GEOTECHNICAL DESIGN REPORT
PLACERVILLE DRIVE AT HANGTOWN CREEK BICYCLES AND PEDESTRIAN FACILITIES: PHASE I
CITY OF PLACERVILLE, CALIFORNIA
CAPITAL IMPROVEMENT PROJECT NUMBER 41816

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HDR Project No. 10324503 /
HDR|WRECO Project No. P18112
October 2025

October 17, 2025

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Attention: Jeff Elmensdorp, PE
Senior Project Engineer

Subject: Geotechnical Design Report
Placerville Drive at Hangtown Creek Bicycles and Pedestrian Facilities: Phase I
City of Placerville, California
Capital Improvement Project #41816
HDR Project No. 10324503 / HDR|WRECO Project No. P18112

Dear Mr. Elmensdorp:

HDR (previously HDR|WRECO) is pleased to submit our Geotechnical Design Report for the Placerville Drive at Hangtown Creek Bicycles and Pedestrian Facilities: Phase I Project (Project). This report was conducted and prepared in general conformance with the scope of work prepared by HDR for the subject Project.

We would like to thank Dewberry and the City of Placerville for the opportunity to prepare this Geotechnical Design Report.

If you have any questions or wish to discuss this report in greater detail, please contact us at (916) 679-8700.

Sincerely,

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PLACERVILLE DRIVE AT HANGTOWN CREEK BICYCLES AND PEDESTRIAN FACILITIES: PHASE I
CITY OF PLACERVILLE, CALIFORNIA

1. INTRODUCTION

The City of Placerville (City) proposes to improve and increase bicycle and pedestrian interconnectivity within the City along Placerville Drive and Green Valley Road. The proposed Placerville Drive at Hangtown Creek Bicycles and Pedestrian Facilities: Phase I (Project), is located along Placerville Drive approximately 0.5 miles north of US 50, within the western portion of the City of Placerville. The improvements would consist of constructing sidewalks and Class II or Class IV bicycle facilities along Placerville Drive between Cold Springs Road and the Ray Lawyer Drive/Green Valley Road intersection. The Project would also construct sidewalks and Class II bicycle facilities along Green Valley Road, between Placerville Drive and Mallard Lane. Additionally, improvements will be made to El Dorado Transit bus stops within the Project limits. The general land use in the Project vicinity consists of commercial, residential, and business park uses. The existing roadway is classified as a "Minor Arterial Road" and accommodates an Average Daily Traffic between 11,000 and 15,000 vehicle trips per day.

The Project is partially funded through Congestion Mitigation and Air Quality (CMAQ) funds; therefore, the improvements from the Project must result in air quality benefits including but not limited to reduced Vehicle Miles Traveled, increased bicycle and pedestrian interconnectivity, and increased transit services and access to bus stops. The Project is also funded through the Active Transportation Program (ATP). The proposed bicycle and pedestrian improvements would also be designed to meet current applicable City, American Association of State Highway and Transportation Officials (AASHTO), and Caltrans design standards.

1.1 Project Description

1.1.1 Existing Conditions

Currently, the Project site along Placerville Drive consists of limited and intermittent sidewalk facilities, and sidewalk facilities are completely absent along Green Valley Road. The Project site also includes intermittent existing Class II bicycle facilities along Placerville Drive between Cold Springs Road and Ray Lawyer Drive/Green Valley Road intersection. Bicycle facilities are absent along Green Valley Road between Placerville Drive and Mallard Lane. Pedestrian and bicycle access along Placerville Drive and Green Valley Road within the Project site is interfered with by narrow shoulders, numerous driveways, intersections, pavement transitions, utilities, walls, fences, landscape features and drainage structures. At several locations within the Project site along Placerville Drive and Green Valley Road, privately owned fences, walls, and landscaping encroach into City-owned right-of-way. The Project site also includes existing transit stops that have limited sidewalk access. Existing land uses adjacent to the Project site include commercial, residential, and business park developments that have multiple accesses along Placerville Drive and Green Valley Road. These accesses would need to be maintained during and after construction. Placerville Drive has sporadically spaced and different types of existing streetlights within the Project limits, and there are some stretches with no street lighting. The sporadically spaced existing streetlights on Placerville Drive consist of some lights attached to PG&E power poles along with

a few stand-alone streetlights. There is intersection lighting on the signal poles at the Placerville Drive/Ray Lawyer Drive/Green Valley Road intersection and the Placerville Drive/Cold Springs Road intersection. There is currently no existing street lighting along Green Valley Road within the Project limits except at the intersections of Green Valley Road/Mallard Lane and Green Valley Road/Placerville Drive/Ray Lawyer Drive.

1.1.2 Proposed Conditions

The Project would establish sidewalk and bicycle facilities along both sides of Placerville Drive between Cold Springs Road and Ray Lawyer Drive/Green Valley Road intersection and would establish sidewalk and bicycle facilities along Green Valley Road between Placerville Drive and Mallard Lane. The Project would install sidewalks, curbs, gutters, ADA curb access ramps, bike lanes, and incidental drainage improvements. The proposed sidewalk improvements would provide increased connectivity to the existing transit stops, and improvements to the bus stops would also be implemented to make them ADA-compliant. Existing storm drain systems would be maintained, and additional storm drain inlets and curb cut drains would be installed to convey surface drainage. Trees that encroach on City right-of-way within the Project site would be trimmed, and tree removal is anticipated to complete construction of the Project. Tree removal would be coordinated with the City and would be conducted according to local, state, and federal standards. Work within the existing roadway is limited to removal of portions of the existing shoulder and pavement surface treatments and, therefore, would only require small amounts of full depth pavement reconstruction and mostly only minor grind and overlays with isolated dig outs. The Project would also include the construction of retaining walls and barrier curbs within the Placerville Drive corridor and relocation of existing utilities that conflict with proposed improvements. Surface drainage patterns within the Project area would generally remain unchanged, and existing storm drain inlets would be adjusted, as necessary. The Project will evaluate and repair/replace any aging or failed storm drain pipes in the Project limits. The Project would include removing the existing and sporadically placed streetlights along Placerville Drive and would install new streetlights along both sides of Placerville Drive and Green Valley Road. The existing intersection lighting would remain in place. The Project will add a crosswalk to the south side of the Placerville Drive/Ray Lawyer Drive/Green Valley Road intersection and includes potential modifications to the existing traffic signals at this intersection.

The Project would be constructed primarily within the existing City right-of-way and would require right-of-way acquisitions and easements from up to 30 parcels. Temporary construction easements would be needed to construct the retaining walls and driveway conforms. Several of the adjacent parcels have encroached into City right-of-way, and private retaining walls, signage, and landscaping that conflict with the proposed bicycle and sidewalk facilities may need to be removed and/or relocated as necessary.

Just beyond the southwest corner of the Green Valley Road/Debbie Lane intersection, there is a small open drainage area that underground drainage pipes run into and out of. The Project will be filling in this small open drainage area such that it will become a fully enclosed underground drainage system. The work within this open drainage area will be done outside of the wet/rainy season from May 1 to October 31 unless otherwise approved by CDFW and RWQCB.

1.1.3 Utility Relocation

Both existing underground and overhead utilities are present throughout the Project site. Anticipated underground utilities include communication, water, sewer, and electrical lines. Much of the anticipated underground utility work along Placerville Drive and Green Valley Road involves adjusting utility boxes, meters, and service lines for adjacent properties. Fire hydrant relocations are also anticipated to complete construction of the Project. Underground utilities that are in conflict with either the proposed improvements or construction activities would be relocated prior to or during construction. Two existing CMP drainage culverts that cross below Green Valley Road near Debbie Lane and A&A Road may be replaced as part of the work to widen and realign Green Valley Road to accommodate the new sidewalks and bicycle lanes.

Overhead utilities at the Project site include communication and electrical distribution lines. The lines primarily run parallel along Placerville Drive and Green Valley Road but frequently run perpendicular to the roadways to provide service to the residences and commercial developments. Utility poles and both overhead communication lines and electrical distribution lines would need to be relocated prior to construction if they are determined to conflict with either the proposed improvement or construction activities.

1.2 Report Scope

HDR has prepared this Geotechnical Design Report to summarize the geotechnical investigation and recommendations for the Project. The report includes the following contents:

- An overall discussion of the Project description
- The scope of work performed as part of this study
- A brief discussion of the regional and local geology and how it relates to the proposed improvements
- A description of the soils and rock encountered in the borings
- Results of the soil laboratory testing
- Recommendations for a new pavement structural section using hot mix asphalt (HMA)
- Recommendations for new pavement tie-ins with the existing pavement sections
- Recommendations for new concrete flatwork (curb, gutter, and sidewalk)
- Recommendations for cutting the existing slopes at stable inclinations to facilitate the roadway bicycle lanes and sidewalk
- Foundation recommendations for the proposed retaining walls along the roadway alignment

This report was developed in general accordance with Caltrans Geotechnical Design Reports guidelines (Caltrans, 2021a). The Project site location is depicted and can be seen in relation to the surrounding natural and artificial features on Figure 1, Vicinity Map, included in Appendix I of this report. Elevations referenced within this report are based on the National Geodetic Vertical Datum of 1929 (NGVD 29), unless otherwise noted.

2. GEOTECHNICAL INVESTIGATIONS

2.1 Subsurface Explorations

2.1.1 Placerville Drive, October 2019

A field investigation was performed on October 7 and 8, 2019, to better define the subsurface soil and rock conditions along Placerville Drive. The investigation consisted of the advancement of six borings using auger and rotary drill equipment by V&W Drilling under the supervision of an HDR geologist and three hand auger borings by an HDR geologist. Soil and rock samples were described at the time of drilling using Caltrans' *Soil and Rock Logging, Classification, and Presentation Manual* (Caltrans, 2022). Detailed visual descriptions of the recovered soil samples are shown on the boring records as an attachment to this report. The borings are listed below in Table 1 and shown on Figure 2 in Appendix I. Details of the investigation for the adjacent Placerville Drive at Hangtown Creek Bridge Replacement Project can be found in the Foundation Report prepared by HDR (HDR, 2025a).

Table 1. Summary of Subsurface Exploration, October 7–8, 2019

Boring ID	Latitude, Longitude* (Decimal Degrees)	Surveyed Surface Elevation** (feet)	Drilled Depth (feet)	Drilling Equipment	Drilling Method	Hammer Type, Energy Efficiency
R-19-001	38.7332º, –120.8309º	1,671	7.0	Central Mine Equipment (CME) 55 HT	6-inch hollow stem auger (HSA) above 4-foot depth, rock core below this	140-pound auto hammer with 30-inch drop, 84.9%
R-19-002	38.7335°, –120.8289°	1,678.5	18.0		6-inch HSA above 8-foot depth, rock core below this	
A-19-004	38.7333°, –120.8298°	1,687	1.0		6-inch HSA	
R-19-005	38.7261°, –120.8366°	1,730	26.0		6-inch HSA above 16-foot depth, rock core below this	
A-19-006	38.7305°, –120.8352°	1,706	26.5		6-inch HSA	
HD-19-007	38.7322°, –120.8331°	1,657	5.0	Geoprobe Model #202838 3-inch-diameter hand auger	Hand augering/ shoveling with SPT split spoon sampler	45-pound hammer with 18-inch drop, 60% (assumed)
HA-19-008	38.7325°, –120.8324°	1,659	5.0			
HD-19-009	38.7328°, –120.8318°	1,661	5.0			

Notes: Table excludes Placerville Drive bridge replacement segment from Project Station 67+50.00 to 76+20.00.
* Coordinates were determined by Google Earth (Google Earth, 2024).
** Elevations were determined from the 2332.004-TP topographic survey (Dewberry, 2023a).

2.1.2 Green Valley Road, December 2023

An HDR field geologist conducted a subsurface geotechnical investigation on December 12, 2023, along the elevated ground adjacent to 7533 to 7559 Green Valley Road. This investigation was made to determine subsurface conditions for the proposed retaining wall and sidewalk and associated concrete curb and gutter.

The investigation involved the completion of four hand auger borings: HA-23-001, HA-23-002, HA-23-003, and HA-23-004. The borings were logged, and the earth materials were classified by an on-site HDR representative as drilling progressed using the procedures in Caltrans' *Soil and Rock Logging, Classification, and Presentation Manual* (Caltrans, 2022). A summary of the borings is presented in Table 2, and locations are shown on Figure 2 in Appendix I.

Table 2. Summary of Subsurface Investigation, December 12, 2023

Boring ID	Latitude, Longitude (Decimal Degrees) [1]	Surveyed Top of Hole Elevation [2] (feet)	Drilled Depth (feet)	Drilling Equipment
HA-23-001	38.7279°, –120.8382°	1,695	2.25	3-inch-diameter hand auger
HA-23-002	38.7281°, –120.8380°	1,694	1.5	
HA-23-003	38.7282°, –120.8379°	1,697	2.0	
HA-23-004	38.7285°, –120.8376°	1,703	2.2	

Notes: [1]Coordinates were determined by Google Earth (Google Earth, 2024).
[2]Elevations were determined from the 2332.004-TP topographic survey (Dewberry, 2023a).

2.2 Laboratory Testing

Laboratory soil testing for this study included a resistance value (R-values) test, as summarized in Table 3.

Table 3. Summary of Laboratory Testing

Boring ID	Sample Interval (feet)	Test	Test Standard
R-19-002	5.0–6.0	Sieve Analysis	ASTM D422/CT 202
		Atterberg Limits	ASTM D4318/CT 204
	11.5–12.1	Point Load Testing	ASTM D5731
	13.5–13.9	Point Load Testing	ASTM D5731
	17.5–17.7	Point Load Testing	ASTM D5731
R-19-005	10.0–11.5	Sieve Analysis	ASTM D422/CT 202
		Atterberg Limits	ASTM D4318/CT 204
	17.0–17.6	Point Load Testing	ASTM D5731
	25.0–25.25	Point Load Testing	ASTM D5731
A-19-006	10.0–11.5	Sieve Analysis	ASTM D422/CT 202
		Atterberg Limits	ASTM D4318/CT 204
HA-19-008	0.0–5.0	Sieve Analysis	ASTM D422/CT 202
		Atterberg Limits	ASTM D4318/CT 204
		R-Value	CT 301
HA-23-001	0.6–2.25	pH and Min. Resistivity	CT 643
		Sulfate	CT 417
		Chloride	CT 422

Notes: ASTM = American Society for Testing and Materials; CT = California Test

Laboratory test reports are provided in Appendix III. The results of the R-value and corrosivity testing are further discussed in Sections 4.2.1 and 4.2.2, respectively.

3. GEOTECHNICAL CONDITIONS

3.1 Geology

3.1.1 Regional Geology

The Project site is located within the Sierra Nevada Geomorphic Province of California (California Geological Survey [CGS], 2002). This province encompasses the Sierra Nevada Mountains and surrounding foothills. This province includes an area approximately 400 miles long bounded by the Basin and Range to the east, Cascade Ranges to the north, Great Valley to the west, and Mojave Desert to the south. The Coast Ranges and Transverse Ranges meet at the southernmost extremity of the Sierra Nevada. The Sierra Nevada is composed of a tilted fault block with a high and rugged eastern scarp and a gentle western slope that extends under the sediments of the Great Valley. Deep river canyons dissect the western slope, and the higher Sierra Nevada has been sculpted by glacial activity.

Existing fault zone systems within El Dorado County are concentrated in its western portion as the Foothill Fault Zone system, with several isolated faults in the central county area and the Lake Tahoe Basin.

3.1.2 Local Geology

Review of the Geologic Map of the Sacramento Quadrangle (California Division of Mines and Geology [CDMG], 1981) shows the majority of the Project site is underlain by plutonic Mesozoic-age granitic rocks (Mzg), which is described as predominantly granite to granodiorite. The east end of the Project is underlain by the Mariposa Formation (Jm) metasedimentary bedrock with Logtown Ridge Formation (Jlr) metamorphosed extrusive igneous bedrock mapped approximately 300 feet east of Cold Springs Road along Placerville Drive. Jlr bedrock is also mapped 200 feet north of Green Valley Road with Jm bedrock mapped 150 feet west of Placerville Drive near the Green Valley Road intersection; the bedrock classification in these areas is described as uncertain. The mapped contact between Mzg and Jm trends north from this Project area. Note that the mapping scale for this map is 1:250,000 and only delineates large areas of the rock and soil units.

Jm rocks are described as a late Jurassic-age metasedimentary rock formation consisting of slate, sandstone, conglomerate, and sedimentary breccia. Jlr bedrock is described as mid-Jurassic-age metamorphosed mafic breccias, flows, and pyroclastic and volcaniclastic rocks. The eastern Jlr bedrock area appears to be a southern extension of a north-south trending, overturned fold toward the east located approximately 4 miles north of the Project area.

The closest mapped fault is the pre-Quaternary-age, north-south trending Gillis Hill Fault[1], located approximately 1.2 miles to the east of the Cold Springs Road intersection. The closest late Quaternary-age fault is the north-south trending Bear Mountains Fault Zone, located about 5.3 miles west of the Green Valley Road intersection. Both the Gillis Hill Fault and Bear Mountains Fault Zone are part of the Foothill Fault Zone System. The Gillis Hill Fault separates the Jm formation, part of the Mother Lode Belt, from the Paleozoic-age Calaveras Complex (chert, argillite, and slate in the Placerville area) further to the east.

The Project site can be seen in relation to the published geology in the Regional Geologic Map, shown on Figure 3 in Appendix I.

3.2 Surface Conditions

The Project is located within the city of Placerville in El Dorado County. Placerville Drive has limited topographic changes within the Project limits. Placerville Drive at Cold Springs Road is at an approximate elevation of 1,705 feet with a gentle downward grade toward a localized low of 1,663 feet approximately 960 feet southwest of Pierroz Road. Placerville Drive then grades upward toward the southwest to a localized high elevation of 1,710 feet, located about 330 feet north of the Green Valley Road intersection, which is at an approximate elevation of 1,707 feet. The majority of the Placerville Drive segment appears to have been built on a relatively flat side slope along most of its length with a north-northwest facing embankment from the Placerville Drive Bridge over Hangtown Creek to the Green Valley Road intersection. The Green Valley Road surface segment slopes down toward the northwest to a localized low elevation at 1,689 feet

[1] Gillis Hill Fault is designated as the Melones Fault Zone south of US 50.

located approximately 75 feet southwest of Debbie Lane then grades upward toward the Mallard Lane intersection, which is at an elevation of 1,703 feet. Land adjacent to the roadway is predominantly rolling hills with some low cuts and fills.

Existing land uses adjacent to the Project area include commercial, residential, and business park developments that have multiple driveway accesses along Placerville Drive and Green Valley Road. Based on the Project utility and topographic maps (Dewberry, 2023a and 2023b), the following existing features were noted. Currently, the Project area along Placerville Drive consists of limited and intermittent sidewalk facilities. Sidewalks are not present along Green Valley Road. The Project area also includes intermittent existing Class II bicycle facilities along Placerville Drive between Cold Springs Road and the Ray Lawyer Drive/Green Valley Road intersection. Bicycle facilities are absent along Green Valley Road between Placerville Drive and Mallard Lane. Reportedly, at several locations along Placerville Drive and Green Valley Road, privately owned fences, walls, and landscaping encroach into the City's right-of-way. The Project area also includes existing transit stops that have limited sidewalk access.

Both existing underground and overhead utilities are present throughout the Project site. Anticipated underground utilities include communication, water, sewer, and electrical conduit. Overhead utilities along the Project site include communication and electrical distribution lines. The lines primarily run parallel along the northern side of Placerville Drive and Green Valley Road but frequently run perpendicular to the roadways to provide service to the residences and commercial developments. Utility poles and electrical utility lines are also located along the southern edge of Placerville Drive, east of Hangtown Creek.

Geologic hazards appear limited. No evidence of landsliding, soil creep, or settlement was observed along the corridor. Erosion appears restricted to steeper cuts, predominately along a cut along the south side of Placerville Drive starting approximately 400 feet west of the bridge over Hangtown Creek. This erosion was minor and limited to a shallow layer of soil on top of the cut.

3.3 Subsurface Conditions

The entire Project limits appear underlain by a thin layer of soil derived from underlying rock that grades to weathered rock. Some fills appear to exist but are limited in thickness and extent and are predominately pavement section materials. Table 4 summarizes the observed generalized subsurface conditions encountered in the Project area. Figure 2 shows the locations of the borings in the Project area (Appendix I).

Table 4. Summary of Encountered Soil and Rock (Borings from West to East)

Project Segment	Placerville Drive	Green Valley Road				Placerville Drive						
Boring ID	R-19-005	HA-23-001	HA-23-002	HA-23-003	HA-23-004	A-19-006	HD-19-007	HA-19-008	HD-19-009	R-19-001	A-19-004	R-19-002
Surveyed Surface Elevation [1] (feet)	1,730 [2]	1,695	1,694	1,697	1,703	1,706	1,657 [2]	1,659	1,661	1,671	1,687	1,678.5
Unit 1 - Fill	xx	Clayey Sand, Sandy Lean Clay	xx	xx	xx	3 inches of Asphalt over Clayey Sand	xx	xx	xx	Silty, Clayey Sand/ Silty Sand with 2.5-inch concrete layer near base	Gravelly Fat Clay with Cobbles	xx
Approximate Bottom Elevation of Unit 1 (feet)	xx	xx	xx	xx	xx	1,698.5	xx	xx	xx	1,666.5	1,686	xx
Unit 2 – Decomposed Bedrock	Silty Sand (SM), dense to very dense, moist	xx	Clayey Sand (SC), reddish yellow, moist	Clayey Sand (SC), light reddish brown, moist	Clayey Sand with Gravel (SC), reddish brown, wet below 1,701 feet	Clayey Sand (SC), yellowish brown, very dense	Clayey Sand (SC), reddish brown, moist	Clayey Sand with Gravel (SC), dark yellowish brown, moist	Sandy Lean Clay (CL), low/ medium plastic fines	xx	xx	Lean Clay (CL), dry over Clayey Sand (SC), very dense, moist
Approximate Bottom Elevation of Unit 2 (feet)	1,714	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	1,670.5
Unit 3 - Bedrock	Igneous Rock (Granite), 34% RQD grading to 27% RQD	xx	xx	xx	xx	xx	xx	xx	xx	Igneous Rock (Granite), 0% RQD, hard, mod. weathered	xx	Igneous Rock (Granite), 0% to 17% RQD
Boring Termination Depth (feet)	1,704	1,692.7	1,692.0	1,695.0	1,699.3	1,679.5	1,654.5	1,653	1,657.0	1,664	1,686	1,660.5

Notes: REC = recovery; RQD = rock quality designation; xx = not encountered
[1] Boring elevations are rounded to the closest whole integer.
[2] Boring location is outside surveyed area and is estimated based on photographs/field notes.

3.4 Groundwater

No free-flowing groundwater was found in the borings completed for this Project. Wet soil was found below a depth of 2 feet in Boring HA-23-004. This boring was made several days after a rain event and likely represents a perched condition.

Groundwater levels are anticipated to vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows into the local creeks, ground surface runoff, and other factors that may not have been present at the time of the investigation. Perched and/or transient groundwater may be encountered in any excavation along the Project limits.

3.5 Seismic Hazards

The Project site is located in a seismically active area of California. Potential geologic and seismic hazards for the site include seismic shaking (ground motion), subsidence, seismically induced landslides and settlement, liquefaction, and seismically induced lateral spreading.

3.5.1 Shear Wave Velocities

For the purposes of calculating seismic parameters for the proposed retaining walls, Borings A-19-006 and R-19-001 were used as listed in Table 5. These borings were selected to bracket the likely conditions along the corridor. The shear wave velocity (V_{s30}) for the upper 30 meters (98.4 feet) of soil profile is estimated based on the 2019 correlations from the Standard Penetration Test (SPT) samples performed at each boring. Due to the bedrock surface being at depth east of approximately Station 59+00, an assumed bedrock surface at an elevation of 1,661 feet was used to calculate the V_{s30} value from Boring A-19-006 since this results in a higher Horizontal Peak Ground Acceleration (HPGA). The V_{s30} value from R-19-001 is used for the Station 59+00 – 68+00 segment. These calculations are summarized in Table 5 and presented in Appendix IV.

Table 5. Representative Shear Wave Velocities (V_{s30})

Project Area	Boring ID	Elevation, feet (NGVD 29)	Calculated Shear Wave Velocity (V_{s30}), meters/second
Stations 45+00 – 59+00	A-19-006	1,706.0	326
Stations 59+00 – 68+00	R-19-001	1,671.0	497

Based on the Seismic Design Criteria (SDC) 2.0 (Caltrans, 2019), the soils at the site can be classified as Class S1.

3.5.2 Ground Motion Parameters

The seismic design parameters were developed following the Caltrans SDC, Version 2.0, and using the Caltrans Acceleration Response Spectrum (ARS) Online, Version 3.1.0 (Caltrans, 2023a) application. This analysis serves to present approximate seismic design parameters and to identify potential seismic hazards such as liquefaction and lateral spreading in accordance with the updated criteria. Table 6 and Table 7 list the design ground motion parameters, and the ARS outputs are presented in Appendix IV.

Table 6. Ground Motion Parameters, Stations 45+00 – 59+00

Site Location (decimal degrees)	Latitude: 38.7305°
	Longitude: –120.8352°
Assumed Site Shear Wave Velocity (V_{S30})	326 meters/second (1,069 feet/second)
Horizontal Peak Ground Acceleration (HPGA)	0.19*g*
Peak Spectral Acceleration (PSA)	0.48*g*
Period of PSA	0.3 seconds
Horizontal Seismic Coefficient (k_h) for Earth Retaining System (ERS) with Seismic Displacement Greater Than 2 Inches	0.06*g*
Horizontal Seismic Coefficient (k_h) for ERS with Seismic Displacement from 1 Inch to Less Than 2 Inches	0.10*g*
Soil Profile Classification	S1

There are three proposed concrete retaining walls within this segment of Placerville Drive. Based on the Caltrans guidance (Caltrans, 2023b), the benchmark horizontal seismic acceleration coefficient (k_h) should be one-third of the HPGA when the expected seismic displacement is greater than 2 inches. This value is applicable to Caltrans Standard Design retaining walls. Similarly, the Caltrans document recommends k_h to be one-half of the HPGA when the expected seismic displacement is from 1 inch to less than 2 inches.

Table 7. Ground Motion Parameters, Stations 59+00 – 68+00

Site Location (decimal degrees)	Latitude: 38.7332°
	Longitude: –120.8309°
Assumed Site Shear Wave Velocity (V_{S30})	497 meters/second (1,630 feet/second)
Horizontal Peak Ground Acceleration (HPGA)	0.17*g*
Peak Spectral Acceleration (PSA)	0.40*g*
Period of PSA	0.2 seconds
Soil Profile Classification	S1

3.5.3 Fault Rupture

The Project site does not lie within an Alquist-Priolo Earthquake Fault Zone, and active faulting has not been mapped as occurring across the Project site (CGS, 2024). The closest active fault is the Emerald Bay Fault Zone, which is located about 41.7 miles east-northeast of the Project site. The risk of ground surface rupture from known faults is considered nonexistent.

3.5.4 Other Seismic Hazards

Due to the low seismic acceleration potential, lack of shallow groundwater, and shallow depth to rock, the site is considered to not have the potential for liquefaction, lateral spreading, or seismically induced settlement. No large bodies of water exist near the site, and the potential for tsunami and seiches is nonexistent.

4. ANALYSES AND DESIGN

4.1 Project Design Information

4.1.1 Retaining Walls

Five retaining walls are planned for the Project; these are summarized in Table 8.

Table 8. Proposed Retaining Walls

Retaining Wall (RW) Number	Project Stationing (Estimated)[1]	Wall Type	Design Length	Design Maximum Height
RW 1	"P" line 45+45.45 Rt 42.41 to 46+40.96 Rt 28.34	Type 6B Case 2 and Type 6A Case 2	96’ 8”	6’ 0”
RW 2	“P” line 46 + 82.89 Rt 28.55 to 50+28.23 Rt 30.84	Type 6A Case 2 Modified	342’ 6”	9’ 0”
RW 3	“P” line 54+97.44 Lt 45.37 to 56+58.92 Lt 28.59	Block Wall MSE	163’ 8”	5’ 8”
RW 4	“P” line 57 + 04.45, Lt 33.38 to 57 + 88.98, Lt 30.61	Block Wall MSE	93’ 0”	7’ 0”
RW 5	“G” line 206+18.36, Lt 27.93 to 206+82.32 Lt 29.14	Caltrans Type 6A Case 2	64’ 0”	6’ 0”
Note: MSE = mechanically stabilized earth				

4.1.2 Pavement

Pavement design was based on traffic loading and pavement type information provided by R.E.Y. Engineers via email (R.E.Y. Engineers, 2023). Table 9 summarizes the values used for pavement designs in the Project area.

Table 9. Pavement Design Parameters

Location	Design Traffic Index (TI)	Flexible/Rigid Pavement	Predicted 2040 Average Daily Traffic Counts
Placerville Drive (West of Pierroz Road, Stations 37+00 to 67+50)	9.0–9.5*	Flexible	17,310
Placerville Drive (East of Pierroz Road, Stations 76+20 to 85+26)	8.5–9.0*	Flexible	11,256
Green Valley Road	8.5–9.0*	Flexible	4,610
Ray Lawyer Drive	8.5–9.0	Flexible	8,260
Pierroz Road	8.5–9.0	Flexible	N/A
Cold Springs Road	8.5–9.0	Flexible	N/A
Transit Stops** (PCC)	N/A	Rigid***	N/A
Transit Stops** (HMA)	N/A	Flexible	N/A
Parking Lot Drive Aisles	N/A	Flexible	N/A
Parking Lot Stalls	N/A	Flexible	N/A
Commercial Driveways (PCC)	N/A	Rigid	N/A

Source: R.E.Y. Engineers, Inc., 2023.
Notes:
* Design TIs reported by Fehr & Peers in *Placerville Drive Bicycle and Pedestrian Analysis Report,* 2019.
**El Dorado County Transit Authority is moving toward the use of zero emission buses, which are generally heavier than currently used buses.
***Project requirements are for the rigid pavement to be reinforced.
PCC = Portland cement concrete; HMA = hot mix asphalt

4.2 Soil Engineering Properties

4.2.1 Subgrade R-Value

Based on visual observations and laboratory results, the majority of Project limits are underlain by a layer of gravelly soils with varying sand and clay content. Decomposed to weathered rock is present at shallow depth at all locations explored. Materials recovered at most locations were too course to perform R-value testing. One soil sample was tested for an R-value, which is provided in Table 10. The tested soil type (clayey sand with gravel) is likely representative of the lower quality Unit 1 (fill) and Unit 2 (native) subgrade soils that will be encountered in the Project area and is conservative for areas with decomposed to weathered rock. Refer to Table 4 and Appendix II for additional soil descriptions. The R-value is higher than the maximum value of 50 allowed for design by Caltrans. Therefore, an R-value of 50 was selected for design.

Table 10. R-Value (ASTM D2844) Testing

Boring ID	Sample No.	Sample Depth (feet)	Soil Classification	Laboratory R-Value	Design R-Value
HA-19-008	S1	0.0–5.0	Clayey Sand with Gravel (SC)	75	50

Fill conditions are likely to vary along Placerville Drive. Only one boring (R-19-001) was located on Placerville Drive west of Station 59+00 that fully penetrated the mantling fill and native soils to bedrock. At this location, approximately 4 feet of fill, consisting of silty clayey sand with gravel grading to a very dense silty sand, was observed to be overlying a 2.5-inch-thick layer of Portland cement concrete (PCC), and soil overlying granitic rock was observed in Boring R-19-001. The roadway embankment further west from Boring R-19-001 is likely to have similar soil conditions but with varying fill depths and densities above the native soil and bedrock.

If the fill material is found to be unacceptable, this material is recommended to be replaced with structure fill as described in Section 7.1.1 below. Regardless, the upper 30 inches of any exposed pavement subgrades should be moisture-conditioned and compacted to at least 95 percent relative compaction using California Test (CT) 216 or 231, per Caltrans' *Standard Specifications* (Caltrans, 2024a). An R-value of 50 is recommended for design to reflect the potential subgrade condition.

4.2.2 Soil Corrosivity

Caltrans has the following definition of corrosive soils (Caltrans, 2021b):

> *"For structural elements, the Department considers a site to be corrosive if one or more of the following conditions exists for the representative soil and/or water samples taken at the site:*
>
> - *Chloride concentration is 500 ppm or greater,*
> - *Sulfate Concentration is 1,500 ppm or greater,*
> - *pH is 5.5 or less."*

In addition to the conditions listed above, Caltrans requires that the structure backfill material for a mechanically stabilized earth (MSE) structure meet the following corrosion-related requirements:

- *Minimum resistivity 2000 ohm-cm*
- *Chloride concentration must be less than 250 ppm*
- *Sulfate concentration must be less than 500 ppm*
- *pH must be between 5.5 and 10.0*

HDR performed corrosive potential testing on one recovered representative soil sample as part of this study. The results are summarized in Table 11.

Table 11. Corrosive Potential Test Data

Sample Location	Depth (feet)	Minimum Resistivity (ohm-cm)	Soil pH	Chloride Content (ppm)	Sulfate Content (ppm)
HA-23-001	0.6–2.25	4,560	6.56	4.3	7.8
Note: ppm = parts per million					

Based on the corrosive potential testing result, the collected soil sample is considered noncorrosive as defined by Caltrans' 2019 *California Amendments to the AASHTO LRFD BDS, Eighth Edition* (Caltrans, 2025) and Caltrans' 2021 Corrosion Guidelines, Version 3.2 (Caltrans, 2021b). Laboratory results are presented in Appendix III.

5. RECOMMENDATIONS

The following recommendations are based on the improvements shown on the provided 100% Project Plans (Dewberry, 2025b; R.E.Y. Engineers, Inc., 2025).

5.1 New Structural Pavement Sections

Recommendations for the various new pavement sections have been provided in Table 12 using the design parameters listed in Table 9. Flexible structural pavement design alternatives were determined using the Caltrans spreadsheet Automated Flexible Pavement Design (May 31, 1996, Version 7.0), which uses the Gravel Equivalent (GE) Methodology. Pavement section calculations are provided in Appendix IV for each TI modeled. The pavement section recommendations assume that the pavement will be fully drained and not subject to inundation.

Pavement design and construction should conform to the HMA, PCC, Class 2 aggregate base, and Class 2 aggregate subbase requirements of Caltrans' *Standard Specifications* (Caltrans, 2024a). Native material or import fill used below the new pavement sections should possess an R-value equivalent to or greater than the design R-value of 50.

Table 12. New Structural Pavement Sections

Location/Description	Design Traffic Index (TI)	Flexible/ Rigid Pavement	PCC (inches)	Pavement Design; R-Value = 50 [2]			
				HMA (inches)	Class 2 Aggregate Base (AB2) (inches)	Class 2 Aggregate Subbase (inches)	Section Thickness (inches)
Placerville Dr, West of Pierroz Rd (Stations 45+00.00 to 68+00.00)	9.0 [1]	Flexible	-	5.5	6.5	-	12.0
	9.5 [1]		-	6.0	6.5	-	12.5
Placerville Dr, East of Pierroz Rd (Stations 76+20.00 to 85+26.00)	8.5 [1]	Flexible	-	5.0	6.5	-	11.5
	9.0 [1]		-	5.5	6.5	-	12.0
Green Valley Rd	8.5 [1]	Flexible	-	5.0	6.5	-	11.5
	9.0 [1]		-	5.5	6.5	-	12.0
Ray Lawyer Dr	8.5	Flexible	-	5.0	6.5	-	11.5
	9.0		-	5.5	6.5	-	12.0
Pierroz Rd	8.5	Flexible	-	5.0	6.5	-	11.5
	9.0		-	5.5	6.5	-	12.0
Cold Springs Rd	8.5	Flexible	-	5.0	6.5	-	11.5
	9.0		-	5.5	6.5	-	12.0
Transit Stops (CRCP)	N/A	Rigid	9.0 [3]	3.0 (base)	-	4.5	16.5
Transit Stops (JPCP)	N/A	Rigid	10.2 [4]	-	6.0	-	16.2
Transit Stops (HMA)	N/A	Flexible [5]	-	6.0	8.0	-	14.0
Parking Lot Drive Aisles [5]	6.0	Flexible	-	3.0	4.5	-	7.5
Parking Lot Stalls [6]	6.0	Flexible	-	3.0	4.5	-	7.5
Commercial Driveways (PCC)[7]	N/A	Rigid	6.0	-	2.0	-	8.0

Source: December 22, 2023, email from Dewberry
Notes: PCC = Portland cement concrete; HMA = hot mix asphalt; CRCP = continuously reinforced concrete pavement; JPCP = jointed plain concrete pavement
[1] Design TIs are based on 10- and 20-year TIs from the *Placerville Drive Bicycle and Pedestrian Analysis Report* (Fehr & Peers, 2019).
[2] R-value is based on R-value test report, HA-19-008, Sample No. 1 (0'–5'), of 75. Caltrans recommends that the maximum R-value be 50; a design value of 50 was selected.
[3] CRCP; minimum thickness is in accordance with Caltrans' *Highway Design Manual,* Table 623.1C(d) with HMA base (Table 623.1D) and Class 2 aggregate subbase (Table 623.1E) (Caltrans, 2023c).
[4] JPCP with dowel bars at transverse joints, minimum thickness per Caltrans' *Highway Design Manual,* Section 620-35, September 29, 2023.
[5] Per Sacramento Regional Transit Design Guidelines for Bus & Light Rail Facilities, September 2023, Section 7.4.5, Bus Stop Pavement (provided design has a TI of 10.0) (Sacramento Regional Transit, 2023).
[6] Per Caltrans' *Highway Design Manual,* Table 613.4B (Minimum TIs for Safety Roadside Rest Areas), Truck Parking Areas, 20-year pavement design life (Caltrans, 2023c).
[7] Per El Dorado County Standard Plan 103G (approved March 14, 1990), Commercial Driveway for Vertical Curb Locations. PCC is to be Class B 2,500 psi strength at 28 days; Class 2 AB is to be compacted to 95% of CT 216 or 231.

5.2 Curb, Gutter, and Sidewalks

For the proposed curb and gutter assembly, curb ramps, and barrier curbs, the existing subgrade should be prepared by removing any soft or yielding material to a depth of 6 inches then backfill with fill material (Specification Section 73-1.03B, Caltrans, 2024a) derived from either on-site native soils and/or imported soil. Subgrade fill material is recommended to be compacted to at least 95 percent as determined by CT 216 or 231 or ASTM D1557 and D2922.

At least 2 inches of Class 2 aggregate base should be placed under the proposed curb and gutter assembly, curb ramps, and barrier curbs. Class 2 aggregate base should conform to Section 26-1.02B of Caltrans' *Standard Specifications* (Caltrans, 2024a). Class 2 aggregate base material is recommended to be compacted to at least 95 percent as determined by CT 216 or 231 or ASTM D1557 and D2922.

5.3 Embankments

Planned fills are limited in height, and the following recommendations are for these minor embankment additions along the roadway that are on generally level ground. Current plans indicate that no embankments are proposed outside the areas of the proposed retaining walls. Embankment recommendations for areas in the replacement bridge segment will be provided in a separate report.

Proposed slopes are generally 2H:1V or flatter and are expected to be stable. Some minor slopes of 1.5H:1V are planned and are expected to be stable if less than 5 feet in height and if stormwater is directed away from these slopes. Appropriate erosion controls should be implemented to protect complete embankment faces and seeded to promote plant growth. No additional stability analyses are required if the embankments are constructed as recommended in this report. If future modifications require steeper or higher fill slopes, these embankments should not be constructed until additional stability analyses are performed to evaluate slope stability and provide additional recommendations.

5.4 Slope Stabilization and Landslide Mitigation

No slope stabilization or landslide mitigations are proposed.

5.5 Erosion Control and Scour Mitigation

Erosion control will be required in exposed subgrade areas and modified slopes. Erosion control measures shall be performed in accordance with Section 21, "Erosion Control," of Caltrans' *Standard Specifications* (Caltrans, 2024a).

Project features do not cross or run adjacent to a waterway, and scour is not a concern.

5.6 Rockfall Hazard Mitigation

No rock slopes or faces are present within the Project corridor, and proposed cuts are low and have no more than a 2H:1V completed angle. Therefore, no rockfall hazard mitigation is proposed.

5.7 Excavated Slopes

Excavated slopes planned for this Project generally include cuts into soil and rock for installation of retaining walls and minor 1.5H:1V to 2H:1V cuts to accommodate small changes to sidewalks. One larger cut is planned along the south side of Placerville Drive near the intersection with Pierroz Road that would be a cut into weathered rock. Slopes of 2H:1V up to 20 feet in height in dense/stiff soils and weathered rock are generally considered stable if stormwater is directed away from the slope face, and no further analysis was performed. Cut slopes of 1.5H:1V in weathered rock are generally considered stable, and completed cuts below 5 feet in height can be made without further review. Rock cuts taller than 5 feet should be reviewed by the geotechnical engineer to identify potentially unstable zones of rock and provide supplemental recommendations. It should be expected that rock cuts will not have a smooth completed surface, and some scaling of unstable blocks may be required. The completed cut faces can also be expected to experience some raveling/erosion after completion, and the use of straw rolls and hydromulch on soil cuts is recommended. Cuts for retaining walls are temporary, and the safety of these cuts, and need for shoring, should be evaluated by the contractor.

5.8 Reinforced Soil Slope

No reinforced soil slopes are present within the Project corridor.

5.9 Earth Retaining System – Retaining Walls

Five retaining walls are planned for the Project. These consist of two Caltrans Standard Plan retaining walls, one modified Caltrans Standard Plan retaining wall, and two masonry block retaining walls with geogrid soil reinforcement.

5.9.1 Caltrans Type 6 Retaining Walls

Borings at all wall locations indicate decomposed rock at proposed footing elevations. For all walls, the tallest design height sections were evaluated for bearing resistance and settlement. The Extreme, Strength, and Service Limit States were determined from the 100% Submittal design plans (Dewberry, 2025b) and using the Caltrans 2024 Standard Plans (Caltrans, 2024b). For the modified Type 6 wall, footing demands were provided by Dewberry via email on August 13, 2025 (Dewberry, 2025c). Foundation data for Type 6 walls are provided in Table 13 to Table 15.

Table 13. Extreme Limit State Foundation Data RW 1, RW 2, RW 5, Type 6 (Case 2)

Retaining Wall	Caltrans RW Type	Length	Maximum Design Height, H (feet)	Bottom of Footing Elevation (feet)	Footing Width, W	Minimum Footing Embedment Depth [1]	Effective Footing Width for Extreme Limit State, B' (feet)	Extreme Limit State Gross Uniform Bearing Stress, $q_{g,u}$ (ksf)	Extreme Limit State Factored Bearing Resistance, q_R (ksf) φ_b (q_N)=1.00
RW 1	6B Case 2	35’ 0”	6	1,695.25	5’ 11”	2’ 3”	4.0	2.8	13.4
RW 1	6A Case 2	61’ 8”	6	1,694.00 to 1,692.75	4’ 6”	2’ 3”	3.0	1.9	12.5
RW 2	6A Case 2 Modified	342’ 6”	9	1,689.5 to 1,676.25	7’ 0”	2’ 6”	4.1	2.4	14.1
RW 5	6A Case 2	64’ 0”	6	1,688.25 to 1,689.53	4’ 6”	2’ 3”	3.0	1.9	12.5

Notes:
Data reference: Dewberry, 2025b; Caltrans, 2024b
[1] Type 6: (1’ 0” min. [final grade to footing/wall joint] + 1’ 3” [footing thickness]) as required by Standard Plan B3-4A.
Caltrans = California Department of Transportation; RW = retaining wall; ksf = kips (1,000 pound-force) per square foot; ’ = ft = feet; ” = in. = inches

Table 14. Strength Limit State Foundation Data RW 1, RW 2, RW 5, Type 6 (Case 2)

Retaining Wall	Caltrans RW Type	Length	Design Height, H (feet)	Bottom of Footing Elevation (feet)	Footing Width, W	Minimum Footing Embedment Depth [1]	Effective Footing Width Strength Limit State, B' (feet)	Strength Limit State Gross Uniform Bearing Stress, $q_{g,u}$ (ksf)	Strength Limit State Factored Bearing Resistance, q_R (ksf) φ_b (q_N) φ_b= 0.45
RW 1	6B Case 2	35’ 0”	6	1,695.25	5’ 11”	2’ 3”	2.0	2.8	4.8
RW 1	6A Case 2	61’ 8”	6	1,694.00 to 1,692.75	4’ 6”	2’ 3”	4.1	1.0	6.1
RW 2	6A Case 2 Modified	342’ 6”	9	1,689.5 to 1,676.25	7’ 0”	2’ 6”	6.3	1.8	7.6
RW 5	6A Case 2	64’ 0”	6	1,688.25 to 1,689.53	4’ 6”	2’ 3”	4.1	1.0	6.1

Notes:
Data reference: Dewberry, 2025b; Caltrans, 2024b
[1] Type 6: (1’ 0” min. [final grade to footing/wall joint] + 1’ 3” [footing thickness]) as required by Standard Plan B3-4A.
Caltrans = California Department of Transportation; RW = retaining wall; ksf = kips (1,000 pound-force) per square foot; ’ = ft = feet; ” = in. = inches

Table 15. Service Limit State Foundation Data RW 1, RW 2, RW 5, Type 6 (Case 2)

Retaining Wall	Caltrans RW Type	Length	Design Height, H (feet)	Bottom of Footing Elevation (feet)	Footing Width, W	Minimum Footing Embedment Depth [1]	Effective Footing Width for Service Limit State, B' (feet)	Service Limit State Net Bearing Stress (ksf)	Calculated Settlement at Net Bearing Pressure (inches)	Total Permissible Settlement (inches)
RW 1	6B Case 2	35’ 0”	6	1,695.25	5’ 11”	2’ 3”	5.4	1.0	0.07	1
RW 1	6A Case 2	61’ 8”	6	1,694.00 to 1,692.75	4’ 6”	2’ 3”	4.3	0.4	0.01	1
RW 2	6A Case 2 Modified	342’ 6”	9	1,689.5 to 1,676.25	7’ 0”	2’ 6”	6.6	0.7	0.02	1
RW 5	6A Case 2	64’ 0”	6	1,688.25 to 1,689.53	4’ 6”	2’ 3”	4.3	0.4	0.01	1

Notes:
Data reference: Dewberry, 2025b; Caltrans, 2024b
[1] Type 6: (1’ 0” min. [final grade to footing/wall joint] + 1’ 3” [footing thickness]) as required by Standard Plan B3-4A.
Caltrans = California Department of Transportation; RW = retaining wall; ksf = kips (1,000 pound-force) per square foot; ’ = ft = feet; ” = in. = inches

5.9.2 MSE Walls

Retaining Walls 3 and 4 are proposed to be MSE walls with block-facing units. Design of block-faced retaining walls is supplier-specific, and a design providing soil reinforcing spacing and length will need to be provided by the contractor for review prior to construction. The following design requirements shall be used for design unless alternative values are provided for review and approval:

- MSE fill meeting the requirements of Caltrans “Structure Backfill” can use the soil pressures provided in Section 5.9.3.
- Subgrade soils at these locations will have similar or better properties than those shown in Section 5.9.3, and use of these values can be used for bearing checks.
- One-third PGA can be used for seismic global stability with a resistance factor of 1.0.
- A resistance factor of 0.9 (AASHTO BDS 22.5.8) can be used for bearing calculations.
- Surface water shall be directed away from the retained fill soils, back of facing, and not directed into back of facing drainage features.
- Bottom of wall facing and reinforced soil mass shall be a minimum of 2 feet below existing grade or 10 percent of design wall height unless an approved alternative is provided.
- Bottom of excavation to received reinforced fill shall be level to 2 percent into slope.

- All fill placed within the reinforced fill prism shall be compacted to a minimum of 95 percent of the maximum density using CT 216 and 231 or ASTM D1557 and D2922 methods.
- Face of wall shall be free-draining or provided a suitable back of wall drainage system. All drainage features shall be constructed with appropriate means to control fines migration. Acceptable methods include granular filters or filter fabric placed between wall face and retained soil.

5.9.3 Retaining Wall Lateral Earth Pressures

The proposed retaining walls shall be backfilled according to the construction techniques described in Section 19-3.03E, "Structure Backfill," of Caltrans' *Standard Specifications* (Caltrans, 2024a). Backfill should be compacted to a minimum of 95 percent of the maximum density using CT 216 and 231 or ASTM D1557 and D2922 methods. Fill placed within 5 feet of the back of retaining walls shall have a maximum expansive index (EI) of 50 and minimum sand equivalence (SE) of 20.

Provided that the retaining walls are backfilled with material conforming to the above requirements, these structures can be designed using the following soil properties and equivalent fluid pressures:

- Total unit weight of soil (γ_{tot}) = 120 pounds per cubic foot (pcf)
- Internal angle of friction (Φ) = 34 degrees
- Cohesion = 0 pounds per square foot (psf)
- Active equivalent fluid pressure = 34 pcf
- Passive equivalent fluid pressure = 350 pcf
- At-rest equivalent fluid pressure = 53 pcf

The retaining walls are considered to be yielding structures, would allow the development of active equivalent fluid pressures, and should be designed using active equivalent fluid pressures to determine the lateral soil loading on them. No additional seismic analysis is required for the retaining walls, as the footings would sit in either undisturbed native material or competent structural fill above existing ground.

5.9.4 Retaining Wall Drainage

Cantilever retaining walls shall be provided a wall drainage system similar to the one shown on the Caltrans 2024 Standard Plan*,* B0-3, Bridge Detail 3-1 (Caltrans, 2024b). Retaining wall drains should provide positive drainage to daylight and be maintained to prevent debris clogging and buildup of hydrostatic pressure. Block-faced retaining walls shall have a minimum 1-foot-wide, free-draining granular prism behind the facing blocks. The granular prism shall be composed of course sand to 0.75-inch angular gravel. The facing units shall have a texture or gaps between blocks sufficient to allow water to seep between blocks. Gaps between blocks should not be larger than 0.25 inch.

5.10 Sound Walls

No sound walls are proposed within the Project corridor.

5.11 Ground Improvement (Modification)

Ground modification technologies are geotechnical construction methods used to improve poor ground conditions. However, no ground improvement is anticipated, and unsuitable subgrade soils will be handled using standard excavation and fill methods.

5.12 Sign and Light Post Foundations

Several utility poles will need relocation. In addition, poles for new signage for pedestrian crossings and lighting are proposed. The site soils meet the minimum shear strength, friction angle, unit weight, and groundwater depth requirements for use of Caltrans Standard Plan pole foundations for installation on ground flatter than 2H:1V.

5.13 Instrumentation and Monitoring

No instrumentation or monitoring are required.

5.14 Other Considerations

5.14.1 Utilities

Numerous underground utilities and aboveground utilities exist within the Project corridor alignment. During construction, utilities must be protected, moved, or de-energized. Underground utilities that were not identified during this study might exist within the Project limits. The contractor should positively locate underground utilities prior to construction and protect or move the utilities as appropriate during construction. If utilities are to remain near or under load-bearing structures, supplemental recommendations by the Geotechnical Engineer of Record will be necessary.

6. NOTES FOR SPECIFICATIONS

The following should be considered when developing specifications for this Project:

- Cobble- and boulder-sized material may be present within existing soil and fills at the site, and the contractor should be prepared to remove oversized material.
- Variably fractured hard rock may be encountered in some areas of the Project.

7. NOTES FOR CONSTRUCTION

7.1 General

Excavation and fill placement work should be performed in accordance with Section 19, "Earthwork," of Caltrans' *Standard Specifications* (Caltrans, 2024a). Structure fill material shall comply with Section 19-6.02A (Caltrans, 2024a).

Site soils tend to be thin with rock at shallow depths. Site soils are considered generally rippable by typical heavy earthmoving equipment. Significant amounts of gravel and cobbles were occasionally encountered above rock. Typically, any unit that contains coarse gravel can contain scattered cobbles, and the presence of cobbles cannot be precluded at locations reporting presence of gravel.

7.1.1 Structure Fill Material

The placement of new fills should be in accordance with the recommendations of Section 19, "Earthwork," of Caltrans' *Standard Specifications* (Caltrans, 2024a).

Any material used as structure backfill should be approved by the Geotechnical Engineer of Record and meet the requirements outlined below, as per Section 19-3.02C, "Structure Backfill," of Caltrans' *Standard Specifications.* The material selected for structure backfill should be free of frozen soil, root mat material, organic and deleterious matter, rock particles larger than 1 inch, large pieces of cemented soils, and other deleterious matter. In addition, some blending of soils and removal of debris may be required to achieve a uniform soil consistency.

Fill material placed within 30 inches of the bottom of pavement sections should be nonexpansive and have an R-value of 50 or greater.

Based on our visual identification of the soils, supplemented with laboratory testing, our opinion is that on-site soils are potentially acceptable for reuse as structure or embankment backfill but may require blending to meet all requirements.

7.1.2 Site Preparation and Grading

The site preparation and grading operations for the proposed areas to receive new structure fill or/and pavement should commence with the removal of current improvements, vegetation, any surficial organic and loose soils, and other deleterious material until firm, generally unyielding subgrade soils are encountered. Clearing and grubbing operations should be performed in accordance with recommendations presented in this report and with the requirements specified in Section 19, "Earthwork," of Caltrans' *Standard Specifications* (Caltrans, 2024a). Any disturbed soils created by removal of structures or grading should be removed to expose firm, generally unyielding soils, and depressions should be backfilled with compacted fill.

Subgrade below planned new/replacement pavement sections should be scarified a minimum of 6 inches, moisture-conditioned to or up to 2% above optimum moisture, and compacted to a minimum of 95% of maximum compaction per ASTM D1557. Areas that cannot meet the compaction requirement should be removed until generally firm, unyielding soils are reached; replace with Class 2 AB compacted to a minimum of 95% of maximum compaction per ASTM D1557.

7.1.3 Excavations

If temporary excavations are required for construction, temporary slopes may be cut in dry soils at a maximum inclination of 1.5H:1V or be supported in accordance with California Division of Occupational Safety and Health (Cal/OSHA) recommendations for Type C soil (Cal/OSHA, 2019). No groundwater was encountered in the subsurface explorations, and cuts below groundwater are not anticipated. However, any cuts below groundwater would likely require shoring and possibly dewatering. It is the contractor's responsibility to assess the actual conditions in the field at the time of construction and to make its own interpretation of the Cal/OSHA soil type for design of the excavation and trench slopes or the need for excavation shoring.

Dewatering of excavations for retaining walls or utilities is not expected to be required for dry season construction. Nuisance water can be expected and is anticipated to be controlled by pumping. Surface water should be directed away from these excavations. Temporary erosion control measures, such as a flash coating, may be required for excavations if left open for extended periods.

7.1.4 Fill Placement and Compaction

Areas to receive new fill shall be graded level by cutting the existing soils to match the lowest elevation of the proposed cuts. Asphaltic concrete and/or PCC pavement should be either completely removed or pulverized in place and compacted prior to the placement of new fill material. Where new fill is to be placed onto existing fill slopes or natural slopes exceeding 5H:1V (i.e., behind the proposed retaining walls), the fill should be fully bonded into the existing slope by placing it on discrete horizontal benches. These benches should be cut fully into the slope and below any loose/soft or otherwise unsuitable materials, per Section 19 of the *Standard Specifications* (Caltrans, 2024a).

All fill should be placed and compacted in layers not exceeding 8 inches in uncompacted thickness, moisture-conditioned, processed as necessary, and compacted prior to the next lift. For fill placed within 30 inches of the bottom of pavement sections and used as structure backfill, a compacted density of not less than 95 percent of the maximum density (based on CT 216 and 231 or ASTM D1557 and D2922) should be obtained. Fills placed outside of these areas should be compacted to a minimum of 90 percent of maximum density (based on CT 216 and 231 or ASTM D1557 and D2922 methods). All fill should be placed at or up to 2 percent above optimum moisture content. The material should be either moistened or dried (depending on actual moisture content) and thoroughly mixed. Mixing should be performed by reprocessing to the full depth of the lift and compacted to achieve the minimum compaction requirement. Density readings should be taken at each lift prior to placing fill on the succeeding lift.

Utility trenches should be backfilled with compacted structural fill per City of Placerville and El Dorado County requirements. Special care should be taken during backfill of soils located above any existing utility lines that run underneath the site. The capacity of existing lines should be evaluated, and measures, taken to address additional stresses due to construction activities. In this regard, the contractor should be aware of the location of all utility lines and take extra precautions when placing and compacting fill soils in the vicinity of utilities. It may be necessary to reduce the compaction effort, directly over the top of the utility, depending on the capacity of the existing lines to accommodate the expected compaction loads. We recommend that a representative of the Geotechnical Engineer provide continuous on-site observation and testing during excavation, subgrade preparation, and placement of structural fill to document compliance with the recommendations contained herein.

8. REFERENCES

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9. REPORT COPY LIST

This report was prepared for the City of Placerville for the design of the Placerville Drive at Hangtown Creek Bicycles and Pedestrian Facilities: Phase I Project. Copies of this report have been provided to Dewberry.

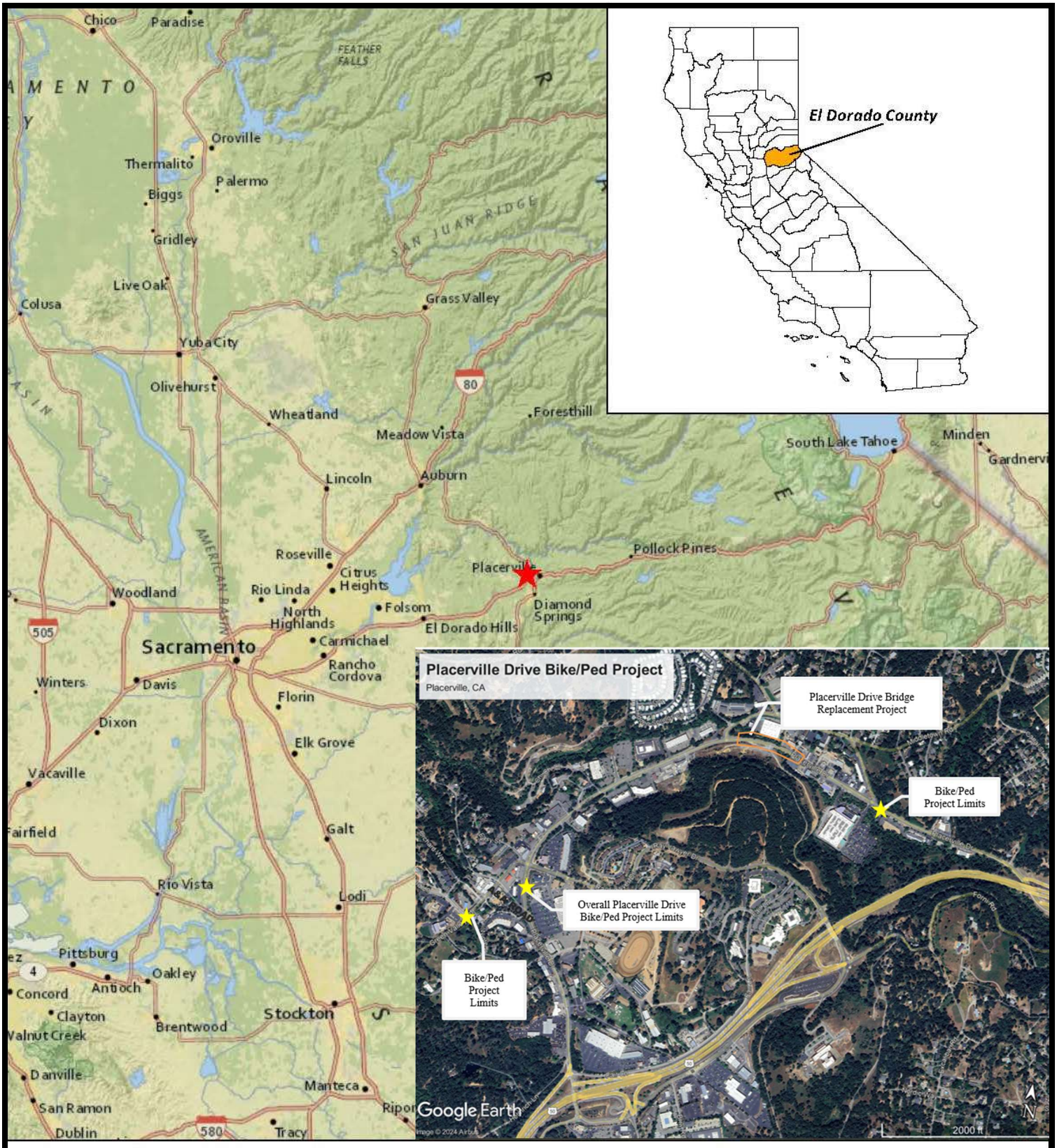
Dewberry
11060 White Rock Road, Suite 200
Rancho Cordova, CA 95670
Phone: (916) 363-4210

10. LIMITATIONS

This Geotechnical Design Report was performed in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made as to the conclusions and professional recommendations made in this report.

This Geotechnical Design Report is intended for design of the Placerville Drive at Hangtown Creek Bicycles and Pedestrian Facilities: Phase I Project. Any proposed designs or changes to the location of the proposed new improvements, however slight, should be brought to our attention so that we may determine how they may affect our conclusions and recommendations. The conclusions and recommendations contained in this report are based upon the data relating only to this specific Project and locations discussed herein.

Appendix I. Figures

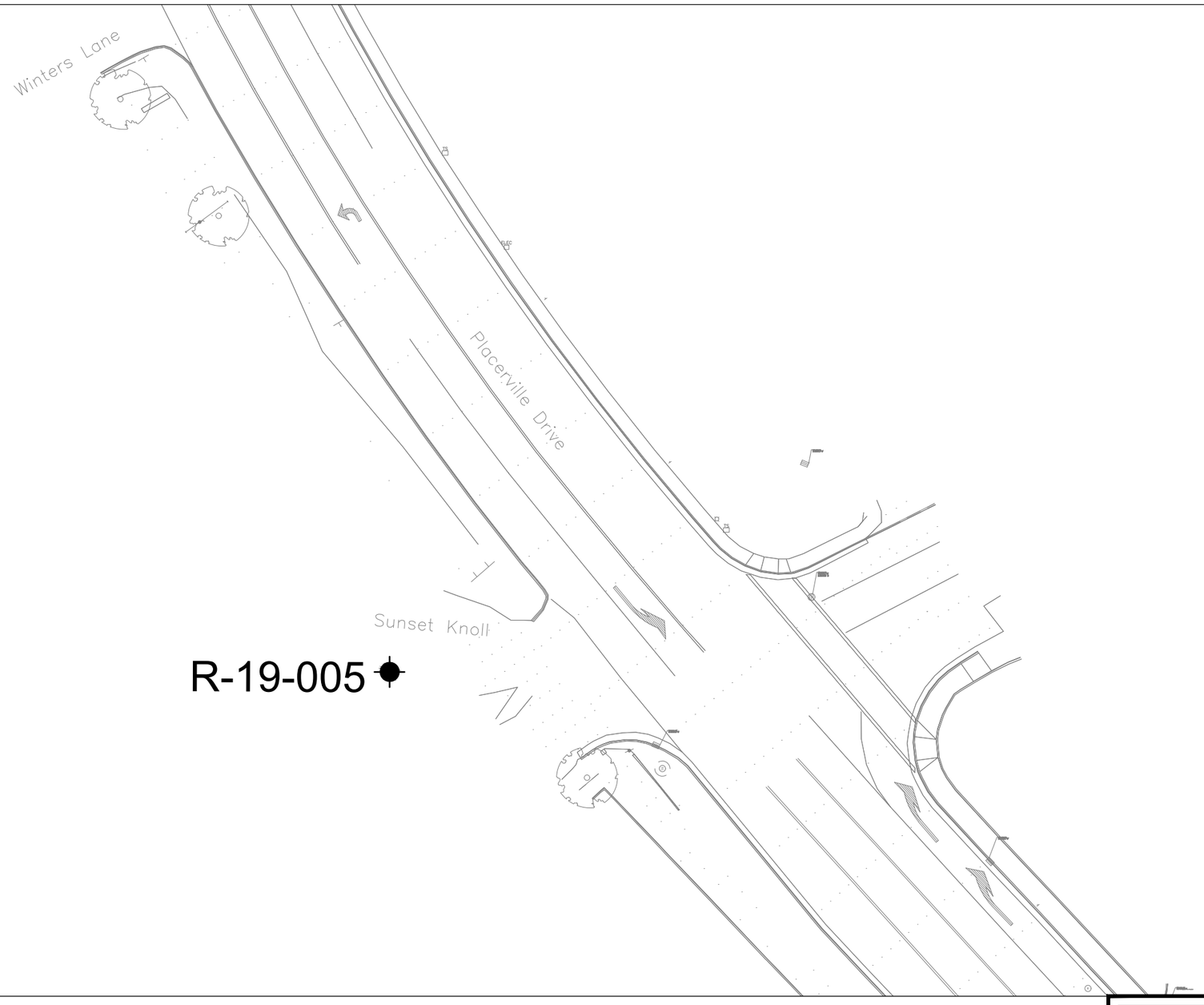


★ Project Location

Not to Scale

Source: Dewberry

Figure 1
Vicinity Map
Placerville Dr Bicycle and Pedestrian Facilities Phase I
City of Placerville, California
HDR Project No. 10324503 /
HDR|WRECO Project No. P18113

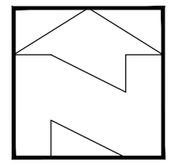


LEGEND:

R–22–001 APPROXIMATE BORING LOCATION

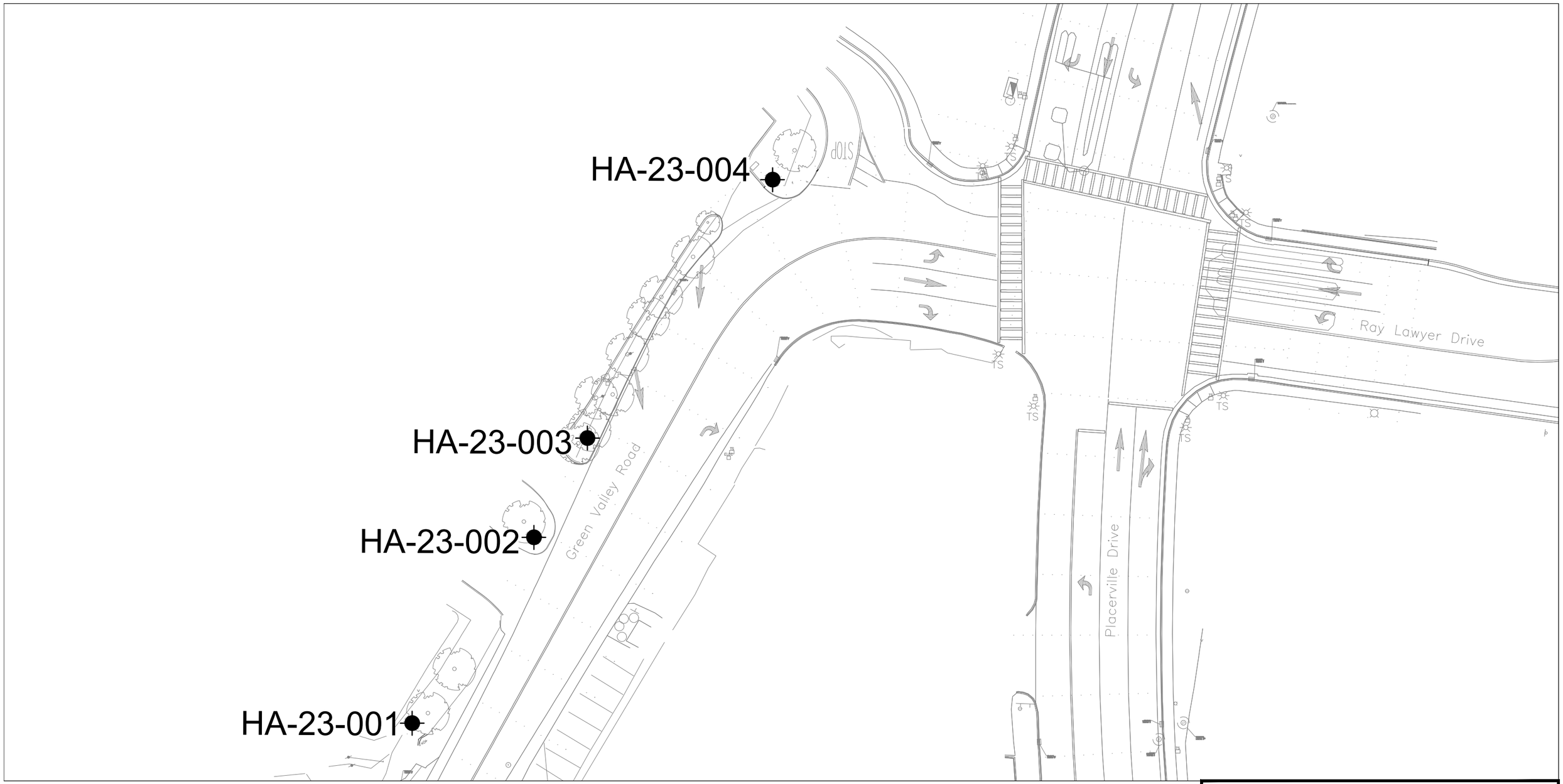
PLAN
1"=20'

0 20 ft 40 ft
SCALE



HDR | WRECO	One Capitol Mall Suite 500 Sacramento, CA 95814
City Of Placerville	
Placerville Drive Bicycle and Pedestrian Facilities Phase I	
Location of Field Tests	
10324503-P18113	Figure - 2

NOTE: All locations are approximate and are referenced from existing site features. Electronic media for plan view provided by Dewberry 2/28/2021



LEGEND:

HA–23–001 APPROXIMATE BORING LOCATION

PLAN
1"=20'

0 20 ft 40 ft
SCALE

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Suite 500
Sacramento, CA 95814

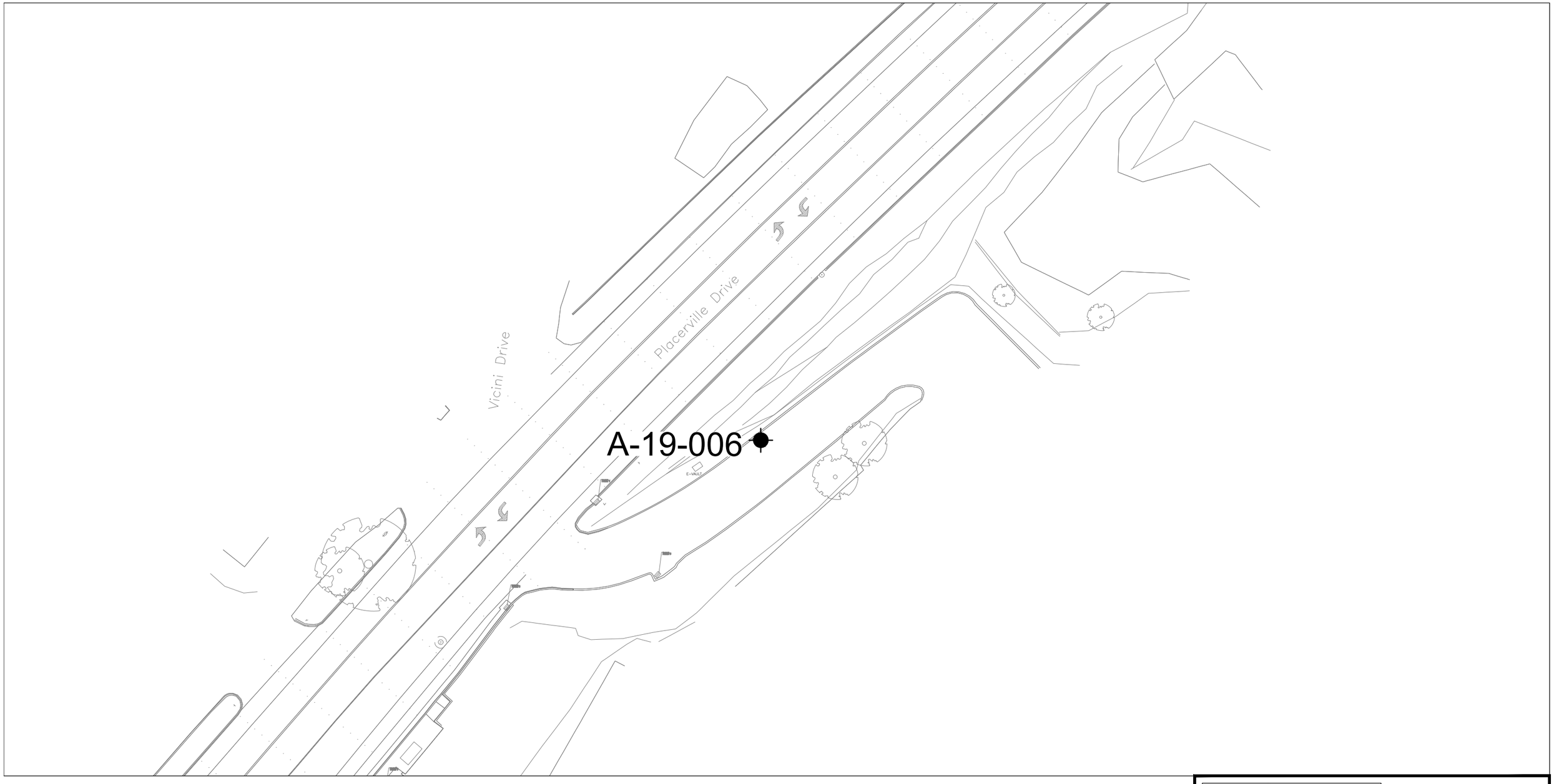
City Of Placerville

Placerville Drive Bicycle and Pedestrian Facilities Phase I

Location of Field Tests

10324503-P18113 | Figure - 2

NOTE: All locations are approximate and are referenced from existing site features. Electronic media for plan view provided by Dewberry 2/28/2021



LEGEND:

R−22−001 APPROXIMATE BORING LOCATION

PLAN
1"=20'

0 20 ft 40 ft
SCALE

HDR | WRECO — One Capitol Mall, Suite 500, Sacramento, CA 95814	
City Of Placerville	
Placerville Drive Bicycle and Pedestrian Facilities Phase I	
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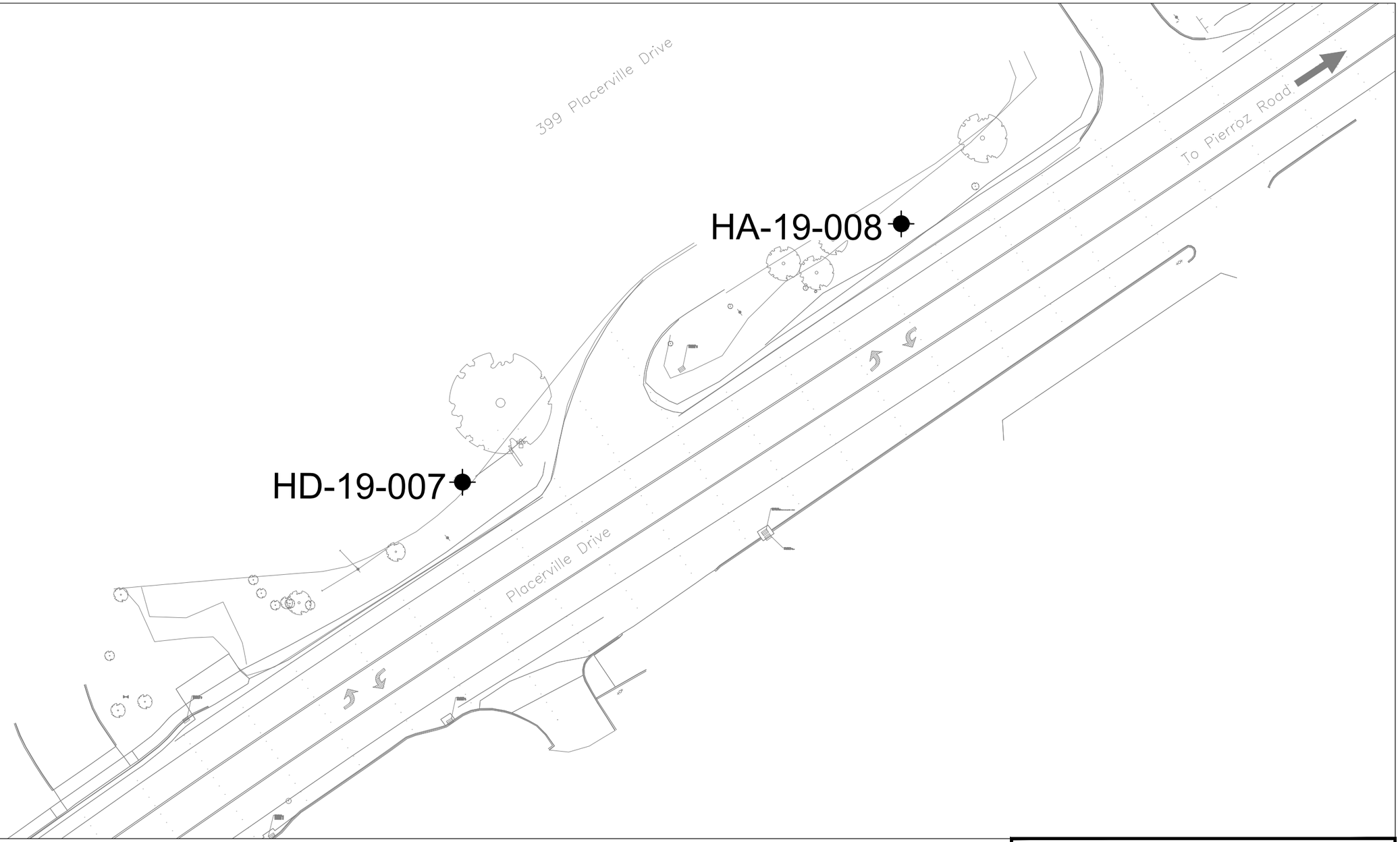

LEGEND:

R–22–001 APPROXIMATE BORING LOCATION

PLAN
1"=20'

0 20 ft 40 ft
SCALE

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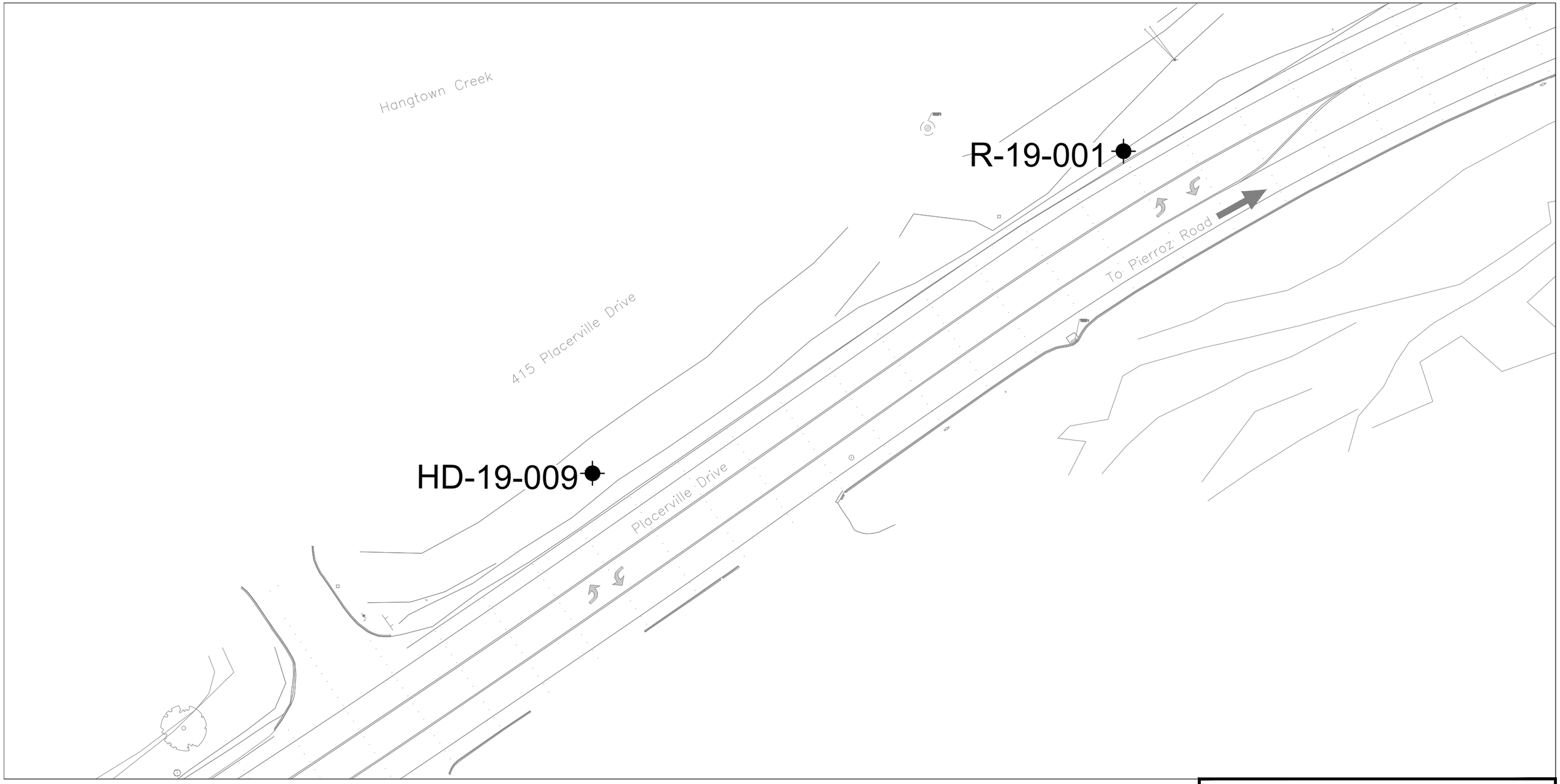
Placerville Drive Bicycle and Pedestrian Facilities Phase I

Location of Field Tests

10324503-P18113 | Figure - 2

NOTE: All locations are approximate and are referenced from existing site features. Electronic media for plan view provided by Dewberry 2/28/2021



LEGEND:

R–22–001 APPROXIMATE BORING LOCATION

PLAN

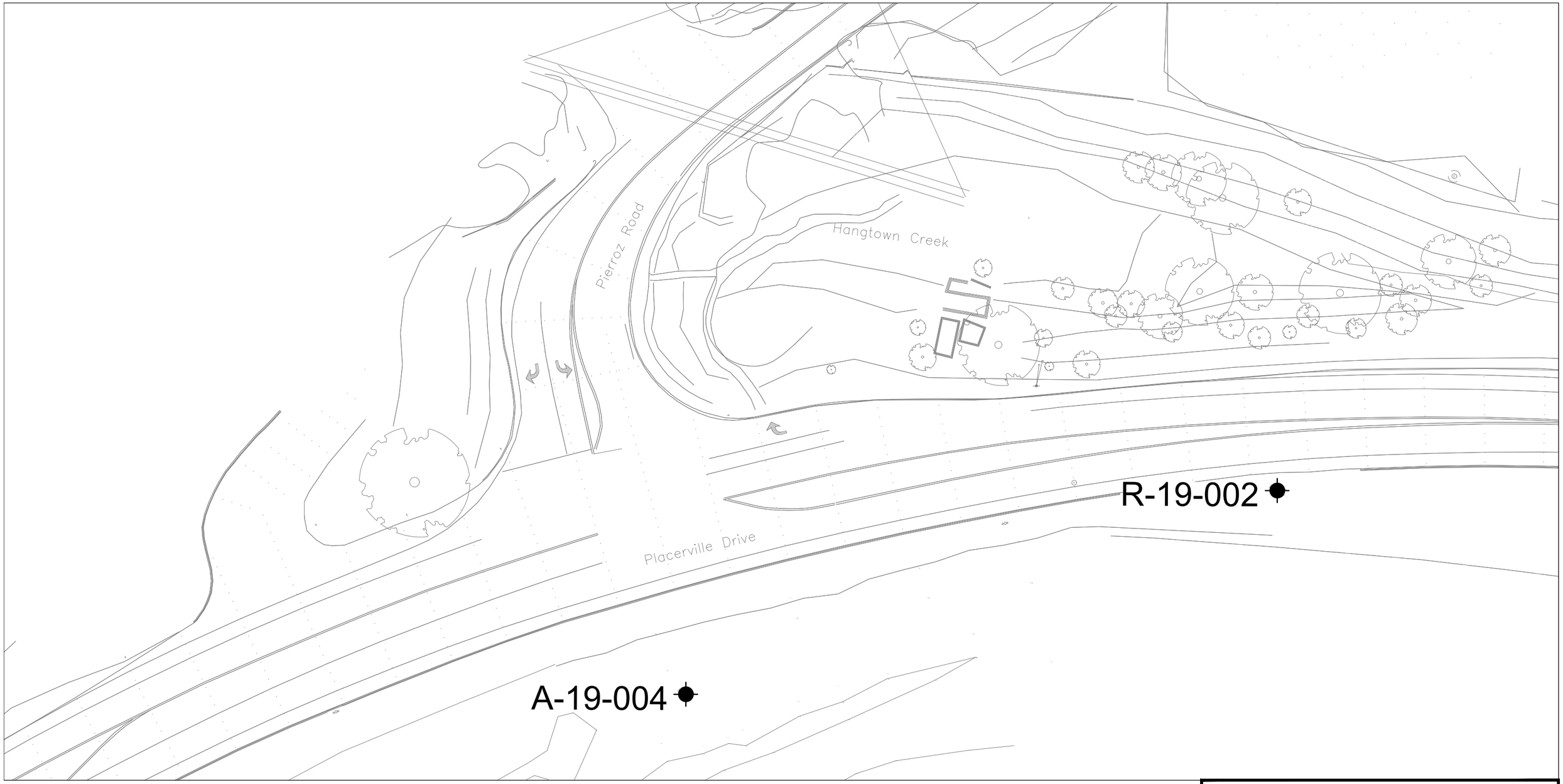
1"=20'

0 20 ft 40 ft

SCALE

HDR | WRECO	One Capitol Mall Suite 500 Sacramento, CA 95814
City Of Placerville	
Placerville Drive Bicycle and Pedestrian Facilities Phase I	
Location of Field Tests	
10324503-P18113	Figure - 2

NOTE: All locations are approximate and are referenced from existing site features. Electronic media for plan view provided by Dewberry 2/28/2021



LEGEND:

R–22–001 APPROXIMATE BORING LOCATION

PLAN
1"=20'

0 20 ft 40 ft
SCALE

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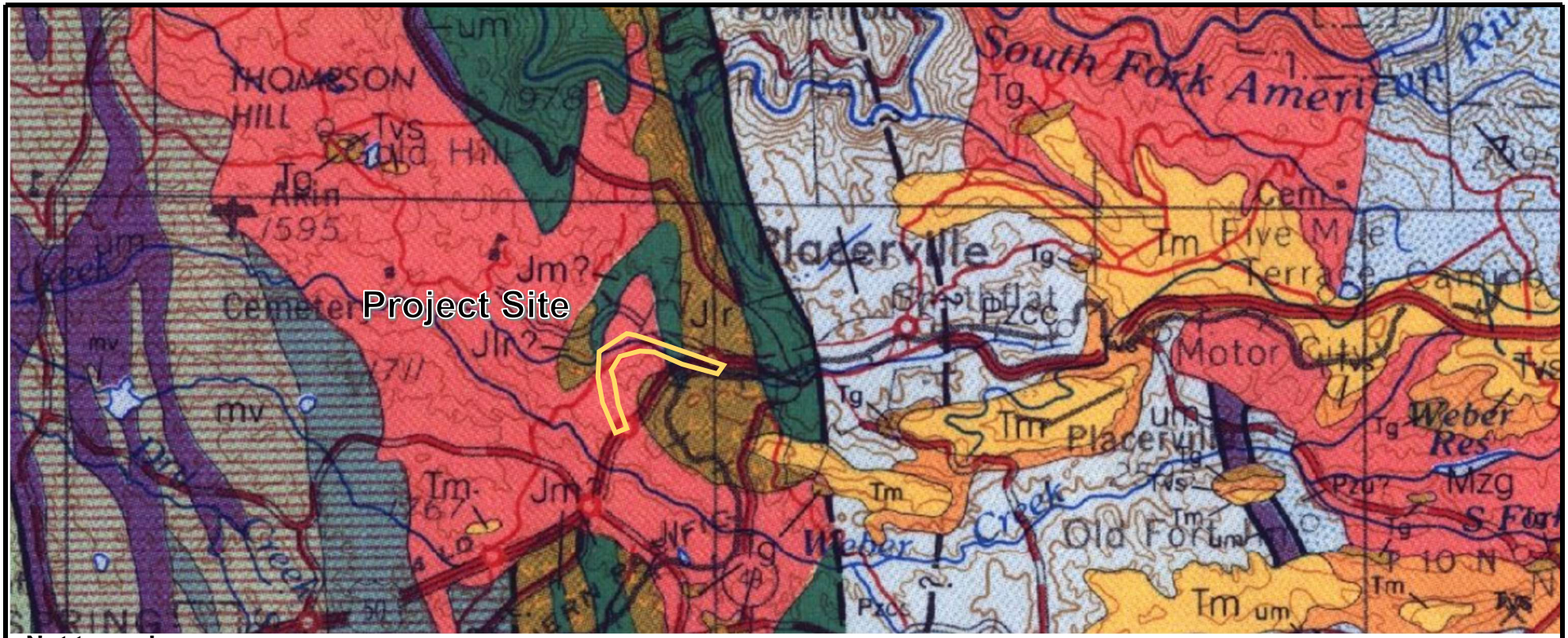
City Of Placerville

Placerville Drive Bicycle and Pedestrian Facilities Phase I

Location of Field Tests

10324503-P18113	Figure - 2

NOTE: All locations are approximate and are referenced from existing site features. Electronic media for plan view provided by Dewberry 2/28/2021



Not to scale

Reference:

Wagner, D.L., Jennings, C.W., Bedrossian, T.L., and Bortugno, E.J., 1981, Geologic map of the Sacramento quadrangle, California, 1:250,000: California Division of Mines and Geology, Regional Geologic Map 1A, scale 1:250,000

LEGEND

PLUTONIC ROCKS

MESOZOIC

- Mzg — Mesozoic granitic rocks
- Mzd — Mesozoic dioritic rocks
- gb — Gabbroic rocks*
- um — Ultramafic rocks*

*Horizontal line pattern denotes melange terrane.

- Tm — Mehrten Formation *(Andesitic conglomerate, sandstone, and breccia)*
- Tvs — Valley Springs Formation *(Rhyolitic tuff and sedimentary rocks)*
- Tmk — Markley Sandstone *(Marine)*
- Tn — Nortonville Shale *(Marine)*
- Td — Domengine Sandstone *(Marine)*
- Tc — Capay Formation *(Marine sandstone)*
- Tg — "Auriferous" Gravels
- Ti — Ione Formation *(Quartzose sandstone and kaolinitic clay)*
- Tmz — Martinez Formation *(Marine quartzose sandstone)*

- Jch — Copper Hill Volcanics
- Jmb — Brower Creek Volcanics
- Jgo — Gopher Ridge Volcanics
- Jlr — Logtown Ridge Formation
- Jmv — Jurassic metavolcanic rocks

- Jss — Salt Springs Slate
- Jm — Mariposa Formation *(Slate, graywacke, and conglomerate)*

N W E S

Figure 3
Regional Geologic Map
Placerville Drive Bicycle And Pedestrian Facilities Project
Placerville, CA
WRECO Project No. P18112

Appendix II. Boring Records

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-7-19**	**10-7-19**	**38° 43' 59.88" / -120° 49' 47.28" 44' SSE Placerville**	**A-19-004**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
V & W Drilling				**1687.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**CME 55 HT**	**6"**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), Rock Core			**140 lb, 30"**	**84.9%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Neat Cement and Grout			**Not Encountered**	**1.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		GRAVELLY fat CLAY (CH); light brown; mostly high plasticity fines ; Cobbles present..										
	1		Bottom of borehole at 1.0 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										Cannot core down below 1-foot depth due to unable to mount casing and core bit cannot safely go through cobbles without breaking.
1685.0	2												
	3												
1683.0	4												
	5												
1681.0	6												
	7												
1679.0	8												
	9												
1677.0	10												
	11												
1675.0	12												
	13												
1673.0	14												
	15												

HDR | WRECO

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REPORT TITLE				HOLE ID
BORING RECORD				**A-19-004**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	DB/JO		**10-21-19**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-8-19**	**10-8-19**	**38° 43' 49.8" / -120° 50' 6.72" 32' SE Placerville Dr**	**A-19-006**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
V & W Drilling				**1706.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**CME 55 HT**	**6"**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4")			**140 lb, 30"**	**84.9%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Neat Cement and Grout			**Not Encountered**	**26.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT CONCRETE (3").		S1								Easy drilling
			CLAYEY SAND (SC); mostly fine to medium SAND ; few medium plasticity fines.										
	1												
1704.0	2												
	3												
1702.0	4												
	5		Medium dense; light brown; moist; some low plasticity fines ; PP = 1.5 tsf.		S2	6 10 14	24						Piece of asphalt observed (fill)
1700.0	6												
	7												
1698.0	8												
	9												
1696.0	10		Very dense; yellowish brown grading to light gray; few fine to coarse, subangular GRAVEL ; little nonplastic fines ; oxidation bands noticeable; PP = 1.25 tsf.		S3	12 27 29	56	10	69	21			(decomposed granitic rock) PA, PI
	11												
1694.0	12												
	13												
1692.0	14												
	15												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**A-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	DB/JO		**10-21-19**	**1 of 2**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	15		Yellowish brown; PP = 0.25 tsf. CLAYEY SAND (SC) *(continued)*.		S4	11 23 32	55						
1690.0	16												
	17												
1688.0	18												
	19												
1686.0	20		Little fine, subangular GRAVEL ; multicolored gravel (white, black, translucent light gray); PP = 0.5 tsf.		S5	33 50/6"							
	21												
1684.0	22												
	23												Hard drilling; drill rig is shaking with high friction
1682.0	24												
	25		PP = 0.75 tsf.		S6	27 37	75						
1680.0	26					38							
	27		Bottom of borehole at 26.5 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1678.0	28												
	29												
1676.0	30												
	31												
1674.0	32												
	33												

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REPORT TITLE				HOLE ID
BORING RECORD				**A-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	DB/JO		**10-21-19**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-8-19**	**10-8-19**	**38° 43' 57" / -120° 49' 56.64" 10' NW Placerville**	**HA-19-008**
DRILLING CONTRACTOR: **Not applicable**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **1658.0 ft**
DRILLING METHOD: **Other Drilling Method**			DRILL RIG	BOREHOLE DIAMETER: **3"**
SAMPLER TYPE(S) AND SIZE(S) (ID): **Hand Driven SPT (1.4")**			SPT HAMMER TYPE: **10 lb, 12"**	HAMMER EFFICIENCY, ERi: **60%**
BOREHOLE BACKFILL AND COMPLETION: **Neat Cement and Grout**			GROUNDWATER READINGS: DURING DRILLING **Not Encountered** AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **5.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND with GRAVEL (SC); dark yellowish brown; little fine to coarse GRAVEL ; mostly fine to coarse SAND ; little fines ; 7% of sample was found to be cobble size rock.		S1			18	51	24			PA, PI
	1												Slope does not provide suitable space to run hand sampler. Appears to be decomposed rock. Visible rock outcrops.
1656.0	2												
	3					40							Hand driven SPT split spoon sampler from 3.0 to 3.5 feet
1654.0	4												Hand dug with shovel to termination depth
	5		Bottom of borehole at 5.0 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1652.0	6												
	7												
1650.0	8												
	9												
1648.0	10												
	11												
1646.0	12												
	13												
1644.0	14												
	15												

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Elk Grove, CA 95758
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REPORT TITLE				HOLE ID
BORING RECORD				**HA-19-008**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME: **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **DB/JO**	DATE **10-21-19**	SHEET **1 of 1**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Olsson	**12-12-23**	**12-12-23**	**38° 43' 40.44" / -120° 50' 17.52" 7533 Green Valley**	**HA-23-001**
DRILLING CONTRACTOR: **Not applicable**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **1695.0 ft**
DRILLING METHOD: **Hand Auger**			DRILL RIG	BOREHOLE DIAMETER: **3"**
SAMPLER TYPE(S) AND SIZE(S) (ID): **Bulk**			SPT HAMMER TYPE: **Not applicable**	HAMMER EFFICIENCY, ERi: **Not applicable**
BOREHOLE BACKFILL AND COMPLETION: **Native soil**			GROUNDWATER READINGS: DURING DRILLING **Not Encountered** AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **2.3 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND with COBBLES (SC); dark brown; moist; little fine to coarse, angular GRAVEL ; mostly fine SAND ; some fines ; 10%; with trace amounts of organic material.										
	1		SANDY lean CLAY (CL); yellowish brown; moist; some fine to coarse SAND ; mostly medium plasticity fines.		S1								asphalt fragments observed (fill)
1693.0	2		Bottom of borehole at 2.3 ft bgs Refusal due to gravel This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										Terminated due to gravel
1691.0	4												
1689.0	6												
1687.0	8												
1685.0	10												
1683.0	12												
1681.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**HA-23-001**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME: **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **JO**		DATE **1-9-24**	SHEET **1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Olsson	**12-12-23**	**12-12-23**	**38° 43' 41.16" / -120° 50' 16.8" 7553 Green Valley**	**HA-23-002**
DRILLING CONTRACTOR: **Not applicable**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **1694.0 ft**
DRILLING METHOD: **Hand Auger**			DRILL RIG	BOREHOLE DIAMETER: **3"**
SAMPLER TYPE(S) AND SIZE(S) (ID): **Bulk**			SPT HAMMER TYPE: **Not applicable**	HAMMER EFFICIENCY, ERi: **Not applicable**
BOREHOLE BACKFILL AND COMPLETION: **Native soil**			GROUNDWATER READINGS: DURING DRILLING **Not Encountered** AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **1.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC); brown; moist; little fine to coarse, subrounded GRAVEL ; mostly SAND ; some fines ; with trace to few organic material.										
	1		CLAYEY SAND (SC); reddish yellow; dry; trace fine and coarse, angular GRAVEL ; mostly medium, angular SAND ; some low plasticity, low dry strength, medium toughness fines ; homogeneous; moderate cementation; translucent, red, and dark brown sand particles in a red fines matrix, gravel particles largely consist of very dark gray, fine grained rock (possible metamorphic rock) and a gravel consisting of translucent, yellow, reddish brown, and black angular particles 1 to 4 mm in size in a red matrix (possible highly weathered granitic rock).		S1							
1692.0	2												
	3		Bottom of borehole at 1.5 ft bgs Refusal due to gravel or rock This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).									
1690.0	4												
	5												
1688.0	6												
	7												
1686.0	8												
	9												
1684.0	10												
	11												
1682.0	12												
	13												
1680.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**HA-23-002**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME: **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **JO**	DATE **1-9-24**	SHEET **1 of 1**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Olsson	**12-12-23**	**12-12-23**	**38° 43' 41.52" / -120° 50' 16.44" 7553 Green Valley**	**HA-23-003**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Not applicable				**1697.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hand Auger				**3"**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**Not applicable**	**Not applicable**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Native soil			**Not Encountered**	**2.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC). Light reddish brown; moist.		S1								
	1		Red; mostly medium, angular SAND ; some medium plasticity, medium dry strength, low toughness fines ; homogeneous; moderate cementation; moisture level decreasing, translucent, red, and dark brown sand particles in a red fines matrix; PP = 4.5 tsf.										
1695.0	2		Bottom of borehole at 2.0 ft bgs Reached planned depth										
	3		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1693.0	4												
	5												
1691.0	6												
	7												
1689.0	8												
	9												
1687.0	10												
	11												
1685.0	12												
	13												
1683.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**HA-23-003**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	JO		**1-9-24**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Olsson	**12-12-23**	**12-12-23**	**38° 43' 42.6" / -120° 50' 15.36" 7559 Green Valley**	**HA-23-004**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Not applicable				**1703.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hand Auger				**3"**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk			**Not applicable**	**Not applicable**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Native soil			**Not Encountered**	**2.2 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND with GRAVEL (SM); reddish brown; moist; with trace to few organic material.										
	1		SANDY lean CLAY (CL); pale yellow; moist; some SAND ; mostly high plasticity fines.		S1								
1701.0	2		CLAYEY SAND with GRAVEL (SC); reddish brown; moist; little fine and coarse, angular GRAVEL ; mostly fine to coarse SAND ; some low plasticity, medium dry strength, medium toughness fines ; homogeneous; weak cementation; translucent, red, and dark brown sand particles in a red fines matrix, gravel particles mostly consist of very dark gray, fine grained rock (possible metamorphic rock) with occassional gravel consisting of translucent, yellow, reddish brown, and black angular particles 1 to 4 mm in size in a red matrix (possible highly weathered granitic rock). Grayish brown; wet.										
1699.0	4		Bottom of borehole at 2.2 ft bgs Reached planned depth										
	5		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1697.0	6												
	7												
1695.0	8												
	9												
1693.0	10												
	11												
1691.0	12												
	13												
1689.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**HA-23-004**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	JO		**1-9-24**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-8-19**	**10-8-19**	**38° 43' 55.92" / -120° 49' 59.16" 23' NW Placerville**	**HD-19-007**
DRILLING CONTRACTOR: **Not applicable**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **1657.0 ft**
DRILLING METHOD: **Hand Auger**			DRILL RIG	BOREHOLE DIAMETER: **3"**
SAMPLER TYPE(S) AND SIZE(S) (ID): **Hand Driven SPT (1.4")**			SPT HAMMER TYPE: **10 lb, 12"**	HAMMER EFFICIENCY, ERi: **60%**
BOREHOLE BACKFILL AND COMPLETION: **Neat Cement and Grout**			GROUNDWATER READINGS: DURING DRILLING **Not Encountered** AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **2.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC); reddish brown; moist; some low to medium plasticity fines.										Difficult to shovel; appears to be decomposed granitic rock
	1				S1	16							Hand driven SPT split spoon sampler from 1.0 to 2.46 feet
1655.0	2					44 50/5.5"							
	3		Bottom of borehole at 2.5 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1653.0	4												
	5												
1651.0	6												
	7												
1649.0	8												
	9												
1647.0	10												
	11												
1645.0	12												
	13												
1643.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**HD-19-007**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME: **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **DB/JO**	DATE **10-21-19**	SHEET **1 of 1**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-8-19**	**10-8-19**	**38° 43' 58.08" / -120° 49' 54.48" 16' NW Placerville**	**HD-19-009**
DRILLING CONTRACTOR: **Not applicable**			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION: **1661.0 ft**
DRILLING METHOD: **Hand Auger**			DRILL RIG	BOREHOLE DIAMETER: **3"**
SAMPLER TYPE(S) AND SIZE(S) (ID): **Hand Driven SPT (1.4")**			SPT HAMMER TYPE: **10 lb, 12"**	HAMMER EFFICIENCY, ERi: **60%**
BOREHOLE BACKFILL AND COMPLETION: **Neat Cement and Grout**			GROUNDWATER READINGS: DURING DRILLING **Not Encountered** AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING: **4.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		SANDY lean CLAY (CL); some SAND ; mostly low to medium plasticity fines.										
1659.0	2												
	3				S1	13 16 16	32						Hand driven SPT split spoon sampler from 2.5 to 4.0 feet found serpentinite; sample was dropped; sample crumpled
1657.0	4		Bottom of borehole at 4.0 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1655.0	6												
1653.0	8												
1651.0	10												
1649.0	12												
1647.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**HD-19-009**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME: **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **DB/JO**		DATE **10-21-19**	SHEET **1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-7-19**	**10-7-19**	**38° 43' 59.52" / -120° 49' 51.24" N Edge Placerville**	**R-19-001**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
V & W Drilling		**1671.0 ft**

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger	**CME 55 HT**	**6"**

SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), Rock Core	**140 lb, 30"**	**84.9%**

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Neat Cement and Grout		**Not Encountered**		**7.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		SILTY, CLAYEY SAND with GRAVEL (SC-SM); brown; moist; some GRAVEL ; low plasticity fines.		S1								
1669.0	2		SILTY SAND (SM); very dense; brown; moist; some fine GRAVEL ; mostly fine SAND ; some low plasticity fines ; PP = 0.5 tsf.		S2	10 50/6"							Initially, buried utility thought to be hit. Stopped drilling and called utility companies listed on USA ticket. No utilities were confirmed.
1667.0	4		2.5" core of Portland cement concrete over soil.		A								Appears to have encountered 2.5" of Portland cement concrete then soil (fill)
1665.0	6		IGNEOUS ROCK (GRANITE); white with black and gray patches; moderately weathered; hard; intensely fractured.										Granitic rock encountered
	7		Bottom of borehole at 7.0 ft bgs Reached planned depth										
1663.0	8		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1661.0	10												
1659.0	12												
1657.0	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**R-19-001**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**

PROJECT OR BRIDGE NAME			
Placerville Drive Bike and Pedestrian Facilities			
BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	DB/JO	**10-21-19**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-7-19**	**10-7-19**	**38° 44' 0.6" / -120° 49' 44.04" 7' S Placerville Dr**	**R-19-002**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
V & W Drilling				**1678.5 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Solid-Stem Auger			**CME 55 HT**	**6"**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), Rock Core			**140 lb, 30"**	**84.9%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Neat Cement and Grout			**Not Encountered**	**18.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		Lean CLAY (CL); light brown; moist; few GRAVEL ; little SAND ; mostly medium plasticity fines ; Seemed mostly dry.		S1								Not very smooth drilling
	1												
1676.5	2												
	3												
1674.5	4												
	5		CLAYEY SAND (SC); brown to white-gray; moist; few fine GRAVEL ; mostly fine to coarse SAND ; some medium plasticity fines ; Decomposed Rock; decomposed to sand; PP=0.5 tsf.		S2	12 50/6"		22	54	24			PA, PI
1672.5	6												
	7												
1670.5	8		IGNEOUS ROCK; very coarse-grained; reddish brown; intensely weathered; moderately soft to hard; intensely fractured.		A								Hard drilling, initiated rock coring; fragments of likely country rock with quartz veining. Run A, Recovery: 29%; RQD: 0%
	9												
1668.5	10		IGNEOUS ROCK; same as above; hard; moderately weathered.		B								Run B, Recovery: 100%; RDQ: 17% Point Load Test, USC Estimate (PLT): 35,457 psi, K = 24.5; diametral break
	11												
1666.5	12												
	13		IGNEOUS ROCK; gray to white; same as above; moderately soft to hard; fat clay was found ~14' depth. Approximately 2" layer. Clay was brown to reddish brown.		C								PLT: 11,890 psi, K = 24.5; diametral break Run C, Recovery: 75%; RDQ: 13%
1664.5	14												
	15												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-19-002**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	DB/JO		**10-21-19**	**1 of 2**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	15		IGNEOUS ROCK; gray; moderately weathered; same as above but harder rock; moderately fractured;.		D								
1662.5	16												Run D, Recovery: 81%; RDQ: 15%
	17												
1660.5	18												PLT: 26,362 psi, K = 24.5; diametral break
			Bottom of borehole at 18.0 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
	19												
1658.5	20												
	21												
1656.5	22												
	23												
1654.5	24												
	25												
1652.5	26												
	27												
1650.5	28												
	29												
1648.5	30												
	31												
1646.5	32												
	33												

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REPORT TITLE				HOLE ID
BORING RECORD				**R-19-002**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **DB/JO**		DATE **10-21-19**	SHEET **2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-7-19**	**10-7-19**	**38° 44' 0.38" / -120° 49' 40.55" 14' SSW Placerville**	**R-19-003**

DRILLING CONTRACTOR	BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
V & W Drilling		**1677.2 ft**

DRILLING METHOD	DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger	**CME 55 HT**	**6"**

SAMPLER TYPE(S) AND SIZE(S) (ID)	SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), Rock Core	**140 lb, 30"**	**84.9%**

BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER READINGS	DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Neat Cement and Grout		**Not Encountered**		**3.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		Poorly-graded GRAVEL (GP); loose to dense; gray; dry; little SAND ; (fill).										Hard drilling with a high proportion of the soil being gravel
1675.2	2		METAMORPHIC ROCK; dark gray; slightly weathered; hard; very intensely fractured; rock fragments are of a coarse gravel or smaller.		A								Hit refusal and started coring Run A, Recovery: 92%; RDQ: 0% Water draining and caving issue within borehole.
	3		Bottom of borehole at 3.0 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
1673.2	4												
	5												
1671.2	6												
	7												
1669.2	8												
	9												
1667.2	10												
	11												
1665.2	12												
	13												
1663.2	14												
	15												

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REPORT TITLE				HOLE ID
BORING RECORD				**R-19-003**
DIST. **03**	COUNTY **El Dorado**	ROUTE	POSTMILE	PROJECT NO. **P18112**
PROJECT OR BRIDGE NAME **Placerville Drive Bike and Pedestrian Facilities**				
BRIDGE NUMBER	PREPARED BY **DB/JO**		DATE **10-21-19**	SHEET **1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
DB	**10-8-19**	**10-8-19**	**38° 43' 33.96" / -120° 50' 11.76" 54' SW Placerville**	**R-19-005**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
V & W Drilling				**1730.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**CME 55 HT**	**6"**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Bulk, SPT (1.4"), Rock Core			**140 lb, 30"**	**84.9%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Neat Cement and Grout			**Not Encountered**	**26.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); brown; moist; some fine to medium SAND ; some low plasticity fines.		S1								Smooth drilling
	1												
1728.0	2												
	3												
1726.0	4												
	5		Dense; light brown; trace GRAVEL ; mostly fine to medium SAND ; some low to nonplastic fines ; PP = 0.5 tsf.		S2	12 18	39						
1724.0	6					21							
	7												
1722.0	8												
	9												
1720.0	10		Very dense; light brown to tan; mostly fine to coarse SAND ; few nonplastic fines ; PP = 0.0 tsf.		S3	13 38	70	26	57	17			PA, PI
	11					32							
1718.0	12												
	13												
1716.0	14												
	15												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**R-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	DB/JO		**10-21-19**	**1 of 2**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per ft	Gravel (%)	Sand (%)	Fines (%)	Drilling Method	Casing Depth	Remarks
	15		SILTY SAND (SM) *(continued)*.		S4	50/0.5"							No recovery; possible boulder consisting of weathered granitic rock Rig is shaking.
1714.0	16		IGNEOUS ROCK; gray; moderately weathered; moderately hard; moderately fractured.		A								Started rock coring. Using HSA as casing. Auger sank once core bit went in. Resealing. Point Load Test, USC Estimate (PLT): 12,867 psi, K = 24.5; diametral break Run A, Recovery: 53%; RDQ: 34%
	17												
1712.0	18												
	19												
1710.0	20												
	21		IGNEOUS ROCK; grayish white; slightly weathered; moderately hard; moderately fractured; Less fractured than above. Less oxidation than above. Bottom of core has noticeably less weathered rock..		B								
1708.0	22												Run B, Recovery: 47%, RQD: 27%
	23												
1706.0	24												
	25												PLT: 13,379 psi, K = 24.5; diametral break
1704.0	26		Bottom of borehole at 26.0 ft bgs Reached planned depth This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2022).										
	27												
1702.0	28												
	29												
1700.0	30												
	31												
1698.0	32												
	33												

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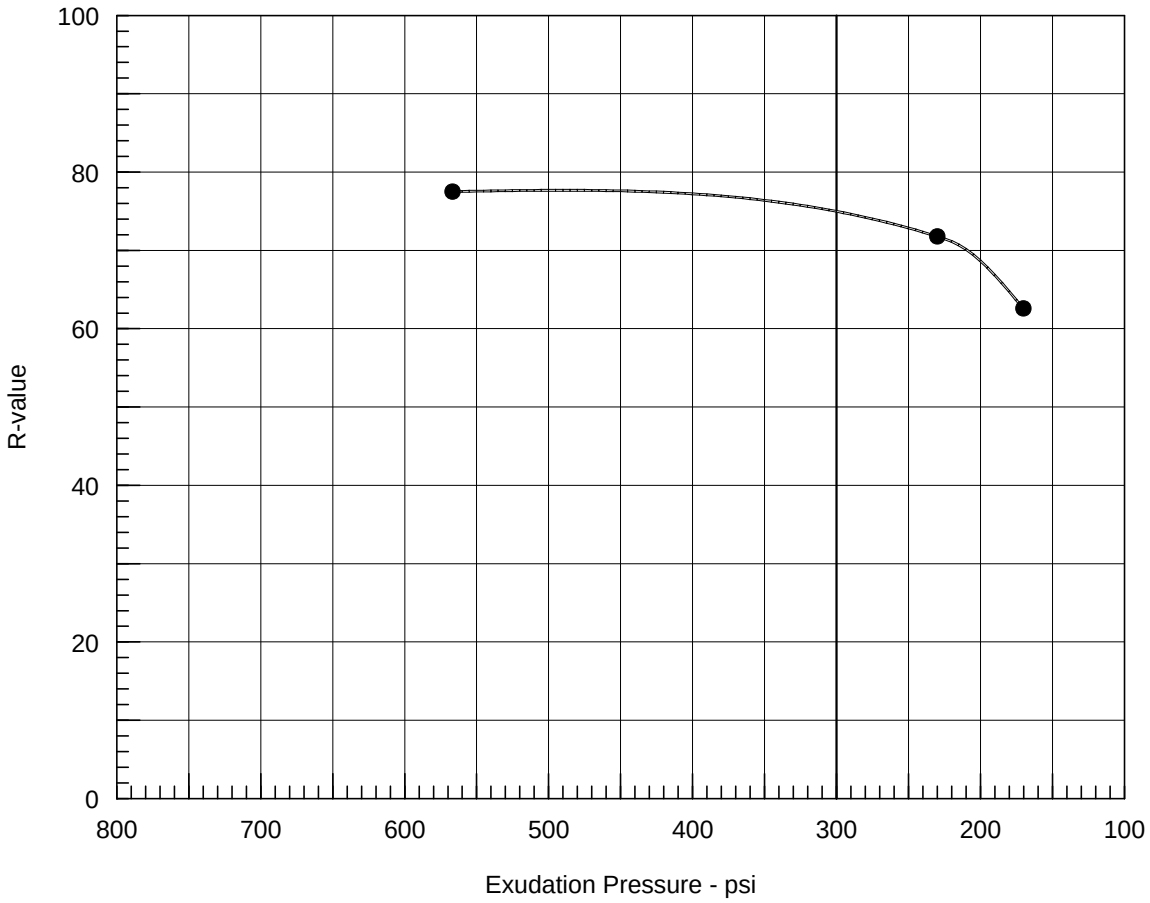
REPORT TITLE				HOLE ID
BORING RECORD				**R-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	PROJECT NO.
03	**El Dorado**			**P18112**
PROJECT OR BRIDGE NAME				
Placerville Drive Bike and Pedestrian Facilities				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	DB/JO		**10-21-19**	**2 of 2**

Appendix III. Laboratory Reports

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	119.3	11.0	153	22	2.49	567	78	78
2	350	120.1	11.5	118	30	2.47	230	72	72
3	350	119.1	12.0	70	41	2.61	170	60	63

Test Results	Material Description
R-value at 300 psi exudation pressure = 75	CLAYEY SAND with GRAVEL, dark yellowish brown

Project No.: 3390.X
Project: WRECO Lab Testing
Source of Sample: P18112 **Depth:** 0-5'
Sample Number: HA-19-008, S1
Date: 12/10/2019

Tested by: BRL
Checked by: RBL

Remarks:
24% retained on the #4 sieve, sample batched

R-VALUE TEST REPORT

Blackburn Consulting

Figure _____

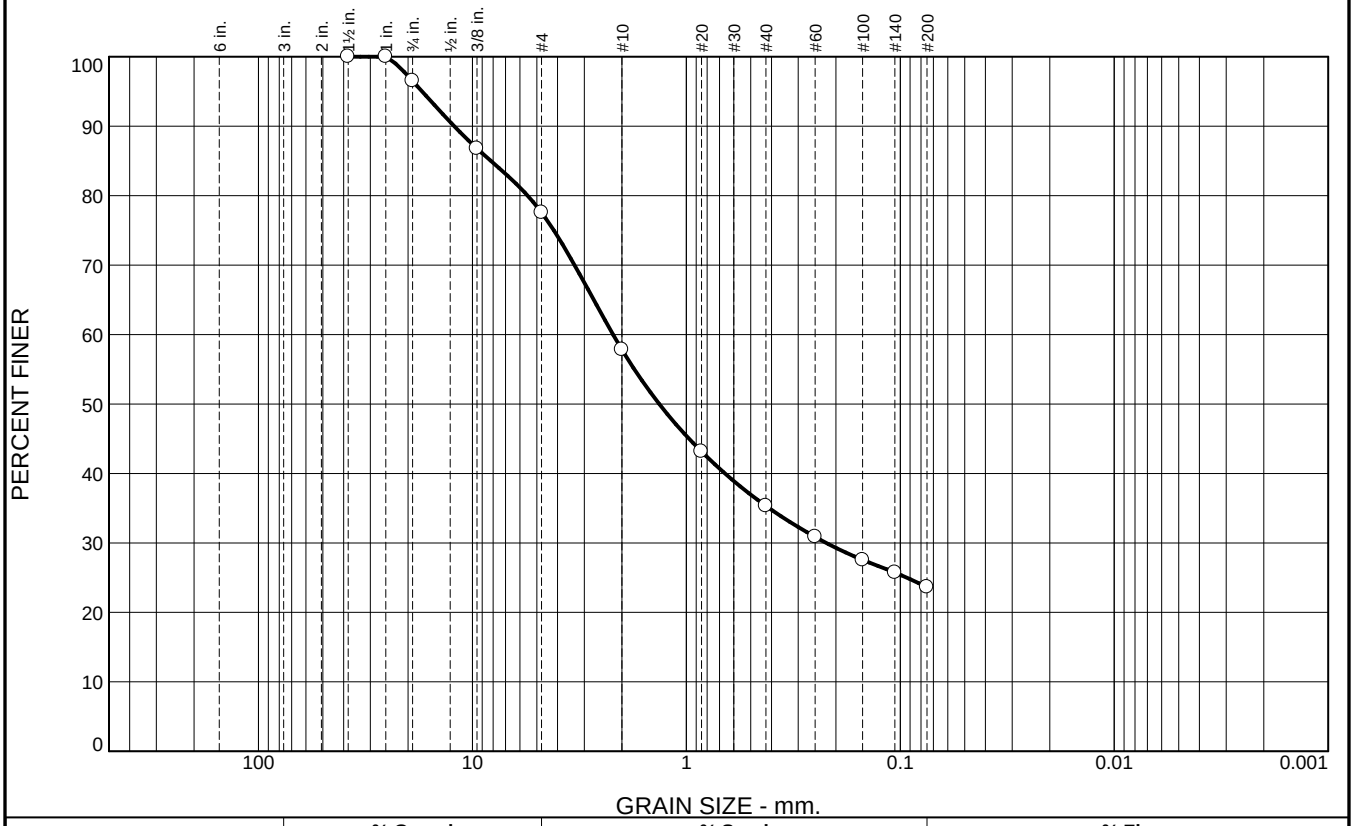
BLACKBURN
CONSULTING

Project: P18112 **Date: 12/10/19** **Technician: BRL**

ASTM D 5731 Point Load Testing

Boring	Run Number	Depth (ft)	D (in)	L (in)	L/D Ratio	Maximum Pressure Reading (psi)	Load at Failure (lbf)	Core Size Correction Factor (F)	PLI (Point Load Index) (psi)	Size Corrected PLI (psi)	UCS Estimate (psi, K=24.5)	Notes
A-19-002	B	11.5	2.4	7.0	2.9	5189	7625	1.09	1324	1447	**35457**	Diametral Break
A-19-002	C	13.5	2.4	5.7	2.4	1740	2557	1.09	444	485	**11890**	Diametral Break
A-19-002	D	17.5	2.4	2.7	1.1	3858	5669	1.09	984	1076	**26362**	Diametral Break
A-19-005	A	17.0	2.4	7.0	2.9	1883	2767	1.09	480	525	**12867**	Diametral Break
A-19-005	B	25.0	2.4	3.0	1.3	1958	2877	1.09	499	546	**13379**	Diametral Break

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	19	20	23	11	24	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100		
1"	100		
3/4"	97		
3/8"	87		
#4	78		
#10	58		
#20	43		
#40	35		
#60	31		
#100	28		
#140	26		
#200	24		

* (no specification provided)

Material Description

CLAYEY SAND with GRAVEL, yellowish brown

Atterberg Limits

PL= 18 LL= 32 PI= 14

Coefficients

D_{90}= 12.1699 D_{85}= 8.2025 D_{60}= 2.2006
D_{50}= 1.3391 D_{30}= 0.2217 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

Source of Sample: P18112 **Depth:** 5'
Sample Number: A-19-002, S2 **Date:**

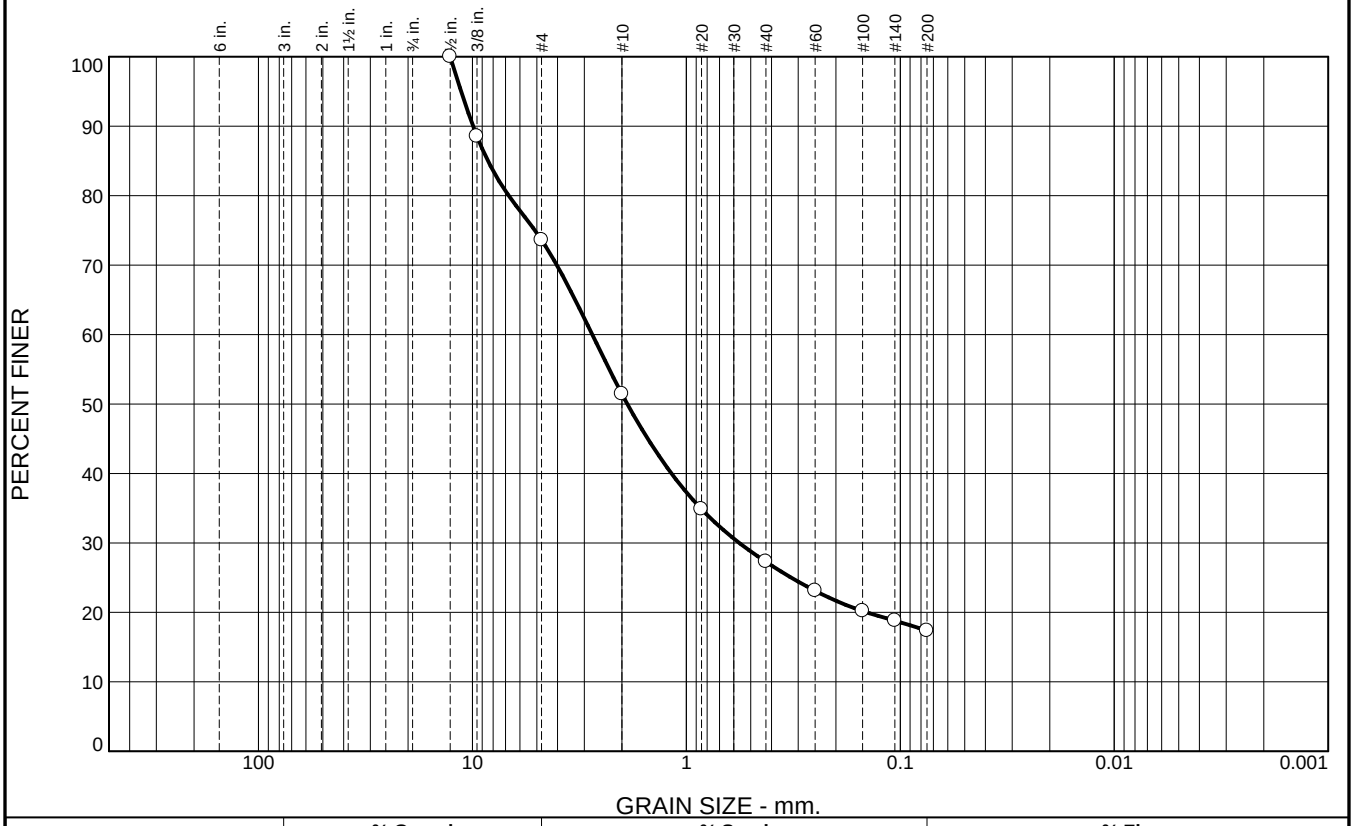
Blackburn Consulting

W. Sacramento, CA

Client: WRECO
Project: WRECO Lab Testing

Project No: 3390.X **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	26	23	24	10	17	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	89		
#4	74		
#10	51		
#20	35		
#40	27		
#60	23		
#100	20		
#140	19		
#200	17		

* (no specification provided)

Material Description

SILTY SAND with GRAVEL, yellowish brown

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 9.9353 D_{85}= 8.4690 D_{60}= 2.7534
D_{50}= 1.8868 D_{30}= 0.5658 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Source of Sample: P18112 **Depth:** 10'
Sample Number: A-19-005, S3 **Date:**

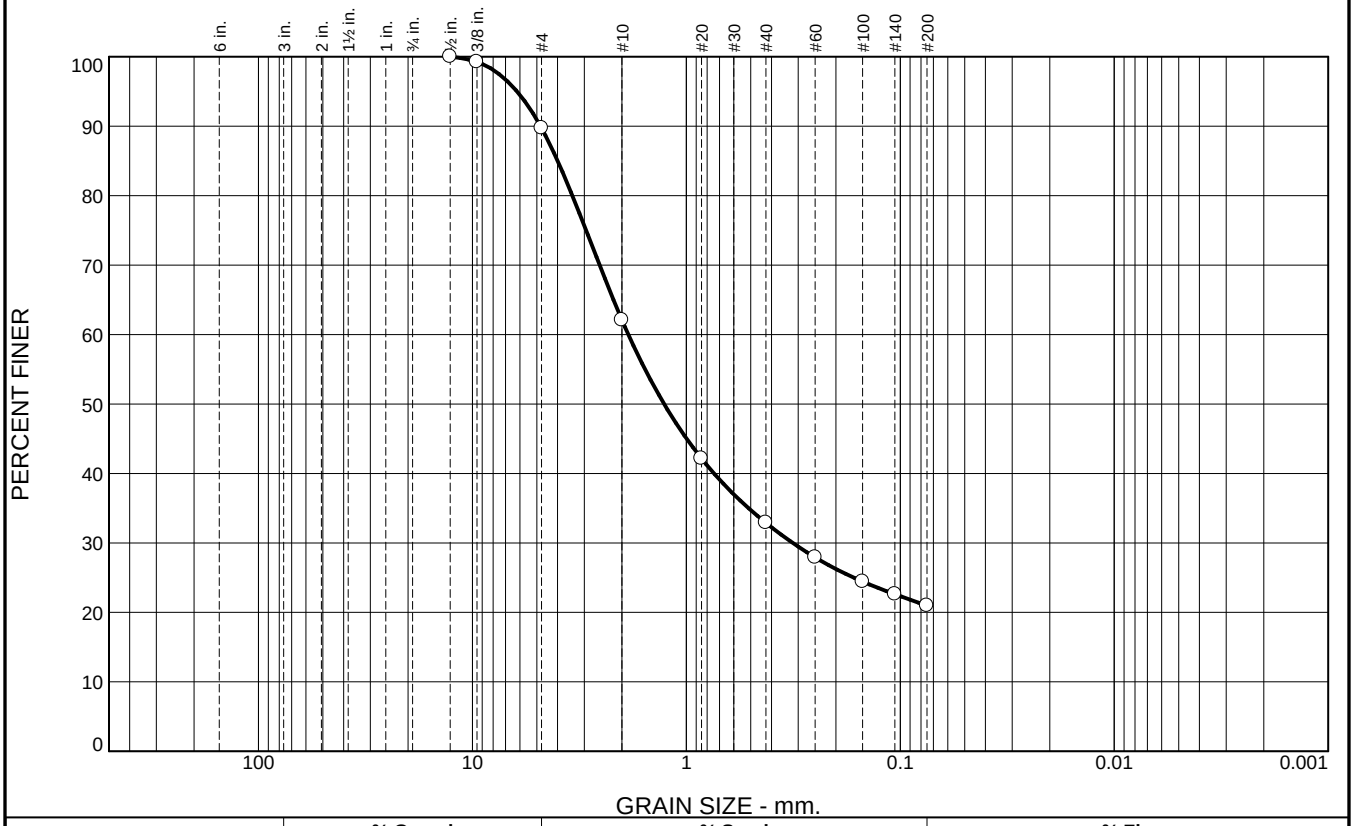
Blackburn Consulting

W. Sacramento, CA

Client: WRECO
Project: WRECO Lab Testing

Project No: 3390.X **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	10	28	29	12	21	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	99		
#4	90		
#10	62		
#20	42		
#40	33		
#60	28		
#100	24		
#140	23		
#200	21		

* (no specification provided)

Material Description

SILTY SAND, yellowish brown

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 4.8069 D_{85}= 3.9981 D_{60}= 1.8670
D_{50}= 1.2703 D_{30}= 0.3184 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Source of Sample: P18112 **Depth:** 10'
Sample Number: A-19-006, S3 **Date:**

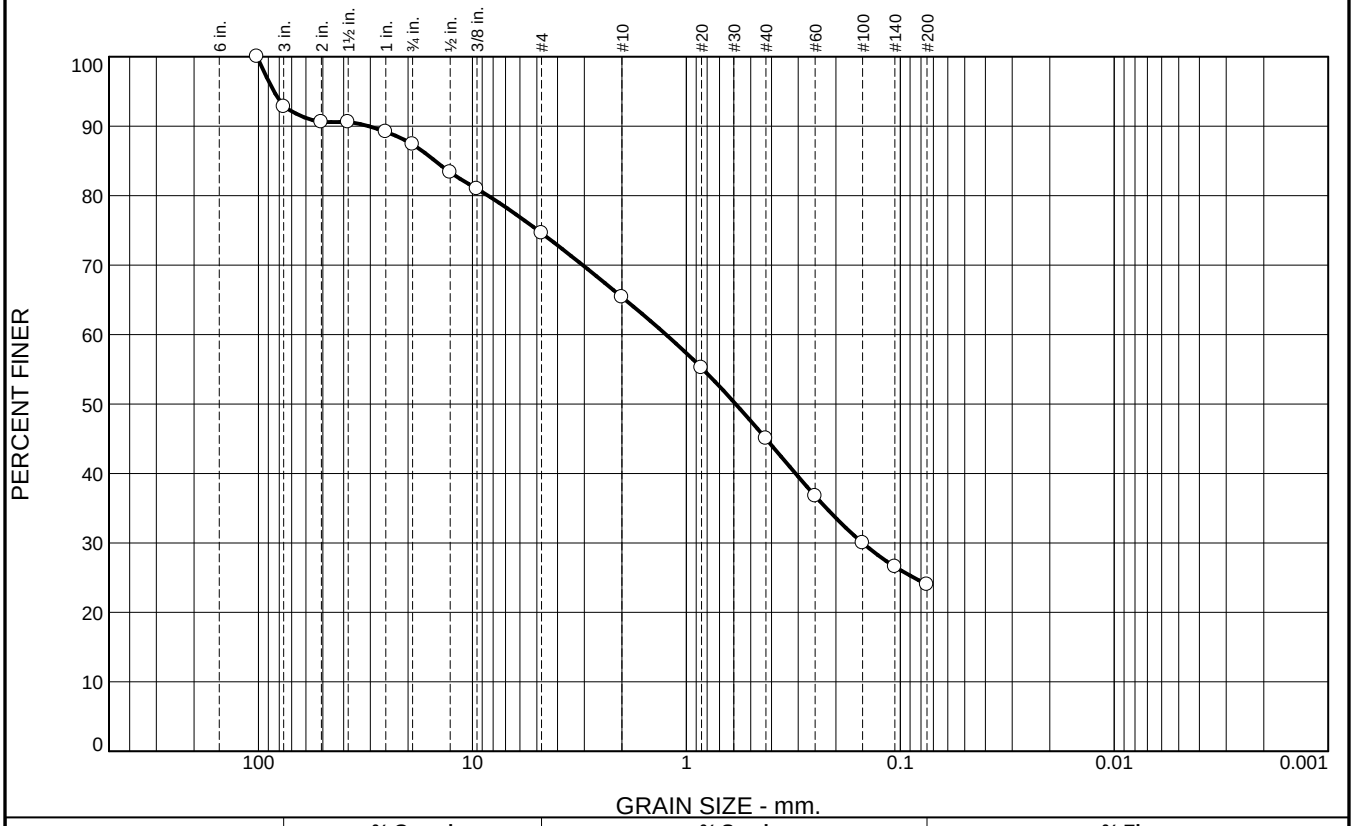
Blackburn Consulting

W. Sacramento, CA

Client: WRECO
Project: WRECO Lab Testing

Project No: 3390.X **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
7	6	12	10	20	21	24	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4"	100		
3"	93		
2"	91		
1.5"	91		
1"	89		
3/4"	87		
1/2"	83		
3/8"	81		
#4	75		
#10	65		
#20	55		
#40	45		
#60	37		
#100	30		
#140	27		
#200	24		

* (no specification provided)

Material Description

CLAYEY SAND with GRAVEL, dark yellowish brown

Atterberg Limits

PL= 24 LL= 34 PI= 10

Coefficients

D_{90}= 30.5354 D_{85}= 14.9428 D_{60}= 1.2448
D_{50}= 0.5882 D_{30}= 0.1501 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

Source of Sample: P18112 **Depth:** 0-5'
Sample Number: HA-19-008, S1 **Date:**

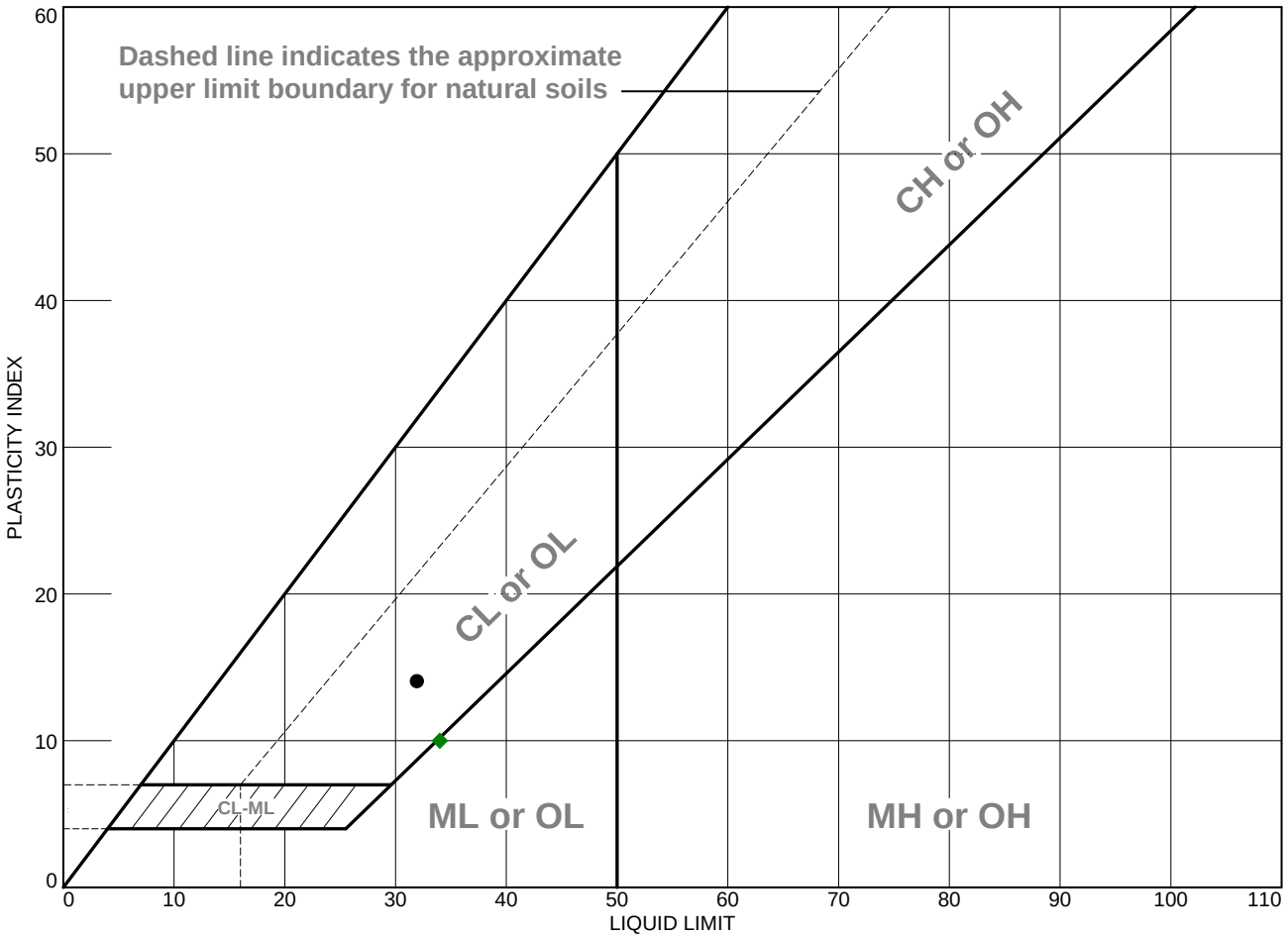
Blackburn Consulting

W. Sacramento, CA

Client: WRECO
Project: WRECO Lab Testing

Project No: 3390.X **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	CLAYEY SAND, yellowish brown	32	18	14	35	24	SC
■	SILTY SAND with GRAVEL, yellowish brown	NP	NP	NP	27	17	SM
▲	SILTY SAND, yellowish brown	NP	NP	NP	33	21	SM
◆	CLAYEY SAND with GRAVEL, dark yellowish brown	34	24	10	45	24	SC

Project No. 3390.X **Client:** WRECO

Project: WRECO Lab Testing

●**Source of Sample:** P18112 **Depth:** 5' **Sample Number:** A-19-002, S2

■**Source:** P18112 **Depth:** 10' **Sample No.:** A-19-005, S3

▲**Source:** P18112 **Depth:** 10' **Sample No.:** A-19-006, S3

◆**Source:** P18112 **Depth:** 0-5' **Sample No.:** HA-19-008, S1

Blackburn Consulting

W. Sacramento, CA

Remarks:

Figure

Sunland Analytical

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

Date Reported 02/02/2024
Date Submitted 01/29/2024

To: Ben Lokteff
Blackburn Consulting
2491 Boatman Ave
W. Sacramento, CA 95691

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

The reported analysis was requested for the following location:
Location : 4207.X022 P18112 Site ID : HA-23-001.
Thank you for your business.

* For future reference to this analysis please use SUN # 91462-189594.

EVALUATION FOR SOIL CORROSION

Soil pH	6.56		
Minimum Resistivity	4.56 ohm-cm (x1000)		
Chloride	4.3 ppm	00.00043	%
Sulfate	7.8 ppm	00.00078	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

Appendix IV. Calculation Package

ARS Online V3.1.0

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 38.7305 **Longitude:** -120.8352 **Vs30 (m/s):** 326 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2014}(g)	$Basin_{2014}$	Near Fault Amp	Design Sa_{2014}(g)
PGA	0.19	1	1	0.19
0.10	0.36	1	1	0.36
0.20	0.47	1	1	0.47
0.30	0.48	1	1	0.48
0.50	0.42	1	1	0.42
0.75	0.33	1	1	0.33
1.0	0.26	1	1	0.26
2.0	0.13	1	1	0.13
3.0	0.09	1	1	0.09
4.0	0.07	1	1	0.07
5.0	0.05	1	1	0.05

Copy table

Deaggregation (based on 2014 hazard)

Mean moment magnitude (for PGA)	6.43
Mean site-source distance, km (for Sa at 1s)	107.7

ARS Online V3.1.0

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 38.7332 **Longitude:** -120.8309 **Vs30 (m/s):** 497 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2014}(g)	$Basin_{2014}$	Near Fault Amp	Design Sa_{2014}(g)
PGA	0.17	1	1	0.17
0.10	0.33	1	1	0.33
0.20	0.4	1	1	0.4
0.30	0.37	1	1	0.37
0.50	0.3	1	1	0.3
0.75	0.23	1	1	0.23
1.0	0.18	1	1	0.18
2.0	0.09	1	1	0.09
3.0	0.06	1	1	0.06
4.0	0.05	1	1	0.05
5.0	0.04	1	1	0.04

Copy table

Deaggregation (based on 2014 hazard)

Mean moment magnitude (for PGA)	6.41
Mean site-source distance, km (for Sa at 1s)	105.4

For spreadfootings with vertical loads and soils above footing bottom that are not as competent as soils below footing.
AASHTO Bridge Design Specifications 8th Edition
Section 10.6.3.1.2

	Initials	Date	
Calc by	JO	12-May	2025
Checked	DK	21-Aug	2025

Yellow Input

Foundation Soil Properties:

Unit Weight of Soil	130
Internal Angle of Friction	34
Cohesion	0
Nc	42.2
Nq	29.4
Nγ	41.1
Depth of Embedment (Df)	2
Groundwater Depth Below Footing (Dw)	0

D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Dw = depth of highest groundwater below footing.
Choose worst case value.

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

Pick Cohesive or Noncohesive and Loading State

Cohesive | Noncohesive

Bike and Ped

Specific Footing Sizes	Effective Footing Size	Effective Footing Length																Cohesive			Noncohesive		
Support / Wall #	B'	L'	L'/B' Ratio	Sc	Sγ	Sq	Ncm	Nqm	Nγm	Sc	Sγ	Sq	Ncm	Nqm	Nγm	Cwq	Cwγ	Stength (qr) ksf	Extreme (qn) ksf	Gross Nominal Bearing Resistance ksf	Stength (qr) ksf	Extreme (qn) ksf	Gross Nominal Bearing Resistance ksf
R1 Type 6B Case 2																							
Strength	2	32	16.0	1.0125	1	1	42.7275	29.4	41.1	1.043543	0.975	1.042147	44.0375	30.63911	40.0725	1	0.5	4.6	10.3	10.3	4.8	10.6	10.6
Extreme	4	32	8.0	1.025	1	1	43.255	29.4	41.1	1.087085	0.95	1.084293	45.875	31.87822	39.045	1	0.5	5.8	13.0	13.0	6.0	13.4	13.4
R1 and R5																							
Strength	4.1	32	7.8	1.025625	1	1	43.28138	29.4	41.1	1.089262	0.94875	1.086401	45.96688	31.94018	38.99363	1	0.5	5.9	13.1	13.1	6.1	13.5	13.5
Extreme	3	12	4.0	1.05	1	1	44.31	29.4	41.1	1.174171	0.9	1.168586	49.55	34.35644	36.99	1	0.5	5.2	11.7	11.7	5.6	12.5	12.5
R2																							
Strength	6.3	12	1.9	1.105	1	1	46.631	29.4	41.1	1.365758	0.79	1.354031	57.635	39.80853	32.469	1	0.5	7.2	16.1	16.1	7.6	17.0	17.0
Extreme	4.1	12	2.9	1.068333	1	1	45.08367	29.4	41.1	1.238033	0.863333	1.230401	52.245	36.1738	35.483	1	0.5	5.9	13.1	13.1	6.4	14.1	14.1

wreco

CLIENT:City Placerville
Placerville Drive Retraining Wall
PROJECT NO.: 18113

STRUCTURE NO.: RW 1 and RW 5

COMPUTED BY: FPT
DATE: 7/27/2025
CHECKED BY: DAK
DATE: 8/18/2025
PAGE:2 of

SETTLEMENT OF STRIP FOOTINGS ON GRANULAR SOILS

(SCHMERTMANN, FHWA-TS-78-209, PGS 49-54)

EQUATIONS: Izp max = 0.5 + 0.1*(DELTA P / SIGMA V')^0.5 ; DELTA P = P - Po'

B, FOOTING WIDTH (FT.)	P, LOAD (KSF)	DEPTH TO FOOTING BASE (FT.)	Po ' (KSF)	DELTA P (KSF)	B (FT.)	SIGMA V ' (KSF)	Izp (MAX)
			(VALUES FOR Po' AND SIGMA V ' COMPUTED BELOW)				
4.5	0.4	2.3	0.28125	0.11875	4.5	0.844	0.538

NOTE: STRATA DEPTH START AT GROUND SURFACE AND EXTEND TO D + 4B
ONE STRATA BREAK AT WATER TABLE, USE BOUYANT UNIT WEIGHTS BELOW WATER TABLE

	STRATA DEPTH		UNIT	P ZERO	P ZERO	Izp	SIGMA V
	FROM	TO	WEIGHT	DEPTH		DEPTH	
	(FT.)	(FT.)	(KCF)	(FT.)	(KSF)	(FT.)	(KSF)
	0	8.5	0.125	2.25	0.281	6.75	0.844
	8.5	20.4	0.070		0.000		0.000

INFLUENCE VALUES & BOUNDARY CONDITIONS:
2.25 FT = D, FIRST LAYER MUST START AT DEPTH D
6.75 FT = D+B, ONE LAYER BOUNDARY MUST OCCUR AT Izp @ D+B
20.25 FT = D+4B, BOTTOM OF LAST LAYER MUST END AT D + 4B

LAYER DEPTH		LAYER	LAYER	E	Iz	Iz*D/Es
FROM	TO	THICKNESS	MID-THICK			
(FT.)	(FT.)	(FT.)	DEPTH, FT	(KSF)		
-	-	-	-	-	-	-
2.25	6.75	4.5	4.5	1000	0.369	0.00166
6.75	20.25	13.5	13.5	1000	0.269	0.00363
SUMMATION, Iz*D/Es =						0.00529

SETTLEMENT COMPUTATION: EQUATIONS:
C1 = 1.0-0.5*(P zero/DELTA P)
C2 = 1.0+0.2*LOG(TIME,YRS/0.1)
S = DELTA P*C1*C2*(SUM(Iz*D/Es)

DELTA P	C1	TIME (YRS)	C2	Iz*D/Es	SETTLEMENT (FT.)	SETTLEMENT (IN.)	½ SETTLEMENT* (IN.)
0.11875	0.50	50	1.54	0.0053	0.0005	0.01	0.00

* If such pre-loading has occurred (i.e. rock), tentatively use ½ the above predicted settlement as probably still conservative.
(SCHMERTMANN, FHWA-TS-78-209, PGS 49-54)

wreco

CLIENT:City Placerville
Placerville Drive Retraining Wall
PROJECT NO.: 18113

STRUCTURE NO.: RW 2

COMPUTED BY: FPT
DATE: 7/27/2025
CHECKED BY: DAK
DATE: 8/18/2025
PAGE:1 of1

SETTLEMENT OF STRIP FOOTINGS ON GRANULAR SOILS

(SCHMERTMANN, FHWA-TS-78-209, PGS 49-54)

EQUATIONS: Izp max = 0.5 + 0.1*(DELTA P / SIGMA V')^0.5 ; DELTA P = P - Po'

B, FOOTING WIDTH (FT.)	P, LOAD (KSF)	DEPTH TO FOOTING BASE (FT.)	Po ' (KSF)	DELTA P (KSF)	B (FT.)	SIGMA V ' (KSF)	Izp (MAX)
			(VALUES FOR Po' AND SIGMA V ' COMPUTED BELOW)				
6.6	0.7	2.5	0.3125	0.3875	6.6	0.967	0.563

NOTE: STRATA DEPTH START AT GROUND SURFACE AND EXTEND TO D + 4B
ONE STRATA BREAK AT WATER TABLE, USE BOUYANT UNIT WEIGHTS BELOW WATER TABLE

	STRATA DEPTH FROM (FT.)	STRATA DEPTH TO (FT.)	UNIT WEIGHT (KCF)	P ZERO DEPTH (FT.)	P ZERO (KSF)	Izp DEPTH (FT.)	SIGMA V (KSF)
	0	6	0.125	2.5	0.313	9.1	0.750
	6	75	0.070		0.000		0.217

INFLUENCE VALUES & BOUNDARY CONDITIONS:
2.5 FT = D, FIRST LAYER MUST START AT DEPTH D
9.1 FT = D+B, ONE LAYER BOUNDARY MUST OCCUR AT Izp @ D+B
28.9 FT = D+4B, BOTTOM OF LAST LAYER MUST END AT D + 4B

LAYER DEPTH FROM (FT.)	LAYER DEPTH TO (FT.)	LAYER THICKNESS (FT.)	LAYER MID-THICK DEPTH, FT	E (KSF)	Iz	Iz*D/Es
-	-	-	-	-	-	-
2.5	9.1	6.6	5.8	1000	0.382	0.00252
9.1	28.9	19.8	19	1000	0.282	0.00558
SUMMATION, Iz*D/Es =						0.00810

SETTLEMENT COMPUTATION:

EQUATIONS:
C1 = 1.0-0.5*(P zero/DELTA P)
C2 = 1.0+0.2*LOG(TIME,YRS/0.1)
S = DELTA P*C1*C2*(SUM(Iz*D/Es)

DELTA P	C1	TIME (YRS)	C2	Iz*D/Es	SETTLEMENT (FT.)	SETTLEMENT (IN.)	½ SETTLEMENT* (IN.)
0.3875	0.60	50	1.54	0.0081	0.0029	**0.03**	**0.02**

* If such pre-loading has occurred (i.e. rock), tentatively use ½ the above predicted settlement as probably still conservative.
(SCHMERTMANN, FHWA-TS-78-209, PGS 49-54)

Shear Wave Velocity (Vs)

Project: **Placerville Drive Bicycle and Pedestrian Facilities Project, Phase I**
Job No: **P18112**
Date: **1/18/2024**
Boring: **R-19-002**

R-19-002
Placerville Drive Bicycle and Pedestrian Facilities Project, Phase I

Hammer Energy (ER): 85 %

Sample Number	Depth (feet)	Depth to Bottom of Layer (feet)	Layer Thickness (feet)	Sample D_i (inches)	Soil Type	Undrained Shear Strength S_u (psf)	Rock *	Material Age **	Field N (bpf)	N_{SPT} (bpf) ***	N_{60}	σ'_v (ksf)	σ'_v (kPa)	d Layer Thickness in upper 30 m (m)	Granular Soil Vs Gravel (m/sec)	Vs SAND (m/sec)	Vs SILT (m/sec)	Cohesive Soil Vs Cohesive[1] (m/sec)	Vs Cohesive[2] (m/sec)	Sedimentary Rock Vs (m/sec)	Profile Vs (m/sec)	Profile D/Vs (sec)
S2	5.0	8.0	8.0	1.4	SC	500		Q	100	100	142	0.65	31.12	2.44	403	207					207	0.012
A	8.0	10.0	2.0	2.5	GW		Rock		200	153	217	1.04	49.80	0.61	459					560	560	0.001
B	10.0	13.0	3.0	2.5	GW		Rock		200	153	217	1.31	62.53	0.91	471					560	560	0.002
C	13.0	15.0	2.0	2.5	GW		Rock		200	153	217	1.73	82.78	0.61	488					560	560	0.001
D	15.0	95.1	80.1	2.5	GW		Rock		200	153	217	2.00	95.81	24.41	496					560	560	0.044
														28.99							489	0.059

* Enter "rock" for Tertiary Age (<70 million years) Sedimentary Rocks. Alternatively, their "Tertiary Sand/Clay" correlation may be used.
** Estimate the age of the soil material as "Q" for Quaternary, "H" for Holocene, or "P" for Pleistocene
*** Corrected for sample diameter

Shear Wave Velocity for Upper 30 m (V_{S30})

Vs_{30} = [1.45 - (0.015*d)]*Vs(d)

d (m)	28.99
Vs(d) (m/sec)	490
V_{S30} (m/sec)	**497**

Soil Profile Type

'C' (360 m/s < Vs < 760 m/s)

Shear Wave Velocity Correlations

Gravel: $Vs = 53(N_{60})^{0.19}(\sigma'_{vo})^{0.18}$ for Holocene; $Vs = 115(N_{60})^{0.17}(\sigma'_{vo})^{0.12}$ for Pleistocene
Sand: $Vs = 30(ASF)(N_{60})^{0.23}(\sigma'_{vo})^{0.23}$ where ASF = dimensionless age scaling factor; 1.0 for Quaternary, 0.9 for Holocene, 1.
Silt: Vs = Same as Cohesive[2]
Cohesive[1]: $Vs = 203(S_u/P_a)^{0.475} \leq 310$ m/sec, valid for range of 100 to 310 m/sec
Cohesive[2]: $Vs = 26(ASF)(N_{60})^{0.17}(\sigma'_{vo})^{0.32}$ where ASF = dimensionless age scaling factor; 1.0 for Quaternary, 0.88 for Holocene,
Young Sedimentary Rock (Tertiary Deposits): $Vs = 109(N_{60})^{0.319} \leq 560$/m/sec
P_a = Atmospheric Pressure = 2116.2 psf

Notes: 1) The calculated Vs value assumes that no significant changes in the subsurface will occur to the extrapolated depth of 100 feet.
2) In the absence of in-situ measurements, limit Vs_{30} to 760 m/sec for competent rock in California.
3) The shear wave velocity (Vs) for SAND and SILT based on SPT correlations are valid where $N_{60} \leq 100$ and $\sigma'_v \leq 506$ kPa.
4) Undrained Shear Strength (S_u) based on 0.5(Pocket Penetrometer) in psf.

Reference: Caltrans "Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations", Appendix A, pgs 15-18, November 2012.

Shear Wave Velocity (Vs)

Project: **Placerville Drive Bicycle and Pedestrian Facilities Project, Phase I**
Job No: **P18112**
Date: **1/18/2024**
Boring: **R-19-005**

R-19-005
Placerville Drive Bicycle and Pedestrian Facilities Project, Phase I

Hammer Energy (ER): 85 %

Sample Number	Depth (feet)	Depth to Bottom of Layer (feet)	Layer Thickness (feet)	Sample D_i (inches)	Soil Type	Undrained Shear Strength S_u (psf)	Rock *	Material Age **	Field N (bpf)	N_{SPT} (bpf) ***	N_{60}	σ'_v (ksf)	σ'_v (kPa)	d Layer Thickness in upper 30 m (m)	Granular Soil: Vs Gravel (m/sec)	Granular Soil: Vs SAND (m/sec)	Granular Soil: Vs SILT (m/sec)	Cohesive Soil: Vs Cohesive[1] (m/sec)	Cohesive Soil: Vs Cohesive[2] (m/sec)	Sedimentary Rock Vs (m/sec)	Profile Vs (m/sec)	Profile D/Vs (sec)
S2	5.0	10.0	10.0	1.4	SM	500		Q	39	39	55	0.61	28.97	3.05	340	164					164	0.019
S3	8.0	15.0	5.0	1.4	SM			Q	70	70	99	0.96	45.87	1.52	398	208					208	0.007
S4	15.0	16.0	1.0	2.5	SM		Rock	Q	100	77	109	1.84	88.10	0.30	437					487	487	0.001
A	16.0	21.0	5.0	2.5	GW		Rock		200	153	217	1.97	94.37	1.52	495					560	560	0.003
B	21.0	95.1	74.1	2.5	GW		Rock		200	153	217	2.66	127.41	22.59	513					560	560	0.040
														28.99							396	0.070

* Enter "rock" for Tertiary Age (<70 million years) Sedimentary Rocks. Alternatively, their "Tertiary Sand/Clay" correlation may be used.
** Estimate the age of the soil material as "Q" for Quaternary, "H" for Holocene, or "P" for Pleistocene
*** Corrected for sample diameter

Shear Wave Velocity for Upper 30 m (V_{S30})

Vs_{30} = [1.45 - (0.015*d)]*Vs(d)

d (m)	28.99
Vs(d) (m/sec)	416
V_{S30} (m/sec)	**423**

Soil Profile Type
'C' (360 m/s < Vs < 760 m/s)

Shear Wave Velocity Correlations

Gravel: $Vs = 53(N_{60})^{0.19}(\sigma'_{vo})^{0.18}$ for Holocene; $Vs = 115(N_{60})^{0.17}(\sigma'_{vo})^{0.12}$ for Pleistocene
Sand: $Vs = 30(ASF)(N_{60})^{0.23}(\sigma'_{vo})^{0.23}$ where ASF = dimensionless age scaling factor; 1.0 for Quaternary, 0.9 for Holocene, 1.
Silt: Vs = Same as Cohesive[2]
Cohesive[1]: $Vs = 203(S_u/P_a)^{0.475} \leq 310$ m/sec, valid for range of 100 to 310 m/sec
Cohesive[2]: $Vs = 26(ASF)(N_{60})^{0.17}(\sigma'_{vo})^{0.32}$ where ASF = dimensionless age scaling factor; 1.0 for Quaternary, 0.88 for Holocene,
Young Sedimentary Rock (Tertiary Deposits): $Vs = 109(N_{60})^{0.319} \leq 560$/m/sec
P_a = Atmospheric Pressure = 2116.2 psf

Notes:
1) The calculated Vs value assumes that no significant changes in the subsurface will occur to the extrapolated depth of 100 feet.
2) In the absence of in-situ measurements, limit Vs_{30} to 760 m/sec for competent rock in California.
3) The shear wave velocity (Vs) for SAND and SILT based on SPT correlations are valid where $N_{60} \leq 100$ and $\sigma'_v \leq 506$ kPa.
4) Undrained Shear Strength (S_u) based on 0.5(Pocket Penetrometer) in psf.

Reference: Caltrans "Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations", Appendix A, pgs 15-18, November 2012.

Shear Wave Velocity (Vs)

A-19-006
Placerville Drive Bicycle and Pedestrian Facilities Project, Phase I

Project: **Placerville Drive Bicycle and Pedestrian Facilities Project, Phase I**
Job No: **P18112**
Date: **1/17/2023**
Boring: **A-19-006**

Hammer Energy (ER): 85 %

Sample Number	Depth (feet)	Depth to Bottom of Layer (feet)	Layer Thickness (feet)	Sample D_i (inches)	Soil Type	Undrained Shear Strength S_u (psf)	Rock *	Material Age **	Field N (bpf)	N_{SPT} (bpf) ***	N_{60}	σ'_v (ksf)	σ'_v (kPa)	d Layer Thickness in upper 30 m (m)	Granular Soil: Vs Gravel (m/sec)	Granular Soil: Vs SAND (m/sec)	Granular Soil: Vs SILT (m/sec)	Cohesive Soil: Vs Cohesive[1] (m/sec)	Cohesive Soil: Vs Cohesive[2] (m/sec)	Sedimentary Rock Vs (m/sec)	Profile Vs (m/sec)	Profile D/Vs (sec)
1	5.0	8.0	8.0	1.4	SC	1500		H	24	24	34	0.62	29.69	2.44	315	133					133	0.018
2	8.0	15.0	7.0	1.4	SC	1250		Q	56	56	79	0.99	47.50	2.13	384	199					199	0.011
3	15.0	20.0	5.0	1.4	SC	250		Q	55	55	78	1.90	90.73	1.52	414	230					230	0.007
4	20.0	25.0	5.0	1.4	SC	500		Q	100	100	142	2.55	122.09	1.52	475	283					283	0.005
5	25.0	45.0	20.0	1.4	SC	750		Q	75	75	106	3.21	153.46	6.10	465	279					279	0.022
*	45.0	95.1	50.1	2.5	GW		Rock		200	153	217	5.83	278.90	15.27	564					560	560	0.027
														28.99							281	0.090

* Enter "rock" for Tertiary Age (<70 million years) Sedimentary Rocks. Alternatively, their "Tertiary Sand/Clay" correlation may be used.
** Estimate the age of the soil material as "Q" for Quaternary, "H" for Holocene, or "P" for Pleistocene
*** Corrected for sample diameter

Shear Wave Velocity for Upper 30 m (V_{S30})

$Vs_{30} = [1.45 - (0.015*d)]*Vs(d)$

d (m)	28.99
Vs(d) (m/sec)	321
V_{S30} (m/sec)	**326**

Soil Profile Type
'D' (180 m/s < Vs < 360 m/s)

Shear Wave Velocity Correlations

Gravel: $Vs = 53(N_{60})^{0.19}(\sigma'_{vo})^{0.18}$ for Holocene; $Vs = 115(N_{60})^{0.17}(\sigma'_{vo})^{0.12}$ for Pleistocene
Sand: $Vs = 30(ASF)(N_{60})^{0.23}(\sigma'_{vo})^{0.23}$ where ASF = dimensionless age scaling factor; 1.0 for Quaternary, 0.9 for Holocene, 1.
Silt: Vs = Same as Cohesive[2]
Cohesive[1]: $Vs = 203(S_u/P_a)^{0.475} \leq 310$ m/sec, valid for range of 100 to 310 m/sec
Cohesive[2]: $Vs = 26(ASF)(N_{60})^{0.17}(\sigma'_{vo})^{0.32}$ where ASF = dimensionless age scaling factor; 1.0 for Quaternary, 0.88 for Holocene, 1
Young Sedimentary Rock (Tertiary Deposits): $Vs = 109(N_{60})^{0.319} \leq 560$/m/sec
P_a = Atmospheric Pressure = 2116.2 psf

Notes: 1) The calculated Vs value assumes that no significant changes in the subsurface will occur to the extrapolated depth of 100 feet.
2) In the absence of in-situ measurements, limit Vs_{30} to 760 m/sec for competent rock in California.
3) The shear wave velocity (Vs) for SAND and SILT based on SPT correlations are valid where $N_{60} \leq 100$ and $\sigma'_v \leq 506$ kPa.
4) Undrained Shear Strength (S_u) based on 0.5(Pocket Penetrometer) in psf.

Reference: Caltrans "Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations", Appendix A, pgs 15-18, November 2012.

FLEXIBLE PAVEMENT DESIGN (ft)

(VERSION 7.0f, 5/31/96)

DESIGN PARAMETERS

Subgrade "R"-value =	50	
TI =	9.0	
AC Gf =	1.89	
Total GE Required =	1.4400	ft
Minimum AS "R" =	50	
Specify TPB Type	A	A=Asphalt, C=Cement

Reference Use/AC Gravel Factor Menu			
TI	AC Gf	TI	AC Gf
up to 5.0	2.54	7.5 - 8.0	2.01
5.5 - 6.0	2.32	8.5 - 9.0	1.89
6.5 - 7.0	2.14	9.5 - 10.0	1.79

*Note: Program Uses Caltrans GE Table if TI > 9.0 or AC > 0.50-ft

Aggregate Subbase (AS) "R"-value Menu				
Class	1	2	3	4 & 5
"R"min	60	50	40	Specify

RESULTING PAVEMENT SECTIONS

"R"-value= 50

Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
9.0	0.45	-	0.55	-	1.00	1.4555	Yes	N/A	Caltrans Acceptable
	-	-	-	-	-	-	-	-	
	0.45	0.25	0.35	-	1.05	1.5855	Yes	N/A	Caltrans Minimum TPB Section
	-	-	-	-	-	-	-	-	
	0.75	-	-	-	0.75	1.5900	Yes	N/A	Caltrans Full Depth AC Section

Non-Highway or Non-Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
9.0	0.35	-	0.70	-	1.05	1.4315	No	N/A	OK: Not for Caltrans Applications
	-	-	-	-	-	-	-	-	

Responsibility/Liability : ***User assumes liability for accuracy and use of information from this program***

Program Design Basis : Flexible pavement design per Caltrans "Highway Design Manual", Chapter 600
Safety Factor is 0.20-ft Gravel Equivalent for Asphalt and Aggregate Base/0.10-ft for full depth AC
Except for full depth AC sections, Class-2 AB is always used and has a minimum "R"-value = 78
Minimum Aggregate thickness is 0.35-ft for Caltrans Sections, 0.50-ft for "Alternative" Sections
TPB sections utilize Caltrans "standard" thicknesses, dependent on alternative selected
AS "R"-value must be greater than or equal to subgrade "R"-value (program will compensate)

FLEXIBLE PAVEMENT DESIGN (ft)

(VERSION 7.0f, 5/31/96)

DESIGN PARAMETERS

Subgrade "R"-value =	50	
TI =	13.0	
AC Gf =	1.57	
Total GE Required =	2.0800	ft
Minimum AS "R" =	50	
Specify TPB Type	A	A=Asphalt, C=Cement

Reference Use/AC Gravel Factor Menu			
TI	AC Gf	TI	AC Gf
up to 5.0	2.54	7.5 - 8.0	2.01
5.5 - 6.0	2.32	8.5 - 9.0	1.89
6.5 - 7.0	2.14	9.5 - 10.0	1.79

*Note: Program Uses Caltrans GE Table if TI > 9.0 or AC > 0.50-ft

Aggregate Subbase (AS) "R"-value Menu				
Class	1	2	3	4 & 5
"R"min	60	50	40	Specify

RESULTING PAVEMENT SECTIONS

"R"-value= 50

Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
13.0	0.65	-	0.90	-	1.55	2.0800	Yes	N/A	Caltrans Acceptable
	-	-	-	-	-	-	-	-	
	0.65	0.25	0.60	-	1.50	2.1000	Yes	N/A	Caltrans Acceptable
	-	-	-	-	-	-	-	-	
	1.10	-	-	-	1.10	2.2000	Yes	N/A	Caltrans Full Depth AC Section

Non-Highway or Non-Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
13.0	0.55	-	1.10	-	1.65	2.0800	No	N/A	OK: Not for Caltrans Applications
	-	-	-	-	-	-	-	-	

Responsibility/Liability : ***User assumes liability for accuracy and use of information from this program***

Program Design Basis : Flexible pavement design per Caltrans "Highway Design Manual", Chapter 600
Safety Factor is 0.20-ft Gravel Equivalent for Asphalt and Aggregate Base/0.10-ft for full depth AC
Except for full depth AC sections, Class-2 AB is always used and has a minimum "R"-value = 78
Minimum Aggregate thickness is 0.35-ft for Caltrans Sections, 0.50-ft for "Alternative" Sections
TPB sections utilize Caltrans "standard" thicknesses, dependent on alternative selected
AS "R"-value must be greater than or equal to subgrade "R"-value (program will compensate)

FLEXIBLE PAVEMENT DESIGN (ft)

(VERSION 7.0f, 5/31/96)

DESIGN PARAMETERS

Subgrade "R"-value =	50	
TI =	8.5	
AC Gf =	1.89	
Total GE Required =	1.3600	ft
Minimum AS "R" =	50	
Specify TPB Type	A	A=Asphalt, C=Cement

Reference Use/AC Gravel Factor Menu			
TI	AC Gf	TI	AC Gf
up to 5.0	2.54	7.5 - 8.0	2.01
5.5 - 6.0	2.32	8.5 - 9.0	1.89
6.5 - 7.0	2.14	9.5 - 10.0	1.79

*Note: Program Uses Caltrans GE Table if TI > 9.0 or AC > 0.50-ft

Aggregate Subbase (AS) "R"-value Menu				
Class	1	2	3	4 & 5
"R"min	60	50	40	Specify

RESULTING PAVEMENT SECTIONS

"R"-value= 50

Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
8.5	0.40	-	0.55	-	0.95	1.3610	Yes	N/A	Caltrans Acceptable
	-	-	-	-	-	-	-	-	
	0.40	0.25	0.35	-	1.00	1.4910	Yes	N/A	Caltrans Minimum TPB Section
	-	-	-	-	-	-	-	-	
	0.70	-	-	-	0.70	1.4500	Yes	N/A	Caltrans Full Depth AC Section

Non-Highway or Non-Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
8.5	0.30	-	0.70	-	1.00	1.3370	No	N/A	OK: Not for Caltrans Applications
	-	-	-	-	-	-	-	-	

Responsibility/Liability : ***User assumes liability for accuracy and use of information from this program***

Program Design Basis : Flexible pavement design per Caltrans "Highway Design Manual", Chapter 600
Safety Factor is 0.20-ft Gravel Equivalent for Asphalt and Aggregate Base/0.10-ft for full depth AC
Except for full depth AC sections, Class-2 AB is always used and has a minimum "R"-value = 78
Minimum Aggregate thickness is 0.35-ft for Caltrans Sections, 0.50-ft for "Alternative" Sections
TPB sections utilize Caltrans "standard" thicknesses, dependent on alternative selected
AS "R"-value must be greater than or equal to subgrade "R"-value (program will compensate)

FLEXIBLE PAVEMENT DESIGN (ft)

(VERSION 7.0f, 5/31/96)

DESIGN PARAMETERS

Subgrade "R"-value =	50	
TI =	9.5	
AC Gf =	1.79	
Total GE Required =	1.5200	ft
Minimum AS "R" =	50	
Specify TPB Type	A	A=Asphalt, C=Cement

Reference Use/AC Gravel Factor Menu			
TI	AC Gf	TI	AC Gf
up to 5.0	2.54	7.5 - 8.0	2.01
5.5 - 6.0	2.32	8.5 - 9.0	1.89
6.5 - 7.0	2.14	9.5 - 10.0	1.79

*Note: Program Uses Caltrans GE Table if TI > 9.0 or AC > 0.50-ft

Aggregate Subbase (AS) "R"-value Menu				
Class	1	2	3	4 & 5
"R"min	60	50	40	Specify

RESULTING PAVEMENT SECTIONS

"R"-value= 50

Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
9.5	0.50	-	0.55	-	1.05	1.5000	Yes	N/A	Caltrans Acceptable
	-	-	-	-	-	-	-	-	
	0.50	0.25	0.35	-	1.10	1.6300	Yes	N/A	Caltrans Minimum TPB Section
	-	-	-	-	-	-	-	-	
	0.80	-	-	-	0.80	1.6400	Yes	N/A	Caltrans Full Depth AC Section

Non-Highway or Non-Caltrans Applications

TI	Asphalt (ft)	Asphalt TPB (ft)	AB(2) (ft)	AS (ft)	Section Thickness (ft)	Total GE Provided (ft)	AC FS?	AB FS?	Section Notes
9.5	0.35	-	0.80	-	1.15	1.5065	No	N/A	OK: Not for Caltrans Applications
	-	-	-	-	-	-	-	-	

Responsibility/Liability : ***User assumes liability for accuracy and use of information from this program***

Program Design Basis : Flexible pavement design per Caltrans "Highway Design Manual", Chapter 600
Safety Factor is 0.20-ft Gravel Equivalent for Asphalt and Aggregate Base/0.10-ft for full depth AC
Except for full depth AC sections, Class-2 AB is always used and has a minimum "R"-value = 78
Minimum Aggregate thickness is 0.35-ft for Caltrans Sections, 0.50-ft for "Alternative" Sections
TPB sections utilize Caltrans "standard" thicknesses, dependent on alternative selected
AS "R"-value must be greater than or equal to subgrade "R"-value (program will compensate)