NOTICE OF SPECIAL ENGINEERING/ENVIRONMENTAL COMMITTEE MEETING
September 14, 2023

NOTICE IS HEREBY GIVEN that the San Lorenzo Valley Water District has called a meeting of the Engineering/Environmental Committee to be held on **Friday, August 4, 2023, 9:00 a.m.**, SLVWD Conference Room,12788 Highway 9, Boulder Creek.

Any person in need of any reasonable modification or accommodation in order to participate in the meeting may contact the District Secretary's Office at (831) 430-4636 a minimum of 72 hours prior to the scheduled meeting.

This meeting is being conducted as an in-person meeting under the Brown Act, Government Code section 54953, and a quorum of the Committee must participate from the location(s) within the District that are identified above. Members of the public may attend the meeting at the identified location(s). Teleconferencing/videoconferencing access as set forth below is being provided as a convenience only and is not guaranteed. The meeting may continue in person even if teleconferencing/ videoconferencing capability is disrupted or unavailable.

The meeting access information is as follows:

https://meet.goto.com/604256661

You can also dial in using your phone.
(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): 1 866 899 4679
- One-touch: tel:+18668994679,,604256661#

United States: +1 (571) 317-3116
- One-touch: tel:+15713173116,,604256661#

Access Code: 604-256-661

AGENDA

1. Convene Meeting/Roll Call

2. Oral Communications
   This portion of the agenda is reserved for Oral Communications by the public for items which are not on the Agenda. Please understand that California law (The Brown Act)

limits what the Board can do regarding issues raised during Oral Communication. No action or discussion may occur on issues outside of those already listed on today's agenda. Any person may address the Committee at this time, on any subject that lies within the jurisdiction of the District. Normally, presentations must not exceed three (3) minutes in length, and individuals may only speak once during Oral Communications. Any Director may request that the matter be placed on a future agenda or staff may be directed to provide a brief response.

3. New Business:

Members of the public will be given the opportunity to address each scheduled item prior to Committee action. The Chairperson of the Committee may establish a time limit for members of the public to address the Committee on agendized items.

a. WATER LEAK DETECTION PROJECT - FINAL REPORT
Discussion and possible recommendation by the Committee regarding the Water Leak Detection Project – final report, prepared by Utility Services Associates.

b. RAW WATER SUPPLY LINES REPLACEMENT
Discussion and possible recommendation by the Committee regarding the 5-Mile and Peavine raw water supply lines replacement.

c. BRACKEN BRAE & FOREST SPRINGS BOOSTER PUMP ACOUSTIC REPORT
Discussion and possible recommendation by the Committee regarding the BB & FS Booster Pump Acoustic Report. (report to be at the meeting)

4. Unfinished Business:

Members of the public will be given the opportunity to address each scheduled item prior to Committee action. The Chairperson of the Committee may establish a time limit for members of the public to address the Committee on agendized items.

a. QUAIL HOLLOW ROAD PROJECT – UPDATE
Discussion by the Committee regarding the Quail Hollow Road project.

b. BROOKSIDE DRIVE STORM DAMAGE REPAIR SCHEDULE-2023 STORM DAMAGE AND CAPITAL PROJECTS LISTING
Review and discussion by the Committee regarding the Brookside Drive repair schedule and other storm damage and capital projects.

c. ENGINEERING PROJECTS UPDATE
Review and discussion by the Committee regarding projects updates.

d. ENVIRONMENTAL PROJECTS UPDATE
Review and discussion by the Committee regarding projects updates.

5. Informational Material

Here is a link to previous Engineering/Environmental Committee meeting minutes: All Engineering/Environmental Committee Meeting Minutes | San Lorenzo Valley Water District (slvwd.com)

6. Adjournment

Agenda documents, including materials related to an item on this agenda submitted to the Committee after distribution of the agenda packet, are available for public inspection and may be reviewed at the office of the District Secretary, 13060 Highway 9, Boulder Creek, CA 95006 during normal business hours. Such documents may also be available on the District website at www.slvwd.com subject to staff's ability to post the documents before the meeting

Certification of Posting

I hereby certify that on September 11, 2023, I posted a copy of the foregoing agenda in the outside display case at the District Office, 13060 Highway 9, and at the SLVWD Boardroom, 12788 Highway 9, Boulder Creek, California, said time being at least 24 hours in advance of the special meeting of the Engineering & Environmental Committee of the San Lorenzo Valley Water District in compliance with California Government Code Section 54956.

Executed at Boulder Creek, California, on September 11, 2023.

_____
Holly B. Hossack, District Secretary

FINAL REPORT

WATER LEAK DETECTION PROJECT

Project Dates:

06/05/2023 through 06/30/2023

Project Location:
San Lorenzo Valley Water District
Boulder Creek, CA

Prepared by:
Utility Services Associates, LLC
916 W. Center St.
Kalispell, MT 59901

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COVER LETTER

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

July 10, 2023

San Lorenzo Valley Water District
Attn: James Furtado
13060 Hwy. 9
Boulder Creek, CA 95006

Re: **June 2023 Water Leak Detection Survey and Pinpointing Project**

Dear Mr. Furtado:

Utility Services Associates, LLC, (USA) is pleased to submit the enclosed Final Report on leak detection services recently completed.

The information contained in this Final Report details the procedures and results specific to this project. When applicable, recommendations have been made concerning the best approach for the repair of leaks detected and preparation for future leak detection projects.

As you review this Final Report, please pay close attention to the Leak Consultant's remarks and field observations in the Project Observation section of this report. These may assist you in determining the best course of action regarding specific leaks.

At times specific individual Leak Reports may differ in the Final Report from those provided during the course of the project. These changes, usually insignificant, generally pertain to the manner in which we report leaks and do not alter the methods used or results of pinpointing.

We strongly suggest you contact us prior to excavating any leak that we have labeled with "CAUTION" for further explanation.

This leak detection project is productive since we pinpointed leakage that, when repaired, can reduce your water loss, saving San Lorenzo Valley Water District dollars now and in the future. We appreciate your confidence in USA. If you have any questions, call us at (877) 585-5325.

Sincerely,

Cory Simonson
President

EXECUTIVE SUMMARY

LEAK DETECTION EXECUTIVE SUMMARY

From June 5, 2023 through June 30, 2023, USA performed a leak survey for **San Lorenzo Valley Water District in Boulder Creek, CA.** Our Water Loss Consultant, Eric Kelsay, used and appreciated the information provided by Ben, Bryan and Jake to expedite and provide an accurate survey. The tables below detail the information gathered.

Time Spent on Project

Surveying:	**108.3 Hr**
Pinpointing:	**7.6 Hr**
Other Time:	**4.1 Hr**
Total Time:	**120 Hr**

Total Areas Surveyed

Total Distance in Miles	**180.9186**
Total Distance in feet	**955,250**

The mileage was estimated by the Water Loss Consultant and may not match maps.

Access Points Contacted

Hydrants	**620**
Valves	**961**
Services	**2,498**
Other	**0**
Total	**4,079**

Leak Type Noises Detected

Hydrants	**6**
Valves	**7**
Services	**4**
Other	**1**
Total	**18**

Leaks Pinpointed

Main	**2**
Valve	**3**
Hydrant	**1**
Service Line	**1**
Service Connection	**3**
Curbstop	**0**
Other	**1**
Total	**11**

Total Water Loss Identified

Gallons Per Minute (GPM):	**44.50**
Gallons Per Day:	**64,080**
Gallons Per Month:	**1,949,100**
Gallons Per Year:	**23,389,200**

Unidentified Water Loss

Faulty Meters	**0**
Unidentified Leaks	**1**
Possible Consumer Side Leaks	**0**

This project was divided into two phases; the survey phase and the pinpointing phase. The following pages outline exactly how those two phases progressed and the results of each. Any leaks pinpointed will be detailed in the attached Leak Reports.

PROJECT OBSERVATIONS

Project Observations
San Lorenzo Valley Water District, CA
Technician: Eric Kelsay

GENERAL

Utility Services Associates (USA) Water Loss Consultant Eric Kelsay recently completed a fifteen (15) day water leak detection project for the San Lorenzo Valley Water District, CA (Utility). The fieldwork portion of the project began on June 5th, 2023, and was completed on June 30th, 2023.

The information listed below is based on field data generated by Eric during the fieldwork.

PROJECT BACKGROUND

USA was hired to conduct a water leak survey of as much of the City's distribution system as possible over the fifteen (15) day period. Based on system variables, both standard and point-to-point survey techniques were employed.

SPECIFICS

The project was broken down into two different phases:

1. **Survey Phase** – sounding of appurtenances and recording all leak anomalies detected for further investigation. Appurtenances were selected based on system variables, location, and accessibility.

2. **Pinpointing Phase** – pinpointing all anomalies that were detected during the survey phase.

SURVEY PHASE NOTES

There are several variables that impact how well a leak sound will carry. The variables include but are not limited to, the following:

- Pipe Type: Sound carries best in metallic-based pipe material and worst in plastic-based pipe material
- Pipe Size: Velocity or sound carry decreases as pipe size increases
- Pressure: Sound carries better as system pressure increases
- Installation: The soil condition impacts how well leak sound carries. Factors to consider are soil type and moisture content.
- Leak Type: The leak type and size will impact how well a leak sound will carry.

Sound carried well throughout the system allowing for a complete and thorough survey to be conducted. During the project, we were able to survey approximately one hundred eighty-one (180.9) miles of the system.

The standard survey technique used on non-plastic-based pipe included the sounding of system appurtenances (hydrants, valves, and service shut-offs) at intervals of approximately 350' in most cases. Where PVC system was surveyed, a point-to-point technique was used. This technique included the sounding of all available appurtenances. This is necessary as plastic-based water lines have significantly slower velocity and muffling characteristics that prevent leak sound from carrying well.

As the survey progressed, Eric documented eighteen (18) potential leak anomalies for further inspection and pinpointing during the pinpointing phase. This multi-phased technique has proven to be the most efficient way to reduce the time spent pinpointing sounds that result from service draw or other ambient interference.

The only unresolved, non-leak issue indicated at the end of the project was a jumper pipe (un-metered) in a meter box at 870 Woodland Dr. This is not leaking but may be a non-revenue water loss.

SYSTEM OBSERVATIONS FIELD NOTES

The entire distribution system was leak surveyed, beginning at the North point of the system and working South through the map. Many of the booster pumps and pressure reducers were active and leak-free during the leak survey. The survey went well due to clear markings of meters with flags and paint, which eliminated meter location delays. Most all valves were clear of debris and easily accessible during the survey.

PINPOINTING PHASE NOTES

Upon secondary verification of the documented leak anomalies, we were able to pinpoint eleven (11) water system leaks and one (1) undefined leak. For details and a diagram for each leak, please see the Leak Report section of this report.

TECHNICIAN RECOMMENDATIONS

We recommend a continued focus on water loss and real loss reduction. Once repairs are made, note any observed differences in our loss estimates versus visual confirmation estimates. It is possible that leak estimates are off dramatically, so the impact on your water loss tracking efforts will be impacted.

CONCLUSION

We would like to thank Ben, Jake, and Bryan for their field assistance. Their hard work and system knowledge proved invaluable. We look forward to working with the San Lorenzo Valley Water District on their future non-revenue water loss reduction projects.

Eric Kelsay
Water Loss Consultant

SURVEY PHASE REVIEW

SURVEY PHASE REVIEW
(Water Distribution Lines)

The first step in our survey was to review the distribution maps of the system for familiarization of the pipe network and available appurtenances to be used for contact points.

As the leak survey progressed, we determined the distances that even quiet leak type sounds traveled in various pipe materials, pipe sizes and pressure zones in each area of the system. This might have been done by slightly turning on fire hydrants, hose bibs, etc., creating a simulated, quiet leak sound. Appurtenances in that area were then checked with a sound amplification instrument to see how far the simulated leak sounds traveled, thus determining how often we would make contact with appurtenances in a given section of the water distribution system. In most areas, contact was made with pipe appurtenances at intervals no greater than 300 feet where contact points were available and accessible at pre-determined distances as noted in Paragraph B (whichever distance is necessary to obtain complete coverage). This allowed for even more quiet leaks to be located. Whenever we surveyed PVC lines, all available appurtenances were contacted.

We then conducted a comprehensive survey by making physical contact with all available main line appurtenances (valves, hydrants, etc.) and necessary customer services. USA used a sonic leak detection amplification instrument designed for this purpose.

Appurtenances Surveyed

Hydrant	620
Valves	961
Services	2,498
Other	0
Total	**4,079**

When normal contact points were not available or could not be created within a reasonable distance, we made an attempt to use a sonic ground listening instrument to make physical ground contact at intervals no greater than 6 feet directly over the pipe. If conditions did not allow this procedure our Leak Consultant advised you at time of project and notes of such are included in the Project Observations. Ground listening devices are employed when ground cover is pavement, cement or similar hard surface.

When ground cover was not a hard surface and normal contact points were not available, we made an attempt to use probe rods or a specially designed sounding plate at 6-foot intervals. A sound amplification instrument with 3VG or greater transducer was employed in conjunction with this equipment, directly over the pipe. If conditions did not allow this procedure our Leak Consultant advised you at time of project and was detailed in the Project Observations section of this Final Report. Direct contact to the main line at intervals outlined in Preparation for Service resulted in the most thorough survey.

Areas Surveyed

Street	From	To	Distance
San Lorenzo Park	Northwest end of line	Ramona Woods	8,700
Ramona Woods	Hwy 9	San Lorenzo Woods	6,200
San Lorenzo Woods	Ramona Woods	Riverside Grove	3,100
Riverside Grove	Teilh Rd	Bernstein Dr	14,800
Mitchell Dr	Hwy 9	East end of line - Tank	2,400
Redwood Grove	Hwy 9	Kings Creek Rd	7,100
Redwood Grove area	Buckknoll Ln	Cresta Dr	68,200
Hwy 9	Mitchell Dr	Brimblecom Rd	9,000
Hwy 9	Brimblecom Rd	Bear Creek Rd	8,700
Wildwood area	Brimblecom Rd	Shadeland Rd	41,000
Bear Creek Estates	Fernwood	Bear Creek Tank	10,600
Ralston Zone	Bear Creek Rd	West end of line	2,100
Redwood Park	Hwy 9	Through loop	31,900
Big Basin Hwy	Hwy 9	North end of line	14,200
Lyon Zone	Redwood Ave	North end of line	41,100
Nina Zone	Highland Dr	South end of line	10,500
Highland Zone	Fairview Booster	Nina Booster	12,000
Boulder Creek	Bear Creek Rd	Irwin Booster	38,100
Brookdale	Irwin Booster	Ben Lomond	26,100
Ben Lomond	Brookdale Zone	Glen Arbor	38,000
Redwood Park	Hwy 9	Through loop	27,400
Glen Arbor	Redwood Park	Brackney	46,400
Brackney	Glen Arbor	Felton	17,300
Olympia	Glen Arbor	E Zayante Rd	68,150
Felton	Brackney	Pine Tank	88,500
Scotts Valley	Manana Woods	South end of line	61,000
Manana Woods	Roaring Camp Rd	Well #7	18,800
E Lompico	Lompico Rd	East end of line	35,800
Zayante	Lompico Rd	East end of line	36,100
W Lompico	Lompico Rd	West end of line	53,600
Hwy 9	San Lorenzo Park	Old Big Trees Rd	108,400
Total Area Surveyed in Feet			**955,250**
Total Area Surveyed in Miles			**180.9186**

A detailed report of decibel levels at suspected leak sound locations and observations were compiled during the survey for reinvestigation and possible pinpointing at a later time. This reinvestigation increased the speed of the survey and eliminated correlating on most false leak sounds.

Leak Type Noises Detected

Contact Points	Noises Detected
Hydrant	6
Valves	7
Services	4
Other	1
Total	**18**

All indications of leaks found during the survey were verified a second time, after which, the leaks were pinpointed with a computer-based sound correlator when possible. Pinpointing information can be found in the Pinpointing and Leak Reports Sections.

End of Section

PINPOINTING PHASE REVIEW

PINPOINTING PHASE REVIEW
(Water Distribution Lines)

All indications of leaks found during the survey were verified a second time, after which, the leaks were pinpointed with a computer-based sound correlator when possible. Pinpointing leak locations through interpretation of sound intensity, either by ear, decibel metering or other like methods was not used when contact points were available for use with the correlator. However, ground listening devises were used as a quick double check on pinpointed leaks.

The equipment used did not normally require valves to be operated during surveying and pinpointing. However, on occasion, services or valves were operated to eliminate service draw noises or to change velocity noise.

The correlator equipment used had the capability to prompt the operator to input the variables when different pipe sizes and/or pipe material were encountered in the same span to be investigated. This is necessary to ensure accuracy of results based on the automatic computation of the correct leak sound velocity in leak pinpointing operations. Our correlators have the capability of correlating up to seven various pipe sizes and types at one time in a given space. To ensure effective performance in all field environments encountered in the distribution system (i.e. traffic noise, draw, pump operation, industrial noise, etc.), the correlator equipment provides 16 auto filter options and/or infinite manual filter options.

We provided a copy of leak reports, when pinpointed, which included leak locations and estimated GPM loss.

Leaks Pinpointed

Number	Leak Type	Location	GPM
1	Service Line	225 Meadow Dr.	1.00
2	Main	433 Manzanita Ave.	3.00
3	Service Connection	195 Sunbeam Ave.	3.00
4	Service Connection	130 A N. Sequoia Rd.	2.00
5	Valve	127 Forest St.	3.00
6	Valve	168 Willowbrook Dr.	1.00
7	Hydrant	140 Woodland Dr.	0.50
8	Main	490 Balch Way	5.00
9	Other	11910 Clear Creek Rd.	5.00
10	Valve	1395 Country Club Dr.	1.00
11	Service Connection	130 Pacific St. (estimated address)	20.00
Total			**44.50**

These leak reports also included a leak repair priority classification. These classifications are as follows:

Class I Any leak which is hazardous in terms of potential undermining, possibly resulting in surface collapse, encroachment and/or damage to nearby utilities, commercial or private properties or leaks severe enough to warrant immediate repair.

Class II All leaks that display water losses significant enough to be monitored on a regular repair schedule.

Class III Relatively small leaks that should be repaired as workload permits.

Repair Priority

Number	Leak Type	Location	GPM
11	Service Connection	130 Pacific St. (estimated address)	20.00
Total Class I			**20.00**

Number	Leak Type	Location	GPM
5	Valve	127 Forest St.	3.00
8	Main	490 Balch Way	5.00
9	Other	11910 Clear Creek Rd.	5.00
Total Class II			**13.00**

Number	Leak Type	Location	GPM
1	Service Line	225 Meadow Dr.	1.00
2	Main	433 Manzanita Ave.	3.00
3	Service Connection	195 Sunbeam Ave.	3.00
4	Service Connection	130 A N. Sequoia Rd.	2.00
6	Valve	168 Willowbrook Dr.	1.00
7	Hydrant	140 Woodland Dr.	0.50
10	Valve	1395 Country Club Dr.	1.00
Total Class III			**11.50**

Whenever any of the leaks detected by USA were repaired prior to completion of the field work, we gave San Lorenzo Valley Water District the option to have that section of the system re-surveyed to be sure no very quiet leaks were missed due to an overpowering noisy leak sound.

Please note that leakage that was detected and pinpointed may be larger or smaller than estimated. Estimates are based on several variables including type and size of pipe, pressure, and interpretation of correlation filter results.

It should be noted that we have listed one area as "Undefined". This is an area where we believe one or more leaks exist, however, after spending considerable time at each location, we could not pinpoint the suspect leakage. This may be due to one or more of many different variables including poor sound travel, limited number of appurtenances, etc. For further information and/or assistance, please contact our main office.

Undefined Leaks

Leak Location	Notes
360 Blue Ridge Dr.	Good leak noise detected on meter. Area fully ground mic'd with no solid results. Leak appears to be small at the present time. No visible problems throughout area.

End of Section

LEAK REPORTS

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	1
Date:	June 8, 2023
Map #:	
Coordinates	

Leak Type
SERVICE LINE
Leak Address
225 MEADOW DR

Client:	San Lorenzo Valley Water District

Agreement:	23027

REMARKS

VISIBLE LEAK IN DITCH ON EXPOSED SERVICE LINE. GALVANIZED SERVICE LINE IS HEAVILY CORRODED AND SHOULD BE REPLACED SOON. LEAK WORSENED WHEN PRIMARY REPAIRS WERE ATTEMPTED.

Action(s) Taken:

Recommendation(s): REPAIR / REPLACE

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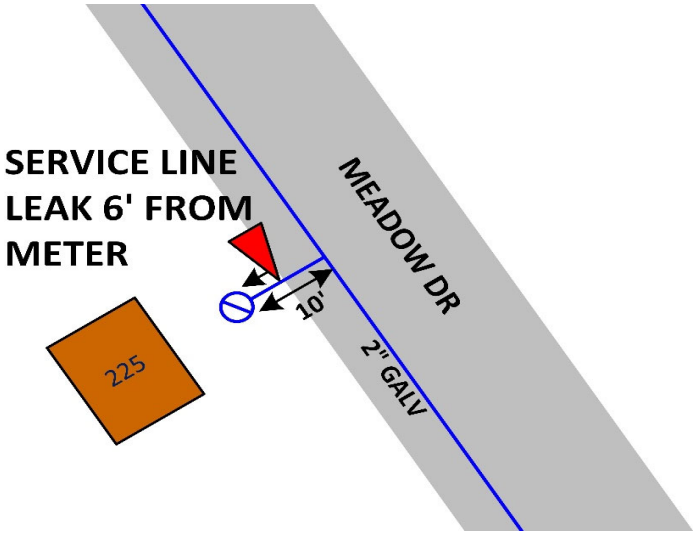


EQUIPMENT USED
S-30

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	1.00
Cover Type:	SOIL
Site Marked:	NO
Mins. Pinpointing:	30

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	1,440
Weekly:	10,080
Monthly:	43,800
Annual:	525,600

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	2
Date:	June 8, 2023
Map #:	
Coordinates	

Leak Type
MAIN
Leak Address
433 MANZANITA AVE

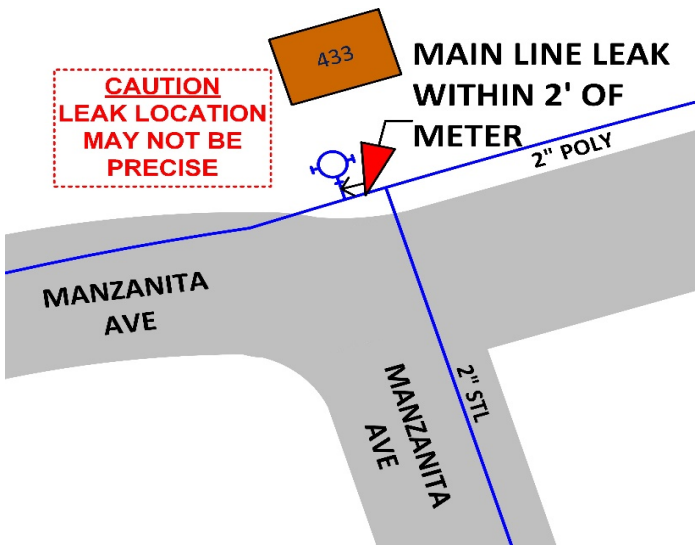
Client:	San Lorenzo Valley Water District
Agreement:	23027

REMARKS

UNCERTAIN OF EXACT MAIN LINE LAY OUT. LEAK IS WITHIN 2' OF WHARF HYDRANT. THIS IS AN EXTIMATED DRAWING OF THE AREA.

Action(s) Taken:
Recommendation(s): *EXCAVATE & REPAIR*

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	3.00
Cover Type:	GRAVEL
Site Marked:	NO
Mins. Pinpointing:	30

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	4,320
Weekly:	30,240
Monthly:	131,400
Annual:	1,576,800

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	3
Date:	June 8, 2023
Map #:	
Coordinates	

Leak Type
SERVICE CONNECTION
Leak Address
195 SUNBEAM AVE

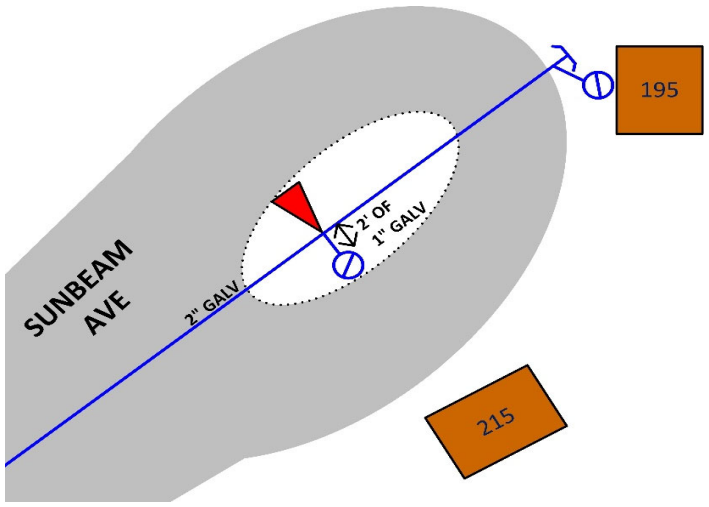
Client:	San Lorenzo Valley Water District
Agreement:	23027

REMARKS

MOIST SOIL IN AREA DOWNHILL OF METER. CONFIRMED WITH PROBE ROD.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30
PROBE ROD

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	3.00
Cover Type:	GRAVEL
Site Marked:	NO
Mins. Pinpointing:	45

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	4,320
Weekly:	30,240
Monthly:	131,400
Annual:	1,576,800

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	4
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
SERVICE CONNECTION
Leak Address
130 A N SEQUOIA RD

Client:	San Lorenzo Valley Water District

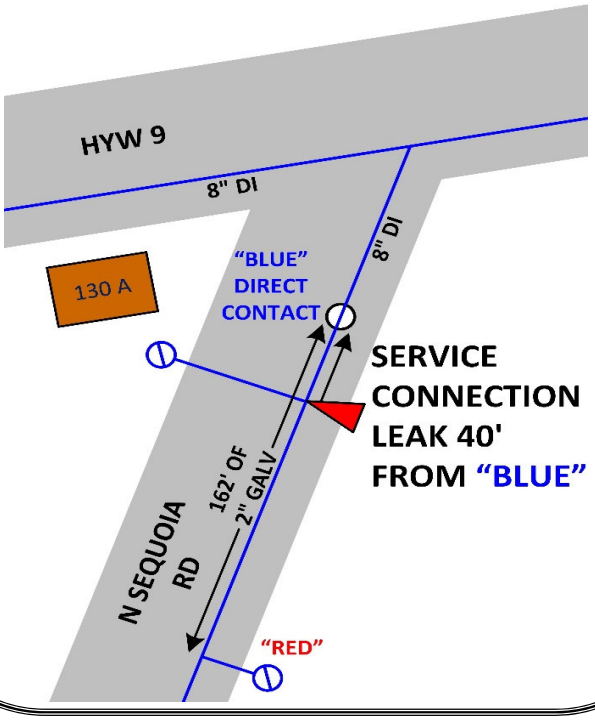
Agreement:	23027

REMARKS

PINPOINTED SERVICE CONNECTION LEAK WITH EXCELLENT CORRELATION. SOIL IS MOIST IN PINPOINTED AREA.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30
LC-2500

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	2.00
Cover Type:	GRAVEL
Site Marked:	NO
Mins. Pinpointing:	60

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"
38	A	123	39

Water Loss (gallons)	
Daily:	2,880
Weekly:	20,160
Monthly:	87,600
Annual:	1,051,200

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	5
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
VALVE
Leak Address
127 FOREST ST

Client:	San Lorenzo Valley Water District

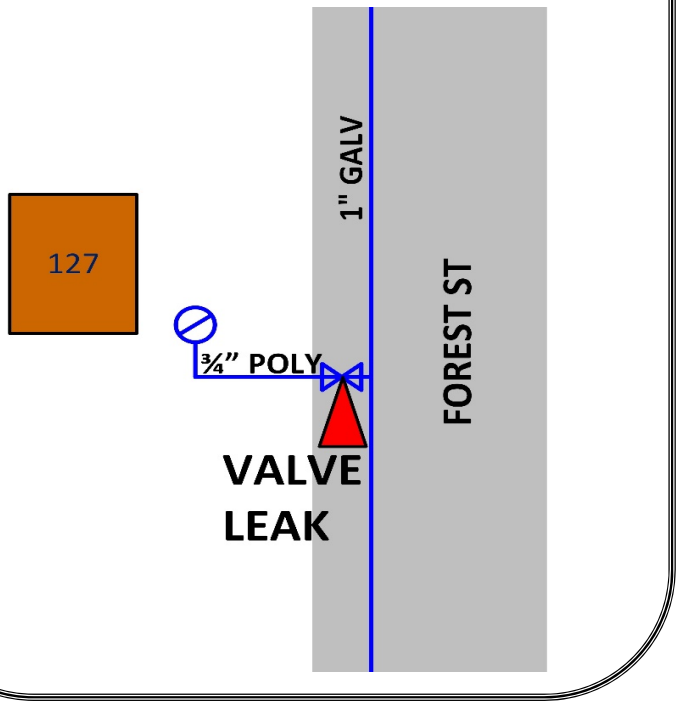
Agreement:	23027

REMARKS

VALVE LEAK. WATER INSIDE VALVE CAN. VERY HIGH FREQUENCY LEAK NOISE DETECTED. LEAK IS ITHER A FLANGE FITTING, NIPPLE, OR PACKING LEAK.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30
VISIBLE

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	II
Leak Rate (GPM):	3.00
Cover Type:	ASPHALT
Site Marked:	NO
Mins. Pinpointing:	30

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	4,320
Weekly:	30,240
Monthly:	131,400
Annual:	1,576,800

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	6
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
VALVE
Leak Address
168 WILLOWBROOK DR

Client:	San Lorenzo Valley Water District

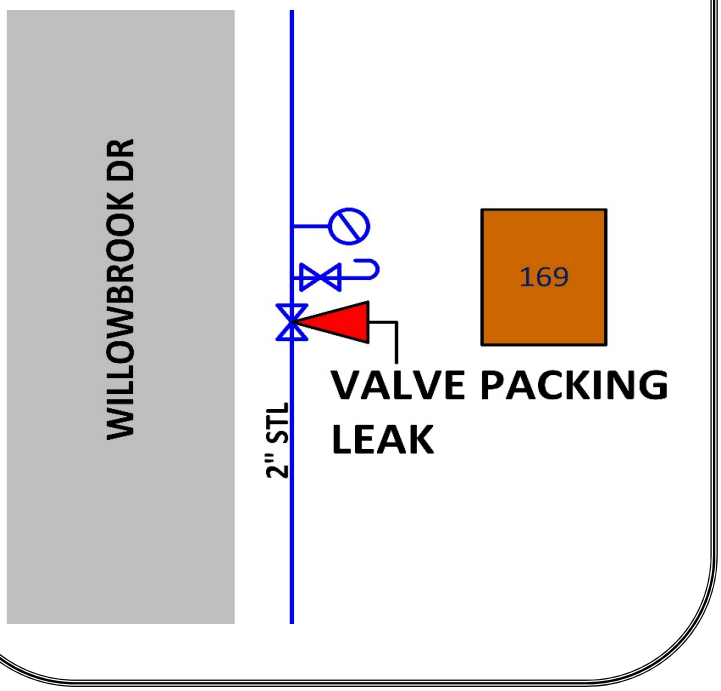
Agreement:	23027

REMARKS

VALVE PACKING LEAK. WATER IN VALVE CAN.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	1.00
Cover Type:	ASPHALT
Site Marked:	NO
Mins. Pinpointing:	20

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	1,440
Weekly:	10,080
Monthly:	43,800
Annual:	525,600

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	7
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
HYDRANT
Leak Address
140 WOODLAND DR

Client:	San Lorenzo Valley Water District

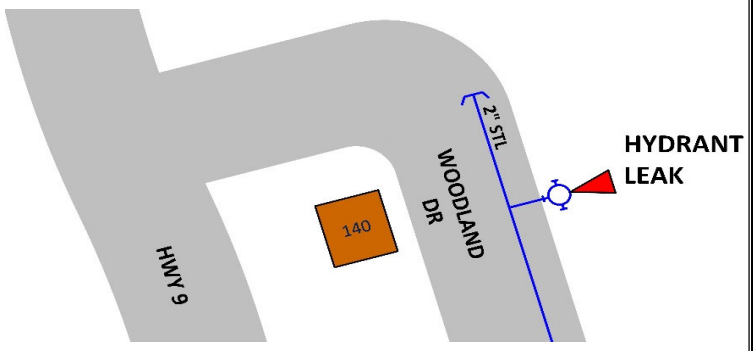
Agreement:	23027

REMARKS

SMALL LEAK ON DAMAGED WHARF HYDRANT. HYDRANT HAS BEEN HIT BY TREE DEBIRIS AND ANGLED AT APPROXIMATELY 45 DEGREE ANGLE.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30
VISIBLE

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	0.50
Cover Type:	GRAVEL
Site Marked:	NO
Mins. Pinpointing:	20

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	720
Weekly:	5,040
Monthly:	21,900
Annual:	262,800

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	8
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
MAIN
Leak Address
490 BALCH WAY

Client:	San Lorenzo Valley Water District

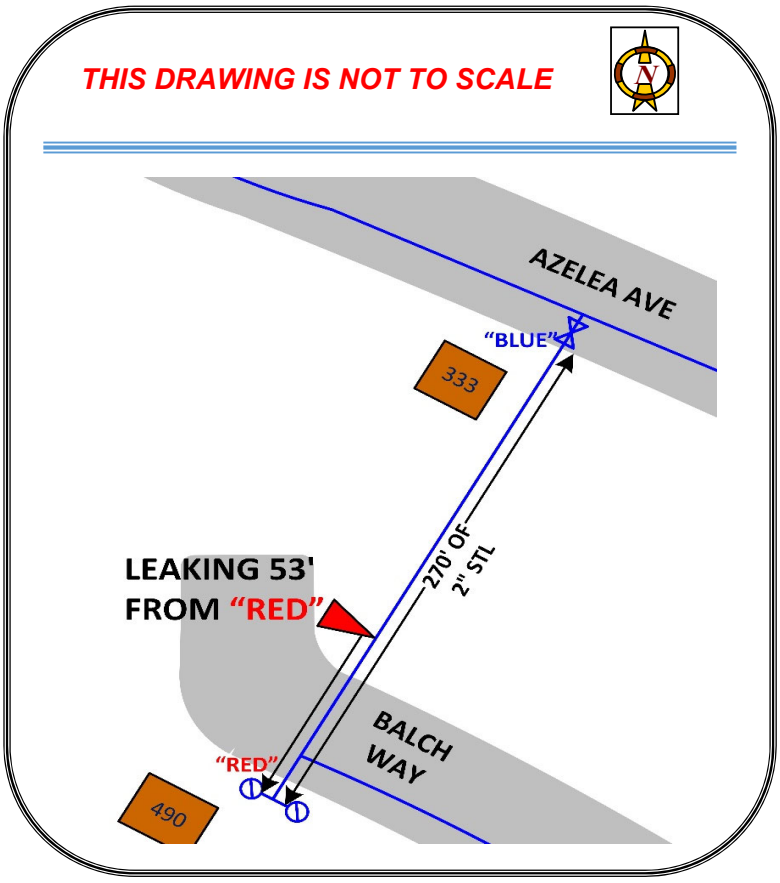
Agreement:	23027

REMARKS

VERY GOOD LEAK NOISE DETECTED AT "BLUE". GOOD CORRELATION WITH ESTIMATED DISTANCE (PIPE LENGTH). EXACT LOCATION OF MAIN LINE ALONG CROSS COUNTRY PATH IS UNKNOWN.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	II
Leak Rate (GPM):	5.00
Cover Type:	SOIL
Site Marked:	NO
Mins. Pinpointing:	60

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"
38	A	53	227

Water Loss (gallons)	
Daily:	7,200
Weekly:	50,400
Monthly:	219,000
Annual:	2,628,000

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	9
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
OTHER
Leak Address
11910 CLEAR CREEK RD

Client:	San Lorenzo Valley Water District

Agreement:	23027

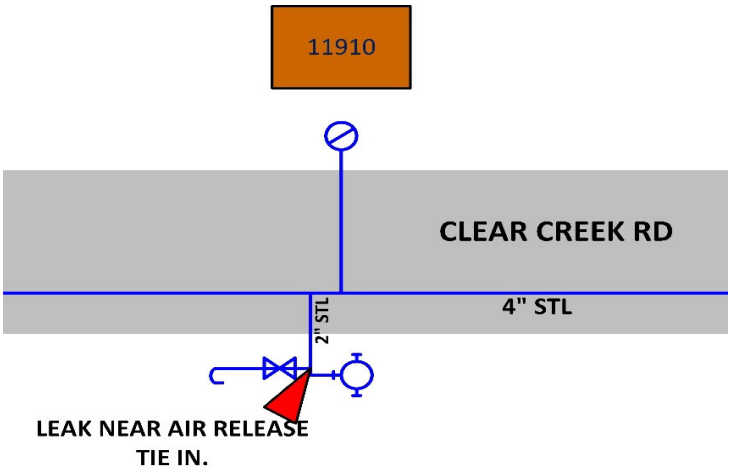
REMARKS

LEAK NEAR AIR RELEASE TIE IN ON WHARF HYDRANT LEATERAL. VERY STRONG LEAK NOISE DETECTED AND WATER FLOWING FROM AFFECTED AREA.

Action(s) Taken:

Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	II
Leak Rate (GPM):	5.00
Cover Type:	GRAVEL
Site Marked:	NO
Mins. Pinpointing:	30

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	7,200
Weekly:	50,400
Monthly:	219,000
Annual:	2,628,000

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	10
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
VALVE
Leak Address
1395 COUNTRY CLUB DR

Client:	San Lorenzo Valley Water District

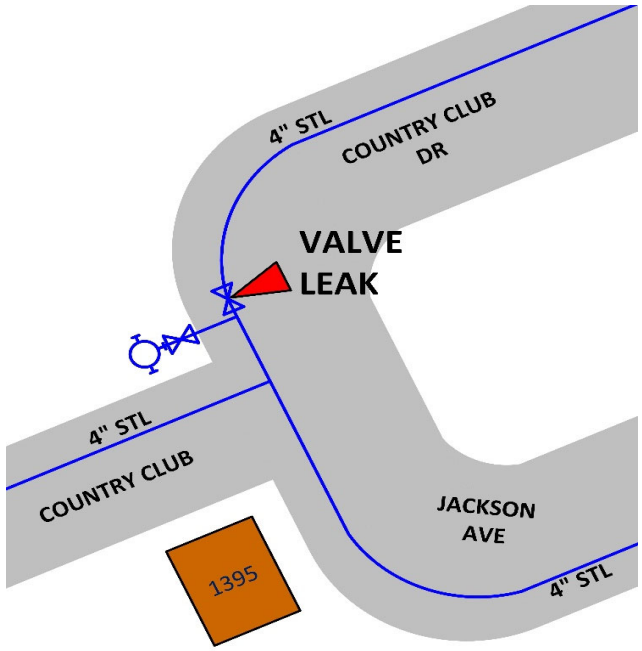
Agreement:	23027

REMARKS

VALVE LEAK. VERY HIGH FREQUENCY LEAK NOISE DETECTED AT INLINE VALVE. BOTH VALVES HAVE LEAK NOISE WITH THE INLINE VALVE REGISTERING THE MOST LEAK NOISE. WATER VISIBLE IN BOTH VALVE CANS. POSSIBLE PACKING OR FLANGE LEAK.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	III
Leak Rate (GPM):	1.00
Cover Type:	ASPHALT
Site Marked:	NO
Mins. Pinpointing:	40

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	1,440
Weekly:	10,080
Monthly:	43,800
Annual:	525,600

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	11
Date:	June 29, 2023
Map #:	
Coordinates	

Leak Type
SERVICE CONNECTION
Leak Address
130 PACIFIC ST (ADDRESS ESTIMATED)

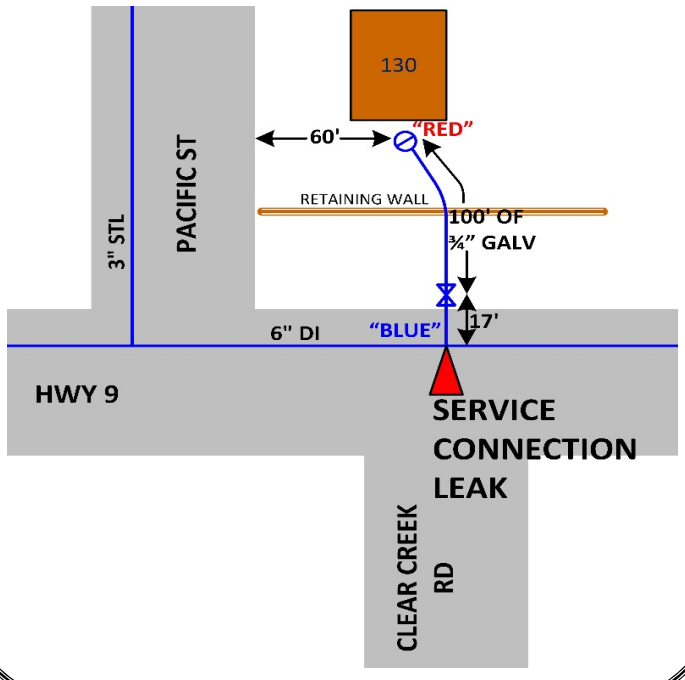
Client:	San Lorenzo Valley Water District
Agreement:	23027

REMARKS

CORRELATION FROM METER TO VALVE PINPOINTED LEAK AT VALVE "BLUE". GROUND MIC PINPOINTED THE LEAK AT SERVICE CONNECTION WHICH IS ON HWY 9 THROUGH A CORNER PROPERTY TO THE DUPLEX / HOUSE. NO WATER IN VALVE CAN "BLUE". DID NOT OPERATE THIS VALVE WHICH APPEARED TO BE A 3/4" GATE VALVE.

Action(s) Taken:
Recommendation(s): REPAIR / REPLACE

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30
LD-12
LC-2500

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	I
Leak Rate (GPM):	20.00
Cover Type:	ASPHALT
Site Marked:	YES
Mins. Pinpointing:	45

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"
42	A	100'	0'

Water Loss (gallons)	
Daily:	28,800
Weekly:	201,600
Monthly:	876,000
Annual:	10,512,000

UTILITY SERVICES ASSOCIATES
Leak Detection & Solutions

LEAK REPORT

Leak #:	U-1
Date:	June 8, 2023
Map #:	
Coordinates	

Leak Type
UNDEFINED
Leak Address
360 BLUE RIDGE DR

Client:	San Lorenzo Valley Water District

Agreement:	23027

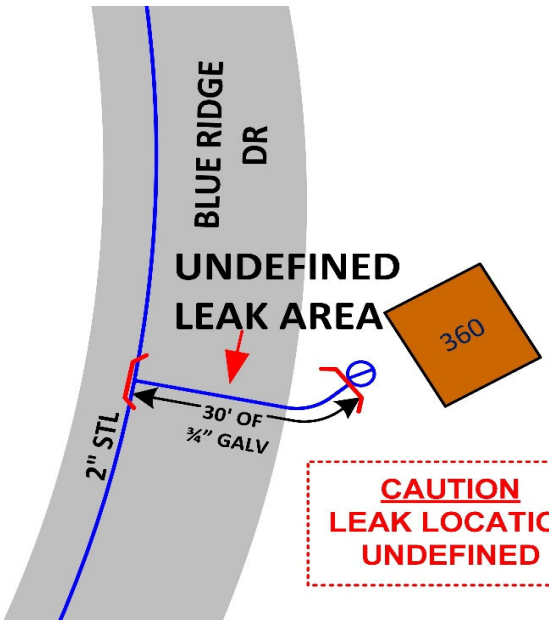
REMARKS

GOOD LEAK NOISE DETECTED ON METER. AREA FULLY GROUND MIC'D WITH NO SOLID RESULTS. LEAK APPEARS TO BE SMALL AT THE PRESENT TIME. NO VISIBLE PROBLEMS THROUGHOUT AREA.

Action(s) Taken: _____ _____

Recommendation(s): _____ _____

THIS DRAWING IS NOT TO SCALE



EQUIPMENT USED
S-30
LD-12

LEAK INFORMATION	
Leak Consultant:	EK
Leak Class:	N/A
Leak Rate (GPM):	N/A
Cover Type:	N/A
Site Marked:	NO
Mins. Pinpointing:	45

LEAK IMAGE NOT AVAILABLE

Computer Correlation Results			
Scan Time	Grade	Dist. "Red"	Dist. "Blue"

Water Loss (gallons)	
Daily:	
Weekly:	
Monthly:	
Annual:	

CONCLUSION

LEAK SURVEY CONCLUSION

Our thanks to James Furtado and all persons involved with this project for their assistance in gathering all the necessary paperwork and personnel to create, with USA, a mutually beneficial leak detection project.

With this survey, you have demonstrated concern for prudent water utilization and conservation.

Capitalizing on the most advanced leak detection technology available today, USA has successfully completed this Leak Detection Survey. The contents of this Final Report provide San Lorenzo Valley Water District with a permanent record of the activities performed to complete a Leak Survey along with the results achieved.

An important characteristic of this Leak Report is that the facts contained herein can be used in formulating a database for decision making regarding: the need for possible future meter programs, rehabilitation and pipeline replacement and/or the investigation of new water sources, etc. These types of decisions, regarding your utilization of water, now can be predicated more on facts rather than supposition or conjecture.

Prompt repair of any leaks reported provide an immediate benefit to San Lorenzo Valley Water District, which includes recovery of most water revenue and water conservation, etc.

Having achieved these results, we recommend that you continue to set up the infrastructure necessary to continue investigating leakage in the water distribution system. Implementation of any on-going leak survey program will ensure that leak losses are kept to a minimum, and the added enhancement of saving costs due to emergency call outs.

Utility Services Associates, LLC, is proud to have served San Lorenzo Valley Water District in this way and we wish to thank you for your substantial assistance and cooperation in this project.

If you or your staff has any questions regarding this Final Report, please feel free to call us at (877) 585-5325.

Best Regards,

Cory Simonson
President

MEMO

DATE: Date of Meeting

TO: Engineering & Environmental Committee, San Lorenzo Valley Water District

FROM: Rick Rogers, District Manager

SUBJECT: Replacement of the District's Raw Water Supply Lines (5-Mile and Peavine)

WRITTEN BY: Rick Rogers District Manager

PRESENTED BY: Rick Rogers District Manager

STAFF RECOMMENDATION

Staff recommends that the Engineering Committee review the Cross Country Pipeline Constructability Study Technical Memorandum and Alternative Analysis Report by Freyer & Laureta and the Cross Country Pipeline Constructability Peer Review of F& L Study and Memo prepared by Haro Kasunich and Associates Inc. and recommend to the full Board to reconstruct the raw water pipelines to pre-CZU Fire condition (above grade). In addition, request staff prepare construction estimates of the above-ground construction method.

RECOMMENDED MOTION

I move that the Committee recommend to the Board the reconstruction of the raw water pipelines to pre-CZU condition and to direct staff to prepare construction estimates for the above-ground construction method.

BACKGROUND

The CZU Fire of August 2020 resulted in substantial damage to Santa Cruz County. The fire consumed approximately 86,509 acres including 1,300 acres of District-owned water shed destroying approximately 7 miles of above-grade HDPE pipe used for raw water conveyance from the district surface water sources to the Water Treatment Plant. In considering replacement the district solicited a request for proposal for a constructability study and alternative analysis report.

The report covered site reconnaissance and an environmental assessment was completed to identify potential constraints that may impact the overall permitting and constructability of the proposed Project improvements. The assessment found that key environmental constraints could result in constraints during the construction of the Peavine segment and 5-Mile segment including:

- Stream crossings where fill or excavation may occur within the limits of the stream will require permits from multiple agencies; and
- Nesting birds could limit the time of year for construction activities or result in unanticipated delays; and
- Forest and habitat removal to facilitate construction must be sequenced in a manner to reduce the risk of construction delays;
- A geotechnical assessment was performed to support the study and provided the following observations and recommendations:
  - Cross-Country Pipeline Constructability Study
  - The potential for seismically induced liquefaction and densification along the existing cross-country pipeline alignment is low.

- Portions of the existing alignment may be subject to active landslide features that generally occur within the upper colluvium.
- Earth-retaining structures to facilitate the construction of the replacement pipeline will stabilize the bench to protect the new pipeline.
- Excavations are anticipated to only require conventional excavating equipment such as backhoes and excavators.
- Additional geotechnical investigations are recommended to be completed during the final design phase for the preferred alternative.

The Peavine and 5-Mile segments must be reconstructed to restore the critical surface water supply for the SLVWD system. The report considers several replacement strategies for replacement of the cross-country pipeline including:

- Replace in kind with new 8-inch diameter HDPE pipeline above grade along the same alignment; and
- Replace with new 8-inch pipeline with alternative pipeline materials above grade along the same alignment; and
- Replace with new 8-inch pipeline with HDPE or other suitable material below grade in a shallow trench; and
- Replace with new 8-inch pipeline with HDPE or other suitable material along an alternative alignment.

In reviewing all the alternatives alternative 3B was recommended by the consultants. Shallow buried (18”) HDPE pipe with below-grade creek crossings following the same Peavine and 5-Mile segment alignments.

The original above-ground HDPE pipeline was installed with hand labor by the California Conservation Corps over 10 years. The result is a very narrow bench that will need to be widened to construct any alternative. The proposed work would be completed by a contractor using mechanical equipment supplemented by minor hand labor.

From a geologic and geotechnical standpoint, the required bench width is the most important factor in burying the pipe. A wider bench will increase the need for (and height of) retaining walls, which will increase the amount of cut and fill grading and will involve more extensive slope stability concerns.

The cost of Alternative 3B below-grade construction method is estimated at:

- Five Mile segment - $49,100,000
- Peavine segment - $12,540,000

FEMA Grants for this disaster to restore the piping to pre-disaster conditions (above ground) is 90%. To bury the pipe would be a change from the pre-disaster condition and would take some time to get the project obligated and most likely would drastically increase the District's share of the expense for the added construction cost. Cost estimating to reconstruct the pipeline to pre-disaster conditions is needed to understand fully what the increased amount of the District's costs might be. Installing the pipe to per-disaster conditions (above grade) would be considerably less expensive, possibly 1/3 of the buried project costs as road building and retaining walls will not be necessary.

Haro Kasunich and Associates Peer Review:

The District solicited a peer review of the F & L Study from Haro Kasunich and Associates. The report found the F&L study did not yet adequately incorporate consideration of the actual field conditions and the difficulty of construction and equipment access which are necessary to determine the best alternative for waterline replacement, constraints for installation, or costs. Moreover, there review finds that large portions of the waterline are likely not accessible by equipment (large or small) without very significant new road/trail construction which will likely be cost-prohibitive and/or unwarranted in light of alternative installation methods. Because of the steep slopes and limited access, the report stated it will be difficult and expensive to reconstruct the entire waterline in a manner to fully protect it from future wildfires while at the same time mitigating risks to downslope water quality and public safety. Their review found multiple physical constraints impact the constructability and ultimately the feasibility of waterline reconstruction, including:

- Very steep slopes(>100%)

  They found about 87% of the alignment (5.7 miles) traverses slopes steeper than 2:1 slope (50% gradient) with nearly 13% (4,600 feet) steeper than 100% gradient
- Steep streamside slopes adjacent to water courses

  The project site is located within the San Lorenzo River watershed, which is listed as impaired by sediment under Section 303(d) of the Clean Water Act and is regulated by the May 16, 2003 California State RWQCB Resolution No. R3 2002 0063, increased sediment

loads to watercourses are of significant concern and may not be permitted.

- Unstable areas (including existing waterline-related failures)
  Much of the project area is subject to shallow debris slide and debris flow land sliding, and debris from such failures can extend long distances down the native slopes and may enter watercourse areas and/or flow offsite and damage neighboring development.
- Localized areas of hard bedrock
  Some of the steep streamside and inner gorge conditions at watercourse crossings locally expose hard granitic bedrock forming very steep slopes that may be difficult to excavate through with small equipment.
- Large trees containing large root wads in the pipeline alignment
  The existence of large stumps essentially blocking the existing waterline bench is a significant constraint that requires further review. Gaining access with equipment that is large enough to remove or route the waterline around the root wads to allow for both the installation of a buried pipeline and equipment to continue and work further along the alignment will be difficult and quite possibly infeasible due mainly to the steep slopes such equipment will need to traverse.
- Watercourse crossings
  The report found that most of the existing smaller watercourse crossings were crossed at grade on a narrow bench and likely can again be crossed on rock fords or similar crossings. The larger crossings will be much more difficult to construct and may be best crossed with elevated pipeline crossing structures.

Haro Kasunich and Associates report concluded that the presented F&L work does not yet adequately incorporate consideration of the actual field conditions and the difficulty of construction and equipment access. The review finds that large portions of the waterline alignment are likely not accessible by equipment (large or small) without very significant new road/trail construction which will likely be cost-prohibitive, environmentally unfeasible, and/or unwarranted in light of alternative installation methods. Thus, it is premature to make definitive conclusions on the best alternative for waterline reinstallation. The steep slopes that dominate the waterline alignment present a significant constraint and were one of the reasons why the original waterline was installed by hand. Access to the waterline is restricted to about 7 locations where existing roads or trails cross the waterline. Moreover, there review found there are multiple physical constraints that impact the constructability and ultimately the feasibility of waterline reconstruction

DISTRICT FINDING

In reviewing both reports they both state additional information is needed to make a firm recommendation on a construction technique. Staff sees two alternatives, bury the pipe which may not even be constructible, or replace the pipe to pre-disaster conditions which is HDPE pipe laid above grade (not protected from fire) on the ground and in some steep slope areas supported on poles on the existing bench/trail based on the following:

- Reduced installation costs

- Eligible 90% Installation Cost reimbursement from FEMA/CalOES, where Alternative 3B (buried pipeline) may have substantial costs to the District
- Less environmental concerns, landslides, retaining walls, mudslides, wildlife, and impacts to the riparian corridor
- Reduced environmental permitting replacement versus new construction
- Less construction time
- Constructible, we did it before, it can be done

PRIOR COMMITTEE ACTION

- 6.15.21 Engineering Committee recommended that the Board accept the Freyer & Laureta 5-Mile Pipeline Constructability proposal
- 12.12.22 Engineering/Environmental Committee recommended that the Board accept the Haro, Kasunich, and Associates Peer Review of the Freyer & Laureta 5-Mile Pipeline proposal

FISCAL IMPACT

- Above grade: TBD
- Below grade: $61.64M
- Possible 90% FEMA Reimbursement

ENVIRONMENTAL IMPACT

Depending on the project: TBD

ATTACHMENTS AND RELEVANT LINKS TO DISTRICT WEBSITE

- https://www.slvwd.com/sites/g/files/vyhlif1176/f/uploads/slvwd_crosscountry_constructability_2022-03-16.pdf
- https://www.slvwd.com/sites/g/files/vyhlif1176/f/uploads/slvwd_cross_country_pipeline_constructability_study_peer_review_11-24-22.pdf

MEMO

DATE: September 14, 2023
TO: E & E Committee, San Lorenzo Valley Water District
FROM: Rick Rogers, District Manager
SUBJECT: Quail Hollow Road 2023 Storm Damage Repairs

WRITTEN BY: Garrett Roffe, Engineering Manager

PRESENTED BY: Garrett Roffe, Engineering Manager

STAFF RECOMMENDATION

It is recommended that the Board of Directors review the background information regarding the 2023 Storm Damage Repairs, Quail Hollow Road Summary of 2023 Storm Damage Repairs (Figure 5) and Proposal for Ground Penetrating Radar data collection of Quail Hollow Road and discuss.

RECOMMENDED MOTION

None

BACKGROUND

On October 22, 2021, the Board awarded the Quail Hollow Pipeline Replacement Project to Granite Rock Company for $2,387,000.00. The project provided 7,455 LF of new 12-inch ductile iron water main in Quail Hollow Road, with associated fittings, valves, services, hydrants, and abandoning in-place the existing 6-inch water main. On December 13, 2022 the County of Santa Cruz accepted the trench paving for the new water main.

On January 17, 2023 a sinkhole developed at the entrance to Quail Hollow Ranch County Park and the County of Santa Cruz chose to proceed with an emergency repair under force account managed by the County with the following site description. “The road is settling in the Eastbound lane at this location due to underground water flow in the soil under the road. Our general scope would be (under field direction) to dewater the site by intercepting upstream surface and subsurface water, excavate roadway and determine extent of undermining, backfill voids, & restore roadway pavement.” On January 18, 2023 the County of Santa Cruz authorized Granite Rock Company to perform emergency sinkhole repairs near the entrance to Quail Hollow Ranch County Park.

On February 21, 2023 Granite Rock Company completed all punchlist items for the District’s Quail Hollow Pipeline Replacement project. On March 7, 2023 a pavement failure near Quail Hollow Circle required the County of Santa Cruz to place a single trench plate over the pavement failure at approximately 7 pm. On March 8, 2023 Granite Rock Company placed eleven additional trench plates on Quail Hollow Road starting at the intersection of Quail Hollow Circle heading easterly towards Zayante Road. On March 16, 2023 Granite Rock Company removed pavement at the pavement failure near Quail Hollow Circle and discovered a sinkhole approximately four feet wide and eight feet long on the north side of the slurry backfill. On the same day, pavement removal near 301 Quail Hollow Road exposed a sinkhole two feet wide and ten feet long on the south side of the slurry backfill. On March 16, 2023 the sinkholes were observed by County of Santa Cruz Public Works personnel and requested voids be temporarily backfilled with drain rock until permanent repairs could be completed. On March 22,

2023 Granite Rock Company placed four additional trench plates near 301 Quail Hollow Road. On March 30, 2023 the repairs to Quail Hollow Road were chosen to be classified as emergency storm damage repairs separate from the Quail Hollow Pipeline contract. On April 5, 2023 Granite Rock Company readjusted the steel trench plates, welded them together at each end and placed drain rock in a void.

On April 11, 2023 Anderson Pacific Engineering Construction Inc. was contacted to provide a time and materials, not to exceed contract for emergency repairs to Quail Hollow Road. On April 17, 2023 the trench plates were removed near Quail Hollow Circle and the slurry backfill was removed from above the new water main exposing a void extending towards the road centerline. The extents of the void appeared to comprise both lanes of Quail Hollow Road and would require a full closure of the road to complete repairs. On April 18, 2023 the County of Santa Cruz denied the proposed full closure of Quail Hollow Road for sinkhole repairs.

On April 20, 2023 an Emergency Construction Contract with Anderson Pacific Engineering Construction, Inc for time and materials not to exceed $108,000.00 was executed to explore and repair of the failed mainline trench in Quail Hollow Road, and includes, but is not limited to, provision of backfill and paving materials, excavation, evaluation of failure extent, backfill, compaction, traffic control, shoring, reestablishment of alignment of existing pipeline, and asphalt paving.

The Notice of Completion for the District's Quail Hollow Pipeline Replacement project with Granite Rock Construction was recorded with the County of Santa Cruz on May 10, 2023.

On May 25, 2023 an Emergency Construction Contract with Anderson Pacific Engineering Construction, Inc for time and materials not to

exceed $250,000.00 was executed to explore and repair of the failed mainline trench in Quail Hollow Road, and includes, but is not limited to, provision of backfill and paving materials, excavation, evaluation of failure extent, backfill, compaction, traffic control, shoring, reestablishment of alignment of existing pipeline, and asphalt paving.
On June 5, 2023 Anderson Pacific Engineering Construction, Inc. began repairs of the sinkholes in Quail Hollow Road.
On August 3, 2023 the Board authorized an amendment to the existing expenditure of time and materials not to exceed $600,000.00 for exploration of the failed potable water main trench in Quail Hollow Road. To date all known sinkholes have been repaired.
Anderson Pacific completed final paving of the trench repair work in Quail Hollow Road on August 14, 2023 and August 15, 2023 and installed minor concrete rings around valve boxes on August 16, 2023 and August 17, 2023. The County of Santa Cruz performed pavement surface treatment on Quail Hollow Road August 25, 2023 & August 28, 2023.
The District has submitted to FEMA for grant funding and is awaiting obligation. The District has several experts looking at the many different aspects of the project that may have caused the sinkholes to develop in Quail Hollow Road. The Geotechnical Report indicates the native material in Quail Hollow Road near the sand quarry was soft material based on the blow counts (This is a standard penetration test where a 140-pound weight is dropped and the number of blows to advance the point one foot is counted. The more the blows the harder the soil.). The region experienced Atmospheric River rain events that caused soil failures throughout the County. At this time, the exact cause of the sinkholes is unknown.

PRIOR COMMITTEE ACTION

None

FISCAL IMPACT

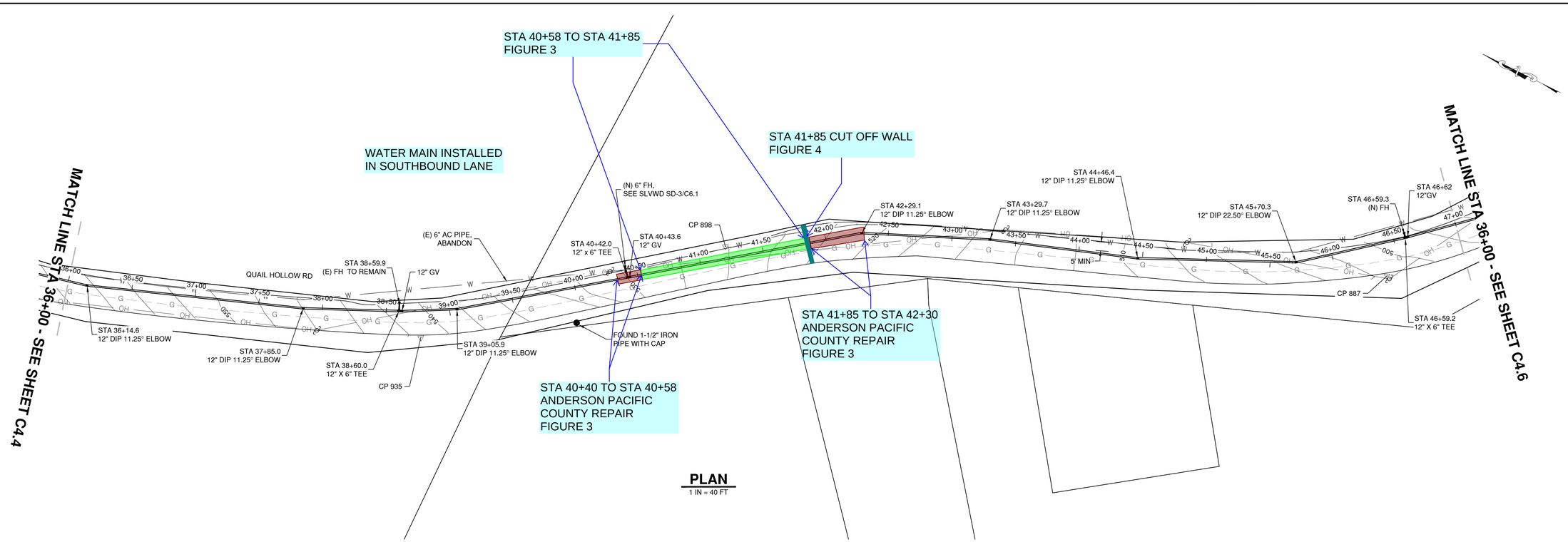
Estimated $950,000.00

ENVIRONMENTAL IMPACT

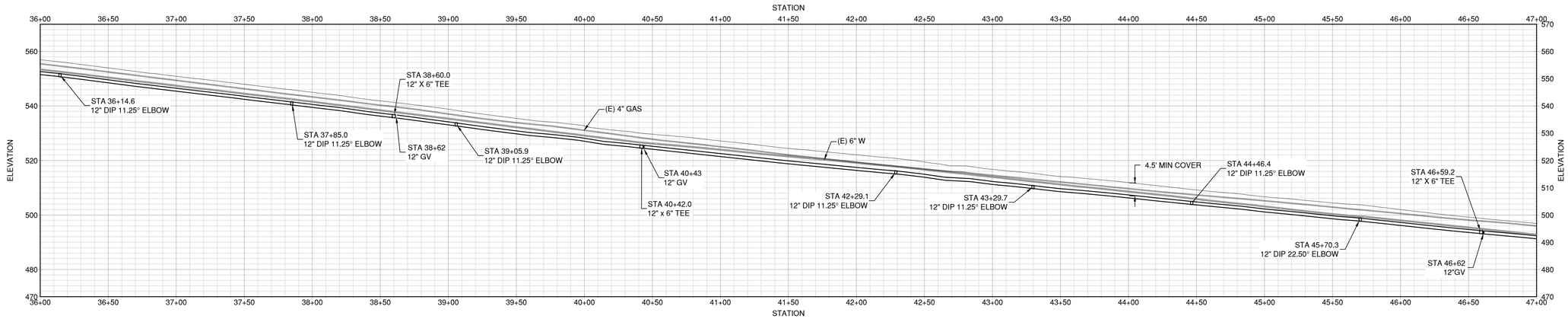
None

ATTACHMENTS

- Quail Hollow Pipeline Replacement 07122021 8
- Quail Hollow Pipeline Replacement 07122021 10
- Quail Hollow Pipeline Replacement 07122021 11
- Figure 1 Trench Repair Detail-Slurry Bedding
- Figure 2 Cleanout and Side Drain
- Figure 3 Trench Repair Detail-Sand Bedding
- Figure 4 Cut Off Wall
- Figure 5 Quail Hollow Summary of 2023 Storm Damage Repairs
- Quail Hollow Road Contour Map
- 191110.001-SLVWD-Waterline-GeotechRpt.
- Proposal from GPRDATA for Ground Penetrating Radar Survey



PLAN
1 IN = 40 FT



PROFILE
HOR. SCALE: 1 IN = 40 FT
VER. SCALE: 1 IN = 20 FT

NOTES:
1. ALONG THE ALIGNMENT OF THE NEW WATER MAINS, ALL EXISTING WATER SERVICES, WHETHER OR NOT SHOWN ON THE DRAWINGS, SHALL BE REPLACED. REPLACEMENT SERVICES SHALL EXTEND FROM THE NEW WATER MAIN TO A NEW WATER METER. WATER METERS SHALL BE FURNISHED BY SLVWD AND INSTALLED BY THE CONTRACTOR. ALL OTHER SERVICE COMPONENTS, INCLUDING WATER METER BOX, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. NEW METER BOXES SHALL BE INSTALLED IN THE SAME LOCATION AS THE EXISTING UNLESS OTHERWISE INDICATED OR OTHERWISE DIRECTED BY SLVWD. NEW SERVICES SHALL BE PER SLVWD STANDARD DETAIL SD-4 OR SD-5. NEW SERVICE PIPING SHALL BE THE SAME SIZE AS THE EXISTING SERVICE PIPING EXCEPT IF THE EXISTING SERVICE PIPING IS LESS THAN 1-INCH DIAMETER. IF THE EXISTING SERVICE PIPING IS LESS THAN 1-INCH DIAMETER, NEW SERVICE PIPING SHALL BE 1-INCH DIAMETER.
2. PARCEL BOUNDARIES ARE IMPORTED FROM GIS AND FOR INFORMATION ONLY. CORNERS ARE NOT FIELD SURVEYED.
3. LOCATION OF GAS MAIN IS APPROXIMATE. PROVIDE A MIN. 5 FT SEPARATION.

0 40 80 Feet

UNDERGROUND SERVICE ALERT
CALL: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

REV. NO.	DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			

Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS
3 Quail Run Circle, Suite 101
Salinas, CA 93907-2348
(831) 883-4848

REGISTERED PROFESSIONAL ENGINEER
JOSEPH T. SIEBERNZ
No. 69703
CIVIL
STATE OF CALIFORNIA

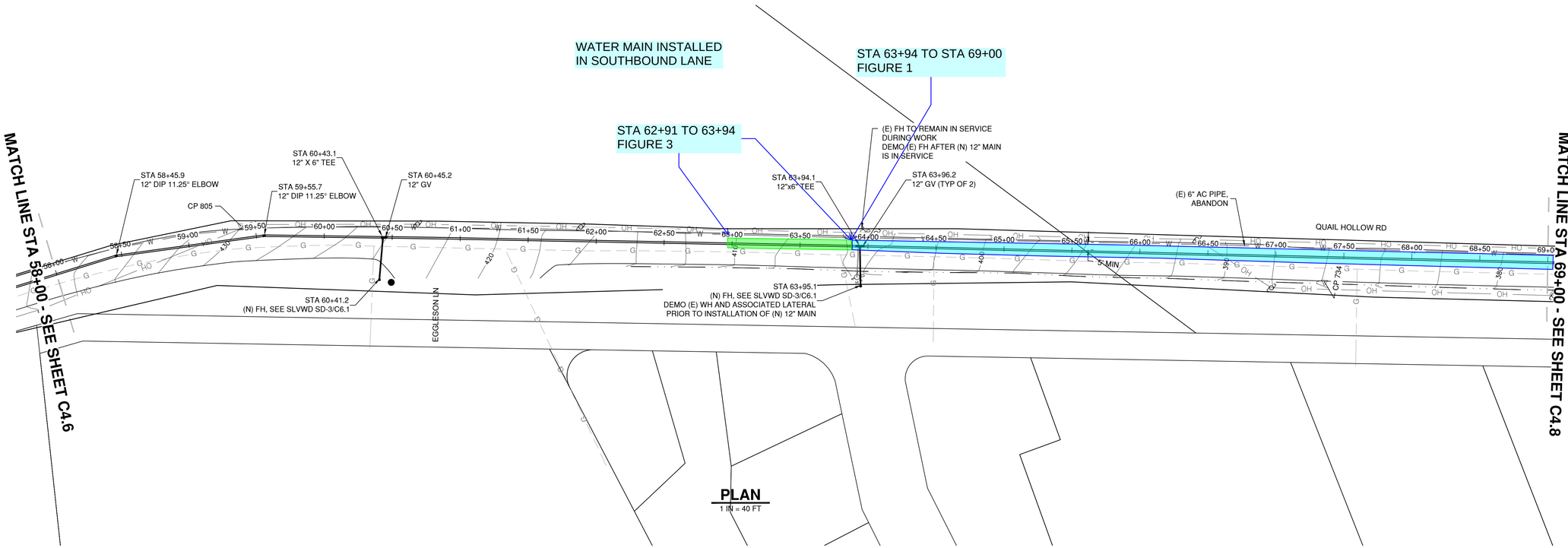
PLAN & PROFILE IV
QUAIL HOLLOW ROAD
PIPELINE REPLACEMENT

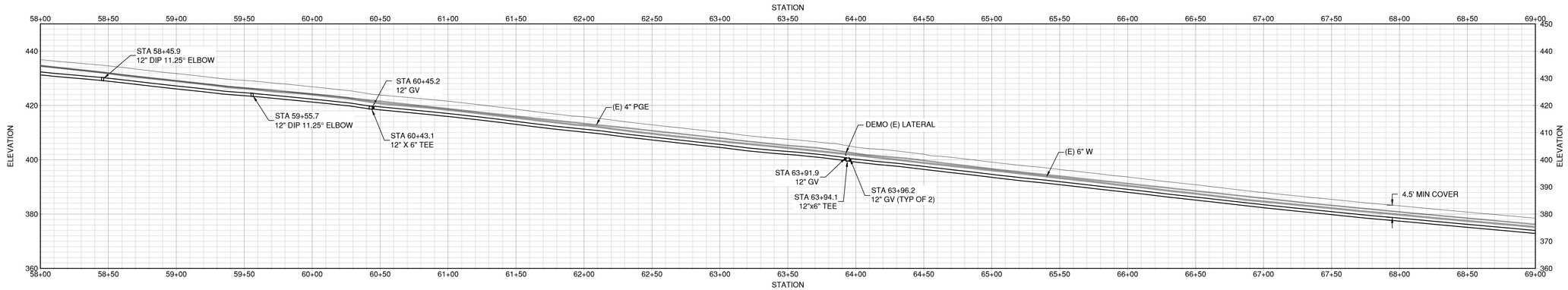
San Lorenzo Valley WATER DISTRICT

DESIGNED BY:	JCT	DATE: 7/12/2021
DRAWN BY:	JCT	DATE: 7/12/2021
QC CHECKED BY:	AAS	DATE: 7/12/2021
PROJECT NO.:		
SCALE:	AS SHOWN	
SUBMITTAL:	100% SUBMITTAL	

C4.5
SHEET 8 OF 14

C:\USERS\JTABUE\DESKTOP\SLVWD QH\QUAIL HOLLOW WORKING\SLVWD QUAILHOLLOW 12JUL'2021.DWG 7/12/2021 BY JTABUE





NOTES:
1. ALONG THE ALIGNMENT OF THE NEW WATER MAINS, ALL EXISTING WATER SERVICES, WHETHER OR NOT SHOWN ON THE DRAWINGS, SHALL BE REPLACED. REPLACEMENT SERVICES SHALL EXTEND FROM THE NEW WATER MAIN TO A NEW WATER METER. WATER METERS SHALL BE FURNISHED BY SLVWD AND INSTALLED BY THE CONTRACTOR. ALL OTHER SERVICE COMPONENTS, INCLUDING WATER METER BOX, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. NEW METER BOXES SHALL BE INSTALLED IN THE SAME LOCATION AS THE EXISTING UNLESS OTHERWISE INDICATED OR OTHERWISE DIRECTED BY SLVWD. NEW SERVICES SHALL BE PER SLVWD STANDARD DETAIL SD-4 OR SD-5. NEW SERVICE PIPING SHALL BE THE SAME SIZE AS THE EXISTING SERVICE PIPING EXCEPT IF THE EXISTING SERVICE PIPING IS LESS THAN 1-INCH DIAMETER. IF THE EXISTING SERVICE PIPING IS LESS THAN 1-INCH DIAMETER, NEW SERVICE PIPING SHALL BE 1-INCH DIAMETER.
2. PARCEL BOUNDARIES ARE IMPORTED FROM GIS AND FOR INFORMATION ONLY. CORNERS ARE NOT FIELD SURVEYED.
3. LOCATION OF GAS MAIN IS APPROXIMATE. PROVIDE A MIN. 5 FT SEPARATION.

PROFILE
HOR. SCALE: 1 IN = 40 FT
VER. SCALE: 1 IN = 20 FT

0 40 80 Feet

UNDERGROUND SERVICE ALERT
CALL: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

REV. NO.	DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			

Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS
3 Quail Run Circle, Suite 101
Salinas, CA 93907-2348
(831) 883-4848

REGISTERED PROFESSIONAL ENGINEER JOSEPH T. SISSERMAN No. 69703 CIVIL STATE OF CALIFORNIA

PLAN & PROFILE VI

QUAIL HOLLOW ROAD PIPELINE REPLACEMENT

San Lorenzo Valley WATER DISTRICT

DESIGNED BY:	JCT	DATE: 7/12/2021
DRAWN BY:	JCT	DATE: 7/12/2021
QC CHECKED BY:	AAS	DATE: 7/12/2021
PROJECT NO.:		
SCALE:	AS SHOWN	
SUBMITTAL:	100% SUBMITTAL	

C4.7
SHEET 10 OF 14

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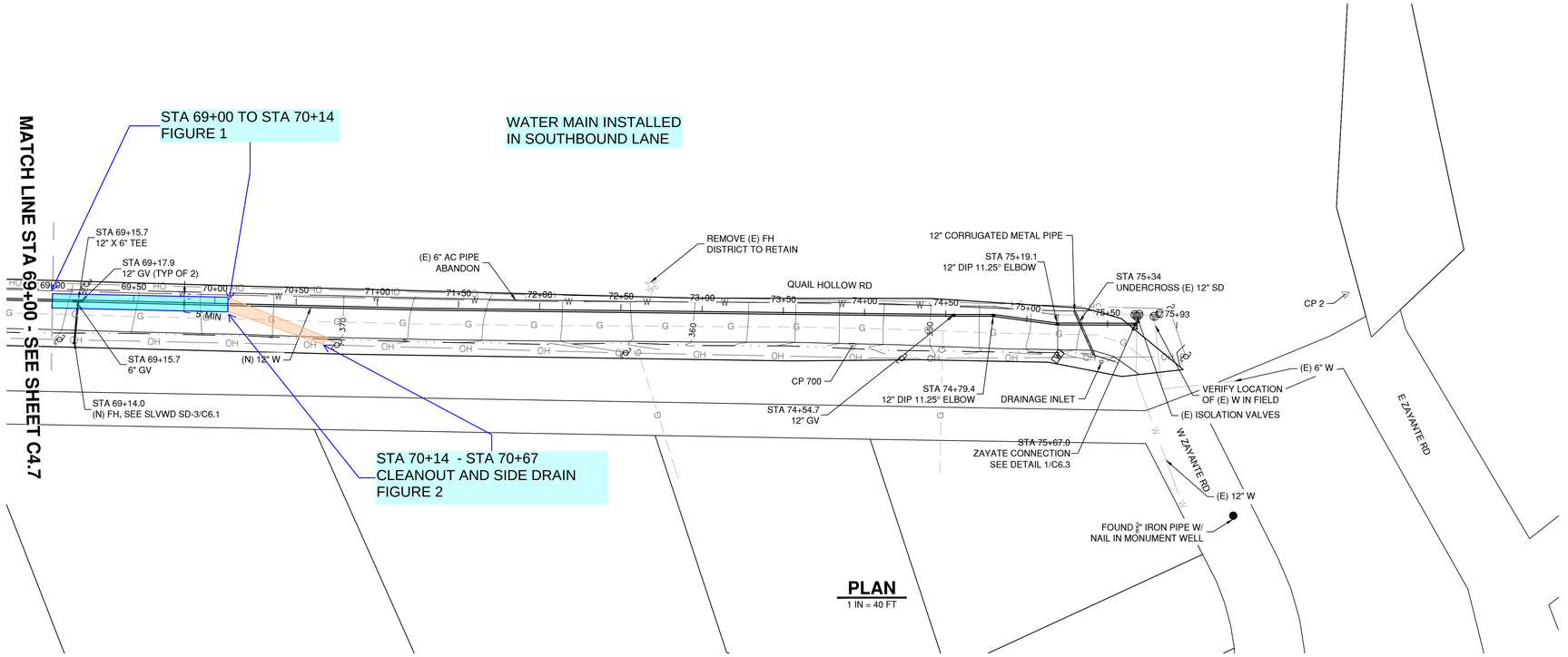
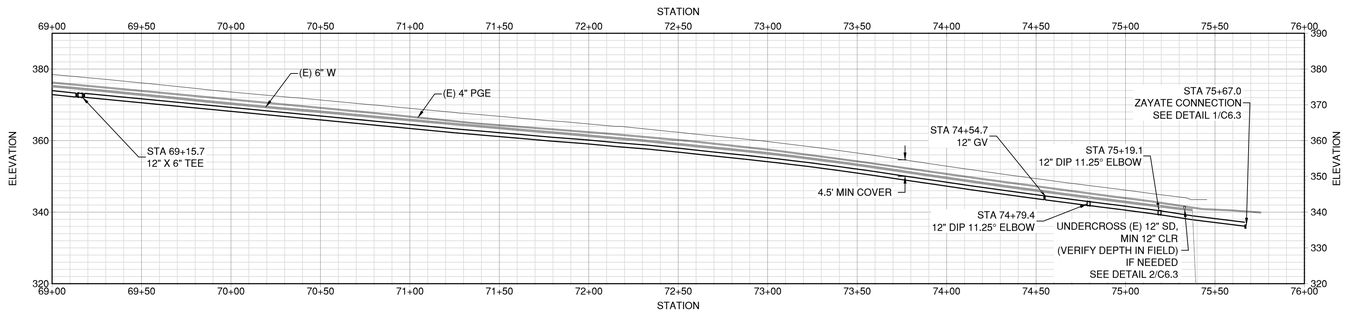


PLAN
1 IN = 40 FT



NOTES:
1. ALONG THE ALIGNMENT OF THE NEW WATER MAINS, ALL EXISTING WATER SERVICES, WHETHER OR NOT SHOWN ON THE DRAWINGS, SHALL BE REPLACED. REPLACEMENT SERVICES SHALL EXTEND FROM THE NEW WATER MAIN TO A NEW WATER METER. WATER METERS SHALL BE FURNISHED BY SLVWD AND INSTALLED BY THE CONTRACTOR. ALL OTHER SERVICE COMPONENTS, INCLUDING WATER METER BOX, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. NEW METER BOXES SHALL BE INSTALLED IN THE SAME LOCATION AS THE EXISTING UNLESS OTHERWISE INDICATED OR OTHERWISE DIRECTED BY SLVWD. NEW SERVICES SHALL BE PER SLVWD STANDARD DETAIL SD-4 OR SD-5. NEW SERVICE PIPING SHALL BE THE SAME SIZE AS THE EXISTING SERVICE PIPING EXCEPT IF THE EXISTING SERVICE PIPING IS LESS THAN 1-INCH DIAMETER. IF THE EXISTING SERVICE PIPING IS LESS THAN 1-INCH DIAMETER, NEW SERVICE PIPING SHALL BE 1-INCH DIAMETER.
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3. LOCATION OF GAS MAIN IS APPROXIMATE. PROVIDE A MIN. 5 FT SEPARATION.

PROFILE
HOR. SCALE: 1 IN = 40 FT
VER. SCALE: 1 IN = 20 FT

0 40 80 Feet

UNDERGROUND SERVICE ALERT
CALL: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

REV. NO.	DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			

Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS
3 Quail Run Circle, Suite 101
Salinas, CA 93907-2348
(831) 883-4848

REGISTERED PROFESSIONAL ENGINEER JOSEPH C. SIEGBERT No. 69703 CIVIL STATE OF CALIFORNIA

PLAN & PROFILE VII

QUAIL HOLLOW ROAD PIPELINE REPLACEMENT

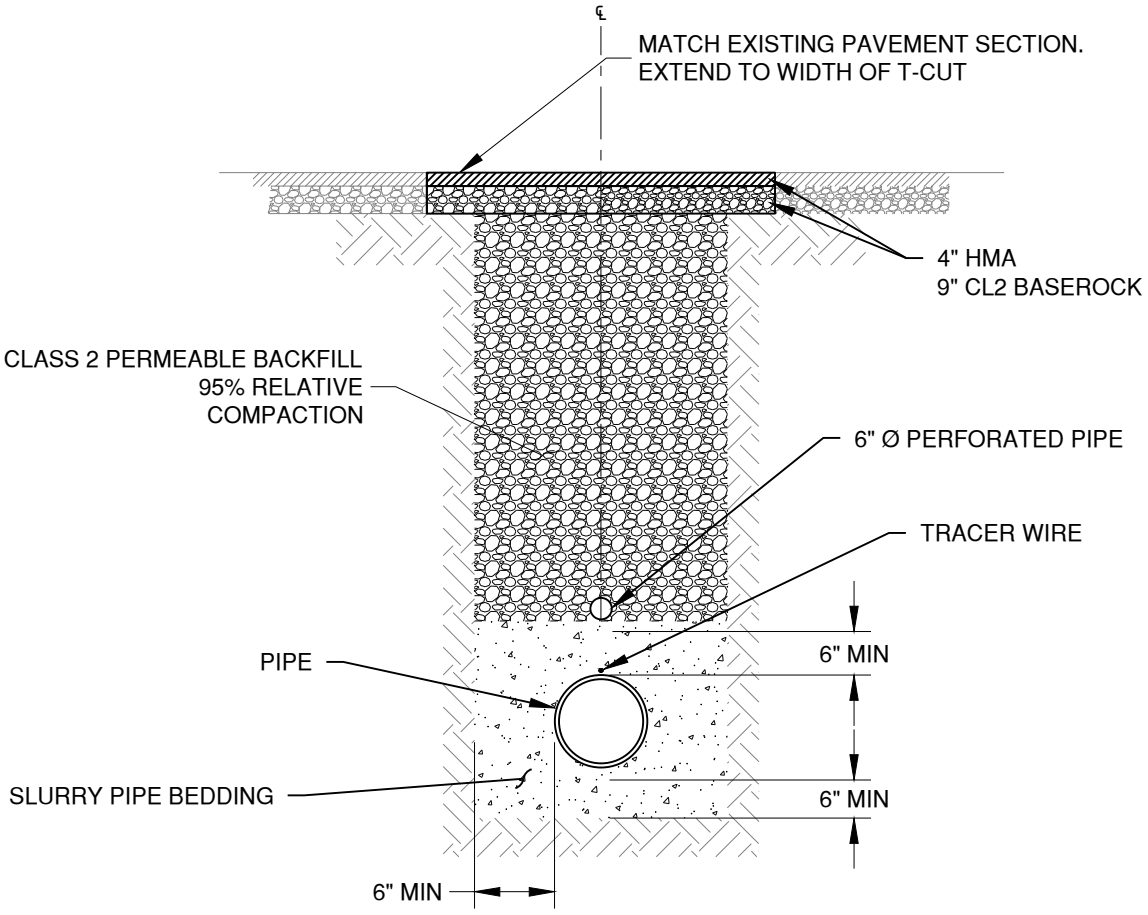
San Lorenzo Valley WATER DISTRICT

DESIGNED BY:	JCT	DATE: 7/12/2021
DRAWN BY:	JCT	DATE: 7/12/2021
QC CHECKED BY:	AAS	DATE: 7/12/2021
PROJECT NO.:		
SCALE:	AS SHOWN	
SUBMITTAL:	100% SUBMITTAL	

C4.8
SHEET 11 OF 14

C:\USERS\JTABUE\DESKTOP\SLVWD QH\QUAIL HOLLOW WORKING\SLVWD QUAIL HOLLOW 12JULY2021.DWG 7/12/2021 BY JTABUE

Figure 1 - Trench Detail



NOTES:

1. FILL ALL VOIDS IN PIPE ZONE WITH SLURRY.

2. BACKFILL MATERIAL SHALL BE AS SHOWN. BACKFILL SHALL BE PLACED IN LIFTS NO GREATER THAN 8 INCHES, UNCOMPACTED. COMPACT BACKFILL LIFTS TO 95% RELATIVE COMPACTION.

3. PERFORATED PIPE SHALL HAVE CLEANOUTS EVERY 100 LF AND TERMINAL ENDS.

4. PAVEMENT CUTTING, RESTORATION SECTION, AND RESTORATION EXTENTS SHALL BE AS DESCRIBED IN THE COUNTY ENCROACHMENT PERMIT.

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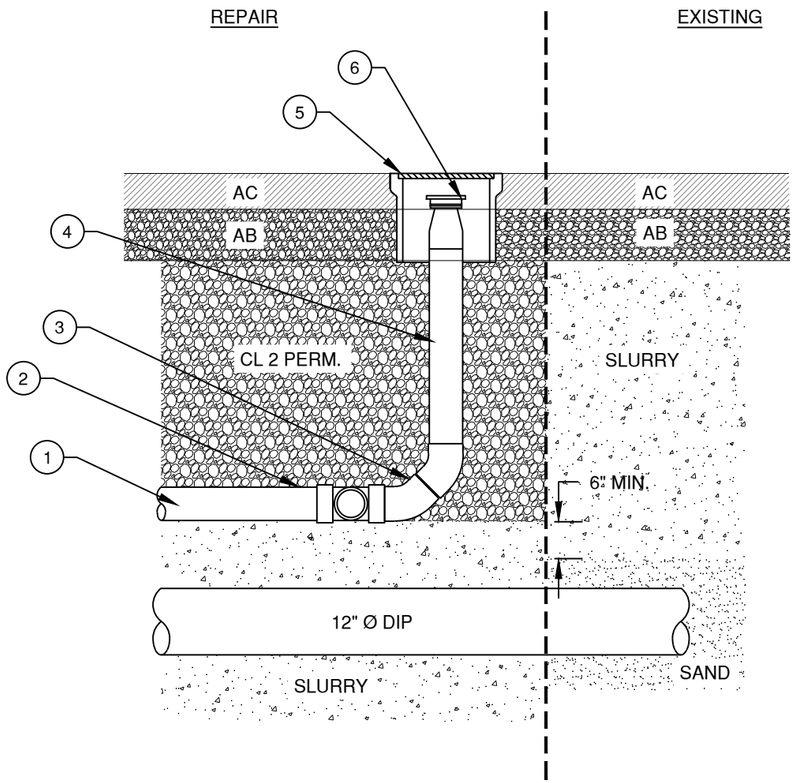
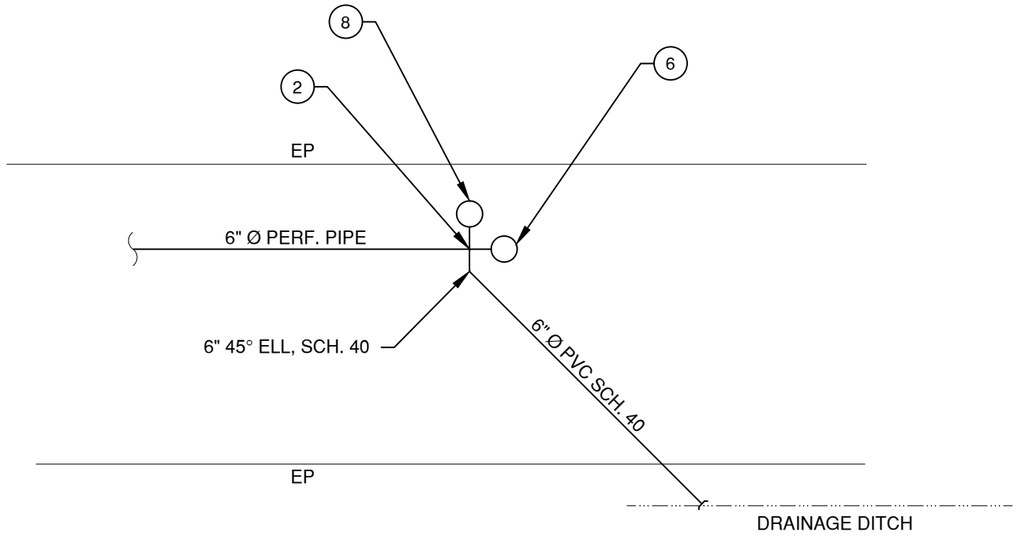
Schaaf & Wheeler

Figure 2





1	6" PERFORATED DRAIN PIPE
2	6" X 6" PVC CROSS
3	6" 45° ELL (TYP)
4	6" PVC, SCH 40 (TYP)
5	F8 VALVE BOX W/ V1-71C GRATE
6	4" POPPER CLEANOUT & RELIEVE VALVE, JONES STEPHENS OR EQUAL
7	6" X 4" PVC RED.
8	CLEANOUT WITH F8 VALVE BOX & F8C LID

NOT TO SCALE

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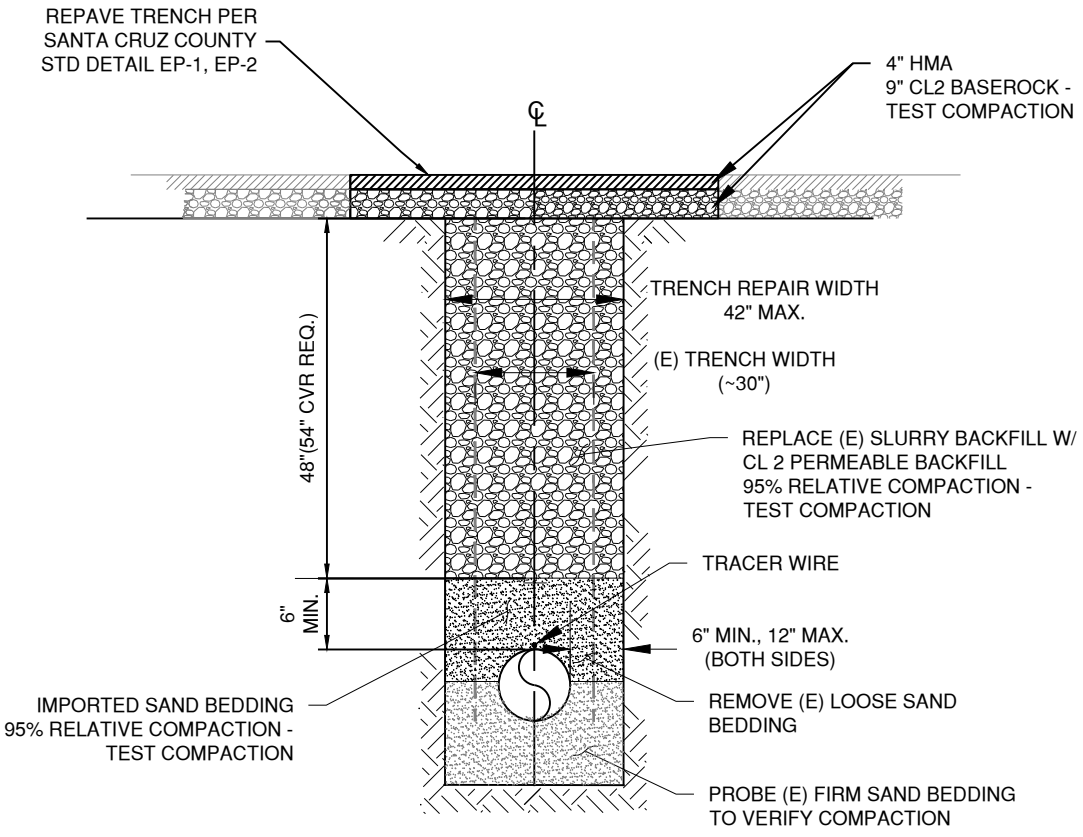
Schaaf & Wheeler

Figure 3 - Trench Repair Detail



TRENCH SECTION
QUAIL HOLLOW RD STA 62+00

NOTE: BACKFILL AND BEDDING SHALL BE
TESTED TO VERIFY COMPACTION

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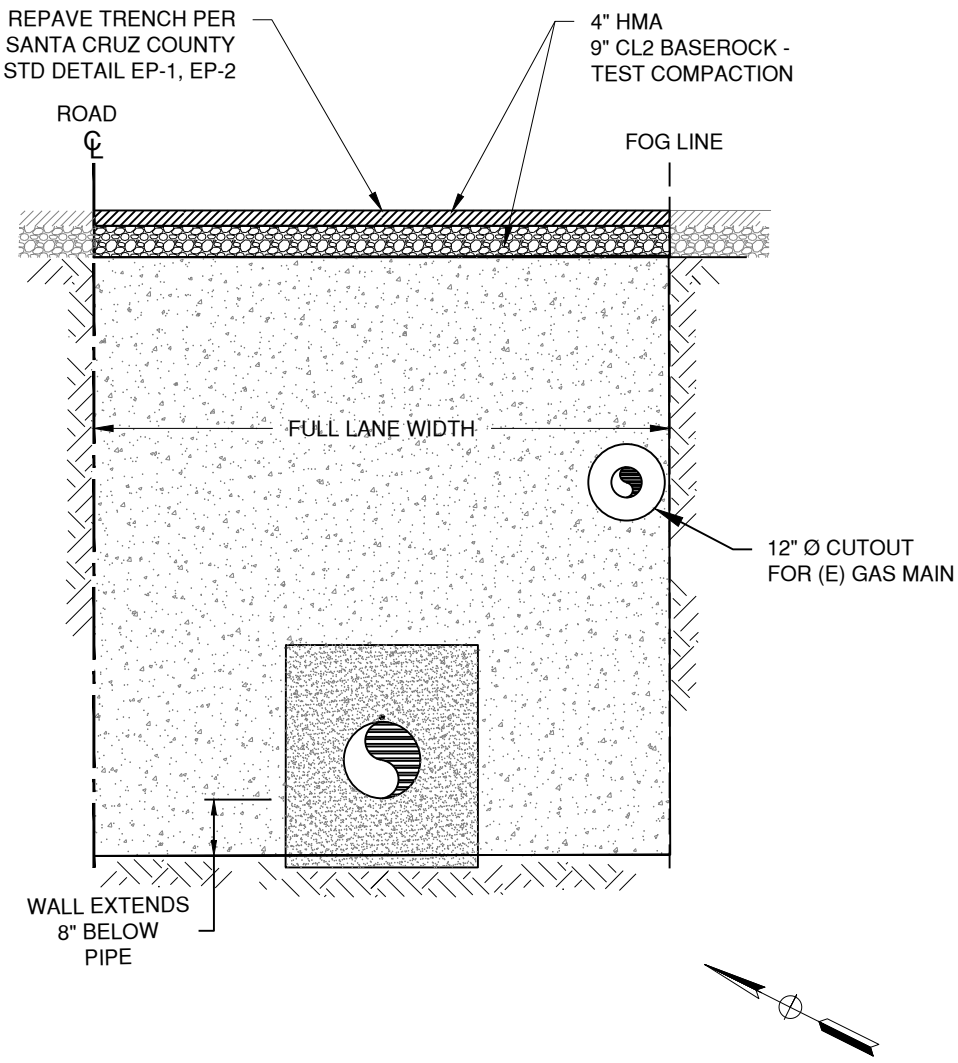
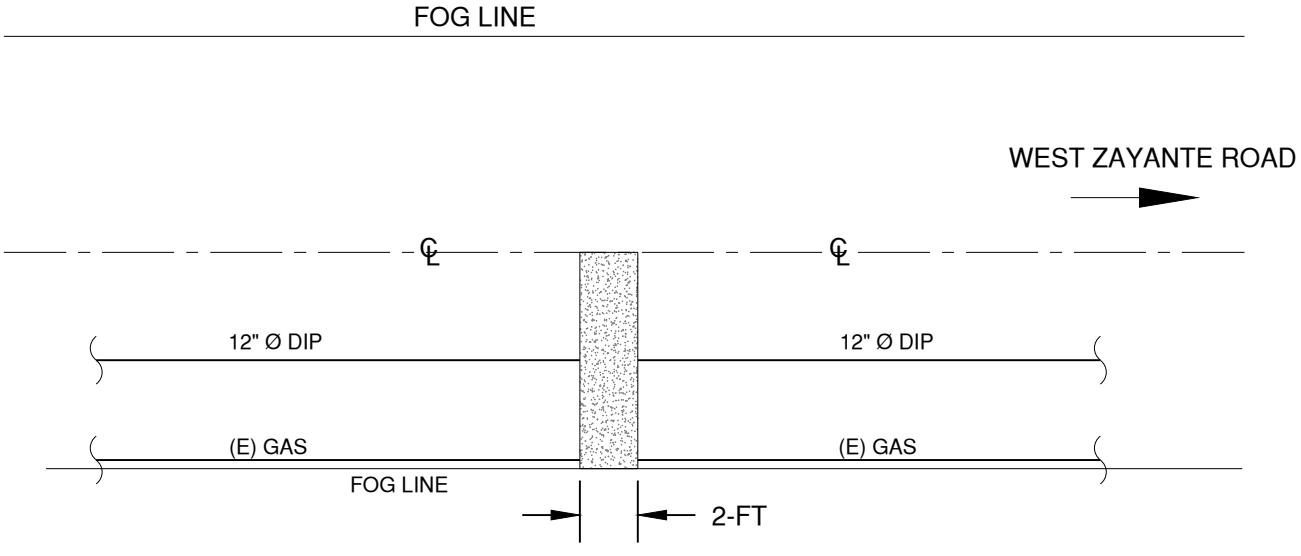
Schaaf & Wheeler

Figure 4 - Cut Off Wall Detail





CUT-OFF WALL
QUAIL HOLLOW RD STA 41+85

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File: C:\Users\GarretRoffe\Desktop\Board of Directors - District Project Update\SLVWD Quail Hollow Engineering Committe Figure.dwg Date:Sep 11, 2023 - 12:29pm, GarretRoffe

EXISTING CULVERT
CONSTRUCTION PHOTOS 07/13/2022

EXISTING CULVERT CONDITION
PHOTOS 09/06/2023

QUAIL HOLLOW RANCH PARKING LOT CLOSED
HIGH WATER TABLE
PHOTO 03/16/2023

EXISTING CULVERT
CONSTRUCTION PHOTOS 08/05/2022

EXISTING CULVERT CONDITION
PHOTOS 08/23/2023

MARCH STORM DAMAGE
REPAIRED BY SLVWD & ANDERSON PACIFIC
PHOTOS 04/18/2023

ROBLES DR

EGGLESON LN

W ZAYANTE RD

CP 734

CP 700

CONNECT TO (E) 12" W
AT W ZAYANTE RD

EXISTING CULVERT
CONSTRUCTION PHOTOS 07/20/2022

EXISTING CULVERT CONDITION
PHOTOS 09/11/2023

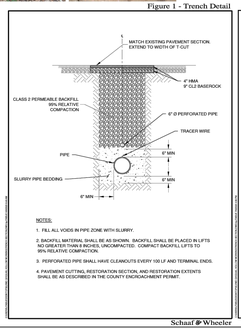
CONNECT TO (E) 12" W
AT CUMORA LN

CUMORA LN

JANUARY STORM DAMAGE
REPAIRED BY SANTA CRUZ COUNTY PUBLIC WORKS DEPARTMENT & GRANITEROCK
PHOTOS 01/17/2023

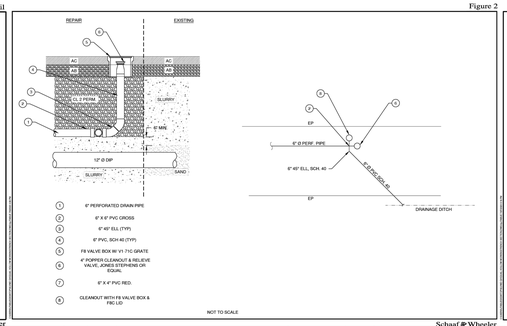
PARALLEL PG&E GAS TRENCH
HIGH WATER TABLE
PHOTOS 03/16/2023

Figure 1 - Trench Detail



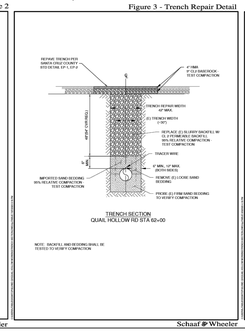
Schaaf & Wheeler

Figure 2



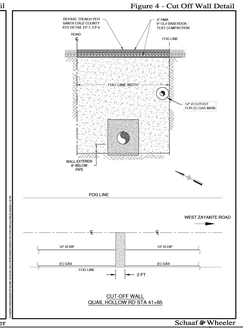
Schaaf & Wheeler

Figure 3 - Trench Repair Detail



Schaaf & Wheeler

Figure 4 - Cut Off Wall Detail



Schaaf & Wheeler

0 200 400 Feet

San Lorenzo Valley WATER DISTRICT

DATE:	09/14/2023
SCALE:	NTS
DRAWN BY:	GR
APPROVED BY:	RR

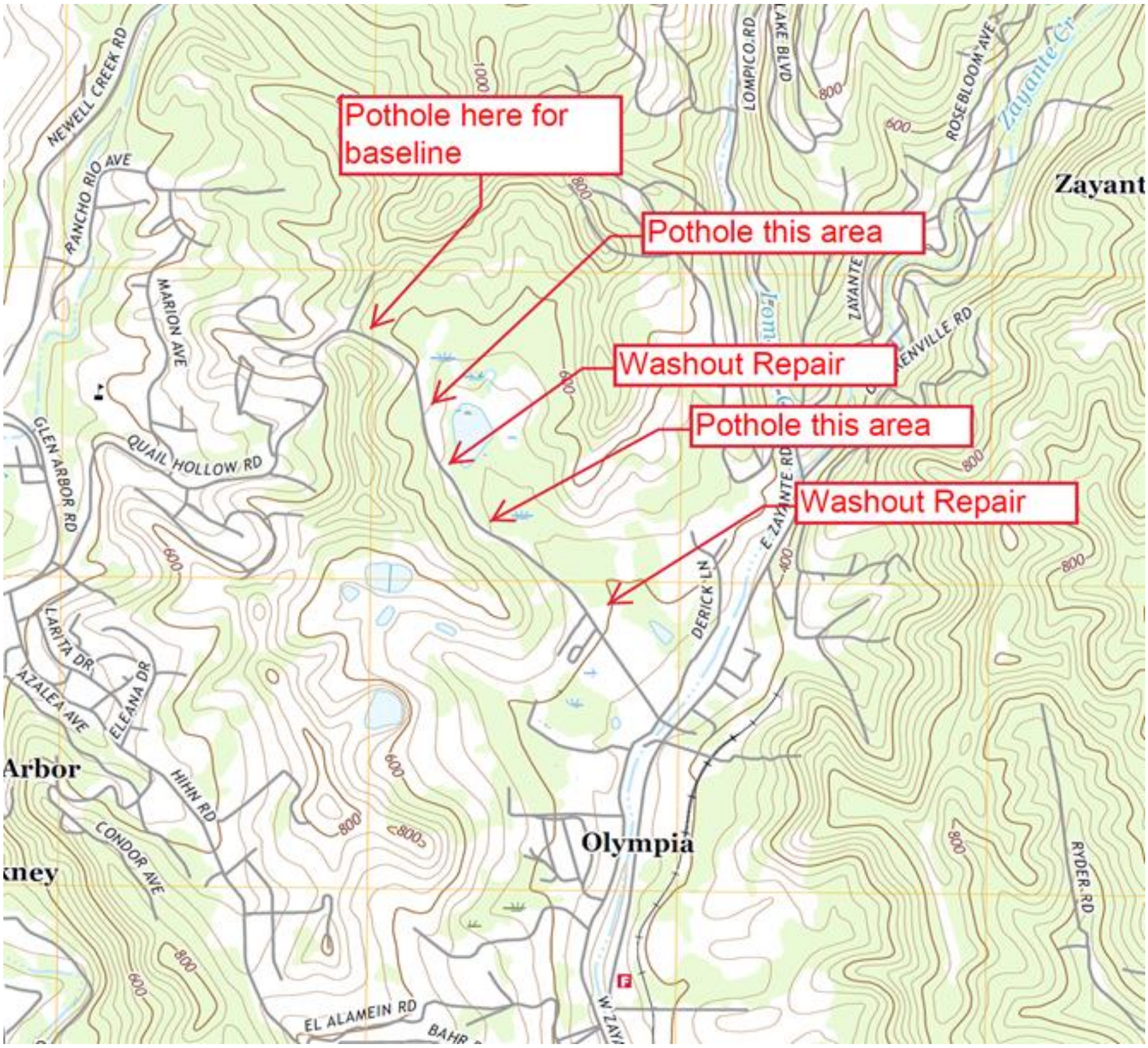
No.	REVISION/ISSUE	DATE	BY

SAN LORENZO VALLEY WATER DISTRICT
ENGINEERING/ENVIRONMENTAL COMMITTEE MEETING
QUAIL HOLLOW ROAD
SUMMARY OF 2023 STORM DAMAGE REPAIRS

13060 Hwy 9
Boulder Creek, CA 95006
(831) 338-2153

SHEET
FIG 5

PART OF THIS DOCUMENT MAY BE REPRODUCED IN ANY FORM INCLUDING PHOTOCOPY, RECORDING OR ANY INFORMATION RETRIEVAL AND STORAGE SYSTEM, WITHOUT PERMISSION IN WRITING FROM SLVWD.


Pothole here for baseline
Pothole this area
Washout Repair
Pothole this area
Washout Repair
NEWELL CREEK RD
RANCHO RIO AVE
MARION AVE
QUAIL HOLLOW RD
GLEN ARBOR RD
LOMPICO RD
LAKE BLVD
ROSEBLOOM AVE
Zayante Cr
ZAYANTE
KENVILLE RD
E ZAYANTE RD
DERICK LN
LARITA DR
ELEANA DR
AZALEA AVE
HIHN RD
CONDOR AVE
EL ALAMEIN RD
RYDER RD
Olympia
Arbor
1000
800
600
400

September 5, 2023

Garrett Roffe
San Lorenzo Valley Water District
groffe@slvwd.com

Dear Garrett Roffe,

GPR Data Inc. is pleased to provide the following proposal for a **ground penetrating radar (GPR) survey** to locate and map voiding in the sand bedding of an existing pipeline in the San Lorenzo Valley, CA.

GPR Data will provide experienced GPMR engineers to perform the scanning. GPR Data's services will be provided at your direction and that of your representatives.

SCOPE OF SERVICES:

A. Field work:

Use of 350 MHz ultra-wideband GPR antenna connected to a GSSI SIR4000 receiving unit to top-down survey the sand bedding around 6500’ linear feet of pipeline to locate and map voiding.

Georeferenced data collection along pipeline for post-processing and analysis.

B. Deliverable:

Data collected during field work will be reproduced and georeferenced in AutoCAD with void locations overlaid on provided plans.

See section D for sample output.

Narrative report describing the methods utilized to conduct the survey, equipment used, and an explanation of the results of the geophysical survey.

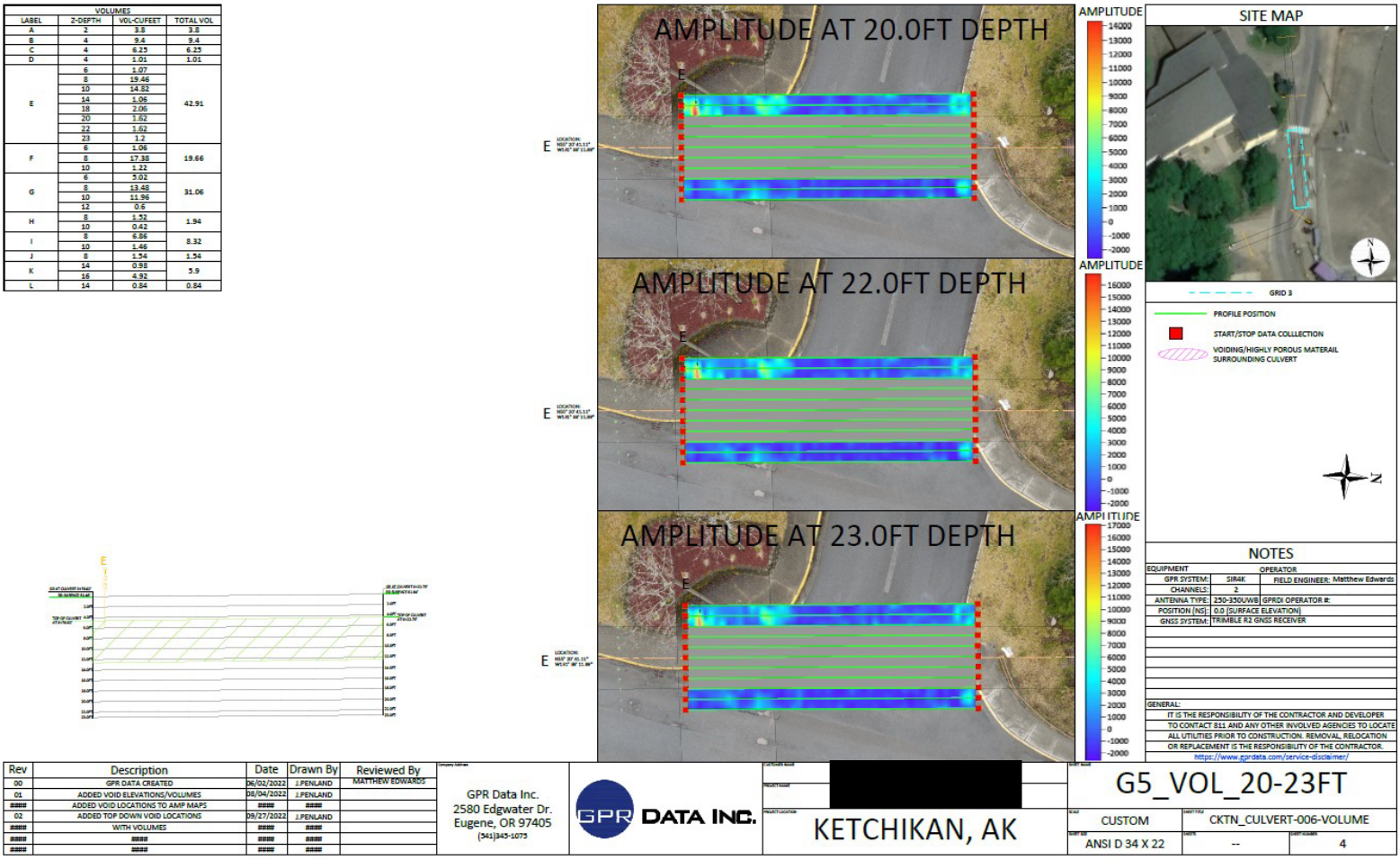
C. Additional Information:

GPR data will meet all the requirements identified in the scope of services within the reasonable considerations of access and the client's direction of scope and schedule. GPR Data understands the schedule for this scope of service to be performed and completed within the client's timeframe.

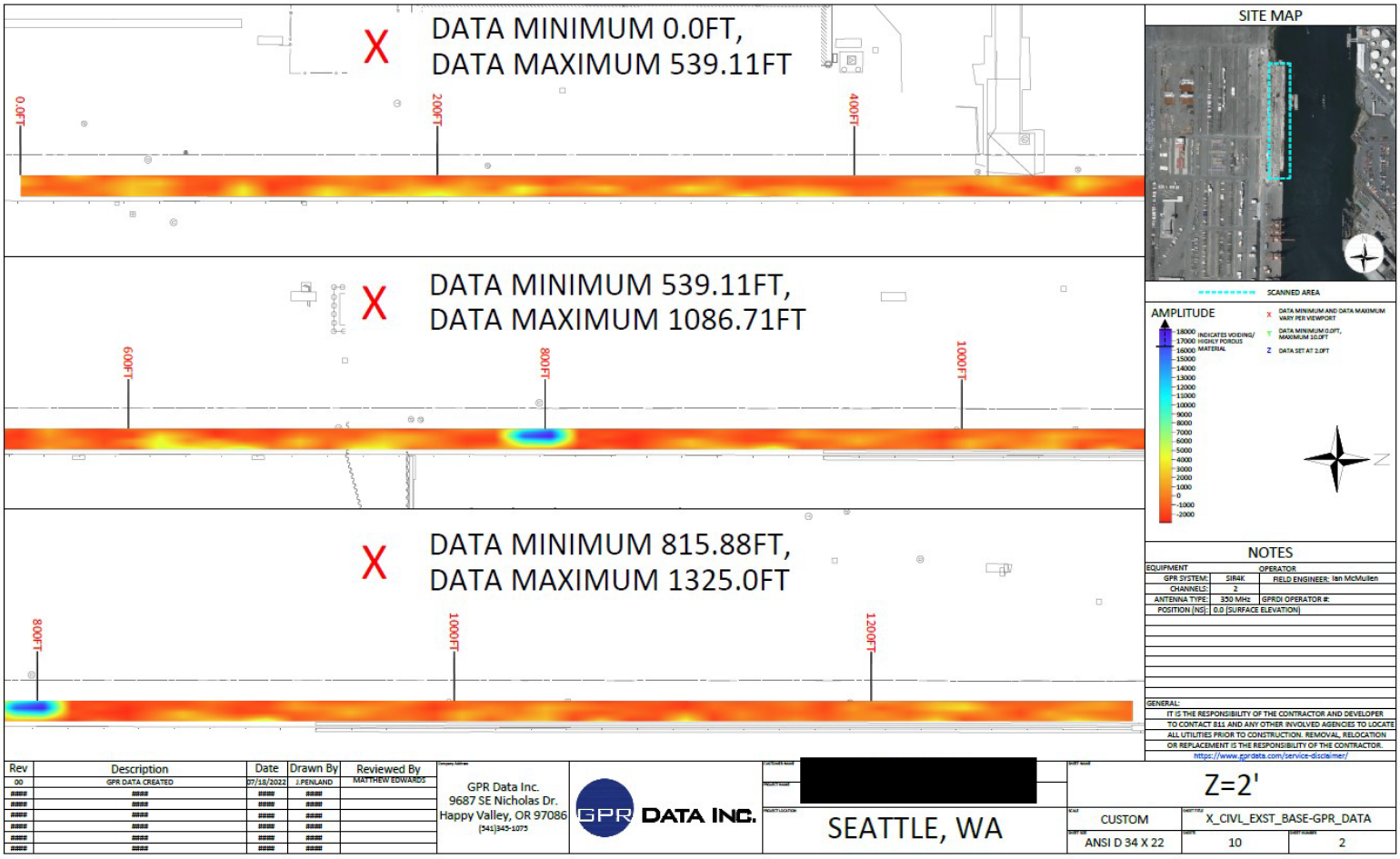
D. Sample Deliverable:

Please note that this is for demonstration only, and the final deliverable will be high quality and full resolution.

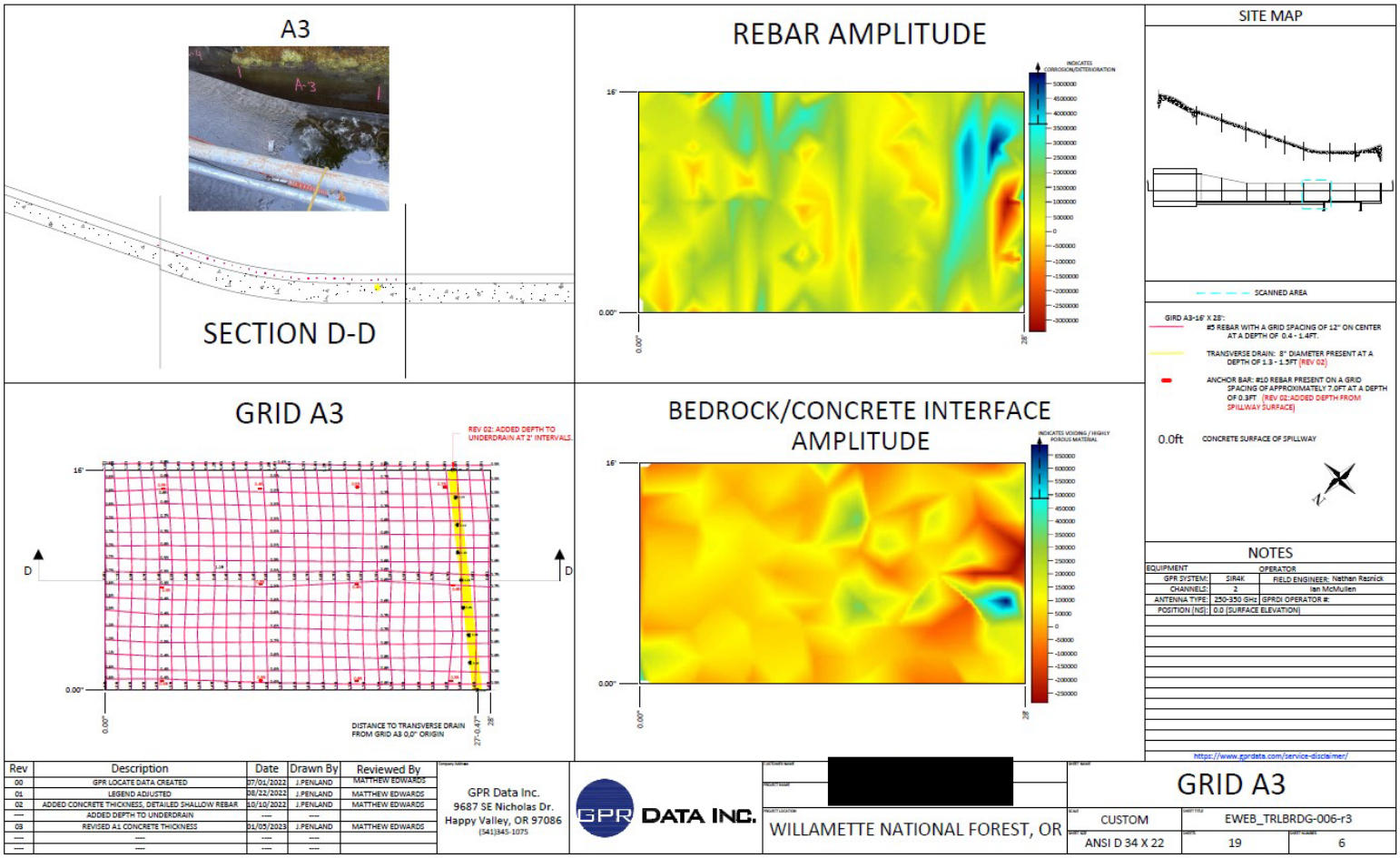
Void mapping around a culvert in Ketchikan, AK with voiding presented in 2' intervals to a depth of 23':



Void mapping at the Port of Seattle:



Void mapping under concrete spillway (bedrock/concrete interface amplitude):



SCHEDULE:

Field Work: TBD

Preliminary Site Survey Deliverable: Delivered 21 calendar days after start of field work

Final Site Survey Deliverable: Delivered 5 calendar days after review of preliminary survey by San Lorenzo Valley Water District

ESTIMATED FEES

Field work, data collection, mobilization, data processing:	$2/ft @ 6500’

Total: $13,000

Stand by time billed at **$250.00** per hour

Additional work required beyond the scope of services included in this proposal, or as caused by factors beyond GPR Data's control, will be invoiced on a time and materials basis. Additional work will not be performed without prior written authorization.

GPR Data, inc. will proceed with the work and issue reports after acceptance of this proposal or a purchase order referencing this proposal and date.

Matthew J. Edwards | President

GPR DATA INC.

O (541) 345-1075 | M (541) 228-6851
Eugene | Portland | Medford
Seattle | Las Vegas | Los Angeles

Related or Noteworthy Projects

IHNC Lock Repairs, Louisiana

Services: Scan and identify concrete voids and delaminated surfaces

Oregon Convention Center Parking Garage (Mortenson Construction), Oregon

Services: Concrete scanning, rebar, and post-tension cable identification

Union Station (City of Portland), Oregon

Services: Concrete scanning and as-built documentation.

Air Station Kodiak (U.S. Coast Guard), Alaska

Services: Locate and map subsurface hangers in concrete and asphalt for one million square feet of tarmac apron.

90/154N Bridge (WSDOT), Washington

Services: Rebar and deterioration mapping.

Siuslaw River Crossing (ODOT), Oregon

Services: Concrete scanning prior to anchor placement.

Lost Hills Oil Field (Seneca), California

Services: Subsurface void detection

Amazon Fulfillment Center (Amazon), Washington

Services: Concrete scanning and as-built drafting

8th Ave Trolley Track Locate (Historical Research Associates), Eugene Oregon

Services: Scan and map historic trolly track location in roadway

Professional References

1. Dee Watson PPE, NextEra Energy Resources, LLC., (727) 254-1826
2. Roberto Hernandez ME, United States Steel Corporation, (219) 545-3094
3. Daniel Joines PE, BP Whiting Refinery, (219) 473-3670
4. Robert Healy RM, Michels Pipeline Corporation, (425) 952-6235
5. Robert Striker PE, Gary Works United States Steel Corporation, (219) 689-4060
6. Guido Portiere PE, David Evans & Associates, (503) 480-1303
7. Scott Ratte PA, Geophysical Survey Systems Inc., (603) 893-1109
8. Chris Hunter PE, Oregon Department of Transportation ODOT, (503) 986-6936
9. Jay Williams Senior PE, Cascade Earth Sciences, (208) 388-1030
10. Randall Brooks PM, T. Lucky & Sons, (513) 353-2544
11. Dan Welch PA, Geophysical Survey Systems Inc., (603) 681-2031
12. Larry Fambrough PM, AERA Energy Inc., (661) 201-7947
13. Scott Williams CEO, Hamilton Construction Company, (541) 726-2426
14. Eric Suriano PM, DEPCOM Power Inc., (602) 510-9332
15. Alyssa Kruger PM, NextEra Energy Resources, LLC., (561) 699-2929

Matthew J. Edwards

President

matthew.edwards@gprdata.com | 541-345-1075

In addition to his vision for the company and leading the overall direction of GPR Data, Matthew is also our lead geophysicists. Matthew oversees sampling, scanning, and our state-of-the-art equipment protocols for most of our projects. He is responsible for client relationships, is an expert in complex problem resolutions, and provides the engineered solutions to meet our client's needs.

Academic Background

Master of Science Geology/Geophysics (2002) University of Oregon
B.S. Geology/Earth Science (2000) University of the Virgin Islands
Re-Certified GPMR Radar Engineer/Geophysical Investigations (2004) GSSI Inc.
Certified GPMR Geology/ Archaeology (2005) University Denver Colorado

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- GPMR Geology/Archaeology
- Radan Data Post Processing, GSSI Inc.

OSHA 30

AutoCAD, Autodesk

Relevant Experience

90/154N Bridge (WSDOT), Washington
Project Manager - Rebar and deterioration mapping.

Air Station Kodiak (U.S. Coast Guard), Alaska
Project Manager – Locate and map subsurface hangers on one million square feet of tarmac apron.

8th Ave Trolley Track Locate (Historical Research Associates), Eugene Oregon
Project Manager - Scan and map historic trolly track location in roadway**.**

Nathan B. Rasnick

Senior Project Manager

nathan.rasnick@gprdata.com | 805-320-2421

Nathan is a Senior Project Manager with GPR Data and heads our Las Vegas office. With 15 years of applied field experience and a background in geophysics, there is rarely a scenario he hasn't seen.

Academic Background

B.S. Communication Studies (2005) California State University
Re-Certified GPMR Radar Engineer/Geophysical Investigations (2018) GSSI Inc.

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- Radan Data Post Processing, GSSI Inc.
- GPMR Geology/Archaeology

OSHA 30

AutoCAD, Autodesk

Relevant Experience

IHNC Lock Repairs, Louisiana
Project Manager - Identify concrete voids and delaminated surfaces

Amazon Fulfillment Center (Amazon), Washington
Project Manager - Concrete scanning and as-built drafting

Lost Hills Oil Field (Seneca), California
Project Manager - Subsurface void detection

Billy Malone

CAD/GIS Specialist

billy.malone@gprdata.com | 254-855-1956

With a background in construction inspection, document control, and project management, Billy is uniquely suited to manage large-scale projects. His level of organization and ability to coordinate all aspects of a project help produce quality results for our clients.

Academic Background

Master of Business Administration (2010) Tarleton State University
B.S. Business Administration (2008) Tarleton State University
Re-Certified GPMR Radar Engineer/Geophysical Investigations (2018) GSSI Inc.

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- Radan Data Post Processing, GSSI Inc.

OSHA 30

Civil 3D, Autodesk

AutoCAD, Autodesk (Certified Professional)

Relevant Experience

Wheatridge Renewable Energy Facility (NextEra), Oregon
Project Manager - Subsurface utility locating and mapping.

Oregon Convention Center Parking Garage (Mortenson Construction), Oregon
Field Engineer - Concrete scanning, rebar, and post-tension cable identification.

Siuslaw River Crossing (ODOT), Oregon
Field Engineer - Concrete scanning prior to anchor placement.

Casey Coyle

Field Engineer/Staff Geologist

casey.coyle@gprdata.com | 541-345-1075

Casey offers a background in geology and serves as our staff geologist. Our clients say Casey's experience and professionalism add value to each project.

Academic Background

B.S. Geology (2016) University of Oregon
Re-Certified GPMR Radar Engineer/Geophysical Investigations (2018) GSSI Inc.

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- Radan Data Post Processing, GSSI Inc.
- GPMR Geology/Archaeology

Radiodetection Underground Cable and Pipe Locator

OSHA 10

OSHA 40 (HAZWOPER)

Relevant Experience

IHNC Lock Repairs, Louisiana
Data Analyst - Identify concrete voids and delaminated surfaces

Fort Rock Solar Project (DEPCOM), Oregon
Field Engineer - Bedrock mapping and subsurface utility locating and mapping.

Rock Springs Generation Facility (ODEC), Maryland
Field Engineer - Subsurface utility locating

Michael J. Edwards

Vice President/Data Analyst

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With 30+ years of construction experience and 20+ years of experience with GPMR Michael pioneered many of the processes we use for subsurface utility locating. As an industry leader in GPMR data processing, Michael still serves as a critical resource for GPR Data.

Academic Background

B.S. Business Administration (1974) University Oregon
Re-Certified Certified GPMR Radar Engineer/Geophysical Investigations (2000) GSSI Inc.
Re-Certified Certified GPMR Geology/ Archaeology (2005) University Denver Colorado

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- GPMR Geology/Archaeology
- Radan Data Post Processing, GSSI Inc.

OSHA 30

GPR Slice, Goodman

Mapper Surfer, Golden Software

Relevant Experience

Rock Springs Generation Facility (ODEC), Maryland
Data analyst - Locate cooling pipe and identify location of leak.

Air Station Kodiak (U.S. Coast Guard), Alaska
Data Analyst - Locate and map subsurface hangers on tarmac apron.

Fort Rock Solar Project (DEPCOM), Oregon
Data Analyst - Bedrock Mapping and subsurface utility locating.

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Field Engineer

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Sean has over 5 years of structural concrete scanning and subsurface utility locating. This combined with his background in concrete construction makes him a valued asset on any project.

Academic Background

Associate of Applied Science (2012) Mt. Hood Community College
Re-Certified GPMR Radar Engineer/Geophysical Investigations (2018) GSSI Inc.

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- Radan Data Post Processing, GSSI Inc.

OSHA 30

Radiodetection Underground Cable and Pipe Locator

Relevant Experience

Wheatridge Renewable Energy Facility (NextEra), Oregon
Field Engineer - Subsurface utility locating and mapping.

90/154N Bridge (WSDOT), Washington
Field Engineer - Rebar and deterioration mapping.

Siuslaw River Crossing (ODOT), Oregon
Field Engineer - Concrete scanning prior to anchor placement.

Tad Letzring

Senior Field Engineer

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Tad has over 20 years of structural NDT concrete scanning and subsurface utility locating. This, combined with his background in construction and surveying, makes him a valued asset on any project.

Academic Background

Associate of Applied Science (2001) Central Oregon Community College
Re-Certified GPMR Radar Engineer/Geophysical Investigations (2017) GSSI Inc.

Certifications and Skills

GPMR Sub-Surface Data Collection and Processing

- 3D GPMR Utility Scan
- Structure Scan Professional
- Bridge Concrete Deterioration Mapping
- Advanced Concrete Assessment
- Highway/ Roadbed/ Pavement Mapping
- Radan Data Post Processing, GSSI Inc.

OSHA 30

Radiodetection Underground Cable and Pipe Locator

Relevant Experience

Siuslaw River Crossing (ODOT), Oregon
Field Engineer - Concrete scanning prior to anchor placement.

Aeration Tank Scanning (Oregon Cherry Growers), Oregon
Field Engineer - Concrete scanning and rebar identification.

Silo Scanning (Quaker Oats), Iowa
Field Engineer - Concrete scanning and evaluation.

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DRAFT GEOTECHNICAL DESIGN REPORT

SAN LORENZO VALLEY WATER DISTRICT 2019 WATERLINE PROJECT

CE&G DOCUMENT NO.: 191110.001

JANUARY 30, 2020

Prepared for:

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1.0 INTRODUCTION

1.1 GENERAL

Cal Engineering & Geology, Inc. (CE&G) has provided geotechnical design services to Schaaf & Wheeler Consulting Civil Engineers (S&W), for the 2019 pipeline Project. The pipeline system is owned and maintained by SLVWD. The project includes five pipeline segments located in the Santa Cruz Mountains in the vicinity of Boulder Creek, California. The project sites are identified based on the roads where they are located; as follows: Hillside Drive, Sequoia Avenue, HWY 236 (Lyon Zone), California Drive, and Quail Hollow Road (Figures 1 & 2). This report has been prepared to provide geotechnical recommendations for the construction of the pipelines.

1.2 PROJECT DESCRIPTION

The project consists of 5 waterline segments, totaling approximately 17,300 lineal feet, that are to be replaced. Each pipeline segment ranges in length from 800 to 7,500 feet. Existing pipe diameters range from 2 to 12-inch pipe. It is anticipated the replacement pipes will consist of a variety of materials, including ductile iron, PVC and HDPE. Each pipe segment will generally be replaced with pipes larger than existing service pipes. Pipe replacement is anticipated to consist of open trench replacement.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of CE&G's geotechnical investigation was to assess the existing surface and subsurface conditions along the planned pipeline alignments, develop geotechnical design recommendations, and prepare this geotechnical design report for the proposed installation of the new water pipelines.

The scope of work completed for this geotechnical investigation and report include: project coordination and consultation with SLVWD and S&W; geologic reconnaissance to observe current site conditions and to mark for USA (Underground Service Alert); subsurface exploration using a truck-mounted drill rig and hand excavation equipment; laboratory testing to determine selected engineering properties; development of geotechnical design recommendations; and the preparation of this report.

2.0 SITE DESCRIPTION

2.1 SITE DESCRIPTION

The five planned water line replacement segments are located in the central area of Santa Cruz County, in the vicinity of Boulder Creek, California. Each of the five pipeline segments vary in topographic settings and have differing site features, which are describe below.

Site specific topographic surveys were provided by (S&W) and is used as the primary base in the attached Site Plan (Figure 2).

2.1.1 Hillside Drive Alignment

The Hillside Drive alignment is located in a forested, residential area of Boulder Creek California (Figure 2A). Starting at, this segment of the pipeline extends from the intersection of Fern Drive and Reynolds Drive southwest along Reynolds drive and continues north along Hillside Drive to the intersection with Fern Drive. Existing vegetation along the roadway consists of large trees and shrubs. Residential properties along the road consist of single-family homes. Overall, the project area is on moderately steep hillside terrain that slopes to the east/northeast towards the San Lorenzo River. The elevation within the project area varies between approximately 617 and 673 feet above sea level (WGS84).

2.1.2 Sequoia Avenue Alignment

The Sequoia Avenue segment of the pipeline extends from the southern end of Sequoia Avenue across an east/west trending ridge to the northwestern end of Margaret Drive (Figure 2B). The area is densely vegetated with shrubs and trees with moderately steep terrain. The elevation within the project area varies between approximately 679 and 730 feet above sea level (WGS84).

2.1.3 Lyon Zone Alignment

The Lyon Zone segment of the pipeline begins at the intersection of Lomond Street and State Highway 9 in downtown Boulder Creek (Figure 2C). The alignment extends southwest along Lomond Street, then continues northwest along Pine Street to the intersection with HWY 236 (Big Basin Way), where it extends west/northwest to the intersection with South Redwood Drive. The alignment trends southwest along South Redwood Drive and continues along Madrone Drive. The southeastern portion of the segment is located in a residential and gently sloping area of downtown. The northwestern portion of the alignment is in moderately steep and densely vegetated terrain. The

elevation within the project area varies between approximately 492 and 680 feet above sea level (WGS84) but increase overall from southeast to northwest.

2.1.4 California Drive Alignment

This segment is in a residential area of unincorporated Ben Lomond, California. This pipeline segment extends along Middle Drive from the intersection of Riverside Drive and Middle Road to the intersection with California Drive, trends along California Drive to the intersection with Riverside Drive (Figure 2D). The topography in this area slopes gently down to the east towards the San Lorenzo River. Single family homes are located along both sides of the streets along this alignment. The elevation within the project area varies between approximately 374 feet and 400 feet above sea level (WGS84).

2.1.5 Quail Hollow Road Alignment

This segment is located along Quail Hollow Road between Cumora Lane and West Zayante Road in Felton, California (Figure 2E). The hillside areas along this segment are generally moderately vegetated with grass, shrub, and trees, with some areas along the segment that are more sparsely vegetated, with grassy land and scattered trees and shrubs. The elevation within the project area varies between approximately 344 feet and 655 feet above sea level (WGS84).

2.2 INFORMATION PROVIDED

Prior to beginning work, S&W provided a request for proposal (RFP) that contained a plan view of the five pipeline alignments to aid in developing a work plan and determine boring locations.

3.0 GEOLOGIC CONDITIONS

3.1 REGIONAL GEOLOGIC SETTING

The five pipeline alignments are located in the Santa Cruz Mountains, within the Coast Ranges geomorphic province of California (Fig. 1). This province is characterized by northwest-southeast trending mountain ranges such as the Santa Cruz Mountains and intervening valleys such as that occupied by San Francisco Bay. The Santa Cruz Mountains mark a mountain-range scale regional uplift centered on the San Andreas fault. The geologic setting is shown on our Regional Geologic Map (Figure 3).

The general vicinity of the pipeline alignments has been mapped several times, at different scales, and with different emphasis. Notable compilations include: Brabb and others (1997); Wentworth and others (1999); and Graymer and others (2006). The resulting geologic maps from these studies are in general agreement. For the purposes of this study, we reference the site geology using Brabb and others (1997).

The various pipeline segments are geographically separated and mapped within different geologic units. In the sections below, we review the dominant bedrock type in each segment's area.

3.1.1 Hillside Drive Alignment

The southern portion of the Hillside Drive alignment is in an area mapped as the Twobar Shale Member (Eocene) of the San Lorenzo Formation (Brabb and others, 1997). This unit is described as "very thin bedded and laminated olive-gray shale." The northern portion of the alignment is in an area mapped as the Rices Mudstone Member (Oligocene and Eocene) of the San Lorenzo Formation and is described as "olive-gray mudstone and massive medium light-gray, very fine- to fine-grained arkosic sandstone" (Brabb and others, 1997). The Twobar Shale and Rices Mudstone Members are shown as having been juxtaposed by the Butano Fault, which crosses the center of the Hillside Drive alignment (Brabb and others, 1997).

3.1.2 Sequoia Avenue Alignment

Brabb and others (1997) show the area of the Sequoia Avenue segment overlying southwesterly dipping Vaqueros Sandstone (Lower Miocene and Oligocene). This unit is described as "thick-bedded to massive yellowish-gray, very fine- to fine-grained arkosic sandstone containing interbeds of olive-gray shale and mudstone."

3.1.3 Lyon Zone Alignment

The Lyon Zone segment extends across three different geologic units as mapped by Brabb and others (1997). The northwestern portion of the alignment is in an area mapped as Lompico Sandstone (Middle Miocene in age), which is shown dipping to the southwest and is described as "thick-bedded to massive yellowish-gray, medium- to fine-grained calcareous arkosic sandstone." The center portion of the alignment is in an area mapped as Monterey Formation bedrock, which is shown in the site vicinity as dipping southwest and overlying the Lompico Sandstone. The Monterey Formation bedrock is described as "medium- to thick bedded and laminated olive-gray to light-gray semi-siliceous organic mudstone and sandy siltstone" (Brabb and others, 1997). The southeastern portion of the segment is shown in an area mapped as undifferentiated alluvial deposits (Holocene), which overlie both the Monterey Formation and Lompico Sandstone. The alluvium is described as "unconsolidated, heterogenous, moderately sorted silt and sand containing discontinuous lenses clay and silty clay, which locally includes large amounts of gravel" (Brabb and others, 1997).

The entire Lyon Zone segment is in an area mapped northeast of the Ben Lomond Fault (see Figure 3; Brabb and others, 1997).

3.1.4 California Drive Alignment

The California Drive segment is in an area mapped as Quaternary age, undifferentiated alluvial deposits (described above), concentrated along a valley floor. Monterey Formation bedrock (Middle Miocene) appears to underlie the alluvium (Brabb and others, 1997).

The northwest-trending Ben Lomond Fault is shown as crossing the southwestern portion of the California Drive segment (Brabb and others, 1997).

3.1.5 Quail Hollow Road Alignment

Mapping by Brabb and others (1997) show the Quail Hollow Road segment on the northeastern side of the Scotts Valley Syncline, in an area underlain by the Santa Margarita sandstone (Upper Miocene). This sandstone is described as "very thick-bedded to massive thickly cross bedded, yellowish-gray to white, friable, medium- to fine-grained arkosic sandstone" (Brabb and others, 1997). The southeastern part of the alignment is in an area mapped as northeasterly dipping Monterey Formation bedrock, described above.

3.2 GEOHAZARD MAPPING

3.2.1 State and Regional Geohazard Mapping

The California Geological Survey (CGS) has not established Seismic Hazard Zone maps for the quadrangles encompassing the project alignments, and/or has not evaluated the vicinity of the segments. This map series identifies zones of required investigation for liquefaction and landslides.

The United States Geological Survey (USGS) produced an Interactive Fault Map using their Quaternary Fault and Fold Database (USGS, 2006). This database includes of information on faults and associated folds throughout the U.S. that show geological evidence of coseismic surface deformation in large earthquakes during the past 1.6 million years. These faults and folds are divided into various categories based on evidence of their most recent movement and include: Historic (< 150 years); Latest Quaternary (< 15,000 years); Late Quaternary (< 130,000 years); Middle and Late Quaternary (< 750,000 years); and Undifferentiated Quaternary (< 1.6 million years). According the Fault Interactive Map, there are no Quaternary faults shown crossing the pipeline alignments for the Sequoia Avenue, Lyon Zone, California Drive, and Quail Hollow Road segments (Figure 4) (USGS, 2015). A splay of the Butano fault, labeled as undifferentiated Quaternary, is shown as crossing the Hillside Drive pipeline segment (see Figure 4; USGS, 2006)

3.2.2 Local Geohazard Mapping

Santa Cruz County produced maps showing Fault Zone Hazard Areas, which included review of the Butano, Sargent, Zayante, Corralitos, and San Andreas faults (County of Santa Cruz, Emergency Management GIS web page (http://www.co.santacruz.ca.us/Departments/ GeographicInformation Systems(GIS).aspx), accessed January 2020). According to Santa Cruz County, the Hillside Drive, Sequoia Avenue, California Drive, and Quail Hollow Road alignments are not in areas mapped as fault hazard zones. The Lyon Zone alignment is shown in an area mapped as lying within a 0.5-mile buffer of fault zones but not within a fault zone itself.

Santa Cruz County also produced maps showing Liquefaction Hazard Areas, which designate various liquefaction potential levels varying from low to very high potential (County of Santa Cruz, Emergency Management GIS web page (http://www.co.santacruz.ca.us/Departments/ GeographicInformation Systems(GIS).aspx), accessed January 2020). The pipeline alignments for Hillside Drive, Sequoia Avenue, and Quail Hollow Road are not shown in areas mapped as potentially

liquefiable. The eastern portion of the Lyon Zone segment as well as most of the California Drive segment are mapped in areas of moderate liquefaction potential.

The County of Santa Cruz produced landslide hazard maps in 2018, which uses Landslide Hazard Areas derived from various USGS open files and a 1975 Landslide Deposit Map of Santa Cruz County by Cooper-Clark and Associates. According to the Santa Cruz County (2018) Big Basin, Felton, and Castle Rock Ridge quad series, the five pipeline alignments are not mapped within landslide hazard zones. (County of Santa Cruz, Emergency Management GIS web page (http://www.co.santacruz.ca.us/Departments/ GeographicInformation Systems(GIS).aspx), accessed January 2020).

3.3 REGIONAL GROUNDWATER

The pipeline alignments, with the exception of Hillside Drive, are located in an area within the Santa Margarita groundwater basin. (County of Santa Cruz, Emergency Management GIS web page (http://www.co.santacruz.ca.us/Departments/ GeographicInformation Systems(GIS).aspx), accessed January 2020).

Groundwater within the hillslope areas encompassing the some of the pipeline alignments is likely variable, with the water table commonly sloping downhill toward the closest drainage axis. We did not identify long-term springs and seeps in the site vicinities, although expressions of these are likely present seasonally.

3.4 SEISMICITY

3.4.1 Active Faults

The five pipeline alignments are located within the greater San Francisco Bay Area, which is recognized as one of the more seismically active regions of California. The right-lateral strike-slip San Andreas fault system controls the northwest-southeast structural grain of the Coast Ranges and the Bay Area. The fault system marks the major boundary between two of earth's tectonic plates, the Pacific Plate on the west and the North American Plate on the east. The Pacific Plate is moving north relative to the North American plate at approximately 40 mm/yr in the Bay Area (WGCEP, 2003).

The transform boundary between these two plates has resulted in a broad zone of multiple, subparallel faults within the North American Plate, along which right-lateral strike-slip faulting predominates. In this broad transform boundary, the San Andreas Fault accommodates less than half of the average total relative plate motion. Much of the remainder in the greater South Bay Area is distributed across faults such as the San

Gregorio-Hosgri, Monte Vista-Shannon, Sargent, Berrocal, Hayward (southern segment), Calaveras, Zayante-Vergeles, and Greenville fault zones.

Since the pipeline alignments are in the seismically active San Francisco Bay Area, they will likely experience significant ground shaking from moderate or large (M_W >6.7) earthquakes on one or more of the nearby active faults during the design lifetime of the project. Some of the seismic sources in the San Francisco Bay area and their distances from the sites are summarized in Table 3-1.

Seismogenic (capable of generating significant earthquakes) earthquake faults near the site include the Zayante-Vergeles and the San Andreas fault.

Table 3-1. Distances to Selected Major Active Faults

Pipeline Segment	Fault Name	Approximate Distance and Direction from Site to the nearest Surface Fault Traces
Hillside Drive	Butano	0.0 km
	Zayante-Vergeles-Upper	4.5 km southwest
	San Andreas	8.6 km northeast
	Berrocal	10.9 km northeast
	San Gregorio	14.9 km southwest
	Monte Vista-Shannon	15.0 km northeast
	Sargent	18.2 km east-southeast
	Monterey Bay-Tularcitos	28.7 km south
	Hayward (southern segment)	35.2 km northeast
Sequoia Avenue	Zayante-Vergeles-Upper	1.3 km southwest
	Butano	2.7 km north-northeast
	San Andreas	10.6 km northeast
	Berrocal	13.4 km northeast
	San Gregorio	13.7 km southwest
	Sargent	16.8 km east
	Monte Vista-Shannon	17.2 km northeast
	Monterey Bay-Tularcitos	24.8 km south-southeast
	Hayward (southern segment)	36.7 km northeast
Lyon Zone	Zayante-Vergeles-Upper	0.6 km northeast
	Butano	5.0 km north
	San Andreas	11.7 km northeast
	San Gregorio	12.8 km southwest
	Berrocal	15.2 km northeast
	Sargent	15.8 km east-northeast
	Monte Vista-Shannon	18.7 km northeast
	Monterey Bay-Tularcitos	22.0 km south-southeast
	Hayward (southern segment)	37.5 km northeast

Table 3-1. Continued

Pipeline Segment	Fault Name	Approximate Distance and Direction from Site to the nearest Surface Fault Traces
California Drive	Zayante-Vergeles-Upper	2.7 km northeast
	Butano	9.0 km northwest
	San Andreas	12.2 km northeast
	Sargent	14.0 km northeast
	San Gregorio	15.1 km southwest
	Berrocal	16.2 km northeast
	Monterey Bay-Tularcitos	18.9 km south
	Monte Vista-Shannon	19.2 km northeast
	Hayward (southern segment)	37.2 km northeast
Quail Hollow Road	Zayante-Vergeles-Upper	2.8 km north
	San Andreas	11.2 km northeast
	Butano	11.4 km northwest
	Sargent	12.2 km northeast
	Berrocal	16.0 km northeast
	Monterey Bay-Tularcitos	16.5 km south-southwest
	San Gregorio	16.5 km southwest
	Monte Vista-Shannon	18.9 km northeast
	Hayward (southern segment)	35.7 km northeast

3.4.2 Liquefaction and Seismic Densification

Soil liquefaction is a phenomenon in which saturated, cohesionless soils (generally sands) lose their strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. Soils most susceptible to liquefaction are saturated, clean, loose, fine-grained sands and silts. The primary factors affecting soil liquefaction include: 1) intensity and duration of seismic shaking; 2) soil type and relative density; 3) overburden pressure; and 4) depth to ground water.

Based on subsurface information collected during this investigation, we judge the potential for liquefaction within the upper 10 feet at the sites to be moderate for the California Drive segment and eastern portion of the Lyon Zone segment due to the presence of shallow groundwater in loose to medium dense alluvial soils. We judge the potential for liquefaction within the upper 10 feet of the Hillside Drive, Sequoia Avenue, and Quail

Hollow Road segments, as well as the western portion of the Lyon Zone segment to be to be low.

Seismic densification is the densification of unsaturated, loose to medium dense granular soils due to strong vibration such as that resulting from earthquake shaking. We judge the potential for seismic densification at the pipeline alignments to be moderate for the encountered alluvial materials because they are loose to medium dense, granular, and generally unsaturated in the upper 10 feet. The uppermost sandy, weathered bedrock along the Quail Hollow Road alignment are unsaturated and granular but is judged too dense for seismic densification.

4.0 FIELD INVESTIGATIONS

4.1 SITE RECONNAISSANCE

CE&G performed geologic reconnaissance of the project site in advance of performing subsurface exploration. Site reconnaissance consisted of photographic documentation of the project pipeline alignments, identification and marking of the boring locations, and marking for USA.

4.2 SUBSURFACE EXPLORATIONS

4.2.1 Scope of Explorations

Subsurface exploration consisted of drilling 15 borings along the proposed pipeline alignments to assess the soil and/or bedrock conditions. Before drilling, CE&G marked and coordinated utility clearance through USA. The approximate locations of the borings are shown on Figures 2A through 2E.

Fourteen of the borings (B-1 through B-14) were drilled by Cenozoic Exploration, LLC., from November 18, 2019 to November 20, 2019 using a SIMCO 2400 truck-mounted drill rig equipped with 6-inch-diameter, solid flight augers. An additional boring (B-15) was drilled by a CE&G geologist on December 16, 2019 using a hand auger. The depths of each boring as well as the pipeline segment along which the borings were drilled are listed in Table 4.1 below. The ground surface conditions are also listed in the table.

Table 4.1

Pipeline Segment	Boring ID	Depth (feet)	Ground Surface Conditions
Lyon Zone	B-1	10	Asphalt Pavement (approx. 3'')
	B-2	10	Asphalt Pavement (approx. 4'')
	B-3	10	Asphalt Pavement (approx. 4'')
	B-5	10	Asphalt Pavement (approx. 3'')
Quail Hollow Road	B-6	9.5	Asphalt Pavement (approx. 5'')
	B-7	10	Asphalt Pavement (approx. 7'')
	B-8	10	Asphalt Pavement (approx. 5'')
	B-9	9.5	Asphalt Pavement (approx. 4'')
	B-10	10	Asphalt Pavement (approx. 4'')
Hillside Drive	B-11	10	Gravel
	B-12	10	Asphalt Pavement (approx. 3'')
California Drive	B-4	10	Asphalt Pavement (approx. 4'')
	B-13	10	Asphalt Pavement (approx. 3'')
	B-14	10	Asphalt Pavement (approx. 3'')
Sequoia Avenue	B-15	6.5	Topsoil & weeds

Upon completion of drilling, the boreholes were backfilled neat cement grout. The upper two feet of the boreholes were backfilled with concrete and troweled smooth to match the existing grade, where appropriate. Boring B-15 was backfilled with soil cuttings from the hand auger.

4.2.2 Logging and Sampling

The soil material encountered in the borings were logged in the field by a CE&G professional geologist. The soil was visually classified in the field, office, and laboratory according to the Unified Soil Classification System (USCS) in general accordance with ASTM D2487 and D2488.

During the drill operation, soil samples were obtained using the following sampling methods:

- California Modified (CM) Sampler; 3-inch outer diameter (O.D.), 2.5-inch inner diameter (I.D.) (ASTM D1586)
- Standard Penetration Test (SPT) Split-Spoon Sampler; 2-inch O.D., 1.375-inch I.D. (ASTM D1586)

The samplers were driven 18 inches, unless otherwise noted on the boring logs, with a 140-pound hammer dropped from a height of 30 inches. The number of blows required to drive the samplers through 6-inch intervals was recorded and are included on the boring logs in Appendix A. The number of blows on the boring logs is an uncorrected value and represents the field count.

Soil samples obtained for the borings were packaged and sealed in the field to reduce the potential for moisture loss and disturbance. The samples we taken to CE&G's local laboratory for storage and further analysis.

4.3 SOIL CONDITIONS ENCOUNTERED

Subsurface soil conditions encountered in our borings were generally consistent with regional geologic mapping. Following are descriptions of the soils encountered in our borings along each pipeline segment:

4.3.1 Hillside Drive Alignment

Borings B-11 and B-12 were drilled along this alignment. Subsurface materials encountered beneath the eastern portion of the alignment consists of approximately 5 feet of what was interpreted to be artificial fill composed of medium dense sandy silt. Underlying this fill is alluvial deposits consisting of medium dense, poorly graded sand. The materials encountered along the western portion of the alignment also consisted of artificial fill composed of medium dense sandy silt. This fill overlies colluvium, which is composed of very stiff to hard sandy lean clay with gravel.

4.3.2 Sequoia Avenue Alignment

Boring B-15 was drilled along this alignment. Subsurface materials encountered in a boring along the center of the proposed segment consist of loose, sandy silt topsoil over loose to medium dense sandy silt colluvium/residual soil, which extends to approximately 4 feet bgs where completely weathered silty sandstone was encountered.

4.3.3 Lyon Zone Alignment

Borings B-1, B-2, B-3 and B-5 were drilled along this alignment. Subsurface materials encountered beneath the center and eastern portions of the Lyon Zone segment primarily consist of alluvial deposits. Alluvium encountered near the eastern portion of the segment consists of medium dense, silty and clayey sand, whereas the alluvium encountered along the central portion of the alignment generally consists of loose to medium dense, well graded sand of granitic source with varying amounts of silt in gravel. Subsurface materials

encountered beneath the western end of the alignment consist of hard, gravely lean clay and sandy lean clay (colluvium), which overly extremely weak and highly weathered siltstone.

4.3.4 California Drive Alignment

Borings B-4, B-13 and B-14 were drilled along this alignment. Borings drilled along the eastern portion of this segment encountered alluvial soils generally consisting of medium dense sandy silt and silty sand. Very stiff lean clay was encountered in one of the eastern borings. The boring drilled along the western portion of the segment consists of alluvium composed of stiff, elastic silt to approximately 5 feet bgs. Beneath this elastic silt is loose to medium dense sandy silt and silty sand. Slightly weathered siltstone was encountered in the western boring at approximately 9.5 feet bgs, but it is unknown whether the retrieved siltstone is part of underlying bedrock or a boulder.

4.3.5 Quail Hollow Road Alignment

Borings B-6, B-7, B-8, B-9 and B-10 were drilled along this alignment. Subsurface materials encountered beneath the Quail Hollow Road segment primarily consists of medium dense to very dense silty sand and poorly graded sand. These sands are most likely representative of completely weathered bedrock from the underlying, weathered sandstone, which was encountered along the segment at depths ranging from 2 to greater than 10 feet bgs.

For a more detailed description of the materials encountered during this investigation, the boring logs and laboratory test results are included in Appendices A and B.

4.4 GROUNDWATER CONDITIONS ENCOUNTERED

Groundwater was only encountered in 2 of the 15 borings during this investigation. Groundwater was encountered in Boring B-1 at approximately 6 feet bgs and in Boring B-4 at approximately 5.5 feet bgs.

4.5 GEOTECHNICAL LABORATORY TESTING

Testing was performed to obtain information concerning the qualitative and quantitative physical properties of the subsurface soil from the samples recovered. Testing was performed by CE&G's testing laboratory in Hayward, California and Cooper Testing Laboratory in Palo Alto, California, in general conformance with the applicable ASTM and the California Department of Transportation (Caltrans) standards:

- Moisture Content and Dry Unit Weight (ASTM D2216)
- Particle Size Analysis (ASTM D422 and D1140)
- Atterberg Limits (ASTM D4318; dry method)
- Minimum Resistivity (Caltrans 643)
- pH (Caltrans 643)
- Sulfate Content (Caltrans 417)
- Chloride Content (Caltrans 422)

The results of the laboratory tests are summarized in Appendices A and B.

5.0 CONCLUSION AND DISCUSSION

The design for the proposed improvements is being completed by Schaaf & Wheeler. The primary geotechnical issues to be considered in the design of the planned improvements include the following:

- Excavatability of encountered materials;
- Shoring and excavation stability;
- Groundwater
- Effects of seismic loading and anticipated ground motions on design and performance; and
- Corrosion.

5.1 EXCAVATABILITY

Subsurface exploration was completed using solid flight augers and did not encounter auger refusal to the depths explored. Based on the subsurface exploration, we anticipate that an appropriately sized backhoe or excavator will be capable of excavating the soil and weathered bedrock underlying the project pipeline alignments in the areas explored. Medium to very dense sandstone that was encountered in our borings along Quail Hollow Road will likely require more effort if encountered in the pipeline trench excavations.

5.2 SHORING AND EXCAVATION STABILITY

The excavations for the pipelines are anticipated to extend to depths between approximately 4 and 6 feet below grade. The sides of the excavations are anticipated to be shored where required.

The soil conditions along the pipeline alignments within the anticipated trench depth of approximately 5 feet primarily consisted of sandy and silty soils of variable in consistency, from loose to medium dense to very dense, sand and silt mixtures, with some areas containing lean clays. Although some subsurface materials along the anticipated trench locations contain some cohesion and/or are likely to be stable in a temporary open trench, shoring will be required for excavations greater than 4 feet.

5.3 GROUNDWATER

Groundwater was only encountered in two of our exploratory borings, both of which were drilled in the valley alluvial deposits along the Lyon Zone and California Drive alignments.

Groundwater depths at these locations ranged from 5.5 to 6 feet bgs. There is a possibility that similar or shallower groundwater conditions will be encountered during construction within alluvial soils, especially during the winter and spring rainy season. If groundwater is encountered for any of the alignments, elevated groundwater may affect the design and construction of temporary shoring, the design and performance of the below ground structures as it pertains to the potential for buoyant uplift, and the means and methods to be considered for construction and future maintenance.

Although it is not anticipated, if high groundwater is encountered at the sites along some portions of the pipeline alignments, the excavation and possibly adjacent areas will need to be dewatered for construction and compaction of trench backfill materials.

5.4 SEISMIC LOADING

Geologic research has revealed that the proposed Quail Hollow Road, California Drive, Lyon Zone, and Sequoia Avenue alignments do not cross mapped active faults. These pipeline alignments are not expected to be damaged as a result of direct fault displacement. However, the planned Hillside Drive alignment crosses an active fault (Butano fault) that shows evidence of activity during the past 1.6 million years. Over the operational life of the Hillside Drive pipeline alignment, the pipelines are likely to be affected by seismic loading from a large earthquake. The most significant potential impacts from ground motions are displacements and possible rupturing of the pipelines due to soil softening or liquefaction of underlying cohesionless deposits.

5.4.1 Seismically Induced Displacements

Due to the flexible nature of HDPE and PVC pipe, other specific design components for seismic elements to mitigate displacements are judged to be unwarranted. For Ductile Iron Pipe, consideration should be given for flexible connections.

5.4.2 Liquefaction

We judge the potential for liquefaction within the upper 10 feet at the sites to be moderate for the California Drive segment and eastern portion of the Lyon Zone segment due to the presence of shallow groundwater in loose to medium dense alluvial soils. We judge the potential for liquefaction at Hillside Drive, Sequoia Avenue, and Quail Hollow Road segments, as well as the western portion of the Lyon Zone segment to be to be low due to the lack of encountered groundwater.

5.5 CORROSION

Corrosion testing was performed on two soil samples in general accordance with Caltrans methods. Testing results are presented below:

Table 5-1. Corrosion Testing Results

Boring (depth in feet)	Resistivity (Ohm-cm)	Chloride (mg/kg)	Sulfate (mg/kg)	pH
B-1 (3.5-5)	3378	5	98	8.6
B-10 (3.5-5)	47581	4	20	7.8

Caltrans Corrosion Guidelines, January 2015, identifies a site to be corrosive for structural elements if one or more of the following conditions exist:

- Chloride concentration is 500 ppm or greater;
- Sulfate concentration is 2000 ppm or greater;
- pH is 5.5 or less.

A minimum resistivity value for soil and/or water less than 1000 ohm-cm indicates the presence of high quantities of soluble salts and a higher propensity for corrosion. Based on the results of the laboratory testing performed, the soil sample tested had values for Chloride, Sulfate, pH that do not meet the Caltrans criteria for a corrosive site. The resistivity of the tested soil sample was above the 1000 ohm-cm threshold defined.

According to ACI 318 Section 4.3, Table 4.3.1:

- Sulfate concentration below 0.10 percent by weight (1,000 ppm) is negligible (no restrictions on concrete type)
- Water-soluble chloride content of less than 500 ppm is generally considered non-corrosive to concrete.

Based on the results of the laboratory testing performed, the soil sample tested had values for Sulfate and Chloride that do not meet ACI criteria and is considered non-corrosive to concrete.

Corrosion results are to be considered preliminary and are an indicator of potential soil corrosivity for the sample tested. Other soils or bedrock found onsite may be more, less, or of similar corrosive nature. Our scope of services does not include corrosion engineering; therefore, a detailed analysis of the corrosion tests is not included.

6.0 DESIGN AND CONSTRUCTION RECOMMENDATIONS

6.1 DESIGN GROUNDWATER LEVEL

For the design of the planned improvements, a design groundwater level of 5 feet below the ground surface is recommended for design and construction in the valley floor portions of the sites that lie within alluvial soils. The contractor and shoring designer should refer to our boring logs presented in Appendix A.

6.2 DEWATERING

Dewatering is generally not anticipated to be required since groundwater was only encountered in two of the borings at depths greater than the anticipated trenching depths. However, within the lower portion of excavations for the replacement waterlines and associated manholes within alluvial soils, especially if work is performed during the winter and spring months, groundwater could be encountered in the excavations. Dewatering, if needed, will be the responsibility of the contractor.

The area within the excavations should be dewatered to at least 3 feet below the bottom of the excavation or deeper as determined by the contractor to facilitate their operations. We recommend the contractor prepare and submit a dewatering plan prior to beginning work in this area. It is anticipated that the contractor will need to be prepared to provide a sump system as a minimum; the need for dewatering well points is not currently anticipated.

6.3 SHORING

The design of temporary excavation shoring should be made the responsibility of the contractor. Shoring design should be completed for the contractor by a qualified California-registered civil engineer and submitted to the Engineer for review and approval prior to construction. It is recommended that all temporary shoring be designed in conformance with the State of California, Department of Transportation, Trenching and Shoring Manual.

The soil conditions along the pipeline alignments within the anticipated trench depth of approximately 5 feet primarily consisted of sandy and silty soils of variable relative density/consistency, from loose to medium dense to very dense, sand and silt mixtures, with some areas containing lean clays. Although some subsurface materials along the anticipated trench locations contain some cohesion and/or are likely to be stable in a temporary open trench, shoring should still be required for excavations greater than 4 feet.

Shoring design should be based on OSHA Type C Soil. The impact of elevated groundwater conditions on the temporary shoring can be mitigated by implementing contractor-designed dewatering measures and designing the shoring to be water-tight and to account for the loading imposed by the groundwater in accordance with the recommendations provided herein.

Shoring should be designed to resist static (braced) earth pressures in combination with hydrostatic pressures where groundwater is encountered. Construction-induced vibrations should be minimized during shoring placement.

6.3.1 Lateral Earth Pressures

Static lateral earth pressure will be imposed on all shored excavations. Table 6-1 summarizes the lateral earth pressures recommended for use in design of unbraced temporary shoring. Active pressure should be assumed for conditions where the top of the wall is free to deflect up to ½ inch. Passive pressure should be ignored for a depth of 24 inches and may be utilized to resist overturning and sliding. Where structures will be located below groundwater, hydrostatic pressures should be added to the passive lateral earth pressure values shown in Table 6-1. As noted previously, the design of unbraced shoring will likely be controlled by deflections, as a result, calculations should also consider allowable ground deformations.

Table 6-1: Lateral Earth Pressures

Pressure Type	Above Groundwater Level (Equiv. Fluid Pressure)	Below Groundwater Level (Buoyant Equiv. Fluid Pressure + Hydrostatic)
Active	42 pcf	83 pcf
At-Rest	63 pcf	94 pcf
Passive	375 pcf	250 pcf

If the temporary shoring will be braced, a rectangular or trapezoidal loading diagram such as those recommended by Terzaghi & Peck, Tschebortarioff, and others (Caltrans Trenching and Shoring Manual and FHWA GEC No. 4) should be used. These methods generally correlate the earth pressure load to a percentage of the unit weight of the soil times the height of the excavation. The method and loading should be determined by the contractor and provided to the Engineer for review.

Surcharge loading from traffic on the adjacent pavement and construction equipment can be modeled as a minimum uniform ground pressure of 250 psf or higher as otherwise determined by the contractor's shoring design engineer.

6.3.2 Installation and Removal of Shoring

To reduce the potential for vibration induced settlements during construction, it is recommended that the contractor monitor the soils encountered during excavation and at a minimum avoid the generation of vibrations at locations where loose cohesionless soils are encountered. Settlement of adjacent improvements during the removal of shoring should not be allowed and should be monitored during removal.

6.4 PIPELINE DESIGN LOADS AND INSTALLATION

6.4.1 Pipe Loading

The pipe should be evaluated and designed for earth, surcharge, and hydrostatic loads, in conformance with Chapter 7 of the Plastic Pipe Institute's *Handbook of Polyethylene Pipe 2nd Edition* (PPI, 2007). Overburden loads should be calculated using the total unit weights of 130 pcf or buoyant unit weights of 67 pcf while the hydrostatic pressure should be determined based on the design groundwater level. In addition to the soil and hydrostatic loads, the pipe will be subjected to live load from vehicular traffic. At a minimum, the pipe design should assume H20 loading for vehicular traffic. The County Traffic Engineer should be consulted to determine if these loadings are appropriate.

6.4.2 Foundation Material

Foundation material should be installed where the excavation bottom is unstable (pumping subgrade, boiling, etc.) and where over excavation of the trench occurs as a result of an unstable or soft trench bottom.

Where required, foundation material should consist of a minimum of 12 inches of clean, durable, 1½-inch crushed rock wrapped in a 6 oz./sy non-woven geotextile. The geotextile shall be designed for separation, stabilization and permeability and constructed of polyester, nylon, and/or polypropylene formed into a stable network meeting the minimum parameters shown in Table 6-2.

Table 6-2 – Geotextile Fabric Requirements

Property	Test Value	Test Method
Weight	6 oz/yd^2	ASTM D5261
Grab tensile strength	150 lbs.	ASTM D4632
Puncture strength	80 lbs.	ASTM D4833
Permittivity	1.0 sec^{-1}	ASTM D4491
UV Resistance	70%	ASTM D4355

6.5 MANHOLES AND OTHER STRUCTURES

Design and construction of manholes within areas of high groundwater will require a means of preventing uplift of the manhole. This may be accomplished with an extended base around the perimeter of the manhole over which soil backfill is placed. Other means of preventing buoyancy uplift include using a cone or reducer section in the manhole and considering friction on the sides of the manhole. If the groundwater encountered during construction is found to be much higher than at the time of drilling, the potential for buoyant uplift should be reevaluated.

6.5.1 Bearing Capacity

It is recommended that the structures be designed as fully compensated structures. Fully compensated structures are those which do not result in a net increase in the load on the soil underlying the structure. If fully compensated design is not possible, the increase in earth pressure should be limited to less than 800 psf to limit total settlement and differential settlement. All permanent buried structures that extend below the design groundwater elevation should be designed with consideration of hydraulic uplift forces due to buoyancy effects.

6.5.2 Lateral Loads

In addition to hydrostatic pressure, the water pipeline should be designed to resist an at-rest lateral earth pressures of 63 pcf for soil above the design groundwater elevation and 94 pcf for soil below the groundwater elevation. These values are consistent with the lateral earth pressures previously described.

6.6 EARTHWORK

6.6.1 Excavation

We anticipate that an appropriately sized backhoe or excavator will be capable of excavating the soil and weathered bedrock underlying the project sites. Medium to very dense sandstone that was encountered in our borings along Quail Hollow Road will likely require more effort if encountered in the pipeline trenches. We note that narrower trenches and use of heavier excavating equipment will reduce excavation difficulty.

6.6.2 Subgrade Preparation

The bottom of the water line pipes will generally encounter moist, medium dense sandy and silty materials, although denser and more cohesive materials may be encountered at some locations. In the event the excavation bottom becomes unstable and difficult to achieve compaction of the backfill, the bottom of the excavation should be lined with a layer of geotextile such as Mirafi 500X (or equivalent) and then a minimum 12 inch thick layer of ¾-inch or 1-½-inch crushed rock. The crushed rock should be compacted with a manual vibratory compaction plate by making a minimum of three passes until a firm non-yielding surface is achieved.

6.6.3 Bedding and Shading

The utility pipes should be bedded in accordance with the requirements of the SLVWD. The bedding and shading material shall be a minimum 6 inches below and over the pipes and should consist of uniformly-graded sand or other material approved by the Engineer. This sand backfill shall be compacted to a minimum of 95 percent relative compaction in lifts not exceeding 8 inches in uncompacted thickness. All imported bedding and shading material should be sampled, tested and approved by the engineer prior to being transported to site.

6.6.4 Utility Trench Backfill

Following placement and compaction of sand over the pipes, Santa Cruz County design requirements indicate the remainder of the trench under County roads be backfilled with "2-Sack cement/sand slurry", also known as controlled density fill (CDF), controlled low strength material – CLSM, or flowable fill, which is comprised of cementitious material, sand, and water, and has a compressive strength between 100 and 200 psi.

Due to the low percentage of fine-grained material anticipated in excavations, the on-site sandy soil is anticipated to be suitable for use as structure backfill under Caltrans roadways

and under non-pavement areas. Imported granular backfill materials, such as aggregate base or quarry fines, may be used. Structure backfill shall be compacted to at least 95 percent relative compaction; 90 percent relative compaction under non-pavement areas. Backfill material should be placed in lifts not exceeding 8 inches in uncompacted thickness. Thinner lifts may be necessary to achieve the recommended level of compaction of the backfill due to equipment limitations. Compaction should be performed by mechanical means only. Water jetting to attain compaction shall not be permitted.

6.6.5 Import Fill

Import fill is anticipated for bedding and shading of the new pipelines as well as for pavement subgrade. All imported fill must be reviewed and approved by the geotechnical engineer prior to importation to the site. A minimum of five days will be required to evaluate and test the suitability of all planned imported materials. All imported materials should conform to the appropriate provisions of the 2018 Caltrans Standard Specifications.

The imported materials should be non-expansive and have a Plasticity Index less than 15 percent and a Liquid Limit of 30 percent or less. The imported material shall be free of organic debris or contaminated materials.

6.7 PAVEMENT REPLACEMENT

As a minimum, replacement of structural pavement sections above trenches is anticipated to be replaced in-kind, that is, with the same thickness as the existing pavement. the pavement section should meet the requirements of the County or Caltrans, as appropriate.

Pavement sections shall be placed on soil surfaces that have been prepared as outlined in the Earthwork section of this report. The full section of aggregate base as well as the upper 12 inches of subgrade soils should be compacted to a minimum of 95 percent relative compaction (ASTM D1557, latest edition).

Asphalt concrete should meet the requirements for 1/2- or 3/4-inch maximum, medium Type A Hot Mix Asphalt (asphalt concrete), Section 39, Caltrans Standard Specifications, latest edition. The Class 2 aggregate base material should conform to Section 26 of the Caltrans Standard Specifications.

6.8 TECHNICAL REVIEW AND CONSTRUCTION OBSERVATION

Prior to construction the geotechnical engineer should review the project plans for conformance with the intent of the recommendations presented in this report. The

geotechnical engineer should be contacted a minimum of 48 hours in advance of earthwork and excavation operations to observe the subsurface conditions.

7.0 LIMITATIONS

The conclusions and recommendations presented in this report are based on the information provided regarding the planned construction, and the results of the geologic mapping, subsurface exploration, and testing, combined with interpolation of the subsurface conditions between boring locations. Site conditions described in the text of this report are those existing at the time of our last field reconnaissance and are not necessarily representative of the site conditions at other times or locations. This information notwithstanding, the nature and extent of subsurface variations between borings may not become evident until construction. If variations are encountered during construction, Cal Engineering & Geology, Inc. should be notified promptly so that conditions can be reviewed and recommendations reconsidered, as appropriate.

It is the owner's responsibility to ensure that recommendations contained in this report are carried out during the construction phases of the project. This report was prepared based on preliminary design information provided which is subject to change during the design process. At approximately the 90 percent design level, Cal Engineering & Geology, Inc. should review the design assumptions made in this report and prepare addenda or memoranda as appropriate. Any modifications included in these addenda or memoranda should be carefully reviewed by the project designers to make sure that any conclusions or recommendations that are modified are accounted for in the final design of the project.

The findings of this report should be considered valid for a period of three years unless the conditions of the site change. After a period of three years, CE&G should be contacted to review the site conditions and prepare a letter regarding the applicability of this report.

This report presents the results of a geotechnical and geologic investigation only and should not be construed as an environmental audit or study. The evaluation or identification of the potential presence of hazardous materials at the site was not requested and was beyond the scope of this investigation and report.

The conclusions and recommendations contained in this report are valid only for the project described in this report. We have employed accepted geotechnical engineering procedures, and our professional opinions and conclusions are made in accordance with generally accepted geotechnical engineering principles and practices. This standard is in lieu of all other warranties, either expressed or implied.

8.0 REFERENCES

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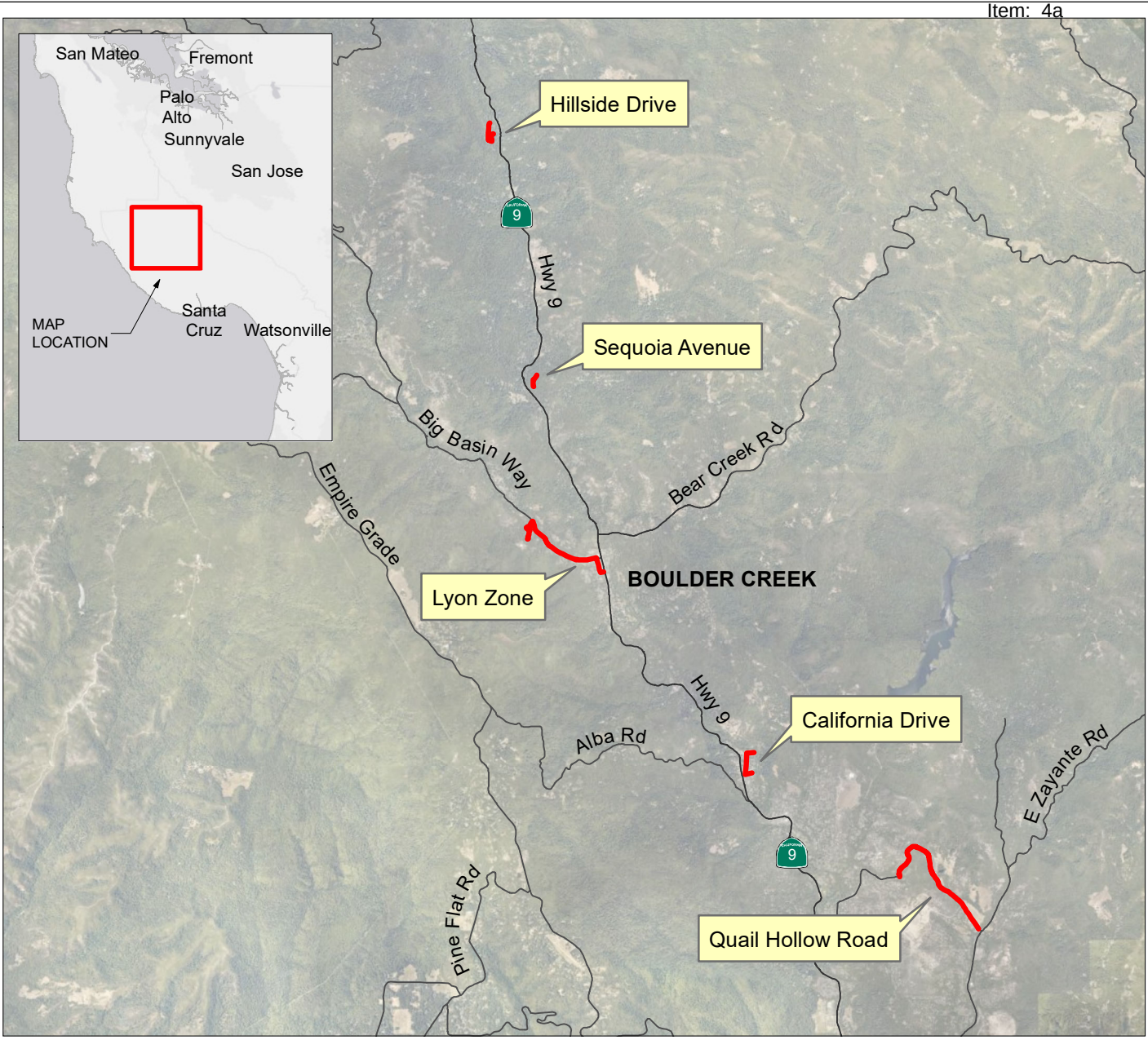
Draft

Figures



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1. ORTHOIMAGERY FROM SANTA CRUZ COUNTY, 2016.
2. STREET CENTERLINES FROM CALTRANS CALIFORNIA ROAD SYSTEM, DOWNLOADED ON 15 MAY 2016.

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MILES

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SLVWD 2019 PIPELINE PROJECT
SAN LORENZO VALLEY
BOULDER CREEK, CALIFORNIA

SITE LOCATION MAP

191110	JANUARY 2020	FIGURE 1

BASEMAP REFERENCE

1. 5-FEET CONTOURS DERIVED FROM 2010 LIDAR DATA.
2. ORTHOIMAGERY FROM SANTA CRUZ COUNTY, 2016
3. PIPE ALIGNMENT LOCATIONS ARE APPRIOXIMATE.
4. PARCEL DATA FROM SANTA CRUZ GIS DATABASE, ACCESSED ONLINE ON 08/03/2018.

LEGEND

B-10 BORING LOCATIONS BY CE&G, DRILLED ON 18-20 NOV AND 16 DEC 2019

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SANTA CRUZ COUNTY, CALIFORNIA

HILLSIDE DRIVE

191110	JANUARY 2020	FIGURE 2A

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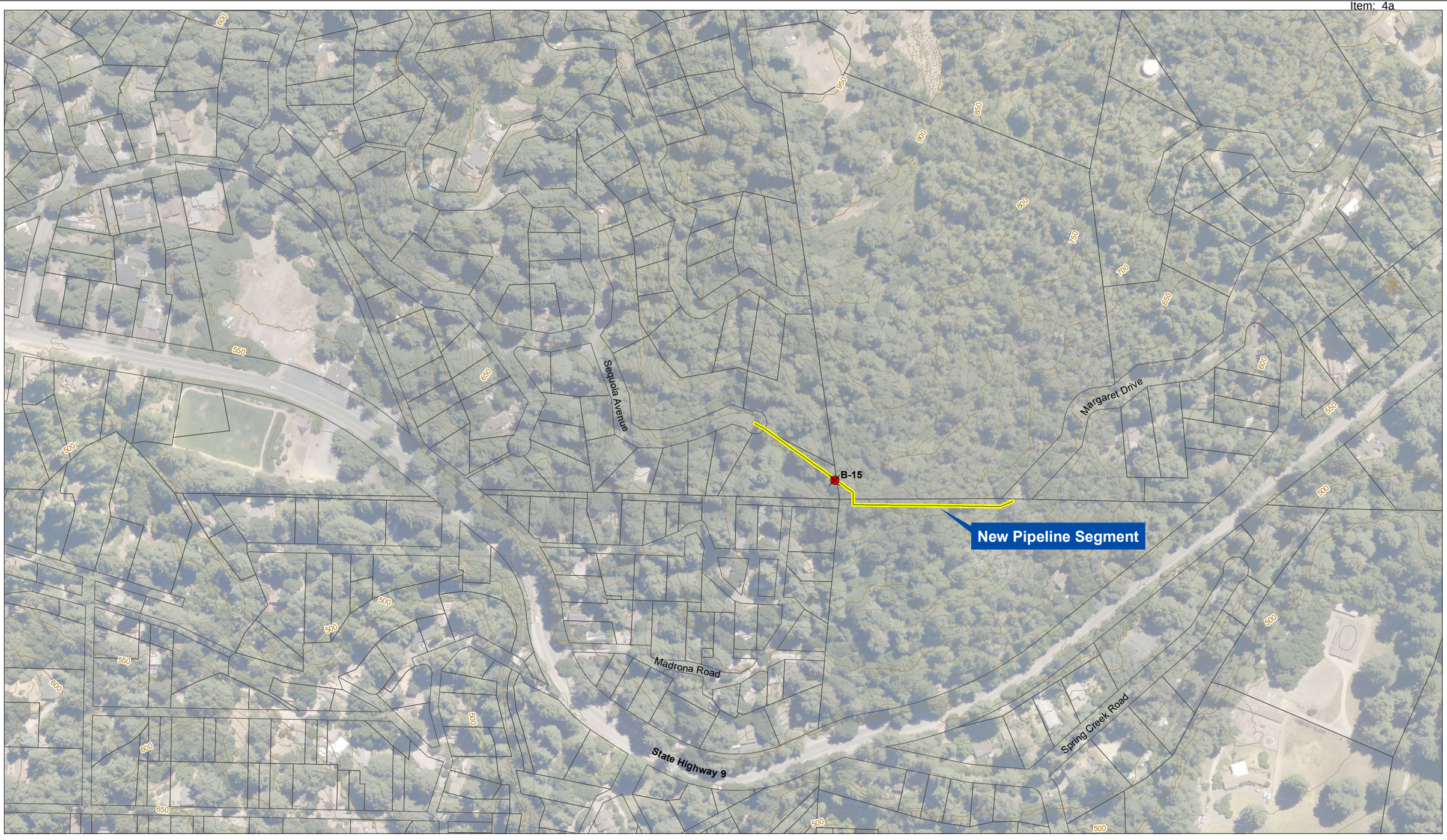

BASEMAP REFERENCE

1. 5-FEET CONTOURS DERIVED FROM 2010 LIDAR DATA.
2. ORTHOIMAGERY FROM SANTA CRUZ COUNTY, 2016
3. PIPE ALIGNMENT LOCATIONS ARE APPRIOXIMATE.
4. PARCEL DATA FROM SANTA CRUZ GIS DATABASE, ACCESSED ONLINE ON 08/03/2018.

LEGEND

B-10 BORING LOCATIONS BY CE&G, DRILLED ON 18-20 NOV AND 16 DEC 2019

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SEQUOIA AVE

191110	JANUARY 2020	FIGURE 2B

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BASEMAP REFERENCE

1. 5-FEET CONTOURS DERIVED FROM 2010 LIDAR DATA.
2. ORTHOIMAGERY FROM SANTA CRUZ COUNTY, 2016
3. PIPE ALIGNMENT LOCATIONS ARE APPRIOXIMATE.
4. PARCEL DATA FROM SANTA CRUZ GIS DATABASE, ACCESSED ONLINE ON 08/03/2018.

LEGEND

B-10 BORING LOCATIONS BY CE&G, DRILLED ON 18-20 NOV AND 16 DEC 2019

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SANTA CRUZ COUNTY, CALIFORNIA

LYON ZONE

191110	JANUARY 2020	FIGURE 2C

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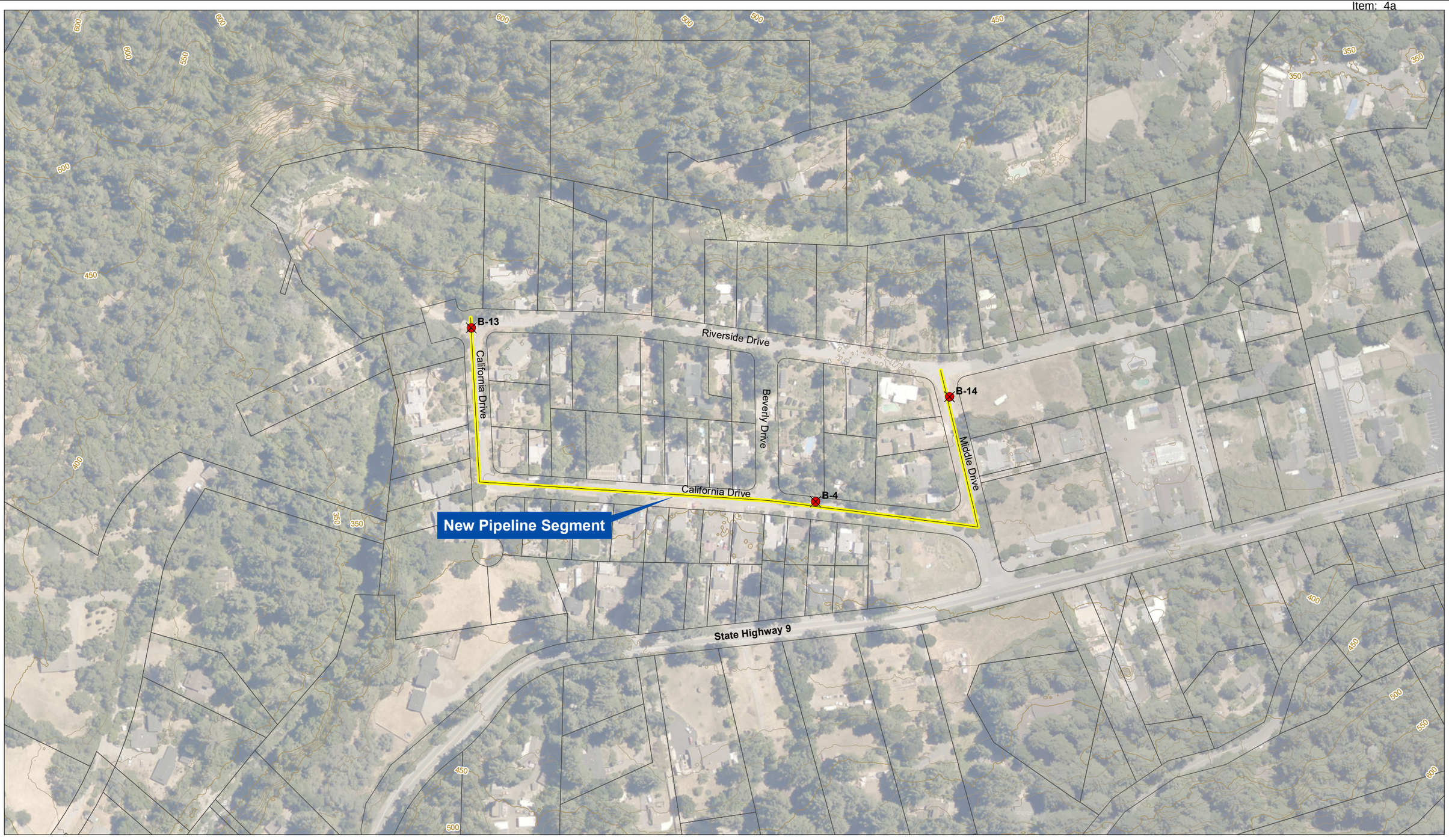

BASEMAP REFERENCE

1. 5-FEET CONTOURS DERIVED FROM 2010 LIDAR DATA.
2. ORTHOIMAGERY FROM SANTA CRUZ COUNTY, 2016
3. PIPE ALIGNMENT LOCATIONS ARE APPRIOXIMATE.
4. PARCEL DATA FROM SANTA CRUZ GIS DATABASE, ACCESSED ONLINE ON 08/03/2018.

LEGEND

B-10 BORING LOCATIONS BY CE&G, DRILLED ON 18-20 NOV AND 16 DEC 2019

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FEET

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SANTA CRUZ COUNTY, CALIFORNIA

CALIFORNIA AVE

191110	JANUARY 2020	FIGURE 2D

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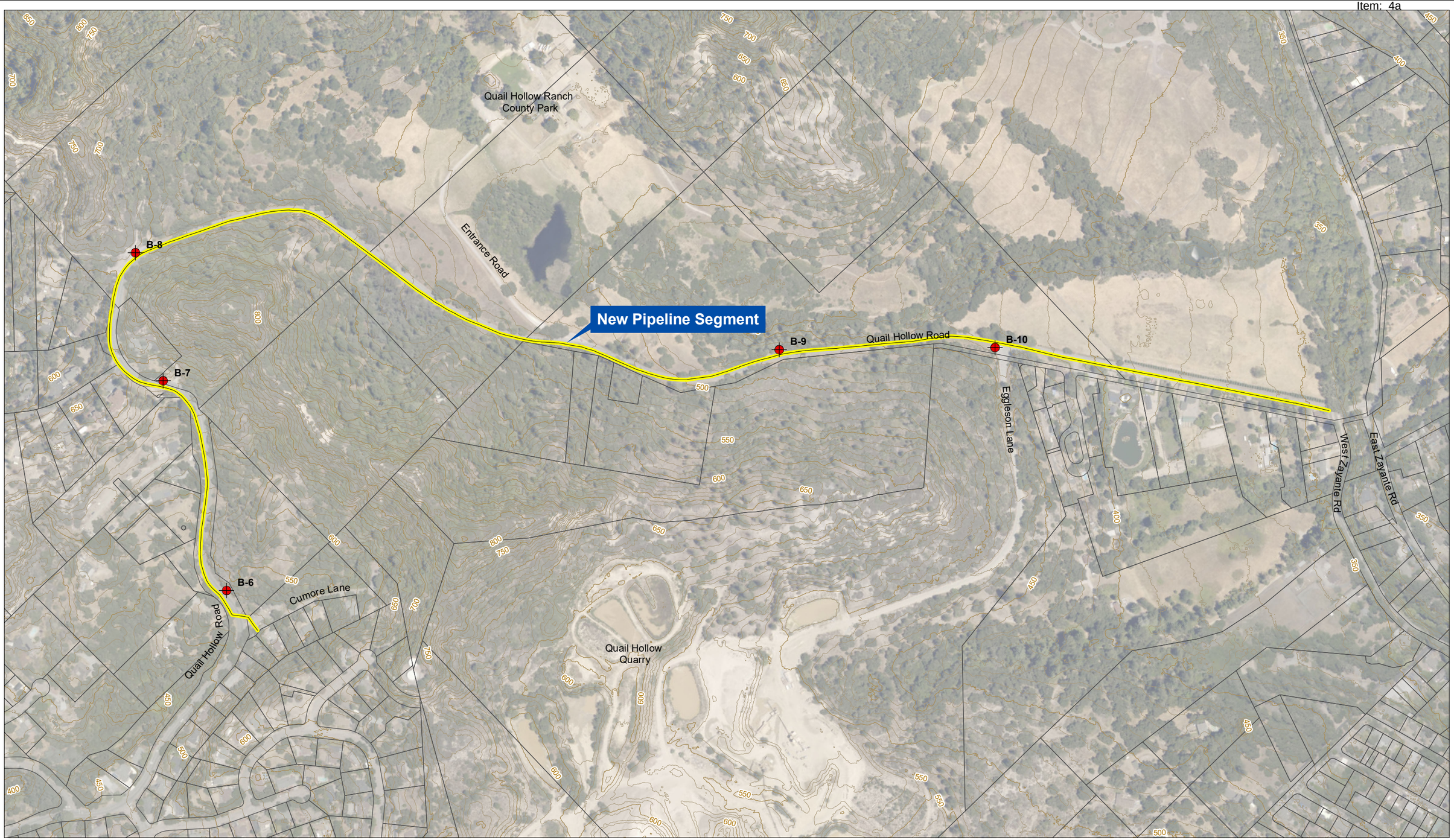

BASEMAP REFERENCE

1. 5-FEET CONTOURS DERIVED FROM 2010 LIDAR DATA.
2. ORTHOIMAGERY FROM SANTA CRUZ COUNTY, 2016
3. PIPE ALIGNMENT LOCATIONS ARE APPRIOXIMATE.
4. PARCEL DATA FROM SANTA CRUZ GIS DATABASE, ACCESSED ONLINE ON 08/03/2018.

LEGEND

B-10 BORING LOCATIONS BY CE&G, DRILLED ON 18-20 NOV AND 16 DEC 2019

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QUAIL HOLLOW ROAD

191110	JANUARY 2020	FIGURE 2E

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MAP UNIT DESCRIPTION

Qcu	COASTAL TERRACE DEPOSITS, UNDIFFERENTIATED (PLEISTOCENE)
Qal	ALLUVIAL DEPOSITS, UNDIFFERENTIATED (HOLOCENE)
Tp	PURISIMA FORMATION (PLIOCENE AND UPPER MIOCENE)
Tsc	SANTA CRUZ MUDSTONE (UPPER MIOCENE)
Tsm	SANTA MARGARITA SANDSTONE (UPPER MIOCENE)
Tm	MONTEREY FORMATION (MIDDLE MIOCENE)
Tlo	LOMPICO SANDSTONE (MIDDLE MIOCENE)
Tvq	VAQUEROS SANDSTONE (LOWER MIOCENE AND OLIGOCENE)
Tz	ZAYANTE SANDSTONE (OLIGOCENE)
Tsl	SAN LORENZO FORMATION, UNDIVIDED (OLIGOCENE AND EOCENE)
Tsr	RICES MUDSTONE MEMBER (OLIGOCENE AND EOCENE)
Tst	TWOBAR SHALE MEMBER (EOCENE)
Tbu	BUTANO SANDSTONE (EOCENE) UPPER SANDSTONE MEMBER
Tbm	MIDDLE SILTSTONE MEMBER
Tl	LOCATELLI FORMATION
Tlss	SANDSTONE
qd	QUARTZ DIORITE (CRETACEOUS)
gd	GNEISSIC GRANODIORITE (CRETACEOUS)
hcg	HORNBLENDE-CUMMINGTONITE GABBRO (CRETACEOUS)
sch	METASEDIMENTARY ROCKS (MESOZOIC OR PALEOZOIC)
m	MARBLE (MESOZOIC OR PALEOZOIC)

CONTACT

FAULT

ANTICLINE

SYNCLINE

80 STRIKE AND DIP OF BEDS INCLINED

50 APPROXIMATE DIP OF BEDS

VERTICAL

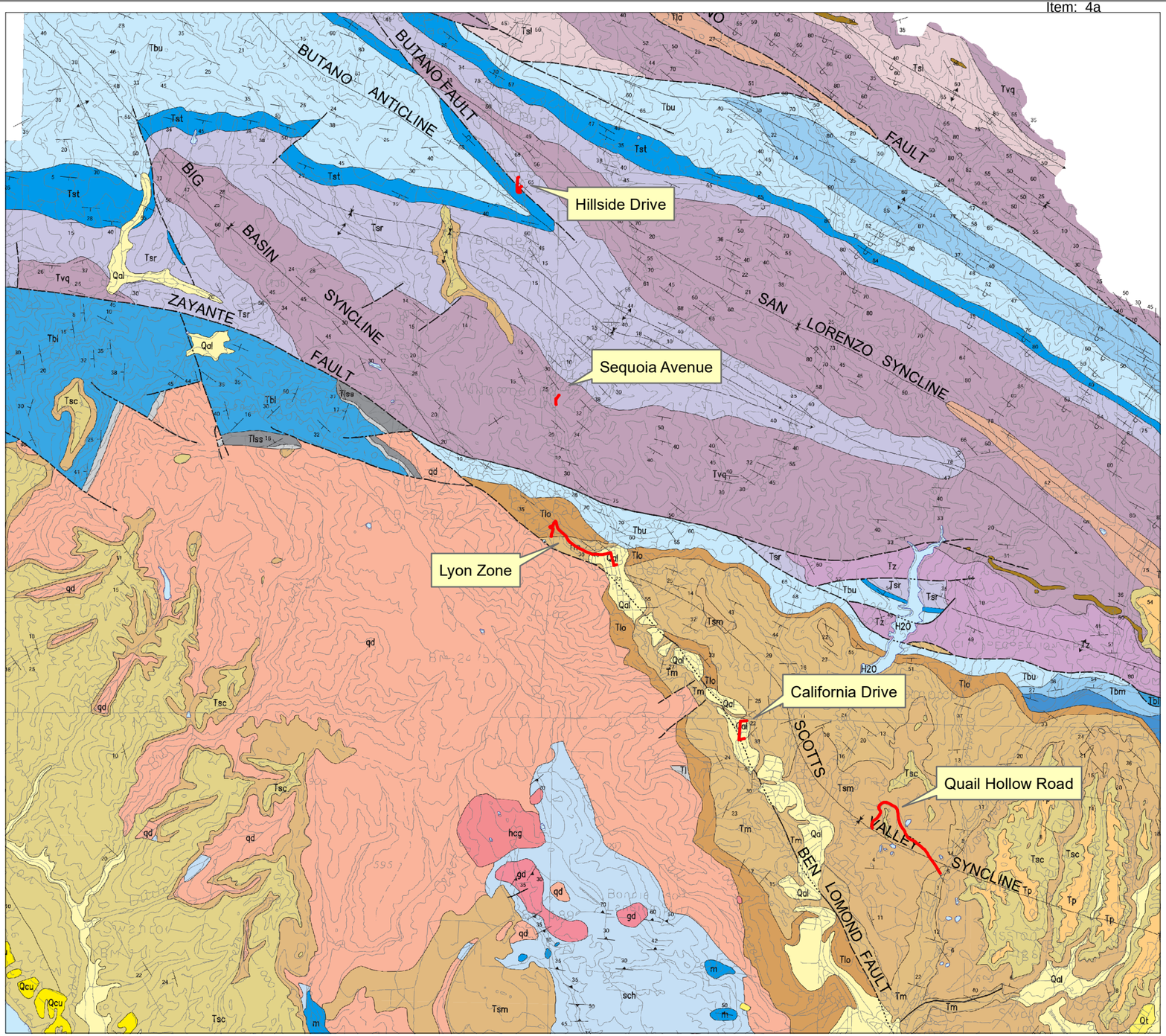
HORIZONTAL

60 OVERTURNED

20 STRIKE AND DIP OF FOLIATION

BASEMAP REFERENCE

1. REGIONAL GEOLOGY FROM BRABB ET AL. 1997.



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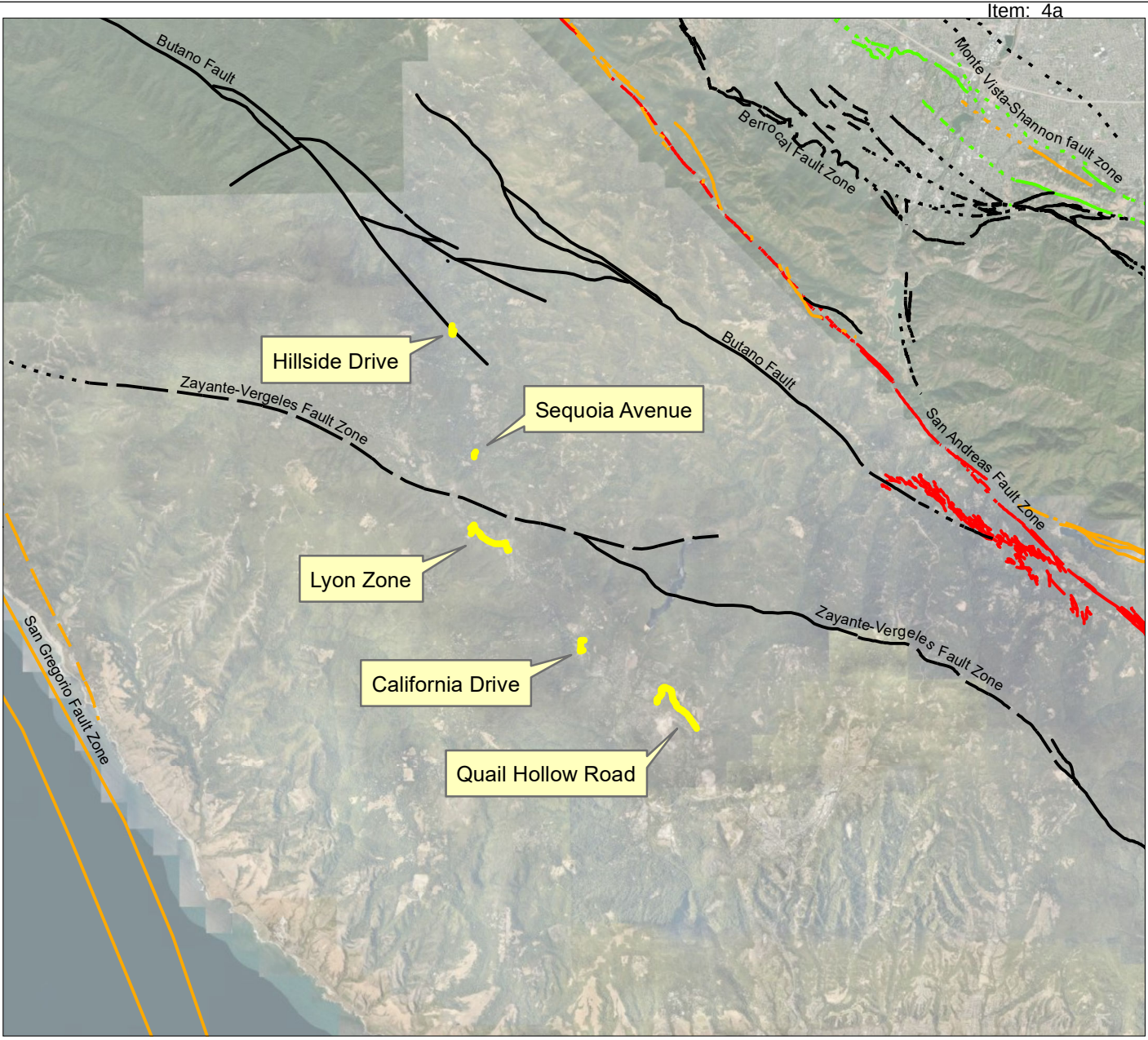
SAN LORENZO VALLEY
BOULDER CREEK, CALIFORNIA

REGIONAL GEOLOGY MAP

191110	JANUARY 2020	FIGURE 3

M:\2019\191110-Schaaf\Wheeler-SanLorenzoWDP ipeline\GIS\ArcGIS\Fig3-Regional-Geology-Large.mxd: 1/24/2020: jhausen



BASEMAP REFERENCE

1. BASEMAP FROM SANTA CRUZ COUNTY, 2016.
2. FAULT LOCATIONS FROM US GEOLOGICAL SURVEY QUATERNARY FAULT AND FOLDS DATABASE, ACCESSED ONLINE ON 12 DECEMBER 2017.

N

0 1.5 3 6
MILES

MAP UNIT DESCRIPTION

- Historical (<150 years), Well Constrained Location
- Historical (<150 years), Moderately Constrained Location
- Historical (<150 years), Inferred Location
- Latest Quaternary (<15,000 years), Well Constrained Location
- Latest Quaternary (<15,000 years), Moderately Constrained Location
- Latest Quaternary (<15,000 years), Inferred Location
- Late Quaternary (<130,000 years), Well Constrained Location
- Late Quaternary (<130,000 years), Moderately Constrained Location
- Late Quaternary (<130,000 years), Inferred Location
- Undifferentiated Quaternary (<1.6 million years), Well Constrained Location
- Undifferentiated Quaternary (<1.6 million years), Moderately Constrained Location
- Undifferentiated Quaternary (<1.6 million years), Inferred Location

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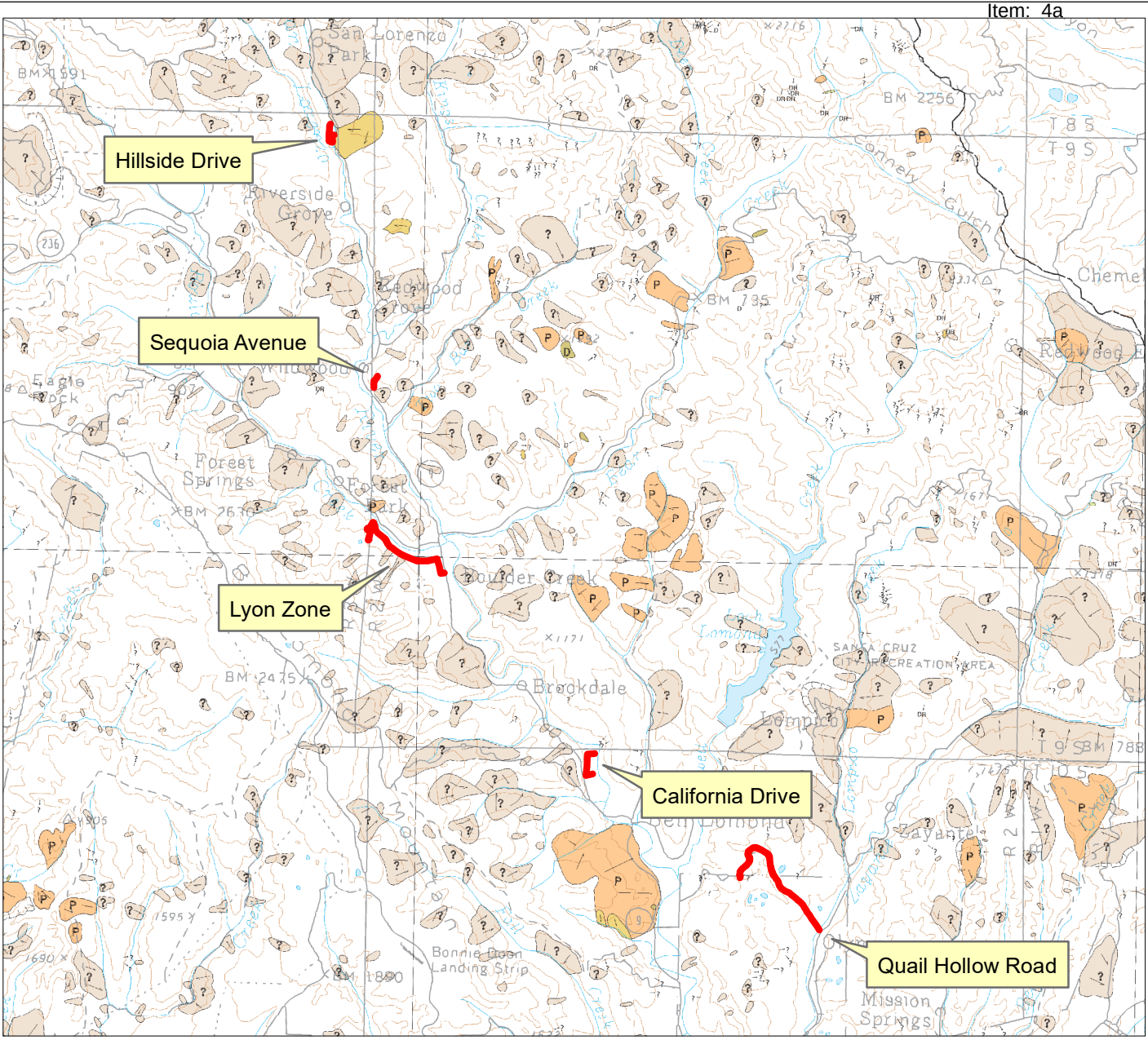
SLVWD 2019 PIPELINE PROJECT
SAN LORENZO VALLEY
BOULDER CREEK, CALIFORNIA

FAULT ACTIVITY MAP

191110	JANUARY 2020	FIGURE 4

M:\2019\191110-SchaafWheeler-SanLorenzoWDPipeline\GIS\ArcGIS\Fig4-Fault-Activity.mxd; 1/24/2020; jhausen



BASEMAP REFERENCE

1. BASEMAP FROM SANTA CRUZ COUNTY, 2016.
2. LANDSLIDE DATA FROM COOPER-CLARK ET AL. 1975.

0 0.625 1.25 2.5
MILES

N

MAP UNIT DESCRIPTION

P — LARGE LANDSLIDE DEPOSIT

SMALL LANDSLIDE DEPOSIT AND GULLY

D	DEFINITE LANDSLIDE DEPOSIT
DR	DEFINTE RAPID LANDSLIDE DEPOSIT
P	PROBABLE LANDSLIDE DEPOSIT
?	QUESTIONABLE LANDSLIDE DEPOSIT
	UNATTRIBUTED LANDSLIDE DEPOSIT

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SAN LORENZO VALLEY
BOULDER CREEK, CALIFORNIA

LANDSLIDE ACTIVITY MAP

191110	JANUARY 2020	FIGURE 5

M:\2019\191110-SchaafWheeler-SanLorenzoWDPipeline\GIS\ArcGIS\Fig5-Landslide-Activity.mxd; 1/24/2020; jhausen

Draft

Appendix A. Boring Logs

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KEY TO SYMBOLS

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


ASPHALT: Asphalt


CH: USCS High Plasticity Clay


CL: USCS Low Plasticity Clay


FILL: Fill (made ground)


MH: USCS Elastic Silt


ML: USCS Silt


SANDSTONE: Sandstone


SC: USCS Clayey Sand


SILTSTONE: Siltstone


SM: USCS Silty Sand


SP: USCS Poorly-graded Sand


SP-SM: USCS Poorly-graded Sand with Silt


SW: USCS Well-graded Sand


SW-SM: USCS Well-graded Sand with Silt

SAMPLER SYMBOLS


California Modified Sampler


Standard Penetration Test

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION


Water Level at Time Drilling, or as Shown


Water Level at End of Drilling, or as Shown


Water Level After 24 Hours, or as Shown

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BORING NUMBER B-01

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/20/2019 **COMPLETED** 11/20/2019
GROUND ELEVATION 496 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.1242 **LONGITUDE** -122.12272
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING 6.0 ft / Elev 490.0 ft
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- Not Measured
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING 8.0 ft / Elev 488.0 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0	Asphalt Pavement (approximately 3")									
	Aggregate Base (approximately 6")									
	Silty SAND w/ Gravel (SM): dark yellowish brown, moist, dense, fine to coarse sand, angular granitic gravel up to 1.5" [Fill]	CM	10-8-5		114	13				
2.5	SIlty SAND (SM): black, moist, medium dense, fine sand [Alluvium]									
	Clayey SAND (SC): dark gray mottled with dark yellowish brown, moist, medium dense, fine sand, medium plasticity fines (Corrosivity test at 3.5-5 feet)	SPT	3-4-10	3.25 3.25			38	17	21	
5.0	becomes very dark gray, fine to medium sand, trace angular gravel									
	decrease in fines, fine to coarse sand, trace subrounded gravel	CM	11-12-14		127	14				
7.5	becomes wet poorly graded sand lens									
	becomes moist to wet	SPT	7-9-11							
10.0	Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.									

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BORING NUMBER B-02

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/20/2019 **COMPLETED** 11/20/2019
GROUND ELEVATION 527 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.12499 **LONGITUDE** -122.12744
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 4")									
		Aggregate Base (approximately 6")									
		Well Graded SAND w/ Silt and Gravel (SW-SM):: dark yellowish brown, dry, dense, angular granitic gravel up to 2.5 in., fine to coarse sand [Alluvium]	CM	23-28-29			4				6
2.5		Well Graded SAND with Silt (SW): dark yellowish brown, dense, fine to coarse sand, some angular granitic gravel [Alluvium]									
			SPT	13-12-21							
5.0											
			CM	10-13-19			4				
7.5		little fine gravel									
		becomes medium dense, increase in fine sand	SPT	15-15-13							
10.0		Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.									

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BORING NUMBER B-03

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/20/2019 **COMPLETED** 11/20/2019
GROUND ELEVATION 551 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.12738 **LONGITUDE** -122.13196
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 4")									
		Aggregate Base (approximately 6")									
		Well Graded SAND with Silt and Gravel (SW-SM): dark yellowish brown, dry, medium dense, fine to coarse sand, strong granitic clasts in borehole over 5"	CM	7-7-9			3				
2.5		Well Graded SAND (SW): dark yellowish brown, dry, medium dense, little angular granitic gravel up to 1 in.									
			SPT	5-6-5							4
5.0		becomes little angular/subangular granitic gravel up to 1.5", mostly fine to medium sand	CM	6-14-12			4				
7.5											
			SPT	8-5-3							
10.0		Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.									

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BORING NUMBER B-04

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/18/2019 **COMPLETED** 11/18/2019
GROUND ELEVATION 395 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.09646 **LONGITUDE** -122.09654
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING 5.5 ft / Elev 389.5 ft
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING ---
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING 4.7 ft / Elev 390.3 ft

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0	Asphalt Pavement (approximately 4")									
	Aggregate Base (approximately 6")									
	Elastic SILT w/ Sand (MH): brown, moist,stiff, high plasticity, little subangular gravel up to 2" [Alluvium]	CM	5-6-7	1.5	77	38	54	37	17	74
2.5	becomes dark gray	SPT	2-3-4	1.5						
	Sandy Elastic SILT (MH): dark gray, moist, stiff, high plasticity, fine sand			1.5						
5.0	Clayey SAND (SC): olive gray mottled with oxidized, wet, loose, fine to medium sand									
	Sandy SILT (ML): olive, moist, medium dense, very fine sand	CM	3-5-7		102	27				
7.5	Silty SAND (SM): olive, wet, dense, fine to coarse granitic sand	SPT	6-20-40							
10.0	SILTSTONE (BEDROCK or BOULDER?): dark gray, dry, very weak, slightly weathered									

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-05

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/20/2019 **COMPLETED** 11/20/2019
GROUND ELEVATION 685 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.12818 **LONGITUDE** -122.13488
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 3")									
		Aggregate Base (approximately 3")									
		Gravelly Lean CLAY (CL): dark brown, moist, hard, angular gravel up to 2 in., trace sand and root [Colluvium]	CM	9-10-11	>4.5	81	19				66
2.5		Sandy Lean CLAY (CL): dark brown, moist, hard, trace sand and root									
			SPT	5-8-7							
		Sandstone clast, roots									
5.0											
			CM	6-8-13							
		Sandy SILT (ML): olive gray mottled with dark yellowish brown, moist, hard,									
7.5											
		SILTSTONE: dark yellowish brown, moist, extremely weak, highly/moderately weathered [Weathered Bedrock]									
			SPT	6-9-14							
10.0											

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-06

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/18/2019 **COMPLETED** 11/18/2019
GROUND ELEVATION 525 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.08205 **LONGITUDE** -122.06961
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 5")									
		Aggregate Base (approximately 7")									
		Silty SAND (SM): light gray brown, dry, medium dense, fine to medium sand, little cementation [Weathered Bedrock]	CM	7-18-21							
2.5											
		decomes dense	SPT	10-16-30							32
5.0											
		SANDSTONE: olive, dry, extremely weak, slightly weathered, friable, oxidized, fine sand [Bedrock]	CM	39-50/5"							
7.5											
		becomes pale yellow	SPT	27-50							

Bottom of borehole at 9.5 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-07

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/18/2019 **COMPLETED** 11/18/2019
GROUND ELEVATION 630 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.08458 **LONGITUDE** -122.06806
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0	Asphalt Pavement (approximately 4")									
	Aggregate Base (approximately 6")									
	Silty SAND (SM): pale yellow, dry, medium dense, fine sand [Residual Soil]	CM	4-10-15		101	6				12
2.5										
		SPT	7-10-10							
5.0										
		CM	9-12-17			5				
	becomes brown, moist									
7.5										
		SPT	9-7-7							
10.0	SANDSTONE encountered in shoe, strong rock, fine to coarse sand, slightly weathered [Weathered Bedrock]									

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-08

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/18/2019 **COMPLETED** 11/18/2019
GROUND ELEVATION 659 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.08592 **LONGITUDE** -122.06702
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 5")									
		Aggregate Base (approximately 5")									
		Poorly Graded SAND (SP): light olive gray, dry, very dense, fine to medium sand [Residual Soil/Weathered Bedrock]	CM	16-22-43							4
2.5											
			SPT	17-33-50			3				
5.0											
			SPT	25-50							
7.5											
			SPT	26-40-50							
10.0											

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-09

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/19/2019 **COMPLETED** 11/19/2019
GROUND ELEVATION 474 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.07971 **LONGITUDE** -122.06109
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 4")									
		Aggregate Base (approximately 6")									
		Silty SAND (SM): light gray, dry, dense, fine sand, possible soft sandstone [Residual Soil/Weathered Bedrock]	CM	22-24-20		108	7				23
2.5		becomes light olive brown, trace subangular gravel up to 1"									
		becomes medium dense, some oxidation	SPT	8-11-14							
5.0		Silty SAND w/ Gravel (SM): dark yellowish brown, moist, dense, fine to coarse sand									
7.5			CM	13-20-30							62
		SANDSTONE: light gray, dry, dense, fine sand [Weathered Bedrock]									

Bottom of borehole at 9.5 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-10

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/19/2019 **COMPLETED** 11/19/2019
GROUND ELEVATION 424 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.07792 **LONGITUDE** -122.05874
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 4")									
		Aggregate Base (approximately 6")									
		Silty SAND (SM): dark olive brown, dry, medium dense, fine sand [Alluvium]	CM	13-11-7			4				6
2.5		(Corrosivity test at 3.5 to 5 feet)									
		becomes olive brown, loose, trace roots and gravel up to 1 in.	SPT	2-3-5							
5.0		Poorly Graded SAND (SP): pale olive, dry, dense, fine to medium sand [Residual Soil/Weathered Bedrock]									
			CM	10-18-30		104	6				
7.5		becomes fine sand, olive									
		becomes medium sand, pale yellow	SPT	10-19-33							
10.0		Silty SAND (SM): olive brown, moist, very dense, fine sand									

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-11

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/19/2019 **COMPLETED** 11/19/2019
GROUND ELEVATION 641 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.18308 **LONGITUDE** -122.14259
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Sandy SILT (ML): very dark gray brown, moist, medium dense, some organics, fine sand [Fill]									
			CM	5-8-11		87	13				
2.5		becomes dark yellowish brown mottled with olive, dry, trace roots									
		no mottling	SPT	5-6-7							57
5.0											
		Poorly Graded SAND (SP): dark yellowish brown, moist, medium dense, fine to medium sand, trace subangular gravel up to 1.5" [Alluvium]									
			CM	5-10-9		106	11				
7.5		lens with gravel becomes fine sand									
		Poorly Graded SAND with Silt (SP-SM): dark yellowish brown, moist, medium dense, fine sand, trace fine gravel									
			SPT	4-6-8							
10.0											

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-12

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/19/2019 **COMPLETED** 11/19/2019
GROUND ELEVATION 651 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.18344 **LONGITUDE** -122.14306
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0	Asphalt Pavement (approximately 3")									
	Aggregate Base (approximately 3")									
	Sandy SILT (ML): dark yellowish brown, medium dense, fine sand some angular gravel [Fill]	CM	7-7-5		75	11				74
2.5	becomes brown, roots, no gravel									
	Sandy Lean CLAY with Gravel (CL): dark yellowish brown, moist, medium dense, little friable gravel, some organics, subangular gravel up to 2.5" [Colluvium]	SPT	3-5-7							
5.0										
	becomes olive brown mottled with dark yellowish brown (oxidized), hard	CM	6-11-13	>4.5	104	19				
7.5										
		SPT	6-9-13	>4.5						
10.0	becomes olive brown mottled with dark yellowish brown (oxidized), hard Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.									

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BORING NUMBER B-13

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/18/2019 **COMPLETED** 11/18/2019
GROUND ELEVATION 374 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.09854 **LONGITUDE** -122.09525
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0	Asphalt Pavement (approximately 3")									
	Aggregate Base (approximately 6")									
	Sandy SILT (ML): very dark gray brown, dry, medium dense, fine sand, trace roots [Alluvium]	CM	9-11-11		94	10				
2.5	Silty SAND (SM): dark yellowish brown, dry, medium dense, fine to medium sand, little subangular gravel									
	becomes dark brown, granitic sand	SPT	10-15-13							14
5.0										
	becomes dark gray, moist, fine to coarse sand, one 2" round clast	CM	15-15-17		111	14				
7.5										
	becomes olive yellow, very dense, fine sand, oxidized	SPT	17-30-40							
10.0										

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-14

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 11/18/2019 **COMPLETED** 11/18/2019
GROUND ELEVATION 380 ft **DATUM** WGS84 **HOLE SIZE** 6" in.
DRILLING CONTRACTOR Cenozoic Exploration, LLC.
COORDINATES: **LATITUDE** 37.09567 **LONGITUDE** -122.09573
DRILLING RIG/METHOD Simco 2400/ 6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Asphalt Pavement (approximately 3")									
		Aggregate Base (approximately 3")									
		Lean CLAY (CL): brown, moist, very stiff, roots, low plasticity [Fill]	CM	5-8-10	3.25	133	13				
2.5		Sandy Lean CLAY (CL): very dark gray, moist, very stiff, fine sand, trace coarse sand									
		Silty SAND (SM): dark olive brown, moist, medium dense, fine sand [Alluvium]	CM	6-7-8		103	15				
5.0		becomes dark yellowish brown, decrease in fines									
		becomes oxidized	CM	5-6-8							
7.5		increase in fines, light brown gray									
		Well Graded SAND (SW): dark brown/dark yellowish brown, moist, medium dense, fine to coarse granitic sand, trace subangular gravel	SPT	6-8-8							
10.0		Fat CLAY (CH): gray, moist, stiff, high plasticity									

Bottom of borehole at 10.0 ft. Borehole backfilled with cuttings.

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BORING NUMBER B-15

CLIENT Schaaf & Wheeler
PROJECT NAME San Lorenzo Valley Water District 2019 Pipeline Project
PROJECT NUMBER 191110
PROJECT LOCATION Santa Cruz County, CA
DATE STARTED 12/16/2019 **COMPLETED** 12/16/2019
GROUND ELEVATION 740 ft **DATUM** WGS84 **HOLE SIZE** 3" in.
DRILLING CONTRACTOR N/a
COORDINATES: **LATITUDE** 37.14987 **LONGITUDE** -122.13425
DRILLING RIG/METHOD Hand Augered by CE&G Staff
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY K. Loeb **CHECKED BY** D. Peluso
GROUNDWATER AT END OF DRILLING --- N/A
HAMMER TYPE N/A
GROUNDWATER AFTER DRILLING --- N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0.0		Sandy SILT (ML): dark brown, moist, loose, very fine sand, roots [Topsoil]									
2.5		Sandy SILT (ML): dark yellowish brown, moist, loose to medium dense, very fine sand, roots [Colluvium/Residual Soil]									
5.0		Silty SAND (SM): olive brown to dark yellowish brown, moist, medium dense, oxidized [Completely Weathered Bedrock]									

Bottom of borehole at 6.5 ft. Borehole backfilled with cuttings.

Draft

Appendix B. Laboratory Testing

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SUMMARY OF LABORATORY RESULTS

CLIENT Schaaf Wheeler **PROJECT NAME** San Lorenzo WD Pipeline

PROJECT NUMBER 191110 **PROJECT LOCATION** San Lorenzo, CA

Borehole	Depth	Date Tested	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Screen Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-01	2.0	12/3/2019							13.2	114.3		
B-01	7.0	12/3/2019							14.2	126.8		
B-02	2.0	12/3/2019				25	6		4.0			
B-02	6.5	12/3/2019							4.4			
B-03	1.5	12/3/2019							3.4			
B-03	3.5	12/3/2019				0.106	4	SP				
B-03	7.0	12/3/2019							3.6			
B-05	2.0	12/3/2019				0.106	66		19.2	80.6		
B-06	3.5	12/3/2019				0.106	32					
B-07	2.0	12/3/2019				0.106	12		6.3	101.4		
B-07	7.0	12/3/2019							5.1			
B-08	1.5	12/3/2019				4.75	4	SP				
B-08	3.5	12/3/2019							2.8			
B-09	2.0	12/3/2019				0.106	23		7.3	108.2		
B-09	8.5	12/3/2019				9.5	62					
B-10	2.0	12/3/2019				0.106	6		3.8			
B-10	7.0	12/3/2019							5.6	103.9		
B-11	2.0	12/3/2019							13.4	87.3		
B-11	3.5	12/3/2019				0.106	57					
B-11	7.0	12/3/2019							10.9	106.2		
B-12	2.0	12/3/2019				0.106	74		10.6	75.1		
B-12	7.0	12/3/2019							18.6	103.5		
B-14	2.0	12/3/2019							12.9	133.3		
B-14	4.5	12/3/2019							15.4	102.5		

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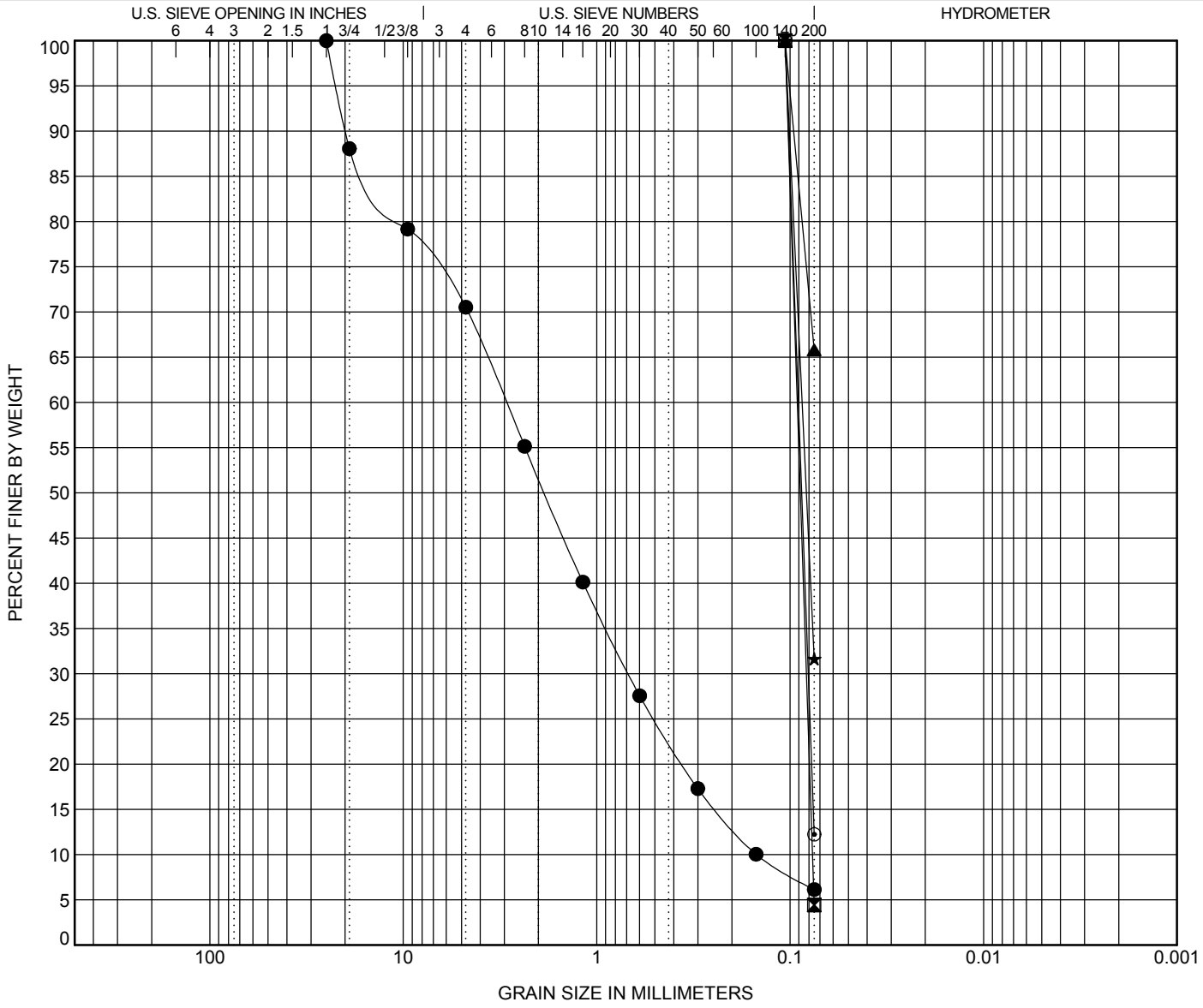
GRAIN SIZE DISTRIBUTION

CLIENT Schaaf Wheeler **PROJECT NAME** San Lorenzo WD Pipeline

PROJECT NUMBER 191110 **PROJECT LOCATION** San Lorenzo, CA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	DATE TESTED	Classification	LL	PL	PI	Cc	Cu
●	**B-02**	**2.0**	**12/3/2019**					**1.07**	**19.74**
⊠	**B-03**	**3.5**	**12/3/2019**	**POORLY GRADED SAND(SP)**				**0.96**	**1.20**
▲	**B-05**	**2.0**	**12/3/2019**						
★	**B-06**	**3.5**	**12/3/2019**						
⊙	**B-07**	**2.0**	**12/3/2019**					**0.96**	**1.22**

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-02**	**2.0**	**25**	**2.944**	**0.684**	**0.149**	**29.5**	**64.4**	**6.1**	
⊠	**B-03**	**3.5**	**0.106**	**0.092**	**0.082**	**0.077**	**0.0**	**95.6**	**4.4**	
▲	**B-05**	**2.0**	**0.106**				**0.0**	**34.2**	**65.8**	
★	**B-06**	**3.5**	**0.106**	**0.087**			**0.0**	**68.4**	**31.6**	
⊙	**B-07**	**2.0**	**0.106**	**0.091**	**0.08**		**0.0**	**87.8**	**12.2**	

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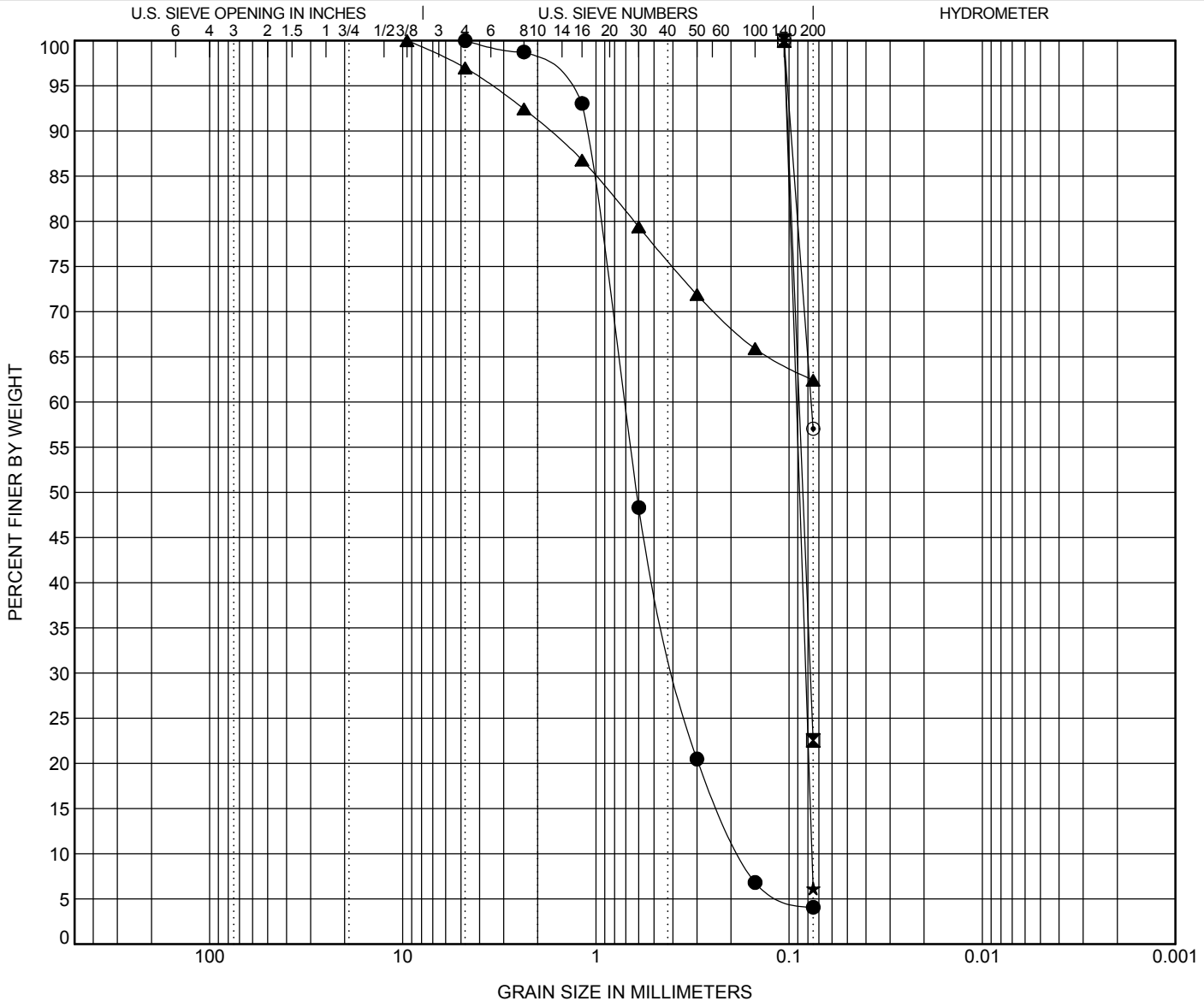
GRAIN SIZE DISTRIBUTION

CLIENT Schaaf Wheeler **PROJECT NAME** San Lorenzo WD Pipeline

PROJECT NUMBER 191110 **PROJECT LOCATION** San Lorenzo, CA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	DATE TESTED	Classification	LL	PL	PI	Cc	Cu
● B-08	1.5	12/3/2019	**POORLY GRADED SAND(SP)**				1.15	4.06
⊠ B-09	2.0	12/3/2019						
▲ B-09	8.5	12/3/2019						
★ B-10	2.0	12/3/2019					0.96	1.20
⊙ B-11	3.5	12/3/2019						

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-08	1.5	4.75	0.716	0.38	0.176	0.0	95.9	4.1	
⊠ B-09	2.0	0.106	0.089	0.078		0.0	77.5	22.5	
▲ B-09	8.5	9.5				3.0	34.6	62.4	
★ B-10	2.0	0.106	0.091	0.082	0.076	0.0	93.9	6.1	
⊙ B-11	3.5	0.106	0.077			0.0	43.0	57.0	

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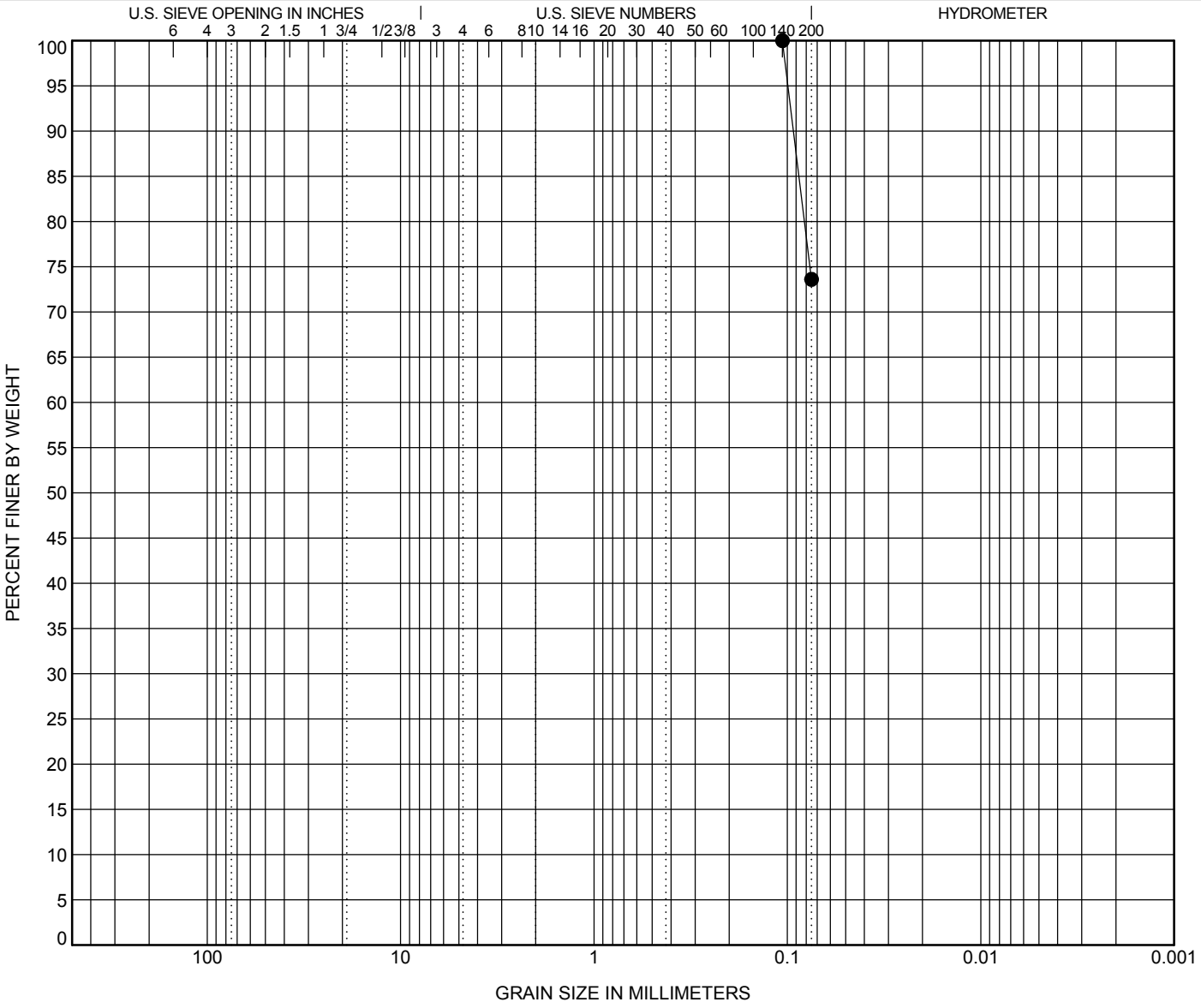
GRAIN SIZE DISTRIBUTION

CLIENT Schaaf Wheeler **PROJECT NAME** San Lorenzo WD Pipeline

PROJECT NUMBER 191110 **PROJECT LOCATION** San Lorenzo, CA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	DATE TESTED	Classification	LL	PL	PI	Cc	Cu
●	**B-12**	**2.0**	**12/3/2019**						

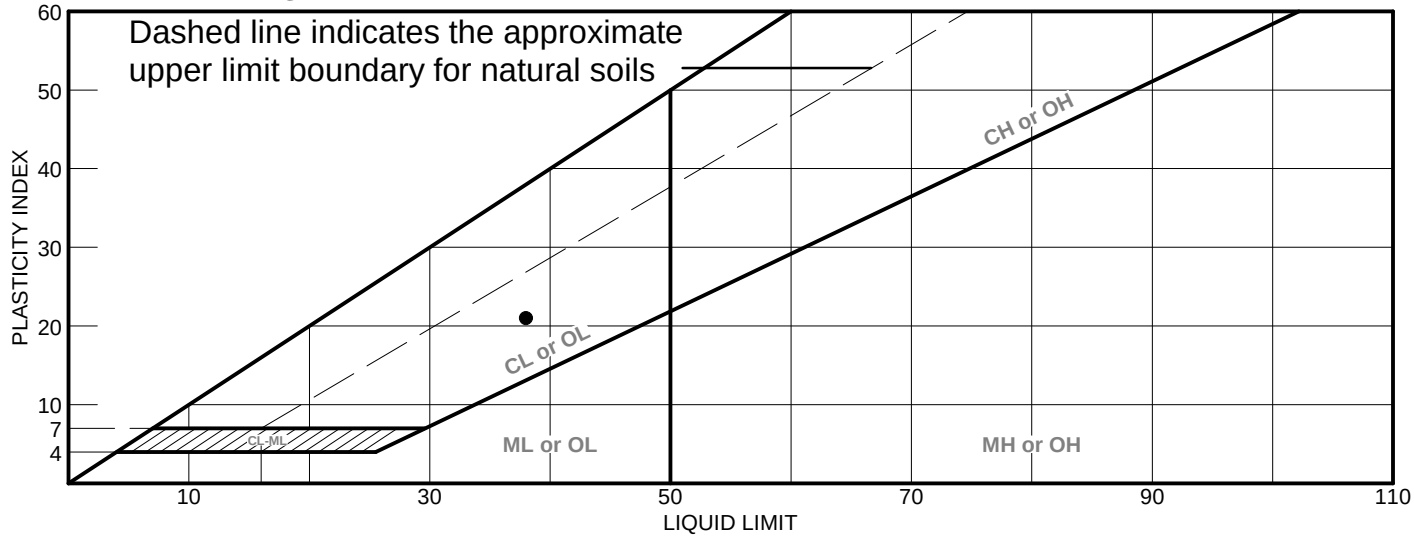
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-12**	**2.0**	**0.106**				**0.0**	**26.4**	**73.6**	

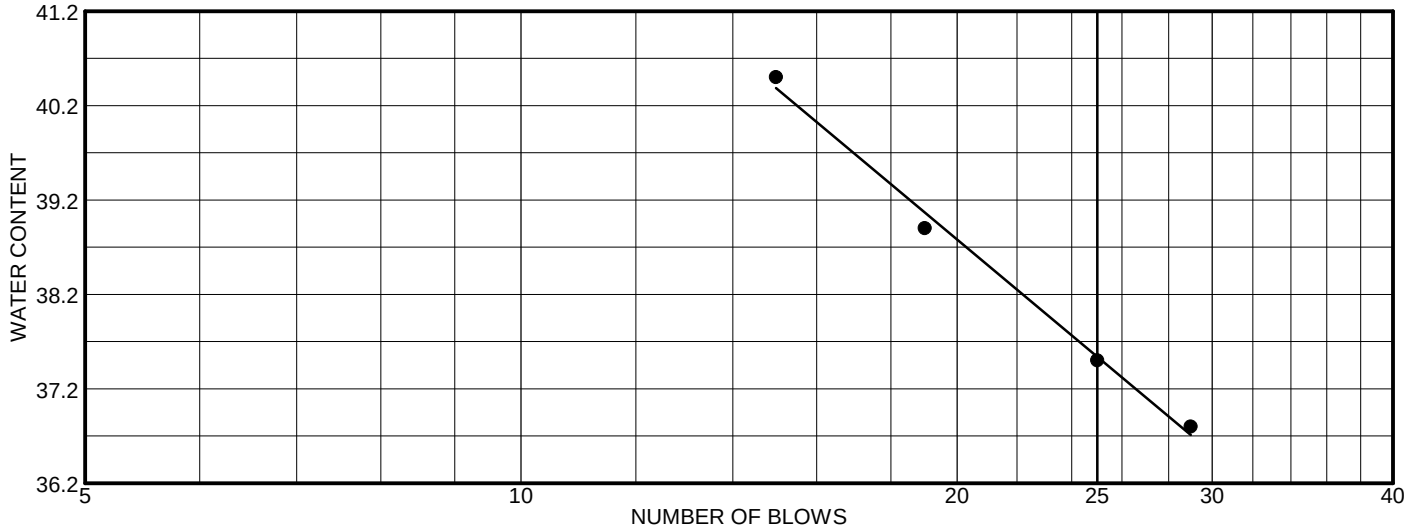
COOPER TESTING LABORATORY

CTL # 471-290 **Date:** 12/4/2019 **Tested By:** PJ **Checked:** PJ
Client: Cal Engineering & Geology **Project:** SLVWD Pipeline **Proj. No:** 191110
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	At Test	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	%	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	Cal 643	SM 2580B	ASTM D2216	
B-1	1-3	3.5-5.0	-	3378	-	5	98	0.0098	8.6	-	12.8	Dark Gray Lean Clayey SAND
B-10	10-2	3.5-5.0	-	47581	-	4	20	0.0020	7.8	-	2.6	Olive Brown SAND

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Gray Lean Clayey SAND	38	17	21			

Project No. 471-290 **Client:** Cal Engineering & Geology

Project: SLVWD Pipeline - 191110

● **Source:** B-1 **Sample No.:** 1-3 **Elev./Depth:** 3.5-5'

Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

MEMO

DATE: September 14, 2023

TO: Engineering & Environmental Committee, San Lorenzo Valley Water District

FROM: Rick Rogers, District Manager

SUBJECT: **Brookside Drive Storm Damage Repair Schedule, 2023 Storm Damage and Capital Projects Listing**

WRITTEN BY: District Manager

PRESENTED BY: District Manager

STAFF RECOMMENDATION

Staff is recommending that the Committee review the attached Brookside Drive Storm Damage Repair Scheduled, 2023 Storm Damage and Capital Projects Listing

RECOMMENDED MOTION

None

BACKGROUND

Informational only.

PRIOR COMMITTEE ACTION

None

FISCAL IMPACT

TBD

ENVIRONMENTAL IMPACT

NA

ATTACHMENTS AND RELEVANT LINKS TO DISTRICT WEBSITE

- Brookside Drive Storm Damage Replacement Schedule
- 2023 Storm Damage Scope of Work FEMA
- Budget FEMA Replacement Capital Improvement Project

San Lorenzo Valley Water District
Brookside Drive Storm Damage Repair
Project Schedule

Task / Date Timeline	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24
Surveying										
Pipeline Route										
Environmental Review - In House										
Financing										
FEMA - Not Obligated										
USDA Grant Program Investigating										
Grants investigating										
Engineering & Design										
Award of Engineering RFP 30 Day										
Environmental										
Environmental CEQA										
CEQA RFP 30 Day										
Permitting Riparian Corridor										
Construction										
Project Bid 30 Day										
Review Funding										
Construction										

Scope of Work for New Year's Storm 2023 Emergency Projects

Bear Creek Wastewater Access Road/WWTF - *CAT B*

Damage: Flooding damaged access road to WWTP.

Permanent Repair: District staff cleared and rocked access road, and Jim Walters Tractor for Trucking of rock. System was pumped multiple times

Completed Permanent Staff Work Cost: $2000
Completed Contractor Work Cost: $1,100 (rock), $9,900 (pumping)

Bear Creek Booster *Cat F*

Damage: Storm-related power fluctuations damaged booster pump.

Permanent Repair: District Staff replaced booster pump

Completed Permanent Staff Work & Materials Cost: $18,000

Bennet Spring Raw Water Pipeline Damage - Cat B/F

Damage: Tree fall damaged approx. 1960-LF of 4" main and 4 gate valves – caused water outage to multiple customers
Completed Temporary Repair: Contractor replaced damaged pipeline with temporary HDPE pipe placed at-grade
Proposed Permanent Repair: Bury pipe to current AWWA and District standards

Completed Temporary Contractor Work Cost: $XXXXX
Completed Permanent Staff Work Cost:0
Permanent Work Cost Estimate: $800,000

Bennet Spring Generator Failure – Cat B

Damage: Flooding damaged generator

Completed Permanent Repair: Service contractor called out Watts On temporarily got generator running Need to replace generator

Completed Permanent Contractor Work Cost: $700
Completed Permanent Staff Work Cost: $815

Brookside Drive Road Washout/Pipe Damage – Cat F

Damage: Road washed out, exposing main in multiple locations; main break at west end of road.

Proposed Repair: Replace approximately 1,650-LF of exposed/damaged main with new fully restrained 8-in ductile iron pipe; to include excavation, bedding, pipe material (pipe, gaskets, bolt kits, mechanical joints as needed) and construction, valves (with valve boxes, bolt kits and gaskets), services (saddles, 1-in PE tubing, meter boxes, meters as needed), slurry backfill, paving, air relief valve at high point of project, tie-in to existing main in Redwood Drive, traffic control, and chlorination, flushing, and testing of completed main, disposal of excavation spoil and demolished existing main.

Permanent Repair Cost Estimate: $800,000

Bull Creek Raw Water Pipeline Damage – Cat B

Damage: Tree fall damaged approx. 2,600-LF of X" main, 5 gate valves, flow meter, and pressure sustaining valve, caused water outage to multiple customers

Completed Temporary Repair: Contractor Replaced damaged pressure sustaining valve, flow meter, and pipeline. Pipeline placed at grade (temporary condition).
Proposed Permanent repair: Bury pipeline to current AWWA and District standards.

Completed Temporary Contractor Work Cost: $XXXXX
Completed Temporary Staff Work Cost: $XXXXX
Estimated Permanent Repair Cost: $1M

Eckley Tank Main Break – Cat B

Damage: tree fall damaged approx. 25-LF of 2-in main

Completed Permanent Repair: District Staff replaced 25-LF of 2-in main and associated fittings

Completed Permanent Staff Work Cost: $450 + $1000 for materials

Fall Creek Intake – Cat B

Damage: Silt blocked intakes

Completed Repair: Staff cleared intakes

Completed Permanent Staff Work Cost: $400

1300 Fern Ave Main Break – Cat B

Damage: flooding damaged approx. 30-LF of 2" main

Completed Permanent Repair: District Staff replaced 30-LF of 2-in main and associated fittings

Completed Permanent Staff Work Cost: $435

Foreman Access Road Slide (Completed) – Cat A
Damage: Soil and tree debris slide blocked access road to District's Foreman Intake

Completed Emergency Repair: SLVWD contracted with Van Der Steen Engineering to clear the debris and repair access road. Work included removal of approximately 270-CY of soil, 30-CY of woody debris, including multiple fallen trees. Soil was disposed of in two separate locations; approximately 250-CY was donated to a local contractor for use in their yard at Lat 37.121779, Long -122.120430, the remaining approx. 50-CY will be trucked to ReGen Monterey's disposal site in Monterey, CA (Lat 36.713392, Long -121.770294).

Completed Work Cost: $XXXX

Foreman Intake Log Jam (Completed) – Cat A
Damage: Trees and other debris slide blocked Foreman Creek and access to District's Foreman Intake

Completed Emergency Repair: Dug out and removed by staff

Completed Work Cost: $2,650

Glen Arbor Hydrant Leak – *Cat B*
Damage: Ground motion damaged 10-LF of 2-in Hydrant service piping/this was a 2" stand pipe hydrant

Completed Emergency Repair: District staff installed new wharf head and 10' of 2" galvanized pipe

Completed Work Cost: $2,800

Huckleberry Booster Main Break (Completed) – *Cat B*
Damage: Tree fall damaged approx. 25-LF of 2-in main

Completed Emergency Repair: District staff cleared tree and replaced 25-LF of 2-in main and associated fittings

Completed Staff Work Cost: $450 + $1000 for materials

Huckleberry Island Main Failure – *Cat B/F*

Damage: Washout of an embankment caused catastrophic failure of existing 12-in main. Breaks occurred at north end of a below-grade river crossing.

Completed Temporary Work: Replace approximately 1,000-LF of existing main, including below-grade river crossing, with new 12-in HDPE pipe placed at-grade and rerouted to cross the river on an existing road bridge. Included provision and installation of new HDPE main, excavation and backfill of tie-in points, saddle tap connections at each end of the repair and a single tee connection to an existing 6-in connection, valves, fittings, traffic control, demo and removal of a portion of the existing steel main.

Proposed Permanent Repair: Construct approximately 1,000-LF of new 12-in main and one new bridge crossing. Construction of the pipeline will include delivery & placement of: pipe, valves, other fittings, gaskets, and bolt sets; work to include 12-in main and connection to existing 6-in main. Bridge crossing construction will include design of new supports and alignment, delivery & placement of: supports, flexible connections, pipe, valves, other fittings, gaskets, and bolt sets. Additional tasks will include excavation, backfill, surface restoration, testing, and connection to existing system.

Completed Temporary Contracted Work Cost: $192,790
Completed Temporary Work Staff Cost: $12,000
Permanent Work Cost Estimate: $750,000

Jaye's Timberlane Slipout – *Cat F*
Damage: Northbound lane of California Route 9 failed and slipped out into the adjacent ravine, exposing approximately 150-FL of existing main.

Proposed Repair: Caltrans will repair the roadway, including construction of a new retaining wall. SLVWD repair will consist of demolition of approximately 200-LF of existing main and construction of approximately 35-LF of new main to provide clearance for Caltrans work. Construction will include pipe, fittings, valves, hot tap of existing 6-in service to make connection to existing system, cut & cap existing main in two locations with blow-off valving, excavation, backfill, surface restoration, testing, and connection to existing system.

Completed Permanent Work Cost: $50,000

Lake Blvd Main Repair – *Cat B*

Damage: Tree fall damaged approx. 1-LF of6-in main

Completed Permanent Repair: District staff installed a repair coupling

Completed Permanent Work Cost: $800

Lompico Storage Building & Well - *Cat F*

Damage: Tree fall damaged building, PG&E power drop, building electrical connections, roof, and fencing.

Completed Permanent Repair: TBD, staff scheduled to clean up and assess April 13

Estimated Permanent Contractor (PG&E) Work Cost: $80,000
Staff Work Cost: $XXXXX

Lyon Access Road Slide - Cat B

Damage: Landslide caused complete failure of temporary access road installed after 2017 slide.

Temporary Repair:

Permanent Repair: District has a version request approved by FEMA to relocate Lyon access road. Evaluation of required slide/slope stabilization measures for tank site above slide and of the slide mass is ongoing. Temporary work listed is due to Dec 22/Jan 23 storms.

Completed Temporary Contracted Work Cost: $XXXXXX
Completed Temporary Work Staff Costs: $265

Permanent Road Relocation Work Cost Estimate: $8.4M

Lyon Treatment Plant Generator Failure – Cat B/F

Damage: Generator at Lyon WTP damaged by flooding.

Temporary Repair: Rental generator in place

Permanent Repair: Replace failed generator

Temporary Repair Staff Costs: $300
Generator Rental Costs: $XXXXXX
Permanent Repair (replacement) Cost: $25,000

Madrone Booster Flooding – Cat F

Damage: Madrone Booster Station flooded by overflow and seepage from adjacent pond to a depth of approximately 3-ft.

Proposed Repair: Provide waterproofed concrete slab to prevent water intrusion, waterproof existing CMU wall (two sides of station), construct and waterproof additional CMU wall and chain link fence

(remaining unwalled side of station), construct sump and provide pump with electrical connections, provide and construct non-flammable roof over entire station.

Contracted Cost Estimate: $132,500
Staff Costs Estimate: $13,000

Spring Booster – *Cat F*

Damage: Storm-related power fluctuations damaged booster pump.

Permanent Repair: Replace pump, materials on order

Completed Permanent Staff Work & Materials Cost: $10,000

Stewart Street Slide/Main Breaks – Cat B/F

Damage: Landslide caused 4 breaks in above-grade main. Slide is extensive, Santa Cruz County is working to determine extents, severity, and mitigation.

Temporary Repair: Construct Approximately 925-LF of temporary, at-grade HDPE pipe. Installation included provision and installation of piping, valves, and fittings, connection to existing, testing, excavation and backfill, and transfer of services from existing main to temporary main.

Proposed Permanent Repair: Subsequent to completion of Santa Cruz County slide mitigation work, provide and install approximately 925-LF of new 8-in main. Provide and install required valves, fittings, air relief valve, hydrant, and pipe anchors. Transfer services from temporary main to permanent main. Project includes excavation, backfill, surface restoration, and disposal of spoils.

Completed Temporary Contracted Work Cost: $74,059
Completed Temporary Work Staff Cost: $11,640
Permanent Work Cost Estimate: $700,000

Water System Operations – *Cat B*

Staff costs: $70,000

CAPITAL PROJECTS

SUMMARY

The Capital Improvement Projects (CIP) section is a component of the non-operating expense section of the budget. The CIP budget includes expenditures for fixed asset/equipment purchases as well as the accumulation of expenditures associated with construction projects undertaken by the District. Whenever a project is done in-house, the related labor costs will be capitalized to the project and off-set the operating expense.

The District funds capital projects by funding internally from cash reserves (pay-go), grants awarded, individual assessments or debt financing. For some of these upcoming projects, the District has leveraged grant/FEMA monies and debt financing.

The Capital Project Listing will list out project titles, project status, anticipated funding sources, and amount expected to be spent in the current budget year. Each project will be described in further detail in the Capital Project Description section.

CAPITAL PROJECTS ADDITIONAL NOTES:

Due to the CZU fires, there are still an exceptionally high amount of capital projects. The District typically has $5-10M in the budget, so these next two fiscal years are abnormal.

Funding for the projects is coming from the following sources:

- 2019 $14.5 COP – this is repaid over time through the general fund
- FEMA 75% – these are projects that are expected to receive 75% reimbursement from FEMA
    - The remaining 25% will come from the general fund
- FEMA 90% - these are the CZU related projects
    - The remaining 10% will come from the general fund, with a portion coming from the fire recovery surcharge
- 2021 $15M – this is repaid over time through the general fund
- 2021 $15M / FEMA – these are projects that are being financed long term through the loan, but will also receive FEMA reimbursement.
    - Non-FEMA projects will be repaid through the general fund.
    - FEMA projects will be repaid over time, with a portion coming from the fire recovery surcharge
- Reserves – any projects above the debt financing amount or projects that did not have a different source of funding are being paid by the general reserve funds.
    - This would include the portion FEMA does not cover.

CAPITAL PROJECT LISTING

Below is the capital project listing with estimated cost and funding source. Further in the document has the project descriptions that line up with this listing.

FY2023-2025 CAPITAL BUDGET

						ESTIMATED FUTURE YEARS			
PROJECT TYPE	PROJECT NAME	STATUS	FUNDING	FY23/24 BUDGET	FY24/25 BUDGET	FY25/26	FY26/27	FY27/28	EST COMPLETION YR
Tank	Redwood Park (Swim) Tank	ENGINEERING & PLANS	$14.5M COP	$ 1,100,000	$ -	$ -	$ -	$ -	2024
Enviro.	Fall Creek Fish Ladder	IN CONTRACT	$14.5M COP	$ 2,300,000	$ -	$ -	$ -	$ -	2024
Pipe	Lyon Zone Pipe	IN CONTRACT	$14.5M COP	$ 4,005,000	$ -	$ -	$ -	$ -	2024
Pipe	Hermosa Oak Fernwood Main Replacement	IN CONSTRUCTION	$15M Loan	$ 568,377	$ -	$ -	$ -	$ -	2024
Pipe	Juanita Woods Water Main Replacement	IN CONSTRUCTION	$15M Loan	$ 721,000	$ -	$ -	$ -	$ -	2024
Pipe	Zayante Drive Water Main Replacement	IN CONSTRUCTION	$15M Loan	$ 899,037	$ -	$ -	$ -	$ -	2024
Tank	Blue Ridge Tank Replacement	IN CONSTRUCTION	$15M Loan	$ 976,516	$ -	$ -	$ -	$ -	2024
Pipe	Orman Road Water Main Replacement	IN CONSTRUCTION	$15M Loan	$ 1,051,932	$ -	$ -	$ -	$ -	2024
Pipe	CZU Bennett Spring Supply /Transmission Main	FEMA/PLANNING	$15M LOAN / FEMA	$ -	$ 700,000	$ -	$ -	$ -	2025
Pipe	CZU Sweetwater Supply Line	FEMA/PLANNING	$15M LOAN / FEMA	$ -	$ -	$ 300,000	$ 1,375,000	$ -	2027
Pipe	CZU Eckley Pumping Station / Main Line	ENGINEERING & PLANS	$15M LOAN / FEMA	$ 25,000	$ 375,000	$ -	$ -	$ -	2025
Pipe	CZU Harmon Street 2"	ENGINEERING & PLANS	$15M LOAN / FEMA	$ 580,000	$ -	$ -	$ -	$ -	2024
Building & Equi	CZU Five Mile Box & Turbidity Station	ENGINEERING & PLANS	$15M LOAN / FEMA	$ 150,000	$ -	$ 500,000	$ -	$ -	2024
Pipe	CZU South Zone Distribution Piping	FEMA/PLANNING	$15M LOAN / FEMA	$ -	$ 250,000	$ 800,000	$ -	$ -	2026
Tank	CZU Big Steel Tank Piping	IN CONTRACT	$15M LOAN / FEMA	$ 1,250,000	$ -	$ -	$ -	$ -	2024
Pipe	CZU Peavine Supply	ENGINEERING & PLANS	$15M LOAN / FEMA	$ 750,000	$ 750,000	$ -	$ -	$ -	2025
Pipe	CZU Alta Via Distribution System Piping	IN CONSTRUCTION	$15M LOAN / FEMA	$ 2,100,000	$ -	$ -	$ -	$ -	2024
Pipe	CZU Big Steel Zone Piping	IN CONTRACT	$15M LOAN / FEMA	$ 1,345,000	$ -	$ -	$ -	$ -	2024
Pipe	2023 Storm - Bennet Spring Raw Water Pipeline Damange	FEMA/PLANNING	FEMA 75%	$ 150,000	$ -	$ -	$ -	$ -	2023
Pipe	2023 Storm - Bull Creek Raw Water Pipeline Damage	FEMA/PLANNING	FEMA 75%	$ 150,000	$ -	$ -	$ -	$ -	2023
Pipe	2023 Storm - Stewart Street Slide/Main Breaks	FEMA/PLANNING	FEMA 75%	$ -	$ 700,000	$ -	$ -	$ -	2025
Pump Station	2023 Storm - Madrone Booster Pump Station	IN CONTRACT	FEMA 75%	$ 140,000	$ -	$ -	$ -	$ -	2023
Pipe	2023 Storm - Huckleberry Island Main Failure	FEMA/PLANNING	FEMA 75%	$ 750,000	$ -	$ -	$ -	$ -	2024
Pipe	2023 Storm - Brookside Drive Road Washout/Pipe Damage	ENGINEERING & PLANS	FEMA 75%	$ 800,000	$ -	$ -	$ -	$ -	2024
Repair	Lyon Slide Repair (2017)	ENGINEERING & PLANS	FEMA 75%	$ 500,000	$ 5,000,000	$ 5,000,000	$ -	$ -	2026
Repair	2023 Storm - Quail Hollow Road Damage	IN CONTRACT	FEMA 75%	$ 1,000,000	$ -	$ -	$ -	$ -	2023
Repair	2023 Storm - Lyon Access Road Slide	ENGINEERING & PLANS	FEMA 75%	$ 300,000	$ 1,000,000	$ 500,000	$ -	$ -	2026
Building & Equi	CZU Lyon Wtp Accessory Building	PROCUREMENT	FEMA 90%	$ 20,000	$ -	$ -	$ -	$ -	2023
Meters	CZU Services & Water Meter Replacement	IN CONSTRUCTION	FEMA 90%	$ 20,000	$ 20,000	$ 15,000	$ -	$ -	Varies
Pipe	CZU Clear Creek 5 Mile Supply Line	FEMA/PLANNING	FEMA 90%	$ -	$ 350,000	$ 2,000,000	$ 2,000,000	$ 2,000,000	2028
Intake	CZU Foreman Creek Intake/Raw Water	IN CONTRACT	FEMA 90%	$ 1,300,000	$ -	$ -	$ -	$ -	2024
Pipe	CZU Cool Creek Intake & Piping	FEMA/PLANNING	FEMA 90%	$ -	$ 100,000	$ -	$ -	$ -	2024

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CAPITAL PROJECT LISTING

FY2023-2025 CAPITAL BUDGET

						ESTIMATED FUTURE YEARS			
PROJECT TYPE	**PROJECT NAME**	**STATUS**	**FUNDING**	**FY23/24 BUDGET**	**FY24/25 BUDGET**	**FY25/26**	**FY26/27**	**FY27/28**	**EST COMPLETION YR**
Meters	Ami Meter Grant - Route 11-14	PLANNING	GRANT	$ 200,000	$ -	$ -	$ -	$ -	2024
Consolidation	Bracken Brae/Forest Springs Consolidation	ENGINEERING & PLANS	GRANT	$ 1,800,000	$ 900,000	$ -	$ -	$ -	2024
Tank Maint.	Bear Creek Tank Coating	PRELIMINARY PLANNING	RESERVES	$ -	$ -	$ 300,000	$ -	$ -	2025
Booster	Madrone Booster Pump Redesign	PRELIMINARY PLANNING	RESERVES	$ -	$ -	$ -	$ 500,000	$ -	2026
Equip.	Dump Truck	PROCUREMENT	RESERVES	$ -	$ 100,000	$ -	$ -	$ -	2025
Pump Station	El Solyo Booster Pump Station	PRELIMINARY PLANNING	RESERVES	$ -	$ -	$ 60,000	$ -	$ -	2026
Tank	Spring Tank Recoating	PRELIMINARY PLANNING	RESERVES	$ -	$ 225,000	$ -	$ -	$ -	2025
Tank	Charlie Tank Recoating	PRELIMINARY PLANNING	RESERVES	$ -	$ 225,000	$ -	$ -	$ -	2025
Equip.	Fork Lift Quail 5	PROCUREMENT	RESERVES	$ -	$ -	$ 45,000	$ -	$ -	2026
Equip.	Quail Tank Scada Upgrade	PRELIMINARY PLANNING	RESERVES	$ -	$ -	$ 100,000	$ -	$ -	2026
Equip.	Brookdale Trtu Scada Upgrades	PRELIMINARY PLANNING	RESERVES	$ -	$ -	$ 160,000	$ -	$ -	2026
Tank	Highland Tank	PRELIMINARY PLANNING	RESERVES	$ -	$ -	$ 200,000	$ 1,500,000	$ -	2026
Meters	600 Meter Replacement Program (15/Day)	PRELIMINARY PLANNING	RESERVES	$ -	$ 236,250	$ 250,000	$ -	$ -	Varies
Tank Maint.	Brookdale Tank Coating	ENGINEERING & PLANS	RESERVES	$ 300,000	$ -	$ -	$ -	$ -	2024
Tank Maint.	Blair Tank Coating	ENGINEERING & PLANS	RESERVES	$ 325,000	$ -	$ -	$ -	$ -	2024
Study	Loch Lomond Feasibility Study	PLANNING	RESERVES	$ 100,000	$ -	$ -	$ -	$ -	2024
Pipe	Kings Creek Bridge	CALTRANS HOLD	RESERVES	$ 200,000	$ 200,000	$ -	$ -	$ -	2025
Pipe	Monaco Ln. Bridge	CALTRANS HOLD	RESERVES	$ 200,000	$ 200,000	$ -	$ -	$ -	2025
Tank	Felton Heights Tank	ENGINEERING & PLANS	RESERVES	$ 100,000	$ 500,000	$ -	$ -	$ -	2025
Facilities	Fire Hardening - Pump Stations	ENGINEERING & PLANS	Grant/Reserves 50%	$ 600,000	$ -	$ -	$ -	$ -	2024
Pipe	Highway 9 Brookdale CalTrans	ENGINEERING & PLANS	RESERVES	$ 350,000	$ -	$ -	$ -	$ -	2023
	= RESERVE PROJECT PRIORITY			**$ 27,126,862**	**$ 11,831,250**	**$ 10,230,000**	**$ 5,375,000**	**$ 2,000,000**	

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STATUS	DESCRIPTION
ENGINEERING & PLANS	PREPARING ENGINEERING DOCS - CALCULATIONS, PLANS, & SPECIFICATIONS
IN CONTRACT	PROJECT HAS BEEN AWARDED
IN CONSTRUCTION	PROJECT HAS BEGUN CONSTRUCTION
FEMA/PLANNING	PROJECT SUBMITTED TO FEMA/WAITING APPROVAL
PROCUREMENT	EQUIPMENT/VEHICLE WILL BE PROCURED
PRELIMINARY PLANNING	STAFF ARE EVALUATING PROJECT NEED AND PARAMETERS
CALTRANS HOLD	ON HOLD PENDING SCHEDULE COORDINATION WITH CALTRANS

BREAKDOWN BY FUNDING SOURCE	FY23/24 BUDGET	FY24/25 BUDGET	FY25/26	FY26/27	FY27/28
$14.5M COP	$ 6,219,214	$ -	$ -	$ -	$ -
$15M Loan	$ 2,711,152	$ -	$ -	$ -	$ -
$15M LOAN / FEMA	$ 6,200,000	$ -	$ -	$ -	$ -
FEMA 75%	$ 2,842,500	$ 5,025,000	$ 4,125,000	$ -	$ -
FEMA 90%	$ 1,206,000	$ 423,000	$ 1,813,500	$ 1,800,000	$ 1,800,000
GRANT	$ 3,416,166	$ 900,000	$ -	$ -	$ -
IN EXCESS $15M LOAN (RESERVES)	$ 1,505,710	$ 2,075,000	$ 1,600,000	$ 1,375,000	$ -
IN EXCESS $14.5M LOAN (RESERVES)	$ 69,620	$ -	$ -	$ -	$ -
RESERVES	$ 1,875,000	$ 1,686,250	$ 1,115,000	$ 2,000,000	$ -
FEMA DISTRICT COST SHARE (RESERVES)	$ 1,081,500	$ 1,722,000	$ 1,576,500	$ 200,000	$ 200,000
Total Capital Projects	**$ 27,126,862**	**$ 11,831,250**	**$ 10,230,000**	**$ 5,375,000**	**$ 2,000,000**
INFLOWS FROM CAPITAL CONTRIBUTIONS [1]					
Financed FEMA Reimbursement	$ 5,580,000	$ -	$ -	$ -	$ -
Reserve Funded FEMA Reimb.	$ 4,048,500	$ 5,448,000	$ 5,938,500	$ 1,800,000	$ 1,800,000
Grant Funded	$ 3,416,166	$ 900,000	$ -	$ -	$ -
	$ 13,044,666	$ 6,348,000	$ 5,938,500	$ 1,800,000	$ 1,800,000
EST. PHYSICAL CASH INFLOW [2]	**$ 6,977,489**	**$ 14,181,957**	**$ 7,378,500**	**$ 6,787,500**	**$ 1,800,000**

[1] This is the funding the District is expected to receive from FEMA based on total project expenses incurred in that FY. This is using accrual based accounting in which you recognize revenue/expenses in the period in which they occurred.

[2] This is the funding the District is expecting to physically receive in FEMA/Grant Reimbursements. This is using cash basis accounting in which you recognize the revenue/expenses in the period in which the cash is received or paid out.

CAPITAL PROJECT DESCRIPTIONS

PROJECT NAME	PROJECT DESCRIPTION
CZU Five Mile Box & Turbidity Station	Replace Turbidity station building and settling chamber, replace turbidity, SCADA equipment and automatic valves.
CZU Lyon WTP Accessory Building	Replace Building Container and equipment, replaced burned flygt pump, water quality sampling stations, and lawn mowers.
Fall Creek Fish Ladder	Upgrades will include reducing the jump height between the pools for fish travel, as required by State and Federal regulations and improvements to the intakes.
Brookdale TRTU SCADA Upgrades	Upgrade Brookdale RTU and 4 legacy communication sites
Dump Truck	Used purchase with low miles.
Fork Lift Quail 5	Replace old fork lift
600 Meter Replacement Program (15/day)	Replace approximately 1,000 meters in the District.
CZU Services & Water Meter Replacement	Replace 150 water meters, meter valves, house valve, meter check coupling, and service lines.
CZU Clear Creek 5 Mile supply line	Fire damaged intake structure and destroyed 5.5 MI of 8" HDPE pipeline and metering and monitoring equipment. Replace supply line, constructability study of hardening for future fire.
Lyon Zone Pipe	Construction of approximately 3,000 lineal feet of new 12-inch water main and appurtenances thereto.
CZU Alta Via Distribution System Piping	Replace 5,000 LF temporary with permanent piping to AWWA/District standards in roadway, including 38 water meter service sets and 6 fire hydrants. Requires plans & Specifications for bidding.
CZU Peavine Supply	Fire destroyed 8,000 LF of 8" HDPE above ground raw water pipeline and support structures, intake and flow/metering monitoring equipment. Replace pipeline, monitoring equipment, constructability study of hardening for future fire.
CZU Sweetwater Supply Line	Fire damaged intake structure and destroyed 1.5 MI of 8" HDPE pipeline and metering and monitoring equipment, replace supply line, constructability study Harding for future fire.

Hermosa Oak Fernwood Main Replacement	Replace 3,000 LF of 8" main, due to current leaking water main. Project will include new water service runs and fire hydrants, including isolation valving.
Juanita Woods Water Main Replacement	Replace 3,000 LF with new 8" water main and apparatuses for proper fire flow. The project will replace existing 2-inch water mains.
Orman Road Water Main Replacement	Replace 2,000 LF with new 8" water main and apparatuses. The project will replace the existing 2-inch and 1 ½-inch water main along Orman Road. Undersized water mains are the source of intermittent low water pressure, interruption of water service, and inadequate fire flow.
Zayante Drive Water Main Replacement	Replace 1,500 LF with new 8" DIP. This improvement will remove a piping restriction to the Lompico Booster increasing fire flow into the Lompico Canyon.
CZU South Zone Distribution Piping	Replace 4,000 LF temporary water distribution piping, 26 water services and meters and install underground to AWWA/District standards along Forest and Western Ave.
CZU Eckley Pumping Station / Main Line	Replace pumping station, power drop, SCADA control, Communications wire. Including engineering plans and specifications.
CZU Bennett Spring Supply /Transmission main	Replace temporary piping and install underground to AWWA/District Standards approximately 1500 lineal Feet
Kings Creek Bridge	CalTrans Required Project
Monaco Ln. Bridge	CalTrans Required Project
CZU Harmon Street 2"	Replace 1,000 LF temporary piping in accordance AWWA/District Standards
El Solyo Boster Pump Station	Replace deteriorated wood building, fire harden.
Loch Lomond Feasibility Study	Study to evaluate processing water from the Loch Lomond allotment
CZU Big Steel Tank Piping	Replace 8" HDPE water main in accordance with AWWA/District Standards and relocate to public right of way.
CZU Big Steel Zone Piping	Replace 10", and 12" piping and fittings to AWWA/District Standards.

Blue Ridge Tank Replacement	Construction of a new 64,000 gallon bolted steel tank in the Blue Ridge Zone. This project will replace the existing redwood storage tank which has reached its service life. Project includes, but not limited to site improvements, tank construction, SCADA control, and appurtenances.
Redwood Park (Swim) Tank	Construction of a new 120,000 gallon bolted steel water tank. The project includes, but is not limited to, construction of a new bolted steel water tank, SCADA control, fencing, retaining walls and a new pump station.
Felton Heights Tank (1)	The project includes but is not limited to property acquisition by easement, engineering, and 60,000 gallon water tank construction.
Highland Tank	Replace the existing 64,000 gallon redwood tank.
Blair Tank Coating	Pushed out from FY20-21 budget.
Brookdale Tank Coating	Pushed out from FY20-21 budget.
Bear Creek Tank Coating	Tank quality inspection and retrofit.
Lyon Slide Repair	Lyon Slide project may be able to have a access road put in for a significant cost reduction than originally planned.
2023 Storm - Bennet Spring Raw Water Pipeline Damange	Replace ~1,960-LF of burned raw water pipeline.
2023 Storm - Bull Creek Raw Water Pipeline Damage	Replace ~2,600-LF of burned raw water pipeline.
2023 Storm - Stewart Street Slide/Main Breaks	Replace ~925-LF of potable water pipeline damaged by landslide/washout.
2023 Storm - Madrone Booster Pump Station	Waterproofing of existing booster pump station.
2023 Storm - Huckleberry Island Main Failure	Replace ~1,000-LF of potable water pipeline to address failed river crossing.
2023 Storm - Brookside Drive Road Washout/Pipe Damage	Replace ~1,650-LF of potable water pipeline damaged by road washout.
2023 Storm - Quail Hollow Road Damage	Restore failed potable water main trench.
2023 Storm - Lyon Access Road Slide	Construct new access road on new alignment, stabilize Lyon tank site.
CZU Foreman Creek Intake/Raw Water	Erosion control and grading to protect recently installed raw water pipeline.
CZU Cool Creek Intake & Piping	Replace burned intake structure and ~250-LF of raw water pipeline.
Ami Meter Grant - Route 11-14	Replace approximately 500 meters in Routes 11-14.

Bracken Brae/Forest Springs Consolidation	Construct connection to two mutual water providers, with tanks and booster station.
Madrone Booster Pump Redesign	Optimization of pump and generator sizing.
Bear Creek Tank Assessment	Determine required repairs to tank.
Spring Tank Recoating	Rehabilitate potable water tank.
Charlie Tank Recoating	Rehabilitate potable water tank.
Quail Tank Scada Upgrade	Upgrade RTU and all communication components for the Quail zone SCADA grid.
Fire Hardening - Pump Stations	Replace station buildings and/or roofs with new non-flammable structures/roofs.
Highway 9 Brookdale CalTrans	Relocate ~400-LF of potable water pipeline to clear Caltrans repair work.
Loch Lomond Feasibility Study	The District is pursuing a feasibility study to bring its 314 AF/yr allotment of Loch Lomond Reservoir water into its system. The Loch Lomond feasibility study will analyze treatment, tie-in locations, purchasing alternatives, permitting needs, and costs.

MEMO

To: District Manager

From: Engineering Manager

Subject: District Projects Update

Date September 14, 2023

Recommendation:

It is recommended that the Board of Directors review and file the Engineering Department Status Report.

District Projects:

2021 CIP Pipeline Replacement Project: JMB Construction Inc. completed the concrete foundation and backfill around ring foundation for Blue Ridge Tank. Installation of160,000 gallon bolted steel tank manufactured by Superior Tank Co. scheduled to start this week and take 2 -3 weeks to complete assembly.

Juanita Woods Water Main Replacement main line, residential services and hydrant installations are complete, awaiting final pavement.

Orman Road Water Main Replacement has completed the main line, residential water services and hydrant installations, awaiting final pavement.

Hermosa Avenue Water Main Replacement started work with existing utility locating, layout, saw cutting and installation of new mainline.

2021 FEMA Pipeline Replacement Project: Staff have prepared an RFP for the Harmon Street work, RFP is undergoing final review before publication.

Sandis is working on possible changes to the Eckley zone (Ridge Drive) portion of this project aimed at leveraging placement of the pump station proposed for the Bracken Brae & Forest Springs Consolidation project to eliminate the need for the Eckley pump station and tank. This scope change will require FEMA approval; Staff will apply for such when plans for the revised scope are completed. Staff will provide further updates on this possible elimination as plans develop.

Alta Via Drive and Monan Way Pipelines: Construction is mostly complete on Alta Via Drive water main, aside from the hydrant & ARV at Moonridge. Anderson Pacific completed installation of water main and hydrant on Prospect Avenue. Installation of the water main for Monan Way is ongoing.

2023 Tank Rehabilitations: Staff are developing an RFP for rehabilitation two existing storage tanks, Blair Tank and Brookdale Tank. Blair Tank rehabilitation will include repair of failing welds, recoating of interior and exterior; updating of access; replacement of outdated piping and pump station; and preparation of the tank for installation of a cathodic protection system at a later date. Brookdale Tank Rehabilitation will include recoating of interior and exterior; updating of access; and preparation of the tank for installation of a cathodic protection system at a later date. A separate RFP will be published for inspections specific to coatings. Staff anticipate publication of this RFP in November of 2023.

CA-9 Bridges 05-1H470: Staff have received a final plan set from MME and reviewed same. Staff and MME will prepare an RFP for construction of this work in coordination with Caltrans. Publication date is dependent on Caltrans schedule, not yet provided to the District.

Cross County Pipelines: Staff are exploring options for construction subsequent to Board discussion when the Peer Review was presented. Tree survey and clearing work is under way.

Consolidation of Bracken Brae and Forest Springs Mutuals: Sandis has completed the design plans and specifications, except for the hydro-booster pump station design for the 20 homes which are adjacent to the Forest Springs tank site and will experience low pressure without this pump station. Boulder Creek Fire Chief Mark Bingham has indicated fire sprinkler demand of 50 gpm at 50 psi. Sandis has completed the acoustical study of the West Park Pump Station to confirm noise mitigation criteria and to provide residents with a study showing the noise from pump operation in their neighborhood. Sandis will update the plans, specifications, and cost estimates accordingly and issue the bid package.

Fall Creek Fish Ladder: Concrete demolition is complete. Rock anchor installation is complete. Completion of concrete work in the channel is delayed 1 week, to be completed by September 22nd. Syblon Reid General Engineering Contractors has been working ten hours per day and working Saturdays to expedite the concrete placement. Concrete placement of 35 cubic yards for footings for weirs 1, 3, 5 & 6 and weir 2 stem wall completed Friday, September 1st. Concrete placement of 16 cubic yards for weir stem walls 1, 3, 4, 5, & 6 completed Thursday, September 7th. First shotcrete lift of the vertical wall completed Saturday, September 9th.

Felton Heights Tank Project: District Staff continue to work with the property owner at the end of Lost Acre towards acquisition of necessary property and/or easements for this project; currently staff are considering a location south of the road vice north (previously considered location). Staff is coordinating survey for

bidding of geotechnical investigation, and subsequent design of the new tank. Survey will be needed for execution of required easements or property purchase.

Foreman Pipeline Access Trail Rehabilitation: McGuire and Hester are providing submittals, staff are reviewing. Schedule for construction is TBD. Changes to the design based on March 2023 site visit are being evaluated by F&L, and District staff. Revised plans will be given to MacGuire and Hester for negotiation of revised construction scope.

GIS System Updates: Staff continue to work on a program of field-verification of the exact location of all at-grade and above-grade district-owned facilities. This effort includes meters, backflow prevention devices, isolation valves, and all similar facilities. The project has been underway since December of 2021 and continues. Initial estimates of one-year duration have been extended due to utilization of staff and equipment needed for this effort in other, more time-sensitive, areas. Staff now anticipate completion of this effort in Spring of 2024.

Huckleberry Island Main: The temporary main is in service, work to obtain easements required for permanent repair is ongoing.

Lyon Pipeline Replacement Project: Monterey Peninsula Engineering are currently installing two new mains on Highway 236, Big Basin Way.

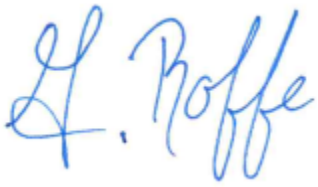
Lyon Slide/Complex Access Road: Sandis has completed the feasibility study and determined the proposed road alignment to be feasible. Sandis has provided preliminary construction documents for this proposed alignment. Staff have received communication from FEMA stating that the proposed change is acceptable. The slide reactivated due to heavy rain in January 2023, staff are coordinating with the County and the State Geological Service to determine extent of new slide. Staff are researching any necessary measures to protect the Lyon complex and possibly include some form of slide mitigation if needed.

Redwood Park Tank Project: Paving of the pipeline construction is complete. Staff will prepare RFPs for design and construction of the tank winter 2023/ spring 2024.

Brookside Drive (Felton) Pipeline Project: Ifland Survey has completed field work and will provide mapping documents on September 15. Staff will prepare RFPs for design and construction of the pipeline as soon as possible.

Foreman Pressure Break: Design awarded to Freyer & Laureta and contract has been approved by legal. Staff will prepare RFPs for construction following completion of design construction documents.

Valley Gardens Housing Development: Proposal received from Akel Engineering Group for peer review of Schaaf & Wheeler hydraulic design for Robson Homes. Robson Homes has provided a deposit to pay for the peer review.



Garrett Roffe, P.E.
Engineering Manager

DATE: 9/14/23

TO: Engineering & Environmental Committee, SLVWD

FROM: Environmental Programs Manager/Administrative Analyst

SUBJECT: Environmental Project Summary

WRITTEN BY: Carly Blanchard

PRESENTED BY: Carly Blanchard

STAFF RECOMMENDATION

It is recommended that the Engineering & Environmental Committee review this project summary.

RECOMMENDED MOTION

None

BACKGROUND

Staff have prepared the project summary to provide highlights of particular interest to the Committee.

Staff will be prepared to discuss any of the projects, to whatever depth the Committee desires.

Current Projects

1. CIP Project Permitting
    a. Lyon & Big Steel Pipeline
        i. Biologists on-call
    b. Redwood Park Tank
        i. Awaiting project start
    c. Blue Ridge Tank Replacement
        i. Biologists on-call
    d. Lyon Treatment Plant Access Road Slide (FEMA funded - 2023)
        i. Awaiting FEMA
    e. 5-mile and Peavine pipeline
        i. Tree surveys complete in May 2023
        ii. Recommendation discussed with Committee 9/14/23

f. Huckleberry Island pipeline replacement
    i. CEQA NOE to be refiled with updated easement information. Awaiting legal direction.
g. Bracken Brae & Forest Springs Consolidation
    i. Initial biological surveys completed
        a. No special status species found
h. Fuel Reduction Annual Maintenance Contract
    i. Fuel reduction contract awarded, contract in review.
i. Felton Heights Tank
    i. Environmental consultant kick-off meeting scheduled for September 2023
j. Bear Creek Estates
    i. Staff seeking alternate funding sources.
k. Alta Via
    i. Notice of Exemption (NOE) filed
    ii. FEMA meeting scheduled in September to move ahead Environmental Historic Preservation (EHP) process for cross-country section
l. Zayante drive pipeline
    i. Awaiting start date
m. Fall Creek Fish Ladder
    i. Permit extension may be needed
n. Valley Gardens will serve letter
    i. Package submitted to SANDIS Engineering for review
    ii. Staff planning to bring the recommendation to the ENV/ENG Committee
o. Orman, Hermosa, and Juanita Pipelines
    i. NOEs filed in March 2023

2. FEMA
    a. Staff working with Panorama Environmental to complete all FEMA project Environmental and Historic Preservation (EHP) reviews.
    b. Staff reviewing proposals for Public Assistance Management Services for all District FEMA projects
3. Grants
    a. State Revolving Funding (SRF) – Forest Springs
        i. Application in process for funding assistance for tank & lateral replacements

   b. USDA Rural Development Funding
      i. Staff looking into potential funding for Brookside Drive and other storm related damages through this program
4. Santa Margarita Groundwater Agency (SMGWA)
   a. Discussions with staff around future modeling in process
5. Environmental Planner Hiring
   a. 16 applications received
   b. Interviews in process
6. Pacific Gas & Electric (PGE)
   a. PGE seeking to complete tree removal around power line infrastructure on Harmon & Madrone
   b. Staff working with PGE to ensure work is completed to District standards and does not affect Sempervirens Fund easement.
7. Conjunctive Use Planning
   a. Regulatory agency permitting (including diversion permitting) in progress.
   b. Hydrologist contract awarded in August 2023
   c. Staff working on operational planning.
   d. Loch Lomond Feasibility Request for Proposals (RFP) in draft stage. Staff planning to release in September 2023.
8. Habitat Conservation Plan
   a. Staff working with consultant to move document forward based on future maintenance and projects occuring in sandhills. Update planned for Committee in October.
9. All other projects, outreach, and further project descriptions will be available in the September Environmental Status Report as part of the BoD agenda