obtained 1 2-5 ft bgs															
	54																	
	55																	
<u> </u>				IE .								FILE	NO.		HO	LE ID		
			COUNTY VUD	Yuba	a Se	wer a	and W	ater	R	DUTE		38	42.X		PC	C-02C	1	
		B		ine	erine	<u>י</u>												
		С	ONSULTING PREPARED BY						Cł L		ED BY	/		SH 2	HEET 2 of	2		

		IY TOP	BEGIN DATE 8-24-20	COMPLETION DATE 8-24-20	LOCATION (Lat. 39.04217° /	/Long - 121	g or N .475	North/1 5 95°	East a	nd Dati	um)				HO T	C-06	6 A	EVATIC		
Tab OPEF	ITRAC IER RATOI		AME HELPEF	R'S NAME	EQUIPMENT	301, C		, LIII	e)						то					
Dav EXCA			Nick/	Tanner	CME 75 DRILLING ROD	TYP	E AN	ID DIA	METE	ER / BL	ICKE	TWI	отн		4 ' BO	1.5 ft REHC			ER	
SAMF	i d-St	em A	(S) AND SIZE(S) (ID)		HAMMER TYPE						_				4	in MMEF	REFF		Y, ERi	
Cal BACK	Mod (FILL)	(2.4") COMPLETION		Safety semi GROUND WAT	-aut ER	oma DU	atic c RING	lrop	(140#) AF	30' TER	') (DAT	E)		CAS	SING ⁻	TYPE	AND C		ER(in
Tre	mie (Ceme	ent Grout Backfill		READINGS	ç	No	t En	coun	tered			,			orat	071	Data		
ON (f	£					ocatio	umbe	6 in.	foot	Ω	(%)	eter	(%	۲ <u>۲</u>	Lau			Dala		thod
EVATI	TH (erial		DESCRIPTION		ple L	nple N	vs per	vs per	(AST	overy	ket etrom	sture tent (°	Densi	тā	ticity ×	#200	ngth	itional Tests	ng Me
ELE		Mate				San	San	Blov	Blov	N60	Rec	Poc	Moi: Con	Dry (pcf	Liqu Liqu	Plas	≈ %	She Stre Test	Add Lab	Drill
			Lean CLAY (CL); Hard;	Reddish Brown; Dry; Me	dium Plasticity															RE
																				KE
	3																			KE
																				KE
	5		Moist																	KE
							1	10 12	30		95	>4.5								KE
			CLAYEY SAND (SC); N	ledium Dense; Reddish I	Brown; Moist;			18												KE
			Mostly Fine to Medium	SAND; Some CLAY (CL); Hard; Yellowish Bro	own; Moist; Little	+														KE
	× ×		Medium SAND																	KE
	9																			
	10		•				2	3 14	42		50	>4.5			41	20				
								28												
	12																			
	13																			
	14		Lean CLAY (CL); Hard; Gray; Few Medium SAN	Mottled Dark Yellowish E	Brown, Olive, and	1														
	15						3	28 39	89/11		70	>4.5								
:1/20	16						-	50/5"							43	22				
B 10/2	17																			
019.GL	18																			
ARY_20	19		Lean CLAY (CL); Hard; Moist: Trace SAND: Tra	Mottled Olive and Dark	 Yellowish Brown;	1														
LIBR/	20						4	25	03/11		70	>15								
S.GPJ	21						-	50/5"			/5	- 1.0			42	22				
ATION	22																			
(PLOR	23					-														
ELDE	24		Fat CLAY (CH); Hard; Y	ellowish Brown; Moist																
12.X FI	25			(continued)																
0IL 38					PROJECT NAM	1E Yuba	a Se	wer a	and W	Vater				FILE 38	NO. 42.X		ноі	E ID C-06A		_
-OR S(2			COUNTY YUB						R	OUTE					PC	STMILE	=	
LOGF		B	LACKBU	JRN	CLIENT Jacobs Eng	jinee	ering	9												
BCI	CONSULTING					,					C	HECK	ED B	Y		SH 1	HEET I of	2		

Γ	(ft)				tion	ber		ţ						Lab	orate	ory	Data		-
	ELEVATION	DEPTH (ft)	Material Sraphics	DESCRIPTION	Sample Locat	Sample Num	Blows per 6 in	Blows per foo	160 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density pcf)	-iquid -imit	Plasticity ndex	% <#200	Shear Strength Fest	Additional _ab Tests	Drilling Method
F		25	20	Fat CLAY (CH) (continued).		5	11 13	31	2	75	>4.5	20				0`			ŽE
		26					18					29	93	57	32			UC	
																			KE
		20																	KE
		30																	KE
		31		SANDY Lean CLAY (CL); Very Stiff; Mottled Olive and Brown; Moist; Some Fine SAND; Low to Medium Plasticity	Ν	6	12 14	31		70	3.5								
		32					17												
		33																	
		34		SANDY Lean CLAY (CL): Hard: Dark Vellowich Brown: Moist	-														
		35		Some Fine to Medium SAND; Medium Plasticity			16												
		36			X	7	32 27	59		95	4.5								
		37																	
		38		Lean CLAY (CL); Hard; Dark Yellow Brown; Moist; Medium	+														
		39		Plasticity															
		40					12												KE
		41				8	21 39	60		100	>4.5								K
		42		Bottom of exploration at 41.5 ft below ground surface (bgs) No Goundwater Encountered															
		43		Tremie Cement Grout Backfill															
		44																	
		45																	
/21/20		40																	
SLB 10																			
2019.0		49																	
BRARY.		50																	
spj Lie		51																	
IONS.0		52																	
LORAT		53																	
.D EXP		54																	
X FIEL		55																	
L 3842				PROJECT NAM OPLID South	/E Yub:	a Se	wer a	and V	Vater				FILE	E NO.		HOI T			
OR SO				COUNTY YUB						R	DUTE					PC	DSTMIL	E	
LOG F.			B	LACKBURN CLIENT Jacobs Eng	ginee	ering	3												
BCI			С	ONSULTING PREPARED BY	/					CI	HECK	ED B	(SH 2	HEET ? of	2		

L		GED	BY	>		BEGIN 8-28	N DATE 8 -20	E	CC 8	MPLE -28-20	tion dat D	TE LO	OCATION (La 39.0769° / -	t/Long 121.5	g or N 5235	lorth/E 5 2°	East a	nd Dat	um)				HC T		7 A	EVATIO		
									א פיכ					1361, 0		· ı, ∟ııı	e)										<u></u>	
	Dav	vid					N	ick/	Tann	er			CME 75							T \A/IF			5	1.5 ft				
	Soli	d-S	tem		ger/ F	Rotar	'y Wa	sh					RILLING ROL		E AN			ER / BU	JCKE	I VVIL	ЛН		4	in		JIAMET	=R	
S	AMF Call	PLER Moc	: TYP I (2.4	E(S) I'')	AND	SIZE(S) (ID)					H	IAMMER TYPI Safety sem	∃ i-aut	oma	atic d	lrop	(140#	/ 30'	')			HA	MMEF	REF	FICIENC	Y, ERi	
В	ACK	FILL		CO	MPLE		ackfill	ı				G	ROUND WAT	ER	DU 23	RING 0 ft		AF	TER	(DAT	E)		CAS	SING	TYPE	E AND D	IAMET	ER(in
	(H)													u	ъ.								Lab	orat	ory	Data		
	NO	(j												ocati	qmn	r 6 in	r foot	Ω	(%)	leter	(%	ity						ethod
	VATI	HT (ilal	hics					DES	CRIP	TION			ple L	ple N	s pe	s pe	(AST	very	cet etrom	ture ent (Dens	σ.	ticity	#200	ngth	tiona	Jg Me
	ELE	DEP	Mate	Grap										Sam	Sam	Blow	Blow	N60	Reco	Pock Pene	Mois Cont	Dry [Liqui	Plast Inde	#> %	Shea Strer Test	Addit Lab ⁻	Drillir
		-0-		A	SPHA	LT C	ONCR	ETE	E (9")																			
		1		P A	GGRI	EGAT	E BAS	E (1	2")																			
		2			ean C	LAY (CL); st	tiff; d	lark re	ddish	brown; m	noist; fe	ew very fine			10												
		3												М	1	7	13		80	1.25								{\E
		4														0												INE
			ŧ/																									KE
		5												Ν	2	14 50/5"	50/5''		55	>4.5								IYE
		6			ean C AND;	LAY w mode	vith SA rate ce	AND emer	(CL); ntatior	hard; y	yellowish l	brown	; little very fine	•		00,0												iXE
		7			,																							IVE
		8																										IVE
		9																										{}E
			É/																									KE
		10														6	10			4.05								IKE
		11		s	tiff; ind	reasir	ng SAI	ND c	conten	t; no c	ementatio	on			3	8 10	18		20	1.25								IYE
		12																										
		13																										IVE
			E/																									{}E
		14	ĒTI	T S	ILT (N	/L); ha	ard; m	ottled	d gray	rish bro	own and c	orangis	sh brown;															
		15		11	10131											13												I
0		16												X	4	26 40	66		100	>4.5			42	4				IYE
0/21/2		17																										iXE
LB 1		10																										IVE
019.G		10																										IVE
RY_2		19		<u>ال</u>	ean C	LAY (CL); h	ard;	dark k	prown v	with orang	gish st	reaks; moist;	1														ISE
-IBRA		20		/"		ile cei	nentat	.011,	uace	very in	IE SAIND					12												I
GPJ 1		21												X	5	19 35	54		100	>4.5			38	16				
ONS.(22		2																								IYE
RATI		22	ť.									_	7	$\overline{\mathbf{A}}$														INE
XPLO		23		S	AND)	/ SILT	(ML); n with	(har oran	d); m aish s	ottled of streaks	dark yellov s: moist. se	wish b some S	rown and SAND:															IVE
EDE		24		n	odera	ite cer	nentat	ion	. <u>.</u>		,, -		,															IVE
2.X FIE		25	НП						(~~	ntinue	d)				<u> </u>													ЦЕ
3842									(00	ue	<i>u</i> /	F	ROJECT NA	ME .			• • • •					FILE	E NO.		HO	LE ID		
SOIL				5	1								OPUD South	Yuba	a Se	wer a	and W	ater	R			38	542.X	<u> </u>	PC	C-07A	، Ξ	
FOR				-			0.800																					
I LOG			E	3 L	. A	C	KE	31	JR	N			Jacobs En	ginee	erinç	9												
BC	CONSULTING PREPARE						REPARED B	ŕ					CH	HECK	ED BY	ſ		SH 1	heet I of	2								

(ft)			ion	ber	<i></i>	t I		_				Lab	orate	ory	Data		_
ELEVATION	DEPTH (ft) Material	S DESCRIPTION	Sample Locat	Sample Num	3lows per 6 in	Blows per foo	V60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density pcf)	-iquid -imit	Plasticity ndex	% <#200	Shear Strength Fest	Additional _ab Tests	Drilling Method
	25	switched to mud rotary SANDY SILT (ML) (continued).	Ň	6	9 15	35	2	90		20		NP	NP	57			
	27				20												
	28																
	29	Poorly Graded SAND (SP); dense; dark brown; moist; fine to medium SAND: trace fines	-														
	30			7	15 18	41		65	NA								
	32				23												
	33																
	34																
	35	dark brown with golden specs; wet		8	10 16	34		70	NA					5			
	37				18												
	38																
	39																
		∴ ∴ ∴ dark brown	X	9	19 24	47		70	NA								
	41				23												
	43																
	45	∴ ∴ ∴ dark brown with golden specs	X	10	11 23	48		70	NA								
	47				25												
	48																
	49																
	50	trace coarse SAND	N	11	13 19	49		70	NA								
	52	Bottom of exploration at 51.5 ft below ground surface (bgs)			30												
	53	Groundwater Encountered at 23 ft bgs															
	54	Tremie Cement Grout Backfill															
	L ₅₅ .土											- 110					
		PROJECT NAM OPUD South COUNTY	⊪ Yuba	a Se	wer a	and V	Vater	R	DUTE		38	= NO. 42.X	[PC	C-07A DSTMILE	E	
		BLACKBURN Uacobe End	line	erin	<u>י</u>												
	Ċ	CONSULTING PREPARED BY			J			CI	HECK	ED BY	(SH 2	HEET ? of	2		

ſ		ED B	Y	BEGIN DATE 8-28-20	COMPLETION DATE 8-28-20	LOCATION (Lat/ 39.07654° / -	Long	or N . 522	North/E 298°	East ar	nd Dati	um)				HO T	LE ID C-07	7 B			
		RAC Pr Atof		AME HELPE	R'S NAME		sel, c		, LIII	e)						ТО				IN	
	Dav EXCA	d /ATIC		ETHOD	Tanner	CME 75	TYP	E AN		METE	ER / BL	JCKE	TWI	отн		5 ' BO	1.5 ft REHC			ER	
	SAMP	d-Ste	em A	(S) AND SIZE(S) (ID)		HAMMER TYPE										4	in MMEF	REFF		Y. ERi	
	Call BACK	lod -ILL /	(2.4''			Safety semi GROUND WATE	-aut ER	oma DU	atic d RING	lrop ((140#) AF	/ 30'	') (DAT	E)		CAS	SING -	ΓΥΡΕ		AMET	ER(in
┢	Trer	nie (Ceme	ent Grout Backfill		READINGS	Ę	15	.0 ft				`	,		Lab	orat	ond	Data		,
	JU (f	ť)					ocatio	umbe	6 in.	foot	Ω	(%)	eter	(%	۲ <u>ح</u>				Dala		thod
	VATIO	тн (f	hics		DESCRIPTION		ple Lo	ple N	's per	's per	(AST	very	tet etrome	ture ent (9	Densi	σ	ticity	<i>‡</i> 200	ar ngth	tional Tests	ng Me
	ELE		Mate Grap				Sam	Sam	Blow	Blow	N60	Reco	Pere	Mois Cont	Dry I (pcf)	Liqui	Plas	¢ ≉	Shea Strei Test	Addi Lab	Drilli
			3- I.	ASPHALT CONCRETE	E (8.5")		+														1E
					0)																XE
				Lean CLAY (CL); very s	stiff; dark brown; moist; fe	w very fine	Ν	1	5 5	10		50	2.25								KE
		Ì							5												XE
		4																			1E
		5		reddish brown				2	3 4	14		100	3.75			24	9				
		6							10								-				
		8		Lean CLAY with SAND	(CL): bard: vellowish bro	wn: moist: little	+														KE
		9		very fine SAND																	{E
		10					X	3	16 50/6"	50/6''		60	>4.5								KE
		11																			
		12																			
		13																			
		14		Increasing SAND conte	871L	Σ_	ļ														
		15		SANDY SILT (ML); (hai	rd); mottled reddish brow	⊻ n and dark eak cementation		4	12	45		00									
1/20		16						4	20	40		90				NP	NP	51			
3 10/2		17		Lean CLAY (CL); hard;	yellowish brown; moist; f	ew very fine	-														
19.GLE		18																			
RY_20		19																			
LIBRA		20						_	11												
S.GPJ		21						5	19 19	38		70	4.5								
ATION(22																			
PLOR		23		SANDY SILT (ML); very	y stiff; brown; moist; some	e very fine SAND	-														
ILD EX		24																			
2.X FIE		25 E			(continued)																
IL 384:						PROJECT NAM	E Yuba	a Se	wer a	and W	/ater				FILE 38	E NO. 42 .X		HOL	E ID C-07R		
OR SO						COUNTY YUB						R	DUTE					PC	STMILE	<u> </u>	
LOG F(CLIENT Jacobs Eng	inee	erino	3			_1													
BCI	CONSULTING PREPARED F											Cł	IECK	ED BY	(Sł 1	HEET	2		

(#)				tion	ber	-	t						Lab	orate	ory	Data		_
ATION	H (ft)	व	g DESCRIPTION	e Loca	e Num	per 6 i	per foc	(MTSA	ery (%	t ometei	rre nt (%)	ensity		ity	8	ţ	onal ests	Metho
ELEV	DEPT	Materi	Gaph	Sample	Sample	Blows	Blows	N60 (A	Recov	Pockel Penetr	Moistu Conter	Dry D€ (pcf)	Liquid	Plastic Index	% <#2	Shear Streng Test	Additio Lab Te	Drilling
	-25- 26		SANDY SILT (ML) (continued).	K	6	5 12	31		90	2.5			36	10				
	27		Poorly GRADED SAND with CLAY (SP-SC); medium dense; dark brown; moist; fine to medium SAND			19												
	28																	
	29																	
	30				7	17 25	52		100	NA					9			
	31 32		switched to mud rotary			27												
	33		Poorty CRADED SAND (SP): donog: dork brown: wat fing to	-														
	34		redium SAND (SF), dense, dark brown, wet, nine to															
	35					12	0.5		75									
	36		. medium dense; moist; trace fines		8	17	35		75	NA								
	37																	
	39																	
	40					12												
	41		wet; few coarse SAND		9	13 9	22		80	NA								
	42																	
	43																	
	45		CLAYEY SAND (SC); very dense; dark yellowish brown; moist; mostly fine SAND; some fines			17												
	46			X	10	35 8 50/5.5	5/11.	5" 	100	NA								
	47																	
	48		Poorly GRADED SAND (SP); medium dense; dark brown; moist; fine to medium SAND; trace fines	-														
	50					10												
	51			X	11	12 17 19	36		100	NA								
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)		•													
	53		Bulk A obtained 2-5 ft bgs															
	54 55		Tremie Cement Grout Backfill															
				IE .								FILE	E NO.		но	LE ID		
			OPUD South COUNTY VIIR	Yuba	a Se	wer a	and V	vater	R	DUTE		38	42.X	<u> </u>	P(DSTMILE	Ē	
		Ê	BLACKBURN CLIENT Jacobs Eng	jine	erin	3												
		(CONSULTING PREPARED BY						C	IECK	ED B	(SH 2	HEE 2 of	2		

LOGO	GED N	BY	BEGIN DATE 8-27-20	COMPLETION DATE 8-27-20	LOCATION (Lat 39.07538° / ·	/Long	g or N . 521	lorth/E 3°	East a	and Dat	um)				HO T	le ID C-0 8	BA			
CONT Tab	RA er	CTOR	· · · · · · · · · · · · · · · · · · ·		LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIO	N	
OPER Dav	ATO id	OR'S N	NAME HELPEI Nick/	R'S NAME Tanner	EQUIPMENT CME 75										ΤΟ 5΄	TAL D 1.5 ft	DEPT	Ή		
EXCA Soli	VAT	TION N	/ETHOD Auger/ Rotary Wash		DRILLING ROD	TYP	E AN	ID DIA	MET	ER / BL	JCKE	TWI	DTH		BO 4	REHC in	DLE	DIAMET	ER	
SAMF			E(S) AND SIZE(S) (ID)			 t		atio d	Iron	/1 40#	1 201	י			HA	MMEF	REFF	ICIENC	Y, ERi	
BACK	FILL	_ AND	COMPLETION		GROUND WAT	-aut ER	DU	RING	nob	AF	TER) (DAT	E)		CAS	SING	TYPE	E AND D	IAMET	ER(ir
fre fre	nie	Cem	ent Grout Backfill		READINGS	L	14. ត	.0 π							l ah	orat	orv	Data		
I) NO	(Ħ					ocatio	nmbe	6 in.	foot	Ω	(%)	eter	(%	۲ <u>ک</u>				Data		thod
VATI	TH 0	rial		DESCRIPTION		ole Lo	ole N	s per	s per	(AST	very	et	ture ent (9	Densi	5	icity	200	gth	ional Fests	lg Me
ELE	DFP	Mate				Sam	Saml	Blow	Blow	N60	Reco	Pock	Moist	Dry [Liqui	Plast Indey	#> %	Shea Strer Test	Addit Lab 7	Drillic
	-0-		ASPHALT CONCRETE	E (9")																Ī
	1		AGGREGATE BASE (9	")																
	2		Lean CLAY (CL); Very S	Stiff; Dark Brown; Moist; t	race SAND															
	3	E/																		I
	4	É/																		INE
	-	É/																		IKE
	5						1	5	23		100	2 75								IYE
	6	Ē/					'	13	23		100	2.75								IYE
	7	E/																		
	8	E/																		
	9	ŧ/	Lean CLAY with SAND	(CL); Hard; Dark Yellowis	sh Brown with	+														
		¥/	Black Streaks; Moist; Li	ttle Fine SAND; Trace Fir	ne GRAVEL															K
	10						2	16	67		00	~ 5								IKE
	11	Ē/					2	30 37	07		90	24.5								IKE
	12	E/																		IYE
	13	E/																		
	14	E/				4														
	15	ŧ/	CLAYEY SAND (SC); (I	Medium Dense); Mottled ne SAND; Little Fines	Dark Brown and															INE
	15						3	6 9	16		80	ΝΔ			28	15	17			1{JE
	16		Poorly-graded SAND w Mottled Dark Brown and	ith CLAY (SP-SC); Mediu d Black; Wet; Fine to Med	ım Dense; lium SAND		Ŭ	7			00				20					INE
	17	E																		IXE
	18																			IKE
	19		Lean CLAY (CL); Stiff; I	Mottled Light Gray and D	ark Yellowish	-														IYE
	20	E/		Plasticity																IYE
	20						4	3	18		90	1 25								1))E
	21		CLAYEY SAND (SC)' M	Aedium Dense [,] mottled lid	oht grav and dark	$-\Delta$	-	12			30	1.20								
	22		yellow brown with black	streaks; moist; little to so	ome fines															
	23	E/																		
	24	E/,	/ /			_														
	-25-	E/	Lean CLAY (CL); hard;	bluish gray; moist; few fir	ne SAND															
	-23			(continued)																
					PROJECT NAM	lE Yuba	a Se	wer a	and V	Vater				FILI 38	e no. 8 42.X		HOL T	C-08A	`	
					COUNTY YUB						R	OUTE					PC	OSTMILI	Ξ	
		Ê	ACKBI	IDN		inor	aring	r			_									
		C	ONSULT	ING	PREPARED BY		, i i i i	1			CI	HECK	ED B	Y		SI	HEET	`		
1			UNJULI		50						- L	JVVC				11	I OT	4		

Γ	(ft)				tion	ber		Ţ		_				Lab	orate	ory	Data		
	ELEVATION	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Locat	Sample Num	Blows per 6 in	Blows per foo	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
ľ		25		Lean CLAY (CL) <i>(continued)</i> .	Ň	5	3 13	50		100	>4.5					91			
		20					37												
		28																	
		29			-														
		30		Lean CLAT (CL), (Sun), dark gray, wet, new very inne Sand			3												
		31			X	6	5 9	14		45	NA								
		32																	
		33																	
		34																	
		35		hard; moist; weak cementation	Ν	7	10 16	35		100	>4.5			27	12				
		30					19												
		38			-														
		39		moist; fine to medium SAND; trace fines															
		40					15												
		41			X	8	19 24	43		70	NA								
		42																	
		43																	
		44																	
		45		very dense; wet	X	9	20 31	62		65	NA								
0/21/20		40					31												
GLB 10		48																	
۲_2019.		49																	
-IBRAR		50					15												
S.GPJ L		51			X	10	26 32	58		65	NA								
ATIONS		52		Bottom of exploration at 51.5 ft below ground surface (bgs) Goundwater Encountered at 14 ft bos															
XPLOR		53		Tremie Cement Grout Backfill															
IELD E		54																	
842.XF		-55-			F											ЦО			
SOILS				OPUD South Y COUNTY	Yuba	a Se	wer a	and V	Vater	R	DUTE		38	42.X		PC	C-08A	Ē	
JG FOR																			
BCI L(C	ONSULTING SS	1196	erin(1			Cł r		ED B	ſ		SH 2	HEET	2		
-											-								

	GED I M	BY	BEGIN DATE 8-27-20	COMPLETION DATE 8-27-20	LOCATION (Lat 39.07514° /	/Long - 121	or N . 520	lorth/l 196°	East a	nd Dat	um)				HC T		BB			
	Der RATO			-R'S NAME		set, e	statio	n, Lin	e)						50 TO				л л	
Dav EXC4	/id			/Tanner	CME 75	TYP	F AN	אום חו		=R / BI	ICKE	TWI	тн		5	1.5 ft			FR	
SAME	id-St	tem /	Auger / Mud Rotary		HAMMER TYPE										4	in MMFF				
Cal	Mod	(2.4'			Safety semi	-aut	oma	atic c	lrop	(140#	/ 30'	')	F)		CAS	SING				(FR(i
Tre	mie	Cem	ent Grout Backfill		READINGS		15.	.0 ft					_,					<u> </u>		
DN (ft	- -					cation	Imber	6 in.	foot	ŝ	(%)	ter	()	~	Lab	orat	ory	Data	<u> </u>	pou
ELEVATIO	DEPTH (f	Material Graphics		DESCRIPTION		Sample Lo	Sample Nu	Slows per	3lows per	V60 (ASTI	Secovery	^o ocket ^o enetrome	Moisture Content (%	Dry Densit pcf)	-iquid Limit	Plasticity ndex	% <#200	Shear Strength Fest	Additional ab Tests	Drilling Met
<u> </u>	-0-	20	ASPHALT CONCRET	E (8")			0,			~			20				0.	07 07		Ū
	1		AGGREGATE BASE (16")																
	2		Lean CLAY (CL); hard	; dark brown; moist; trace		K	1	6 11 12	23		100	>4.5								
	4		Lean CLAY with SANE) (CL); hard; dark yellowis	 h brown; moist;	_														
	6		little very fine SAND; s	ome moderate cementatio	n	X	2	8 12 22	34		70	>4.5								
	7 8 9 10 11 12 13 14 15		dark yellowish brown v increasing SAND cont	with gray streaks and black	< specks;		3	6 9 10	19		50	2.75			30	17				
071	16		coarse SAND; few fine	wet; mostly fine GRAVEL; ss CL); hard; mottled orangish	; little fine to	X	4	42 28	70		75	>4.5					9			
2018.0410 1015	17 18 19		gray; moist; some fine	SAND	 ray; moist;	_														
1	20			modium donasi dork vella	wich brown with		5	3 8	24		100	NA								
	22 23 24 25		orangish brown and gr wet	riedium dense; dark yello rayish brown streaks and g	wish prown with golden specks;			16												
100			. ^	(continued)	PROJECT NAM	1E								FILE	E NO.		HO	LE ID		
JG FUK SUIL					OPUD South COUNTY YUB CLIENT	Yuba	a Se	wer a	and V	Vater	R	OUTE		38	342.X	<u> </u>	PC	C-08E	; E	
מכו ר		C	ONSULT	ING	PREPARED BY	jinee	ərinç				Cł	HECK	ED B'	ſ		Sł 1	HEET I of	2		

(ft)				tion	ber	-i	t						Lab	orate	ory	Data		-	
ELEVATION	DEPTH (ft)	/aterial Sraphics	DESCRIPTION	Sample Loca	Sample Num	3lows per 6 i	slows per foc	160 (ASTM)	Recovery (%	^o ocket ^o enetrometei	Aoisture Content (%)	Dry Density pcf)	-iquid -imit	Plasticity ndex	% <#200	Shear Strength Test	Additional .ab Tests	Drilling Metho	
	25		Lean CLAY (CL); hard; grayish brown with orangish brown streaks: moist: few fine SAND		6	8 12	35	~	100	>15	20			<u>u =</u>	0	000		Ī	-
	26				Ŭ	23			100	- 4.5									-
	27																	INE	-
	28		SILTY SAND (SM): medium dense: dark brown with orangish	+														I	-
	29		brown streaks and golden specks; wet															RE	_
	30				7	9 12	27		100	3.25			NP	NP	43			RE	_
			SANDY Lean CLAY (CL); very stiff; grayish brown; moist; some fine SAND	\mathbf{P}		15												KE	-
	32																	KĒ	
																		I	
	35		CLAYEY SAND (SC); medium dense; grayish brown with orangish brown streaks; moist; mostly fine SAND																
	36			М	8	7 10	26		90	NA			27	11	49				
	37					16													
	38																		
	39																		
	40					7													_
	41	///	Deetly Creded SAND (SD); dense wellowigh brown and block	X	9	7 10 15	25		0	NA									
	42		no recovery, switched to mud rotary																
	43																		
	44																		
	45					22													_
	46			X	10	25 26	51		75	NA									
	47																		
	48																		
	49																		
	50					26													
	51		very dense	Ň	11	34 42	76		75	NA								8	
	52		Bottom of exploration at 51.5 ft below ground surface (bgs) Groundwater Encountered 15 ft bos																
	53		Bulk A obtained 2-5 ft bgs															=	
	54		Tremie Cement Grout Backfill																
	55	1																	-
			PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	/ater				FILE 38	NO. 42.X		но Т	C-08B			_
		2	COUNTY YUB						R	JULE					PC	JSTMILE	=		_
		B	LACKBURN Jacobs Eng	inee	ərinç)						/		0		r			_
		С	ONSULTING IDM								ים ט_			2	2 of	2			

	GED B	Y	B	egin dat 8-26-20	ΓE	COMF 8-26	PLETION DATE 5 -20	E LOCATION (L 39.07174°	at/Long / -121	g or N .516	North/E 509°	East a	and Dat	um)				HC T		9A			
Tak							_		Jiiset, c	Jialio	, LIII	e)											
	vid			N	Nick/T	anner	с ,	CME 75										5	1.5 ft				
EXCA Sol	id-Ste	n ME 2m Au	i hod uger							'E AN		MEI	ER / BU	JCKE		лн		BC 4	in)LE L	DIAMEI	ER	
SAMF Cal	PLER 1 Mod (YPE(8	S) AND S	SIZE(S) (ID	D)			HAMMER TY	∘∈ ni-aut	toma	atic c	lrop	(140#	/ 30'	")			HA	MMEF	REF	ICIENC	Y, ERi	
BACH	(FILL /		OMPLET	ION I t Backfi				GROUND WA	TER	DU 25	RING		AF 24	TER	(DAT	E) 8-26-	20	CA	SING	TYPE	E AND E	JIAMET	ER(ir
Ê				Ducki				-	u	e.								Lab	orat	ory	Data		
ELEVATION	DEPTH (ft)	Material Graphics				DESCF	RIPTION		Sample Locati	Sample Numb	Blows per 6 in	Blows per fool	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
			ASPHAL	T CONCI	RETE	(8")					_			_					<u> </u>				ĪÆ
	1 2 3 4 5 6		AGGRE	GATE BA: AY (CL); i /	SE (16 Hard; ["') Dark Bro	own; Dry; Medi	um to High		1	8 8 8	16		70	>4.5								
	7 8 9 10 11		CLAYEY Moist ⁻ Fi	ŚAND (S	GC); Me	edium [Dense; Dark Re	ddish Brown;		2	16 9 9	18		95	NA			27	12	46			
	12 13 14		Lean CL	AY (CL); V	 Very S	tiff; Red		oist; Trace Fine															
21/20	15								K	3	10 7 10	17		90	3.5			34	19				
BRARY_2019.GLB_10	18 19 20		SANDY Fine thro	Lean CLA bugh Coar	AY (CL) rse SAI	; (Stiff t ND; Fev	o Very Stiff); O v Fine GRAVE	ive; Moist; Some			8												
(FIELD EXPLORATIONS.GPJ LI	21 22 23 24 25		Lean CL SAND	AY with S	AND (CL); Ve	ry Stiff; Olive; M	<i>l</i> loist; Little Fine	Ĭ ▼ ⊻	4	6 7 10	17		100	3.0								
8842.)						(conti	nued)													ЦO	FID		
DG FOR SOIL 3					CUIENT	₩E h Yuba	a Se	wer a	and V	Vater	R	JUTE		38	= NO. 342.X	<u> </u>	РС	C-09A	L E				
BCILC		C	ON	SUL		INC	PREPARED I	nginee BY	erinș	9			Cł	HECK	ED B`	Y		SI	HEET I of	2			

(ft)				ion	Der		Ŧ						Lab	orate	ory	Data		-
TION	(#)		DESCRIPTION	Locat	Num	er 6 ii	er foc	STM)	ry (%)	meter	e (%)	Isity		y	0		ıal sts	Vlethoo
EVA.	EPTH	aterial		mple	mple	d swo	d swo	0 (AS	cover	cket	oisture Intent	y Den :f)	luid nit	asticit lex	<#20(ear ength st	dition b Tes	lling N
Ш	25 25	j≊ů −∕	Lean CLAY (CL): Stiff: Olive Grav: Moist: Interhedded Lenses of	Sa	Sa	B 5	ă	9Z	Re	ЪР	ĕö	<u>5,9</u>	Li Ci	n P	%	H S Ch	Ad La	in C
	26		CLAYEY SAND (SC); (Medium Dense); Dark Yellowish Brown; Wet; Fine to Medium SAND; Few to Little Fines	M	5	6	12		100	1.75			38	17	56			
	27																	
	28																	
	20																	
	20	Ľ																
	30				6	4	15		100	2.75								
	31					9												
	32																	
	33		SILTY SAND (SM); Medium Dense; Reddish Brown; Wet; Mostly	+														
	34		SANDY SILT (ML); (Stiff); Reddish Brown; Moist; Some Fine															
	35					8												
	36			X	7	10 13	23		85	NA			NP	NP	34			
	37																	
	38		Lean CLAY (CL): Medium Stiff: Dark Reddish Brown: Moist: Little	-														
	39		Weak Cementation															
	40					6												
	41			H	8	9	21		80	1.25 2.0								
	42		 SANDY Lean CLAY/CLAYEY SAND (CL/SC); Stiff/Medium Dense; Dark Reddish Brown; Moist to Wet; Some Fine to Medium SAND: Some Weak Cementation 			12												
	43																	
	15		SANDY Lean CLAY (CL); Stiff; Dark Reddish Brown; Moist; Some Fine SAND															
	40				9	8 11	22		80	1.75								
	46					11												
	47																	
	48																	
I	49																	
	50					14			0.5									
	51		Some Fine to Medium SAND; Weak to Moderate Cementation	\wedge	10	29 33	62		85	>4.5								
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)															
	53		Bulk A obtained 2-5 ft bgs															
	54		Tremie Cement Grout Backfill															
	55	_																
				Æ				later				FILE	NO.	,	НО			
			COUNTY	TUD	a 50	wer a	and V	vater	R	DUTE		38	42.X	<u>.</u>	PC	DSTMILE	E	
			CNICHTINIC PREPARED BY	gine	ering	g			Cł	HECK	ED BY	/		SH	HEET	Г		
		C	UNJULIING SS											2	2 of	2		

	GED	BY	סר		BE 8	Egin 3-26	DAT -20	ΓE	(сом 8-2	1PLET 26-20	FION D)	DATE	LO(39	CATION	(Lat/ 5° / -	Long 121	or N .515	lorth/l 5 7°	East a	nd Dat	um)				HC T) 9B	EVATIO		
	Der RAT(S N	AME			—н		FR'S		MF			FQ			οσι, c	Jalio	II, LIII	e)						тс					
Dav EXCA							<u> </u>	Nick	<u>v/Ta</u>	nne	<u>۳</u>				ME 75		TYP	F AN	אום ח		=R / BI	ICKE	TWI	тн		5	1.5 ft			FR	
SAME	id-S		n A		r In si	175/	<u></u>	<u></u>																		4					
	Mo	d (1	2.4"))			5) (IL	<i>'</i>)						S	afety s	emi-	aut	oma	atic c	lrop	(140#	/ 30'	')								
Tre	mie	- AI	eme	ent G	irou	ION I t Ba	ickfi	ill						GR RE	ADINGS	VATE	=R	23.	RING 0 ft		AF 2	5.0 ft	(DAT 00 8	⊢) 8 -26-	20	CA	SING	TYP	= AND L	JAME	ER(I
N (ft)																	ation	nber	. <u>.</u>	ot		(%)	<u>م</u>		1	Lab	orat	ory	Data	1	g
ELEVATIO	DEPTH (#)		Material Graphics						DI	ESC	RIPT	ΓΙΟΝ					Sample Loc	Sample Nur	Blows per 6	Blows per fo	N60 (ASTM	Recovery (%	Pocket Penetromet	Moisture Content (%)	Dry Density (pcf)	Liquid	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Meth
	-0-	E		ASF AGC		<u>.T CC</u> Gate	ONCI E BA	RET SE (Έ (6 (12")	")							-														R
	1					ΔΥ ((<u></u>	 Harr	1. De		eddis	h Brov				·	-														
	2			Med	ium	SAN	D; Fe	ew N	/ode	rate	Ceme	entatio	'n	0131,	Tabe		K	1	6 9 9	18		60	>4.5								
	4		F	SIL ⁻ Mec	Y Cl	LAY (SAN	(CL-ľ D	 ML);	; Har	;;	ark R	eddish	Brow	 vn; M	oist; Tra	ice	-														
	6																M	2	5 6 8	14		90	>4.5			22	7				
	7 8		K														-														
	9			Cen	nenta	ation	<i>J</i> ∟ <i>)</i> , I	narc	1, Da		CIIOWI		, D	лу, С	tong																
	10			Lea	n CL/	AY (C	CL);	Harc	j; Da	ark Br	rown;	; Moist						3	9 8 8	16		80	>4.5								
	12 13			SAN		. <u> </u>		$\overline{\nabla} \overline{c}$				Brown					-														
	14			Med	ium	SAN	D		, v, v	Jun,	Onve	, DIOWI	1, 1010	31, 01		0.10															
120	15			SAN		Lean	CLA	Yw	ith G	RAV	/EL ((CL); Ve	ery Sti	iff; OI	ive Brov	wn;	X	4	5 7 10	17		70	1.5 3.0								
10/2.	17 18				si, oc	JIIIE I	lile		leulu	111 37	AND,	Lille i	Fille C																		
KAKY_2015	19 Lean CLAY (CL); Hard; Mottled Olive Gray and D Brown; Moist; Medium Plasticity; Few Moderate to Cementation									 Dark to Str	Reddisl ong	<u>ו</u>	_																		
IS.GPJ LIB	21			Cen	ICIII.a	luon											X	5	6 13 21	34		95	>4.5								
LORATION	22 23 CLAYEY SAND (SC); (Medium Dense); Dark Redo Wet; Fine to Medium SAND; Some CLAY											7																			
	24		/./.	Wet	; Fine	e to N	Vedi	um s	SANI	D; So	ome C	ĊĽĂŸ			. 2.011	,															
3842.X	20									(cont	tinueo	d)													EII				טו ב וח		
												uth \	≟ Yuba	a Se	wer a	and V	Vater	R	OUTE		38	≝ №0. 342.)	(P(r C-09E DSTMIL	\$ E					
BCI LOG F			BC	L.	A	CI		BI	U	RI	N G			CL J	ENT acobs EPARE S	Eng D BY	inee	erinç]			CI	HECK	ED B	Y		s	HEE	T F 2		

(ft)					ion	Der		t t						Lab	orate	ory	Data		_
ELEVATION	DEPTH (ft)	Material	Graphics	DESCRIPTION	Sample Locat	Sample Numt	Blows per 6 ir	Blows per foo	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	-25-	Ē		CLAYEY SAND (SC) (continued). Lean CLAY with SAND (CL); Very Stiff; Strong Brown; Some	N	6	4	10		100	2.75	40	81	42	17			UC	
	20			Weak Cementation			6												
	28																		
	29	E																	
	30			SILTY SAND (SC); (Medium Dense); Dark Reddish Brown; Wet; Fine SAND; Some Fines			_												
	31			SILT (ML); Very Stiff; Dark Yellowish Brown; Moist	X	7	5 7 12	19		100	3.25	13	70	16	16				
	32											40	15	40				00	
	33																		
	34		Щ	SANDY Lean CLAY (CL); Very Stiff; Dark Yellowish Brown;	+														
	35			Moist; Some Fine SAND			7												
	36	ľ	\square		Å	8	10 11	21		80	2.5								
	37	Ē																	
	38		/./	CLAYEY SAND (SC); Loose to Medium Dense; Dark Yellowish Brown: Wet	-														
	39		/./																
	40		/./			9	5 5	11		85	1.0								
	41					-	6 3												
	42				\mathbb{X}	10	5 9	14		100	NA								
	44		/./																
	45						10												
	46	E		Moist; Some Fine to Medium SAND	X	11	16 21 30	51		85	4.0								
	47	Ē																	
	48			CLAYEY SAND (SC); Medium Dense; Dark Yellowish Brown;	+														
I	49		//	Wet; Fine to Medium SAND; Some Fines; Weak Cementation															
	50		/				8												
	51		/	Detter of evelopetion of 54.5.6 below ground outpact (b.c.)		12	9 12	21		85	1.5								
	52			Groundwater Encountered at 25 ft bgs															
	53			Tremie Cement Grout Backfill															
	54																		
	-55-	·!			C								E11 1			ЧO			
1				OPUD South	Yuba	a Se	wer a	and V	Vater	R	DUTF		38	42.X		P(C-09B		
1			4													<u> </u>			
			B	CNISTILITING PREPARED BY	inee	əring	9			CH	IECK	ED B	ſ		Sł	HEET	Г		
			0	UNJULINU SS											2	of 2	2		

	LOGG SS	ied I	3Y		B	egin 9-2-2	DATI 20	E	со 9-	MPLE ⁻	TION DATE	E LOC. 39.	ATION (La 06253° /	it/Long -121	or N . 502	lorth/l 1 9°	East a	nd Dat	um)				HC T	DLE ID C-1	DA			
	CONT	RAC er		R								LOC		fset, S	Statio	n, Lin	e)						SU				/N	
		y					E	rnes	sto/Ja	ason			IE 75					-0 / 0		T \A/II			5	1.5 ft				
	Soli	d-St			ger/R	otary	y Wa	sh				DRIL			E AN			ER / BU	JCKE		ЛН		4	in			=R	
		LER /lod	(2. 4	'E(S) 1'')	AND S	SIZE(S	5) (ID))				HAM Sat	MER TYPI	= ni-aut	oma	ntic c	lrop	(140#	/ 30'	')			НА	MMEF	(EFF		Y, ERi	
	BACK Trer	FILL nie	ANE Cen	COI	MPLET t Gro l	ion ut Ba	ckfil	I				GRO REAI	UND WAT DINGS	ΓER	DU 24.	RING 0 ft		AF	TER	(DAT	E)		CA	SING	ΓΥΡΕ	E AND D	IAMET	ER(in
	l (ft)													ation	her	in.	ot		()	L.			Lab	orat	ory	Data		g
	EVATION	PTH (ft)	erial	ohics					DES	CRIPT	ΓΙΟΝ			nple Loc	nple Nun	vs per 6	vs per fo	(ASTM)	overy (%	ket etromete	sture tent (%)	Density	t	sticity	#200	ar ngth t	itional Tests	ing Metho
	ШЦ		Mat	G G G					()					San	San	Blov	Blov	NGC	Rec	Poc Pen	No.	pcf DrV	Liq.	Pla: Inde	× %	She Stre Tes	Add Lab	
		1		A A	SPHAL GGRE		E BAS	RETE SE (10	(7"))")					+														IKE
		2		S S	ANDY	Lean	CLA	Y (CL); har	d; redo	dish brown;	dry; soi	me fine	-														IYE
		3		ľ	irougn	coars	e SA	ND; I	ew iin		arse GRAV	/EL		K	1	4 6 11	17		80	>4.5								
		4																										
		5		L	ean CL tle fine	.AY (C SAN	CL); v D	ery s	tiff to ł	hard; d	lark yellowi	sh brow	n; dry;	K	2	12 18 21	39		95	4.0								
		7														21												
		8																										
		10		C tr	LAYE	/ SAN coars	ID (S e SA	C); m ND; s	ediun some f	n dens fines	e; strong br	rown; m	oist; fine															
		11												X	3	8 9 14	23		100	2.0			47	29				
		12		/																								
		13																										
		15		/ / 11 s		<u></u>	(MI)·									7												
1/20		16		Š	AND		(1112),	, vory	oun, v	511 1 0, 0	ing, como in				4	14 22	36		90	3.0								
3LB 10/2		17 18																										
۲_2019.	19 19 20 20 20 20 20 20 20 20 20 20									um den	se; dark	_																
J LIBRAF		20		ye 	ellowis	h brov	wn; w	et; fin	e thro	ough co	oarse SANI	D			5	8 12	22		100	2.25								
ONS.GP		21 22		•											-	10												
PLORAT	23 Poorly-graded SAND (SP); medium dense; dark yel 24 moist; fine to medium SAND; interbedded lenses wi								k yellow	ish brown	;																	
ELD EX		24		. m	ioist; tii	ne to i	medil	ım Si	and;	Interbe	edded Iense	es with t	ew fines	4														
12.X FI		-25	_						(coi	ntinued	d)						I			l						<u> </u>	<u> </u>	
IL 384					1.5	~						PRC OPI	JECT NA	ME I Yub a	a Se	wer a	and V	Vater				FILI 38	E NO. 342.X		HOI	LE ID C-10A		
OR SO												COL YL	INTY						R	OUTE					PC	OSTMILE	Ē	
-0G F(Ē	31	A	CI	KF	31	IR	N			NT Cobs En	ainee	erina	1												
BCI L	CONSULTING											PRE	PARED B	Y					Cł	HECK	ED B	Y		SI	HEET	2		

(ft)					tion	oer	-i	t						Lab	orate	ory	Data		5
VATION	TH (ft)	rial	hics	DESCRIPTION	ple Loca	ple Numl	's per 6 ii	's per foc	(ASTM)	very (%)	tet etrometer	ture ent (%)	Jensity	q	ticity x	#200	ar ngth	tional Tests	ng Metho
ELE		Mate	Grap		Sam	Sam	Blow	Blow	NGO	Reco	Pock Pene	Mois	Dry [(pcf)	Liqui	Plast Inde	⊭> %	Shea Strer Test	Addit Lab ⁻	Drillir
	20			Poorly Graded SAND (SP) (continued).	Μ	6	10 13	28		100	NA								
	26			SANDY SILT (ML); very stiff; dark yellowish brown; moist; some very fine SAND			15												IYE
	27																		IYE
	28																		
	29			SILTY SAND (SM); dense; mottled dark yellowish brown and	+														IYE
	30			uive gray, moist, me SAND, some mes		_	13												
	31				À	7	22 27	49		100	>4.5					43			
	32																		
	33	Ē		switched to mud rotary															
	34																		
	35			dark vellowish brown: fine to medium SAND: little fines			13												
	36				М	8	22 27	49		100	>4.5			NP	NP			UC	
	37																		
	38																		
	39		11	Poorly Graded SAND (SP); medium dense; dark yellowish	1														
	40	▤.		brown, wet, nice to needen on the, trace nices															
	41		• •		М	9	12 16	31		85	NA								
	42	Ē		SII TY SAND (SM): medium dense: dark vellowish brown: moist:			15												
	13			fine to medium SAND; little fines															
	40	₽!		Poorly Graded SAND (SP); medium dense; gray; wet; fine to	-														
	44	Ē		medium SAND															
	45					10	15 16	34		95	NA								
	46		• • •		\square		18												
	47																		
	48		•																
	49	.																	
	50			fine through coarse SAND; trace GRAVEL in shoe			20	50		00									
	51	1			\wedge	11	29 30	59		80	NA								
	52			Bottom of exploration at 51.5 ft below ground surface (bgs)															
	53			Bulk A obtained 1.4-5 ft bgs															
	54			Tremie Cement Grout Backfill															
<u> </u>	-55																		
				PROJECT NAM	E	. 50	Nor	and M	lator				FILE			НО			
				COUNTY VIEW		a 30	were	anu V	alei	R	DUTE		<u> </u> 30	42.X		PC	DSTMILE	E	
					ine														
		2		ONISIUITING PREPARED BY	1196	rınç	1			Cł	HECK	ED BY	/		SI	IEET	`		
			<u> </u>													: Of	2		

LOG	gee NC) BI	(BEGI 8-2	N DAT 5-20	Ē	COI 8- 2	MPLETI 25-20	ON DATE	LOCATIC 39.062	DN (Lat/ 2 02° / -	/Long • 121 .	or N . 502	lorth/E 2 16°	East a	nd Dati	um)				HC T	LE ID C-1 (ЭB			
CON Ta	NTR/	ACT	OR								LOCATIO	DN (Offs	set, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIO)N	
OPE Da	RAT	OR	'S N/	AME		HE N	ELPEF	r's NA Tann e	ME er		EQUIPME CME 7	ENT '5										то 5	TAL D 1.5 ft	DEPT	Ή		
EXC So	AVA olid-	TIO <u> Ste</u>	n ME m A	ETHOE \uger /) <mark>Rota</mark>	ry Wa	ash				DRILLING	GROD	TYPI	E AN	D DIA	METE	ER / BL	JCKE	TWI	отн		ВО 4	REHC		DIAMET	ER	
SAN Ca	IPLE	R T d (YPE(2.4''	(S) ANI ')) SIZE	(S) (ID	י)				HAMMEF Safety	r type ' Semi :	-aut	oma	atic d	lrop ((140#/	/ 30'	')			HA	MMEF	REF	FICIENC	Y, ERi	
BAC Tr	KFIL	L A e C	ND C eme	OMPL	ETION	Jackfi	11				GROUNE	D WATE GS	ER	DU 24.	RING 0 ft	•	AF	TER	(DAT	E)		CA	SING	TYPE	E AND E	DIAMET	ER(in
(ft)													tion	ber	Ŀ	ot						Lab	orat	ory	Data		σ
ION	á	Ē	_ ഗ					DES	CRIPTI	ON			Loca	Num	er 6 i	er foo	STM)	ry (%	mete	e (%):	sity		7	0	_	ial ts	Metho
LEVA	Ē		ateria aphic										ample	ample	d swc	d swc	30 (A	ecove	ocket enetro	Distur	of Der	nit	asticit dex	<#20	iear rengti	lditior b Tes	Illing I
	0	Ē	ΪŪ	Lean	CLAY	(CL): {	Stiff: F	Reddis	h Brown	n: Moist: M	ledium Plas	sticity	ů	Š	ă	ă	ž	Å	ጟጟ	žŏ	Ъŝ	ڭ ڭ	ë ë	%	あおĔ	La C	ы ПЛЕ
	1					(,, -	, -			.,,		,															
	2														2											<u> </u>	INE
	3												M	1	4	9		60	1.0								K
	4	E													5												
	5	E																									IKE
													Μ	2	2 2	5		80	1.25								IKE
		E													3											<u> </u>	IXE
	'																										IKE
	8			SANE)Y Lear	n CLA	Y (CL	_); (Ver	ry Stiff);	Reddish E	Brown; Mois	 st	-														IKE
	9	E																									KE
	10	۶Ē		lean			Hard [.]		Yellowis	h Brown [.] M					14											<u> </u>	IYE
	11	۱E		Ceme	ented	(0Ľ), I	iara,	Dark	renowio	n Drown, r		i y	Ň	3	31 32	63		90	>4.5								JKE
	12	2 E																									IVE
	13																										
	14	٩Ē			- <u>—</u> —								+														
	15	5 E	Ķ	Dens	e; Dark Fine t	Yellov hrouał	wish E h Coa	Brown; arse SA	: Moist; AND	Fine to Co	arse GRAV	/EL;														<u> </u>	
	16	,E	Ķ										М	4	33 30	75		80	NA					11			
02/12/	17		Ś												45												1)}E
LB 10		E		Lean Fine t	CLAY o Medi	with Sa ium Sa	AND (and	(CL); ł	Hard; Ye	ellowish Br	rown; Moist	; Little															
:019.G	18																										
	19	₽																									
LIBK	20	٢Ē												_	10	00		100	4.0			10					
S.GPJ	21	۱E												5	14 19	33		100	4.0			46	21				
NOL	22																										
LOR	23	B																									
	24	٩Ē			 Y SANI	 (SM)). Wec)ense [.] [Dark Olive	Brown [·] We	 t [.] Fine	7														A
	25	<u>, E</u>		to Me	dium S	SAND;	Little	SILT																		<u> </u>	Ø
3842.				15	12			(COI	ntinuea)		PROJEC	T NAM	E.				• •				FILE	E NO.		НО	LE ID		
s soil				1	6						COUNT	South ` Y	Yuba	a Se	wer a	and W	later	R	DUTE		38	342.X	<u> </u>	PC	C-10E	; E	
G FOF			4	177	-	14.1	-				CLIENT																
CI LO			B	LA	AC	KE	sυ	JR	N		Jacob PREPAR	S Eng RED BY	inee	ering	3			Cł	IECK	ED B	ŕ		Sł	HEET	Г		
ш			C	U	VD	UL		IN	G		SS												1	l of	2		

(ft)				lion	ber	خ	ţ						Lab	orate	ory	Data		-
LEVATION	DEPTH (ft)	laterial	DESCRIPTION	ample Locat	ample Numt	lows per 6 ir	lows per foo	60 (ASTM)	ecovery (%)	ocket enetrometer	loisture ontent (%)	ry Density cf)	quid mit	lasticity idex	, <#200	hear trength est	dditional ab Tests	rilling Methoo
	-25-		SILTY SAND (SM) (continued).	s v	S	四 7	47	z	8		20	09		스느	8	v v ⊢	۲Þ	
	26				6	8 9	17		95	NA			NP	NP	19			
	27																	
	28																	
	29		SANDY Lean CLAY (CL); Hard; Dark Yellowish Brown; Moist; Some Fine to Medium SAND	1														
	30				7	20 23	46		100	4.5								
	32		Lean CLAY (CL); Stiff; Dark Yellowish Brown; Moist; Trace SAND; Some Moderate Cementation			23				2.0			27	10				
	33																	
	34																	
	35					16												
	36		Hard	M	8	24 30	54		100	>4.5								
	37																	
	38		SILTY SAND (SM); Dense; Dark Yellowish Brown; Moist; Mostly	+														
	39		Fine to Medium SAND; Some SIL I															
	40					16	26		100	NIA								
	41				9	18	30		100	NA								
	42																	
	43		Poorly-graded SAND (SP); Dense; Olive Gray; Moist; Fine to Medium SAND; Interbedded Lens of SANDY SILT (ML)	1														
	44																	
	46			Ν	10	15 16	38		100	NA								
	47					22												
	48																	
I	49																	
	50					13												
	51		Little Coarse SAND	M	11	14 16	30		60	NA								
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)															
	53		Transis Connect Creat Dealeful															
	54		Fremie Cement Grout Backfill															
	55-																	
			PROJECT NAM OPUD South	1E Yuba	a Se	wer a	and W	/ater	1			FILE 38	E NO. 42.X		но Т	LE ID C-10B		
			COUNTY YUB						R	UTE					PC	JSTMILE	: 	
		Ē	BLACKBURN Jacobs Eng	jine	ərinç	3						/		0		r		
		C	ONSULTING SS	PREPARED BY SS										2	? of	2		

	DGG SS	ED E	3Y			BEGIN 9-9-2	i dat 20	E	COM 9-9	IPLETION DAT I -20	re l	OCATION (L 39.05402°	at/Lon / -121	g or I . 51	North/ 507°	East a	nd Dat	um)				HC T	C-12	2A			
		RAC er								4			mset, a	Static	n, Lin	e)						50					
F		ATO (R 5				ne N	lick/N	/ike	ИЕ		Diedrich D	120									5	1.5 ft				
Š	Soli	d-St	em	∕⊪⊨ Αι	iger/ I	Rotar	y W	ash					DIYP	'E AN			ER / BU	JCKE		ЛН		4	in		JAMET	ER	
S/	AMP Call	ler /od	TYP (2.4	E(S !'')	S) AND	SIZE(S) (ID)			ŀ	HAMMER TYP Safety ser	∘∈ n i-au t	tom	atic d	drop	(140#	/ 30'	')			HA	MMEF	REF	FICIENC	Y, ERi	
B/	ACK Frer	FILL nie	AND Cen	CC ner	OMPLE n t Gro	TION ut B a	ackfi				(F	GROUND WA READINGS	TER	DU 24	RING . 0 ft		AF	TER	(DAT	E)		CAS	SING	TYPE	E AND D	DIAMET	ER(in
(#)	(11)												tion	oer		t		_				Lab	orat	ory	Data		_
		TH (ft)	ial	lics					DESC	RIPTION			ole Locat	le Numl	s per 6 ir	s per foc	ASTM)	very (%)	et trometer	ure ent (%)	ensity		city	200	r gth	ional ests	g Metho
		DEP	Mate	Grap									Samp	Samp	Blows	Blows	N60 (Reco	Pock	Moist	Dry (pcf)	Liquic	Plast	#> %	Shea Stren Test	Addit Lab T	Drillin
		-0-			ASPH/			RETE	(3')				_											-			ĪÆ
		1		1	Lean C	LAY (<u>E DA</u> CL); \	<u>>⊏ (4</u> /ery st	⊥ iff; darŀ	k yellowish bro	wn; r	noist; few fine															
		2			SAND										6												╢╞
		3											M	1	8 12	20		100	2.25								
		4																									
		5													_												I
		6			some o		tation	; few fi	ine thro	bugh coarse S/		n and alive:	_	2	5 8	21		85	1.25			40	26				IKE
					moist;	EAY (ry fin	e to fin	ie SAN	D; trace cemer	ntatio	n and olive; n			13												IXE
		1																									IKE
		8																									IYE
		9																									IVE
		10			SILT w			ML): Ve	erv stiff	: dark vellowis	 sh bro	wn: moist: litt			3												₩Ē
		11		†	fine SA	ND; b	lacks	specks	s (orgar	nics?)		,		3	6	14		85	2.0								
		12																									
		13																									{}E
		14																									{]E
		15		2	CLAYE	Y SAN	ND (S	SC); m	edium	dense; dark ye	ellowi	sh brown;			4	10											1{[E
50		16			moist,		meui	uni Or	110, SC					4	9	16		100	NA								IKE
10/21		17																									IKE
GLB		18																									IKE
_2016		19																									IYE
RARY		20																									INE
J LIB		21			Poorly brown;	Grade moist;	d SA ; fine	ND wit to med	th SILT dium S	(SP-SM); me AND; few fines	dium s	dense; dark		5	9 11	24		85	NA			NP	NP	9			
NS.GF		~													13									-			₩Ē
\$ATIO		22																									
(PLOF		23											$ \downarrow$														
ΈD		24	<u></u>]										4														
IX FIE		25	<u>]</u>						(cort	tinued)																	
3842					5.				(cont			PROJECT N/	ME								FILE	E NO.		НО	LE ID		
SOIL				5	1							COUNTY	n Yub	a Se	wera	and V	vater	R	OUTE		38	542.X	<u> </u>	PC	C-12A	L E	
G FOF												CLIENT															
CILO				5	LA	C	KI	зU	R	N			ngine	erin	g				HEUK	FD B'	Y		12	HEET	<u>г</u>		
۵		CONSULTING										LDM	· ·								•		1	lof	2		

(ft)				ion	ber	c:	t t						Lab	orate	ory	Data		-
VATION	TH (ft)	rial hics	DESCRIPTION	ole Locat	ole Numt	s per 6 ir	s per foo	(ASTM)	very (%)	et trometer	ture ent (%)	Density	n	icity ć	200	r igth	ional Tests	ig Method
ELE		Mate Grap		Sam	Sam	Blow	Blow	N60	Reco	Pock Pene	Moist Conte	Dry D (pcf)	Liquid	Plast Indey	#> %	Shea Strer Test	Addit Lab 7	Drillir
	26		fine through coarse SAND; wet Poorly Graded SAND with SILT (SP-SM) <i>(continued)</i> .	X	6	4 7 12	19		60	NA								
	27		switched to mud rotary															
	28																	
	29																	
	30		SILT (ML); hard; yellowish brown; moist; trace fine SAND; weak cementation	Ν	7	8 15	38		95	>4.5								
	31					23							42	11	-			
	33																	
	34																	
	35		olive brown		Q	20	50/4"		100	>4.5								
	36				0	50/4"	50/4		100	-4.5								
	37																	
	38																	
	39																	
	40		Poorly Graded SAND with SILT (SP-SM); very dense; dark brown; wet; fine to medium SAND; few fines	X	9	16 24	55		65	NA								
	42					31												
	43																	
	44																	
	45		dense; lenses of SILT with SAND (ML); (stiff); olive brown; moist;			18												
	46		little fine SAND		10	20 22	42		65	NA								
	47																	
	48																	
	50																	
	51			X	11	14 19 24	43		65	NA								
	52	- <u>1-111</u>	Bottom of exploration at 51.5 ft below ground surface (bgs)	<u>, '</u>			1		I	1				1	<u> </u>	ļ	<u> </u>	
	53		Goundwater Encountered at 24 ft bgs Bulk A obtained 0.6-5 ft bgs															
	54		Tremie Cement Grout Backfill															
	L ₅₅ –	1																
			PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	/ater				FILE 38	NO. 42.X		HO T			
										JUIE						JOTIVILLE	-	
		B	CNSULTING PREPARED BY	inee	erinç)			CI	HECK	ED BY	/		SH	HEET	「 <u> </u>		
		C												2	: of	2		

LOG DW	GED BY	BEGIN DATE 9-9-20	COMPLETION DATE 9-9-20	LOCATION (Lat/ 39.05476° / -	Long	or N .515	lorth/E 5 07°	East ar	nd Datu	ım)				HC T	C-12	2B			
Tat	ber				set, S	statio	n, Line	=)						50				/IN	
Cha	ad	S NAME HELPER	o/Cody	CME 75										5	1.5 ft		н		
EXC/	id-Ster	n Method m Auger		DRILLING ROD	TYPI	E AN	D DIA	METE	:R / BU	CKE		ЛН		во 4	in	DLE L	DIAMET	ER	
SAMI Ca	PLER TY IMod (2	YPE(S) AND SIZE(S) (ID) 2.4'')		HAMMER TYPE Safety semi	-aut	oma	atic d	rop (140#/	30"	')			HA	MMEF	REF	FICIENC	Y, ERi	
BACH	kfill án E mie Ce	ND COMPLETION		GROUND WATE READINGS	ER	DU 17.	ring .0 ft		AF 18	TER 5.0 ft	(DAT on 9	E) - 9-2(D	CAS	SING	TYPE	E AND D	IAMET	ER(in
(ft)					tion	ber	Ŀ.	ot		(Lab	orat	ory	Data		σ
ATION	H (ft	cs a	DESCRIPTION		e Loca	e Num	per 6 i	per foc	STM)	ery (%	t ometei	re nt (%)	ensity		ity	8	÷	nal sts	Metho
ELEV	DEPT	Graphi			Sampl	Sampl	Blows	Blows	N60 (A	Recov	Pocke	Moistu Contei	Dry De (pcf)	Liquid	Plastic Index	% <#2	Shear Streng Test	Additic Lab T€	Drilling
		ASPHALT CONCRETE	2")		+														
		Lean CLAY (CL); hard;	dark gray; moist; few fine	to medium	+														IYE
		SAND	5 77 7																IYE
																			IYE
																			IYE
	5						10												
	6	Lean CLAY (CL); hard;	reddish brown; moist; fev	v fine SAND; few	X	1	22 36	58		85	>4.5								
	7	moderate cementation																	
	8																		
																			ISE
		SILT with SAND (ML); h	ard; dark yellowish brow	n; dry; little fine															
					X	2	24 50/4"	50/4''		100	>4.5								IXE
	11																		IKE
	12																		IYE
	13																		IYE
	14																		IYE
	15						00							10	15				
	16	IIII fine SAND; some strong	cementation			3	23 50/4"	50/4''		90	>4.5			43	15				I)}E
21/20				$\overline{\nabla}$															
B 10/				_ <u>×</u>															ISE
19.GL	18				-														I
۲_20	19																		
IBRAF	20	trace cementation					9												IIE
SPJ L	21				M	4	15 20	35		85	4.5								KE
ONS.0	22																		IYE
DRATI		Wet; fine to medium SAN	nedium dense); dark yell ND; some fines	owish brown;															IYE
EXPL(
IELD																			IYE
42.X F	-25		(continued)															·	
IL 38			1.1	PROJECT NAM	E Yuba	a Se	wer a	nd W	ater				FILE 38	E NO.		HOI	LE ID C-12B		
DR SC										R	DUTE					PC	DSTMILE	E	
OG F(BLACKBI	IDN		inco	ring	ч. – – – – – – – – – – – – – – – – – – –			_									
BCIL		CONSULT	ING		mee	, ,,,,,,	1			CH	IECK	ED B)	Y		Sł	HEET	•		
		CONJULI													1	i ot	2		

(#)				tion	ber	<i>.</i> .	ţ		_				Lab	orat	ory	Data		-
ELEVATION	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Locat	Sample Numl	Blows per 6 ii	Blows per foc	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25	$\langle \cdot \rangle$	CLAYEY SAND (SC) <i>(continued).</i> Lean CLAY (CL); hard; olive gray; moist	V	5	7 12	32		95	4.0								R
	20					20												KE
	28																	KE
	29		SILT (ML); hard; mottled dark yellowish brown and brown; moist;	-														KE
	30					45												
	31			M	6	28 45	73		85	>4.5			39	8			UC	
	32																	
	33		SILTY SAND (SM); hard; mottled dark olive gray and dark brown;	-														
	34		moist															KE
	35				7	26 23	47		100	>15			ND	ND	46			KE
	36				,	23	47		100	24.5					40			KE
	37		Poorly Graded SAND (SP); (dense); dark gray; wet	-														
	39																	
	40																	
	41		SANDY SILT (ML); very stiff; dark gray; moist; some fine SAND	M	8	15 25 38	63		100	2.0								
	42		SILTY SAND (SM); very dense; dark gray; moist; fine to medium SAND; little fines			00												
	43																	KE
	44		Poorly Graded SAND (SP); dense; dark gray; wet; fine to medium	-														KE
	45		SAND; trace fines			9												
	46			Å	9	23 31	54		60	NA								
	47																	
	48																	
	49																	IYE
	51			M	10	8 20	56		95	NA								KE
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)			36												
	53		Goundwater Encountered at 17 ft bgs Bulk A obtained 1.5-5 ft bgs															
	54		Tremie Cement Grout Backfill															
<u> </u>	55																	
			PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	Vater				FILE 38	E NO. 42.X		но. Т	LE ID C-12B		
		-	COUNTY YUB						R	DUTE					PC	OSTMILE	Ξ	
		B	LACKBURN CLIENT Jacobs Eng	inee	ering	3						,		1 -				
		С	ONSULTING PREPARED BY						CI	HECK	ED BY	(Sł	HEET ? of	2		

	DGG SS	ED E		BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	LOCATION (Lat. 39.03709° /	/Long - 121	or N . 514	lorth/E .98°	East a	nd Dati	um)				HO T	LE ID C-13	3			
		er			R'S NAME		501, C			6)						_ 30 то				<u></u>	
Ľ	Rick			Nick/	Mike	Diedrich D1	20						T \A/IF			5	I.4 ft				
	Solic	d-St		Auger/ Rotary Wash							ER / DU					4	in				
		ler /lod	(2.4)	(S) AND SIZE(S) (ID) ")		Safety semi	-aut	oma	tic d	lrop	(140#/	30'	')			НА	NIVIEF			Y, ERI	
B	acki Fren	FILL / nie (and Cem	COMPLETION ent Grout Backfill		GROUND WAT	ER	DU 28.	ring 0 ft		AF 26	ter 5.0 ft	(DAT 0 n 9	E))-8-2(0	CAS	SING ⁻	ΓΥΡΕ	E AND E	IAMET	ER(ir
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	ш	<u> </u>	ŽČ	5 ASPHALT CONCRETE	E (6.5")		Й	ő	ā	ā	ž	Å	ፈፈ	žŏ	<u>5</u> ē	בּבֿ	ËË	%	あおĔ	La	1 TTE
		1		AGGREGATE BASE (1	12")		1														
		2		SILT (ML); very stiff; da	ark brown; moist				-												L{}E
		3					H	1	5 6 7	13		80	2.25								KE
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		5		Lean CLAY (CL): stiff: c	dark vellowish brown moi	st: trace fine	$\overline{\mathbf{A}}$	2	3 4	10		95	1.75								1XE
		6		SAND	,,,,			_	6											<u> </u>	IYE
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SOIL 3						OPUD South	⊪⊨ Yuba	a Se	wer a	and W	/ater	1 = 1			-⊪LE 38	= NO. 342.X		T	C-13		
FOR S						YUB							JULE					PC	SIMILI	-	
LOG			B	LACKBL	JRN	CLIENT Jacobs Eng	jinee	ering	9												
BC			C	ONSULT	ING	PREPARED BY						CH	HECK	ED B)	ſ		SH	HEET of	2		

(ft)				E b Labo								orate	ratory Data					
TION	(ft)	s S	DESCRIPTION	Locat	Num	er 6 ir	er foo	STM)	ry (%)	meter	(%)	Isity		У	0	_	lal tts	Vethod
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Ш	-25 ⊢	žΰ	SILT (ML): hard: mottled gravish brown and vellowish brown:	Sa	Sa	16		92	ж 100	2 2 2 4	ĕö	٦٩	Lir Lir	E P	%	Te Str Te	Ad La	ā
	26		moist; trace; fine SAND	⊻ ^	6	47 50/4"	97/10		100	>4.5								
	27																	
	28			\triangleleft														ITE
	29																	ITE
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			switched to mud rotary			30												KE
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	33																	
	34																	
	35		SANDY SILT (ML); hard; dark brown; moist; some very fine SAND: trace cementation		8	13	80/11 5	5"	100	>4.5								
	36				Ŭ	50/5.5	j"											
	37																	
	38																	
	39																	
	40		SILTY SAND (SM); dense; dark brown; wet; very fine to fine			12												
	41		SAND, Some lines, interbedded lenses of lines		9	33	55		90	NA								
	42																	
	43																	
	44																	
	45					15												
	46		SILT (ML): very stiff light brown: moist	-	10	26 31	57		85	2.75								
	47																	
	48																	
	49																	
	50		Poorly Graded SAND with SILT (SP-SM); very dense; dark			22												
	51		brown; wet; fine through coarse SAND; few fines	X	11	41 50/5"	91/11' 		90	NA								
	52		Bottom of exploration at 51.4 ft below ground surface (bgs)															
	53		Bulk A obtained 1.5-5 ft bgs															
	54		Tremie Cement Grout Backfill															
<u> </u>	_55 E																	
			PROJECT NA OPI ID South	ME 1 Yuh	a Se	wer :	and W	/ater				FILE	E NO. 42 ¥		HOI T			
				COUNTY F					ROUTE POSTMILE					E				
		R		aine	orin	'n												
		C	ONSULTING PREPARED B	Y	Gint	9			CI	HECK	ED BY	(SH		2		
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		ED B C	Y	BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	LOCATION (Lat/ 39.05742° / -	Long 121.	or N .495	North/E	East a	nd Dati	um)				HO T	LE ID C-14 REAC	1	EV/ATIC		
	Tabe	er Atof		AME HELP	ER'S NAME	EQUIPMENT			, L III							то			H		
	Cha EXCA	d /ATIC	DN M	Cal ETHOD	eb/Cody	CME 75 DRILLING ROD	TYPE	E AN		METE	R/BL	ICKE	TWI	DTH		4 ' BO	1.5 ft REHC	DLE D	DIAMET	ER	
	SAMPI	d-Ste _ER 1	em A TYPE	(S) AND SIZE(S) (ID)		HAMMER TYPE										4	in MMEF	REFF	ICIENC	Y, ERi	
	Call BACK	ilod ((2.4''	COMPLETION		Safety semi- GROUND WATE	-auto ER	oma DU	atic d RING	lrop ((140#) AF	/ 30'' TER	') (DAT	E)		CAS	SING ⁻	TYPE	AND D	IAMET	ER(in
┢	Tren ⊋	nie C	eme	ent Grout Backfill		READINGS	Ę	28	.0 ft							Lah	orat	onv	Data]	
	ON (f	ft)					ocatic	umbe	.0	foot	Ŵ	(%)	eter	(%	ť				Dala		sthod
	EVATI	TH (erial		DESCRIPTION		ple L	nple N	vs per	vs per	(AST	overy	ket etrom	sture tent ("	Densi	t g	ticity	#200	ar ngth	itional Tests	ng Me
	ELE		Mate Grap				San	Sam	Blov	Blov	N60	Rec	Pen	Nois Con	Dry pcf	Liqu	Plas Inde	≌ %	She Stre Test	Addi Lab	Drilli
				ASPHALT CONCRE	ΓΕ (8") (2")																
		2		Lean CLAY (CL); har	d; brown; dry; trace fine SA	 ND															
							М	1	20 36	65		60	>4.5								IYE
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				Lean CLAY with SAN medium SAND	D (CL); hard; brown; moist;	little fine to															KE
			\bigvee	dry			X	2	10 50/4"	50/4''		90	>4.5								IKE
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		9																			KE
		10		dark vellowish brown	moist: some moderate to s	trong		3	12 28	78/12'		80	>4.5								IKE
		11		cementation		liong		-	50/6"												
		12																			
		13					-														
		14		SAND; some fines		, moist, ime															
		15					∇	4	12	47		65	ΝΛ								
1/20		16						4	28	47		05									
3 10/2		17																			
19.GLE		18																			
RY_20		19																			
LIBRA		20		Poorly Graded SAND	(SP); medium dense to de	nse; olive gray;			12												
GPJ		21		moist; fine to mealum	SAND; trace coarse SAND		Å	5	16 16	32		90	NA								
TIONS		22																			
PLOR		23																			
LD EXI		24	265	CLAYEY GRAVEL wi	th SAND (GC); very dense;		+														
P.X FIE		25 E	8¢	fine GRAVEL; some f	ine through coarse SAND; I	ittle fines														<u> </u>	
L 3842					(tornanded)	PROJECT NAM	E Yuba	s Se	wera	and W	/ater				FILE	E NO.	,	HOL	E ID		
La contracta de				COUNTY ROUTE VIE						00	POSTMILE										
.0G FC			R	LACKB	URN	CLIENT	inee	ering	3												
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(ft)												Laborato			ory	ory Data			Τ
VATION	отн (ft)	erial bhics	DESCRIPTION	ple Locat	ple Numb	/s per 6 ir	/s per foo	(ASTM)	overy (%)	ket etrometer	ture tent (%)	Density	P	ticity x	#200	ar ngth	tional Tests	ng Method	,
ELE		Mate Grap		Sam	Sam	Blow	Blow	N60	Reco	Pere	Mois Cont	Dry I (pcf)	Liqui	Plast Inde:	\$ %	Shea Strei Test	Addi [.] Lab	Drilli	
			CLAYEY GRAVEL with SAND (GC) (continued).	X	6	23 50/3"	50/3''		100	NA								R	
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	27		Σ															$ \rangle$	Ē
	28	69	<u>_</u>	4														$\left \right\rangle$	É
	29	YX ///	CLAYEY SAND with GRAVEL (SC); dense; gray; wet; mostly fine	+														}}	Ē
	30	/./.	to medium SAND; little fines; few fine GRAVEL; few coarse SAND			17													Ļ
	31	//		M	7	22	49		45	NA								K.	,E
	32	//		\square		21												ł{	E
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	34	/./	CLAYEY SAND (SC); very dense; gray; moist; fine to medium	1														K	E
	35	/./.	SAND, Some miles, lade mile GRAVEL			14												łX	Ē
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	42		Goundwater Encountered at 28 ft bgs																Ξ
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			OPUD South COUNTY	rub	a Se	wer a	and W	vater	R	DUTE		38	642.X		PC	C-14 DSTMILE	E		
		4	YUB CLIENT															—	
		B	LACKBURN Jacobs Eng	jine	erin	3			CI	HECK	ED BY	<u> </u>		SF SF	HEFT	r			
		C	UNSULTING LDM												? of	2			

BCI LOG FOR SOIL 3842.X FIELD EXPLORATIONS.GPJ LIBRARY_2019.GLB 10/21/20

Sunland Analytical



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

> Date Reported 10/21/2020 Date Submitted 10/15/2020

To: Dan Contreras Blackburn Consulting (W.SAC) 2491 Boatman Ave West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney General Manager \ Lab Manager

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : OS-2-3B. Thank you for your business.

* For future reference to this analysis please use SUN # 83257-173751.

EVALUATION FOR SOIL CORROSION

00.00179 %

Soil pH 6.92 Moisture 26.5 % Minimum Resistivity 0.99 ohm-cm (x1000) 17.9 ppm Chloride

Sulfate 8.5 ppm 00.00085 %

Redox Potential (+) 208 mv

Sulfides Presence - NEGATIVE

METHODS

pH and Min.Resistivity CA DOT Test #643 Mod. (Sm.Cell) Sulfate CA DOT Test #417, Chloride CA DOT Test #422m Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5









Project Name: OPUD Project Number: 3842.X Sample ID: P-11-3C Type of Sample: 2.4" Cal Mod Sample Description: SANDY SILT, reddish brown Depth: 11-11.5'

Sample Data

•					
Sample Length:	5.16	in	Sample + Tube:	738	g
Diameter:	2.41	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.15		Sample Weight:	738	g
Sample Area:	4.55	in ²	Wet Density:	119.8	pcf
Sample Volume:	23.5	in ³	Moisture:	18	%
Specific Gravity:	2.65	(assumed)	Dry Density:	101.8	pcf
			• • • •		

Test Results

Poto of Strain	0 0200	in/min
Rale of Strain.	0.0300	
Deflection at Max. Load:	0.072	in
Maximum Load:	145	lbs
Strain at Failure:	1.39	%
Average cross-sectional area		
at failure:	4.61	in ²

wei Density.	119.0	pc
Moisture:	18	%
Dry Density:	101.8	рс
Saturation:	75.1	%
*Moisture content	t taken after tes	t

Strain Information

Rate of Strain 1/2%:	0.026	in/min
Rate of Strain 2%:	0.103	in/min
Strain Rate:	0.030	in/min
15% Strain:	0.774	in







Project Name: OPUD Project Number: 3842.X Sample ID: P-11-3C Type of Sample: 2.4" Cal Mod Sample Description: SANDY SILT, reddish brown Depth: 11-11.5'

Compressive Strength: 2.26 tsf 31.4 psi





Project Name: OPUD Project Number: 3842.X Sample ID: P-14, 2C Type of Sample: 2.4" Cal Mod Sample Description: SANDY lean CLAY, strong brown Depth: 6-6.5'

Sample Data

-					
Sample Length:	5.39	in	Sample + Tube:	868	g
Diameter:	2.40	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.25		Sample Weight:	868	g
Sample Area:	4.53	in ²	Wet Density:	135.4	pcf
Sample Volume:	24.4	in ³	Moisture:	16.3	%
Specific Gravity:	2.65	(assumed)	Dry Density:	116.4	pcf
			Saturation:	102.9	%

*Moisture content taken after test

Test Results

Rate of Strain:	0.0300	in/min
Deflection at Max. Load:	0.136	in
Maximum Load:	215	lbs
Strain at Failure:	2.52	%
Average cross-sectional area		2
at failure:	4.64	in²
Compressive Strength:	3.34	tsf

Strain	Information	
D (1 0 1 1 1 1 1	

Rate of Strain ½%:	0.027	in/min
Rate of Strain 2%:	0.108	in/min
Strain Rate:	0.030	in/min
15% Strain:	0.809	in







Project Name: OPUD Project Number: 3842.X Sample ID: P-14, 2C Type of Sample: 2.4" Cal Mod Sample Description: SANDY lean CLAY, strong brown Depth: 6-6.5'

Compressive Strength: 3.34 tsf 46.3 psi


Unconfined Compression ASTM D 2166



Project Name: OPUD Project Number: 3842.X Sample ID: P-15, 2C Type of Sample: 2.4" Cal Mod Sample Description: SANDY lean CLAY, strong brown Depth: 6-6.5'

Sample Data

-					
Sample Length:	5.46	in	Sample + Tube:	846	g
Diameter:	2.39	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.28		Sample Weight:	846	g
Sample Area:	4.49	in ²	Wet Density:	131.4	pcf
Sample Volume:	24.5	in ³	Moisture:	14.4	%
Specific Gravity:	2.65	(assumed)	Dry Density:	114.9	pcf
			Saturation:	86.8	%

Test Results

Rate of Strain:	0.0300	in/min
Deflection at Max. Load:	0.153	in
Maximum Load:	454	lbs
Strain at Failure:	2.79	%
Average cross-sectional area at failure:	4.62	in²

Strain	Information

Rate of Strain ½%:	0.027	in/min
Rate of Strain 2%:	0.109	in/min
Strain Rate:	0.030	in/min
15% Strain:	0.819	in

*Moisture content taken after test





Unconfined Compression ASTM D 2166



Project Name: OPUD Project Number: 3842.X Sample ID: P-15, 2C Type of Sample: 2.4" Cal Mod Sample Description: SANDY lean CLAY, strong brown Depth: 6-6.5'

Compressive Strength:	7.08	tsf
	98.4	psi





11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

> Date Reported 09/30/2020 Date Submitted 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-2-3C. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173433.

EVALUATION FOR SOIL CORROSION

Soil pH	6.02		
Minimum Resistivi	ty 2.04 ohm-cm	(x1000)	
Chloride	15.4 ppm	00.00154	010
Sulfate	4.1 ppm	00.00041	%

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

 Date Reported
 09/30/2020

 Date Submitted
 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney General Manager \ Lab Manager

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-4-4C. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173434.

EVALUATION FOR SOIL CORROSION

Soil pH	6.03				
Minimum Resistivi	ty	3.22	ohm-cm	(x1000)	
Chloride	6	5.7 ppm	n	00.00067	00
Sulfate	0).2 ppm	ı	00.00002	06

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

> Date Reported 09/30/2020 Date Submitted 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney General Manager \ Lab Manager

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-7-3B. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173435.

EVALUATION FOR SOIL CORROSION

Soil pH	6.33			
Minimum Resistivi	ty 1.42	ohm-cm	(x1000)	
Chloride	9.1 pp	m	00.00091	olo
Sulfate	5.0 pp	m	00.00050	010

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

 Date Reported
 09/30/2020

 Date Submitted
 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-8-3B. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173436.

EVALUATION FOR SOIL CORROSION

Soil pH	6.24		
Minimum Resistivi	ty 1.15 ohm-cm	(x1000)	
Chloride	3.1 ppm	00.00031	0,0
Sulfate	19.8 ppm	00.00198	%

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

 Date Reported
 09/30/2020

 Date Submitted
 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-11-3B. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173437. EVALUATION FOR SOIL CORROSION

TANDATION FOR DOTH COURODIC

Soil pH	7.09		
Minimum Resistivi	ity 1.23 ohm-cm	(x1000)	
Chloride	17.4 ppm	00.00174	06
Sulfate	40.7 ppm	00.00407	00

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

 Date Reported
 09/30/2020

 Date Submitted
 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-16-3C. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173438.

EVALUATION FOR SOIL CORROSION

Soil pH	7.26			
Minimum Resistivi	.ty 1.6	53 ohm-cm	(x1000)	
Chloride	2.2	ppm	00.00022	010
Sulfate	7.5	ppm	00.00075	010

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

> Date Reported 09/30/2020 Date Submitted 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-18-4B. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173439.

EVALUATION FOR SOIL CORROSION

Soil pH	7.25	
Minimum Resistivi	ty 0.91 ohm-c	cm (x1000)
Chloride	10.9 ppm	00.00109 %
Sulfate	31.5 ppm	00.00315 %

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

> Date Reported 09/30/2020 Date Submitted 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney General Manager \ Lab Manager \

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-24-2B. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173440.

EVALUATION FOR SOIL CORROSION

Soil pH	7.18		
Minimum Resistivi	ty 1.02 ohm-cm	(x1000)	
Chloride	1.3 ppm	00.00013	00
Sulfate	40.6 ppm	00.00406	%

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

 Date Reported
 09/30/2020

 Date Submitted
 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-28-1C. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173441.

EVALUATION FOR SOIL CORROSION

Soil pH	6.58		
Minimum Resistivi	ity 1.07 ohm-cm	(x1000)	
Chloride	2.5 ppm	00.00025	06 06
Sulfate	30.0 ppm	00.00300	olo

METHODS



11419 Sunrise Gold Circle, #10 Rancho Cordova, CA 95742 (916) 852-8557

 Date Reported
 09/30/2020

 Date Submitted
 09/23/2020

To: Rob Pickard Blackburn Consulting (W.SAC) 2491 Boatman Ave W. Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney

The reported analysis was requested for the following location: Location : 3842.X OPUD Site ID : P-32-3B. Thank you for your business.

* For future reference to this analysis please use SUN # 83095-173442.

EVALUATION FOR SOIL CORROSION

Soil pH	7.33	
Minimum Resistivi	lty 1.63 of	um-cm (x1000)
Chloride	1.5 ppm	00.00015 %
Sulfate	8.0 ppm	00.00080 %

METHODS




























































































 Project Name: OPUD
Project Number: 3842.X
Sample ID: TC-2C, 6B
Type of Sample: 2.4" Cal Mod
Sample Description: Lean CLAY with SAND, yellowish brown Depth: 20.5-21'

Sample Data

-					
Sample Length:	5.27	in	Sample + Tube:	692	g
Diameter:	2.40	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.19		Sample Weight:	692	g
Sample Area:	4.54	in ²	Wet Density:	110.2	pcf
Sample Volume:	23.9	in ³	Moisture:	41.3	%
Specific Gravity:	2.65	(assumed)	Dry Density:	78.0	pcf
			Saturation:	97.6	%

*Moisture content taken after test

Test Results

Compressive Strength:	2.35	tsf
Average cross-sectional area at failure:	4.66	in ²
Strain at Failure:	2.66	%
Maximum Load:	152	lbs
Deflection at Max. Load:	0.140	in
Rate of Strain:	0.0200	in/min

Str	ain	In	Ifoi	ma	ation	
_		~	~ .			

Rate of Strain ½%:	0.026	in/min
Rate of Strain 2%:	0.105	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.791	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-6A-5C Type of Sample: 2.4" Cal Mod Sample Description: Fat CLAY, yellowish brown Depth: 26-26.5'

Sample Data

					-
g	738	Sample + Tube:	in	5.26	Sample Length:
g	0.00	Tube:	in	2.39	Diameter:
g	738	Sample Weight:		2.20	Height-to-Diameter Ratio:
pcf	119.7	Wet Density:	in ²	4.47	Sample Area:
%	29	Moisture:	in ³	23.5	Sample Volume:
pcf	93.0	Dry Density:	(assumed)	2.65	Specific Gravity:
%	97.7	Saturation:			

*Moisture content taken after test

Test Results

Rate of Strain:	0.0500	in/min
Deflection at Max. Load:	0.135	in
Maximum Load:	112	lbs
Strain at Failure:	2.56	%
Average cross-sectional area		2
at failure:	4.58	in²

Strain Information		
Rate of Strain 1/2%:	0.026	in/min
Rate of Strain 2%:	0.105	in/min
Strain Rate:	0.050	in/min
15% Strain:	0.788	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-6A-5C Type of Sample: 2.4" Cal Mod Sample Description: Fat CLAY, yellowish brown Depth: 26-26.5'

Compressive Strength:	1.75	tsf
	24.4	psi





Project Name: OPUD
Project Number: 3842.X
Sample ID: TC-9B-6B
Type of Sample: 2.4" Cal Mod
Sample Description: Lean CLAY with SAND, strong brown
Depth: 25.5-26'

Sample Data

-						
5	Sample Length:	5.02	in	Sample + Tube:	672	g
	Diameter:	2.39	in	Tube:	0.00	g
Height-to-[Diameter Ratio:	2.10		Sample Weight:	672	g
	Sample Area:	4.49	in ²	Wet Density:	113.4	pcf
S	ample Volume:	22.6	in ³	Moisture:	40	%
S	Specific Gravity:	2.65	(assumed)	Dry Density:	81.3	pcf
				Saturation:	101.4	%

*Moisture content taken after test

Test Results

Rate of Strain:	0.0200	in/min
Deflection at Max. Load:	0.195	in
Maximum Load:	20	lbs
Strain at Failure:	6.08	%
Average cross-sectional area at failure:	4.78	in²

Strain Information

Rate of Strain ½%:	0.025	in/min
Rate of Strain 2%:	0.100	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.753	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-9B-6B Type of Sample: 2.4" Cal Mod Sample Description: Lean CLAY with SAND, strong brown Depth: 25.5-26'

Compressive Strength: 0.42 tsf 5.9 psi





Project Name: OPUD
Project Number: 3842.X
Sample ID: TC-9B-7C
Type of Sample: 2.4" Cal Mod
Sample Description: SILT, dark yellowish brown
Depth: 31-31.5'

Sample Data

•					
Sample Length:	5.19	in	Sample + Tube:	694	g
Diameter:	2.40	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.16		Sample Weight:	694	g
Sample Area:	4.52	in ²	Wet Density:	112.5	pcf
Sample Volume:	23.5	in ³	Moisture:	43	%
Specific Gravity:	2.65	(assumed)	Dry Density:	78.9	pcf
			Saturation:	103.0	%

Test Results

Rate of Strain:	0.0200	in/min
Deflection at Max. Load:	0.242	in
Maximum Load:	56	lbs
Strain at Failure:	4.65	%
Average cross-sectional area at failure:	4.74	in ²

Dry Density:	78.9	p
Saturation:	103.0	ç
*Moisture content	taken after test	

Strain Information

Rate of Strain ½%:	0.026	in/min
Rate of Strain 2%:	0.104	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.779	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-9B-7C Type of Sample: 2.4" Cal Mod Sample Description: SILT, dark yellowish brown Depth: 31-31.5'

Compressive Strength:	0.85	tsf
	11.9	psi





Project Name: OPUD Project Number: 3842.X Sample ID: TC-10A, 8B Type of Sample: 2.4" Cal Mod Sample Description: SILTY SAND, strong brown Depth: 35.5-36'

Sample Data

-					
Sample Length:	5.00	in	Sample + Tube:	768	g
Diameter:	2.41	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.08		Sample Weight:	768	g
Sample Area:	4.56	in ²	Wet Density:	128.3	pcf
Sample Volume:	22.8	in ³	Moisture:	22.2	%
Specific Gravity:	2.65	(assumed)	Dry Density:	105.0	pcf
			Saturation:	102.2	%

Test Results

	0 0000	. , .	
Rate of Strain:	0.0300	in/min	
Deflection at Max. Load:	0.083	in	
Maximum Load:	26	lbs	
Strain at Failure: Average cross-sectional area	1.67	%	
at failure:	4.64	in ²	
Compressive Strength:	0.41	tsf	

*Moisture content	taken	after	test

Strain Information

Rate of Strain ½%:	0.025	in/min
Rate of Strain 2%:	0.100	in/min
Strain Rate:	0.030	in/min
15% Strain:	0.750	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-12B-6C Type of Sample: 2.4" Cal Mod Sample Description: SILT, yellowish brown Depth: 31-31.5

Sample Data

•					
Sample Length:	4.87	in	Sample + Tube:	682	g
Diameter:	2.39	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.04		Sample Weight:	682	g
Sample Area:	4.47	in ²	Wet Density:	119.4	pcf
Sample Volume:	21.7	in ³	Moisture:	34	%
Specific Gravity:	2.65	(assumed)	Dry Density:	89.2	pcf
			Saturation:	105.2	%

*Moisture content taken after test

Test Results

Rate of Strain:	0.0200	in/min
Deflection at Max. Load:	0.191	in
Maximum Load:	197	lbs
Strain at Failure:	3.93	%
Average cross-sectional area		
at failure:	4.65	in ²

Strain	Information	

Rate of Strain ½%:	0.024	in/min
Rate of Strain 2%:	0.097	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.730	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-12B-6C Type of Sample: 2.4" Cal Mod Sample Description: SILT, yellowish brown Depth: 31-31.5

Compressive Strength:	3.05	tsf
	42.4	psi



UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX B: Trenchless Pipeline Crossings

B1: Site Plan B2: Boring and Test Pit Logs Legend Boring and Test Pit Logs B3: Laboratory Test Results







	Approximate Pipeline Water Only
	Approximate Pipeline Sewer Only
	Approximate Pipeline Sewer and Water
\bigcirc	Trenchless Crossing Location

Source: South County Sewer and Water Project, Volume 2 plans created by Jacobs, dated October 2020. Alignment Package Admin Draft 10-12-2020.

TRENCHLESS CROSSINGS LOCATIONS OPUD Yuba County Sewer and Water Infrastructure Project Olivehurst, California

File No. 3842.x

April 2021

Appendix B1a
















		GROUP SYMBO	DLS AN	ID NAN	IES	FIELD AN	D LABORATORY TESTS
Graphic	/ Symbol	Group Names	Graphic	/ Symbol	Group Names	C Consolidatio	n (ASTM D 2435)
	GW GP	Well-graded GRAVEL Well-graded GRAVEL with SAND Poorly graded GRAVEL Poorly graded GRAVEL With SAND		CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY	CL Collapse Po CP Compaction CR Corrosion, S CTM 417, C	tential (ASTM D 5333) Curve (ASTM D 698 & 1557, CTM 216) ulfates, Chlorides (CTM 643, TM 422)
	GW-GM GW-GC	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		CL-ML	GRAVELLY lean CLAY with SAND SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND	CU Consolidater DS Direct Shear EI Expansion Ir M Moisture Co OC Organic Con	d Undrained Triaxial (ASTM D 4767) (ASTM D 3080) ndex (ASTM D 4829) ntent (ASTM D 2216) tent (ASTM D 2974)
00000000000000000000000000000000000000	GP-GM GP-GC	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND	P Permeability PA Particle Size PI Liquid Limit, (ASTM D 43 PL Point Load In	(ASTM D 5084) Analysis (ASTM D 6913 & 7928) Plastic Limit, Plasticity Index 18) ndex (ASTM D 5731)
	GM GC	SILTY GRAVEL SILTY GRAVEL with SAND CLAYEY GRAVEL CLAYEY GRAVEL with SAND		OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND	PM Pressure Me PP Pocket Pene R R-Value (CT SE Sand Equiva SG Specific Gra	ter trometer M 301) Ient (CTM 217) vity (AASHTO T100)
	GC-GM SW	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND Well-graded SAND Well-graded SAND with GRAVEL		OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT	SL Shrinkage Li SW Swell Potent TV Pocket Torva UC Unconfined (Unconfined (mit (ASTM D 4943) ial (ASTM D 4546) ane Compression - Soil (ASTM D 2166) Compression - Rock (ASTM D 7012)
å <mark>0</mark> 8	SP SW-SM	Poorly graded SAND Poorly graded SAND with GRAVEL Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		СН	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND	UUUnconsolida (ASTM D 28)UWUnit WeightVSVane Shear	ted Undrained Triaxial 50) (ASTM D 7263) (AASHTO T223 / ASTM D 2573)
	SW-SC SP-SM	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL	-	мн	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT GRAVELLY elastic SILT GRAVELLY elastic SILT	SAMPLE Standard	R GRAPHIC SYMBOLS Penetration Test (SPT)
	SP-SC SM	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) SILTY SAND SILTY SAND with GRAVEL		он	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY	California S	Sampler (2" ID)
	SC SC-SM	CLAYEY SAND CLAYEY SAND with GRAVEL SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		он	ORGANIC elastic SILT ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT ORGANIC elastic SILT	Shelby Tu	ibe Piston Sampler
	РТ	PEAT			ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL	NX Rock	Core HQ Rock Core
<u>9</u> 99		COBBLES COBBLES and BOULDERS BOULDERS		010H	SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND	Bulk Sam	ple Other (see remarks)
		DRILLING MET	HOD	SYMB	OLS	WATE	R LEVEL SYMBOLS
R	Auger	r Drilling Rotary Drilling)ynamic r Hand	Cone Diamond Core	 ✓ First Water ✓ Static Wate ✓ Static Wate ✓ Static Wate 	Level Reading (during drilling) r Level Reading (short-term) r Level Reading (long-term)



BORING RECORD LEGEND

PAGE 1

	CONSISTENCY OF COHESIVE SOILS													
Descriptor	Unconfined Compressive Strength (tsf)	Field Approximation												
Very Soft	< 0.25	< 0.25	< 0.12	Extrudes between fingers when squeezed										
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb										
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort										
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort										
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail										
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty										

APPARENT DENSITY OF COHESIONLESS SOILS											
Descriptor	SPT N ₆₀ - Value (blows / foot)										
Very Loose	0 - 4										
Loose	5 - 10										
Medium Dense	11 - 30										
Dense	31 - 50										
Very Dense	> 50										

PERCENT	OR PROPORTION OF SOILS
Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%
	1

MOISTURE												
Descriptor	Criteria											
Dry	Absence of moisture, dusty, dry to the touch											
Moist	Damp but no visible water											
Wet	Visible free water, usually soil is below water table											

	SOIL P/	ARTICLE SIZE
Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Crowel	Coarse	3/4 inch to 3 inches
Graver	Fine	No. 4 Sieve to 3/4 inch
	Coarse	No. 10 Sieve to No. 4 Sieve
Sand	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

	PLASTICITY OF FINE-GRAINED SOILS											
Descriptor	Criteria											
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.											
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.											
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.											
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.											

	CEMENTATION
Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.



BORING RECORD LEGEND

LOGO DW	jed C	BY	BEGIN DATE 9-10-20	COMPLETION DATE 9-10-20	LOCATION (Lat/ 39.07996° /	HOLE ID TC-02AA																
CON Tab	RAC	TOR			LOCATION (Offs	set, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIC)N			
OPEF Ric	λ κ	ĴR'S N	AME HELPER	₹'S NAME Mike	EQUIPMENT Diedrich D1	20									то 5 ′	TAL D 1.5 ft)EPT	Ή				
EXCA Sol	.VAT	ION M	ETHOD Auger		DRILLING ROD	TYP	E AN	ID DIA	METE	ER / BL	ICKE	TWI	DTH		BOREHOLE DIAMETER							
SAMF Cal	LER	TYPE	(S) AND SIZE(S) (ID)		HAMMER TYPE Safety semi-automatic drop (140#/ 30")										HAMMER EFFICIENCY, ERI							
BACK	FILL	AND	COMPLETION		GROUND WATER DURING AFTER (DATE) READINGS 29.0 ft										CASING TYPE AND DIAMETER(in							
(ft)						ation	iber		ot		()				Lab	orate	ory	Data		Ţ		
LION	(H)		0	DESCRIPTION		Loce	Num	ber 6	ber fo	STM)	»ry (%	omete	e t (%)	nsity		Σ	g	ے ا	sts	Methc		
LEVA	EPT	ateria	5 5			ample	ample	1 SWO	1 SWO	60 (A	ecove	ocket enetro	oistur	ry Dei cf)	quid	astici dex	<#20	trengt est	dditior ab Te:	illing		
ш		ש≊ט 	ASPHALT CONCRETE			Ň	ŭ	ā	ā	ž	Ř	ዸ፝ዾ፟	žŬ	<u>р</u> е	Ē	ĒÉ	%	あおド	Ϋ́			
	1	E/	SANDY Lean CLAY (CL some fine to medium S/	_); very stiff; dark yellowis AND	h brown; moist;	1																
	2							4							<u> </u>					{{]Ę		
	3					M	1	6 10	16		90	2.25										
	4																					
	5																			KE		
	6		mottled dark yellowish t	prown and black and brow	<i>w</i> n; strong		2	28 50/4"	50/4''		100	>4.5								KE		
	7	ŧ/																		KE		
		Ē/																		IKE		
	ð		Lean CLAY with SAND	(CL); hard; dark yellowish	n brown; moist;	1														IKE		
	9																			IKE		
	10						2	8	27		00	4 25								IKE		
	11					Δ	3	1∠ 15	21		90	4.20								IKE		
	12	ŧ/	1																	INE		
	13	Ē/	1																	RE		
	14	Ē/																		∦E		
	15	ŧ/						17							<u> </u>							
	16	E/	fine to medium SAND			M	4	28 35	63		100	>4.5										
	17					-														INE		
	18		medium SAND	.); hara; olive brown, more	st; some line to																	
	19	E/	1																			
1	20	E/	1																			
	20	$\mathbb{E}/$	1			M	5	9 16	51		90	>4.5										
	21		Lean CLAY with SAND and black; moist; little fir	(CL); hard; mottled olive ne SAND; some moderat	gray and brown	μ		35							 							
	22																					
	23																					
	24		SANDY Lean CLAY (CL	_); hard; mottled dark oliv	e gray and	+																
	-25-			(continued)	moderate																	
					PROJECT NAM	1E Yub;	a Se	wer a	and V	Vater				FILE	ILE NO. HOLE ID 3842.X TC-02AA							
					COUNTY YUB						R	DUTE			POSTMILE							
		Ē	LACKBL	IRN	CLIENT Jacobs Enc	line	erino	a			_											
I.	BLACKBURN Jacobs Engineering CONSULTING PREPARED BY CONSULTING PREPARED BY													SH 1	HEET	2						

(#)																		7
ELEVATION	DEPTH (ft)	Material		Sample Locat	Sample Num	Blows per 6 in	Blows per foo	V60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density pcf)	-iquid -imit	Plasticity ndex	% <#200	Shear Strength Fest	Additional _ab Tests	Drilling Method
	-25-	Ē	cementation SANDY Lean CLAY (CL) (continued).	Ŵ	6	22 50/5"	50/5"		100	>4.5								Ī
	26 27 28 29		SANDY Lean CLAY (CL); very stiff; olive gray; moist; some fine	7														
	30				7	7	34		85	2 25								
	31 32 33 34					21			00	2.23								
	35 36		hard; mottled olive brown and brown	X	8	12 16 27	43		100	>4.5								
	37 38 39		Lean CLAY with SAND (CL); hard; olive gray; moist; little fine to medium SAND; moderate cementation	_														
	40 41 42			X	9	24 38 50/4"	88/10'		85	>4.5								
	43 44 45		come strong comentation		10	17	34/10.5	5"	100	>4.5								
	46 47 48					50/4.5	<u>"</u>											
ł	49 50					14	74/40		100	. 45								
	51	ľ	A uark readish prown veins; moderate cementation		11	24 50/6"	/4/12		100	>4.5								
	52		Groundwater Encountered at 29 ft bgs															
	53 54 -55-		Tremie Cement Grout Backfill															
			PROJECT NAM	1E V	. 6-		and 14	later				FILE	NO.		HO		•	
			COUNTY YUB	ruDa	a 50	wera	and W	ater	R	DUTE	POSTMILE							
		Ē	BLACKBURN CLIENT Jacobs Eng	jinee	ərin	9												
		(CONSULTING PREPARED BY	PREPARED BY								(SH 2	SHEET 2 of 2			

LOGGED BY BEGIN DATE COMPLETION DATE LDM 8-31-20 8-31-20										LOCATION (Lat/Long or North/East and Datum) 39.08058° / -121.52931° I OCATION (Offset Station Line)											HOLE ID TC-02C								
	CONT	RACT	OR							LOCATION (Of	fset, S	Static	n, Lin	e)															
	OPER	атоғ у	''S N/	AME		HELPE Erne	R'S NA	AME awrence		EQUIPMENT CME 75										TO 5'	TAL D 1.5 ft	DEPT	H						
	EXCA Soli	vatic d-Ste	N ME	ETHOD Luger						DRILLING ROD) TYP	E AN	id dia	METE	ER / BL	JCKE	TWI	DTH		ВО 4	REHC in	DLE D	DIAMETI	ER					
	SAMP	ler t Mod (YPE(2.4"	(S) AND), SPT	SIZE(S)	(ID)				HAMMER TYPE Safety sem	∃ i-aut	oma	atic c	lrop (140#	/ 30'	')			HAMMER EFFICIENCY, ERI									
	BACK Trer	FILL A	ND C	OMPLE	TION Dut Bac	:kfill				GROUND WATER DURING AFTER (DATE READINGS 27.5 ft								E)	CASING TYPE AND DIA						ER(in				
ſ	(ft)										tion	ber	Ŀ	ot						Lab	orat	ory	Data		σ				
	ELEVATION	JEPTH (ft)	laterial òraphics				DES	CRIPTION			ample Loca	ample Num	lows per 6 i	lows per foo	160 (ASTM)	tecovery (%	ocket enetromete	loisture content (%)	rry Density ocf)	iquid imit	lasticity ndex	° <#200	thear trength est	dditional ab Tests	rilling Metho				
ŀ		-° <u>–</u> E	20 20	ASPH	ALT COM	VCRETE	E (2.5"))			0	0			2	Ľ.		20				6	000F		ΪŻΕ				
		1			EGATE I	BASE (1	12") 	vellowish bro			-																		
		2		brown;	; dry; few	very fin	ie SAN	D	, wir ar	a grayion																			
		3										1	35 40 49	89		100	>4.5			29	4								
		į																							KE				
											X	2	25 50/4.5	50/4.5	•	100	>4.5								IKE				
		6																							IKE				
		7																							RE				
		8																							IYE				
		9																							IYE				
		10											3												IYE				
		11		mediu	m stiff to	stiff; mo	oist; trac	ce fine SAND			X	3	4 5	9		100	1.0								IYE				
		12									\mathbb{N}	4	4	14		90									IYE				
		13									\square	-	8																
		14									-														IYE				
		15		and gr	ayish bro	own with	i blacki	sh streaks; mo	oist; lit	ttle very fine			0																
		16									М	5	8 19	43		100	>4.5												
/5/20		17											24												1)}E				
iLB 11																													
2019.G																													
ARY																													
J LIBR		20		aravisł	h brown v	with dark	k reddi	sh brown stre	aks		Ν	6	17 37	87/10'		90	>4.5	41	78					UC					
IS.GP.		21		grayio	1 brown i		it roadi		ano				50/4"												1))E				
ATION		22																											
PLOR		23																											
LD EX		24																											
2.X FIE		25 E					(00	ntinued)																					
3842					~	5	(00)			PROJECT NAME								FILE	E NO. HOLE ID										
R SOIL			0	1						COUNTY ROUTE							38	POSTMILE											
DG FOI				1 4	CV	DI	ID	N		CLIENT																			
CONSULTING PREPARED								Jacobs Eng	ginee ⁄	erin	g			Cł	HECK	ED B	(Sł	HEET									
-L	CONSULTING LDM									LDM							DWC				_ 1	of	2	2					

(#)																			
EVATION	EPTH (ft)	iterial aphics	DESCRIPTION	mple Locat	mple Numl	ws per 6 ii	ws per foc	0 (ASTM)	covery (%)	cket netrometer	isture ntent (%)	/ Density :f)	luid nit	asticity lex	<#200	ear ength st	ditional o Tests	lling Metho	
Ш	25 25	G G M a	Lean CLAY with SAND (CL) (continued).	Sa	Sa	요 전 15	B	N6	Re	Pe	ůğ	<u>ę</u> g	Lia Lia	Pla	%	T S S T	Ad Lat	<u>Б</u> DE	
	26		grayish brown with orangish brown streaks; increasing SAND content		/	50/6"	50/6"		70	>4.5									
	27		$\overline{\lambda}$																
	28		SILTY SAND (SM); dense; dark yellowish brown; wet; fine to medium SAND																
	29																		
	30					11													
	31				8	20 23	43		100	NA			NP	NP	20				
	32																	<i>∦</i> ∃	
	33																		
	34																	KE	
	35		sand catcher		9	7 14	32		90	NA									
	30					18													
	38																		
	39		Lean CLAY (CL); hard; gravish brown with orangish brown	+															
	40		streaks, moist, lew very line SAIND			20													
	41			M	10	20 46 50/4"	 96/10' 		100	>4.5			44	19					
	42																		
	43																		
	44		SANDY SILT (ML); hard; grayish brown with orangish brown streaks; moist; very fine SAND															{₿	
	45					20													
	46				11	26 22	48		100	>4.5									
	47																		
	48																		
	49																		
	50				12	16 19	40		100	NA									
	51		moist; fine SAND with CLAY (SP-SC); dense; dark brown; moist; fine SAND Bottom of exploration at 51.5 ft below ground surface (bas)			21													
	53		Groundwater Encountered at 27.5 ft bgs Bulk A obtained 1 2-5 ft bgs																
	54																		
	55																		
<u> </u>				IE .								FILE	NO.		HO	LE ID			
			COUNTY VUD	Yuba	a Se	wer a	and W	ater	R	DUTE		38	42.X		PC	C-02C	1		
		B		ine	erine	<u></u>													
		С	ONSULTING PREPARED BY	TING PREPARED BY								/		SH 2	SHEET 2 of 2				

LOG DV	GED E VC	3Y	BEGIN DATE 8-24-20	COMPLETION DATE 8-24-20	LOCATION (Lat/ 39.04217° / -	/Long	g or N . 475	North/1 5 95°	East a	nd Dat	um)				HO T	le ID C-06	3A			
	TRAC	TOR				set, S	Statio	n, Lin	e)						SU	RFAC			/N	
DPE Da	vid	R'S N	IAME HELPEI Nick/	R'S NAME Tanner	CME 75										4	I AL L		H		
EXC.	AVATI	ON M	ETHOD Auger/ Rotary Wash		DRILLING ROD	TYP	E AN	ID DIA	METE	ER / BL	JCKE	TWI	отн		во 4	REHC in)LE C		ER	
SAM Ca	PLER	TYPE (2.4	E(S) AND SIZE(S) (ID)		HAMMER TYPE Safety semi	-aut	oma	atic c	lrop	(140#	/ 30'	')			HA	MMEF	≀EFF		Y, ERi	
BAC Tre	KFILL	AND Cem	COMPLETION ent Grout Backfill		GROUND WATI READINGS	ER	DU No	RING ot En	coun	AF tered	TER	(DAT	E)		CAS	SING	ΓΥΡΕ	: AND D	IAMET	ER(in
7 (£t)						ation	lber	. <u></u>	ğ		(9	5			Lab	orat	ory	Data		g
ATION	(H)		3	DESCRIPTION		e Loc	e Nun	per 6	per fo	STM	%) (%	omete	re it (%)	nsity		ţ	8	÷	nal sts	Metho
ILEV/	EPTI	lateria				ample	ample	lows	lows	160 (A	ecove	ocket	loistu	rry De	iquid	lastic	6 <#2(hear treng est	dditio ab Te	rilling
<u> </u>		≥¢ =//	Lean CLAY (CL); Hard;	Reddish Brown; Dry; Me	dium Plasticity	S	S			z	R	<u> </u>	20	DB		ዋ ፫	%	ທທ⊢	Ľ۷	
	1																			
	2																			
	3																			
	4		Moist																	
	5		WOISt																	
	6					И	1	10	30		95	>4.5								
	7		CLAYEY SAND (SC); N	Aedium Dense; Reddish E	Brown; Moist;			18												
			Lean CLAY with SAND	(CL); Hard; Yellowish Bro	own; Moist; Little	-														INE
			Medium SAND																	KE
	9																			IKE
	10						2	3	42		50	>4 5			41	20				IKE
	11						-	28			00	- 4.0				20				
	12																			KE
	13																			KE
	14		Lean CLAY (CL); Hard;	Mottled Dark Yellowish E	Brown, Olive, and	-														KE
	15		Gray; Few Medium SAN	ND; Some Moderate Cem	entation			28												KE
	16					X	3	39 50/5"	89/11'	; 	70	>4.5			43	22				KE
11/5/2(17																			
GLB	18																			
2019	19					-														
RARY	20		Moist; Trace SAND; Tra	ace Moderate Cementatio	rellowish Brown; n															
oj LIB	21					И	4	25 43	 93/11'		79	>4.5								
NS.GF								50/5"							42	_22_				IYE
RATIO																				IYE
XPLO	23		Eat CLAY (CH): Hard: Y			-														
ELDE	24																			
42.X F	-25-	//	Δ	(continued)						1										
01L 38					PROJECT NAM	lE Yuba	a Se	wer a	and W	/ater				FILE 38	NO. 42.X		HOL T	E ID C-06A		
FOR S		1			COUNTY YUB						R	OUTE					PC	STMILE		
LOGF		B	LACKBL	JRN	CLIENT Jacobs Eng	inee	ering	9												
BCI		C	ONSULT	PREPARED BY						Cł	HECK	ED B	ſ		SI 1	HEET	2			

Γ	(ft)				tion	ber		ţ						Lab	orate	ory	Data		7
	ELEVATION	DEPTH (ft)	/aterial Sraphics	DESCRIPTION	sample Locat	Sample Numt	slows per 6 ir	slows per foo	160 (ASTM)	Recovery (%)	ocket enetrometer	Aoisture Content (%)	Dry Density pcf)	iquid imit	Plasticity ndex	% <#200	Shear Strength Test	Additional ab Tests	Drilling Method
F		25		Fat CLAY (CH) (continued).	Ň	5	11 13	31	2	75	>4.5	20			<u> </u>	0.			Ī
		26					18					29	93	57	32			UC	
		21																	
		20																	KE
		30																	
		31		SANDY Lean CLAY (CL); Very Stiff; Mottled Olive and Brown; Moist; Some Fine SAND; Low to Medium Plasticity	K	6	12 14	31		70	3.5								
		32					17												
		33																	
		34		SANDY Lean CLAY (CL): Hard: Dark Vellowish Brown: Moist	-														
		35		Some Fine to Medium SAND; Medium Plasticity			16												
		36			X	7	32 27	59		95	4.5								
		37																	
		38		Lean CLAY (CL); Hard; Dark Yellow Brown; Moist; Medium	-														
		39		masucity															
		40					12	60		100	> 4 E								
		41		Pottom of ovaloration at 41.5 ft below ground surface (bgs)		°	39	00		100	24.0								
		42		No Goundwater Encountered															
		43		Tremie Cement Grout Backfill															
		44																	
		40																	
1/5/20		47																	
GLB 1		48																	
2019		49																	
BRAR		50																	
GPJ L		51																	
TIONS		52																	
PLORA		53																	
ELD EX		54																	
12.X FIE		L <u>55</u> ⊢	-																_
OIL 38/				PROJECT NAM OPUD South	∕/E Yuba	a Se	wer a	and W	Vater				FILE 38	= NO. 342.X		HOI T	LE ID C-06A		
FOR S(1	COUNTY YUB						R	OUTE					PC	OSTMILE		
CI LOG			B	LACKBURN Jacobs Eng	gine	erin	g					ים חם	/		0		r		
B			С	ONSULTING SS	I						IECK	נשיטיי	1		2	? of	2		

		ED E	3Y		B	EGIN 8-28-	DATE 20		COM 8-28	PLETIC 8-20	ON DATE	LOCATION (La 39.0769° / -	t/Long 121.5	g or N 5235	lorth/E 5 2°	East a	nd Dati	um)				HO T	LE ID C-07		EVATIC		
T		r						<u>בסיפ</u>					1501, 0		II, LIII	e)						- 30 - TO					
	avi						Nic	k/Ta	nner	r		CME 75							T \A/IF	<u></u>		5	1.5 ft				
S		/A11 J-St	em	Aug	er/ R	otary	Was	h				DRILLING ROL		E AN			ER / BL	ICKE	I VVIL	ЛН		4	in			=R	
SA C	.MPL all	.er lod	TYPI (2.4	E(S)/ . ")	AND S	SIZE(S) (ID)					HAMMER TYP Safety sem	≣ ii-aut	oma	atic d	lrop ((140#/	30"	')			HA	MMEF	REFF	ICIENC	Y, ERi	
BA T	CKF	FILL Die (AND Cerr	CON		ION	ckfill					GROUND WA	ER	DU 23	RING 0 ft		AF	TER	(DAT	E)		CAS	SING ⁻	TYPE	AND D	IAMET	ER(in
ŧ													ы	ъ.								Lab	orate	ory	Data		
NC	5	(tt)											ocati	qmn	r 6 in	r foot	Ω	(%)	leter	(%	ity						ethod
VATI		TH (erial	SILICS				D	ESC	RIPTIC	N		ple L	ple N	s pe	s pe	(AST	very	trom	ture ent (Dens	σ	ticity	¢200	ar Jgth	tiona	Jg Me
		DEP	Mate	<u>la</u>									Sam	Sam	Blow	Blow	N60	Reco	Pock Pene	Mois Cont	Dry [Liqui	Plast Inde)	#> %	Shea Strer Test	Addit Lab ⁻	Drillir
		-0-		AS	SPHAL	_T CO	NCRE	TE (9)")																		
		1		AC	GGRE	GATE	BASE	(12"))																		
		2		Le	an CL	AY (C	L); stiff	; dark	< redd	dish bro	own; mois	t; few very fine			10												
		3											М	1	7	13		80	1.25								{\E
		4													0												INE
		_	\mathbb{I}																								KE
		5											Η	2	14 50/5"	50/5''		55	>4.5								IYE
		6		Le	an CL ND; r	AY wi	th SAN ate cen	ID (Cl nental	L); ha	ard; yell	lowish bro	wn; little very fin	•														IYE
		7	Ľ																								
		8																									
		9																									
		10																									KIE
			ľ	sti	ff [.] incr	reasin			tont [.] r	no cem	entation			3	6	18		20	1 25								INE
		11		Su	n, moi	Casin	JOAN		tent, i		ientation			Ŭ	10			20	1.20						<u> </u>		IYE
		12																									IYE
		13																									
		14					· 	 .	— .				_														
		15			LI (M bist	L); hai	a; moti	lied g	rayısr	n browi	n and orar	ngish brown;															
														4	13 26	66		100	>4 5			42	4				ISE
/20		16												-	40												I
11/5		17																									
9.GLB		18																									KE
2019		19		<u> </u>							<u> </u>		_														IYE
RARY		20		m	oderat	e cem	entatio	o; dai n; tra	ce vei	ry fine	SAND	i streaks; moist;															IYE
J LB			Ľ	1									Μ	5	12 19	54		100	>4.5			38	16				
IS.GP		21	₹∕												35												INE
ATION		22																									
PLOR		23		/ S/		SILT ((ML); (h	nard);	mottl	led dar	k yellowis	h brown and	4												l		{}E
DEXF		24		gra	ayish oderat	brown e cem	with or entatio	angis n	sh stre	eaks; n	noist, som	e SAND;															
(FIEL		25																							L		IRE
3842.>					_		~		(conti	inued)			ME								FII			HO	LE ID		
SOIL					1	~						OPUD South	Yuba	a Se	wer a	and W	/ater				38	42.X		T	C-07A	<u>.</u>	
FOR				1														R	JUIE					PC	151 MILL	-	
LOG	BLACKBURN								CLIENT Jacobs En	ginee	ering	3															
BCI	CONSULTING						PREPARED B	Y					CH	IECKI	ED BY	(SH 1	IEET	2							

Γ	(ft)						ber	Ŀ.	t		_				Lab	orate	ory	Data		_
	ELEVATION	DEPTH (ft)	Material Graphics	DESCRIPTION	Samila Locat		Sample Num	Blows per 6 ir	Blows per foo	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
		25		switched to mud rotary SANDY SILT (ML) <i>(continued</i>).			6	9 15	35		90				NP	NP	57			
		27					+	20												
		28																		
		29		Dearly Graded CAND (CD) denses ded browns resist fine to																
		30		medium SAND (SP); dense; dark brown; moist; fine to medium SAND; trace fines			_	15												
		31					7	15 18 23	41		65	NA								
		32						-												
		33																		
		34																		
		35					+	10												
		36		dark brown with golden specs; wet			8	16 18	34		70	NA					5			
		37																		
		38																		
		39																		
		40					_	19	47		70	ΝΑ								
		41		dark brown			9	24 23	47		70	NA								
		42																		
		43																		
		45		dark brown with golden specs			10	11 23	48		70	NA								
/5/20		40					_	25												
iLB 11		47																		
2019.0		49																		
RARY		50																		
PJ LIB		51		trace coarse SAND			11	13 19 20	49		70	NA								
ONS.G		52	· · · ·	Bottom of exploration at 51.5 ft below ground surface (bgs)				30												
ORATI		53		Groundwater Encountered at 23 ft bgs																
D EXPL		54		Tremie Cement Grout Backfill																
X FIELI		55																		
- 3842.				PROJECT		ha			nd M	latar				FILE	E NO.	,	НО			
JR SOI					aan ru	ud i	Jev	vei d		ater	R	DUTE		30	₩ <u></u>	<u>.</u>	PC	DSTMILE	Ē	
-OG FC			B		Engine	eer	ina				_									
BCIL			С	ONSULTING PREPARED	BY						CI	HECK	ED B	(SH 2	HEE 2_of	2		
-																				

	LOGG LDN CONT	ED B' I RACT	Y OR	B	EGIN DAT 8-28-20	ΓE	COMP 8-28	LETION DATE -20	LOCATION (La 39.07654° /	at/Long 2 -121 ffset, S	g or N .522 Statio	North/I 298° on. Lin	East ai e)	nd Dat	um)				HC T SU	ILE ID C-07 RFAC	7 B	EVATIO	DN	
	Tabe OPER	er Atof	2'S N/	AME	H	ELPER	'S NAME	E	EQUIPMENT										ТО	TAL	DEPT	H		
1	Davi EXCA Solid	id Vatic d -Ste Ler t	ON ME	ETHOD Auger/ R	n otary W SIZE(S) (ID	Nick/T	anner		CME 75	D TYP	E AN	ID DIA	METE	ER / BL	JCKE	TWI	DTH		Б [.] ВО 4 НА	1.5 ft REHC in MMEF		DIAMET	ER CY. ERi	
	Call BACK	/Iod (Fill A	2.4") COMPLET		,			GROUND WA	ni-aut	oma DU	atic o RING	lrop ((140#) AF	/ 30" TER	') (DAT	E)		CA	SING	TYPE	E AND E		ER(in
┢	Tren	nie C	eme	ent Grou	it Backfi	ill			READINGS		15	.0 ft				`	,		Lab	orat	0.77.4	Dete		
	J) NC	t)								catio	umbe	6 in.	foot	Ω	(%)	eter	(%	2				Dala		thod
	ELEVATIO	DEPTH (f	Material Graphics				DESCR	IPTION		Sample Lo	Sample N	Blows per	Blows per	N60 (ASTI	Recovery	Pocket Penetrome	Moisture Content (9	Dry Densit (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Me
ľ		-0- E		ASPHAL	T CONC	RETE	(8.5")														_			RE
		1		AGGRE	GATE BA	SE (16	")																	
		2		Lean CL SAND	AY (CL);	very sti	iff; dark l	brown; moist; fe	ew very fine	K	1	5 5 5	10		50	2.25								
		4																						
		6		reddish	brown					X	2	3 4 10	14		100	3.75			24	9				
		7 8		- - 																				
		9		Lean CL very fine	AY with S SAND	and (CL); har	d; yellowish bro	own; moist; little			16												
		11									3	50/6"	50/6"		60	>4.5								
		13		increasir	ng SAND	conten	t																	
					-																			
20		16		SANDY yellowisł	SILT (ML) n brown; v); (hard vet; fine	l); mottle es; fine S	ad reddish brow SAND; some w	n and dark eak cementation		4	12 20 25	45		90	NA			NP	NP	51			
9.GLB 11/5		17 18		Lean CL SAND	AY (CL);	 hard; y	ellowish	few very fine	-															
3RARY_201		19 20																						
NS.GPJ LIE		21								X	5	11 19 19	38		70	4.5								
PLORATIO.		22		SANDY	SILT (ML)); very	stiff; bro		e very fine SANE	-														
ELD EX		24																						
42.X FI		25 <u>–</u>	1111				(contin	nued)		1	<u> </u>												<u> </u>	
NL 384				1.5	~		PROJECT NA	ME 1 Yuba	a Se	wer a	and W	/ater				FILE 38	E NO.		но.	E ID C-07E	;			
OR SC			-	1		COUNTY YUB						R	DUTE					PC	OSTMILI	Ξ				
LOG F			B	LA	СКІ	CLIENT Jacobs En	ginee	ering	9															
BCI	CONSULTING							PREPARED B	Y					CH	IECK	ED BY	(SI 1	HEET	2			

(#)				tion	ber	-	t						Lab	orate	ory	Data		_
ATION	H (ft)	व	g DESCRIPTION	e Loca	e Num	per 6 i	per foc	(MTSA	ery (%	t ometei	rre nt (%)	ensity		ity	8	ţ	onal ests	Metho
ELEV	DEPT	Materi	Gaph	Sample	Sample	Blows	Blows	N60 (A	Recov	Pockel Penetr	Moistu Conter	Dry D€ (pcf)	Liquid	Plastic Index	% <#2	Shear Streng Test	Additio Lab Te	Drilling
	-25- 26		SANDY SILT (ML) (continued).	K	6	5 12	31		90	2.5			36	10				
	27		Poorly GRADED SAND with CLAY (SP-SC); medium dense; dark brown; moist; fine to medium SAND			19												
	28																	
	29																	
	30				7	17 25	52		100	NA					9			
	31 32		switched to mud rotary			27												
	33		Poorty CRADED SAND (SP): donoci dork brown: wat fing to	-														
	34		redium SAND (SF), dense, dark brown, wet, nine to															
	35					12	0.5		75									
	36		. medium dense; moist; trace fines		8	17	35		75	NA								
	37																	
	39																	
	40					12												
	41		wet; few coarse SAND		9	13 9	22		80	NA								
	42																	
	43																	
	45		CLAYEY SAND (SC); very dense; dark yellowish brown; moist; mostly fine SAND; some fines			17												
	46			X	10	35 8 50/5.5	5/11.	5" 	100	NA								
	47																	
	48		Poorly GRADED SAND (SP); medium dense; dark brown; moist; fine to medium SAND; trace fines	-														
	50					10												
	51			X	11	12 17 19	36		100	NA								
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)		•													
	53		Bulk A obtained 2-5 ft bgs															
	54 55		Tremie Cement Grout Backfill															
				IE .								FILE	E NO.		но	LE ID		
			OPUD South COUNTY VIIR	Yuba	a Se	wer a	and V	vater	R	DUTE		38	42.X	<u> </u>	P(DSTMILE	Ē	
		Ê	BLACKBURN CLIENT Jacobs Eng	jine	erin	3												
		(CONSULTING PREPARED BY	G PREPARED BY C							ED B	(SH 2	HEE 2 of	2		

LOGO	ied N	BY	BEGIN DATE 8-27-20	COMPLETION DATE 8-27-20	LOCATION (Lat. 39.07538° / ·	/Long	g or N . 521	lorth/E 1 3°	East a	and Dat	um)				HO T	le ID C-0 8	BA			
CONT Tab	RA(CTOR			LOCATION (Off	set, S	Statio	n, Lin	e)						SU	RFAC	EEL	EVATIC	N N	
OPER Dav	ATC id)r's M	AME HELPER	R'S NAME Tanner	EQUIPMENT CME 75										ΤΟ 5΄	TAL D 1.5 ft	DEPT	Ή		
EXCA	VAT		/ETHOD		DRILLING ROD	TYP	E AN	id dia	MET	ER / BL	JCKE	TWI	DTH		BO	REHO	DLE [DIAMET	ER	
SAMF	LEF		E(S) AND SIZE(S) (ID)							(4 40#		n.			HA	MMEF	REFF	FICIENC	Y, ERi	
BACK	FILL	<u>1 (2.4</u> . AND	COMPLETION		GROUND WAT	-aut Er	DU	ring	irop	(140#) AF	TER	DAT	E)		CAS	SING	TYPE	E AND E		ER(ir
Trei	<u>nie</u>	Cem	ient Grout Backfill		READINGS	ç	14	.0 ft							Lab	orot	oni	Dete		\Box
J) NC	÷					catio	aquur	6 in.	foot	ŝ	(%)	eter		2				Dala		poų
'ATIC	LH (ft	ial .	los	DESCRIPTION		le Lo	le N	per	ber	ASTN	/ery (tome	ure int (%	ensit		city	500	, fi	onal ests	g Met
ELEV	DEPT	Aater Aater				Samp	samp	slows	lows	160 (Seco	ocke	Aoisti Conte	Dry D	imit	Plasti	% <#	shear streng	Additi ab T	Drilling
	-0-		ASPHALT CONCRETE	= (9")		0	0			2	Ľ.		20			<u>a -</u>	~	000 F		
	1		AGGREGATE BASE (9)")		1														{]Ę
	2	ŧ,	Lean CLAY (CL); Very S	Stiff; Dark Brown; Moist; t	race SAND	1														KE
	0	E/																		IKE
	3																			IYE
	4	Ē/																		
	5	E/						5											<u> </u>	╢Ӻ
	6					М	1	10	23		100	2.75								ISE
	7	Ē/						13												INE
	1	Ē/																		IKE
	8		4																	INE
	9	E/	Lean CLAY with SAND Black Streaks; Moist; Li	(CL); Hard; Dark Yellowis ittle Fine SAND; Trace Fir	sh Brown with ne GRAVEL															}}E
	10	Ē/																	<u> </u>	
	44	E/				Μ	2	16 30	67		90	>4.5								ISE
	1.1	\mathbb{F}				\square		37											<u> </u>	INE
	12	Ē/																		IKE
	13	E/																		INE
	14	E/			<u> </u>	4														IVE
	15	E/,	Grayish Brown; Wet; Fi	ne SAND; Little Fines	Dark Brown and															JVE
	15						3	6 9	16		80	ΝΔ			28	15	17			ISE
	16		Poorly-graded SAND with Mottled Dark Brown and	ith CLAY (SP-SC); Mediu d Black; Wet; Fine to Med	um Dense; dium SAND		Ŭ	7							20					INE
	17																			IXE
	18																			IYE
	10		Lean CLAY (CL); Stiff; !	Mottled Light Gray and Da	ark Yellowish	+														IVE
	15		Brown; Moist; Medium F	Plasticity																I))E
	20	Ē/						3												11JE
	21	E4					4	6 12	18		90	1.25								KLE
	22	E/	yellow brown with black	c streaks; moist; little to sc	ont gray and dark ome fines															Ø
	23																			
	23																			
	24	Ē/	Lean CLAY (CL); hard;	bluish gray; moist; few fir		+														
	-25-		1	(continued)																
				(PROJECT NAM	IE Vurba	. 6.		and V	Notor				FILI	E NO.		HO			
				COUNTY	TUD	a Se	wera	ana v	valer	R	OUTE		30	94Z.X		PC	C-U8A	E		
		-																		
		B	BLACKBL	JRN	Jacobs Eng	jinee	erinç	3												
		C	CONSULT	PREPARED BY							HECK	ED B	Y		S	HEET I of	2			

Γ	(ft)				tion	ber	<i>.</i>	ţ						Lab	orate	ory	Data		
	ELEVATION	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Locat	Sample Num	Blows per 6 in	Blows per foo	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
ľ		25		Lean CLAY (CL) <i>(continued)</i> .	Ň	5	3 13	50		100	>4.5					91			
		20					37												
		28																	
		29		Lean CLAY (CL): (stiff): dark gray, wat faw yon fine SAND	-														
		30		Lean CLAT (CL), (Sun), dark gray, wet, new very line Sand			3												
		31			X	6	5 9	14		45	NA								
		32																	
		33																	
		34																	
		35		hard; moist; weak cementation	Ν	7	10 16	35		100	>4.5			27	12				
		30					19												
		38			-														
		39		moist; fine to medium SAND; trace fines															
		40					15												
		41			X	8	19 24	43		70	NA								
		42																	
		43																	
		44																	
		45		very dense; wet	X	9	20 31	62		65	NA								
1/5/20		40					31												
GLB 1		48																	
۲_2019		49																	
-IBRAR		50					15												
S.GPJ L		51			X	10	26 32	58		65	NA								
ATIONS		52		Bottom of exploration at 51.5 ft below ground surface (bgs) Goundwater Encountered at 14 ft bos															
XPLOR		53		Tremie Cement Grout Backfill															
IELD E		54																	
842.XF		-55-			-											ЦО			
SOILS				OPUD South Y COUNTY	Yuba	a Se	wer a	and W	Vater	R	DUTE		38	42.X		PC	C-08A	E	
JG FOR					.														
BCI L(C	ONSULTING SS	1196	εnnę	1			Cł F		ED B	ſ		SH	HEET	2		
-											-								

	GED M	BY	BEGIN DATE 8-27-20	COMPLETION DATE 8-27-20	LOCATION (Lat 39.07514° /	/Long - 121	g or N . 520	lorth/l 196°	East a	nd Dat	um)				HC T		BB			
	Der RATC	DR'S N	IAME HELPE	ER'S NAME			blallO	11, LIII	e)						ТС			H		
Dav EXC/	/id		Nick IETHOD	/Tanner	CME 75 DRILLING ROD	TYP	E AN		METE	ER / BL	JCKE	TWI	DTH		5	1.5 ft REHC			ER	
SAM	id-S	tem /	Auger / Mud Rotary		HAMMER TYPE										4	in MMEF	REFF	FICIENC	Y, ERi	
Cal BAC		I (2.4	COMPLETION		Safety semi	-aut	oma DU	atic (RING	lrop	(140#) AF	/ 30'	') (DAT	E)		CA	SING	TYPE			ER(i
Tre	mie	Cem	ent Grout Backfill		READINGS		15	.0 ft				(2/	_,					D . t .		<u> </u>
DN (ft) 					catio	Imbel	6 in.	foot	ŝ	(%)	ter	()	2		orat	ory	Data		poų
ELEVATIO	DEPTH (f	Material Graphice		DESCRIPTION		Sample Lo	Sample Nu	Blows per	Blows per	V60 (ASTI	Secovery	^o ocket ^o enetrome	Moisture Content (9	Dry Densit pcf)	-iquid imit	Plasticity ndex	% <#200	Shear Strength Fest	Additional ab Tests	Drilling Me
_	-0-		ASPHALT CONCRET	E (8")			0,			~			20				0.	0,0,1		Ū
	1		P AGGREGATE BASE (16")																
	2 3		Lean CLAY (CL); hard	; dark brown; moist; trace	fine GRAVEL	K	1	6 11 12	23		100	>4.5								
	4		Lean CLAY with SANE	0 (CL); hard; dark yellowis		-														
	6		little very fine SAND; s	ome moderate cementatio	n	X	2	8 12 22	34		70	>4.5								
	8 9 10 11 12 13 14 15		dark yellowish brown v increasing SAND contr Poorty-graded GRAVE	vith gray streaks and black ent	specks;		3	6 9 10	19		50	2.75			30	17				
120	16	000	dense; grayish brown; coarse SAND; few fine SANDY Lean CLAY (C	wet; mostly fine GRAVEL s CL); hard; mottled orangish	i little fine to	X	4	42 28	70		75	>4.5					9			
	17 18 19		Lean CLAY with SANE moderate cementation	SAND) (CL); (very stiff); bluish g	 ray; moist;	_														
	20 21 22		CLAYEY SAND (SC); orangish brown and gr wet	medium dense; dark yello ayish brown streaks and ç	wish brown with golden specks;		5	3 8 16	24		100	NA								
	23 24																			
044.7	20-			(continued)		4											10			
JG FOK SOIL 3					PROJECT NAM OPUD South COUNTY YUB CLIENT	1E Yuba	a Se	wer a	and V	Vater	R	OUTE		FILE 38	= NO. 342.X	<u></u>	PC	'C-08E)STMILI	\$ E	
BCILL		C	CONSULT	ING	PREPARED BY	jinee	ering	3			CI		ED B	Y		SI	HEET	2		

(ft)				tion	ber	-i	t						Lab	orate	ory	Data		-	
ELEVATION	DEPTH (ft)	/aterial Sraphics	DESCRIPTION	Sample Loca	Sample Num	3lows per 6 i	slows per foc	160 (ASTM)	Recovery (%	^o ocket ^o enetrometei	Aoisture Content (%)	Dry Density pcf)	-iquid imit	Plasticity ndex	% <#200	Shear Strength Test	Additional .ab Tests	Drilling Metho	
	25		Lean CLAY (CL); hard; grayish brown with orangish brown streaks: moist: few fine SAND		6	8 12	35	~	100	>15	20			<u>u =</u>	0	000		J E	-
	26				Ŭ	23			100	- 4.5									-
	27																	INE	-
	28		SILTY SAND (SM): medium dense: dark brown with orangish	+														I	-
	29		brown streaks and golden specks; wet															RE	_
	30				7	9 12	27		100	3.25			NP	NP	43			RE	_
			SANDY Lean CLAY (CL); very stiff; grayish brown; moist; some fine SAND	\mathbf{P}		15												KE	-
	32																	KĒ	
																		I	
	35		CLAYEY SAND (SC); medium dense; grayish brown with orangish brown streaks; moist; mostly fine SAND																
	36			М	8	7 10	26		90	NA			27	11	49				
	37					16													
	38																		
	39																		
	40					7													_
	41	///	Deetly Creded SAND (SD); dense wellowigh brown and block	X	9	7 10 15	25		0	NA									
	42		no recovery, switched to mud rotary																
	43																		
	44																		
	45					22													_
	46			X	10	25 26	51		75	NA									
	47																		
	48																		
	49																		
	50					26													
	51		very dense	Ň	11	34 42	76		75	NA								8	
	52		Bottom of exploration at 51.5 ft below ground surface (bgs) Groundwater Encountered 15 ft bos																
	53		Bulk A obtained 2-5 ft bgs															=	
	54		Tremie Cement Grout Backfill																
	<u>55</u>	1																	-
			PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	/ater				FILE 38	NO. 42.X		но Т	C-08B			_
		2	COUNTY YUB						R	JULE					PC	JSTMILE	=		_
		B	LACKBURN Jacobs Eng	inee	ərinç)						/		0		r			_
		С	ONSULTING IDM								ים ט_			2	2 of	2			

LOGO DW	GED B` /C TRACT	Y OR	B	Egin da 8-26-20	TE	COMP 8-26	LETION DATE -20	LOCATION (La 39.07174° / LOCATION (Of	t/Long -121 fset, S	g or N .516 Statio	lorth/f 609° n, Lin	East a e)	nd Dat	um)				HC T SU	DLE ID C-09 RFAC	JA JE EL	EVATIC	DN N	
Tab OPEF	Der RATOR	R'S NAI	ME	н	IELPEF	R'S NAME	E	EQUIPMENT										ТО	TAL	DEPT	Ή		
Dav EXCA	/id Avatic	ON MET	THOD		Nick/	anner		CME 75) TYP	E AN		MET	ER / BL	JCKE	TWI	DTH		5 BO	1.5 ft REHC)LE [DIAMET	ER	
SAMF	id-Ste Pler t	m AL YPE(S	J ger 6) AND S	SIZE(S) (II	D)			HAMMER TYPE	Ξ									4	in MMEF	R EFF	FICIENC	Y, ERi	
Cal BACk	Mod (Kfill A	(2.4")	OMPLET	ION				Safety sem	i-aut ER	oma DU	atic c RING	lrop	(140#) AF	/ 30'	') (DAT	E)		CAS	SING	TYPE			ER(i
Tre	mie C	emer	nt Grou	ut Backf	fill			READINGS		25	0 ft		24	1.0 ft	i on 8	3-26-2	20						
N (ft									catior	mber	. <u>.</u> .	oot	((%	ter		<u> </u>	Lab	orat	ory	Data	<u> </u>	po
ELEVATIC	ОЕРТН (ft	/aterial Sraphics				DESCR	IPTION		sample Lo	sample Nu	Blows per (Blows per f	460 (ASTN	Recovery (Pocket Penetrome	Aoisture Content (%	Density pcf)	iquid imit	Plasticity ndex	6 <#200	Shear Strength Test	Additional ab Tests	Drilling Metl
		20	ASPHAL	T CONC	RETE	(8")				0)			2			20				0`			1JE
	1		AGGRE	GATE BA	ASE (16	6")																	
	2				Hard [.]			 m to High	-														
	3		Plasticity	y (OE),	r iara,	Ban Bro	wii, Dry, Weald	in to riigh															
	Ē																						K
	5										8	10		70									181
	6									1	8	16		70	>4.5								
	7																						
	8																						
	10	4			<u></u>						16	10		05				07	10	40			1/1
	11		CLAYEY Moist; Fi	SAND (SC); M dium S	edium D AND	ense; Dark Red	dish Brown;		2	9	18		95	NA			27	12	46			R
	12	//																					Ι <i>μ</i>
	13																						
	'4 E		Lean CL SAND	AY (CL);	Very S	Stiff; Redo	dish Brown; Mo	st; Trace Fine															
	15										10												
	16									3	10	17		90	3.5			34	19				K
	17																						14
	18								_														И
			SANDY Fine thro	Lean CL/ ough Coa	AY (CL arse SA); (Stiff to ND; Few	very Stiff); Oliv Fine GRAVEL	/e; Moist; Some															
	20										6												
	21		Lean CL SAND	AY with S	SAND ((CL); Ver	y Stiff; Olive; M	oist; Little Fine		4	7 10	17		100	3.0								
	22]/[
	23																						K
								,															X
								- 7															$ \rangle$
	-25					(contin	nued)				1				1	1					<u>.</u>	<u> </u>	
			1.5	~				PROJECT NAM	ME Yub:	a Se	wer :	and V	Vater				FILI	E NO.		HO			
			1					COUNTY						R	OUTE				<u> </u>	PC	OSTMILI	E	
			TT A	010				CLIENT															
		B	LA	CK	BU	RN	4		ginee ⁄	ering	3				HECK	FD B'	Y		12		г		
	CONSULTING SS						SS SS	•						1201	U	•			lof	2			

(ft)				ion	Der		t I						Lab	orate	ory	Data		_
lion	(#)			Locat	Numk	er 6 ir	er foo	(MT	y (%)	neter	(%)	sity					ts al	lethoo
EVA ⁻	PTH	terial	DESCRIPTION	mple	mple	ws pe	ws pe	0 (AS	cover	cket	isture ntent	, Den	uid	sticity	<#200	ear ength st	dition: 7 Test	ling N
Ē	25 -	ла У Д		Sat	Sai	B	Bo	NG	Re	P 00	ΩQΩ	<u>2</u> 9	Liq	Pla	*	A She	Lab	Drii
	26		CLAY (CL); Suff. Olive Gray; Molst, Interbedged Lenses of CLAYEY SAND (SC); (Medium Dense); Dark Yellowish Brown; Wet: Fine to Medium SAND: Few to Little Fines	М	5	5 6	12		100	1.75			38	17	56			
	27					6												
	29																	
	30				c	4	15		100	0.75								
	31				0	9	15		100	2.75								
	32																	
	33		SILTY SAND (SM); Medium Dense; Reddish Brown; Wet; Mostly	+														
	34		Fine SAND; Some Medium SAND; Interbedded Lenses of SANDY SILT (ML); (Stiff); Reddish Brown; Moist; Some Fine															
	35					8												
	36			X	7	10 13	23		85	NA			NP	NP	34			
	37																	
	38			-														
	39		Lean CLAY (CL); Medium Stiff; Dark Reddish Brown; Moist; Little Weak Cementation															
	40																	
				Μ	8	6 9	21		80	1.25								
			SANDY Lean CLAY/CLAYEY SAND (CL/SC); Stiff/Medium Dense; Dark Reddish Brown; Moist to Wet; Some Fine to	\square		12				2.0								
	42		, Medium SAND; Some Weak Cementation															
	43																	
	44		SANDY Lean CLAY (CL); Stiff; Dark Reddish Brown; Moist; Some Fine SAND	1														
	45					8	00		00	4 75								
	46				9	11	22		80	1.75								
	47																	
	48																	
1	49																	
	50					14												
	51		Some Fine to Medium SAND; Weak to Moderate Cementation	X	10	29 33	62		85	>4.5								
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)				-									<u></u>		
	53		Goundwater Encountered at 25 ft bgs Bulk A obtained 2-5 ft bgs															
	54		Tremie Cement Grout Backfill															
	L ₅₅ E																	=
				F								FILE			НО	LE ID		
			OPUD South COUNTY	Yuba	a Se	wer a	and V	Vater	R			38	42.X			C-09A		
		1																
		B	LACKBURN Jacobs Eng	inee	əring	3					ים חם	/		0				
		С	CONSULTING SS								ום עב			2	? of	2		

	GED BY	BEGIN DATE 8-26-20	COMPLETION DATE 8-26-20	LOCATION (Lat. 39.07146° / -	/Long - 121	or N . 515	lorth/E 7°	East a	nd Datu	ım)				HO T	C-09	9 B			
Tak OPE	ber RATOR'S	NAME HELPE	R'S NAME	EQUIPMENT	501, C	Jalio								то			.EVANC	//N	
Dav EXC/	vid AVATION I	Nick/	Tanner	CME 75 DRILLING ROD	TYP	E AN	d dia	METE	R / BU	CKE	TWI	отн		5 ' BO	1.5 ft REHC		DIAMET	ER	
SAM	lid-Stem PLER TYP	Auger PE(S) AND SIZE(S) (ID)		HAMMER TYPE										4 HA	in MMEF	REFF		Y, ERi	
Ca BACI	IMod (2.4 KFILL AND	4") COMPLETION		GROUND WAT	-aut ER	DUI	tic d RING	rop (/ 140# /	30' TER	') (DAT	E)		CAS	SING	TYPE	E AND D	JAMET	ER(in
<u>Tre</u> €	emie Cen	nent Grout Backfill		READINGS	u	23. ือ	<u>0 ft</u>		25	.0 ft	on 8	-26-2	20	Lab	orat	orv	Data		
ELEVATION (DEPTH (ft) Material	Graphics	DESCRIPTION		Sample Locati	Sample Numb	Blows per 6 in	Blows per foot	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
		ASPHALT CONCRETE AGGREGATE BASE (1	E (6") 2")																R
	2	Lean CLAY (CL); Hard Medium SAND; Few M	Dark Reddish Brown; Mo oderate Cementation	ist; Trace		1	6 9 9	18		60	>4.5								
	5 6 7	SILTY CLAY (CL-ML); Medium SAND	Hard; Dark Reddish Brow	<i>r</i> n; Moist; Trace	K	2	5 6 8	14		90	>4.5			22	7				
	8 9 10	Lean CLAY (CL); Hard Cementation	, Dark Yellowish Brown; D	Dry; Strong			9												
	11 12 13 14	Lean CLAY (CL); Hard SANDY Lean CLAY (C Medium SAND	Dark Brown; Moist	st; Some Fine to	-	3	8	16		80	>4.5								
20	15	SANDY Lean CLAY with	h GRAVEL (CL); Very Sti	ff; Olive Brown;	X	4	5 7 10	17		70	1.5 3.0								
/_2019.GLB 11/5	17 18 19		Mottled Olive Gray and I		_														
ONS.GPJ LIBRAR	20 21 22	Brown Moist, Medium Cementation	Plasticity; Few Moderate I	io Strong	K	5	6 13 21	34		95	>4.5								
FIELD EXPLORATI	23 24 25	CLAYEY SAND (SC); (Wet; Fine to Medium S	Medium Dense); Dark Re AND; Some CLAY	eddish Brown;															
3842.X	20		(continued)										FII			HO	LE ID		
5 FOR SOIL 5				OPUD South COUNTY YUB	Yuba	a Sev	wer a	Ind W	/ater	R	DUTE		38	42.X	[PC	C-09B	; =	
BCI LOC	(BLACKBU Consult	JRN ING	Jacobs Eng PREPARED BY SS	jinee	ering]			CH	HECK	ED B	ſ		SI 1	heet I of	2		

(ft)					tion	ber		Ţ						Lab	orate	ory	Data		7
ELEVATION	DEPTH (ft)	Matarial	Graphics	DESCRIPTION	Sample Locat	Sample Numt	Blows per 6 ir	Blows per foo	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	-25-	Ē		CLAYEY SAND (SC) (continued). Lean CLAY with SAND (CL); Very Stiff; Strong Brown; Some	Ň	6	4	10		100	2.75	40	81	42	17			UC	
	26			Weak Cementation			6												
	21																		
	20																		
	29			SILTY SAND (SM); (Medium Dense); Dark Reddish Brown; Wet; Fine SAND; Some Fines															
	31			SILT (ML); Very Stiff; Dark Yellowish Brown; Moist	М	7	5	19		100	3.25								
	32						12					43	79	46	16			UC	
	33																		
	34		Щ		-														
	35	Ē		Moist; Some Fine SAND			7												
	36	Đ			X	8	10 11	21		80	2.5								
	37																		
	38		À	CLAYEY SAND (SC); Loose to Medium Dense; Dark Yellowish	+														
	39		///	Brown; Wet															
	40						5			0.5									
	41	Ē	./.			9	5 6	11		85	1.0								
	42				X	10	5 9	14		100	NA								
	43		//																
	44																		
	45	Đ		SANDY Lean CLAY (CL); Very Stiff; Dark Yellowish Brown; Moist; Some Fine to Medium SAND	Ν	11	16 21	51		85	4.0								
	47	Ē			\square		30												
	48				_														
I	49			Wet; Fine to Medium SAND; Some Fines; Weak Cementation															
	50	Ē	./.)				8												
	51				X	12	9 12	21		85	1.5								
	52		~	Bottom of exploration at 51.5 ft below ground surface (bgs)															
	53																		
	54			i remie Gement Grout Backfill															
	-55-	Н																	
				PROJECT NAM OPUD South	E Yuba	a Se	wer a	and V	Vater				FILE 38	NO. 42.X		но Т	LE ID C-09B		
			4	COUNTY YUB						R	DUTE					PC	OSTMILE		
		ļ	B	LACKBURN Jacobs Eng	ine	ering	g						/		0		r		
			C	ONSULTING SS								ום חי			2	2 of	2		

LOG SS	GED	BY			BEGI 9-2-	N DA -20	TE	СС 9	omple -2-20	ETION DAT	TE L	.OCATION (La 39.06253° /	it/Long -121	or N . 502	lorth/E 9°	East a	nd Dat	um)				HC T	DLE ID	DA			
CON Tal	TRA()er	СТС	R								L	OCATION (O	fset, S	Statio	n, Lin	e)						SU	RFAC	EEL	.EVATIC	N	
OPE To	RATO D Y	DR'S	S NA	AME		H	ielpe Erne	R'S N	IAME Jason		E	EQUIPMENT										тс 5	TAL D 1.5 ft	DEPT	Ή		
EXC.	AVAT		I ME	ETHOD	Rota	rv W	Vash				C	RILLING ROI) TYP	E AN	d dia	METE	ER / BL	JCKE	TWI	DTH		BC 4	REHC	DLE	DIAMET	ER	
SAM Ca		1 (2	PE((S) AND	SIZE((S) (I	D)				H	AMMER TYP	E ni-aut	oma	atic d	Iron	(140#	/ 30'	")			HA	MMEF	REF	FICIENC	Y, ERi	
BAC	<fill< td=""><td>AN</td><td>D C</td><td>COMPLE</td><td></td><td>ack</td><td>fill</td><td></td><td></td><td></td><td>G</td><td>GROUND WA</td><td>TER</td><td>DU 24</td><td>RING 0 ft</td><td></td><td>AF</td><td>TER</td><td>(DAT</td><td>E)</td><td></td><td>CA</td><td>SING</td><td>TYPE</td><td>E AND D</td><td>DIAMET</td><td>ER(in</td></fill<>	AN	D C	COMPLE		ack	fill				G	GROUND WA	TER	DU 24	RING 0 ft		AF	TER	(DAT	E)		CA	SING	TYPE	E AND D	DIAMET	ER(in
(#)													ion	Jer	<i></i>	ţ						Lab	orat	ory	Data		_
NOI	(#)		6										Locat	Num	er 6 ir	er foo	(MT	у (%)	meter	(%)	sity		~			al ts	lethoo
EVA.	L T H	torio	aphic					DEC	Joran	non			mple	mple	d swo	d swo	0 (AS	covel	cket	isture	() (f)	nit	asticit lex	<#20(ear ength st	dition 5 Tes	lling N
Ш			2 0	ASPH			RET	F (7")					Sa	Sa	B	ă	9V	Re	6 g	≚ů	5.9	Lig	립니	%	ਜ ਲੋ ਕ	Lal	5
	1	E		AGGR	EGAT	TE BA	ASE (10")					+														IKE
	2			SAND'	Y Lear	n CL	AY (C	L); ha	rd; rec	dish browi	n; dry	; some fine														<u> </u>	IKE
	3	Ē					,						Μ	1	4 6	17		80	>4.5								IKE
	1	Ē													11												IKE
	- -	Ë	\land																								IKE
	0	Ē	\mathcal{A}	Lean C	LAY ((CL);	very	stiff to	hard;	dark yellov	wish b	prown; dry;		2	12 18	39		95	4.0								1KE
	0	Ē		nue n											21												IKE
	7	Ē																									IKE
	8	E																									IKE
	9			CLAYE	EY SA	ND (SC); r	nediu	m den	se; strong	browr	n; moist; fine	-														KE
	10	Ē		unoug	i ocai		,	Como							8	00		100				47	00				IYE
	11	Ē												3	9 14	23		100	2.0			47	29				IYE
	12	E	./.																								INE
	13																										INE
	14	E	//																								IYE
	15	E		SAND	<u></u>): ver	v stiff	olive.		fine to				7												HYE
	16			SAND		. (_), voi	y oun,	onvo,	ury, como			Ν	4	14 22	36		90	3.0								IYE
1/5/20	17																										1XE
GLB 1																											
2019.	18 19 19 20 20 18 19 20 19 20 19 20 19 20 19 20 20 20 20 20 20 20 20 20 20																										
RARY											dium ND	dense; dark															
J LIB												Μ	5	8 12	22		100	2.25									
NS.GF		Ē	•												10												
RATIC		Ē																									
XPLO	23	Ē		Poorly- moist;	-grade fine to	ed SA	AND (SP); n SAND:	nediun ; intert	n dense; da bedded len	ark ye ises w	llowish brown with few fines	;														
IELD E	24											-	<u>×</u>														
42.X F	<u></u> 25	<u> </u>						(Co	ontinue	ed)															l		
JIL 38				5	4	6					F	PROJECT NA OPUD South	ME Yuba	a Se	wer a	and V	Vater				FILE 38	E NO. 342.X		HOI T	LE ID C-10A		
OR S(-			-					(COUNTY YUB						R	OUTE					PC	OSTMILI	Ξ	
LOGF			B	LA	C	K	BI	JR	N		(CLIENT Jacobs En	ginee	ering	3												
BCI	CONSULTING							F	PREPARED B	Y					Cł	HECK	ED B	Y		SI	HEET	2					

(ft)				tion	oer	-i	t						Lab	orate	ory	Data		-
LEVATION	EPTH (ft)	aterial	DESCRIPTION	ample Locat	ample Numl	ows per 6 ii	ows per foc	60 (ASTM)	scovery (%)	ocket enetrometer	oisture ontent (%)	y Density cf)	quid mit	asticity dex	<#200	near rrength est	dditional ab Tests	illing Metho
ш	-25-	∣ E	 O Poorly Graded SAND (SP) (continued). 	ů N	ő	面 10		ž	Ř	<u> </u>	ΣŬ	٥đ	ככ	르드	%	ភភ្	ΓΫ́	
	26		∵] SANDY SILT (ML); very stiff; dark yellowish brown; moist; some	Å	6	13 15	28		100	NA								
	27		very fine SAND															
	28																	
	29		SILTY SAND (SM): dense: mattled dark vellowish brown and															
	30		olive gray; moist; fine SAND; some fines			10												
	31	E		X	7	22 27	49		100	>4.5					43			
	32					21												
	33	E																
	34																	
	35																	
	36		dark yellowish brown; fine to medium SAND; little fines	X	8	13 22	49		100	>4.5			NP	NP			UC	
	37					21												
	38																	
	39		Poorly Graded SAND (SP); medium dense; dark yellowish															
	40		Contract in the contract of th															
	11			X	9	12 16	31		85	NA								
	41		SII TV SAND (SM): medium dense: dark vellowish brown: moist:			15												
	42		fine to medium SAND; little fines															
	43]	Poorly Graded SAND (SP); medium dense; gray; wet; fine to															
	44		mediúm SAND															
	40	Ē		V	10	15 16	34		95	NA								
	46					18												
	47	.																
	48																	
	49																	
	50		fine through coarse SAND; trace GRAVEL in shoe	V	11	20 29	59		80	NA								
	51	-	Bottom of evolution at 51.5 ft below around surface (bas)			30	00		00	10.1								
	52		Goundwater Encountered at 24 ft bgs															
	53		Bulk A obtained 1.4-5 ft bgs															
	54		Tremie Cement Grout Backfill															
	-55-																	
			PROJECT NAME OPUD South Y	_ ′uba	a Se	wer a	and W	Vater				FILE 38	42.X		HOI T	LE ID C-10A		
			COUNTY YUB						R	DUTE					PC	OSTMILE	=	
			BLACKBURN CLIENT Jacobs Engli	nee	ering	3												
		(CONSULTING PREPARED BY						Cł	IECK	ED BY	/		SH 2	IEET	2		

LOG	gee NC) By	/		BEGI 8-25	N DATI 5-20	E	COM 8-2	IPLETION	I DATE	LOCATION 39.06202	(Lat/Lor ?° / -12 ′	ig or 1.50	North/ 216°	East a	nd Dat	um)				HC T	DLE ID	0B			
CON Ta	NTR/	ACT	OR								LOCATION	(Offset,	Statio	on, Lin	ie)						SU	RFAC	EEL	EVATIO)N	
OPE Da	ERAT	OR	'S N/	AME		HE N	LPER	''S NAM Tanne	ME Pr		EQUIPMEN CME 75	Т									тс 5	TAL D	DEPT	.н		
EXC So	ava blid-	T10 Ste	n me m A	ETHOD	Rota	ry Wa	ash				DRILLING F	ROD TYP	PEAN		AMETE	ER / BL	JCKE	TWI	DTH		ВС 4	REHC	DLE	DIAMET	ER	
SAN Ca	APLE	RΤ d ()	YPE(2.4''	s) ane)) SIZE(S) (ID))				HAMMER T Safety s	YPE emi-au	tom	atic d	drop	(140#	/ 30'	')			HA	MMEF	R EFF	FICIENC	;Y, ERi	
BAC Tr	KFIL	L À e C	ND C eme	OMPLI	ETION out B	ackfil					GROUND V READINGS	VATER	DL 24	JRING . 0 ft	i	AF	TER	(DAT	E)		CA	SING	TYPE	E AND E	DIAMET	ER(in
(ft)		-					-				ľ	tion	ber	Ŀ	ot		_				Lab	orat	ory	Data		σ
ION	1		_ v					DESC	RIPTION	N		Loca	Num	er 6 i	er foo	STM)	ry (%	mete	(%)	sity		~	0		ial ts	Metho
LEVA	Ē	Г Г П	ateria aphic										mple	d swc	d swc	30 (A	ecove	ocket enetro	bistur	of Der	nit	asticit	<#20	near rengt	lditior b Tes	Illing I
Ξ	0	5	≌ŏ ∕/	Lean	CLAY ((CL): S	Stiff: R	eddish	n Brown: I	Moist: M	edium Plastic	itv	S	ă	ă	ž	Å	ሻ ሻ	žö	Ъë	בֿבֿ	흔드	%	<u>ب بع</u> ج	La C	15 IDE
	1					// -	,		, .	,																
	2													2										<u> </u>	<u> </u>	INE
	3												1	4	9		60	1.0								K
	4																									
	5																									IKE
													2	2	5		80	1.25								IKE
		E										Ľ		3											<u> </u>	IXE
	'		\square																							IKE
	8			SAND)Y Lear	ו CLA	Y (CL)); (Very	y Stiff); Re	eddish B	rown; Moist															IKE
	9	E																								KE
	10	ΡĒ	1			(CI). F		 Dark Y	ellowish F	Brown: M				14											<u> </u>	IYE
	11			Ceme	ented	OL), I	iaru, i	Jan	CHOWISH	510001, 10			3	31 32	63		90	>4.5								JYE
	12																									IVE
	13	ß																								
	14																									
	15	; E	Ŕ	Dense	e; Dark	Yellov	איבע w wish B נוסמו	Brown; Srown;	Moist; Fir ND	ne to Coa	arse GRAVE	_;												ļ	<u> </u>	
	16		X										4	33	75		80	NA					11			
<i>b/2</i> 0	17		X											45												1)}E
LB 11				Lean (Fine to	CLAY v o Medi	<i>w</i> ith SA um Sa	AND (and	CL); H	lard; Yello	wish Bro	own; Moist; L	ittle														
:019.G	18																									
	19) 																								
LIBK	20	ΡĒ												10	00		400	10			40	0.1				
S.GPJ	21												5	14	33		100	4.0			46	21				
NOL	22																									
LOR	23	ß																								
	24	E) (SM)	. Med		ense: Dar	k Olive F																A
	25	; E		to Med	dium S	AND;'İ	Little	SILT			,													<u> </u>		Ø
3842.				5.	120			(con	tinuea)		PROJECT	NAME								FILI	E NO.	-	Ю	ILE ID		
SOIL				1							COUNTY	uth Yuk	a Se	ewer a	and V	Vater	R	OUTE		38	342.X		PC	C-10E	; E	
G FOF			4	174	-		100				CLIENT															
CI LO			B		1C	KE	sυ	R	N		Jacobs PREPAREI	Engine D BY	erin	g			Cł	HECK	ED B	Y		SI	HEET	г		
ш	CONSULTING SS								SS											1	l of	2				

(ft)				lion	ber	خ	ţ						Lab	orate	ory	Data		-
LEVATION	DEPTH (ft)	laterial	DESCRIPTION	ample Locat	ample Numt	lows per 6 ir	lows per foo	60 (ASTM)	ecovery (%)	ocket enetrometer	loisture ontent (%)	ry Density cf)	quid mit	lasticity idex	, <#200	hear trength est	dditional ab Tests	rilling Methoo
	-25-		SILTY SAND (SM) (continued).	s v	S	四 7	47	z	8		20	09		스느	8	v v ⊢	۲Þ	
	26				6	8 9	17		95	NA			NP	NP	19			
	27																	
	28																	
	29		SANDY Lean CLAY (CL); Hard; Dark Yellowish Brown; Moist; Some Fine to Medium SAND	1														
	30				7	20 23	46		100	4.5								
	32		Lean CLAY (CL); Stiff; Dark Yellowish Brown; Moist; Trace SAND; Some Moderate Cementation	\square		23				2.0			27	10				
	33																	
	34																	
	35					16												
	36		Hard	M	8	24 30	54		100	>4.5								
	37																	
	38		SILTY SAND (SM); Dense; Dark Yellowish Brown; Moist; Mostly	+														
	39		Fine to Medium SAND; Some SIL I															
	40					16	26		100	NIA								
	41				9	18	30		100	NA								
	42																	
	43		Poorly-graded SAND (SP); Dense; Olive Gray; Moist; Fine to Medium SAND; Interbedded Lens of SANDY SILT (ML)	1														
	44																	
	46			Ν	10	15 16	38		100	NA								
	47					22												
	48																	
I	49																	
	50					13												
	51		Little Coarse SAND	M	11	14 16	30		60	NA								
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)															
	53		Transis Connect Creat Dealeful															
	54		Fremie Cement Grout Backfill															
	55-																	
			PROJECT NAM OPUD South	1E Yuba	a Se	wer a	and W	/ater	1			FILE 38	E NO. 42.X		но Т	LE ID C-10B		
			COUNTY YUB						R	UTE					PC	JSTMILE	: 	
		Ē	BLACKBURN Jacobs Eng	jine	əring	3						/		0		r		
		C	ONSULTING SS								ום טי			2	? of	2		

	OGG SS	ED E	BY		E	Begin 9-9-2	DATI 20	E	COM 9-9 -	PLETION DAT	EL	OCATION (L 39.05402°	at/Long	g or 1 .515	North/ 507°	East a	nd Dat	um)				HC T	C-12	2A			
	Tab	RAC er											nset, a	Static	on, Lin	e)						50			EVATIC	/N	
	Rick	410 (RSP	IAM	=		HE N	IPER	Iike	E		Diedrich D	120									5 ⁻	1.5 ft	DEPT	н		
E	XCA Soli	VATI d-St	ON N em /	1et⊦ Aug	iod er/ R	otary	y Wa	sh			D	RILLING RO	D TYP	'E AN	ID DIA	METE	ER / BL	JCKE	TWI	отн		во 4	REHC		DIAMET	ER	
S	AMP Call	ler /Iod	TYPE (2.4	E(S) '')	AND S	SIZE(S	6) (ID)				H	AMMER TYF Safetv sen	'E 1i-au1	toma	atic d	lrop	(140#	/ 30'	')			HA	MMEF	REF	FICIENC	;Y, ERi	
В	ACK Trer	FILL		CON	IPLET	TION	ckfil	1			G	ROUND WA	TER	DU 24	RING .0 ft		AF	TER	(DAT	E)		CAS	SING	TYPE	E AND E	IAMET	ER(in
	Ê				0.00			•					ion	Der		Ŧ						Lab	orat	ory	Data		_
		(ft)											Locat	Num	er 6 ir	er foo	(MT	y (%)	neter	(%)	sity					le s	lethoo
	EVAL	PTH	terial										nple	nple	ws pe	ns pe	(AS	cover	sket	sture	Den	in i	sticity	#200	ength st	ditiona Test	ling ∿
L	Щ Ш		Sa Ma	5				CTC /	(01)				Sar	Sar	B	Be	N6(Re	Per Po	₹Ō	ξĝ	L C	Pla Ind	*	H Str	Add	Ē
		1	\mathbf{P}		<u>GGRE</u>		BAS	ETE (E (4")	<u>(3')</u> 																		KE
		2		S	an Cl ND	_AY (C	CL); v	ery sti	ff; dark	yellowish brov	wn; m	ioist; few fine															IKE
		2												1	6 8	20		100	2.25								INE
		3													12												HYE
		4	¥/																								
		5		sc	me ce	ementa	ation;	few fi	ne thro	ugh coarse SA	AND				5												ĺ∦Ē
		6		Le	an Cl	_AY (C	CL); s	tiff; mo	ottled d	ark yellowish b	brown	and olive;		2	8 13	21		85	1.25			40	26				
		7			JI31, 10		y in ic				natioi																
		8		1																							
		9																									
		10																									
		11		SI fin	LT wit e SAN	th SAN ND; bl	ND (N ack s	1L); ve pecks	ery stiff; (organ	dark yellowish ics?)	h brov	wn; moist; litt		3	36	14		85	2.0								IN.
															8								-				HIE
		12																									
		13																									IXE
		14																									IKE
		15		CI	AYE	Y SAN	ID (S0	 C); me	edium c	 lense; dark yel	llowis				4												HE
		16		m	oist; fi	ne to ı	mediu	ım SA	ND; so	me fines			N	4	7 9	16		100	NA								RE
1/5/2(17																									1XE
GLB		18																									INE
2019.		19																									IYE
RARY		20									1																
J LIB		20		Po br	oorly C own; r	Gradeo moist;	d SAN	ID wit o med	h SILT lium SA	(SP-SM); mec ND; few fines	dium o	dense; dark		5	9 11	24		85	NA			NP	NP	9			
NS.GP		21													13												-I)/E
RATIO		22																									
(PLOF		23																									
ΕD		24											4														
EX FIE		25	<u> - </u>						(conti	inued)																<u> </u>	
- 3842						~			CONT	nacay	F		ME				Vote-				FILE	E NO.	,	НО			
SOIL					6		-					COUNTY	ITUD	a 50	wera	and V	vater	R	OUTE		38	942.X	•	PC	C-12A DSTMILI	E	
G FOF					TA.	~	1-	11	-		C	YUB CLIENT															
3CI LO			E	L	A	CI	1 E	SU T	RI		F	Jacobs Er PREPARED E	igine Y	erin	g			Cł	HECK	ED B	Y		Sł	HEET	r		
۳L			C	.(N	21	JL	.	N	2		LDM											1	lof	2		

(ft)				ion	ber	c:	t t						Lab	orate	ory	Data		-
VATION	TH (ft)	rial hics	DESCRIPTION	ole Locat	ole Numt	s per 6 ir	s per foo	(ASTM)	very (%)	et trometer	ture ent (%)	Density	n	icity ć	200	r igth	ional Tests	ig Method
ELE		Mate Grap		Sam	Sam	Blow	Blow	N60	Reco	Pock Pene	Moist Conte	Dry D (pcf)	Liquid	Plast Indey	#> %	Shea Strer Test	Addit Lab 7	Drillir
	26		fine through coarse SAND; wet Poorly Graded SAND with SILT (SP-SM) <i>(continued)</i> .	X	6	4 7 12	19		60	NA								
	27		switched to mud rotary															
	28																	
	29																	
	30		SILT (ML); hard; yellowish brown; moist; trace fine SAND; weak cementation	Ν	7	8 15	38		95	>4.5								
	31					23							42	11	-			
	33																	
	34																	
	35		olive brown		Q	20	50/4"		100	>4.5								
	36				0	50/4"	50/4		100	-4.5								
	37																	
	38																	
	39																	
	40		Poorly Graded SAND with SILT (SP-SM); very dense; dark brown; wet; fine to medium SAND; few fines	X	9	16 24	55		65	NA								
	42					31												
	43																	
	44																	
	45		dense; lenses of SILT with SAND (ML); (stiff); olive brown; moist;			18												
	46		little fine SAND		10	20 22	42		65	NA								
	47																	
	48																	
	50																	
	51			X	11	14 19 24	43		65	NA								
	52	- <u>1-111</u>	Bottom of exploration at 51.5 ft below ground surface (bgs)	<u>, '</u>			1		I	1				1	<u> </u>	ļ	<u> </u>	
	53		Goundwater Encountered at 24 ft bgs Bulk A obtained 0.6-5 ft bgs															
	54		Tremie Cement Grout Backfill															
	L ₅₅ –	1																
			PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	/ater				FILE 38	NO. 42.X		HO T			
										JUIE						JOTIVILLE	-	
		B	CNSULTING PREPARED BY	inee	erinç)			CI	HECK	ED BY	/		SH	HEET	「 <u> </u>		
		C												2	: of	2		

	GED BY		BEGIN DATE 9-9-20	COMPLETION DATE 9-9-20	LOCATION (Lat. 39.05476° / -	/Long	or N .515	lorth/E 607°	East a	nd Datu	ım)				HC T	C-12	2B			
Tab	er					set, S	statio	n, Line	e)						50				JIN	
Cha	d	S NA		/Cody	CME 75										5	1.5 ft		н		
EXCA Soli	d-Ste	ν ΜΕ m Αι	uger		DRILLING ROD	TYPI	E AN	D DIA	METE	R / BU	CKE		ЛН		во 4	in	DLE L	DIAMET	ER	
SAMF Cal	Pler t Mod (2	/PE(S 2.4'')	6) AND SIZE(S) (ID)		HAMMER TYPE Safety semi	-aut	oma	atic d	rop (140#/	30'	')			HA	MMEF	REF	FICIENC	Y, ERi	
BACK	FILL AI mie C	ND CO	OMPLETION nt Grout Backfill		GROUND WAT READINGS	ER	DU 17.	ring .0 ft		AF 18	TER 5.0 ft	(DAT on 9	E) - 9-2(D	CAS	SING	TYPE	E AND D	IAMET	ER(in
(ft)						tion	ber	Ŀ.	ot		(_			Lab	orat	ory	Data	1	Ţ
ATION	TH (ft)	1al Nics		DESCRIPTION		le Loca	le Num	s per 6 i	s per foo	ASTM)	very (%	et tromete	ure ent (%)	ensity		city	200	gth	onal ests	g Metho
ELEV		Mater Graph				Samp	Samp	Blows	Blows	N60 (Reco	Pocke Penei	Moist Conte	Dry D (pcf)	Liquic	Plasti Index	#> %	Sheal Stren Test	Additi Lab T	Drillin
	1		ASPHALT CONCRETE AGGREGATE BASE (12	(7") 2")		-														
	2		Lean CLAY (CL); hard; o	dark gray; moist; few fine	e to medium	+														
	3		SAND																	
	4																			
	5							- 10												
	6	4				М	1	10 22	58		85	>4.5								
	7		Lean CLAY (CL); hard; r moderate cementation	reddish brown; moist; fev	w fine SAND; few			30												
	8																			
	9																			
			SILT with SAND (ML); h to medium SAND	ard; dark yellowish brow	n; dry; little fine/															
							2	24 50/4"	50/4''		100	>4.5								
	15		fine SAND; some strong	cementation		X	3	23 50/4"	50/4''		90	>4.5			43	15				
8/20	16				7															
B 11/5	17				<u> </u>															
019.GL	18					4														
ARY_2(19																			
LIBR/	20		trace cementation					9	25		05	4.5								
S.GPJ	21						4	20	35		85	4.5								
ATION	22		CLAYEY SAND (SC); (n	nedium dense); dark yell	lowish brown;	+														
(PLOR	23																			
ELD EX	24																			
2.X FIE	-25	/. /		(continued)																ĽΕ
IL 384.		2		. ,	PROJECT NAM	lE Yub≉	a Se	wer a	Ind W	/ater				FILE	E NO.		HO T		;	
OR SO											R	DUTE		_ 00		-	PC	DSTMIL	Ē	
-06 F(B	ACKBL	IRN	CLIENT	linee	erino	3												
BCIL		C	ONSULT	ING	PREPARED BY						Cł	IECK	ED B	ſ		Sł 1	HEET	2		

(#)				tion	ber	<i>.</i> .	ţ		_				Lab	orat	ory	Data		-
ELEVATION	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Locat	Sample Numl	Blows per 6 ii	Blows per foc	N60 (ASTM)	Recovery (%)	Pocket Penetrometer	Moisture Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% <#200	Shear Strength Test	Additional Lab Tests	Drilling Method
	25	$\langle \cdot \rangle$	CLAYEY SAND (SC) <i>(continued).</i> Lean CLAY (CL); hard; olive gray; moist	V	5	7 12	32		95	4.0								R
	20					20												KE
	28																	KE
	29		SILT (ML); hard; mottled dark yellowish brown and brown; moist;	-														KE
	30					45												
	31			M	6	28 45	73		85	>4.5			39	8			UC	
	32																	
	33		SILTY SAND (SM); hard; mottled dark olive gray and dark brown;	-														
	34		moist															KE
	35				7	26 23	47		100	>15			ND	ND	46			KE
	36				,	23	47		100	24.5					40			KE
	37		Poorly Graded SAND (SP); (dense); dark gray; wet	-														
	39																	
	40																	
	41		SANDY SILT (ML); very stiff; dark gray; moist; some fine SAND	M	8	15 25 38	63		100	2.0								
	42		SILTY SAND (SM); very dense; dark gray; moist; fine to medium SAND; little fines			00												
	43																	KE
	44		Poorly Graded SAND (SP); dense; dark gray; wet; fine to medium	-														KE
	45		SAND; trace fines			9												
	46			Å	9	23 31	54		60	NA								
	47																	
	48																	
	49																	IYE
	51			M	10	8 20	56		95	NA								KE
	52		Bottom of exploration at 51.5 ft below ground surface (bgs)			36												
	53		Goundwater Encountered at 17 ft bgs Bulk A obtained 1.5-5 ft bgs															
	54		Tremie Cement Grout Backfill															
<u> </u>	55																	
			PROJECT NAM OPUD South	E Yuba	a Se	wer a	and W	Vater				FILE 38	E NO. 42.X		но. Т	LE ID C-12B		
		-	COUNTY YUB						R	DUTE					PC	OSTMILE	Ξ	
		B	LACKBURN CLIENT Jacobs Eng	inee	ering	3						,		1 -				
		С	ONSULTING PREPARED BY	PREPARED BY						HECK	ED BY	(Sł	HEET ? of	2		

	LOGG SS	ED E	Y	BEGIN DATE 9-8-20	COMPLETION DATE 9-8-20	LOCATION (Lat. 39.03709° / -	/Long - 121	or N . 514	lorth/E • 98°	East a	nd Dat	um)				HO T	LE ID C-13	3			
					R'S NAME		561, 0		, LIII	6)						то Т				<u></u>	
				Nick/	Mike	Diedrich D1	20		מוח ח		ER / BI			אדר		5	1.4 ft			FR	
Ľ	Soli	d-St														4	in				
Ľ			(2.4	((3) AND SIZE(3) (ID)		Safety semi	-aut	oma	tic d	lrop ((140#	/ 30'	')	-							
Ľ	Trer	nie (Cem	ent Grout Backfill		READINGS	ER	28 .	0 ft		26	5.0 ft	(DAT : on 9	⊨) -8-2(0	CAS	SING	IYPE	E AND L	IAMET	ER(II
	N (ft)						ation	nber	Ľ	ot		(%)	Ŀ		1	Lab	orate	ory	Data		р
	EVATIO	PTH (ft)	erial		DESCRIPTION		nple Loc	nple Nur	vs per 6	vs per fo	(ASTM	overy (%	ket etromet	sture tent (%)	Density	t ë	sticity x	#200	ar ngth t	itional Tests	ing Meth
	ELE		Mat	5			San	San	Blo	Blov	N60	Rec	Poc Pen	Con Con	p C D	Ligu	Plas	> %	She Stre Tes	Add Lab	D
		1	ð,	ASPHALT CONCRETE AGGREGATE BASE (1	<u>[(6.5")</u> 2")		+														IKE
				SILT (ML); very stiff; da			-														IKE
								1	5 6	13		80	2.25								IKE
		3							7											<u> </u>	IYE
		4																			IYE
		5							3												IXE
		6		Lean CLAY (CL); stiff; d	lark yellowish brown; moi	st; trace fine		2	4 6	10		95	1.75								
		7																			
		8																			
		9																			
		10							18											<u> </u>	
		11		cementation	n brown; dry; iew line SAI	ND; IIlle		3	<u>50/4"</u>	50/4''		90	>4.5							<u> </u>	
		12																			
		12																			
																					I{]E
		14																			{]E
		15		light brown				4	8	46		05	> 4 E								1{]E
20		16						4	27	40		00	~4.5								
11/5/		17																			I
9.GLB		18																			KE
Y_201		19																			IKE
BRAR		20		trace computation					10												╢┋
PJ LI		21		trace cementation			K	5	14	33		100	4.0								IYE
ONS.G		22							15												IYE
DRATIC		23																			INE
EXPLO		20																			IYE
IELD I		24																			INE
42.XF		-25-			(continued)																
OIL 38						PROJECT NAM	1E Yuba	a Se	wer a	and W	Vater				FILE	E NO. 342.X		HOI	E ID C-13		
OR S(COUNTY YUB						R	DUTE					PC	OSTMILI	=	
LOGF			B	LACKBL	JRN	CLIENT Jacobs End	jinee	erino	3												_
BCI			C	ONSULT	ING	PREPARED BY	,					Cł	HECK	ED BY	ſ		SH 1	HEET	2		

(ft)				ion	ber		ţ						Lab	orate	ory	Data		-
TION	l (ft)	s	DESCRIPTION	Locat	Num	er 6 in	er foo	STM)	ry (%)	meter	e (%)	Isity		y	0	_	ial tts	Method
LEVA	EPTH	aterial		ample	ample	d swo	d swo	30 (AS	ecove	ocket	oisture ontent	y Der cf)	quid	asticit dex	<#20	near rength sst	ldition b Tes	illing N
	-25 E	ΞŪ	SILT (ML); hard; mottled grayish brown and yellowish brown;	s	s S	16	97/10	ž	يم 100	<u>م</u> م	žŏ	<u>5</u>	ĒĒ	<u> </u>	%		La	
	26		moist; traće; fine SAND			47 50/4"	57710		100	- 4.5								
	27																	
	28			1														
	29																	
	30					10										<u> </u>		
	31			М	7	17	47		90	>4.5								
	32		switched to mud rotary															
	33																	
	34																	
	35					40										<u> </u>		
	36		SAND' SILT (ML), haid, dark blown, moist, some very line SAND; trace cementation	М	8	30 8 30/5 5	 80/11.5 #	 5"' 	100	>4.5								
	37					00,0.0												
	38																	
	39																	
	40					40												
	41		SAND; some fines; interbedded lenses of fines	М	9	12 22 33	55		90	NA								
	42					00												
	43																	
	44																	
	45					45										<u> </u>		
	46			M	10	26 31	57		85	2.75								
	47		SILT (ML); very stiff; light brown; moist															
	48																	
	49																	
	50		Porty Craded SAND with SILT (SP SAN) your dopportate			22										<u> </u>		
	51		brown; wet; fine through coarse SAND; few fines	М	11	41 50/5"	 91/11' 	¦ 	90	NA								
	52	<u> </u>]]	Bottom of exploration at 51.4 ft below ground surface (bgs)	<u> </u>										1		<u>.</u>		
	53		Goundwater Encountered at 28 ft bgs Bulk A obtained 1.5-5 ft bgs															
	54		Tremie Cement Grout Backfill															
	55																	
<u> </u>			PROJECT NAM	E				lat-				FILE	NO.		HO			
			COPUD South	ruba	a Se	wer a	and W	vater	R	DUTE		38	42.X		PC	JOSTMILE	Ξ	
				inc		~												
		C	ONSULTING PREPARED BY	11166	ering	1			Cł	HECK	ED BY	1		SH	HEET	Г г 2		
<u> </u>		V													. 01	۷		

BCI LOG FOR SOIL 3842.X FIELD EXPLORATIONS.GPJ LIBRARY_2019.GLB 11/5/20

LOGO DW	ED C	BY	BEGIN DATE 9-8-20	LOCATION (Lat/Long or North/East and Datum) 39.05742° / -121.49553° LOCATION (Offect Statics Line)									HOLE ID TC-14								
	er																				
Cha				EQUIPMENT CME 75										101AL DEPTH 41.5 ft							
Soli	d-S	Stem	Auger	DRILLING ROD TYPE AND DIAMETER / BUCKET WIDTH BOREHOLE DIAME													JIAMET	=R			
SAMF Call	VLEF	R TYP d (2.4	E(S) AND SIZE(S) (ID) !'')	HAMMER TYPE Safety semi	HAMMER TYPE Safety semi-automatic drop (140#/ 30")										HAMMER EFFICIENCY, ERI						
BACK	FILI mie	AND	COMPLETION Tent Grout Backfill	GROUND WATI READINGS	GROUND WATER DURING AFTER (DATE READINGS 28.0 ft							E)) CASING TYPE AND DIAMETER							in	
(ft)						tion	ber	-	t						Lab	orat	ory	ory Data			
LION	(#)		10	DESCRIPTION			Num	er 6 i	er foc	(MT	у (%)	meter	(%)	sity		~			al ts	Aetho	
EVA	PTH HT	terial	aphics				nple	d sw	d sv	0 (AS	covel	cket	isture	(Den	i niq	sticit	<#20(ear ength t	dition Tes	ling N	
Ш	_0_	N N N		3					B	N6	Re	P P O	₿Ō	Ęŝ	Li Li	Pla Ind	* %	⊣ Str She	Lab	Ē	E
ASPHALT CONCRETE (8")																				K	-
	2	É/	Lean CLAY (CL); hard;	 ND	1														K	Ē	
	2	Ē/						20 36	65		60	>4 5								K	Ē
	3	Ē/						29						_						K	Ē
	4		Lean CLAY with SAND	(CL); hard; brown; moist;	; little fine to	1														И	Ē
	5 meaium SAND						2	10	50/4''		90	>4.5								١X	Ē
	6	E/	dry					50/4"												$ \rangle$	Ē
	7	E/																			=
	8																				Ē
	9	E/																			F
	10	Ē/																			
dark vellov		dark vellowish brown: n	noist: some moderate to s	trona	Ν	3	12 28	 78/12'		80	>4.5								K		
	11 commentation			5	\square		50/6"												K		
	12	E/																		K	
	13																		K	Ē	
	14		SILTY SAND (SM); den	SILTY SAND (SM); dense; dark yellowish brown SAND; some fines																K	
	15	目					_	12					\vdash			+		<u> </u>	<u> </u>	K	F
					M	4	19	47		65	NA								И	F	
	17							20												١X	Ē
	18																i		$ \rangle$		
	10	目旧																		$ \rangle$	Ē
1																		$ \rangle$			
	20	E.	Poorly Graded SAND (SP); medium dense to de	nse; olive gray;		E	12	22												=
	21						5	16	32		90										
	22																			{	Ē
	23																			1	-
	24				+														K	F	
	ittle fines															K	_				
				PROJECT NAM								FILF	FILE NO. HOLE ID								
					OPUD South Yuba Sewer and Water							384 ROUTE				2.X TC-14					
				YUB							NOUTE				FUSTMILE						
		E	BLACKBL	Jacobs Eng	ine	ering	9				15 5										
		C	CONSULT	PREPARED BY	CI	CHECKED BY SHEET 1 of 2															

(ft)					ion	oer	:	Ţ				Laborato				ory	ory Data			
TION	(ff)		s	DESCRIPTION		Num	er 6 ir	er foo	(MT	y (%)	meter	(%)	Isity		Y	0	_	ial its	Jethod	
EVA.	EPTH		aphic		mple	mple	d swc	d swc	30 (AS	scovel	ocket enetrol	bisture	y Den sf)	nit	asticit	<#20(iear rength st	ldition b Tes	Iling N	
Ξ	-25-		в Кал	CLAYEY GRAVEL with SAND (GC) (continued).	Se	S S	23	50/3"	ž	يم 100	а а NA	žŭ	ਹ ਕੁ	ĔĔ	흘르	%	ے بڑ بڑ	Ac La	δ	
	26						50/3	,00/0		100										
	27		en la																	
	28	Ë	200	$\overline{\Delta}$	1															
	29																		KE	
	30	Ē	/./	CLAYEY SAND with GRAVEL (SC); dense; gray; wet; mostly fine to medium SAND; little fines; few fine GRAVEL; few coarse															IKE	
	50	B	//	SAND	Μ	7	17 22	49		45	NA								KE	
	31	Ē	/./		\square		27												KE	
	32	Ē	//																RE	
	33	Ē	/./																IYE	
	34	Ē	/;	CLAYEY SAND (SC); very dense; gray; moist; fine to medium	+														IYE	
	35	B	//	SAND; some fines; trace fine GRAVEL			14												IYE	
	36		//		X	8	23 49	72		45	NA								IYE	
	37	E	//																	
	38	F		Lean CLAY (CL): (stiff): dark vellowish brown: moist: trace fine	+															
	39	Ē		SAND																
	40	Ē																		
	41	Ē			М	9	10	22		30										
	42	Ê		Bottom of exploration at 41.5 ft below ground surface (bgs)															ΠĒ	
	43			Goundwater Encountered at 28 ft bgs																
	44			Tremie Cement Grout Backfill															Ξ	
	45																			
	40																		=	
	40																			
	47																		Ξ	
	48																		Ξ	
	49	Ē																	Ξ	
	50																		Ξ	
	51	E																	Ξ	
	52	E																	Ξ	
	53																		Ξ	
	54	Ξ																	=	
	55	E																		
				PROJECT NAM	E	uba Source and Mater							FILE	FILE NO. 3842 ¥						
						. 00				R	DUTE		- 30	·		PC		Ē		
					inc	orin	~													
CONSULTING PREPARED						enni	9			CI	HECK	ED B)	(SI	HEET				
																2 01 2				

BCI LOG FOR SOIL 3842.X FIELD EXPLORATIONS.GPJ LIBRARY_2019.GLB 11/5/20






























































 Project Name: OPUD
Project Number: 3842.X
Sample ID: TC-2C, 6B
Type of Sample: 2.4" Cal Mod
Sample Description: Lean CLAY with SAND, yellowish brown Depth: 20.5-21'

Sample Data

-					
Sample Length:	5.27	in	Sample + Tube:	692	g
Diameter:	2.40	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.19		Sample Weight:	692	g
Sample Area:	4.54	in ²	Wet Density:	110.2	pcf
Sample Volume:	23.9	in ³	Moisture:	41.3	%
Specific Gravity:	2.65	(assumed)	Dry Density:	78.0	pcf
			Saturation:	97.6	%

*Moisture content taken after test

Test Results

Compressive Strength:	2.35	tsf
Average cross-sectional area at failure:	4.66	in ²
Strain at Failure:	2.66	%
Maximum Load:	152	lbs
Deflection at Max. Load:	0.140	in
Rate of Strain:	0.0200	in/min

Str	ain	In	Ifoi	ma	ation	
_		~	~ .			

Rate of Strain ½%:	0.026	in/min
Rate of Strain 2%:	0.105	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.791	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-6A-5C Type of Sample: 2.4" Cal Mod Sample Description: Fat CLAY, yellowish brown Depth: 26-26.5'

Sample Data

					-
g	738	Sample + Tube:	in	5.26	Sample Length:
g	0.00	Tube:	in	2.39	Diameter:
g	738	Sample Weight:		2.20	Height-to-Diameter Ratio:
pcf	119.7	Wet Density:	in ²	4.47	Sample Area:
%	29	Moisture:	in ³	23.5	Sample Volume:
pcf	93.0	Dry Density:	(assumed)	2.65	Specific Gravity:
%	97.7	Saturation:			

*Moisture content taken after test

Test Results

Rate of Strain:	0.0500	in/min
Deflection at Max. Load:	0.135	in
Maximum Load:	112	lbs
Strain at Failure:	2.56	%
Average cross-sectional area		2
at failure:	4.58	in²

Strain Information		
Rate of Strain 1/2%:	0.026	in/min
Rate of Strain 2%:	0.105	in/min
Strain Rate:	0.050	in/min
15% Strain:	0.788	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-6A-5C Type of Sample: 2.4" Cal Mod Sample Description: Fat CLAY, yellowish brown Depth: 26-26.5'

Compressive Strength:	1.75	tsf
	24.4	psi





Project Name: OPUD
Project Number: 3842.X
Sample ID: TC-9B-6B
Type of Sample: 2.4" Cal Mod
Sample Description: Lean CLAY with SAND, strong brown
Depth: 25.5-26'

Sample Data

-						
5	Sample Length:	5.02	in	Sample + Tube:	672	g
	Diameter:	2.39	in	Tube:	0.00	g
Height-to-[Diameter Ratio:	2.10		Sample Weight:	672	g
	Sample Area:	4.49	in ²	Wet Density:	113.4	pcf
S	ample Volume:	22.6	in ³	Moisture:	40	%
S	Specific Gravity:	2.65	(assumed)	Dry Density:	81.3	pcf
				Saturation:	101.4	%

*Moisture content taken after test

Test Results

Rate of Strain:	0.0200	in/min
Deflection at Max. Load:	0.195	in
Maximum Load:	20	lbs
Strain at Failure:	6.08	%
Average cross-sectional area at failure:	4.78	in²

Strain Information

Rate of Strain ½%:	0.025	in/min
Rate of Strain 2%:	0.100	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.753	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-9B-6B Type of Sample: 2.4" Cal Mod Sample Description: Lean CLAY with SAND, strong brown Depth: 25.5-26'

Compressive Strength: 0.42 tsf 5.9 psi





Project Name: OPUD
Project Number: 3842.X
Sample ID: TC-9B-7C
Type of Sample: 2.4" Cal Mod
Sample Description: SILT, dark yellowish brown
Depth: 31-31.5'

Sample Data

•					
Sample Length:	5.19	in	Sample + Tube:	694	g
Diameter:	2.40	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.16		Sample Weight:	694	g
Sample Area:	4.52	in ²	Wet Density:	112.5	pcf
Sample Volume:	23.5	in ³	Moisture:	43	%
Specific Gravity:	2.65	(assumed)	Dry Density:	78.9	pcf
			Saturation:	103.0	%

Test Results

Rate of Strain:	0.0200	in/min
Deflection at Max. Load:	0.242	in
Maximum Load:	56	lbs
Strain at Failure:	4.65	%
Average cross-sectional area at failure:	4.74	in ²

Dry Density:	78.9	p
Saturation:	103.0	ç
*Moisture content	taken after test	

Strain Information

Rate of Strain ½%:	0.026	in/min
Rate of Strain 2%:	0.104	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.779	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-9B-7C Type of Sample: 2.4" Cal Mod Sample Description: SILT, dark yellowish brown Depth: 31-31.5'

Compressive Strength:	0.85	tsf
	11.9	psi





Project Name: OPUD Project Number: 3842.X Sample ID: TC-10A, 8B Type of Sample: 2.4" Cal Mod Sample Description: SILTY SAND, strong brown Depth: 35.5-36'

Sample Data

-					
Sample Length:	5.00	in	Sample + Tube:	768	g
Diameter:	2.41	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.08		Sample Weight:	768	g
Sample Area:	4.56	in ²	Wet Density:	128.3	pcf
Sample Volume:	22.8	in ³	Moisture:	22.2	%
Specific Gravity:	2.65	(assumed)	Dry Density:	105.0	pcf
			Saturation:	102.2	%

Test Results

	0 0000	. , .	
Rate of Strain:	0.0300	in/min	
Deflection at Max. Load:	0.083	in	
Maximum Load:	26	lbs	
Strain at Failure: Average cross-sectional area	1.67	%	
at failure:	4.64	in ²	
Compressive Strength:	0.41	tsf	

*Moisture content	taken	after	test

Strain Information

Rate of Strain ½%:	0.025	in/min
Rate of Strain 2%:	0.100	in/min
Strain Rate:	0.030	in/min
15% Strain:	0.750	in







Project Name: OPUD Project Number: 3842.X Sample ID: TC-12B-6C Type of Sample: 2.4" Cal Mod Sample Description: SILT, yellowish brown Depth: 31-31.5

Sample Data

•					
Sample Length:	4.87	in	Sample + Tube:	682	g
Diameter:	2.39	in	Tube:	0.00	g
Height-to-Diameter Ratio:	2.04		Sample Weight:	682	g
Sample Area:	4.47	in ²	Wet Density:	119.4	pcf
Sample Volume:	21.7	in ³	Moisture:	34	%
Specific Gravity:	2.65	(assumed)	Dry Density:	89.2	pcf
			Saturation:	105.2	%

*Moisture content taken after test

Test Results

Rate of Strain:	0.0200	in/min
Deflection at Max. Load:	0.191	in
Maximum Load:	197	lbs
Strain at Failure:	3.93	%
Average cross-sectional area		
at failure:	4.65	in ²

Strain	Information	

Rate of Strain ½%:	0.024	in/min
Rate of Strain 2%:	0.097	in/min
Strain Rate:	0.020	in/min
15% Strain:	0.730	in




Unconfined Compression ASTM D 2166



Project Name: OPUD Project Number: 3842.X Sample ID: TC-12B-6C Type of Sample: 2.4" Cal Mod Sample Description: SILT, yellowish brown Depth: 31-31.5

Compressive Strength:	3.05	tsf
	42.4	psi



UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX C: Pump Stations

C1: Site Plan C2: Boring and Test Pit Logs Legend Boring and Test Pit Logs C3: Laboratory Test Results







LEGEND



Planned Pump Station/Lift Station Boring Location

Proposed Pipeline Location

Source: South County Sewer and Water Project, Volume 2 plans created by Jacobs, dated October 2020. Alignment Package Admin Draft 10-12-2020.



PUMP STATION #26 SITE PLAN

OPUD Yuba County Sewer and Water Infrastructure Project Olivehurst, California File No. 3842.x

April 2021

Appendix C1b

















LEGEND

Proposed Pipeline Location



Planned Pump Station/Lift Station Boring Location

Source: South County Sewer and Water Project, Volume 2 plans created by Jacobs, dated October 2020. Alignment Package Admin Draft 10-12-2020.



LIFT STATION #1 SITE PLAN

OPUD Yuba County Sewer and Water Infrastructure Project Olivehurst, California File No. 3842.x

April 2021

Appendix C1j

Appendix C2: Exploratory Borings for Pump Stations not complete at the time of this Report

Appendix C3: Laboratory Tests for Pump Stations not complete at the time of this Report

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX D: WWTP Improvements

D1: Site Plan D2: Boring and Test Pit Logs Legend Boring and Test Pit Logs D3: Laboratory Test Results D4: Site Specific Analysis D5: Previous Geotechnical Studies and Data







OPUD Water and Sewer Project Sewer Plant and Pipeline Yuba County, California

April 2021

Appendix D1

		GROUP SYMBO	DLS AN	ID NAN	IES	FIELD AN	D LABORATORY TESTS
Graphic	/ Symbol	Group Names	Graphic	/ Symbol	Group Names	C Consolidatio	n (ASTM D 2435)
	GW GP	Well-graded GRAVEL Well-graded GRAVEL with SAND Poorly graded GRAVEL Poorly graded GRAVEL With SAND		CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY	CL Collapse Po CP Compaction CR Corrosion, S CTM 417, C	tential (ASTM D 5333) Curve (ASTM D 698 & 1557, CTM 216) ulfates, Chlorides (CTM 643, TM 422)
	GW-GM GW-GC	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		CL-ML	GRAVELLY lean CLAY with SAND SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND	CU Consolidater DS Direct Shear EI Expansion Ir M Moisture Co OC Organic Con	d Undrained Triaxial (ASTM D 4767) (ASTM D 3080) ndex (ASTM D 4829) ntent (ASTM D 2216) tent (ASTM D 2974)
00000000000000000000000000000000000000	GP-GM GP-GC	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND	P Permeability PA Particle Size PI Liquid Limit, (ASTM D 43 PL Point Load In	(ASTM D 5084) Analysis (ASTM D 6913 & 7928) Plastic Limit, Plasticity Index 18) ndex (ASTM D 5731)
	GM GC	SILTY GRAVEL SILTY GRAVEL with SAND CLAYEY GRAVEL CLAYEY GRAVEL with SAND		OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND	PM Pressure Me PP Pocket Pene R R-Value (CT SE Sand Equiva SG Specific Gra	ter trometer M 301) Ient (CTM 217) vity (AASHTO T100)
	GC-GM SW	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND Well-graded SAND Well-graded SAND with GRAVEL		OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT SILT with SAND	SL Shrinkage Li SW Swell Potent TV Pocket Torva UC Unconfined (Unconfined (mit (ASTM D 4943) ial (ASTM D 4546) ane Compression - Soil (ASTM D 2166) Compression - Rock (ASTM D 7012)
å <mark>a a</mark>	SP SW-SM	Poorly graded SAND Poorly graded SAND with GRAVEL Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		СН	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND	UUUnconsolida (ASTM D 28)UWUnit WeightVSVane Shear	ted Undrained Triaxial 50) (ASTM D 7263) (AASHTO T223 / ASTM D 2573)
	SW-SC SP-SM	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL	-	мн	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT GRAVELLY elastic SILT GRAVELLY elastic SILT	SAMPLE Standard	R GRAPHIC SYMBOLS Penetration Test (SPT)
	SP-SC SM	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) SILTY SAND SILTY SAND with GRAVEL		он	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY ORGANIC fat CLAY ORGANIC fat CLAY	California S	Sampler (2" ID)
	SC SC-SM	CLAYEY SAND CLAYEY SAND with GRAVEL SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		он	ORGANIC elastic SILT ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT ORGANIC elastic SILT	Shelby Tu	ibe Piston Sampler
	РТ	PEAT			ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL	NX Rock	Core HQ Rock Core
<u>9</u> 99		COBBLES COBBLES and BOULDERS BOULDERS		010H	SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND	Bulk Sam	ple Other (see remarks)
		DRILLING MET	HOD	SYMB	OLS	WATE	R LEVEL SYMBOLS
R	Auger	r Drilling Rotary Drilling)ynamic r Hand	Cone Diamond Core	 ✓ First Water ✓ Static Wate ✓ Static Wate ✓ Static Wate 	Level Reading (during drilling) r Level Reading (short-term) r Level Reading (long-term)



BORING RECORD LEGEND

PAGE 1

	CONSISTENCY OF COHESIVE SOILS												
Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation									
Very Soft	< 0.25	< 0.25	< 0.12	Extrudes between fingers when squeezed									
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb									
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort									
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort									
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail									
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty									

APPARENT DENSITY OF COHESIONLESS SOILS									
Descriptor	SPT N ₆₀ - Value (blows / foot)								
Very Loose	0 - 4								
Loose	5 - 10								
Medium Dense	11 - 30								
Dense	31 - 50								
Very Dense	> 50								

PERCENT	OR PROPORTION OF SOILS
Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%
	1

MOISTURE										
Descriptor	Criteria									
Dry	Absence of moisture, dusty, dry to the touch									
Moist	Damp but no visible water									
Wet	Visible free water, usually soil is below water table									

SOIL PARTICLE SIZE									
Descriptor		Size							
Boulder		> 12 inches							
Cobble		3 to 12 inches							
Crowel	Coarse	3/4 inch to 3 inches							
Graver	Fine	No. 4 Sieve to 3/4 inch							
	Coarse	No. 10 Sieve to No. 4 Sieve							
Sand	Medium	No. 40 Sieve to No. 10 Sieve							
	Fine	No. 200 Sieve to No. 40 Sieve							
Silt and Clay		Passing No. 200 Sieve							

PLASTICITY OF FINE-GRAINED SOILS										
Descriptor	Criteria									
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.									
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.									
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.									
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.									

CEMENTATION										
Descriptor	Criteria									
Weak	Crumbles or breaks with handling or little finger pressure.									
Moderate	Crumbles or breaks with considerable finger pressure.									
Strong	Will not crumble or break with finger pressure.									

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.



BORING RECORD LEGEND

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0	DUIK DPERA		R'S NAM	/E			NT O Baakhaa						TOTAL DEPTH OF TEST PIT 8.0 ft						
Ē	EXCAV		ON MET	HOD		BUCKET WIDTH								SAMPLER SIZE(S)					
ŀ	TEST I	PIT I	BACKF	ILL AND COMPLET	ION	2' GROUNDWATER DURING EXCAVATION							CalMod (2.4"), Bulk Bag						
	Back	fille	d with	spoils, tamped wi	th backhoe bucket		No Groundwa	ater E	ncou	Intere	ed								
┢	(t)							E	ř				Laboratory Data						
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				Lean CLAY (CL); Ha Moderate Cementation	rd; Dark; Grayish Brown; on; PP>4.5	Dry; Few Fi	ne SAND; Weak to												
		1																	
		2		SANDY Lean CLAY	(CL); Hard; Dark Yellowis	 h Brown wit	h Black Streaks; Dry;	-											
		3				- 1.0													
		4							1	>4.5									
		5		Moist															
		6			ID (CL): (Ven: Stiff): Dark	Brown: Moi	st: Little Fine SAND: No	-											
		7		Cementation	(CL), (Very Sun), Dark		SI, LIMET THE SAIND, NO												
		8																	
		0		Bottom of test pit at 8	3.0 ft bgs														
		9		No Free Groundwate	r Encountered	ICKEL											=		
		10		Bulk A 0-2 ft bgs													=		
		11		Bulk B 2-6 ft bgs															
		12		Bulk C 6-8 IL bgs													=		
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		2		Cementation; PP>4.					1	>4.5										
		3		Cementation; PP>4	ard; Dark Yellowish Brown 5	; Moist; Few	Fine SAND; Weak													
		4							2	>4.5										
		5																		
		6		(Ven/ Stiff): Orangi	ich Brown: No Comentatio	'n														
		7			Sin Brown, No Cementatio	1														
		8																		
		9		Bottom of test pit at 8	8.0 ft bgs s tamped with backhoe bu	icket														
		10		No Free Groundwate	er Encountered	JCKEL											=			
		10		Bulk A 0-1.5 ft bgs													=			
		11		Bulk B $1.5-2.5$ ft bgs	S												-			
		12		Bulk D 6-8 ft bgs																
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			Few Fine SAND; Mod	derate Cementation; PP>	×4.5	II DIOWIT Streaks, Dry,														
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	3		SANDY Lean CLAY (CL); Hard; Dark Yellowis	 sh Brown wit	h Black Streaks; Moist;	1													
	4		Some Fille SAND, W		.0															
	5																			
	6																			
	7		Lean CLAY (CL); (Ve	ry Stiff); Dark Brown; Mo	pist; Few Fine	e SAND; No Cementation	+													
			Bottom of test pit at 8	.0 ft bgs																
	9		Backfilled with spoils, No Free Groundwater	, tamped with backhoe b r Encountered	ucket											=				
	10		Bulk A 0-3 ft bgs													=				
	11		Bulk B 3-6.5 ft bgs													-				
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TEST PITS - LEVEE 3842.X TEST PITS (10_29_20).GPJ LIBRARY_2019.GLB 11/17/20

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ł	OPERATOR'S NAME					EQUIPMENT							TOTAL DEPTH OF TEST PIT					
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	Test						WATER DURING EXCAV		N				Bulk Bag					
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		3		Lean CLAY with SAN Streaks; Dry; Little Fi	ND (CL); Hard; Dark Yello ine SAND; Moderate Cerr	wish Brown nentation; Pf	with Orangish Brown											
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		5	¥//	Moist														
		6		(Very Stiff); Dark Y	ellowish Brown; No Ceme	entation												
		7																
		8			0.64													
		9		Bottom of test pit at a	3.0 π bgs	icket												
		10	=	No Free Groundwate	r Encountered	JCKEL											Ē	
		10		Bulk A 0-3 ft bgs													=	
		11		Bulk B 3-5.5 ft bgs														
		12	=	Bulk C 5.5-8 ft bgs													=	
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LO	GGED BY	BEGIN DATE	COMPLETION DATE	TEST PIT	LOCATION (Lat/Long or	North/	East ar	nd Dat	um)		HOL	E ID				
CO	DIVI DNTRACTOR	10-19-20	10-19-20	TEST PIT	LOCATION (Offset, Stati	on, Lin	e)				SUF	RFACE	ELEV	ATION		
B OP	PERATOR'S NAM	E		EQUIPMENT							TOTAL DEPTH OF TEST PIT					
K		HOD		CAT 420 Backhoe							8.0 ft					
T	Test Pit 2'								B	ulk B	ag	(3)				
TE B	rEST PIT BACKFILL AND COMPLETION GROUNDWATER DURING EXCAVATION Backfilled with spoils, tamped with backhoe bucket No Groundwater Encountered															
		• • •														
ŧ						u	ēr			L	abo	orato	ory Da	ata		
Z	E E					ocati	lumb	leter	(%	ity						
VAT	TH (DESCRIPT	ION		ple L	ple N	et	ture ent (Dens		ticity	#200	ar ngth	tiona	
μ	Mate Grap					Sam	Sam	Pere	Mois	Dry (pcf)	Lindu	Plas	₽%	Shei Strei (psf)	Addi	
		Lean CLAY with SAN	ND (CL); Hard; Dark Grayi	ish Brown; D	ry; Fine SAND; Weak											
		Comonation, 1124.	0													
	2															
	3	SANDY Lean CLAY/	CLAYEY SAND (CL/SC);	Hard/Very D	Dense; Dark Yellowish											
		brown, bry, weak o		in oand, i	1 - 4.0											
	5															
	6	SAND; Little Fines); (Dense); Dark Yellowisr	n Brown; Mo	st; Fine to Medium											
	7															
	8															
		Bottom of test pit at a	3.0 π bgs	ualvat											=	
		No Free Groundwate	er Encountered	ICKEL											=	
		Bulk A 0-2.5 ft bgs													=	
	11	Bulk B 2.5-5.5 ft bgs	5												Ξ	
	12	Bulk C 5.5-8 ft bgs													Ξ	
	13														=	
	14														_	
															=	
															=	
20	16														-	
1/17/	17														-	
GLB 1	18														=	
2019.0	19														_	
ARY_															=	
LIBR															-	
GPJ	21														=	
9_20).	22														-	
(10_2	23														_	
PITS (24														_	
EST															=	
42.X																
EE 38					PROJECT NAME OPUD South Yub:	a Sew	ver ar	nd Wa	ater	F	ILE N 384	NO. 2.X	HOLE I	5		
LEVE							R	OUTE		I			POST	ſMILE		
- STIC		ACKDI	LDA		CLIENT											
ESTF	BL	ACKBU	JKN		Jacobs Engineeri PREPARED BY	ng	0	HECK	ED BY	/		SH	EET			
⊢L	CC	JNSULI	ING		SS							1	of 1			

Appendix D3: Laboratory Tests for WWTP not complete at the time of this Report



APPENDIX C: Site-Specific Design Spectra Calculation

In this appendix we present the details of our site-specific ground motion analysis performed in accordance with Chapter 21 of ASCE 7-16 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. We calculated:

- Site Classification D per ASCE 7-16 Table 20.3-1.
- Probabilistic geometric mean (MCE_G¹) and risk targeted maximum considered earthquake (MCE_R²) response spectra for a 5% damped, 2% probability of exceedance within a 50 year period (2,475 year return period).
- Design Earthquake (DE³) response spectra.
- Design acceleration parameters.
- Maximum considered earthquake geometric mean (MCE_G) peak ground acceleration (PGA_M).

C1.0 PROBABILISTIC SEISMIC HAZARD ANALYSIS

Methodology

We performed a site-specific probabilistic ground motion analysis in accordance with ASCE 7-16 Section 21.2.1.2. A probabilistic analysis is used because the location, recurrence interval, and magnitude of future earthquakes are uncertain.

To develop the site-specific probabilistic MCE_R response spectra we:

- Used the United States Geological Survey (USGS) Unified Hazard Tool⁴ to develop uniform hazard curves for spectral periods ranging from 1 to 5 seconds and calculate the MCE_G response spectra.
- 2. Applied scaling factors (per ASCE 7-16,21.2) to each hazard curve to calculate the maximum response in the horizontal plane.
- 3. Used the scaled hazard curve data and the USGS Risk-Targeted Ground Motion Calculator⁵ to develop the risk targeted ground motion for selected periods (maximum of 5 seconds).
- 4. Plotted the risk targeted ground motion at selected periods to create the site-specific MCE_R response spectra.

¹ MCE_G - The most severe earthquake effects considered by ASCE 7-16 without adjustment for targeted risk.

 $^{^{2}}$ MCE_R - The most severe earthquake effects considered by ASCE 7-16 adjusted to the orientation considered to provide the maximum horizontal response.

³ DE – The earthquake effects that are 2/3 of the corresponding risk-targeted maximum consider MCE_R effects.

⁴ https://earthquake.usgs.gov/hazards/interactive/

⁵ https://earthquake.usgs.gov/designmaps/rtgm/



Results

Figure C-1 shows the calculated site-specific MCE_G and MCE_R probabilistic spectra.



Figure C-1 – MCE_G (Geometric mean) and MCE_R (Risk Targeted) site-specific spectra for 2% probability of exceedance in 50 years.



Table C-1: Probabilistic MCE _R and MCE _G Spectral Accelerations (g's)						
Period	Probabilistic MCE _G Spectra	Scaled Probabilistic MCE _R Spectra				
0	0.317	0.334				
0.1	0.570	0.600				
0.2	0.785	0.830				
0.3	0.835	0.906				
0.5	0.769	0.870				
0.75	0.607	0.721				
1	0.485	0.603				
2	0.266	0.337				
3	0.180	0.234				
4	0.135	0.180				
5	0.108	0.147				

Table C-1 shows the calculated spectral values for the probabilistic MCE_R and MCE_G spectra.

Figures C-2 through C-5 show the deaggregation of the probabilistic seismic hazard results for MCE_G hazard level for the PGA, 0.2, 1, and 5 second periods. The faults that dominate the hazard at the site are:

- PGA and 0.2 second periods The Great Valley Mysterious Ridge and Hunting Creek-Bartlett Springs connector.
- 1 second period The San Andreas fault, Hunting Creek-Bartlett Springs connector, Great Valley Mysterious Ridge, and Rodgers Creek-Healdsburg.
- 5 second period The San Andreas fault and Hunting Creek-Bartlett Springs connector⁶

⁶ Deaggregation results show the Cascadia Megathrust governs at the 5 second period, however we reference only the San Andreas fault and Hunting Creek-Bartlett Springs connector because the Cascadia Megathrust is over 120 miles away.





Figure C-2- Deaggregation for PGA (MCE_G)



Figure C-3- Deaggregation for 0.2 seconds (MCE_G)

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Figure C-4- Deaggregation for 1 second (MCE_G)





C2.2 Deterministic Analysis

The ASCE 7-16 Amendment for 21.2.3 states that when the largest probabilistic spectral response acceleration is less than 1.2 F_a , the site-specific MCE_R shall be taken as the site-specific probabilistic spectrum. This amendment applies to our site; therefore, a deterministic site-specific spectrum was not calculated.

C2.3 Recommended Site-Specific MCE_R and Design Response Spectra

Figure C-6 and Table C-2 compare the calculated site-specific probabilistic MCE_R spectra, the MCE_R spectra calculated in accordance with ASCE 7-16 Section 11.4.7, 80% value of the ASCE 7-16 Section 11.4.7 MCE_R spectra, and the recommended MCE_R spectra.



Figure C-6 – Site-Specific Probabilistic MCE_R Spectrum, ASCE 7-16 Section 11.4.7 MCE_R Spectrum, 80% of ASCE 7-16 Section 11.4.7 MCE_R Spectrum, and the recommended MCE_R Spectrum.





Table C-2: Comparison of Recommended and ASCE 7-16 Section 11.4.7 Spectra							
Period	Site-Specific Recommended MCE _R Spectrum	ASCE 7-16 11.4.7 MCE _R Spectrum	80% of the ASCE 7-16 11.4.7 MCE _R Spectrum	Recommended MCE _R Spectrum			
0	0.335	0.283	0.227	0.335			
0.1	0.600	0.539	0.431	0.600			
0.166	0.760	0.708	0.567	0.760			
0.2	0.830	0.708	0.567	0.830			
0.3	0.906	0.708	0.567	0.906			
0.5	0.870	0.708	0.567	0.870			
0.75	0.722	0.708	0.567	0.722			
0.865	0.660	0.708	0.567	0.660			
1	0.603	0.613	0.490	0.603			
2	0.337	0.306	0.245	0.338			
3	0.234	0.204	0.163	0.234			
4	0.180	0.153	0.123	0.180			
5	0.147	0.123	0.098	0.147			

For this site the site-specific probabilistic spectra controls the site response for all periods.

ASCE 7-16 Section 21.3 defines the design response spectrum (DE) as 2/3 times the site-specific MCE_R spectrum. The design spectral response acceleration at any period is not taken as less than 80% of spectral acceleration determined in accordance with ASCE 7-16, Section 11.4.6, where F_a is determined using Table 11.4-1 and F_v is determined using Section 21.3. Figure C-7 and Table C-3 present the calculated DE response spectra, the ASCE 7-16 section 11.4.6 Spectrum, and 80% of the ASCE 7-16 11.4.6 Spectrum. The site-specific design response spectrum is greater than the response spectrum calculated using ASCE 7-16 Section 11.4.6 for all periods and therefore governs the recommended design response spectrum.





Figure C-7 – Design Response Spectrum (Greater of 2/3*SaM or 80% of General Response Spectrum), ASCE 11.4.6 Design Response Spectrum, and 80% of 11.4.6 Design Response Spectrum.



Table C-3: Comparison of Recommended and ASCE 7-16 Section 11.4.6 Spectra						
Period	Recommended Design Response Spectrum	ASCE 7-16 11.4.6 Response Spectrum	80% of ASCE 7-16 11.4.6 Response Spectrum			
0	0.223	0.189	0.151			
0.1	0.400	0.359	0.288			
0.166	0.507	0.472	0.378			
0.2	0.553	0.472	0.378			
0.3	0.604	0.472	0.378			
0.5	0.580	0.472	0.378			
0.75	0.481	0.472	0.378			
0.865	0.440	0.472	0.378			
1.0	0.402	0.408	0.327			
2.0	0.225	0.204	0.163			
3.0	0.156	0.136	0.109			
4.0	0.120	0.102	0.082			
5.0	0.098	0.082	0.065			

Design Acceleration Parameters

We calculated the site-specific acceleration parameters in Table C-4 in accordance with ASCE7-16, Section 21.4 and 21.5.3.

Table C-4: Design Spectral Acceleration Values and Peak Ground Acceleration						
Parameter	Acceleration Value (g's)					
S _{MS}	0.544 ¹					
S _{M1}	0.490 ²					
S _{DS}	0.815 ³					
S _{D1}	0.7354					
PGA _M	0.3175					

 $^1S_{\text{MS}}$ 1.5 times the S_{DS} value in Table C-4

 $^2S_{\text{M1}}$ 1.5 times the S_{D1} value in Table C-4

³S_{DS} 90% of the maximum spectral acceleration from the site-specific spectrum (0.399)

 $^{4}S_{D1}$ Maximum value of the product of TS_a (time multiplied by spectral acceleration value) for periods of 1 to 2 seconds for sites with V_{S30} of greater than 1,200 ft/s)

⁵The site-specific MCE_G peak ground acceleration (PGA_M) is the lesser of the probabilistic or deterministic mean peak ground acceleration.

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Olivehurst Public Utility District Wastewater Treatment Plant Expansion and Upgrade Project Schematic Design – Preliminary Geotechnical Exploration Report

PREPARED FOR:	Olivehurst Public Utility District (OPUD)
PREPARED BY:	Allen Evans/CH2M HILL
DATE:	February 13, 2004

Introduction

This technical memorandum (TM) presents the preliminary results of the geotechnical exploration for the Olivehurst Wastewater Treatment Plant (plant) Phase 1 and 2 expansion and upgrade project. The project includes construction of new facilities and modifications to existing facilities to expand treatment capacity. The geotechnical exploration consisted of observing and testing surface and subsurface soil conditions in areas where new or remodeled facilities are planned. This TM was to provide initial geotechnical recommendations for the preliminary design and construction, and recommendations will be reevaluated when final facility layout and designs are established. To accomplish this, the scope of work includes the following:

- Conduct a site visit to observe site layout and existing surface soil conditions.
- Perform subsurface exploration using soil borings.
- Conduct laboratory testing to evaluate engineering properties of subsurface soils.
- Analyze subsurface conditions for the proposed facilities.
- Recommend preliminary design criteria for foundations, excavation and backfill, and lateral earth pressure for purposes of the preliminary design.

Project Description

The proposed treatment plant expansion is located in Olivehurst, California. The layout of the existing is show on Figure 4-1. New facilities include influent screening and grit removal facilities, influent pump station, primary effluent distribution box, potential headworks expansion, primary clarifier, oxidation ditches, secondary clarifiers, flow equalization basin, filter influent pump station, tertiary filters, chemical storage/feed building, anaerobic digesters, and solids handling building. In addition, modifications to change the chlorine contact basin to an ultraviolet disinfection system, and modifications to the control building will be made. To accommodate the facility expansion, a new levee will be constructed on the northwest side of the plant. The new levee will extend approximately 200 feet north of the existing levee.



The area proposed for anaerobic digesters and solids handling building is occupied by the existing solids storage ponds. The area proposed for the flow equalization basin is currently a portion of the emergency storage pond. Locations of the influent screening and grit removal facilities, influent pump station, primary effluent distribution box, and primary clarifiers are proposed for the area north of the plant's north levee into the a portion of the farm field north of the plant. All other facilities are proposed for areas unoccupied by structures. Yard piping may be present in these areas.

Previous Geotechnical Exploration

The previous geotechnical exploration report prepared by CH2M HILL was reviewed. The geotechnical investigation was performed in 1975 for the expansion and modernization of the plant.

Field Exploration

The field exploration was performed on January 12 and 13, 2004, and consisted of a site reconnaissance and subsurface exploration. The site reconnaissance was conducted to observe existing site conditions, topography, and surface soil and water conditions. The subsurface exploration consisted of drilling four borings at the locations shown in Figure 4-1. Soil borings were performed by using a CME-550 track-mounted drill rig equipped with an 8-inch OD hollow-stem auger. The borings were advanced to depths between 25 and 40 feet below ground surface (bgs).

In situ testing and soil sampling were performed in the borings using the Standard Penetration Test (SPT) in accordance with ASTM D1586 at approximately 5-foot intervals throughout the depth of each boring. The SPT provides a disturbed sample of the soil and an empirical indication (N-value) of the soil density. Additional sampling was performed by driving modified California samplers lined with 2.5-inch-diameter sleeves and by hydraulically pushing 3-inch-diameter, thin-walled steel Shelby tubes into the soil at various depths in the borings.

The field exploration was directed by CH2M HILL geotechnical personnel. The soils encountered were visually classified in approximate accordance with ASTM D2488 (visual-manual procedure for description of soils). Soil boring logs are included in Attachment 4-1. Upon completion of drilling, the soil borings were backfilled with cement gout to the ground surface using the hollow-stem auger to tremmie the grout to the bottom of the boring.

Geology

The plant is located in the Great Valley geologic province. The plant is underlain by the Victor Formation of Pleistocene age. The Victor Formation is composed of interbedded sand, silt, and clay with lenses of gravel. The formation includes some meandering stream channel deposits of poorly sorted cobble, gravel and sand. Shallow materials typically contain hardpan. Infiltration rates are very low.
Subsurface Conditions

The general area around the site is a very flat, poorly drained plain used primarily for farmland. The plant facilities are surrounded by 6 to 10 feet tall levees, with the levee road at Elevation 63. The elevation inside the levees varies between Elevations 52 and 59.

The upper 3 to 5 feet of subsurface material consists of sandy clay. The sandy clay was soft and saturated in the unpaved areas around the existing structures. The grassy area at B-10 did not have a saturated upper layer due to drainage provided by underdrains from the old sludge drying bed. Under this upper layer, a hard, sandy clay that compromises the Victor Formation hardpan was encountered up to 8 feet bgs. Pocket penetrometer readings in the hardpan were greater than 4.5 tons per square foot (tsf), the maximum reading on the instrument. Penetration was less than 0.1 inch. The hardpan was underlain by layers of medium dense to dense clayey sand, and stiff to very stiff sandy clay. Pocket penetrometer readings in these soils were all greater that 3 tsf. In Borings B-8 and B-9, a 6- to 7-foot-thick gravely sand and sandy gravel layer was encountered at Elevation 31. At Boring B-10, a gravely sand layer was encountered from elevation from 42 to 39 feet, and no similar layer was encountered at Boring B-11. In Borings B-8 and B-9 the gravel layer was underlain by multiple layers of clayey sand and sandy clay. The gravel layer in B-10 was underlain by clayey sand to Elevation 29. Under this clayey sand, a sandy silt was encountered. At Boring B-11, clayey sand layer was found from the surface to 23 feet bgs that was underlain by silty sand.

Groundwater was encountered in all borings at approximately Elevation 33. These water levels were taken at the time of drilling inside of the hollow-stem auger. Drilling was paused for 10 minutes before measuring the water level, however, it should be noted that the water levels on the boring logs were not allowed enough time to reach equilibrium. Site groundwater levels may also vary depending on the season. Surface water was encountered in the first soil layer and it is believed this water is perched on the hardpan layer.

Laboratory Testing

A testing program was developed to provide classification and engineering properties of the soils. Particle-size Analysis of Soils (ASTM D422), Particles Passing the No. 200 sieve (ASTM C1140), Moisture Content (ASTM D2216), Atterberg Limits (ASTM D4318), Unit Weight (ASTM D2937), Direct Shear Testing (ASTM D3080), and Modified Proctor (ASTM D1557) tests were conducted on selected soil samples. Test results are summarized and included in Attachment 4-2.

Site Seismicity

Probabilistic Seismicity

A probabilistic assessment of the peak ground acceleration of the site was obtained from published U.S. Geological Survey (USGS) and California Geological Survey (CGS) sources. As part of the National Seismic Hazard Mapping Project (2002), a peak ground acceleration of 0.12g was obtained, with the probability of exceedance of 10 percent in 50 years.

Using the probabilistic 1996 Caltrans California Seismic Hazard Map, the maximum credible earthquake (MCE) is magnitude 6.5 produced by the Prairie Creek-Spencerville-Dentman

fault estimated to be approximately 12 miles east of the site. Based on this map, the estimated peak ground acceleration (PGA) is 0.2 g.

1997 UBC Design Criteria

Table 4-1 presents UBC seismic coefficients and factors for the plant. The subsurface material is stiff to hard sandy clay and medium to dense clayey sand.

TABLE 4-1

UBC 1997 Seismic Coefficients and Factors

Olivehurst Waste Water Treatment Plant Phase 1 and 2 Expansion and Upgrade Schematic Design

Factor or Coefficient	Value	UBC Table Number
Soil Profile Type	Sp	16-J
Z	0.30	16-1
Ca	0.36	16-Q
Cv	0.54	16-R
Seismic Source Type	В	16-U
Na	1.0	16-S
Nv	1.0	16-T

Recommendations

Excavation

All anticipated structures are listed in Table 4-2, together with their estimated excavation depths. Some structures require deep excavations up to approximately 21 feet bgs. As described previously, subsurface materials consist of sandy clay, clayey sand, and gravel. The subsurface materials are anticipated to be excavatable with conventional equipment. Highly organic, soft surface soils should be stripped a minimum of 3 feet outside structure foundation areas. It is anticipated that soils other that highly organic soils can be stockpiled for use backfill. Softer near surface soil may be stockpiled for use in the levee after vegetation and roots are removed.

The final excavation bottom for any structure should be cleared of loose material and compacted to at least 90 percent of its maximum dry density in accordance with ASTM D1557 before placing any concrete. The base of all excavations should be approved by a geotechnical specialist to verify its capability to support the overlying structure without unacceptable settlement.

Where excavations are required adjacent to existing structures, excavations should not be carried below the base of the existing footings unless there is a stable slope 1:1 or flatter that will not ravel or cause loss of support to the existing structure.



TABLE 4-2

Excavation and Foundation Depths for Structures Requiring Deep Excavation

Olivehurst Waste Water Treatment Plant Phase 1 and 2 Expansion and Upgrade Schematic Design

Structure	Existing Ground Surface Elevation	Estimated Depth to Bottom of Lowest Foundation (ft)	Elevation at Bottom of Excavation
Influent Pump Station	56	20	35
Headworks	56	21	34
Primary Effluent Distribution Box	56	11	44
Primary Clarifiers	57	12	43
Oxidation Ditch	57	13	42
Secondary Clarifier	55	20	33
Flow Equalization Basins	53	12	39.5
Filter Influent Pump Station	56	19.5	34.5
Filtration	55	Slab On Grade	52
Chemical Storage	55	Slab On Grade	52
RAS/WAS Pump Station	57	Slab on Grade	53
Anaerobic Digesters	53	5	46
Solids Handling Building	53	Slab on Grade	51
Levee	56	56	52



Imported granular fill should be used as backfill under below grade structures. Granular fill should be placed in loose lifts not exceeding 8 inches, moisture conditioned as necessary, and compacted to at least 95 percent of its maximum dry density in accordance with ASTM D1557 within influence zones of structures unless otherwise recommended below. The influence zone is defined as the area beneath a structure within planes sloped downward and outward at a 60° angle from the horizontal measured from the outermost footing element. A minimum of 12 inches of imported granular fill should be placed under shallow foundations. A minimum of 6 inches of granular fill should be placed below floating slabs. Granular fill should be placed in loose lifts not exceeding 8 inches, moisture conditioned as necessary, and compacted to at least 95 percent of its maximum dry density in accordance with ASTM D1557.

Native soil obtained from onsite excavations, blended to provide a homogeneous mixture, and free of soft surface soils and organic material and debris, may be used as backfill around structures. It may also be used as backfill in areas of over-excavation for shallow foundations not requiring granular fill. Native soil backfill should be placed in loose lifts not exceeding 8 inches, and compacted to at least 90 percent of its maximum dry density and within 2 percent of optimum moisture content in accordance with ASTM D1557. The backfill should be placed and compacted in even lifts around the structure perimeter.

Processed native material including softer near surface soils may be used as fill for construction of levee expansions. Fill should be placed in loose lifts not exceeding 8 inches, moisture conditioned as necessary, and compacted to at least 90 percent of its maximum dry density in accordance with ASTM D1557. The levee slopes should be constructed at a maximum slope of 2:1, horizontal to vertical, to match existing slopes.

Groundwater Design Considerations

Multiple excavations will extend near the top of the estimated groundwater level found at the time of drilling; therefore, some dewatering may be required. Depending on the season, surface water perched on the hardpan layer may drain into the excavation and will require additional control measures to prevent inflow.

Review of previous geotechnical explorations performed at the site provide limited information on the variability of groundwater elevations at the site. No regular monitoring using peizometers has been performed to determine the response of groundwater levels to the filling of Western Pacific Interceptor Canal. The 100-year flood elevation of 60 is higher that the site elevation. Unknown gravel layers that could connect the area outside the levee to the structures inside the levee may exist. Because of these uncertainties, design of belowgrade structures should use the ground surface as the static water level.

Lateral Earth Pressures

Restrained structure exterior walls should be designed to resist at-rest earth pressures. Walls free to move about the top should be designed to resist active pressures. Passive pressures may be used to resist lateral forces. Walls should be designed to resist the static lateral equivalent fluid pressures shown in Table 4-3 plus any equipment or earth surcharge loads. Concrete footings and slabs cast against undisturbed soil may use a sliding friction factor of 0.4 in resisting lateral loads.

TABLE 4-3

Lateral Earth Pressures

Olivehurst Public Utility District Wastewater Treatment Plant Expansion and Upgrade Project Schematic Design

	Equiv	alent Fluid Pressur	es (pcf)
Soil Type—Drainage Condition	Active	At-rest	Passive
Native-Drained	40	60	350
Native—Undrained	90	100	200
Imported Granular Backfill – Drained	40	60	400
Imported Granular Backfill – Undrained	80	90	275

Note: Assumed Values: Native y : 114 pcf; (c): 30 °, ysat : 130 pcf; Imported ysat : 140 pcf; (c): 35 °

Ground motion during earthquakes tends to increase the earth pressure above static levels. Retaining walls should be designed to resist a dynamic active lateral force increase of $16^{*}H^{2}$ pounds per linear foot of wall, which acts at a height of 0.6*H above the base of the wall (H = height of wall). The dynamic lateral force increase should be used in addition to the static active earth pressure force.

Foundations

The proposed structures should be supported on foundations similar to those that have been successfully used for similar facilities at this plant. Based on a visual reconnaissance of the existing facilities, there is no evidence of significant settlement, either total or differential. New facilities should be supported on strip footings, mat foundations, rectangular column footings, or combinations as required to provide support.

The shallow foundations for the filtration building, RAS/WAS pump station, anaerobic digesters, and solids handling building should be designed for a maximum allowable net bearing pressure of 2,000 pounds per square foot (psf). Total post-construction settlement for these near-grade structures is expected to be less than 0.75 inch. Footings should be placed a minimum of 1.5 feet below finish grade. Mat foundations should be keyed a minimum of 1 foot below finish grade. All other belowgrade structures should be designed for a maximum allowable net bearing pressure of 2,500 pounds per square foot (psf). Loads from these structures are not expected to be significantly greater than the current overburden pressures, therefore, total post-construction settlement is expected to be less than 0.5 inch. An increase of up to one-third of the allowable bearing pressure may be used for short-term loading such as wind, seismic, or equipment loading.

Construction Observation and Testing

If any unusual conditions are encountered at the footing locations, a geotechnical specialist should review the excavation bottom and determine if revisions are needed. Compaction testing and periodic fill observations should be performed during placement of engineered fill. Photos should be taken to document specific conditions.

References

California Geological Survey/U.S. Geological Survey, Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (Revised April 2003).

CH2M HILL. 1975. Geotechnical Exploration Report for Olivehurst Public Utility District

Mualchin, Lalliana. July 1996. THE CALTRANS CALIFORNIA SEISMIC HAZARD MAP 1996.

Limitations

This technical memorandum has been prepared for the exclusive use of the Olivehurst Public Utility District for specific application to Phase 1 and 2 plant expansion and upgrade schematic design. It has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The analyses and preliminary recommendations contained in this report are based on the data obtained from our exploratory borings for the proposed structures. These borings indicate subsurface conditions only at specific locations and times, and only to the depths pene-trated. They do not necessarily reflect strata variations that may exist between such locations. Subsurface conditions and water levels at other locations may differ from conditions occurring at these indicated locations. The passage of time may result in a change in the conditions at these locations. If variations in subsurface conditions from those described are noted during construction, recommendations in this report must be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by CH2M HILL. CH2M HILL is not responsible for any claims, damages, or liability associated with the interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the express written authorization of CH2M HILL.

Attachment 4-1 Soil Boring Logs

BORING AND TEST PIT LOG LEGEND:

SAMPLE TYPE:

- Bulk BAG SAMPLE
 - SS SPLIT BARREL (ASTM D1586 UNLESS OTHERWISE NOTED)
- MC MODIFIED CALIFORNIA DRIVEN SLEEVE SAMPLE
- SH SHELBY TUBE SAMPLE

STANDARD PENETRATION TEST:

6"-6"-6" – THE NUMBER OF BLOWS FOR THREE 6-INCH INCREMENTS REQUIRED FROM A 140-LB HAMMER FALLING 30 INCHES TO DRIVE A STANDARD 2-INCH O.D. SPLIT-BARREL SAMPLER (ASTM D1586)

(N) – THE NUMBER OF BLOWS FOR THE SECOND AND THIRD 6-INCH INCREMENTS

NOTES:

- THE BORING AND/OR TEST PIT LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITION AND WATER LEVELS ONLY AT THE SPECIFIC LOCATIOINS AND DATES INDICATED. SOIL CONDITIONS AND WATER LEVELS OCCURING AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BOING AND/OR TEST PIT LOCATIONS. ALSO, THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE LOCATIONS.
- BORING LOCATIONS AND ELEVATIONS ARE APPROXIMATE. ELEVATIONS WERE ESTIMATED FROM 1975 MAPPING. LOCATIONS WERE ESTIMATED FROM MAJOR STRUCTURES
- BORINGS AND WERE DIRECTED BY CH2M HILL GEOTECHNICAL PERSONEL. THE SUBSURFACE MATERIALS WERE CLASSIFIED IN APROXIMATE ACCORDANCE WITH ASTM D2488 (VISUAL-MANUAL PROCEDURE FOR DESCRIPTION OF SOILS).
- IN THE COMMENTS SECTION OF THE SOIL BORING LOGS, PP STANDS FOR POCKET PENETROMETER TEST (UNCONFINED COMPRESSIVE STRENGTH.

BORING AND TEST PIT LOG LEGEND



PROJECT NUMBER	BORING NUMBER				
186380	B-8	SHEET	a.	OF	2

SOIL BORING LOG

PROJECT Olivehurst WWTP Expansion

LOCATION Clarifier Location

ELEVATION 54' est.

DRILLING CONTRACTOR Taber

DRILLING METHOD AND EQUIPMENT CME-550 Track Rig

TE		SAMPLE		STANDARD	SOIL DESCRIPTION	COMMENTS
DEPTH BELON SURFACE (F	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	RESULTS 6" -6" -6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
1	1.5	SS-1	12"	1-2-2 (4)	<u>SANDY CLAY</u> (CL), reddish/orange brown, moist, soft -	0.5 tsf - Pocket Pen (PP) Difficulty setting up on soft ground, outrigger sinking
4					-Transition	
6.0 —	5 6.5	SS-2	18"	12-15-18 (33)	SANDY CLAY (CL), orange brown to brown, dry, hard, probably hardpan layer	9:07 >4.5 tsf on PP (maxed out)
-	10					
- 0.0	11.5	SS-3	18"	5-12-13 (25)	CLAYEY SAND (SC), light brown with some black coarse sand, dry, medium	4.25 tsp - PP
5.0 -	15		_		- - SANDY CLAY (CL), orangeish light brown,	1 - Sleeve
	16.5	MC-4	9"	4-5-6 (11)	moist, stiff	
0.0	20	8 -				425 osi dowo orospuro @ 215'
-	22	SH-5	2,0'		brown, moist, firm to stiff	
-	23.5	SS-6	18''	21-43-40 (83)	SANDY GRAVEL (GP), bluish grav. wet.	
5.0 -	25	1		10.05.15	very dense, small to medium Similar, dense, 1 - 2" gravels	
-	26.5	SS-7	18"	13-23-23 (46)	Now (GW)	
-	30				- Transition	

CHALL					PROJECT NUMBER 186380	BORING NUMBER B-8 SHEET 2 OF 2
					SOIL	BORING LOG
ROJEC	T Oliv	ehurst W	WTP Ex	pansion	LOCA	ATION Clarifier Location
EVA	TION 5	4' est.			DRILLING CONTRACTOR Taber	Vac.
ATER	ng met Level	HOD AN	bgs 1/1	PMENT CME-550 12/04	D Track Rig START 1/12/04 8:20FINI	SH 1/12/04 12:00 LOGGER Allen Evans
F		SAMPLE		STANDARD	SOIL DESCRIPTION	COMMENTS
	IAL	Q.	ERY	TEST RESULTS	SOIL NAME, USCS GROUP SYMBOL, COLUMNISTURE CONTENT, RELATIVE DENSI	OR, DEPTH OF CASING, DRILLING RATE
SURFA	INTER		RECOV (FT)	6* -6* -6* (N)	OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	TESTS AND INSTRUMENTATION
-	30 31,5	SS-8	2"	6-15-17 (32)	<u>SANDY CLAY</u> (CL), yellowish light brow moist, hard	wn, Very little recovery -
-					Transition	
6.0 -	35				STI TY CLAY W/some SAND zones (CL	1 257 tef - PP fractured sample
		0-22	19"	8-18-21	light brown with orange stains, moist, h	hard

-	36.5	SS-9	18"	8-18-21 (39)	light brown with orange stains, moist, hard coarse sands	
	- 31	SH-10	1.1		Same	750 psi down pressure, stopped after 1.3' push, end slightly crushed
	39	dir io				
40.0 -	40				SANDY OLAY (CL) light brown with supty	
-	41.5	SS-11	12''	12-17-22 (39)	colored zones, moist, hard	PP > 4.5 tsf
-					End Boring @ 41.5'	Backfilled with neat cement, grout 13:10, some cuttings fell in hole while pulling auger.
-						
45.0 -					-	-
1						
]						
50.0 -						
_						
-						
-						
-						
55.0 -						-
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9						
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186380	B-9	SHEET	1	OF	2	-

PROJECT Olivehurst WWTP Expansion

LOCATION Extreme South Portion of Property

ELEVATION 54' est.

DRILLING CONTRACTOR Taber

DRILLING METHOD AND EQUIPMENT 8" HSA, CME-550 Track Rig

	PENETRATION	JOIL DESCRIPTION	COMMENTS
TYPE NUMBE NUMBE RECOV (FT)	RESULTS 6" -6" -6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
SS-1 12"	2-2-2 (4)	<u>SANDY CLAY</u> (CL), yellowish brown, moist, soft	1.25 tsf - Pocket Pen (PP)
	1.1	Similar, color reddish brown	
		-Transition	
SS-2 18"	11-18-26 (44)	brown, dry, hard, sand medium grained and black, probably local hardpan layer	24.5 ISI - PP maxed out
SS-3 18"	6-9-13 (22)	<u>CLAY SAND</u> (SC), light brown-gray, moist, medium	>4.5 tsf - PP maxed out
SH-4 2'		<u>CLAYEY SAND</u> (SC), reddish brown, moist, very stiff -	
SS-5 18"	5-10-14 (24)	Same	.3 tsf - PP
_		CLAYEY SAND (SC), reddish brown, moist,	
SS-6 18"	5-8-8 (16)	medium, fine grained	
		-Transition	⊈ Groundwater @ 23.7' @ time of drillin Grinding
SS-7 18"	15-26-32 (58)	SANDY GRAVEL (GW), blueish gray, wet, very dense, well graded with maximum size ~2"	5.0170.0
SS-7	18"	18" ^{15–26–32} (58)	18" 15-26-32 (58) SANDY GRAVEL (GW), blueish gray, wet, very dense, well graded with maximum size ~2"

BORING NUMBER					
B-9	SHEET	2	OF	2	
	B-9 B-9	B-9 SHEET	BORING NUMBER B-9 SHEET 2	BORING NUMBER B-9 SHEET 2 OF	BORING NUMBER B-9 SHEET 2 OF 2

SOIL BORING LOG

PROJECT Olivehurst WWTP Expansion

LOCATION Extreme South Portion of Property

ELEVATION 54' est.

DRILLING CONTRACTOR Taber

DRILLING METHOD AND EQUIPMENT 8" HSA, CME-550 Track Rig

*Ê		SAMPLE	_	STANDARD	SOIL DESCRIPTION	COMMENTS
DEPTH BELO SURFACE (F	INTERVAL	TYPE AND NUMBER	RECOVERY (FT)	TEST RESULTS 6* -6* -6* (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	30	SS-8	18"	8-24-32	Same	
- - 35.0 — -	31.5			1007	End Boring @ 30'	Grout to surface
- - - - -						
- 15.0 — - -						
- 50.0 — -						-
55.0 -						
-						

	1994 TO 1 41 7 9 1				
186380	B-10	SHEET	1	OF	2

SOIL BORING LOG

PROJECT Olivehurst WWTP Expansion

LOCATION ORBAL Process Area

ELEVATION 57.5' est. DRILLING CONTRACTOR Taber

DRILLING METHOD AND EQUIPMENT 8" HSA CME-550 Track Rig

	uster. 7 tale	CAMPLE		OTHERIDE				
ME		SAMPLE		PENETRATION	SOIL DESCRIPTION	COMMENTS		
OEPTH BELO SURFACE (TH		RECOVERY (FT)	TEST RESULTS 6" - 6" - 6" (N) 2-7-14 (21)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION 2.5 tsf - Pocket Pen (PP)		
			18"		SANDY CLAY (CL), light yellowish gray, moist, very stiff			
- - -			11-21-33 (54)	-Transition <u>CLAYEY SAND</u> (SC), orangeish brown, dry, hard, hardpan	Bulk-1 Sampled (5' - 17') >4.5 tsf on PP (maxed out on penetration)			
0	10 10.5 12	SH-3 SS-4	6" 18"	13-20-21 (41)	<u>CLAYEY SAND</u> (SC), orangeish brown, moist, dense, fine grained	750 psi down pressure PP >4.5 tsf		
	15	SS-5	18"	6-8-16 (24)	<u>CLAYEY SAND</u> (SC), orangeish brown, moist, medium, fine to medium grained <u>GRAVELLY SAND</u> (SW), light brown-gray, moist, dense, well graded sand, small to medium gravel	-		
1					- Transition	Harder grinding		
0 -	20	SS-6	18"	10-15-21 (36)	<u>CLAYEY SAND</u> (SC), orangeish brown, moist, dense, fine to medium grained	3.25 tsf - PP		
0	25	MC+7	9"	7-8-11 (19)	Similar, higher % clay, medium	¥ 27.8 @ time of drilling 2.5 tsf - PP 1 - Sleeve		

PROJECT NUMBER BORING NUMBER 186380 B-10

SHEET 2 OF 2

SOIL BORING LOG

PROJECT Olivehurst WWTP Expansion

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LOCATION ORBAL Process Area

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ELEVATION 57.5' est.

DRILLING CONTRACTOR Taber

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DRILLING METHOD AND EQUIPMENT 8" HSA CME-550 Track Rig

T)		SAMPLE		STANDARD	SOIL DESCRIPTION	COMMENTS		
DEPTH BELO SURFACE (F	INTERVAL TYPE AND NUMBER		RECOVERY (FT)	RESULTS 6" -6" -6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION		
-	30 31.5	SH-8	21"		SANDY SILT (ML), orangeish brown to yellow brown, wet, very stiff layered system with some very thin sand lenses	Pushed 1.5' 900 psi down pressure PP - 3.75 tsf		
-	33	SS-9	18"	6-9-17 (26)		- PP - 4.5 tsf		
5.0 -	35			1	SANDY SILT with SAND lenses (ML),	- 1100 psi down pressure		
-	37	SH-10	1.9'	_	orangeish brown, moist to wet, stiff to hard, end of Shelby sample very hard	>4.5 tsf - PP maxed out		
-	38.5	SS-11	18"	7-8-11 (19)		-		
2.0 -	40				SANDY SILT (ML), orangeish brown, wet,	PP - 2.25 - 2.75 tsf		
-	41.5	SS-12	18"	6-7-11 (18)	Stiff to very stiff	Grout to surface		
-								
5.0 -								
-						-		
]						-		
						-		
-						-		
-						-		
50 -						-		
-						-		
-						-		
-						-		

PROJECT NUMBER 186380	BORING NUMBER	SHEET	1	OF	T	
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PROJECT Olivehurst WWTP Expansion

LOCATION NW Corner of Plant

ELEVATION 57.5' est.

DRILLING CONTRACTOR Taber

DRILLING METHOD AND EQUIPMENT 8" HSA CME-550 Track Rig

	1	SAMPLE		STANDADD	SOIL DESCRIPTION	CONNENTS		
8Ê	-	SAMPLE	-	PENETRATION	SUIL DESCRIPTION	CUMMENTS		
DEPTH BEL SURFACE (INTERVAL TYPE AND NUMBER		RECOVERY (FT)	RESULTS 6" -6" -6" (N)	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION		
	1.5	SS-1	18"	0-1-3 (4)	<u>SANDY CLAY</u> (CL), brown, wet, soft	0.25 tsf – Pocket Pen (PP) –		
					-Transition			
5.0 -	5		2		CLAYEY SAND (SC) vellowish brown	Unable to Packel Pen sand		
	6.5	SS-2	18"	8-9-11 (12)	moist, medium			
-								
	10							
10.0	10.5	SH-3	8"		CLAYEY SAND (SC), orangeish brown, moist, medium	1500 psi end crushed Pocket Pen >4.5 tsf		
	12	SS-4	18"	10-10-13 (23)				
	15					-		
15.0 —	16.5	SS-5	18"	3-7-5 (12)	Similar, some gravel, small size			
1		1.						
. 1	20							
- 0.0	21.5	MC-6	18"	11-20-41 (61)	<u>CLAYEY SAND</u> (SC), light brown with orange stains, moist, very dense	Catcher used		
1								
50	25							
- 10	27	SH-7	2.1		<u>SILTY SAND</u> (SM), orangeish and light yellow brown, wet, medium	900 psi down pressure		
	28.5	SS-8	18"	8-8-10 (18)		1.25 PP −27.7 ¥ WT at lime of drilling		
	60.0							

Attachment 4-2 Laboratory Testing FROM : MATERIALS TESTING, INC.

PHONE NO. : 530 222 1116

Jan. 28 2004 09:51AM P2



Materials Testing, Inc.

8798 Airport Road Redding, California 96002

865 Cotting Lane, Suite A Vacaville, California 95688 (530) 222-1116, fax 222-1611 (707) 447-4025, fax 447-4143

CLIENT: CH2M Hill 2525 Airpark Drive Redding, CA 96001-2443

CLIENT NO:	0103-003
REPORT NO:	0300-008
DATE:	01/26/04

PROJECT: Olivehurst Public Utilities District # 186380.A1.01

SUBMITTED BY: Client

DENSITY OF IN PLACE SOIL BY THE DRIVE TUBE METHOD (ASTM D2937) LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX OF SOILS (ASTM D4318) AND PERCENT MOISTURE (ASTM D-2216) DATA SHEET

Sample #	Description	Dry Density pcf.	Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Percent Moisture	
B-8 (SS-1) @ 0'	$\left(\right)$						25.2	
B-8 (SS-2) @ 5'	Brown Clayey Sand (Visual)	÷		36	17	19		
B-8 (SH-5) @ 20'	Brown Claycy Sand (Visual)	95.9	27.2		-			
B-8 (SH-10) @ 35'	Brown Sandy Clay (Visual)	90.9	38.8			يەن تىر		
B-9 (SS-2) @ 5'	Brown Sandy Clay (Visual)		-	50	22	23	19.5	
B-10 (SH-3) @10'	Brown Clayey Sand (Visual)	105.0	18.9		-			
B-10 (SH-10) @ 35'	Brown Sandy Clay (Visual)	89.8	36.6	31	29	2		
B-11 (SH-3) @ 10'	Brown Clayey Sand (Visual)	89.0	18.3					
B-11 (SH-7) @ 25'	Brown Clayey Sand (Visual)	94.1	32.6	56	32	24		
B-9 (SH-4) @15'	Brown Clayey Silt (Visual)	(74.9) 31.5	-				



















UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX E: Water Tank and Booster Station

E1: Site Plan E2: Boring and Test Pit Logs Legend Boring and Test Pit Logs E3: Laboratory Test Results





4/30/2021 3842.x AppE1 OPUD South Yuba Sewer.d





Appendix E2: Exploratory Borings for Water Tank and Booster Station not complete at the time of this Report

Appendix E3: Laboratory Tests for Water Tank and Booster Station not complete at the time of this Report

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX F

Blackburn Response to Jacobs Comments on December 11, 2020 Draft Preliminary Geotechnical Basis of Design Report



Comment Number	Subject	Page Label	Status	Author	Date	Comments	2/3/2021 Blackburn Response
1	Text Box	18	V	mtwede	14/01/2021	Suggest including pipeline borings with total depths and "not encountered" in depth to water column.	The previous table (3.1) includes all borings and the depth to ground water. Table 3.2 is intended to pull out and focus only on the borings in which we encountered ground water to show the information concisely in one location/table. We will revise the wording in the ground water column of table 3.1 to say "Not Encountered" rather than "NA" for borings that did not encounter ground water.
2	Tout Dou	22		mtwede	13/01/2021	Not sure how native soil can be used when it consists mostly of clay? see next comment.	See response to comment #4 below.
3	Text Box	22		mtwede	13/01/2021	Please provide estimated E' of native soil in case the trench width requires a composite E' to be used.	Our borings show the pipe zone will be withing stiff to hard clays. We will recommend a E' of 3,000 psi for the native, undisturbed soils.
4	Text Box	22		mtwede	13/01/2021	Was this meant to say if native soil meets these requirements, it is okay to use as fill? It would be difficult to separate out suitable material, and more reasonable to abide by Class 2 AB requirements for fill within roadways.	We are revising our report to recommend that native soil can be used for intermediate backfill provided it is free of debris and observable concentrations of organics. We are revising our report to recommend that if import fill is required for pipeline backfill, the import fill must meet the following: 100% passing the 1-inch sieve, 75% to 100% passing the #4 sieve, at least 12% passing the #200 seive, and a Plasticity Index not greater than 20.
5	Callout	23	\checkmark	mtwede	14/01/2021	12" Seems excessive for trench compaction equipment	We will reword to state: "To protect the pipe, use a maximum loose lift thickness of 12 inches for the first lift of fill placed above the top of the pipe. Use a maximum thickiness of 8 inches for subsequent lifts."
6	Text Box	23		mtwede	13/01/2021	In roadways, 1 inch of settlement for 15 foot deep trench is not likely to be acceptable. Can this be reduced using Class 2 AB instead of the specified imported fill?	Agreed. We will reword to state: "The magnitude of potential trench backfill settlement will be largely dependent on the degree and uniformity of compaction; therefore, it is important that recommend backfill methods are perfromed and compaction checked at frequent intervals to limit potential settlement." This is regardless of whether the backfill is AB or soil.
7	Text Box	44	V	mtwede	14/01/2021	Can drained EFW values be used above some maximum depth?	The EFWs we recommended are valid for buoyant soil conditons or near-saturated soil and consider the range of backfill materials that could be used. Rereading this section, we now think that using the word "undrained" could be misleading/misunderstood. Therefore, we will replace "undrained EFW" with simply "EFW". We are performing additonal evalution of these values and may update them in our Revised Draft Preliminary Report.
8	Colleut	49		KELLOGJA	08/01/21	Please verify that the design groundwater elevation for facilities at the WWTP is 15 feet below finish grade. Can the design groundwater be defined with a specific elevation as the finish grade across the site varies? a.lt is assumed that the new EQ basin will be constructed at roughly the same elevations as the existing EQ basin which has a maximum depth of approximately 24 feet. It is assumed that the center of the new secondary clarifier will be approximately 19 feet below finish grade. Please provide groundwater design considerations/mitigations for structures founded below the design groundwater elevation.	We will updated ground water information and refer to design ground water elevations rather than depths. Jacobs informed us last year that the new EQ basin would be about be 10 to 11 feet deep and therfore about 5 to 7 ft deeper than the depth of the current basin at that loation. Based on that depth, we understood that it will not be below groundwater. We will address ground water conditions at the new for clarifier after we drill the exploations for the clarifier
9	Callout	48 50		KELLOGJA	08/01/21	Please provide the site-specific response analysis. The clarifier structure design base shear is calculated per ASCE 7-16 section 15.7, and thus, the exceptions from ASCE 7 section 11.4.8 are not applicable.	ciarrer. We can complete a site-specific analysis. Is site-specific analysis requested at the water tank site also?
10	Callout	53	~	KELLOGJA	08/01/21	The secondary clarifier will not be constructed 20 deep. The top of the circumferential perimeter foundation will likely be around 14ft minimum below finish grade, with the perimeter foundation bottom around 15.5ft below finish grade. Please revise the section as required.	We will provide recommendations appropriate to whatever depth is used. Please note, comment on page 48 says clarifier will be 19' below grade
11	Callout	60	~	KELLOGJA	08/01/21	Joint spacing will be greater than 12ft and associated reinforcing will be selected to exceed the requirements of ACI 350-06 Table 7.12.2.1 to accommodate the joint spacing utilized. Please revise this section to not limit the joint spacing. If desired, the joint spacing criteria of ACI 350-06 can be referenced, or the joint spacing criteria can be deferred on the structural engineer.	We will remove limits and reference ACI 350-06
12	Callout	60	V	KELLOGJA	08/01/21	Two different minimum slab and subgrade thicknesses are listed, 4" over 6" and 6" over 8". Note that the slab will have a 6" minimum thickness to provide proper cover over the reinforcing and clearances for waterstop, so the reference to the 4" minimum thickness can be deleted to avoid confusion. Please clarify if expansive soil is required to be considered.	Will replace 4" concrete over 6" AB with 6" concrete over 8" AB
13	Callout	120	\checkmark	mtwede	13/01/2021	Clayey Sand (SC)	We will correct log P-06 to say "CLAYEY SAND (SC); very loose" instead of "SANDY Lean CLAY (CL); soft"
14	Callout	121	\checkmark	mtwede	13/01/2021	Clayey Sand (SC)	We will correct log P-07 to say "CLAYEY SAND (SC); medium dense" instead of "SANDY Lean CLAY (CL); hard"
15	Callout	135	\checkmark	mtwede	13/01/2021	(SP-SM)	We will correct log P-26 to say "(SP-SM)" instead of "(SP)"

UPDATED DRAFT PRELIMINARY GEOTECHNICAL BASIS OF DESIGN REPORT

Olivehurst Public Utilities District South Yuba Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX G

Important Information about This Geotechnical Engineering Report, Geoprofessional Business Association, 2019



Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you - assumedly a client representative - interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will <u>not</u> likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will <u>not</u> be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnicalengineering report did not read the report in its entirety. Do <u>not</u> rely on an executive summary. Do <u>not</u> read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*
responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnicalengineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform constructionphase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note* conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration* by including building-envelope or mold specialists on the design team. *Geotechnical engineers are <u>not</u> building-envelope or mold specialists.*



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Appendix F Phase 1 Initial Site Assessment (June 2021)

PHASE 1 INITIAL SITE ASSESSMENT

OPUD Yuba County Sewer and Water Infrastructure Project

Olivehurst, CA

June 2021

Prepared for:



2485 Natomas Park Drive, Ste. 600 Sacramento, CA 95833

Prepared by:



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File No. 3842.x June 28, 2021

Mr. Steve DeCou Vice President and Principal Program Manager Jacobs Engineering Group 2485 Natomas Park Drive, Ste. 600 Sacramento, CA 95833

Subject: PHASE 1 INITIAL SITE ASSESSMENT OPUD Yuba County Sewer and Water Infrastructure Project Olivehurst, California

Mr. DeCou,

Blackburn Consulting (Blackburn) prepared this Phase 1 Initial Site Assessment (ISA) for the OPUD Sewer and Water Infrastructure Project located in Yuba County, California. The purpose of the ISA is to identify hazardous and potentially hazardous materials issues that may significantly impact the Project. Blackburn prepared this ISA in accordance with our May 14, 2020 proposal.

As always, Blackburn appreciates the opportunity to be part of your team. Please call if you have questions or require additional information.

Sincerely,

BLACKBURN CONSULTING

Jaura Jona On behalf of

Matthew Kinney Project Geologist II

aura fon

Laura Long Environmental Project Manager



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EXECUTIVE SUMMARY

Blackburn Consulting (Blackburn) prepared this Initial Site Assessment (ISA) for Jacobs Engineering Group (Jacobs) for the Olivehurst Public Utilities District (OPUD) Yuba County Sewer and Water Infrastructure Project (Project) in Olivehurst and unincorporated areas of Yuba County, California. Figure 1 presents the Vicinity Map. Jacobs, in cooperation with OPUD and Yuba County, proposes to construct new water and sewer utility infrastructure. All work is planned within existing right-of-way, except for the pump and lift station locations which have not been determined.

The purpose of this ISA is to identify Recognized Environmental Conditions¹ (RECs), Historical Recognized Environmental Conditions (HRECs), and potential RECs, collectively referred to herein as RECs, that may be present within or adjacent to the Project limits. We prepared this ISA in general conformance with the American Society of Testing and Materials (ASTM) Standard E1527-13, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process".

The following section summarizes the RECS identified within and adjacent to the Project limits. Blackburn further discusses these conditions in the body of this ISA.

RECs Located Within the Project Limits

APN 014-270-002: OPUD Wastewater Treatment Facility - Public Utilities District 3908 Mary Avenue

A 2,500-gallon diesel above ground tank (AST) is located at this facility. There are no indications of a release of diesel to soil or groundwater.

Recommendation: No additional assessment.

RECs Located Adjacent to the Project Limits

Four sites located immediately adjacent to the project alignment were identified with high risk RECs. These sites are listed in Section 3.2.2 and are identified on Figures 2a-c. Documented impacts to soil or groundwater are present on or have been remediated at these adjacent parcels. There is a potential that impacts from these parcels extend into the right-of-way (ROW) adjacent to the parcel. There is a potential to encounter residual contamination during excavation.

Recommendation: If excavation is planned within the right-of-way (ROW) adjacent to these parcels, conduct a Phase II screening of the soil within the area of excavation to assess the presence of potential hazardous materials.

¹ Blackburn uses the term Recognized Environmental Condition (REC) in general compliance with ASTM E1527-13, which defines the meaning as "The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property (1) due to any release to the environment, (2) under conditions indicative of a release to the environment or (3) under conditions that pose a material threat of a future release to the environment. The term is not intended to include de minimus conditions that generally do not present a threat to human health or the environment and generally would not be the subject of an enforcement action if brought to the attention of the appropriate regulatory agencies. Conditions determined to be de minimus are not recognized environmental conditions."



• APN 014-143-026: Tower Mart #60/Cheaper #60, 1976 McGowan Parkway

Two single-walled 10,000-gallon gasoline underground storage tanks (USTs) tanks were removed in 1986. One 8,000-gallon diesel and three 12,000-gallon gasoline tanks were installed in 2004. A release of gasoline and diesel to soil and groundwater occurred sometime before 2003. Groundwater monitoring in April 2005, did not identify detectable amounts of constituents. The regulatory case was closed in 2008. Potential contaminants of concern (COC) include total petroleum hydrocarbons (TPH) as diesel (TPH-d), gas (TPH-g) and motor oil (TPH-mo), metals, and benzene/toluene/ethylbenzene/xylene (BTEX).

• APN 014-510-033: Marysville Forest Products/Erickson Group Limited, 4083 Rancho Road

Two USTs were reportedly removed after a leak was detected. A reported release of diesel to soil was recorded in 1992. Documentation was not found to verify impacted soil was excavated. The regulatory case was closed on July 14, 1993. The site was formerly occupied by a wood treating facility. Pentachlorophenol (PCP) was used as an anti-fungal wood treatment. PCP was released to soil during site operations. Site soil is also impacted with volatile organic compounds (VOCs) from the maintenance shop and dioxins at the ash disposal and burn areas. The horizontal and vertical extent of impacts is unknow. The Regional Water Quality Control Board (RWQCB) regulatory case is currently open. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, BTEX, VOCs, dioxins, and PCP.

• APN 014-280-065: PG&E North Valley Materials, 3736 Rancho Road

One 10,000-gallon AST of unknown contents, one 8,000-gallon gasoline UST, and one 12,000-gallon diesel UST are located at this facility. This facility operates as a staging area for PG&E operations throughout the area. A release of diesel to soil from a UST was reported on November 3, 1992. Contaminated soil was removed from the facility, and a No Further Action Letter was issued on March 1, 1993. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, and BTEX

• APN 014-270-079: Flying U Ranch, 3718 Forty Mile Road

A 13,500-gallon AST of unknown fuel type is identified at the site. The location of the AST was not identified during site reconnaissance. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, and BTEX.

Five sites located immediately adjacent to the project alignment were identified with medium risk RECs. These sites are listed in Section 3.2.2 and are identified on Figures 2a-c. Fuel storage tanks are present on these adjacent parcels. There is no evidence in the records review to suggest releases have occurred from the tanks or hazardous material issues from these sites will impact the Project, however, there is a potential to encounter residual contamination at these sites. If plans for acquisition change to include one or more of these sites, a Phase II Environmental Site Assessment to further investigate potential hazardous materials within the acquisition areas will be necessary.

• APN 014-280-046: Alfaro Farms/Jean Pierre Alfaro, 3374 Forty Mile Road

This farm is listed in the searched databases as having a 15,000-gallon AST of unknown contents. Violations were reported for failure to properly label hazardous waste containers, and failure to properly store and label used batteries.



• APN 014-360-014: Frank Hofman Ranch, 3002 Forty Mile Road

This business is listed as a hazardous waste generator. A UST of unknown contents and volume was located at the site. The Yuba UST database lists the UST status as closed. No spills or leaks were reported at this facility.

• APN 014-510-018: Livingston Concrete, 2571 Rosser Road

This facility is listed in the searched databases as operating an AST. Violations are reported and include failure to provide training to oil-handling personnel.

• APN 014-510-021: Roger L. Murray, 3938 Shimer Road

This facility is listed as having a 5,000-gallon AST storing an unknown fuel type. The AST is located at the southeast corner of the parcel, adjacent to the project. The AST had secondary containment, but the AST is within twenty feet of the project limits.

• APN 015-060-075: Tollcrest Dairy, 3355 Virginia Road, Wheatland

A 10,200-gallon AST is located at this facility. The AST is not located on the west side of the parcel near the project alignment. No additional information is provided in the records search.

Three sites located north of the project alignment on Olivehurst Avenue were identified with high risk RECs. The project limits do not currently extend to these sites. These sites are listed in Section 3.2.2 and are identified on Figures 2a-c. Documented impacts to soil or groundwater are present on or have been remediated at these parcels. There is a potential that impacts from these parcels extend into the right-of-way (ROW) adjacent to the parcel. There is a potential to encounter residual contamination during excavation.

Recommendation: If the project limits are extended to include excavation within the ROW adjacent to these parcels, conduct a Phase II screening of the soil within the area of excavation to assess the presence of potential hazardous materials. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, and BTEX.

• APN 013-072-011: Gee Property, 4880 Olivehurst Avenue

The site is currently vacant but was formerly occupied by a fueling station. Two gasoline underground storage tanks (USTs) were removed in 1988 and one UST removed in 2019. Soil samples from the UST excavation indicated a release had occurred. Low levels of total petroleum hydrocarbons (TPHs) were detected in groundwater. The regulatory case was closed on January 10, 2020.

• APN 013-081-015: AGV Corner Market, 4881 Olivehurst Avenue

The site is an active gas station. Currently a 20,000-gallon compartmentalized gasoline and diesel tank is in the same excavation area as the former UST. A release of gasoline to soil and groundwater occurred at this facility sometime prior to 2001. The most recent groundwater monitoring event conducted at the facility occurred in May 2011 and demonstrated that groundwater beneath the facility has residual impacts from gasoline related constituents. The regulatory case was closed on June 25, 2012.

• APN 013-130-060: Former E-Z Serve, 4867 Olivehurst Avenue

Three USTs were removed in 1989 and a release of gasoline was discovered. Soil and groundwater were impacted. Groundwater monitoring was conducted from sometime before 2004 until 2017.



A No further Action letter was issued by the CVRWQCB and the regulatory case was closed on November 22, 2019.

General Contamination Issues

The following general contamination issues were identified within the Project limits.

Yellow traffic stripes

Yellow traffic stripes are known to contain heavy metals, such as lead and chromium, at concentrations in excess of the hazardous waste thresholds established by the *California Code of Regulations* and may produce toxic fumes when heated.

Recommendation: If the Project includes removal of yellow traffic striping, remove and dispose of in accordance with Caltrans Standard Special Provisions for Hazardous Waste.

Aerially Deposited Lead (ADL)

ADL has been found to occur in soils adjacent to highways and high use roadways. The lead is presumably from the historical use of leaded gasoline and subsequent exhaust emissions. There is potential for encountering ADL during construction and grading activities within the proposed Project limits along its entirety. Some of these roadways have been present in various alignments since at or before 1910 and, therefore, have the potential to be impacted with ADL.

Recommendation: A soil screening to evaluate the potential presence of ADL within the Project limits should be performed. An appropriate soil management plan will need to be developed for soil containing significant concentrations of ADL.

Southern Pacific Railroad

An active railroad is adjacent to the east side of Rancho Road. Soils located adjacent to railroad tracks may be impacted by on-going railroad operations. Potential contaminants at these locations commonly include petroleum hydrocarbons, semi-volatile organic compounds (SVOCs), heavy metals, and pesticides.

Recommendation: Conduct a limited subsurface soil screening for potential contaminants in the upper 1.5 feet where soil will be disturbed adjacent to the railroad.

Asbestos Containing Material (ACM) and Lead in Buildings Materials

Structures constructed pre-1989 have the potential to contain ACM/Lead materials. Aerial photographs identify structures along the project alignment as developed prior to 1989.

Recommendation: If parcels are acquired as part of the Project any structures on those parcels should be evaluated for the presence of lead and asbestos containing materials. Any structure to be modified or demolished as part of the Project must be surveyed for the presence of ACM and Lead by a certified Asbestos Inspector prior to building demolition/modification.

Transformers

Our scope did not include an inventory of past and present transformers. We observed pole-mounted transformers and power lines within the existing right-of-way.



Recommendation: If the relocation of power facilities or high voltage power lines is required, existing transformers should be checked for the presence of PCBs or other hazardous materials by the utility owner, and if present, properly remediated and disposed. Identification and remediation of old transformers is the responsibility of the utility owner.

Organochlorine Pesticides (OCPs)

Historical topographic maps from 1947 and 1949 depict an orchard in the southeastern ½-mile alignment of Rancho Road and the eastern 1/3-mile alignment of Morrison Road.

Recommendation: Conduct a shallow soil screening to evaluate the potential presence of OCPs within the footprint of the former orchard in the Project limits.



1 INTRODUCTION

Blackburn completed this Phase 1 Initial Site Assessment (ISA) for the OPUD Sewer and Water Infrastructure Project (Project) located in Yuba County California. The purpose of the ISA is to identify Recognized Environmental Conditions² (RECs), Historical Recognized Environmental Conditions (HRECs), and potential RECs, collectively referred to herein as RECs, that may be present within and/or adjacent to the Project limits.

To conduct this ISA, Blackburn:

- Reviewed historical aerial photographic coverage and topographic map coverage for the Project area and surrounding properties for indications of potential sources of contamination.
- Performed federal, state, and county records review for indications of the use, misuse, or storage of hazardous and/or potentially hazardous materials on or near the Project area.
- Conducted a site inspection on September 9, 2020 to observe current land use and indications of potential contamination, as well as hazardous and potentially hazardous waste issues for the Project area.
- Performed state records review of the on-line regulatory databases GeoTracker and EnviroStor, to determine if known site impacts and/or previous environmental work exist for the Project area.
- Reviewed the general site geology, groundwater, and soil conditions through published maps and literature.

Blackburn prepared this report for Jacobs Engineering Group (Jacobs) and the project design team to use during design and construction. This report shall not be used or relied upon by others, or for different locations or improvements without the written consent of Blackburn.

2 PROJECT LOCATION AND DESCRIPTION

2.1 Location and Description

The Project spans approximately 12.2 miles within the town of Olivehurst and surrounding areas. The Project alignment includes the OPUD Wastewater Treatment Plant located on Mary Avenue, and portions of the following alignments:

- Olivehurst Avenue from 7th Avenue to approximately 170 feet south of 11th Avenue;
- Mary Avenue from OPUD wastewater treatment plant to McGowan Parkway;
- McGowan Parkway from Mary Avenue to Rancho Road;

² BCI uses the term Recognized Environmental Condition (REC) in general compliance with ASTM E1527-13, which defines the meaning as "The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property (1) due to any release to the environment, (2) under conditions indicative of a release to the environment or (3) under conditions that pose a material threat of a future release to the environment. The term is not intended to include de minimus conditions that generally do not present a threat to human health or the environment and generally would not be the subject of an enforcement action if brought to the attention of the appropriate regulatory agencies. Conditions determined to be de minimus are not recognized environmental conditions."



- Olive Avenue from McGowan Parkway to approximately 100 feet to the north, then east crossing under Highway 65 to the northern terminus of Rancho Road;
- Rancho Road from its northern end to Morrison Road;
- Morrison Road from Highway 65 to Forty Mile Road;
- Forty Mile road from the Toyota Amphitheater to Rancho Road;
- Slaughterhouse Road from Forty Mile Road to northwest for approximately 0.4 miles, crossing Highway 65 to the western terminus of Plute Road;
- Plute Road from its westernmost extent to Shimer Road; and
- Shimer Road from Plute Road to Rancho Road.

Pump and lift stations locations will be installed on privately owned parcels, however these locations have not been finalized.

The Project location with Project limits is shown on Figure 1, Vicinity Map. Site-specific features are shown on Figures 2a-e.

2.2 Geology and Physical Setting

The site lies within the Great Valley Geomorphic Province of California, which is a large, elongated, northwest-trending structural trough. The Province is subdivided into two major divisions designated as the Sacramento and San Joaquin Valleys. These valleys have been filled to their present elevation with thick sequences of sediment, ranging in age from Jurassic to present day, creating a nearly flat-lying alluvial plain that extends from the Tehachapi Mountains in the south to the Klamath Mountains in the north. The western and eastern boundaries of this province are formed by the California Coast Ranges and the Sierra Nevada, respectively.

The study area is located on an alluvial plain in the Sacramento Valley located approximately 2.2 miles east of the Feather River at its closest point. The underlying deposits are mapped by Saucedo, G.J. and Wagner D.L. (1981) as alluvium, natural levee and channel deposits, basin deposits, Modesto Formation, and the Riverbank Formation. This formation is composed of fine-grained soils such as clay, silts, sand and gravel.

The site topography is generally flat, except near Highway 65 and Highway 70, where the topography slopes toward the highways. The site elevations, excluding areas near the Highways, range between 55 feet above mean sea level (msl) in the western portion of the Project and 75 feet above msl in the easternmost portion of the Project.

2.3 Surface Water, Groundwater, Wells

The Site lies within the South Yuba Subbasin where groundwater flow direction is generally to the southwest toward the Feather River, though flow directions vary both locally and seasonally. The study area is east of the Feather River, south of the Yuba River, and north of the Bear River. Blackburn reviewed groundwater level data made available at California Department of Water Resources (DWR) website www.water.ca.gov/waterdatalibrary. The groundwater beneath the site rises to within approximately 40



feet of the ground surface for up to six months of the year. Depth to groundwater during the rest of the year is approximately 45 feet below ground surface. Surface/storm water is directed by sidewalk curb, gutter and drains. The general flow direction is to the south and west towards the Feather River, except in area in proximity to Hutchison Creek and Reed Creek, which transect the Project in multiple areas flowing southwest toward the Feather River.

2.4 Current Land Use

Most of the Project area consists of roadways which traverse rural areas of Yuba County, with a portion of the project limits transecting the town of Olivehurst. Land adjacent to the Project along Rancho Road is zoned as agricultural industrial and light industrial. Land along Morrison Road is designated as sports entertainment district and employment center district. Land adjacent to Forty Mile Road is designated for agricultural use and sports entertainment. Land near the OPUD Wastewater treatment Facility on Mary Road is designated for use as public utilities land as well as single-family residential.

2.5 Historic Land Use

Land use adjacent to the project limits varies throughout the project alignment. Blackburn reviewed historical aerial photography, topographic maps, and Sanborn maps to identify conditions that may indicate potential hazardous materials issues within the Project limits.

2.5.1 Aerial Photograph Review

Blackburn reviewed the following historic aerial photography to identify conditions that may indicate potential hazardous materials issues within or adjacent to the Project area. The listing includes aerial photo flight year, source, scale, and a brief description of observed conditions. Copies of aerial photographs are provided in Appendix A.

Aerial Photograph Review

The following aerial photos were reviewed:

```
1947
       Photo by Agriculture and Soil Conservation Service, Scale 1" =2,000'
1954
       Photo by Army Mapping Service, Scale 1" =2,000'
1977
       Photo by USGS, Scale 1" =2,000'
1987
       Photo by USGS, Scale 1" =2,000'
1998
       Photo by USGS, Scale 1" = 2,000'
2005
       Photo by National Agriculture Information Program (NAIP), Scale 1" =2,000'
2009
       Photo by NAIP, Scale 1" =2,000'
2014
       Photo by NAIP, Scale 1" =2,000'
```

2018 Photo by NAIP, Scale 1" =2,000'

Areas of the Project limits south of Morrison Road along Forty Mile Road are not shown on Aerial Photographs. This includes the area that is now the Toyota Amphitheater.

1947: Improved roads, Rancho Road, Forty Mile Road, Morrison Road, and McGowan Road are depicted in their present-day alignments. The town of Olivehurst is visible north of the Project limits. Agricultural



use is visible along the alignment. Rural residences are visible near the project alignment. Hutchinson Creek and Reed Creek transect the project alignment in multiple locations similar to present day. A large industrial facility is adjacent to the north side of Rancho Road in the location that is currently the Marysville Forest Products/Erikson Group Limited facility.

1954: Additional development of roads and residences in the south portion of Olivehurst. Olivehurst is generally in its present-day footprint.

1977: Highway 65 transects the project limits. Highway 70 appears under construction and transects the project limits. What is now a PG&E facility is adjacent to the south of the Project limits on Rancho Road. Mary Road appears on the map, along with the OPUD wastewater treatment facility. Additional residences appear along Morrison Road. A commercial/industrial facility is at the intersection of Slaughterhouse Road and Forty Mile Road. A mobile home park is at the intersection of Olive Avenue and McGowan Parkway. Additional residences and commercial businesses appear along the Project alignment within the town of Olivehurst.

1987: The OPUD wastewater Treatment Facility appears to expand to the south.

1998: No significant changes.

2005: An additional commercial facility is adjacent to the south of Rancho Road southeast of the PG&E facility.

2009: No significant changes.

2014: No significant changes.

2018: The Project alignment and surrounding area appear as they are today.

2.5.2 Topographic Map Review

Blackburn reviewed the following topographic maps for features that may indicate an impact to the Project. This summary includes noted changes within and adjacent to the Project location as recorded on the maps. Copies of the topographic maps are provided in Appendix B.

- 1910 Wheatland 7.5-minute Quad, Scale 1:24,000,
- 1911 Ostrom 7.5-minute Quad, Scale 1:24,000,
- 1947 Wheatland 7.5-minute Quad, Scale 1:24000,
- 1949 Wheatland 7.5- and 15-minute Quad, Scale 1:24000,
- 1952 Olivehurst 7.5-minute and Marysville 15-minute Quads, Scale 1:24,000
- 1973 Olivehurst and Wheatland 7.5-minute Quads, Scale 1:24000, and
- 2015 Olivehurst and Wheatland 7.5-minute Quads, Scale 1:24000.

1910 and 1911: Western Pacific Railroad and the Marysville Line of the Southern Pacific Railroad are depicted on the map near the project alignment. The development of Ostrom is depicted near the present-day intersection of Highway 65 and Forty Mile Road. Structures are depicted sparsely near the



project alignment along present-day Forty Mile Road, Morrison Road, and Rancho Road. Hutchinson Creek and Reed Creek are depicted near their present-day alignments transecting the Project. Plumas Lake is depicted approximately one mile south and west of the Project limits.

1947, 1949, and 1952: The town of Olivehurst, including Olivehurst Avenue, what is now Mary Road, and McGowan Road (Parkway) are depicted, as are residences and structures along their alignments. A commercial or industrial facility is depicted to the north of what is now Rancho Road between Reed Creek and Hutchinson Creek. This facility is in the same location as the present-day Marysville Forest Products/Erikson Group Limited facility. An orchard is depicted in the southeastern portion of the project alignment encompassing the intersection of present-day Highway 65, Morrison Road, and Rancho Road.

1973: The OPUD wastewater treatment facility is depicted in its present-day location. Several additional structures are depicted at the Marysville Forest Products/Erikson Group Limited facility. Highways 65 and 70 are depicted in their present-day alignments. A mobile home park is depicted at the intersection of Olive Drive and McGowan Parkway. The orchard is no longer depicted near the southeastern corner of the Project alignment. Additional commercial/industrial facilities are depicted in the area between Rancho Road and Highway 65. Additional roads and residential structures are depicted within the town of Olivehurst in the vicinity of Olivehurst Avenue and McGowan Parkway.

2015: Structures and land uses are not depicted on this map. The town of Olivehurst is depicted as it is today.

2.5.3 Sanborn[®] Map Review

Environmental Risk Information Services (ERIS) searched the Sanborn Maps Library for the Site and surrounding area. The ERIS search did not return Sanborn Maps (fire insurance) covering the Site or the surrounding area. Appendix C contains ERIS's Sanborn Map Report.

3 RECORDS REVIEW

3.1 County, State and Federal Records Review

ERIS, a commercial data base search firm, performed a radius search for the study area on August 20, 2020. The search includes a review of county, state, federal and ERIS proprietary databases. The maximum search radius is 1 mile from the outline of the Project area. Sites with adequate address information are plotted on ERIS's site plan "Map: 1.0 Mile Radius". ERIS lists sites with inadequate address information in their "Unplottable Summary" and does not provide mapped locations. Blackburn reviewed the 13 "unplottable sites" identified by ERIS and determined that only the PG&E facility, which is located on Rancho Road though identified on Morrison Road in the report, is located adjacent to the Project area. The complete EDR report is included in Appendix D.

3.2 Summary of Records Search

Blackburn reviewed the databases for facilities within ½-mile of the Project alignment with a potential to impact project operations. Our review of records identified the following sites with potentially hazardous material conditions at, adjacent to, or considered close enough to the project site to potentially impact



the project. 50 facilities within a ½-mile radius of the Project are listed in the Records Search. Below, we summarize the database records.

3.2.1 RECs Within the Project Alignment

APN 014-270-002: OPUD Wastewater Treatment Facility/Olivehurst Public Utilities District/Western Water Constructors, Inc., 3908 Mary Avenue, Olivehurst, CA

Databases: Yuba CUPA, AST, FINDS, HAZNET, HIST Manifest, ICIS, YUBA UST, CERS TANK, RCRA NonGen A 2,500-gallon diesel AST is located at this facility. No additional information is provided in the records search.

3.2.2 RECs Adjacent to the Project Alignment (Medium and High Risk)

The following sites have conditions such as above ground or underground fuel storage tanks that are considered RECs to the project. The RECs include releases of petroleum hydrocarbons or other hazardous materials that may have resulted in residual impacts within the Project alignment.

APN 013-072-011: Gee Property, 4880 Olivehurst Avenue, Olivehurst, CA

Database: GeoTracker

Formerly occupied by a fueling station. Two gasoline USTs were removed in 1988. Soil samples from the UST excavation indicated a release had occurred. An additional UST was excavated in 2019. Low levels of TPH as diesel was detected in groundwater. Low concentrations of motor oil were detected in stockpile sampling. The regulatory case was closed on January 10, 2020. The site is within the service area of OPUD.

APN 013-081-015: AGV Corner Market, 4881 Olivehurst Avenue, Olivehurst, CA

Database: GeoTracker

The site is an active gas station. Currently a 20,000 gallon compartmentalized gasoline and diesel tank is in the same excavation area as the former UST. A release of gasoline to soil and groundwater occurred at this facility sometime prior to 2001. The most recent groundwater monitoring event conducted at the facility occurred in May 2011 and demonstrated that groundwater beneath the facility has residual impacts from gasoline related constituents. The regulatory case was closed on June 25, 2012.

APN 013-130-060: Former E-Z Serve, 4867 Olivehurst Avenue, Olivehurst, CA Databases: GeoTracker, LUST

On August 30, 1989, three USTs were removed, and a release of gasoline was discovered. Soil and groundwater were impacted. Groundwater monitoring was conducted from sometime before 2004 until 2017. A No further Action letter was issued by the CVRWQCB and the regulatory case was closed on November 22, 2019.

APN 014-143-026: Tower Mart #60/Colonial Energy CE/Fred and Liquor 60/Cheaper #60, 1976 McGowan Parkway, Olivehurst, CA

Databases: Delisted TNK, Emissions, GeoTracker, FINDS/FRS, Yuba CUPA, LUST, HHSS, HAZNET, Yuba UST, CERS TANK, UST, Emissions, HIST TANK, RCRA NonGen



In 1986, two single-walled 10,000-gallon fuel tanks were removed from the site. In 2004 four USTs were installed including one 8000-gallon diesel and three 12,000-gallon gasoline tanks. This fueling station is a hazardous waste generator. A release of gasoline and diesel to soil and groundwater occurred sometime before 2003. Groundwater monitoring in April 2005, did not identify detectable amounts of constituents. The regulatory case was closed on January 31, 2008.

APN 014-270-079: Flying U Ranch, 3718 Forty Mile Road, Olivehurst, CA Databases: Yuba CUPA, AST, CERS TANK

A 13,500-gallon AST of unknown fuel type is identified at the site. The CERS TANK database identifies violations including failure to dispose of hazardous waste within 180 days, and failure to inspect hazardous waste storage areas weekly.

APN 014-280-046: Alfaro Farms/Jean Pierre Alfaro, 3374 Forty Mile Road, Olivehurst, CA Databases: AST, RCRA NonGen, Yuba CUPA, CERS TANK

This farm is listed in the searched databases as having a 15,000-gallon AST of unknown contents. Violations were reported for failure to properly label hazardous waste containers, and failure to properly store and label used batteries.

APN 014-280-065: PG&E North Valley Materials, 3736 Rancho Road, Olivehurst, CA Databases: Yuba CUPA, Delisted TNK, AST, HHSS, Yuba UST, HIST TANK, Delisted CTNK, RCRA SQG, CHMIRS, LUST

One 10,000-gallon AST of unknown contents, one 8,000-gallon gasoline UST, and one 12,000-gallon diesel UST are located at this facility. This facility operates as a staging area for PG&E operations throughout the area. A release of diesel to soil from a UST was reported on November 3, 1992. Contaminated soil was removed from the facility, and a No Further Action Letter was issued on March 1, 1993. The CHMIRS database lists this facility as having a leak of 5-10 gallons of insulating oil (no PCB content).

APN 014-360-014: Frank Hofman Ranch, 3002 Forty Mile Road, Olivehurst, CA Databases: Yuba CUPA, HHSS, Yuba UST, HIST TANK

This business is listed as a hazardous waste generator. A UST of unknown contents and volume was located at the site. The Yuba UST database lists the UST status as closed. No spills or leaks were reported at this facility.

APN 014-510-018: Livingston Concrete, 2571 Rosser Road, Olivehurst, CA Databases: Yuba CUPA, CERS TANK, Emissions

This facility is listed in the searched databases as operating an AST. Violations are reported and include failure to provide training to oil-handling personnel.

APN 014-510-021: Roger L. Murray, 3938 Shimer Road, Olivehurst, CA Databases: Yuba CUPA, AST, Delisted CTNK

This facility is listed as having a 5,000-gallon AST storing an unknown fuel type. No additional information is provided in the records search.



APN 014-510-033: Marysville Forest Products/Erickson Group Limited/Sun Gro Horticulture/Berdex Forest Products, Inc., 4083 Rancho Road, Olivehurst, CA

Databases: RCRA SQG, Yuba CUPA, Cleanup Sites, LUST, EnviroStor, HHSS, Yuba UST, Delisted HAZ, Emissions, HIST TANK, RCRA NonGen

Marysville Forest Products is a hazardous waste generator that reported a release of diesel to soil on June 18, 1992. Impacted soil was excavated and the regulatory case was closed on July 14, 1993.

Erickson Group Limited is a former wood treating facility. Pentachlorophenol (PCP) was released to soil during site operations. Soil remediation occurred and groundwater monitoring indicates that groundwater was not impacted by the release. The regulatory case is currently open. As of June 18, 2020, a Phase 1 ESA was requested by a potential buyer of the property.

APN 015-060-075: Tollcrest Dairy, 3355 Virginia Road, Wheatland, CA Databases: Yuba CUPA, AST, CERS TANK

A 10,200-gallon AST is located at this facility. The AST is not located on the west side of the parcel near the project alignment. No additional information is provided in the records search.

3.2.3 Sites identified Adjacent to the Project Alignment (Low Risk)

The following sites are listed in the searched database for storage and handling of hazardous materials and other hazardous materials conditions that are not considered RECs to the project. If these parcels are acquired as part of the project, additional assessment should be conducted.

Frankenstein Motors/McCinskey's Frankenstein Motors, 3906 Shimer Road, Olivehurst, CA Databases: Yuba CUPA, CERS HAZ, RCRA NonGen

This facility is identified in the Yuba CUPA and CERS HAZ databases as a hazardous waste generator. This database identifies a violation on September 27, 2016 for failure to manage used oil and/or fuel filters, label portable tanks appropriately, and submit an emergency response plan for hazardous materials release.

JS West Propane-Marysville Storage, 2698 Plute Road, Olivehurst, CA Databases: Yuba CUPA, CERS HAZ

No information regarding this facility is provided in the listed databases.

Livingston's Concrete, 2572 Rosser Road, Olivehurst, CA Database: FINDS/FRS

This facility is identified as a ready-mix concrete business. No additional information is provided in the records search.

AT&T California, Ostrom Road and Rancho Road, Olivehurst, CA Database: CERS HAZ

This facility is identified as a chemical storage facility. No additional information is provided in the records search.



3948 Shimer Road, Olivehurst, CA Databases: NCDL, CDL This facility was identified on February 1, 2006 as being an illegal drug lab where hazardous materials were stored.

Centurylink Olivehurst, 3365 Rancho Road, Olivehurst, CA Databases: Yuba CUPA, CERS HAZ

This facility is identified in the CERS HAZ database as a chemical storage facility. No additional information is provided in the records search.

Verizon Wireless Olivehurst, 3359 Forty Mile Road, Olivehurst, CA Database: Yuba CUPA

No information is listed in the searched database.

Yetter Steel Corp., 3548 Rancho Road, Olivehurst, CA Databases: Yuba CUPA, Delisted Haz

This business is listed as a hazardous waste generator. No additional information is provided in the records search.

Sprint Nextel, 3516 Rancho Road, Olivehurst, CA Database: Yuba CUPA

No information regarding this site is in the searched database.

United Truck Dismantlers/ Rocliff Enterprises, Inc., 2488 McGowan Parkway, Olivehurst, CA Databases: FINDS/FRS, Yuba CUPA, HAZNET, HIST Manifest, CERS HAZ, RCRA NonGen

This facility is a hazardous waste generator that operates an oil/water separator and disposes of oil-containing waste.

Verizon Wireless McGowan Parkway, 4404 Rancho Road, Marysville, Ca Databases: FINDS/FRS, Yuba CUPA, CERS HAZ

This facility is listed in the CERA HAZ database as being a chemical storage facility. No regulatory action, spills, or leaks are identified in the records search.

2352 McGowan Parkway/Highway 65 & McGowan Parkway, Olivehurst, CA Database: CDL

This address is listed in the searched database as an illegal drug lab that was reported in May 2000.

Rocking S Livestock, 3380 Rancho Road, Wheatland, CA Database: Yuba CUPA

No information is provided in the records search.



Via Grande Way, Space 19, Olivehurst, CA Database: CDL

This listing is a residence in a mobile home park located at the intersection of Olive Avenue and McGowan Parkway that was reported to be an illegal drug lab in March 2003.

Highway 70 & McGowan Parkway, Olivehurst, CA

Database: CDL

This location is the location of a vehicle that contained illegal drug lab equipment.

NRC/UPRR, Virginia Road & Rancho Road, Wheatland, CA Database: CHMIRS

This location is listed in the searched databases as the location of a natural gas line leak, and an auto vs. train collision that resulted in the spill of an unknown amount of an undisclosed fluid. No regulatory action was documented regarding the spill.

Dollar General #14976, 1990 McGowan Parkway, Olivehurst, CA Databases: Yuba CUPA, HAZNET, FINDS/FRS, CERS HAZ, RCRA NonGen

This business generates hazardous waste that is transported offsite.

Burrow Garage, 1909 McGowan Parkway, Olivehurst, CA Databases: FINDS/FRS, Yuba CUPA, HAZNET, Delisted HAZ

This business is listed in the searched records as a hazardous waste generator that disposes of liquids with halogenated organic compounds. No violations, spills, or regulatory actions are documented in the records search.

Verizon Wireless Olivehurst, 3076 Rancho Road, Wheatland, CA Databases: CERS HAZ, Yuba CUPA

This facility is listed as a chemical storage facility. No additional information is provided in the records search.

AT&T Corp, 4242 Deaton Drive, Olivehurst, CA Database: CERS HAZ

This business is listed in the searched database as a chemical storage facility. No regulatory violations, spills, or leaks are documented for this facility.

Kubich Lumber, 1630 Rancho Road, Marysville, CA Database: HAZNET

This business is listed in the HAZNET database. No additional information is identified in the records search.



3.2.4 RECs at Facilities identified within ½-mile of the Project alignment

Marysville Army Airfield/Yuba County Airport/G.N. Dibble, Inc./Public Works Airport Shop, 1300 and 1364 Sky Harbor Drive, Olivehurst, CA (1/2-mile west)

This facility is listed in the GeoTracker and EnviroStor online databases.

This 972-acre facility was constructed in 1941 and served as both a staging area for aircraft that applied herbicides and insecticides to surrounding agricultural properties, as well as a military installation that facilitated firearms training, aircraft storage, and aircraft refueling. In 1999, seven USTs and 790 tons of contaminated soil were removed from this facility. In 2014 A&M, a consultant working on behalf of the Central Valley Regional Water Quality Control Board (CVRWQCB), conducted a soil and groundwater investigation at the Site. Analysis of soil and groundwater samples collected during the investigation indicated that no contamination was present from petroleum hydrocarbons or volatile organic compounds (VOCs). The regulatory case was closed on July 21, 2015.

Two open regulatory cases are ongoing at this facility in relation to pesticide and herbicide releases to soil that occurred because of past uses. This facility is approximately 1/2 -mile west and downgradient of the Project alignment and is therefore not a REC for the Project.

3.3 City Directory Review

Blackburn reviewed the historical city directory. The City Directory review did not identify any conditions that are not already identified in other sections of this ISA. The City Directory Image Report is provided in Appendix E.

3.4 Title Documents Review

Title documents were not provided for this assessment.

4 RECONNAISSANCE INFORMATION

Blackburn completed a site reconnaissance on September 9, 2020. The purpose of the visual survey is to collect information regarding potential hazardous material contamination including identification of evidence of current and/or past use, evident storage of toxic or hazardous materials, the presence of onsite ponds, landfills, drywells, waste streams or other disposal units, visible soil contamination, above ground or underground storage tanks, drums, barrels and other storage containers. Photos from the site visit are in Appendix F. Observations were made from accessible portions of the study area.

The observations generally support the descriptions and background data above. Additional observations are presented in Section 3.2.1.

5 OWNER INTERVIEWS

Per ASTM, past owners, operators, and/or occupants of the subject property who are likely to have material information regarding the potential for contamination at the subject property shall be contacted



to the extent that they can be identified and that the information likely to be obtained is not duplicative of information already obtained from other sources.

Blackburn did not conduct interviews with property owners. Lack of contact with the owners of property adjacent to the Project is a data gap but is not expected to change the conclusions of this ISA.

6 DATA GAPS

In accordance with ASTME E1527-13, this section discusses data gaps in the documents we obtained and reviewed as part of this ISA and discusses the significance. ASTM E1527-13 defines a data gap as "a lack of or inability to obtain information required by this practice despite good faith efforts by the environmental professional to gather such information." In our opinion, we did not observe a data gap significant enough to change the conclusions of this ISA.

7 FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The scope of this ISA was directed at:

- Determining if hazardous materials exist at or near the Project area at concentrations likely to warrant mitigation pursuant to regulations;
- Identifying sites RECs and/or potential RECs within and adjacent to the proposed Project area which could affect the design, constructability, feasibility, and/or the cost of the proposed Project; and
- Identify potential site contamination issues.

The assessment identified the following environmental conditions that should be considered for present and future planning for the proposed Project.

RECs Located Within the Project Limits

APN 014-270-002: OPUD Wastewater Treatment Facility - Public Utilities District 3908 Mary Avenue

A 2,500-gallon diesel above ground tank (AST) is located at this facility. There are no indications of a release of diesel to soil or groundwater.

Recommendation: No additional assessment.

RECs Located Adjacent to the Project Limits

Four sites located immediately adjacent to the project alignment were identified with high risk RECs. These sites are listed in Section 3.2.2 and are identified on Figures 2a-c. Documented impacts to soil or groundwater are present on or have been remediated at these adjacent parcels. There is a potential that impacts from these parcels extend into the right-of-way (ROW) adjacent to the parcel. There is a potential to encounter residual contamination during excavation.



Recommendation: If excavation is planned within the right-of-way (ROW) adjacent to these parcels, conduct a Phase II screening of the soil within the area of excavation to assess the presence of potential hazardous materials.

• APN 014-143-026: Tower Mart #60/Cheaper #60, 1976 McGowan Parkway

Two single-walled 10,000-gallon gasoline underground storage tanks (USTs) tanks were removed in 1986. One 8,000-gallon diesel and three 12,000-gallon gasoline tanks were installed in 2004. A release of gasoline and diesel to soil and groundwater occurred sometime before 2003. Groundwater monitoring in April 2005, did not identify detectable amounts of constituents. The regulatory case was closed in 2008. Potential contaminants of concern (COC) include total petroleum hydrocarbons (TPH) as diesel (TPH-d), gas (TPH-g) and motor oil (TPH-mo), metals, and benzene/toluene/ethylbenzene/xylene (BTEX).

• APN 014-510-033: Marysville Forest Products/Erickson Group Limited, 4083 Rancho Road

Two USTs were reportedly removed after a leak was detected. A reported release of diesel to soil was recorded in 1992. Documentation was not found to verify impacted soil was excavated. The regulatory case was closed on July 14, 1993. The site was formerly occupied by a wood treating facility. Pentachlorophenol (PCP) was used as an anti-fungal wood treatment. PCP was released to soil during site operations. Site soil is also impacted with volatile organic compounds (VOCs) from the maintenance shop and dioxins at the ash disposal and burn areas. The horizontal and vertical extent of impacts is unknow. The Regional Water Quality Control Board (RWQCB) regulatory case is currently open. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, BTEX, VOCs, dioxins, and PCP.

• APN 014-280-065: PG&E North Valley Materials, 3736 Rancho Road

One 10,000-gallon AST of unknown contents, one 8,000-gallon gasoline UST, and one 12,000-gallon diesel UST are located at this facility. This facility operates as a staging area for PG&E operations throughout the area. A release of diesel to soil from a UST was reported on November 3, 1992. Contaminated soil was removed from the facility, and a No Further Action Letter was issued on March 1, 1993. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, and BTEX

• APN 014-270-079: Flying U Ranch, 3718 Forty Mile Road

A 13,500-gallon AST of unknown fuel type is identified at the site. The location of the AST was not identified during site reconnaissance. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, and BTEX.

Five sites located immediately adjacent to the project alignment were identified with medium risk RECs. These sites are listed in Section 3.2.2 and are identified on Figures 2a-c. Fuel storage tanks are present on these adjacent parcels. There is no evidence in the records review to suggest releases have occurred from the tanks or hazardous material issues from these sites will impact the Project, however, there is a potential to encounter residual contamination at these sites. If plans for acquisition change to include one or more of these sites, a Phase II Environmental Site Assessment to further investigate potential hazardous materials within the acquisition areas will be necessary.

• APN 014-280-046: Alfaro Farms/Jean Pierre Alfaro, 3374 Forty Mile Road

This farm is listed in the searched databases as having a 15,000-gallon AST of unknown contents. Violations were reported for failure to properly label hazardous waste containers, and failure to



properly store and label used batteries.

• APN 014-360-014: Frank Hofman Ranch, 3002 Forty Mile Road

This business is listed as a hazardous waste generator. A UST of unknown contents and volume was located at the site. The Yuba UST database lists the UST status as closed. No spills or leaks were reported at this facility.

• APN 014-510-018: Livingston Concrete, 2571 Rosser Road

This facility is listed in the searched databases as operating an AST. Violations are reported and include failure to provide training to oil-handling personnel.

• APN 014-510-021: Roger L. Murray, 3938 Shimer Road

This facility is listed as having a 5,000-gallon AST storing an unknown fuel type. The AST is located at the southeast corner of the parcel, adjacent to the project. The AST had secondary containment, but the AST is within twenty feet of the project limits.

• APN 015-060-075: Tollcrest Dairy, 3355 Virginia Road, Wheatland

A 10,200-gallon AST is located at this facility. The AST is not located on the west side of the parcel near the project alignment. No additional information is provided in the records search.

Three sites located north of the project alignment on Olivehurst Avenue were identified with high risk RECs. The project limits do not currently extend to these sites. These sites are listed in Section 3.2.2 and are identified on Figures 2a-c. Documented impacts to soil or groundwater are present on or have been remediated at these parcels. There is a potential that impacts from these parcels extend into the right-of-way (ROW) adjacent to the parcel. There is a potential to encounter residual contamination during excavation.

Recommendation: If the project limits are extended to include excavation within the ROW adjacent to these parcels, conduct a Phase II screening of the soil within the area of excavation to assess the presence of potential hazardous materials. Potential COCs include TPH-d, TPH-g, TPH-mo, metals, and BTEX.

• APN 013-072-011: Gee Property, 4880 Olivehurst Avenue

The site is currently vacant but was formerly occupied by a fueling station. Two gasoline underground storage tanks (USTs) were removed in 1988 and one UST removed in 2019. Soil samples from the UST excavation indicated a release had occurred. Low levels of total petroleum hydrocarbons (TPHs) were detected in groundwater. The regulatory case was closed on January 10, 2020.

• APN 013-081-015: AGV Corner Market, 4881 Olivehurst Avenue

The site is an active gas station. Currently a 20,000-gallon compartmentalized gasoline and diesel tank is in the same excavation area as the former UST. A release of gasoline to soil and groundwater occurred at this facility sometime prior to 2001. The most recent groundwater monitoring event conducted at the facility occurred in May 2011 and demonstrated that groundwater beneath the facility has residual impacts from gasoline related constituents. The regulatory case was closed on June 25, 2012.

• APN 013-130-060: Former E-Z Serve, 4867 Olivehurst Avenue



Three USTs were removed in 1989 and a release of gasoline was discovered. Soil and groundwater were impacted. Groundwater monitoring was conducted from sometime before 2004 until 2017. A No further Action letter was issued by the CVRWQCB and the regulatory case was closed on November 22, 2019.

General Contamination Issues

The following general contamination issues were identified within the Project limits.

Yellow traffic stripes

Yellow traffic stripes are known to contain heavy metals, such as lead and chromium, at concentrations in excess of the hazardous waste thresholds established by the *California Code of Regulations* and may produce toxic fumes when heated.

Recommendation: If the Project includes removal of yellow traffic striping, remove and dispose of in accordance with Caltrans Standard Special Provisions for Hazardous Waste.

Aerially Deposited Lead (ADL)

ADL has been found to occur in soils adjacent to highways and high use roadways. The lead is presumably from the historical use of leaded gasoline and subsequent exhaust emissions. There is potential for encountering ADL during construction and grading activities within the proposed Project limits along its entirety. Some of these roadways have been present in various alignments since at or before 1910 and, therefore, have the potential to be impacted with ADL.

Recommendation: A soil screening to evaluate the potential presence of ADL within the Project limits should be performed. An appropriate soil management plan will need to be developed for soil containing significant concentrations of ADL.

Southern Pacific/Union Pacific Railroad

An active railroad is adjacent to the east side of Rancho Road. Soils located adjacent to railroad tracks may be impacted by on-going railroad operations. Potential contaminants at these locations commonly include petroleum hydrocarbons, semi-volatile organic compounds (SVOCs), heavy metals, and pesticides.

Recommendation: Conduct a limited subsurface soil screening for potential contaminants in the upper 1.5 feet where soil will be disturbed adjacent to the railroad.

Asbestos Containing Material (ACM) and Lead in Buildings Materials

Structures constructed pre-1989 have the potential to contain ACM/Lead materials. Aerial photographs identify structures along the project alignment as developed prior to 1989.

Recommendation: If parcels are acquired as part of the Project any structures on those parcels should be evaluated for the presence of lead and asbestos containing materials. Any structure to be modified or demolished as part of the Project must be surveyed for the presence of ACM and Lead by a certified Asbestos Inspector prior to building demolition/modification.

Transformers

Our scope did not include an inventory of past and present transformers. We observed pole-mounted transformers and power lines within the existing right-of-way.



Recommendation: If the relocation of power facilities or high voltage power lines is required, existing transformers should be checked for the presence of PCBs or other hazardous materials by the utility owner, and if present, properly remediated and disposed. Identification and remediation of old transformers is the responsibility of the utility owner.

Organochlorine Pesticides (OCPs)

Historical topographic maps from 1947 and 1949 depict an orchard in the southeastern ½-mile alignment of Rancho Road and the eastern 1/3-mile alignment of Morrison Road.

Recommendation: Conduct a shallow soil screening to evaluate the potential presence of OCPs within the footprint of the former orchard in the Project limits.

8 QUALIFICATIONS

This ISA was prepared by Laura Long. I declare that, to the best of my professional knowledge and belief, I meet the definition of an environmental professional as defined in Section 312.10 of 40 Code of Federal Regulations (CFR) 312 and have the specific qualifications based on education, training, and experience to assess a property of its nature, history, and setting of the subject property. I have performed all appropriate inquiries in general conformance with the standards and practice set forth in 40 CFR 312.

9 LIMITATIONS

The accompanying ISA summarizes the findings and opinions of Blackburn, with regard to the potential for hazardous materials to be present on the properties at concentrations likely to warrant mitigation under current statutes and guidelines. Our findings and opinions are based on information obtained on given dates or provided by specified individuals, through records review, site review, and related activities. Conditions can change after we have made our observations. We cannot warrant or guarantee that hazardous materials do not exist at the described site. To further reduce your risk, an extensive invasive exploration may be necessary.

Blackburn prepared this ISA for the specific use of our client and applies only to the Project area. We are not responsible for interpretations by others of data presented in this ISA. This ISA does not represent a legal opinion. No warranty is expressed or implied. We base our conclusions in this ISA on judgment and experience. We performed this work in accordance with generally accepted standards of practice existing in northern California at the time of the assessment.

The governmental records portion of this ISA is derived from public records and is updated on a continual basis. For this reason, we do not advise you to use this information to base a decision after one (1) year of the issue date of this ISA. Also, conditions at the site can and will change over time. Please contact Blackburn to revise this ISA to reflect new information.

PHASE 1 INITIAL SITE ASSESSMENT

OPUD Yuba County Sewer and Water Infrastructure Project

Olivehurst, CA

FIGURES

Figure 1: Vicinity Map Figures 2a-e: Project Site Map











TRAIL CHIPPAWA

4083 Rancho Rd APN 014-510-033

PIPELINE

RANCHO RO

PROJECT MAP OPUD Yuba County Sewer and Water Phase 1 Initial Site Assessment Olivehurst, California

File No. 3842.x

June 2021

Figure 2c





Figure 2e

PHASE 1 INITIAL SITE ASSESSMENT

OPUD Yuba County Sewer and Water Infrastructure Project

Olivehurst, CA

APPENDIX A

Aerial Photographs





Project Property:

Requested By: Order No: Data Completed: OPUD Sewer and Water n/a Olivehurst CA Blackburn Consulting 20281800434 August 24,2020

Environmental Risk Information Services A division of Glacier Media Inc. 1.866.517.5204 | info@erisinfo.com | erisinfo.com


Date	Source	Source Scale	Comments
2018	National Agriculture Information Program	1" to 2000'	
2014	National Agriculture Information Program	1" to 2000'	
2009	National Agriculture Information Program	1" to 2000'	
2005	National Agriculture Information Program	1" to 2000'	
1998	US Geological Survey	1" to 2000'	
1987	US Geological Survey	1" to 2000'	Best Copy Available
1977	US Geological Survey	1" to 2000'	
1954	Army Mapping Service	1" to 2000'	
1947	Agriculture and Soil Conservation Service	1" to 2000'	



















