GEOTECHNICAL INVESTIGATION
CALAVERAS COUNTY WATER DISTRICT
EBBETTS PASS REACH 1
WATER TRANSMISSION PIPELINE PROJECT

Prepared for
Calaveras County Water District
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September 27, 2018
Condor Project No. 7517-Ph02

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CONDOR

GEOTECHNICAL INVESTIGATION
CALAVERAS COUNTY WATER DISTRICT
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1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Condor Earth (Condor) for the planned Ebbetts Pass Reach 1 Water Transmission Pipeline project located in Ebbetts Pass, Calaveras County, California. The general location of the site is shown on Figure 1 – Vicinity Map, in Appendix A. Condor performed this study at the request of Mr. Jack Scroggs of KASL Consulting Engineers (KASL).

2.0 PROJECT DESCRIPTION

We understand that the existing steel 8-inch diameter pipeline installed in 1965 is being replaced due to age, poor condition, and a series of recent failures and repairs. The project consists of 24,000 feet of new 10 or 12-inch diameter ductile iron pipeline and replacement/rehabilitation of twelve (12) pressure reducing stations. The alignment starts at the water plant at Hunter Dam Road, continues westerly along State Route 4 through Hathaway Pines, Red Apple Ranch and ends approximately 6,000 feet downhill from the entrance of Forest Meadows. The high pressure (250 pounds per square inch gauge (psig)) pipeline is proposed to be fully mechanically restrained with concrete thrust blocks at tie-in points to the existing system.

3.0 SCOPE OF SERVICES

Condor's scope of services included performing geologic mapping along the proposed pipeline route, and site specific investigations at four locations where the pipeline crosses Highway 4. The site specific locations are shown on Figures 2 through 5. The results of our geologic mapping were provided in a Technical Memorandum dated July 6, 2018, and is included as Appendix B. The purpose of the Technical Memorandum was to assess the potential difficulty of excavation along the pipeline alignment. Specific test pits to verify the anticipated difficulty of excavation were not performed due to lack of anticipated hard bedrock. While the soil borings performed in this investigation were not designed to replace the test pits to verify ground conditions, the borings support the findings and general conclusions of the Technical Memorandum at the investigated locations.

4.0 SITE GEOLOGY

Additional discussion of the anticipated site geology is provided in Appendix B. A general Geologic Map is provided in Figure 7

5.0 SITE INVESTIGATION METHODS

The site-specific investigation was performed using a Simco 2400 drill rig. The borings were advanced with a 4 1/2-inch solid stem auger to a depth of 10- to 15-feet. Borings were terminated when "refusal" was met where blow counts exceeded 50 blows for the final 6 inches of an 18-inch sample driven with a 140-pound hammer (Standard Penetration Test Sampling Method). Logs of the encountered soils and weathered bedrock are provided in Appendix A.

6.0 GROUND CHARACTERIZATION

The soils encountered in the borings B-1 through B-6 consist of sandy clay (CL) to clayey sand (SC) and lesser amounts of clayey to sandy silt (ML). The sandy clay is generally a low to moderate plasticity clay with high sand content. The clayey sand is similarly of a low to moderated plasticity clayey sand. The materials often vary with depth between sandy clay to clayey sand within the same boring. Laboratory tests are provided in Appendix B to provide a typical range of gradation and plasticity index (PI) of the soils. The results of corrosion tests are also in Appendix B.

We also anticipate that excavations will encounter cobble- to boulder-sized rock fragments, and may range from 4 inches to 18-24 inches in typical dimension. However, larger boulders may also be encountered occasionally. A detailed study of the frequency and size of over-sized (greater than 4 inches) is outside the scope of this report.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Condor concludes that the improvements described in Section 2.0 may be constructed as proposed when the general intent of the recommendations that follow are implemented for design and during construction.

7.1 SEISMIC AND GEOLOGIC HAZARDS

Condor concludes that there are no significant seismic and geologic hazards for this project that require remediation.

The site is not located in an Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). Therefore, ground displacement from surface rupture and the associated potential for structural damage and unsafe conditions is not considered a significant hazard for the project, and no mitigation is warranted.

The potential for significant ground shaking from earthquakes is low. We used the internet based Probabilistic Seismic Hazards Assessment (USGS 2012/2015 IBC) to evaluate the Site Class C, Very Dense Soil and Soft Rock, which best represents the site conditions. A copy of the seismic evaluation output is provided in Appendix C.

Because the peak ground acceleration (PGA) is less than 0.3g, Condor concludes that no seismic increment in addition to active (or at-rest) pressures is required to design retaining walls.

Based on our site investigation and evaluation, Condor concludes that the potential for liquefaction occurring at the site is negligible.

Based on our observations and evaluation, Condor concludes that there is low expansive soil at the site, and that the potential for movements to the proposed foundations and pipe systems from shrink and swell of expansive soil is negligible, and does not warrant specific remedial actions.

7.2 EARTHWORK

7.2.1 Site Preparation

Site preparation should be performed for all areas to be excavated, areas to receive fill, and areas to receive improvements. Site preparation includes stripping the ground surface of vegetation or waste debris and demolition/removal of existing surface and subsurface improvements. Site preparation operations should extend at least 5 feet beyond the limits of new fill or improvements (where possible). Any vegetation and organic topsoil with more than 2 percent organic material by dry weight should be removed. The exposed

ends of pipes removed (if encountered) should be capped. Condor anticipates that stripping vegetation to a depth of 3 inches should be adequate, plus additional depth where roots over 1/2-inch in diameter are encountered. Site preparation may also include mechanical or manual separation of tree roots from material to be used as backfill or engineered fill.

The Geotechnical Engineer should observe and approve the prepared site prior to any excavation, subgrade preparation, and placement of fill or improvements.

7.2.2 Excavations

The Contractor shall be responsible for the stability of all temporary excavations and should comply with applicable CalOSHA regulations (California Construction Safety Orders). A competent person shall determine the soil type and requirements for temporary cutslope inclinations during excavation. All open cuts should be regularly monitored for evidence of incipient stability failures.

Permanent cutslopes up to 10 feet high should be planned to have inclinations as steep as 2:1 (H:V) unless approved steeper by the Geotechnical Engineer.

7.2.3 Subgrade Preparation

Soil loosened during site preparation and excavation, or any other soft or loose soil remaining after excavation and beneath proposed fills and improvements should be removed and replaced with properly compacted engineered fill. Soft ground conditions may be anticipated along the proposed improvements where there is a natural depression in the ground surface. Subgrade preparation in these areas should include over-excavation and recompaction of at least the top 1 foot of existing soil. Subgrades should be approved by the Geotechnical Engineer prior to compacting and covering them.

After approval by the Geotechnical Engineer, subgrades or excavated surfaces beneath fill or improvements should be scarified to a depth of 6 inches, and compacted to at least 90 percent compaction (based on ASTM Test Method D-1557). Subgrades beneath vehicular pavement areas should be compacted to at least 95 percent compaction. Scarification is not required in the bottom of pipe trenches.

Scarification, moisture conditioning, and recompaction of subgrades that become dry and/or disturbed should be performed. The Geotechnical Engineer should approve all subgrades before they are covered by fill or improvements.

7.2.4 Engineered Fill

Engineered fill should have less than 2 percent by dry weight of vegetation and deleterious material and should meet the gradation requirements presented in the following table:

Sieve Designation	Minimum Percent Passing by Dry Weight
6-inch square	100
4-inch square	90
0.75-inch square	70
US No. 4	60

The existing material excavated from the project site may be used as engineered fill and trench backfill. See Section 8.0, Construction Considerations for recommendations on re-use of excavated materials. The Geotechnical Engineer should approve all fill for use prior to placement.

Engineered fill meeting the requirements given in the preceding paragraphs should be uniformly moisture conditioned and compacted to at least 90 percent compaction (ASTM Test Method D-1557). All permanent fill slopes should have a maximum inclination of 2:1 if they are no higher than 10 feet. The Geotechnical Engineer should be contacted for recommendations if fill slopes higher than 10 feet are required.

7.3 SURFACE DRAINAGE AND EROSION CONTROL

Surface drainage should be provided to reduce ponding and drain surface water away from foundations, slabs-on-grade, and edges of pavements. Surface runoff should be directed toward suitable collection or discharge facilities. We recommend surface gradients of at least 2 to 4 percent be used for paved and unpaved surfaces, respectively. Gradients of 1.5 percent may be used for paved surfaces where horizontal drainage distances are less than 20 feet.

We recommend that approved temporary and permanent erosion control measures be implemented to reduce erosion and comply with applicable State, County and/or agency requirements. Soil on graded or cut slopes should be fertilized, mulched, and planted as soon as possible after grading with erosion-resistant vegetation. These plants should be watered lightly at appropriate intervals until growth is established.

7.4 FOOTINGS AND THRUST BLOCKS

Footings should be embedded at least 18 inches below the lowest adjacent soil subgrade. We define soil subgrade as the prepared soil beneath floor slabs, pavement, aggregate layers, and landscape soil. Footings supporting the proposed retaining walls may be designed using a net allowable vertical bearing capacity of 4,000 pounds per square foot (psf) for dead plus normal duration live loads for footings that lie a minimum of 3 feet below existing grade. Shallower footing may be designed for 2,000 psf. This allowable bearing capacity values may be increased by one-third for total load conditions, including wind and seismic.

Thrust blocks may be designed for a lateral bearing capacity of 1,000 psf when the top of block is a minimum of 3 feet below existing or final grade.

For resistance to lateral loads, base friction resistance may be calculated using an ultimate friction coefficient of 0.35 for footings and thrust blocks. Passive resistance may be calculated using an equivalent fluid unit weight of 300 pounds per cubic foot for shallow footings founded a minimum of 18 inches below existing or final grade. This friction coefficient and equivalent fluid unit weight may be used together without reduction. Gaps between the footing thrust blocks, or keyway and the adjacent ground should be completely backfilled using engineered fill, concrete or lean cement slurry. Passive resistance contributed by the top 12 inches of soil should be neglected unless a concrete slab-on-grade or pavement covers the ground. The passive equivalent fluid weight values assume a ½ inch maximum deflection at the top of the retaining walls and buried thrust blocks.

The Geotechnical Engineer should check all footing excavations prior to placing steel and casting concrete. Any unsuitable, loose, or soft soil encountered at footing bottoms, as determined by the Geotechnical Engineer during construction, should be removed and replaced by concrete or lean cement slurry.

7.5 RETAINING WALLS

We understand retaining walls are currently not planned. The following section may be used if they are included at a later date.

Retaining walls should be designed to resist static, lateral earth pressures, and surcharge pressures. Active earth pressures may be used for design of unrestrained retaining walls where the top of the wall is free to translate or rotate. Rigid walls should be designed for restrained conditions. We recommend using the table that follows to calculate static lateral earth pressures for various back slope inclinations.

Maximum Backslope Inclination	Unrestricted Equivalent Fluid Unit Weight (pounds per cubic foot)		Restrained Equivalent Fluid Unit Weight (pounds per cubic foot)	
	Drained Conditions	Undrained Conditions	Drained Conditions	Undrained Conditions
Level	35	80	50	90
3:1	45	85	60	95
2:1	55	90	70	100

The equivalent fluid unit weights should extend from the ground surface down to the bottom of footing to calculate pressures. Subsurface drainage systems should be provided behind walls, where walls are designed for drained conditions.

Surcharge loads imposed by stockpiles or other sources within a distance of H of the back of the wall, or from heavy compaction equipment operating within a distance of one-third the backfill height should be considered on a case-by-case basis.

8.0 CONSTRUCTION CONSIDERATIONS

Condor concludes that the proposed improvements described in Section 2.0, Project Description, may be constructed as proposed with the following considerations:

- The excavatability of the ground should be correlated with the conditions described in Section 6.0, Ground Characterization.
- Hard bedrock that is difficult to excavate with a backhoe, and that may require a hydraulic hammer for excavation, may be encountered. While hard rock is generally not anticipated within the anticipated excavation depths, it remains a potential condition. If footings require a keyway or hard bedrock is encountered, the Geotechnical Engineer may provide recommendations for doweling of footings into bedrock as an alternative design. In these cases, minimum footing embedment may be reduced per the Engineer.
- Excavated existing material will most likely need to be processed in order to meet the engineered fill requirements described in Section 7.2.4, Engineered Fill. Corestones, boulders, and moderately weathered bedrock that is strong, hard, and difficult to crush may be encountered. Therefore, it is not uncommon for materials that are excavatable to require processing to comply with Engineered Fill criteria. The contractor should be prepared to remove hard rock particles larger than 4-6 inches from fill material and tree roots.

9.0 ADDITIONAL SERVICES

The geotechnical recommendations and design criteria given in this report are sensitive to the location, design details, and any special requirements of the new construction. Condor should review the geotechnical elements of project grading, plans, and specifications prior to construction bidding to check that the intent of our recommendations has been incorporated into these project documents. If Condor does not review the geotechnical elements of the plans and specifications, the reviewing geotechnical engineer should thoroughly review this report and concur with its conclusions and recommendations or provide alternative recommendations.

Because surface conditions vary across the site, geotechnical recommendations used as a basis for construction contracting are sensitive to the possible need for adjustment in the field. The adjustments are dependent upon conditions revealed during construction that could previously only be assumed based upon limited site exploration. Since the intent of the recommendations given in this report are best understood by a Condor representative, we recommend that field observations and testing during earthwork and construction be performed by Condor. If Condor does not provide the field observations and testing, the geotechnical engineer of record should thoroughly review this report and concur with its conclusions and recommendations or provide alternative recommendations.

The geotechnical engineer or qualified representative should be on-site to observe and advise during site preparation, grading and earthwork, paving, and construction of foundations and slabs-on-grade. These observations should be supplemented with periodic density and compaction testing of subgrade and engineered fills to evaluate conformance with the recommendations contained in this report. It is important that foundation excavations be checked after cleaning and immediately prior to concrete placement to verify their suitability.

10.0 LIMITATIONS

The geotechnical conclusions and recommendations presented in this report are intended for planning, design, and construction of the planned Ebbetts Pass Reach 1 Water Transmission Pipeline Project as described in this report. These conclusions and recommendations may be invalid if:

- the design assumptions change;
- the report is used for another site or project;
- the encountered soil or groundwater conditions are different than those anticipated in this report;
- the recommendations contained in this report are not followed; or
- any other change is implemented that materially alters the project.

This report was prepared in accordance with the generally accepted standards of geotechnical engineering practice existing in Calaveras County at the time it was written. No other warranty, express or implied, is made. It is the owner's responsibility to see that all parties to the project, including the designer, contractors, subcontractors, etc., are made aware of this report in its entirety.

The analyses and recommendations submitted herein are based upon subsurface and surface soil data as shown on Figure 2, and on general field observations made during site visits and geologic mapping. Subsurface exploration of any site is necessarily confined to selected locations and conditions may, and often do, vary between and around these locations. Should varied conditions come to light during construction on the project site, additional exploration, testing, or analysis may be required. Any person concerned with this project who

observes conditions or features of the site or its surrounding areas that are different from those described in this report, should report them immediately to Condor for evaluation.

It should be noted that changes in the standards of practice in the field of geotechnical engineering, changes in site conditions (such as new excavations or fills), new agency regulations, or modifications to the proposed project are grounds for this report to be professionally reviewed. In light of this, there is a practical limit to the usefulness of this report without critical professional review. It is suggested that two years be considered a reasonable time for the usefulness of this report.

We trust this report provides the information required at this time. Please call with any questions.

Respectfully submitted,

CONDOR EARTH

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Vice President

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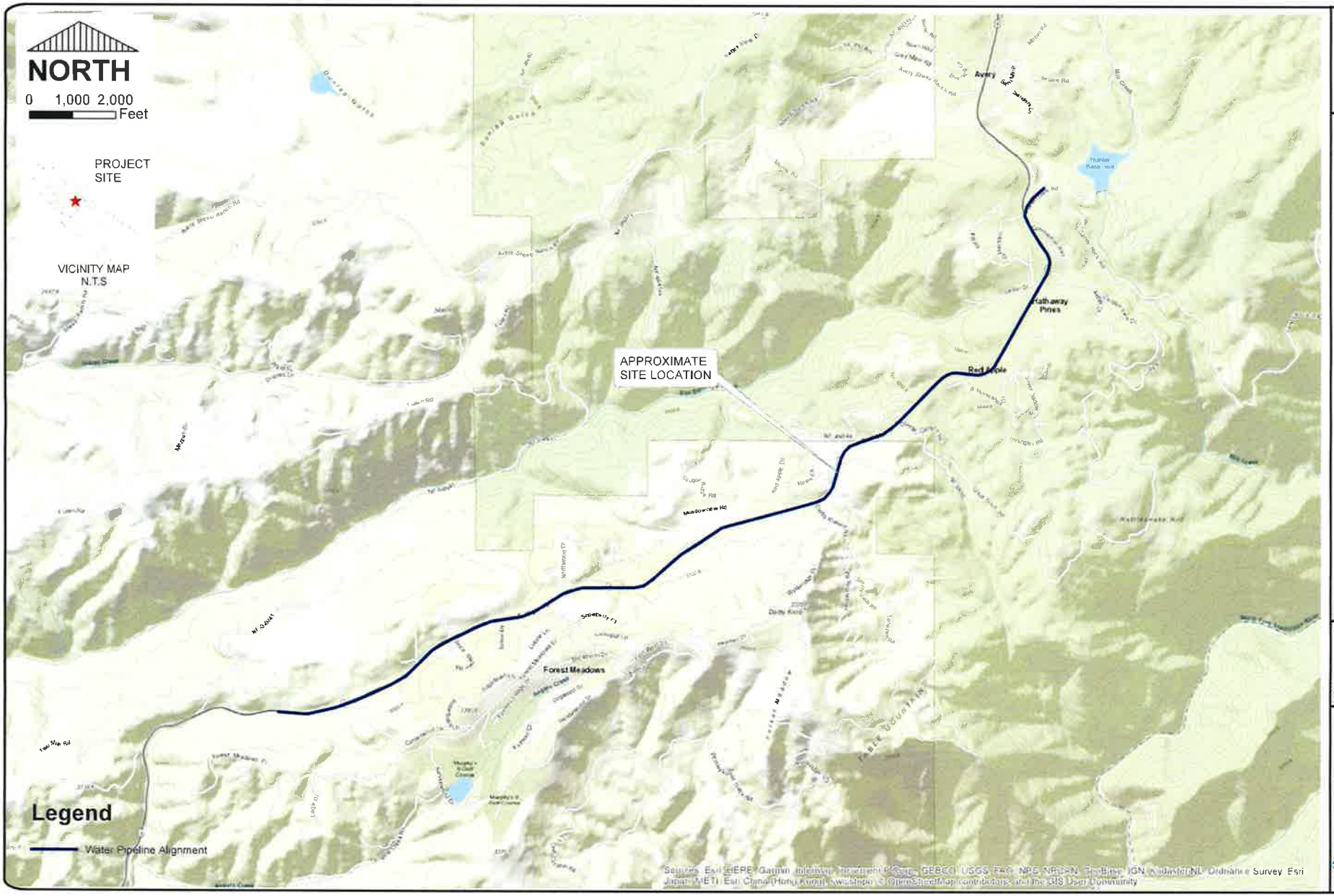

FIGURE 1

VICINITY MAP
CALAVERAS COUNTY WATER DISTRICT
EBBETS PASS REACH 1 WATER TRANSMISSION PROJECT

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Date: AS SHOWN
Drawn: JW
Check: LA

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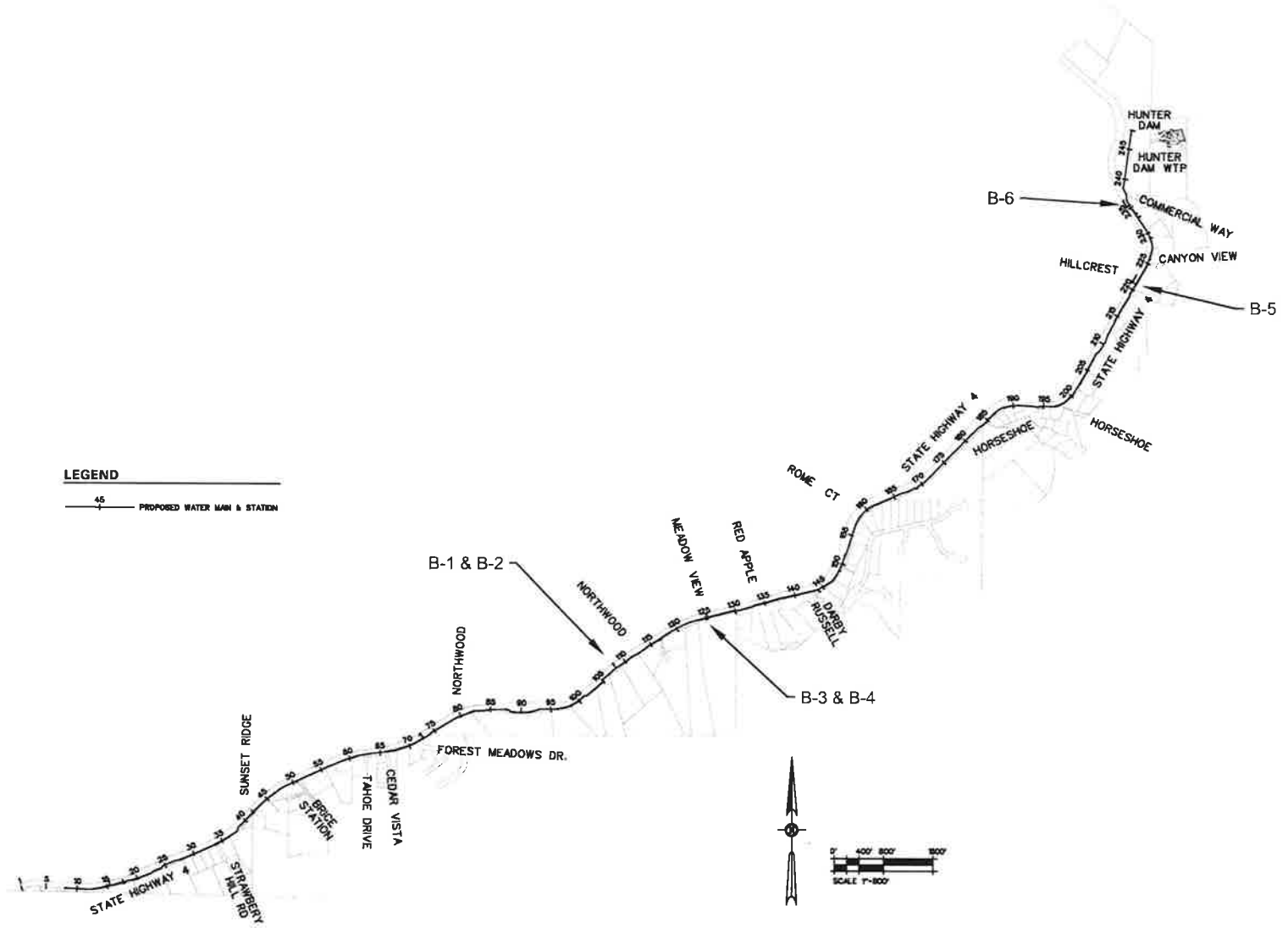

REVISIONS

NO.	DESCRIPTION	DATE

90% PLANS

RELEASE 7
MAY 2018

SCALE: AS SHOWN
JOB NO 1330-24

IMPROVEMENT PLANS FOR CONSTRUCTION OF
EBBETTS PASS REACH 1
WATER TRANSMISSION PIPELINE PROJECT #11085
CALAVERAS COUNTY, CALIFORNIA

KEY MAP

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CIVIL WATER RESOURCES SURVEYING

SHEET 03 OF 66

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F2_7517

FIGURE 2

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BORING LOCATIONS
CALAVERAS COUNTY WATER DISTRICT
EBBETTS PASS REACH 1 WATER TRANSMISSION PROJECT

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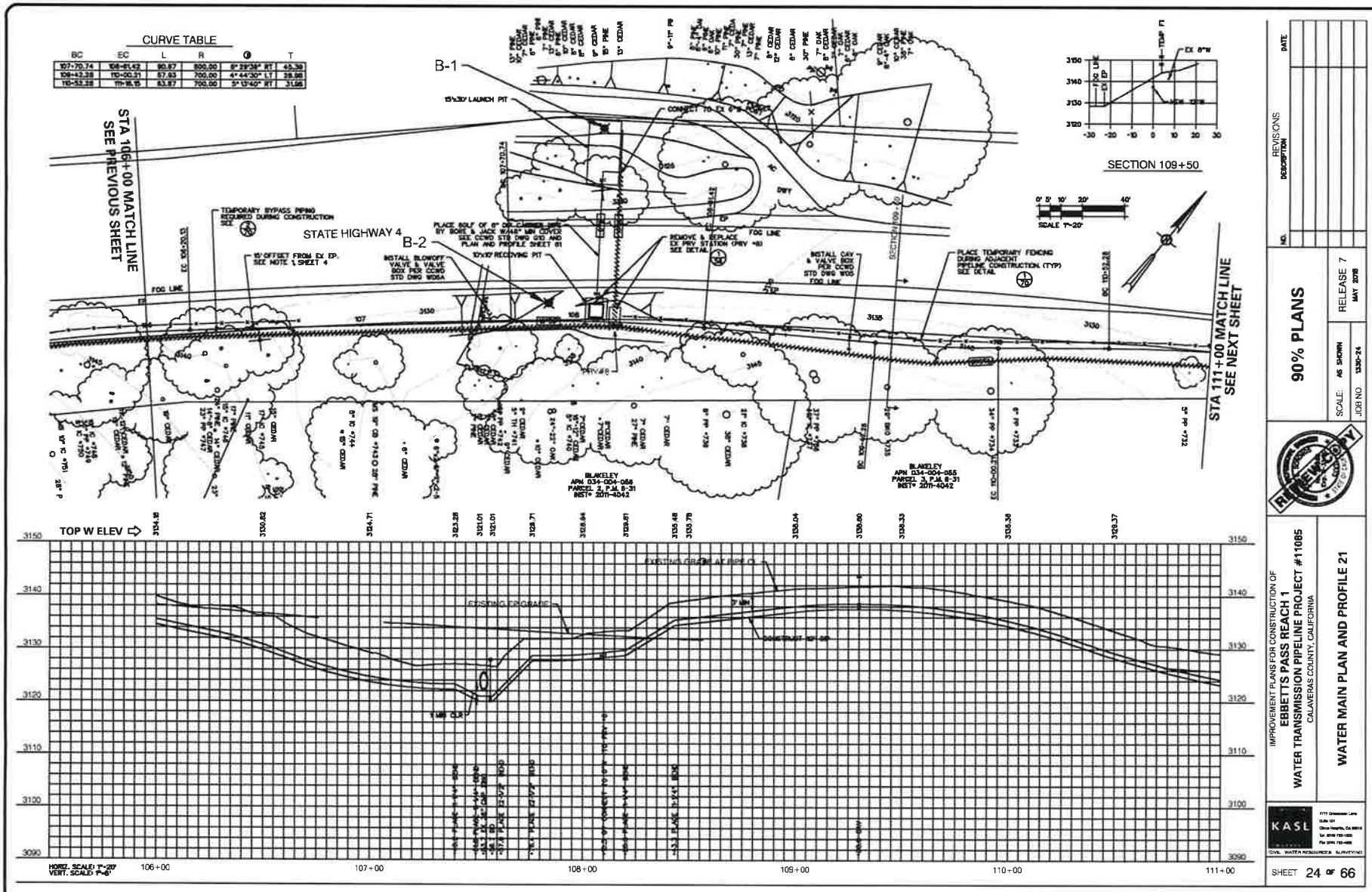

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IMPROVEMENT PLANS FOR CONSTRUCTION OF
EBBETTS PASS REACH 1
WATER TRANSMISSION PIPELINE PROJECT #11085
CALAVERAS COUNTY, CALIFORNIA

WATER MAIN PLAN AND PROFILE 21

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FIGURE 3

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BORINGS 1&2
CALAVERAS COUNTY WATER DISTRICT
EBBETTS PASS REACH 1 WATER TRANSMISSION PROJECT

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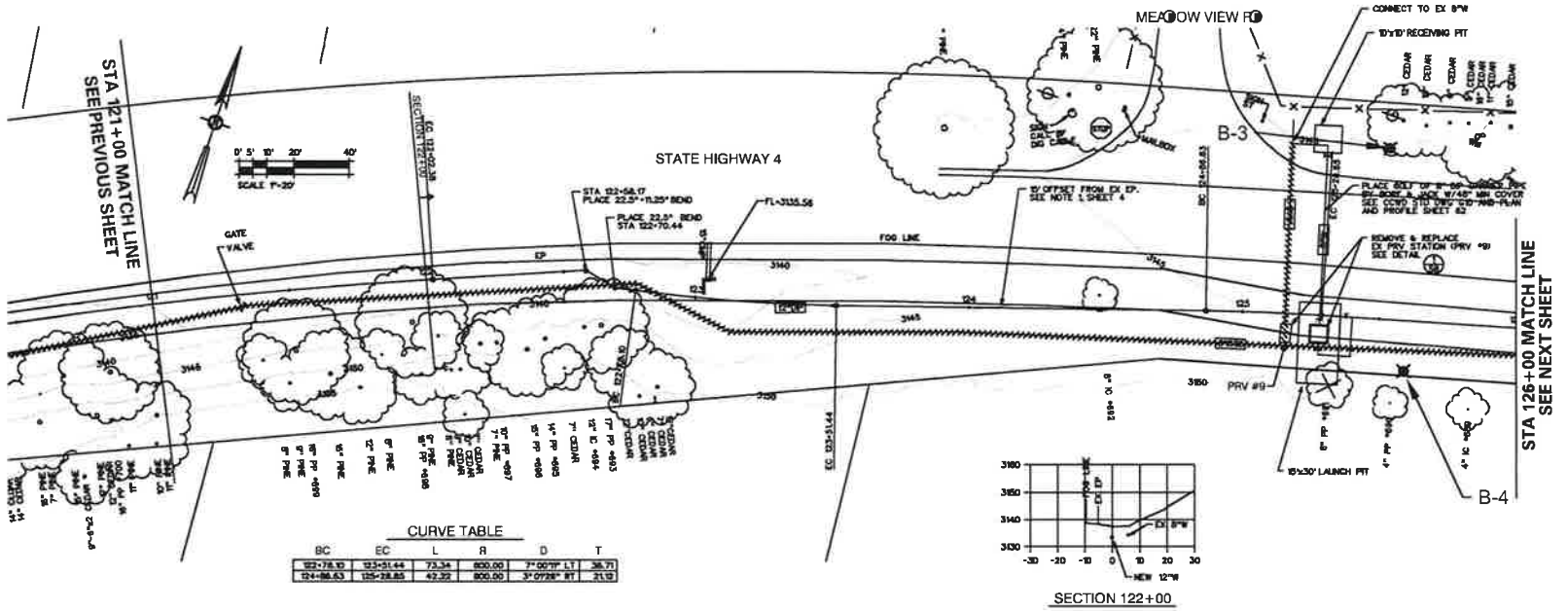

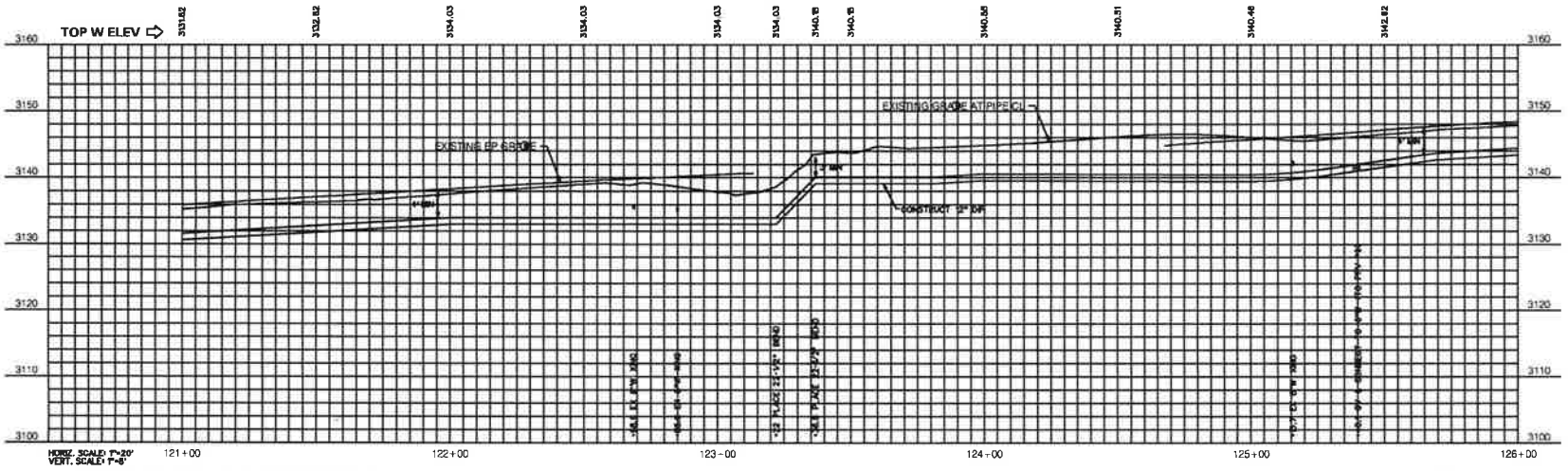

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EBBETTS PASS REACH 1
WATER TRANSMISSION PIPELINE PROJECT #11085
CALAVERAS COUNTY, CALIFORNIA

WATER MAIN PLAN AND PROFILE 24

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SHEET 27 OF 66

FIGURE 4

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BORINGS 3&4
CALAVERAS COUNTY WATER DISTRICT
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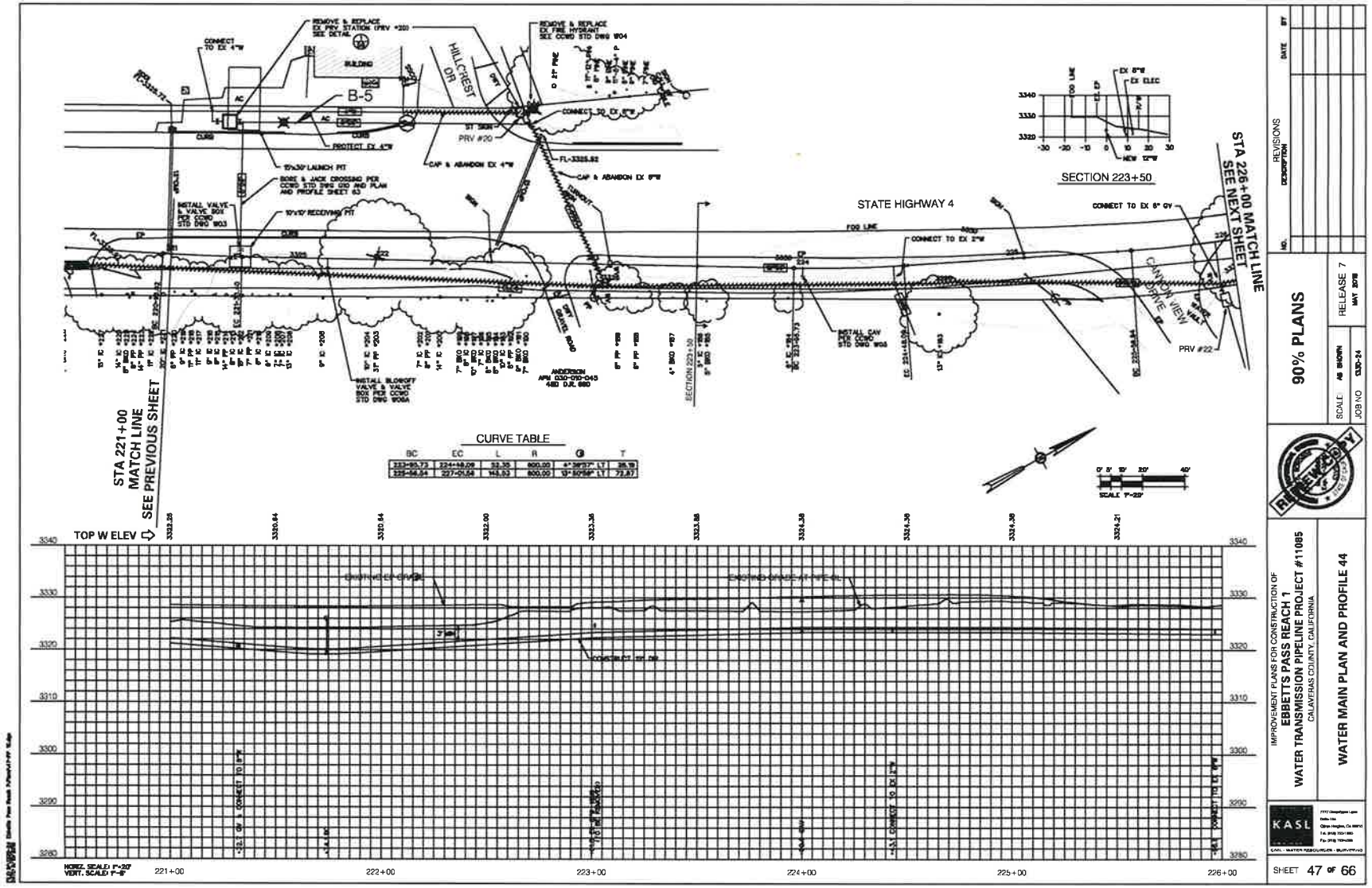

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CALAVERAS COUNTY, CALIFORNIA

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FIGURE 5

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BORING 5
CALAVERAS COUNTY WATER DISTRICT
EBBETTS PASS REACH 1 WATER TRANSMISSION PROJECT

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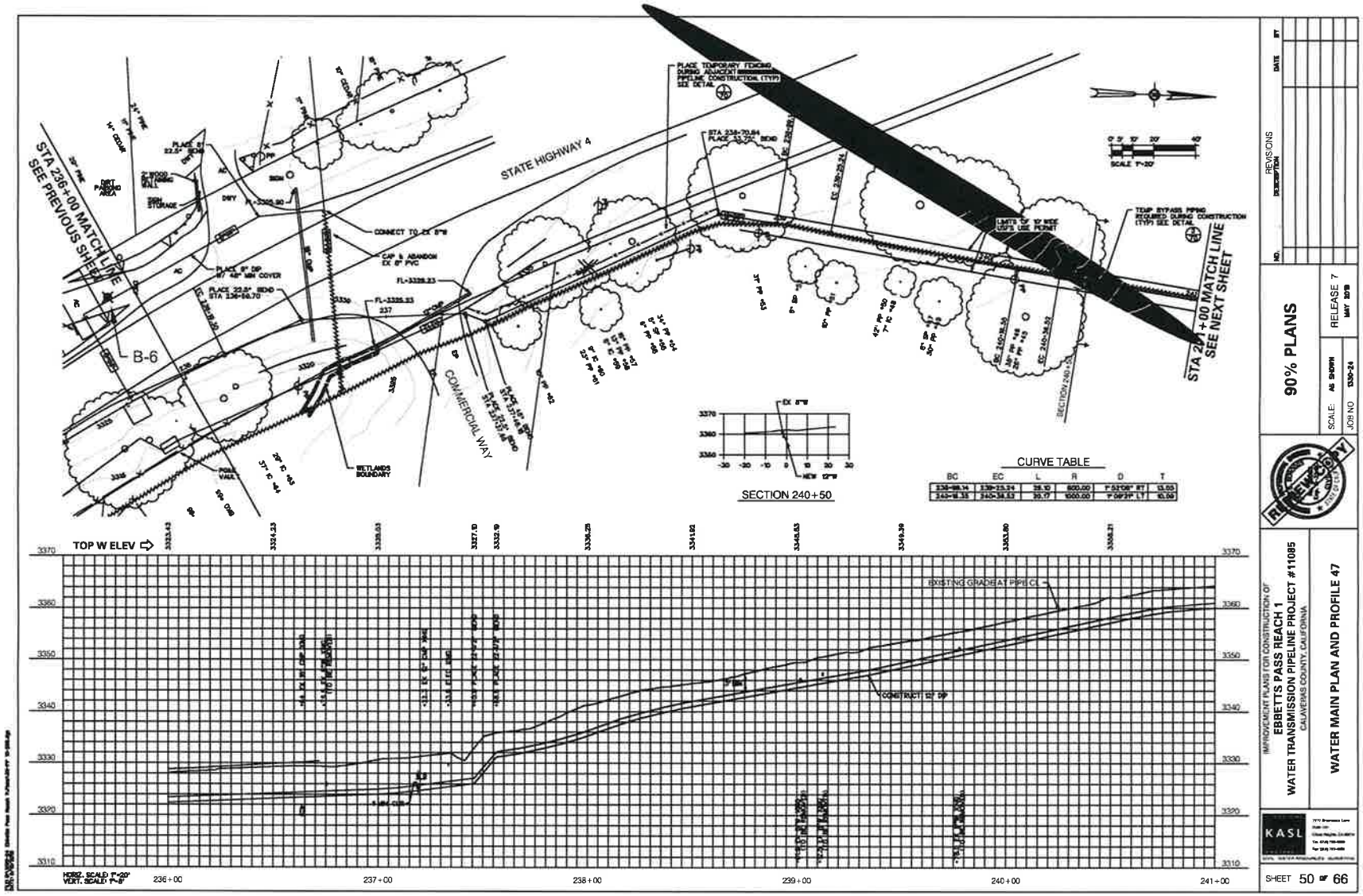

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CALAVERAS COUNTY, CALIFORNIA

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FIGURE 6

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BORING 6
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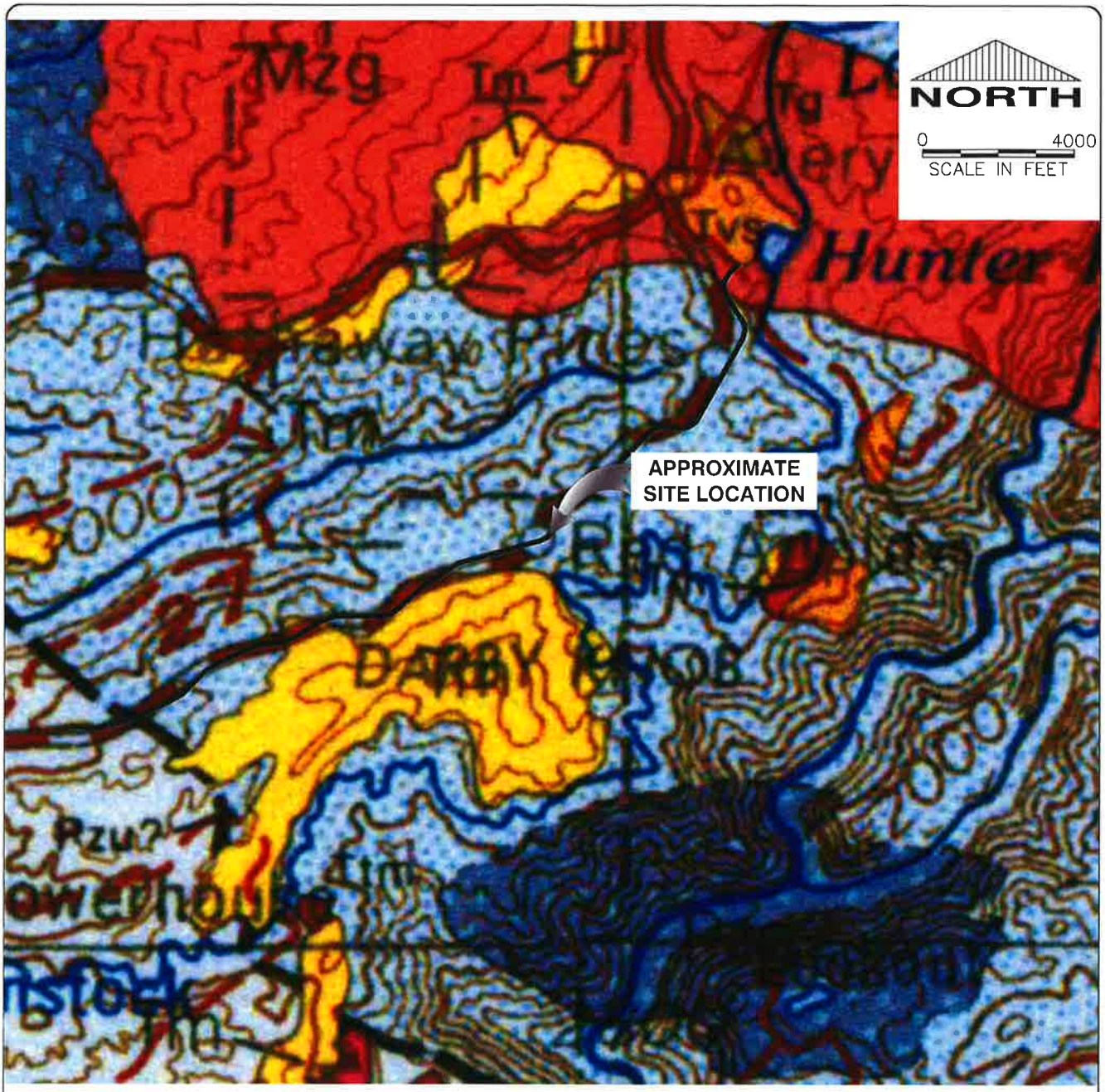

LEGEND

Mzg — MESOZOIC GRANITE ROCKS

Tm — MERHTIN FORMATION *(ANDESITIC CONGLOMERATE, SANDSTONE, AND BRECCIA)*

Pzu? — UNDIFFERENTIATED PALEOZOIC (?) ROCKS

GEOLOGIC MAP OF THE SACRAMENTO QUADRANGLE, CALIFORNIA D.L.WAGNER 1981

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GEOLOGIC MAP
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FIGURE 7

7675_F7

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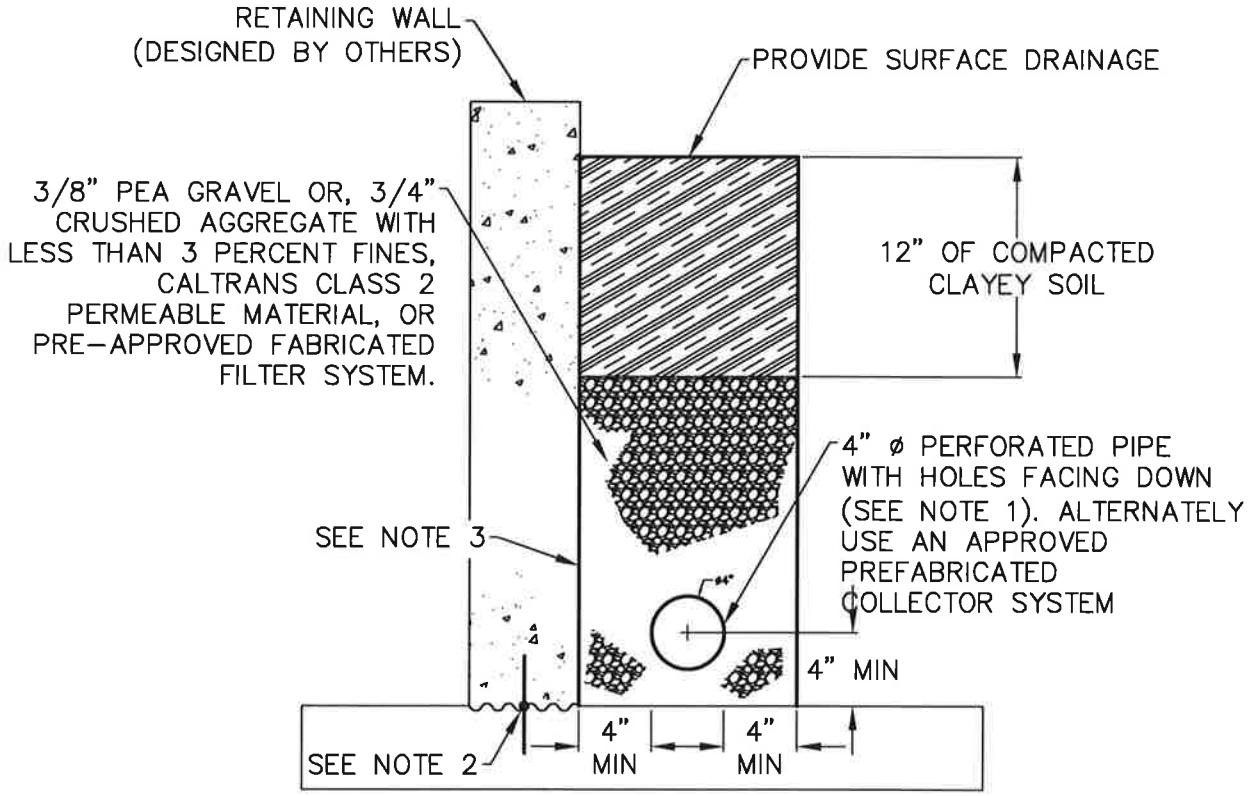

NOTES:

1. SLOPE PIPE OR PREFABRICATED COLLECTOR SYSTEM AT LEAST 2% TO DRAIN. PLACE PIPE BELOW ADJACENT INTERIOR FLOORS.
2. PROVIDE WATER STOP OR EQUIVALENT DETAIL FOR BASE OF INTERIOR WALLS AT ALL COLD JOINTS.
3. PROVIDE APPROVED WATERPROOFING ON INTERIOR WALLS.
4. ALL WATERPROOF AND DRAINAGE PRODUCTS TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

CONDOR EARTH
21663 Brian Lane
P.O. Box 3905
Sonora, CA 95370
(209) 532-0361
fax(209) 532-0773
www.condorearth.com

Job No.	Date	Scale	Drawn	Chk'd
7517	19 SEPT 2018	AS SHOWN	JW	LA

TYPICAL RETAINING WALL AND STRUCTURE DRAINAGE CALAVERAS COUNTY WATER DISTRICT EBBETTS PASS REACH 1 WATER TRANSMISSION PROJECT

FIGURE 8

7517_F8

CONDOR EARTH TECHNOLOGIES, INC.
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FAX 209-234-0538

LOG OF BORING No. B-1

PROJECT: CCWD Ebbetts Pass Reach I Water Transmission Pipeline **PROJECT NO.:** 7517-Ph02
CLIENT: Calaveras County Water District
PROJECT LOCATION: Ebbetts Pass, Highway 4
LOCATION: South of Northwood at Sta 108+00; on Eastbound Lane **ELEVATION:**
DRILLER: West Coast Explorations **LOGGED BY:** N. Garnica
DRILLING METHOD: 4.5-Inch Solid Stem Auger **DATE:** 08/30/18
DEPTH TO - WATER> INITIAL: ▽ **AFTER DRILLING:** ▼ **CAVING>** C

Depth (feet)	Sample Type	USCS	Description	Graphic	Sample No.	Blow Counts	N Value	Moisture Content (%)	Dry Density (pcf)	Plasticity Index	Liquid Limit	% < #200	Misc. Tests
0		CL-ML	Reddish brown sandy silty clay, moist, hard		1	20 25 52	51	7.2	96.5				
5		CL	Grayish brown sandy lean clay with gravel, moist to dry, hard (5.0)		2	20 25 43	68						
10		CL	Grayish brown sandy lean clay with gravel, moist, hard		3	20 35 40	75						
15		SC	Olive green clayey sand (weathered bedrock), moist, refusal (15.0)		4	72/2	72+	4.5	75.0			31.7	
20			Boring Terminated at 16.5 ft.										
25													
30													
35													

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

CONDOR EARTH TECHNOLOGIES, INC.
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FAX 209-234-0538

LOG OF BORING No. B-2

PROJECT: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline **PROJECT NO.:** 7517-Ph02
CLIENT: Calaveras County Water District
PROJECT LOCATION: Ebbetts Pass, Highway 4
LOCATION: South of Northwood at Sta 108+00; at Residential Drive Way **ELEVATION:**
DRILLER: West Coast Explorations **LOGGED BY:** N. Garnica
DRILLING METHOD: 4.5-Inch Solid Stem Auger **DATE:** 08/30/18
DEPTH TO - WATER> INITIAL: ▽ **AFTER DRILLING:** ▽ **CAVING>** C

Depth (feet)	Sample Type	USCS	Description	Graphic	Sample No.	Blow Counts	N Value	Moisture Content (%)	Dry Density (pcf)	Plasticity Index	Liquid Limit	% < #200	Misc. Tests
0		CL											
		CL	Brown sandy lean clay with gravel, moist to dry, hard		1	11 17 17	34						
5		CL	Brown sandy lean clay with gravel, moist, hard		2	10 13 22	35						
10		SM	Olive green silty fine sand (weathered bedrock), moist, very dense, refusal (10.0)		3	30 55/6	55+						
			Boring Terminated at 11.5 ft.										
15													
20													
25													
30													
35													

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

CONDOR EARTH TECHNOLOGIES, INC.
CONDOR
209-234-0518
FAX 209-234-0538

LOG OF BORING No. B-3

PROJECT: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline **PROJECT NO.:** 7517-Ph02
CLIENT: Calaveras County Water District
PROJECT LOCATION: Ebbetts Pass, Highway 4
LOCATION: East of Meadow View @ Sta 125+00; Outside Eastbound Shoulder **ELEVATION:**
DRILLER: West Coast Explorations **LOGGED BY:** N. Garnica
DRILLING METHOD: 4.5-Inch Solid Stem Auger **DATE:** 08/30/18
DEPTH TO - WATER> INITIAL: ▽ **AFTER DRILLING:** ▽ **CAVING>** C

Depth (feet)	Sample Type	USCS	Description	Graphic	Sample No.	Blow Counts	N Value	Moisture Content (%)	Dry Density (pcf)	Plasticity Index	Liquid Limit	% < #200	Misc. Tests
0		SC	Overburden, reddish, sandy silty clay										
		SC	Reddish clayey sand with gravel, moist, dense										
		SC			1	63/6	63	12.7	101.1				
5													
			Greenish gray clayey sand, moist, dense		2	6 13 20	33			14	40	43.3	
10													
		CL	Yellowish gray sandy clay, moist, hard	10.0	3	20 29 40	69					57.3	
15		CL	Greenish sandy clay to clayey sand (weathered bedrock), moist, hard, refusal		4	25 52/6	52+						
			Boring Terminated at 16.5 ft.										
20													
25													
30													
35													

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209-234-0518
FAX 209-234-0538

LOG OF BORING No. B-4

PROJECT: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline **PROJECT NO.:** 7517-Ph02
CLIENT: Calaveras County Water District
PROJECT LOCATION: Ebbetts Pass, Highway 4
LOCATION: East of Meadow View @ Sta 125+00; Outside Westbound **ELEVATION:**
DRILLER: West Coast Explorations **LOGGED BY:** N. Garnica
DRILLING METHOD: 4.5-Inch Solid Stem Auger **DATE:** 08/30/18
DEPTH TO - WATER> INITIAL: ▽ **AFTER DRILLING:** ▽ **CAVING>**

Depth (feet)	Sample Type	USCS	Description	Graphic	Sample No.	Blow Counts	N Value	Moisture Content (%)	Dry Density (pcf)	Plasticity Index	Liquid Limit	% < #200	Misc. Tests
0													
		CL	Reddish brown sandy lean clay with some gravel, moist, very stiff		1	7 12 19	28	17.1	84.6			52.7	
5			Reddish brown sandy lean clay with gravel, moist, hard		2	11 13 20	33	17.6	96.1				
10			Olive gray sandy lean clay, moist, hard		3	16 20 25	45						
		CL-ML	14.0										
15			Olive Gray Sandy, Silty Clay (weathered bedrock), refusal		4	30 50/6	50+					54.2	
			Boring Terminated at 16.5 ft.										
20													
25													
30													
35													

CONDOR EARTH TECHNOLOGIES, INC.
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209-234-0518
FAX 209-234-0538

LOG OF BORING No. B-5

PROJECT: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline **PROJECT NO.:** 7517-Ph02
CLIENT: Calaveras County Water District
PROJECT LOCATION: Ebbetts Pass, Highway 4
LOCATION: South of Hillcrest @ Sta 221+00; Outside Westbound Shoulder **ELEVATION:**
DRILLER: West Coast Explorations **LOGGED BY:** N. Garnica
DRILLING METHOD: 4.5-Inch Solid Stem Auger **DATE:** 08/30/18
DEPTH TO - WATER> INITIAL: ▽ **AFTER DRILLING:** ▼ **CAVING>** C

Depth (feet)	Sample Type	USCS	Description	Graphic	Sample No.	Blow Counts	N Value	Moisture Content (%)	Dry Density (pcf)	Plasticity Index	Liquid Limit	% < #200	Misc. Tests
0		AC	3" AC										
		CL	0.5										
		CL	Reddish sandy lean clay, moist, stiff		1	7 6 4	7	13.3	96.0	9	27	52.7	
5			Reddish sandy lean clay with fragments of weathered rock		2	20 21 30	51	15.5	108.2				
10		ML	10.0										
			Yellowish orange sandy silt (weathered bedrock), refusal		3	24 30 55/6	55+						
			Boring Terminated at 11.5 ft.										
15													
20													
25													
30													
35													

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FAX 209-234-0538

LOG OF BORING No. B-6

PROJECT: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline **PROJECT NO.:** 7517-Ph02
CLIENT: Calaveras County Water District
PROJECT LOCATION: Ebbetts Pass, Highway 4
LOCATION: South of Commercial Way @ Sta 236+00; Outside Westbound **ELEVATION:**
DRILLER: West Coast Explorations **LOGGED BY:** N. Garnica
DRILLING METHOD: 4.5-Inch Solid Stem Auger **DATE:** 08/30/18
DEPTH TO - WATER> INITIAL: ▽ **AFTER DRILLING:** ▽ **CAVING>** C

Depth (feet)	Sample Type	USCS	Description	Graphic	Sample No.	Blow Counts	N Value	Moisture Content (%)	Dry Density (pcf)	Plasticity Index	Liquid Limit	% < #200	Misc. Tests
0		ML	Yellowish orange sandy silt										
		ML	Yellowish orange sandy silt, dense, moist		1	20 30 22	52						
5		ML	Yellowish orange sandy silt (with weathered rock fragments), dense		2	59/6	59+	7.3	116.4				
10		ML	Yellowish orange sandy silt (with weathered rock fragments)		3	32 25 22	47						
15		ML	Yellowish orange sandy silt (with weathered rock fragments), refusal		4	18 50/2	50+						
			Boring Terminated at 16.5 ft.										
20													
25													
30													
35													

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Silty clay, Silty clay with sand, Sandy silty clay
	Lean clay, Lean clay with sand, Sandy lean clay
	Clayey sand
	Silty sand, Clayey sand
	Asphalt
	Silt, Silt with sand, Sandy silt
Soil Samplers	
	California modified sampler
	Standard penetration test

Notes:

1. These logs are subject to limitations, conclusions, and recommendations in this report.

CONDOR EARTH
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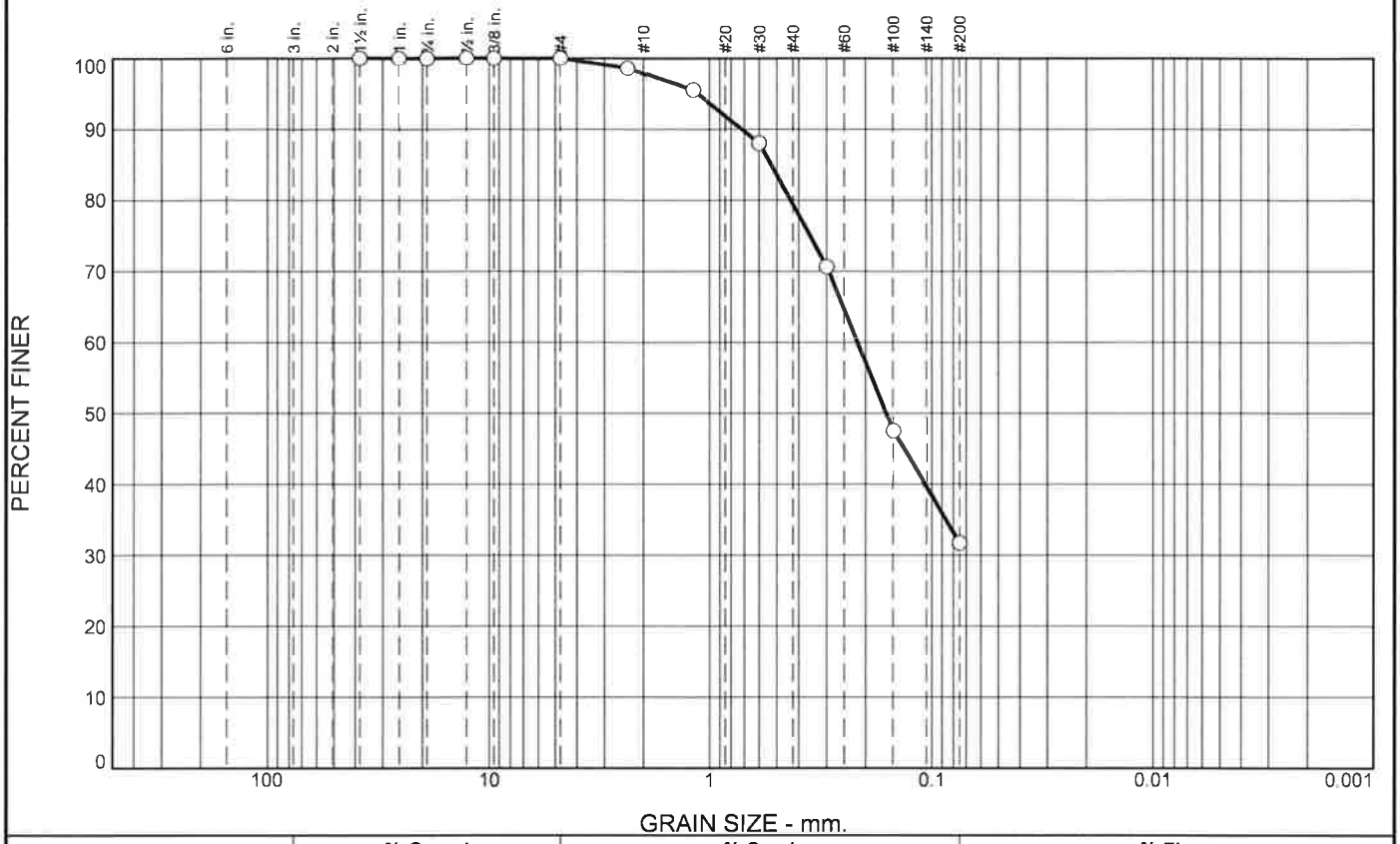
Project #: 7517 - Phase 02
Client: Calaveras County Water District
Project: Ebbetts Pass Reach 1 Water Transmission
Test Date: 9/14/2018
Tested by: E. Gamez

Natural Dry Density/Unit Weight								
Sample #	B1-1	B1-4	B3-1	B4-2	B4-1	B5-1	B5-2	B6-2
Date	9/14/2018	9/14/2018	9/14/2018	9/14/2018	9/14/2018	9/14/2018	9/14/2018	9/14/2018
Depth (ft)	3.0	15	2.5	6	2.5	3	5.5	6.5
Sleeve Diam. (in)	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
Sleeve Area (sq in)	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Sample Length (in)	6.0	5.3	5.0	5.5	4.9	5.6	5.9	4.7
Volume (cu.in)	28.3	25.1	23.7	25.8	22.9	26.5	28.0	22.2
Volume(cu ft)	0.016	0.015	0.014	0.015	0.013	0.015	0.016	0.013
Gross wt (grms)	1187.6	927.7	1118.1	1185.0	1019.4	1078.8	1239.4	1042.6
Tare wt (grms)	419.7	411.9	410.3	420.5	422.5	318.6	321.2	315.3
Soil wt (grms)	767.9	515.8	707.8	764.5	596.9	760.2	918.2	727.3
Soil wt (lbs)	1.7	1.1	1.6	1.7	1.3	1.7	2.0	1.6
Wet density (pcf)	103.5	78.4	114.0	113.0	99.1	109.2	125.0	124.8
Dry Density(pcf)	96.5	75.0	101.1	96.1	84.6	96.0	108.2	116.4

Moisture Content								
Tare #	A	C	D	F	E	CD	J	H
Wet wt & Tare (grms)	1187.6	927.7	1118.1	1185.0	1019.4	1078.8	1239.4	1042.6
Dry wt & Tare (grms)	1135.8	905.4	1038.1	1070.4	932.1	987.4	1116.1	993.4
Wt of Water (grms)	51.8	22.3	80.0	114.6	87.3	91.4	123.3	49.2
Wt of Tare (grms)	419.7	411.9	410.3	420.5	422.5	318.6	321.2	315.3
Wt dry Soil (grms)	716.1	493.5	627.8	649.9	509.6	668.8	794.9	678.1
Moisture Content %	7.2	4.5	12.7	17.6	17.1	13.7	15.5	7.3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.1	18.5	47.7	31.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	98.6		
#16	95.4		
#30	88.0		
#50	70.6		
#100	47.5		
#200	31.7		

* (no specification provided)

Material Description

Olive green clayey sand (weathered bedrock), moist, refusal

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7191 D_{85}= 0.5320 D_{60}= 0.2181
D_{50}= 0.1615 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sampled by N. Garnica
F.M.=1.00

Source of Sample: B-1 **Depth:** 15.0
Sample Number: 4

Date: 09/17/18

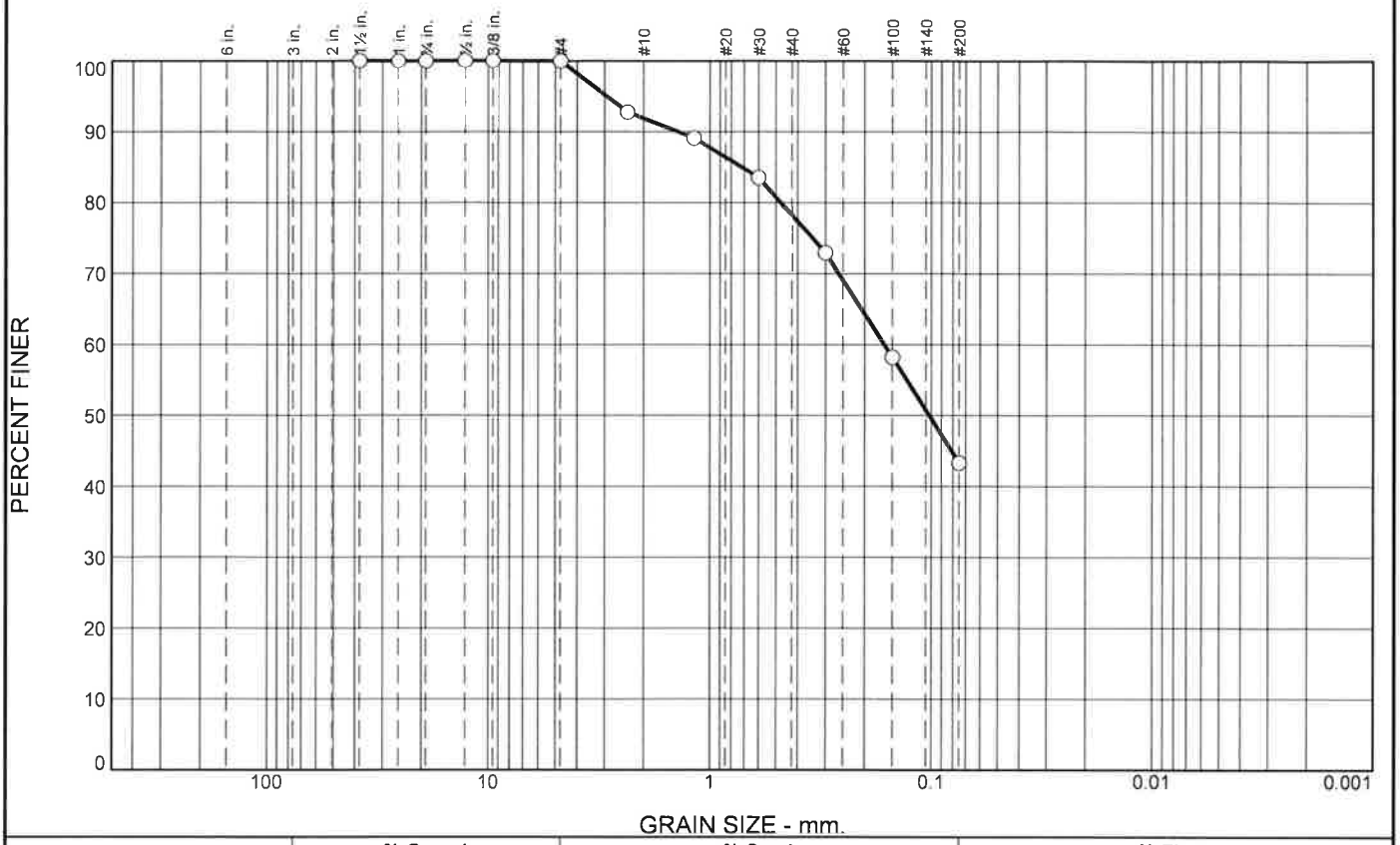
CONDOR EARTH TECHNOLOGIES, INC.
Stockton, California

Client: Calaveras County Water District
Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Project No: 7517-Ph02 **Figure**

Tested By: N. Garnica

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	8.1	13.7	34.9	43.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	92.7		
#16	89.1		
#30	83.5		
#50	72.9		
#100	58.2		
#200	43.3		

* (no specification provided)

Material Description

Greenish gray clayey sand, moist, dense

Atterberg Limits

PL= 26 LL= 40 PI= 14

Coefficients

D_{90}= 1.4015 D_{85}= 0.7197 D_{60}= 0.1631
D_{50}= 0.1023 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-6(3)

Remarks

Sampled by N. Garnica
F.M.=1.04

Source of Sample: B-3 **Depth:** 5.0
Sample Number: 2

Date: 9/17/18

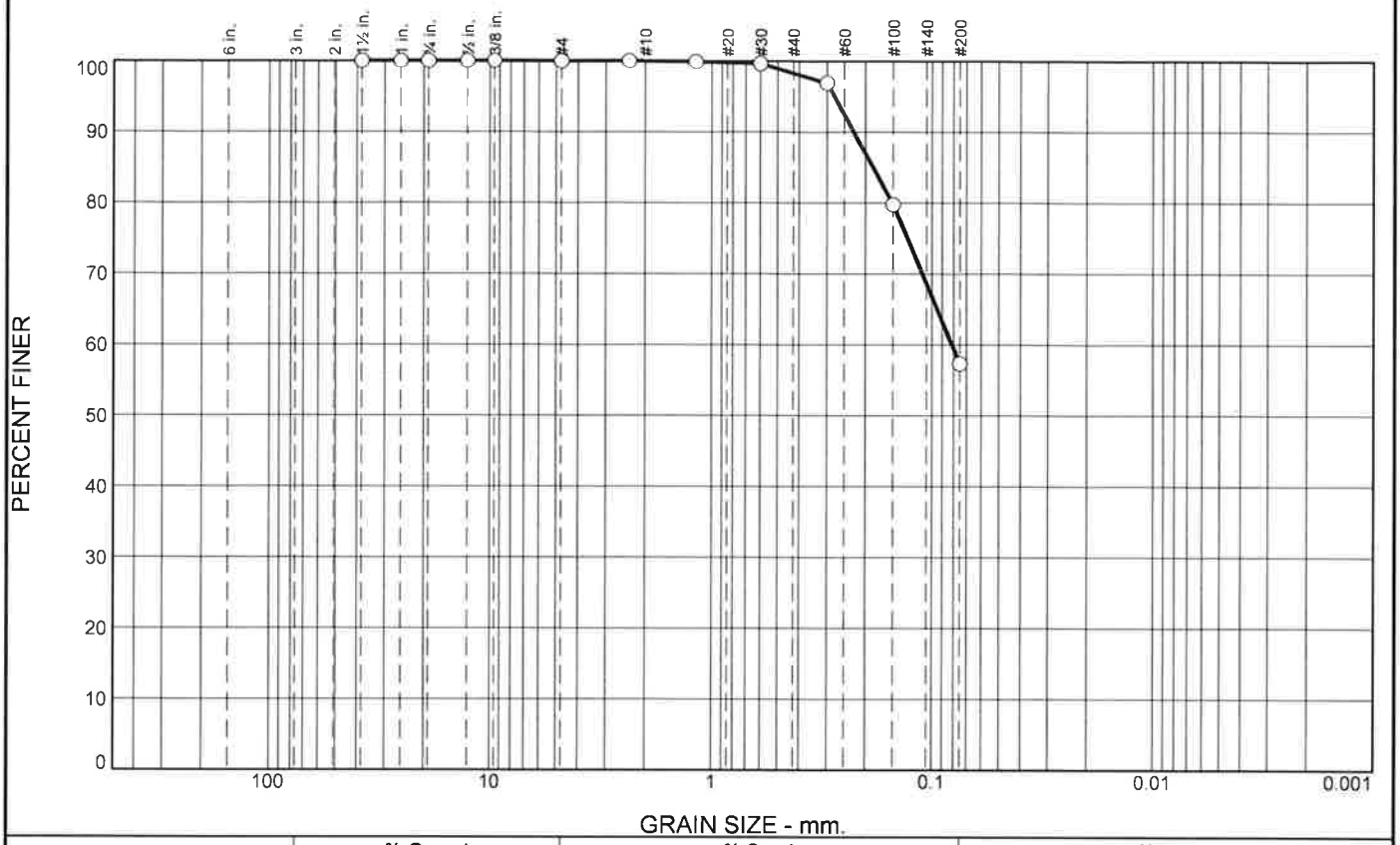
CONDOR EARTH TECHNOLOGIES, INC.
Stockton, California

Client: Calaveras County Water District
Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Project No: 7517-Ph02 **Figure**

Tested By: N. Garnica

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.7	41.0	57.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	100.0		
#16	99.9		
#30	99.6		
#50	96.9		
#100	79.8		
#200	57.3		

* (no specification provided)

Material Description

Yellowish gray sandy clay, moist, hard

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2268 D_{85}= 0.1854 D_{60}= 0.0815
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sampled by. N. Garnica
F.M.=0.24

Source of Sample: B-3 **Depth:** 10.0
Sample Number: 3

Date: 9/17/18

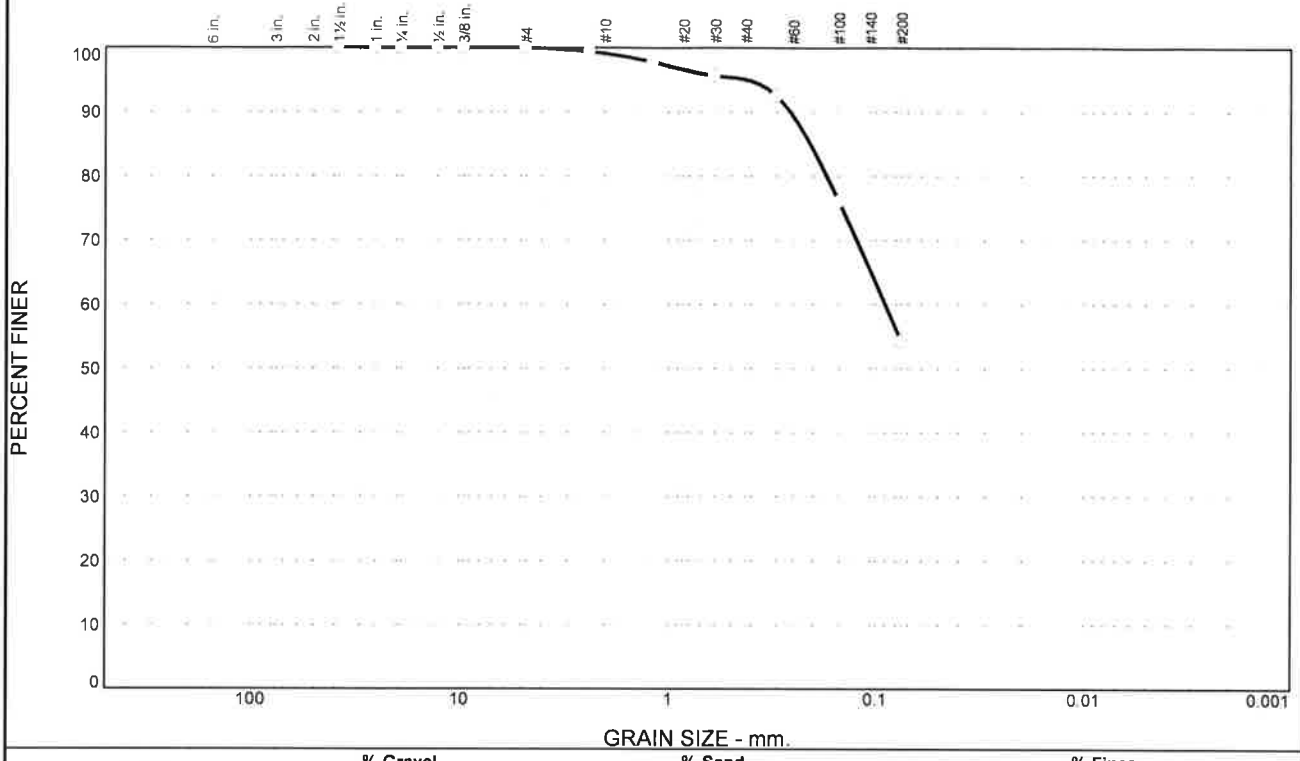
CONDOR EARTH TECHNOLOGIES, INC.
Stockton, California

Client: Calaveras County Water District
Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Project No: 7517-Ph02 **Figure**

Tested By: N. Garnica

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	4.1	40.8	54.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	99.4		
#16	97.7		
#30	95.6		
#50	92.4		
#100	76.0		
#200	54.2		

* (no specification provided)

Material Description

Olive Gray Sandy Silty Clay, Moist, Hard

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2585 D_{85}= 0.2067 D_{60}= 0.0899
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sampled by N. Garnica
F.M.=0.39

Source of Sample: B-4 **Depth:** 15.0
Sample Number: 4

Date: 9/17/18

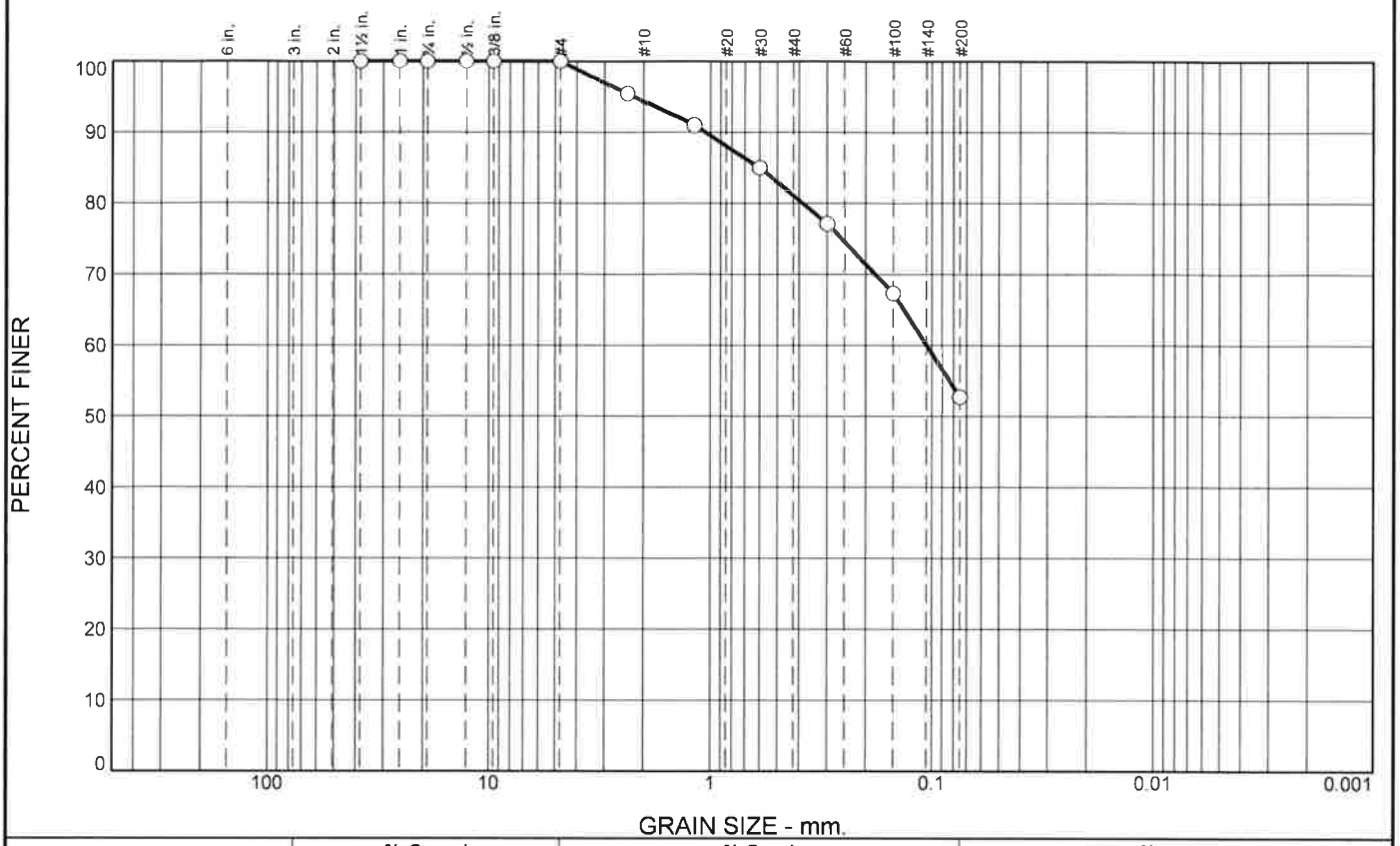
CONDOR EARTH TECHNOLOGIES, INC.
Stockton, California

Client: Calaveras County Water District
Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Project No: 7517-Ph02 **Figure**

Tested By: N. Garnica

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	5.7	13.3	28.3	52.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	95.4		
#16	91.0		
#30	84.9		
#50	77.1		
#100	67.3		
#200	52.7		

* (no specification provided)

Material Description

Reddish sandy lean clay, moist, stiff

Atterberg Limits

PL= 18 LL= 27 PI= 9

Coefficients

D_{90}= 1.0598 D_{85}= 0.6035 D_{60}= 0.1061
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

Remarks

Sampled by N. Garnica
F.M.=0.84

Source of Sample: B-5 **Depth:** 2.5
Sample Number: 1

Date: 9/17/18

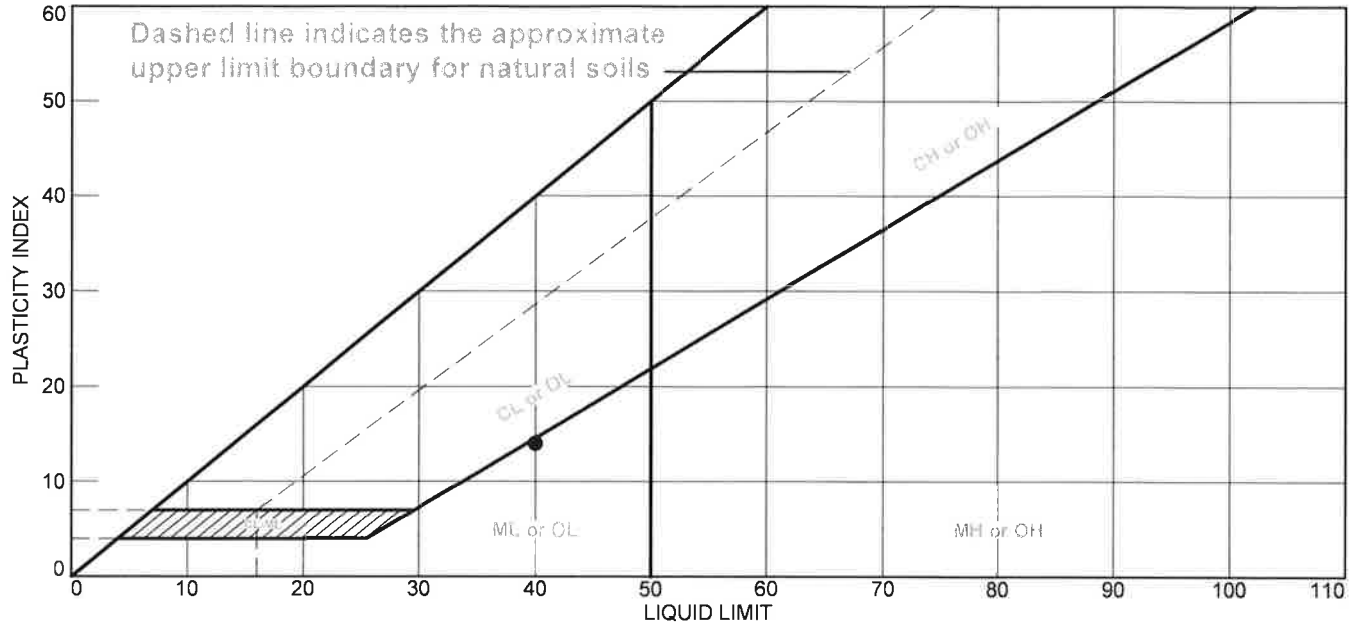
CONDOR EARTH TECHNOLOGIES, INC.
Stockton, California

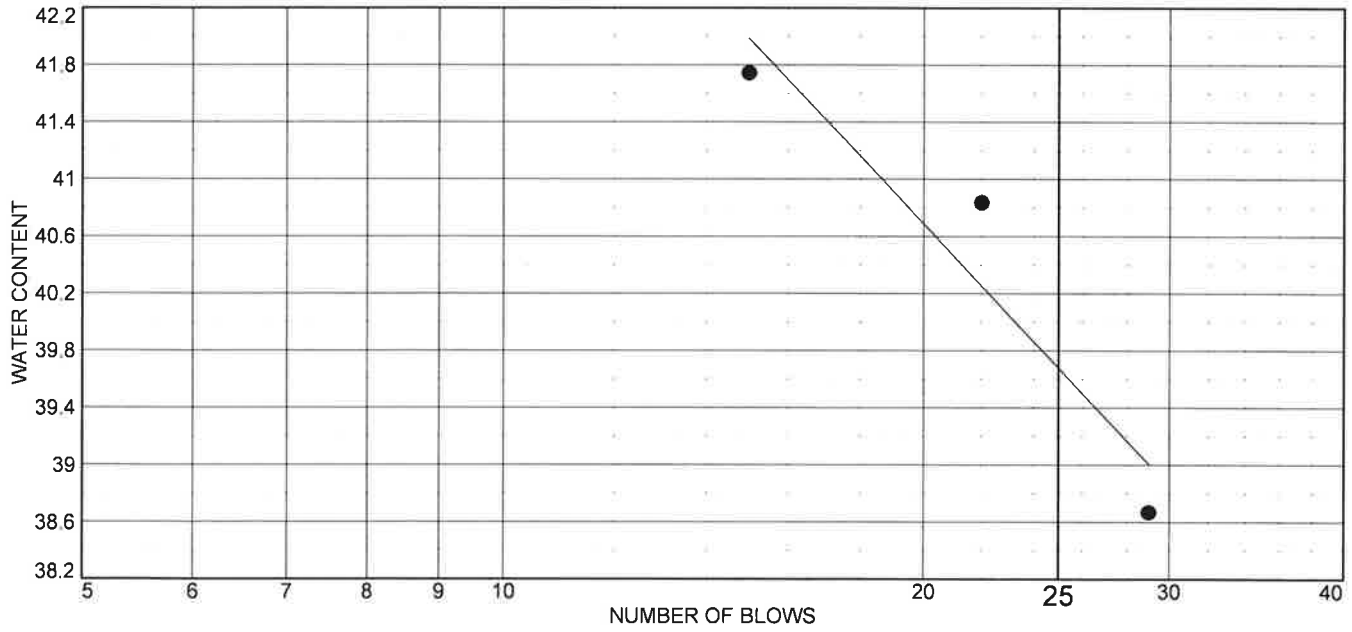
Client: Calaveras County Water District
Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Project No: 7517-Ph02 **Figure**

Tested By: N. Garnica

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Greenish gray clayey sand, moist, dense	40	26	14	78.2	43.3	SM

Project No. 7517-Ph02 **Client:** Calaveras County Water District

Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Source of Sample: B-3 **Depth:** 5.0
Sample Number: 2

CONDOR EARTH TECHNOLOGIES INC.

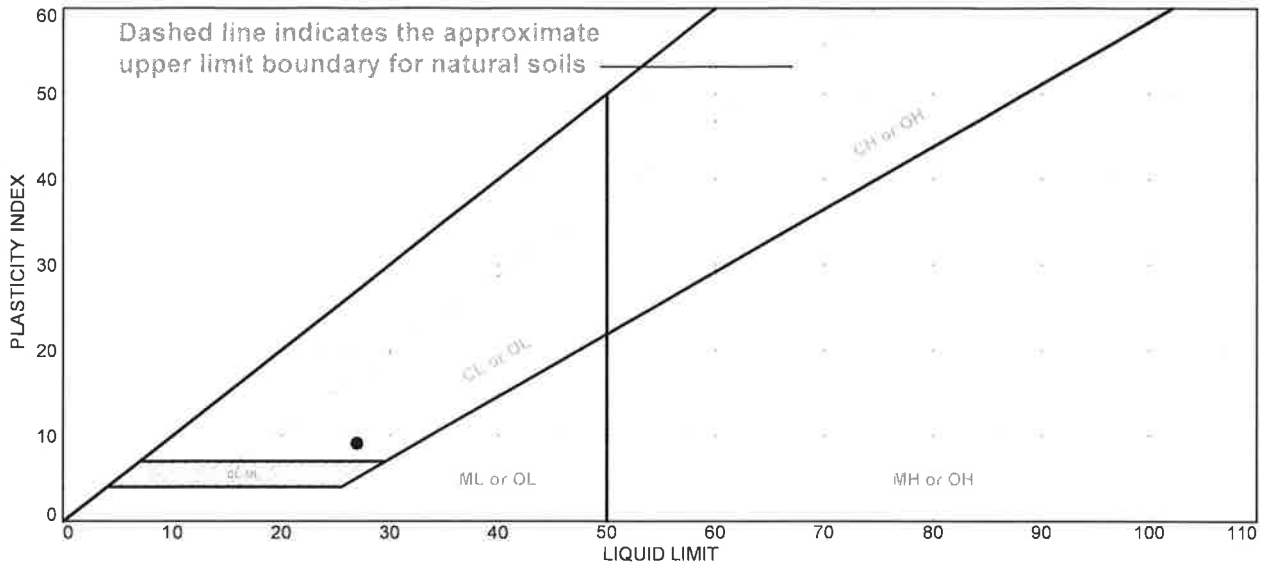
Stockton, California

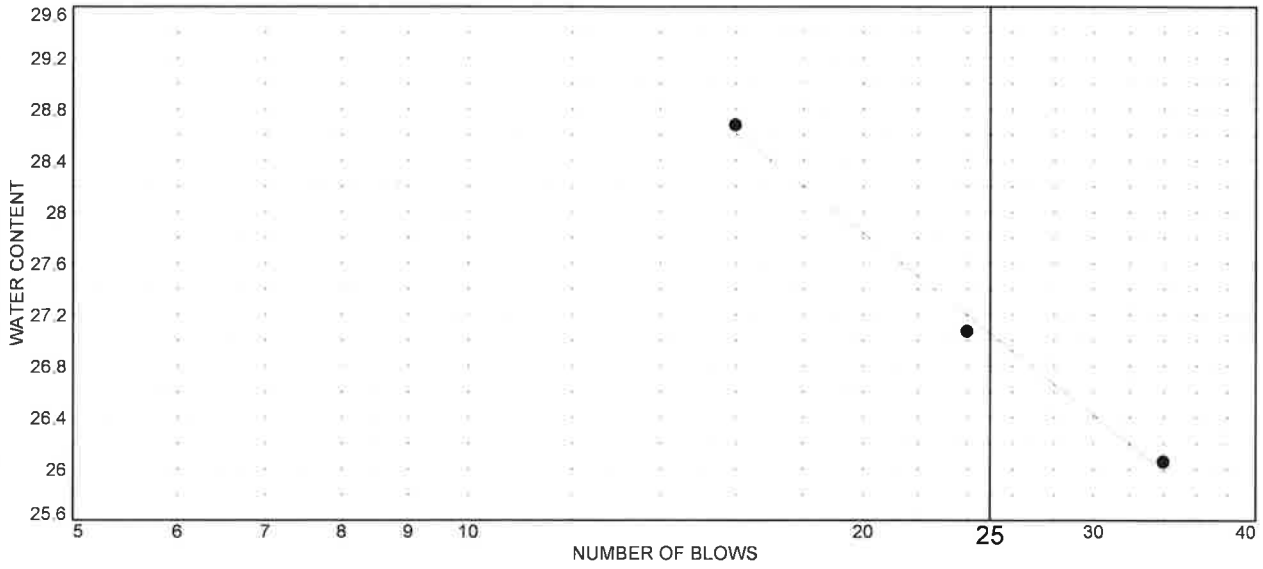
Remarks:
● Sampled by N. Garnica

Figure

Tested By: N. Garnica

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Reddish sandy lean clay, moist, stiff	27	18	9	81.2	52.7	CL

Project No. 7517-Ph02 **Client:** Calaveras County Water District

Project: CCWD Ebbetts Pass Reach 1 Water Transmission Pipeline Project

Remarks:
●Sampled by N. Garnica

Source of Sample: B-5 **Depth:** 2.5
Sample Number: 1

CONDOR EARTH TECHNOLOGIES INC.

Stockton, California

Figure

Tested By: N. Garnica

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

14 September, 2018

Job No. 1809063
Cust. No. 12016

Mr. Narciso Garnica
Condor Earth Technologies, Inc.
P.O. Box 3905
Sonora, CA 95370

Subject: Project No.: 7517
Project Name: Ebbetts Pass Reach 1 – Hwy 4
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Garnica:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on September 06, 2018. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Sample No.002 is classified as "corrosive", Sample No.001 is classified as "moderately corrosive" and the remaining samples are classified as "mildly corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations were none detected & 64 mg/kg and are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations reflect none detected with a reporting limit of 15 mg/kg.

The pH of the soils ranged from 5.76, to 6.80, which does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Any soils with a pH of <6.0 is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potentials ranged from 330 to 400-mV and are indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

for Steven Moore
J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Condor Earth Technologies, Inc.
Client's Project No.: 7517
Client's Project Name: Ebbetts Pass Reach 1 - Hwy 4
Date Sampled: 6-Sep-18
Date Received: 6-Sep-18
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 14-Sep-2018

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1809063-001	B1-2	330	6.80	-	4,600	-	N.D.	N.D.
1809063-002	B1-3	360	6.48	-	1,300	-	64	N.D.
1809063-003	B4-2	380	6.55	-	8,100	-	N.D.	N.D.
1809063-004	B5-2	400	5.76	-	8,600	-	N.D.	N.D.

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	13-Sep-2018	13-Sep-2018	-	13-Sep-2018	-	13-Sep-2018	13-Sep-2018

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Chain of Custody 1809063

Page 1 of 1

Concord, CA 94520-1006
925 462 2771
Fax: 925 462 2775
CERCO analytical

Job No.	CU#	Client Project I.D.	Schedule	Date Sampled	Date Due
757	120168		Analyte		

Full Name NARCISO GARNICA

Phone (209) 601 x 6851

Fax

Company and/or Mailing Address CONDOR EARTH

Cell ☒

Sample Source Ebbetts Pass Reach 1 - Hwy 4

Lab No.	Sample I.D.	Date	Time	Matrix	Contain.	Size	Preserv.	Qty.	Redox Potential	pH	Sulfate	Chloride	Resistivity-100% Saturated			Brief Evaluation						
									ANALYSIS													ASTM
001	B1-2	9/6/18	4:00pm	S	2.5x6 TUBE	2.5x6"	NONE	1	x	x	x	x	x			X						
002	B1-3	9/6/18	"	S	SEALED BAG	9x12	NONE	1	X	X	X	X	X			X						
003	B4-2	9/6/18	"	S	2.5x6 TUBE	2.5x6"	NONE	1	X	X	X	X	X			X						
004	B5-2	9/6/18	"	S	2.5x6 TUBE	9x12	NONE	1	X	X	X	X	X			X						

MATRIX: DW - Drinking Water; GW - Ground Water; SW - Surface Water; WW - Waste Water; Water; SL - Sludge; (S) Soil; Product

ABBREVIATIONS: HB - Hosebib; PV - Petcock Valve; PT - Pressure Tank; PH - Pump House; RR - Restroom; GL - Glass; PL - Plastic; ST - Sterile

SAMPLE RECEIPT: Total No. of Containers; Rec'd Good Cond/Cold; Conforms to Record; Temp. at Lab -°C; Sampler

Relinquished By: Narciso Garnica Date 9/6/18 Time 4:05pm

Received By: Kristy Pereira Date 9-6-18 Time 1406

Relinquished By: Date Time

Received By: Date Time

Relinquished By: Date Time

Received By: Date Time

Comments:

THERE IS AN ADDITIONAL CHARGE FOR EXTRUDING SOIL FROM METAL TUBES

Email Address: ngarnica@condorearth.com

CONDOR EARTH
21663 Brian Lane, P.O. Box 3905
Sonora, CA 95370
209.532.0361
Fax 209.532.0773
www.condorearth.com

TECHNICAL MEMORANDUM

TO: Jack Scroggs, KASL Consulting Engineers

FROM: Marc Crum, CEG (CA #2254), Condor Earth

DATE: July 26, 2018

PROJECT NO.: 7517

SUBJECT: **Geologic Mapping – Calaveras County Water District Ebbetts Pass Reach 1 Water Transmission Project**

PROFESSIONAL GEOLOGIST
Marc R. Crum
NO. 2254
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

DISCUSSION

On June 26, 2017, Condor Earth performed geologic mapping along the approximately 4.5 miles of planned Ebbetts Pass Reach 1 Water Transmission Pipeline alignment using pace and compass methods to identify positions on the Limits of Work base map by KASL Consulting Engineers (KASL). Based on information provided to us by KASL, "the existing pipeline is shown by a blue line on the base map. The new pipe will be placed as close as practical to the existing; either on the south side or the north side of the existing pipe and within +/- 5 feet."

During our field mapping, four rock types and three ground surface conditions where encountered. Calaveras Complex underlies a majority of the site. These rocks are overlain locally by Mehrten Formation and to a lesser extent by Valley Springs Formation. Crystalline bedrock is exposed in the road bed of ancillary roads in the Hunters Dam Road area. East of the Limits of Work, granitic bedrock is exposed. Ground conditions are typically cut or fill, and to a lesser extent at-grade. Based on our field mapping, we recommend the excavation of approximately 33 to 41 test pits within the attached Limits of Work to evaluate subsurface conditions along the alignment. The following sections provide a summary of our field observations and recommendations. References to stationing and locations are approximate. A summary of the recommended test pits and difficulty of excavation is also provided in Table 1 - Preliminary Excavation Difficulty for Backhoe/Small Excavator (attached).

ST 0+00 to 63+50
Calaveras Complex rock: primarily soft, weak, highly to completely weathered phyllite. Hard, moderately strong, moderately weathered bedrock is present from approximately Station 4+00 to 5+00. Ground surface conditions within the right-of-way (ROW) are primarily cut and to a lesser extent at-grade and fill. **Approximately five (5) to eight (8) test pits are recommended in this area.**

ST 63+50 to 75+50
Mehrten Formation rock: reworked volcaniclastic deposits containing moderately hard, moderately strong cobbles and boulder in a soft, weak matrix. Ground surface typically cut or at-grade. **Three (3) test pits are recommended in this area.**

ST 75+50 to 88+00
Calaveras Complex rock: soft, weak, highly to completely weathered phyllite. Ground surface conditions within the ROW are primarily cut and some fill. **One (1) to two (2) test pits are recommended in this area.**

ST 83+00
A shallow translational slope failure is present and hummocky topography indicative of an older slide surface is present. Also present are two water valves that may have influenced the shallow slope failure. Ground surface conditions are cut. **Two (2) test pits are recommended in this area.**

ST 88+00 to 122+00
Mehrten Formation rock: moderately hard, moderately strong cobbles and boulders in soft, weak matrix. Ground surface conditions are cut, fill, and at-grade. **Approximately four (4) to six (6) test pits are recommended in this area.**

ST 122+00 to 169+00
Calaveras Complex rock: soft, weak, highly to completely weathered phyllite. Hard, moderately strong, moderately weathered bedrock present from approximately Station 161+00 to 162+00. Ground surface conditions within the ROW are primarily cut with some fill and at-grade surfaces. **Approximately four (4) to six (6) test pits are recommended in this area.**

ST 169+00 to 175+50
Valley Springs Formation rock, weakly cemented tuff and ash, some clay, silt, and sand, generally soft, weak rock. Ground surface conditions are cut. **At least two (2) test pits recommended in this area.**

ST 175+50 to 230+00
Calaveras Complex rock: phyllite ranging from soft to hard, weak to moderately strong, completely to moderately weathered. Ground surface conditions within the ROW from to approximately ST 212+50 are primarily cut with some fill. The balance is fill from ST 212+50 to 230+00. **Test pits recommended in each of the five areas of moderately weathered bedrock: approximately seven (7) test pits total recommended.**

ST 230+00 to end of alignment
Crystalline bedrock ranging from soft to hard, weak to moderately strong, completely to moderately weathered. Ground surface conditions within the ROW are cut and at-grade. Rock is exposed are on the road bed of ancillary roads. To the east, beyond the Limits of Work, granitic bedrock is exposed. Ground conditions are cut and at-grade. **Two test pits recommended in each of the two areas of moderately weathered bedrock: five test pits total.**

Attachments: Table 1 - Preliminary Excavation Difficulty for Backhoe/Small Excavator
KASL Limits of Work, Sheets 1 Through 10

X:\Project\7000_prj\7517 CCWD Ebbetts Pass Pipeline\Correspondence\M 20180726 Geologic Mapping.docx

Table 1 – Preliminary Excavation Difficulty for Backhoe/Small Excavator

Station	Anticipated Trench Depth, ft.	Material Description	Anticipated Difficulty of Excavation	Recommended Number of Test Pits
ST 0+00 to 63+50	5-6	Generally soft, weak rock, hard, moderately strong locally	Easy to Moderate	5-8
ST 63+50 to 75+50	5-6	Moderately hard, moderately strong cobbles and boulder in a soft to weak matrix	Easy	3
ST 75+50 to 88+00	5-6	Generally soft, weak rock	Easy	1-2
ST 83+00	5-6	Landslide deposit	Easy	2
ST 88+00 to 122+00	5-6	Moderately hard, moderately strong cobbles and boulder in a soft to weak matrix	Easy	4-6
ST 122+00 to 169+00	5-6	Generally soft, weak rock, hard, moderately strong locally	Easy to Moderate	4-6
ST 169+00 to 175+50	5-6	Generally soft, weak rock	Easy	2
ST 175+50 to 230+00	5-6	Soft, weak rock, hard, moderately strong locally	Easy to Moderate	7
ST 230+00 to end	5-6	Soft to hard, weak to moderately strong	Moderate to Hard	5

CONDOR

CONSULTING
KASL
ENGINEERS

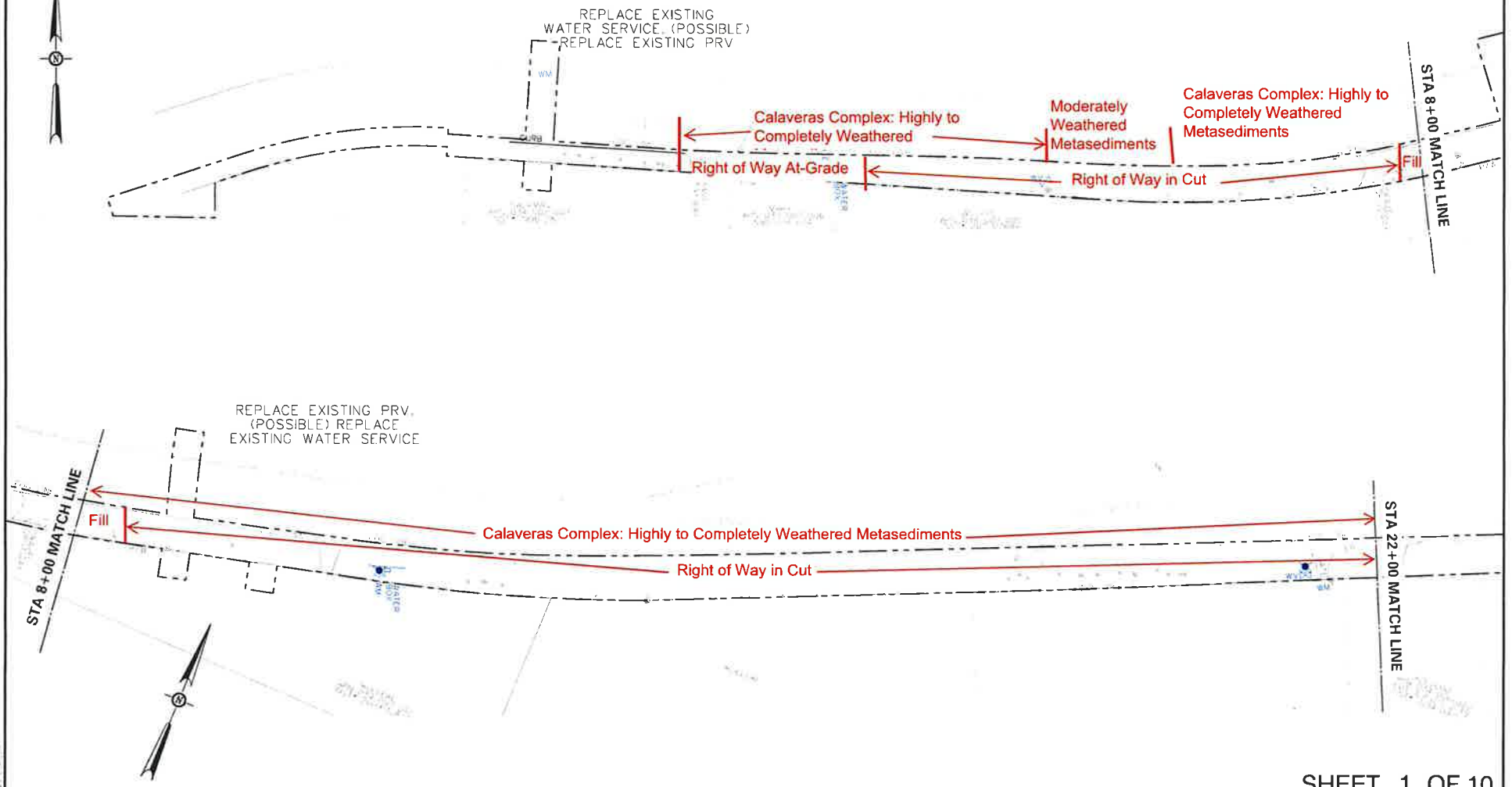
Limits of Work

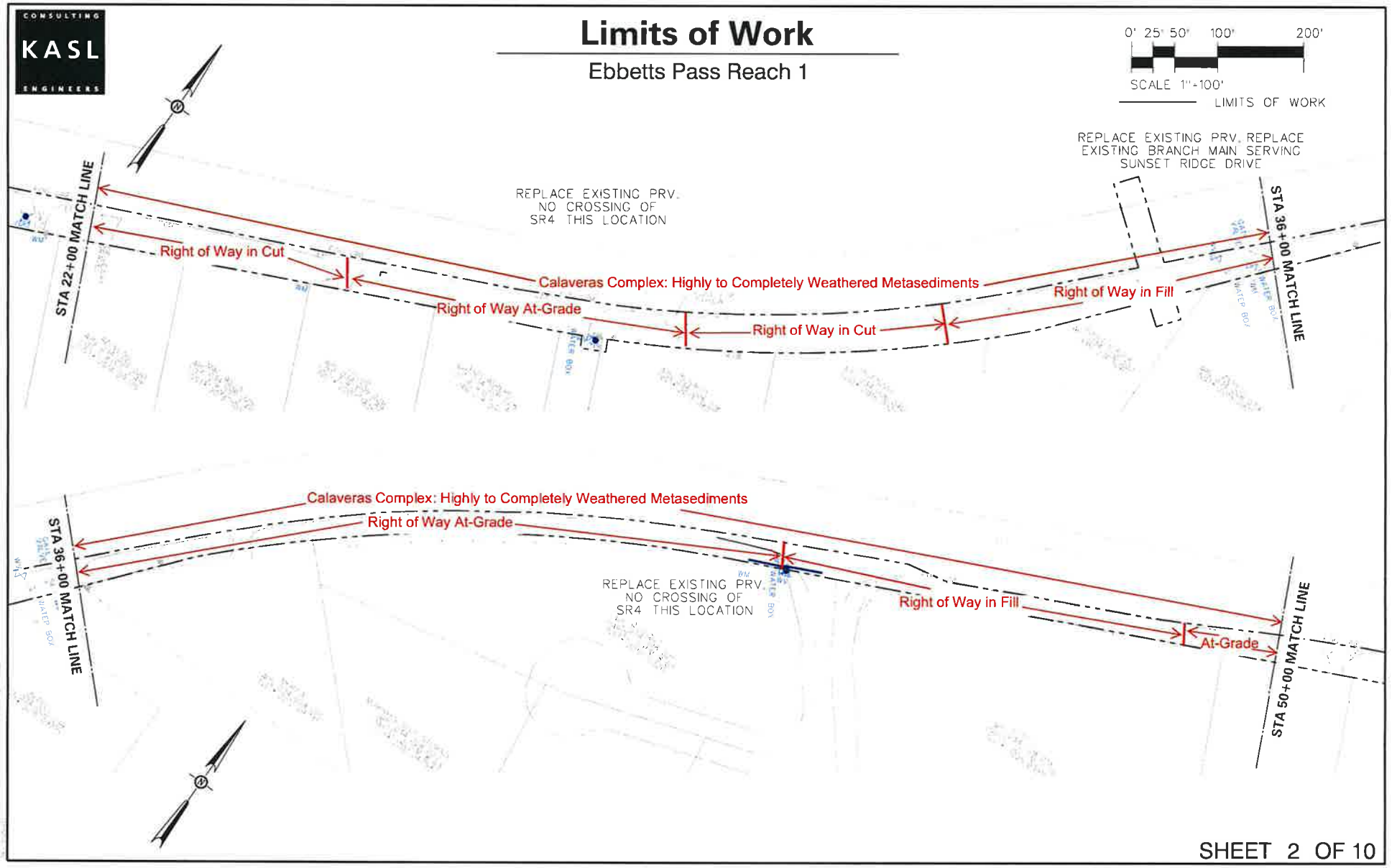
Ebbetts Pass Reach 1

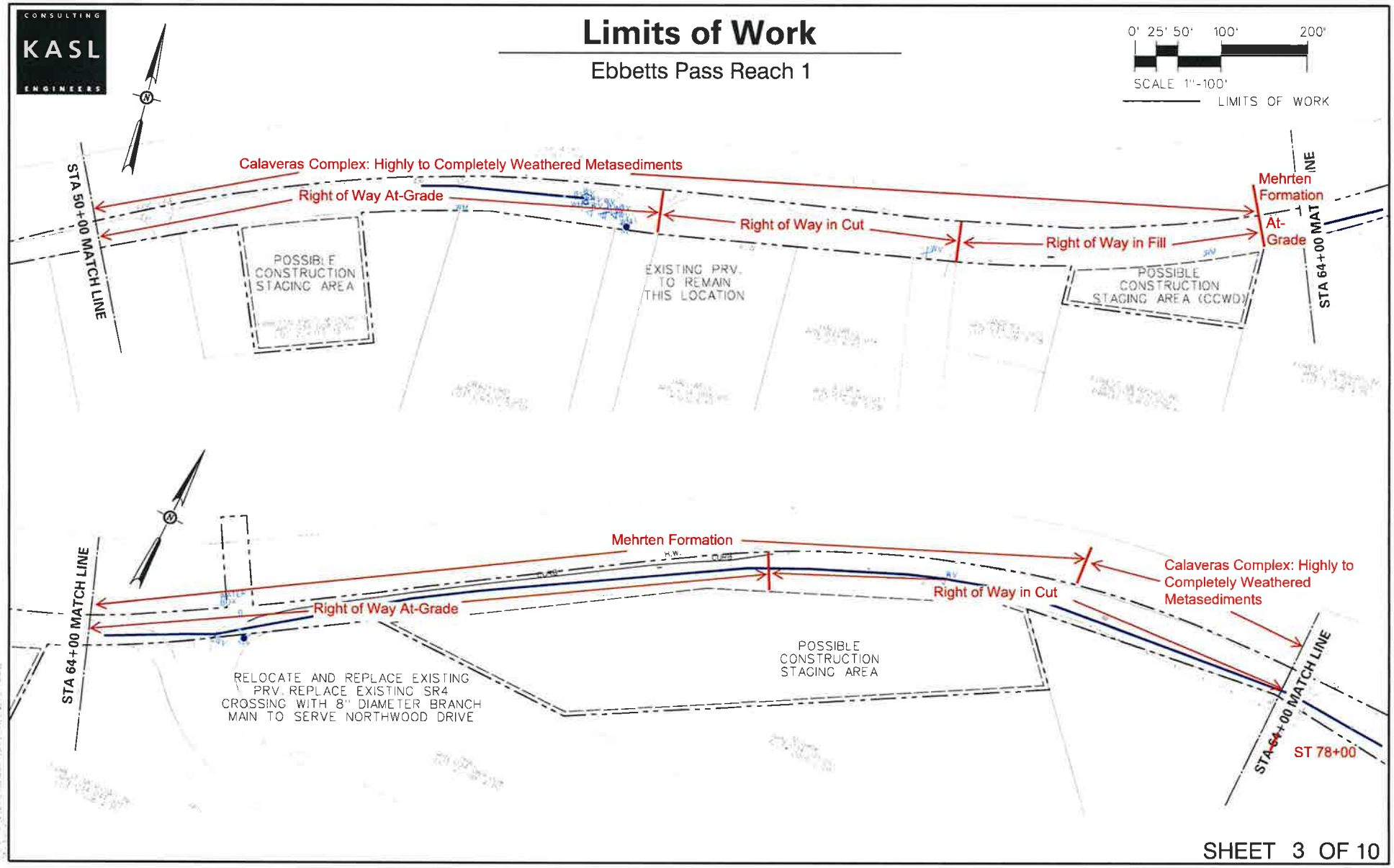
0' 25' 50' 100' 200'

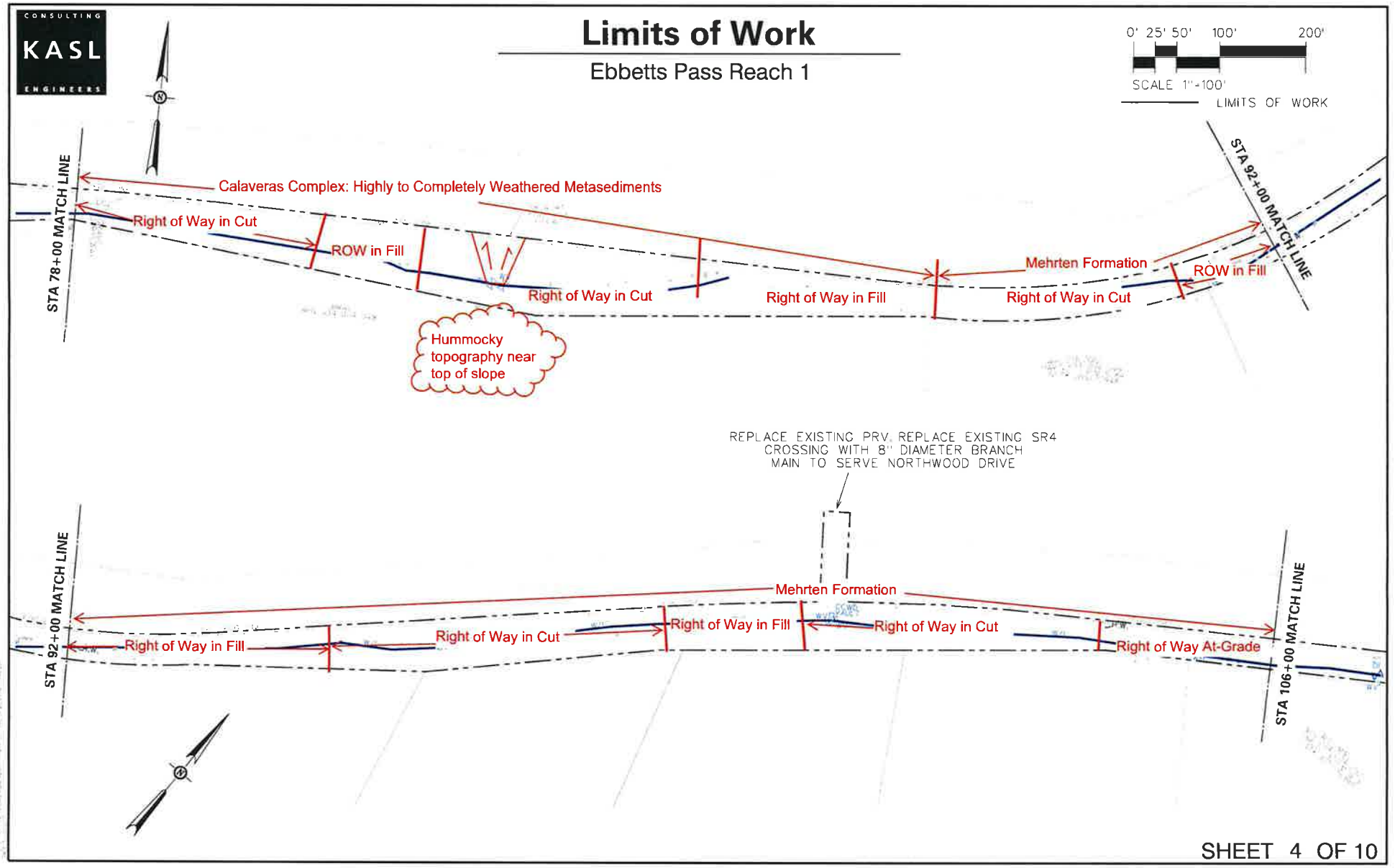
SCALE 1"=100'

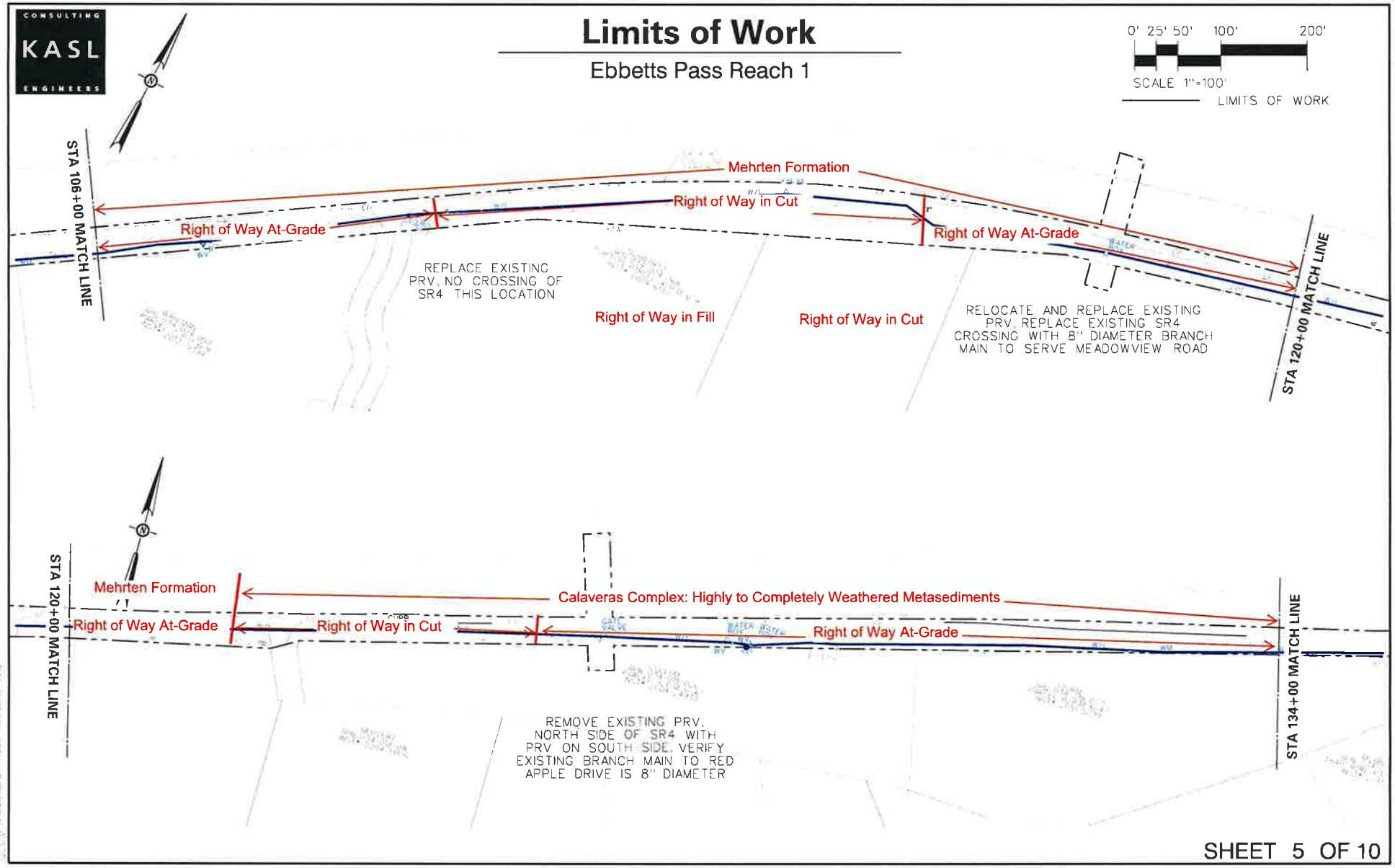
LIMITS OF WORK




CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
REPLACE EXISTING PRV, REPLACE EXISTING BRANCH MAIN SERVING SUNSET RIDGE DRIVE
REPLACE EXISTING PRV, NO CROSSING OF SR4 THIS LOCATION
STA 22+00 MATCH LINE
STA 36+00 MATCH LINE
Right of Way in Cut
Right of Way At-Grade
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Cut
Right of Way in Fill
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way At-Grade
STA 36+00 MATCH LINE
REPLACE EXISTING PRV, NO CROSSING OF SR4 THIS LOCATION
Right of Way in Fill
At-Grade
STA 50+00 MATCH LINE


CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way At-Grade
Right of Way in Cut
Right of Way in Fill
Mehrten Formation
At-Grade
STA 50+00 MATCH LINE
STA 64+00 MAT
INE
POSSIBLE CONSTRUCTION STAGING AREA
EXISTING PRV. TO REMAIN THIS LOCATION
POSSIBLE CONSTRUCTION STAGING AREA (CCWD)
Mehrten Formation
Right of Way At-Grade
Right of Way in Cut
Calaveras Complex: Highly to Completely Weathered Metasediments
STA 64+00 MATCH LINE
RELOCATE AND REPLACE EXISTING PRV. REPLACE EXISTING SR4 CROSSING WITH 8" DIAMETER BRANCH MAIN TO SERVE NORTHWOOD DRIVE
POSSIBLE CONSTRUCTION STAGING AREA
STA 64+00 MATCH LINE
ST 78+00
SHEET 3 OF 10


CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
STA 78+00 MATCH LINE
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Cut
ROW in Fill
Right of Way in Cut
Right of Way in Fill
Mehrten Formation
Right of Way in Cut
ROW in Fill
STA 92+00 MATCH LINE
Hummocky topography near top of slope
REPLACE EXISTING PRV, REPLACE EXISTING SR4 CROSSING WITH 8" DIAMETER BRANCH MAIN TO SERVE NORTHWOOD DRIVE
STA 92+00 MATCH LINE
Mehrten Formation
Right of Way in Fill
Right of Way in Cut
Right of Way in Fill
Right of Way in Cut
Right of Way At-Grade
STA 106+00 MATCH LINE
SHEET 4 OF 10


CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
STA 106+00 MATCH LINE
Mehrten Formation
Right of Way in Cut
Right of Way At-Grade
Right of Way At-Grade
REPLACE EXISTING PRV, NO CROSSING OF SR4 THIS LOCATION
Right of Way in Fill
Right of Way in Cut
RELOCATE AND REPLACE EXISTING PRV, REPLACE EXISTING SR4 CROSSING WITH 8" DIAMETER BRANCH MAIN TO SERVE MEADOWVIEW ROAD
STA 120+00 MATCH LINE
STA 120+00 MATCH LINE
Mehrten Formation
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way At-Grade
Right of Way in Cut
Right of Way At-Grade
REMOVE EXISTING PRV, NORTH SIDE OF SR4 WITH PRV ON SOUTH SIDE. VERIFY EXISTING BRANCH MAIN TO RED APPLE DRIVE IS 8" DIAMETER
STA 134+00 MATCH LINE

CONSULTING KASL ENGINEERS

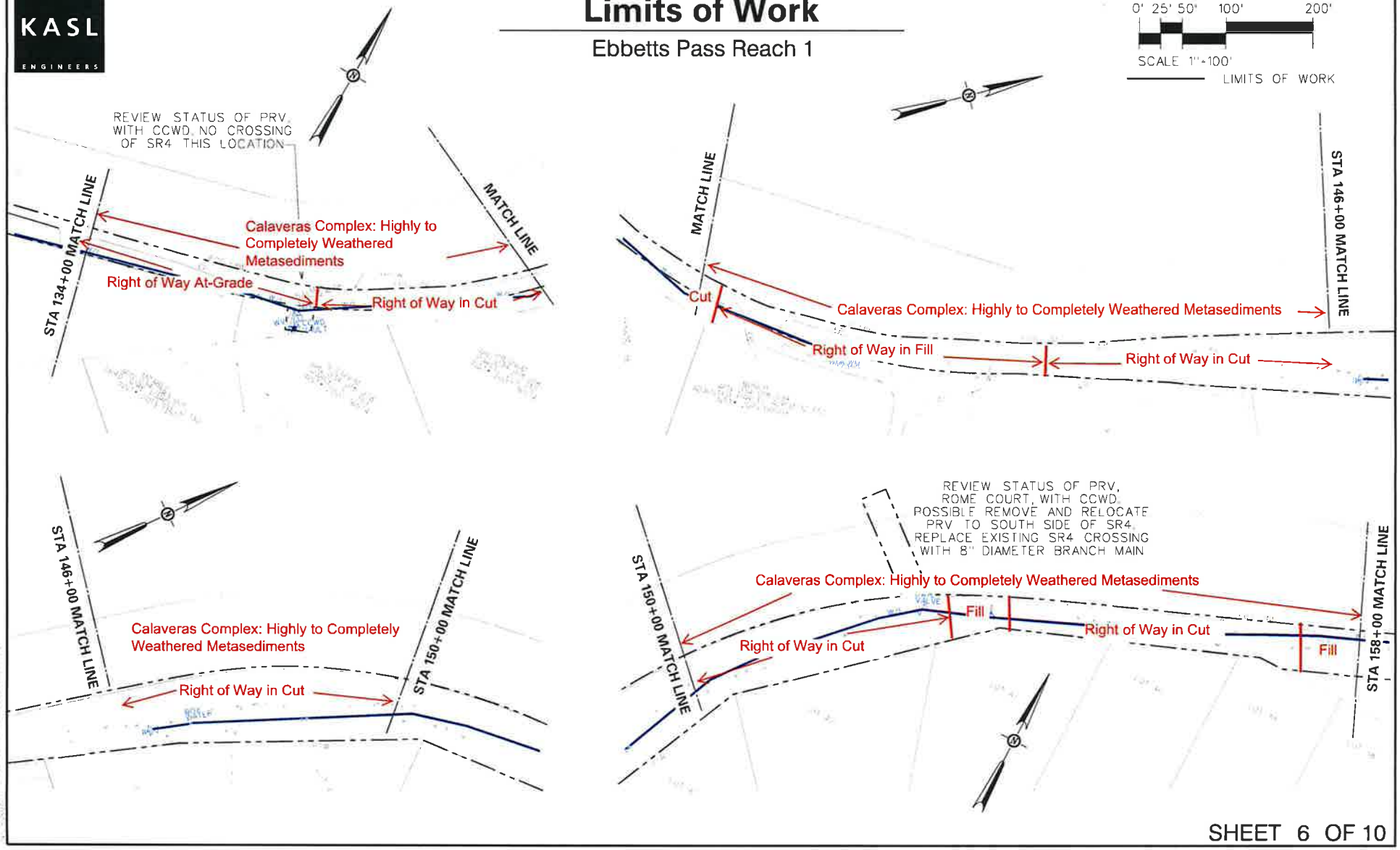
Limits of Work

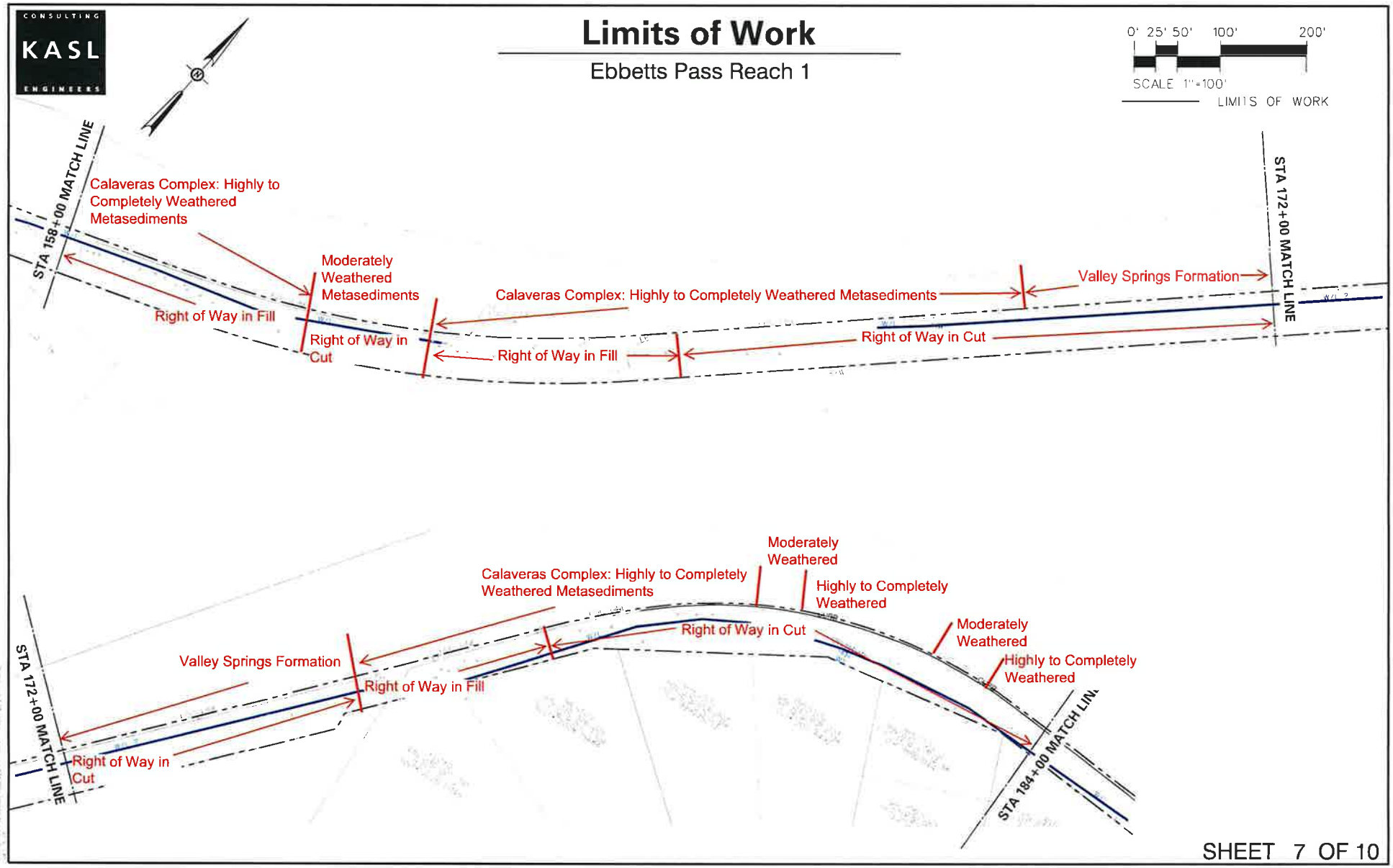
Ebbetts Pass Reach 1

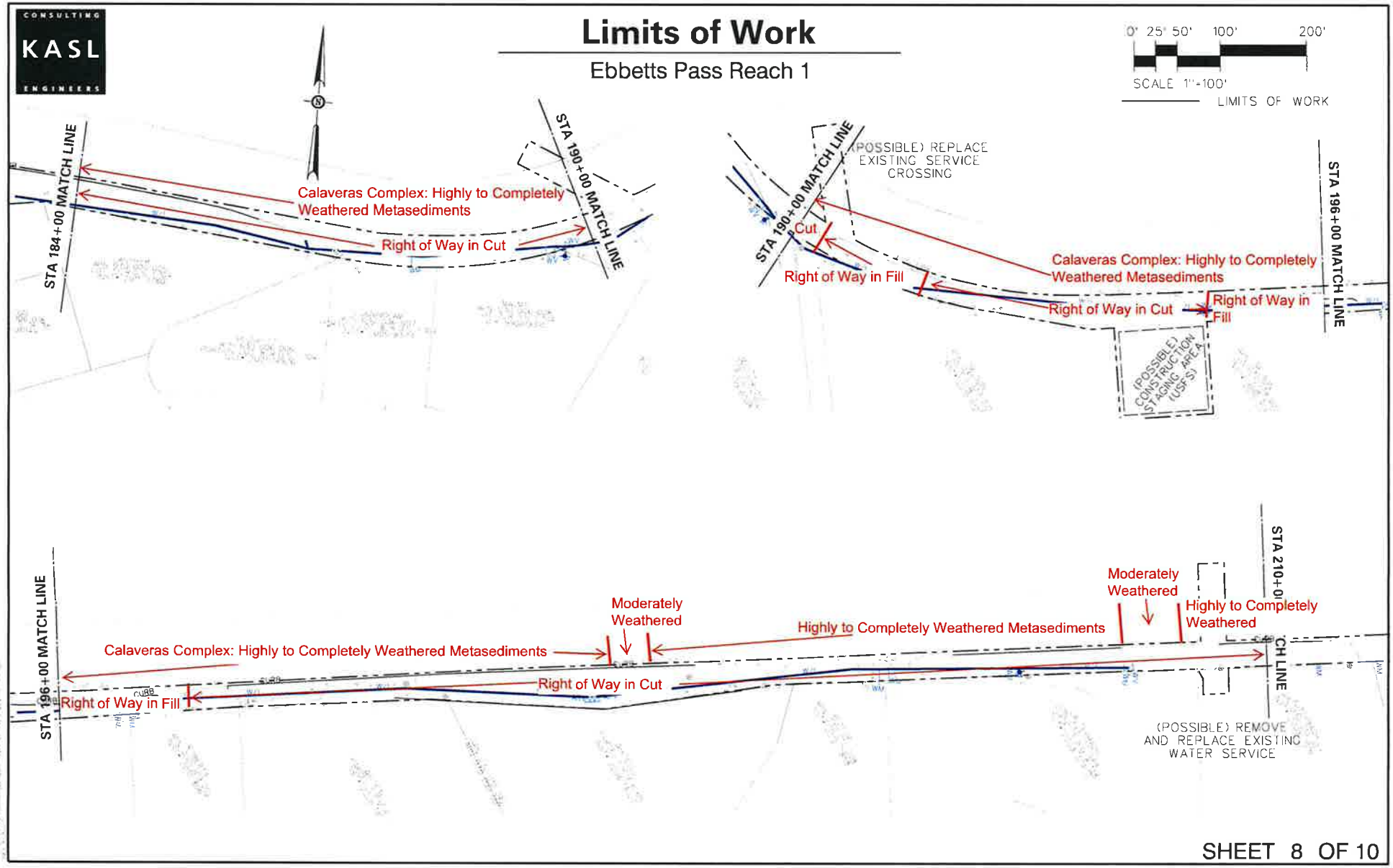
0' 25' 50' 100' 200'

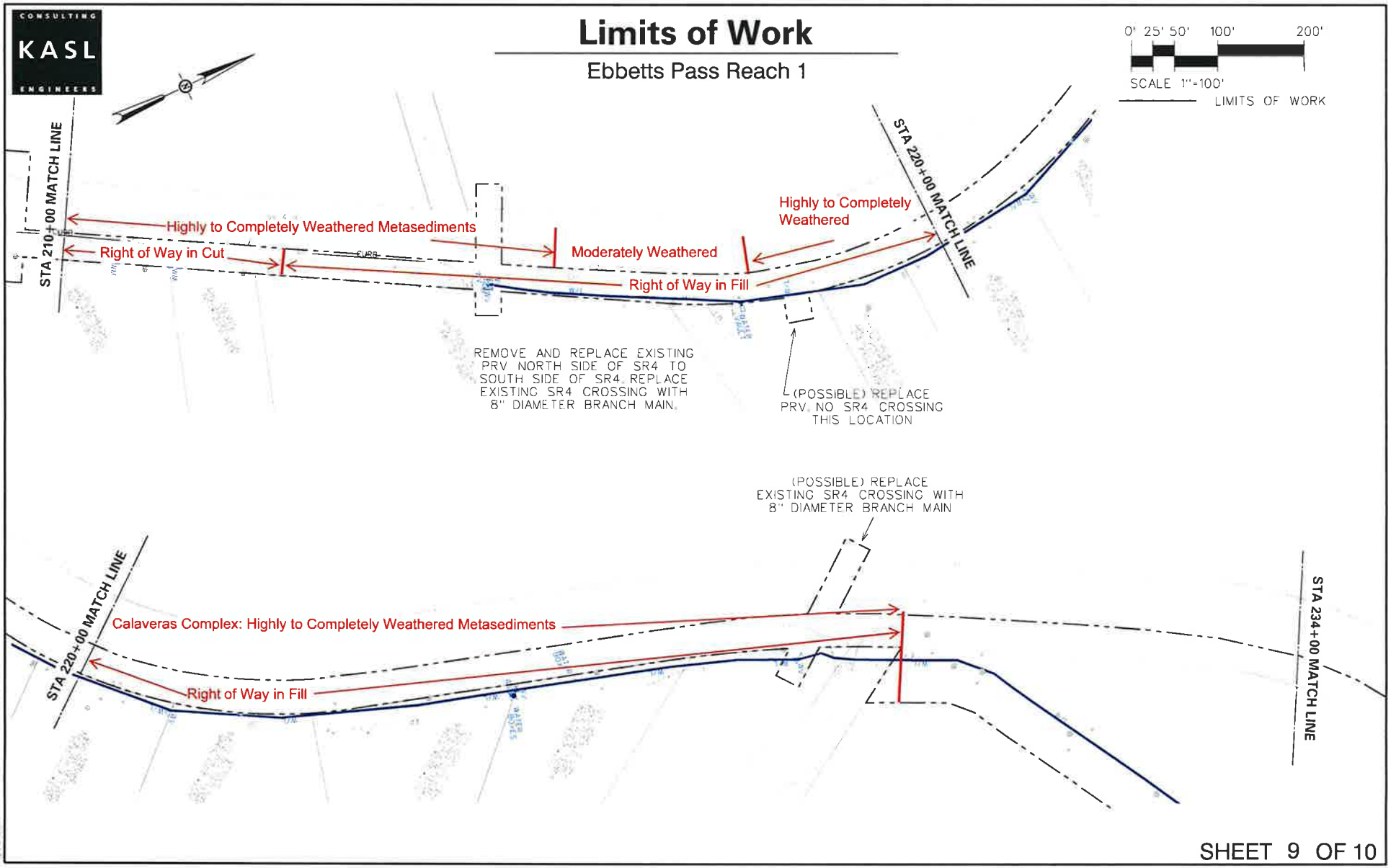
SCALE 1"=100'

LIMITS OF WORK




CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
STA 158+00 MATCH LINE
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Fill
Moderately Weathered Metasediments
Right of Way in Cut
Right of Way in Fill
Calaveras Complex: Highly to Completely Weathered Metasediments
Valley Springs Formation
Right of Way in Cut
STA 172+00 MATCH LINE
STA 172+00 MATCH LINE
Valley Springs Formation
Right of Way in Cut
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Fill
Moderately Weathered
Highly to Completely Weathered
Right of Way in Cut
Moderately Weathered
Highly to Completely Weathered
STA 184+00 MATCH LINE


CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
STA 184+00 MATCH LINE
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Cut
STA 190+00 MATCH LINE
(POSSIBLE) REPLACE EXISTING SERVICE CROSSING
STA 190+00 MATCH LINE
Cut
Right of Way in Fill
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Cut
Right of Way in Fill
STA 196+00 MATCH LINE
(POSSIBLE) CONSTRUCTION STAGING AREA (USFS)
STA 196+00 MATCH LINE
Calaveras Complex: Highly to Completely Weathered Metasediments
Moderately Weathered
Highly to Completely Weathered Metasediments
Right of Way in Cut
Right of Way in Fill
Moderately Weathered
Highly to Completely Weathered
STA 210+0 CH LINE
(POSSIBLE) REMOVE AND REPLACE EXISTING WATER SERVICE
SHEET 8 OF 10


CONSULTING
KASL
ENGINEERS
Limits of Work
Ebbetts Pass Reach 1
0' 25' 50' 100' 200'
SCALE 1"=100'
LIMITS OF WORK
STA 210+00 MATCH LINE
Highly to Completely Weathered Metasediments
Right of Way in Cut
Moderately Weathered
Highly to Completely Weathered
Right of Way in Fill
STA 220+00 MATCH LINE
REMOVE AND REPLACE EXISTING PRV NORTH SIDE OF SR4 TO SOUTH SIDE OF SR4. REPLACE EXISTING SR4 CROSSING WITH 8" DIAMETER BRANCH MAIN.
(POSSIBLE) REPLACE PRV. NO SR4 CROSSING THIS LOCATION
(POSSIBLE) REPLACE EXISTING SR4 CROSSING WITH 8" DIAMETER BRANCH MAIN
STA 220+00 MATCH LINE
Calaveras Complex: Highly to Completely Weathered Metasediments
Right of Way in Fill
STA 234+00 MATCH LINE

CONSULTING KASL ENGINEERS

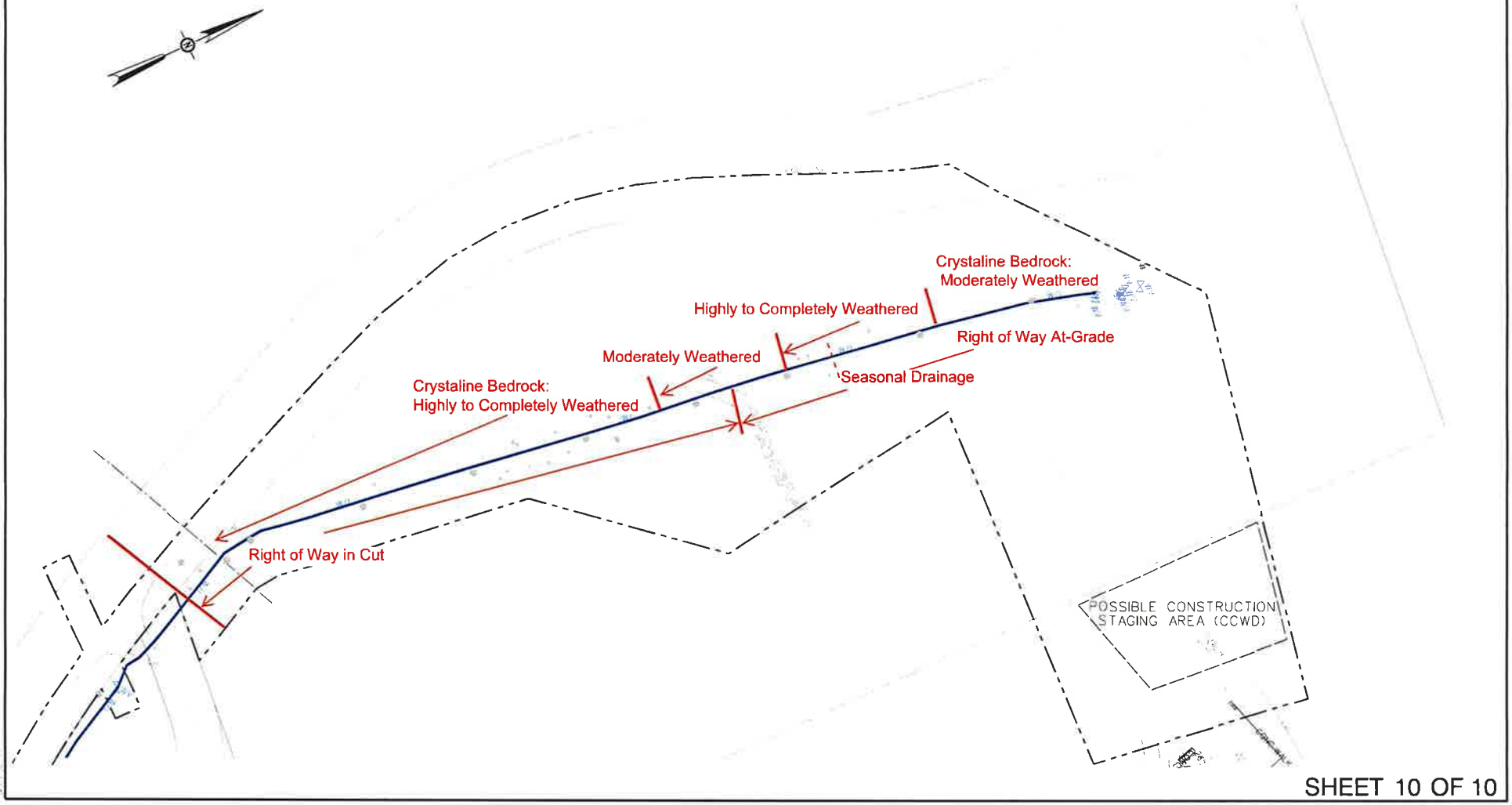
Limits of Work

Ebbetts Pass Reach 1

0' 25' 50' 100' 200'

SCALE 1"=100'

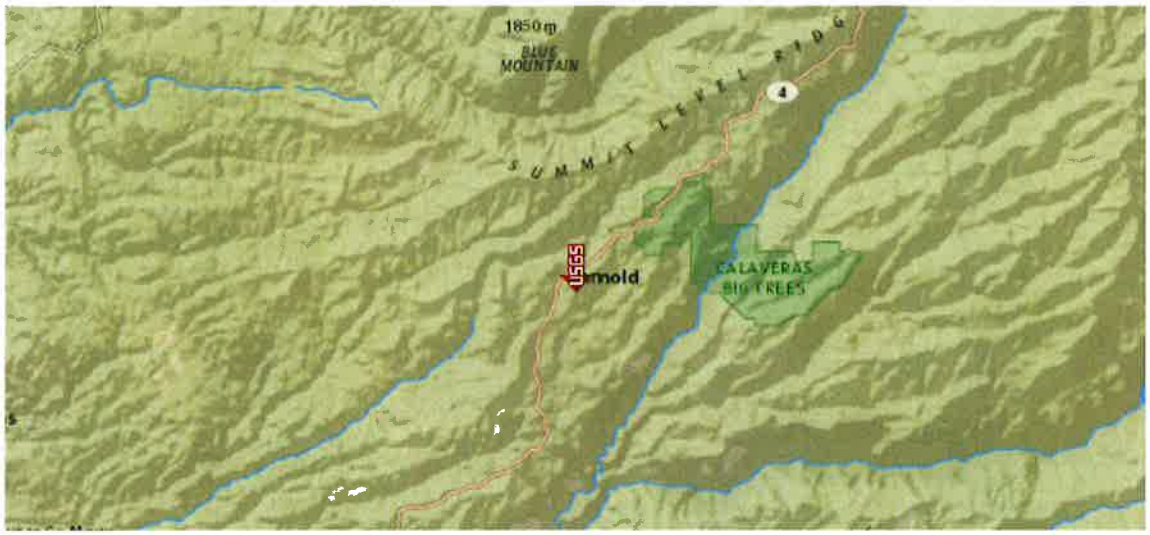
LIMITS OF WORK



USGS Design Maps Summary Report

User–Specified Input

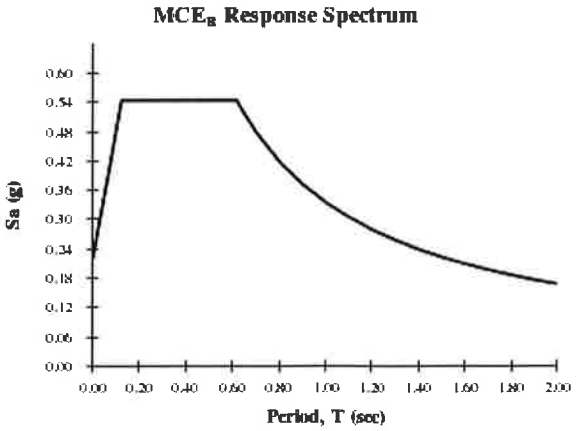
Report Title	Ebbetts Pass Pipeline Wed September 19, 2018 00:13:20 UTC
Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	38.25579°N, 120.35023°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"
Risk Category	I/II/III

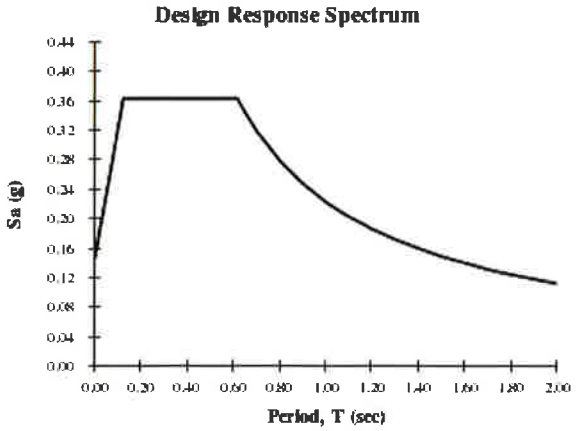


USGS–Provided Output

S_S =	0.453 g	S_{MS} =	0.544 g	S_{DS} =	0.363 g
S_1 =	0.211 g	S_{M1} =	0.335 g	S_{D1} =	0.223 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





USGS Design Maps Detailed Report

2012/2015 International Building Code (38.25579°N, 120.35023°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2012/2015 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From Figure 1613.3.1(1) [1]	S_S = 0.453 g
From Figure 1613.3.1(2) [2]	S_1 = 0.211 g

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1
SITE CLASS DEFINITIONS

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content w ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.453 g, F_a = 1.200

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1-s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.211 g, F_v = 1.589

Equation (16-37): $S_{MS} = F_a S_S = 1.200 \times 0.453 = 0.544$ g

Equation (16-38): $S_{M1} = F_v S_1 = 1.589 \times 0.211 = 0.335$ g

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39): $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.544 = 0.363$ g

Equation (16-40): $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.335 = 0.223$ g

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.363 g, Seismic Design Category = C

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.223 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = D

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 1613.3.1(1)*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf
2. *Figure 1613.3.1(2)*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf