GEOTECHNICAL INVESTIGATION REPORT
LONG VALLEY RD/VALLEY CIRCLE BLVD/US-101 ON-RAMP IMPROVEMENTS, HIDDEN HILLS, CALIFORNIA

PREPARED FOR

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WILLDAN GEOTECHNICAL PROJECT NO. 108760-1000-007

AUGUST 20, 2019

August 20, 2019

Mr. Tyrone Peter
Willdan Engineering
2401 E. Katella Avenue, Suite 300
Anaheim, CA 92806

Subject: Geotechnical Investigation Report
Long Valley Rd/Valley Circle Blvd/US-101 On-Ramp Improvements
Hidden Hills, California
Willdan Geotechnical Project No. 108760-1000-007

Dear Mr. Peter,

Willdan Engineering, Geotechnical Group (Willdan Geotechnical) is pleased to submit this report for the proposed Long Valley Road/Valley Circle Boulevard/US-101 Freeway on-ramp improvement project in Hidden Hills, California. This report presents our geotechnical findings, conclusions and recommendations for the design and construction of the proposed improvements. Based on the results of our investigation, the proposed improvements are feasible from a geotechnical standpoint, provided the recommendations in this report are followed.

We appreciate the opportunity to assist you and look forward to future projects. If you have any questions, please contact us.

Respectfully submitted,
WILLDAN GEOTECHNICAL

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Sr. Engineering Geologist

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Distribution: Addressee

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1. INTRODUCTION

This report presents the results of our geotechnical investigation performed for the proposed Long Valley Road/Valley Circle Boulevard/US-101 on-ramp improvements project in Hidden Hills, California. This report includes our recommendations for the design and construction of the proposed improvements from a geotechnical standpoint. The recommendations provided within this submittal are based on the results of our field investigation and testing, laboratory testing and engineering analyses.

2. SCOPE OF SERVICES

This investigation was conducted to explore and evaluate the site soil engineering conditions to the depths that may be significantly influenced by the proposed improvements. Our scope of services included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site;
- Review of selected published geologic maps, reports and literature pertinent to the site and surrounding areas;
- A field exploration consisting of drilling four (4) exploratory borings including three (3) borings to the depth of 6.5 feet below ground surface (bgs) and one (1) boring to the depth of 11.5 feet bgs to evaluate subsurface soils conditions at the subject project sites;
- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and engineering properties of the subsurface soils;
- Engineering evaluation of the data obtained from the field investigation and laboratory testing program; and
- Preparation of this report summarizing our findings, results of geotechnical laboratory and field testing, and our conclusions and recommendations for the geotechnical aspects of the project design and construction.

3. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

It is our understanding that the proposed improvement includes construction of the retaining wall, sidewalk, proposed right turn pocket and a park and ride lot with footprint area of 19,073 square feet within the subject project site located at Long Valley Road, Valley Circle Boulevard, and US-101 on-ramp in Hidden Hills, California, as shown on Figure 1 in Appendix A. The latitude and longitude at the approximate center of the subject project site are 34.1593° N and 118.6388° W, respectively.

4. GEOTECHNICAL INVESTIGATIONS

4.1. FIELD EXPLORATION

Field exploration for this investigation consisted of drilling and sampling four (4) borings including three (3) borings to the depth of 6.5 feet bgs, and one (1) boring to the depth of 11.5 feet bgs. Approximate locations of the borings are shown on Figure 2 in Appendix A. The boring logs are provided in Appendix B. Prior to field exploration, a site visit was performed to mark the boring locations and evaluate access conditions for drilling equipment. In addition, an encroachment permit application was filed in the City of Los Angeles for the purpose of drilling within the proposed retaining wall area.

Soil borings for the current investigations were advanced using a truck-mounted CME 75 rig equipped with 8-inch diameter hollow-stem augers. Bulk and relatively undisturbed soil samples were collected from each soil boring during drilling. Bulk samples were collected from auger cuttings obtained from within the near-surface soils. At selected intervals throughout the boring depths, relatively undisturbed soil samples were collected by driving a 3-inch outside diameter Modified California Sampler lined with brass rings. The samplers were driven into the underlying soil to a depth of 18 inches, or the interval noted on the boring logs, with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler was recorded for each 6-inch penetration interval and is shown on the boring logs. Soil samples were retained for possible laboratory testing. The number of blows required to drive the sampler the last 12 inches was used to estimate the in-situ relative density of granular soils and to less accuracy, the consistency of cohesive soils. Upon completion of drilling, the boring was backfilled with soil cuttings, tamped, and patched with cold asphalt as appropriate. Soil samples collected from the borings were delivered to Willdan's laboratory for testing.

Classification of the soils encountered in our exploratory borings was made in general accordance with the Unified Soil Classification System (USCS), using visual-manual procedure (ASTM D2488) and/or based on laboratory testing (ASTM D2487). A key for the classification of the soils (USCS classification) along with the boring logs are provided in Appendix B.

4.2. Laboratory Testing

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. Laboratory testing included determination of in-situ moisture content and dry density, gradation, shear strength characteristics, R-value and corrosion potential. Laboratory tests were conducted in general accordance with American Society for Testing of Materials (ASTM) Standards or California Test Methods (CTM). The in-situ dry density and moisture content test results are shown on the boring logs. The remaining laboratory test results are provided in Appendix C.

4.3. Subsurface Conditions

Subsurface investigations were performed to the depths of 6.5 feet and 11.5 feet bgs to evaluate the soil conditions within the limits of the proposed improvements of right turn pocket/parking lot and retaining wall respectively.

Based on the field exploration and the results of laboratory tests on the soils samples collected within the proposed right turn pocket/ride and park lot areas, a very stiff sandy clay layer is predominantly present in the upper 6.5 feet. In addition, the subsurface investigation within the limits of the proposed retaining wall showed a 10-foot thick dense sandy layer underlain by hard sandy clay layer to the maximum drilled depth of 11.5 feet bgs.

The above is a general description of soil conditions encountered at the site in the borings drilled for this investigation. For more detailed description of the subsurface soil conditions encountered, please refer to the boring logs in Appendix B.

4.4. Groundwater

The subject project site is located within an area where historically highest groundwater has not been identified (CGS, 1997). The exploratory boring conducted for the current investigation was monitored for visible signs of free groundwater during and immediately after completion of the borehole. Groundwater was not encountered during our field explorations in August 5, 2019.

Depth to groundwater can be expected to fluctuate both seasonally and from year to year. Fluctuations in the groundwater level may occur due to variations in precipitation, flow in nearby creeks, irrigation practices at the site and in the surrounding areas, climatic conditions, pumping from wells, and possibly as the result of other factors that were not evident at the time of our investigation. Because of the type of the proposed improvements and expected depth of grading and/or excavation, it is not likely that groundwater would be encountered during construction for the proposed improvements.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. General

Based on our geotechnical investigation, the proposed developments are feasible from a geotechnical point of view, provided the recommendations contained in this report are implemented in the design and construction of the project.

5.2. Earthwork

5.2.1. Site Preparation

During grading, the contractor should take all necessary measures to protect existing utilities within the grading limits. All abandoned utilities encountered should be removed or otherwise drained for all content, if any, and properly capped.

Any soils disturbed during site clearing operations in the construction areas should be removed down to the required depth within the suitable undisturbed soils. After removal of unsuitable soils and prior to placement of fill, the bottom of removal shall be observed and confirmed to be competent by the Geotechnical Engineer of Record. Following the over-excavation, the areas to receive engineered fill shall be scarified to a minimum depth of 8 inches, moisture-conditioned within optimum and 3% above optimum moisture content and compacted to at least 90% of the maximum dry density obtained per ASTM D1557.

Unless stated otherwise, all fill materials should be placed in loose lifts of 8 inches or less, moisture-conditioned within optimum and 3% above optimum moisture content and compacted to at least 90% relative compaction of the maximum density as determined by the ASTM D1557. Compaction should be verified by observation, probing, and testing by a geotechnical consultant's representative.

Once the subgrade and fill soil have been moisture conditioned and compacted, the soil should not be allowed to dry out prior to additional fill placement or concrete placement at finished grade. If it is dried out prior to compaction of the fill or prior to construction, reprocessing of the soil is required to reestablish the recommended soil moisture content.

When the work is interrupted by heavy rains, fill operations shall not be resumed until the Geotechnical Engineer indicates that the moisture content, density and stability of previously placed fill are as specified. All soft or wet subgrade soil encountered during construction should be stabilized prior to the placement of new fill and further construction. Wet to saturated soils may become unstable or "pump" under dynamic loading such as equipment movement during grading and may not respond to densification techniques. Typical remedial measures include discing and aerating the soil during dry weather, mixing the soil with dryer materials, removing and replacing the soil with an approved fill material, or mixing the soil with an approved lime or cement product.

Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

5.2.2. Fill Materials

The on-site soils free of organic materials, debris and cobbles larger than 3 inches may be used for backfilling purposes. Also, imported granular soils may be used in the required compacted fills within the subject project site. Imported materials should contain sufficient fines (binder material) to be relatively impermeable and result in a stable subgrade when compacted. The imported materials should also be low expansive, with an EI less than 35 and free of organic materials, debris and cobbles larger than 3 inches, with no more than 25 percent of materials being larger than 2 inches in size and no more than 25 percent passing #200 Sieve. Within the upper 2 feet of fills the materials should be free of particles greater than 2 inches in size. A bulk sample of potential import material, weighing at least 30 pounds, should be submitted to the Geotechnical Consultant at least 48 hours before fill operations. All proposed import materials should be approved by the Geotechnical Consultant prior to being placed at the site.

5.2.3. Utility Trench Bedding and Backfill

Bedding materials consisting of sand, gravel, or crushed aggregate should be used to backfill around utility pipes to approximately one foot above the top of the pipe. Onsite soils which have a Sand Equivalent (SE) of 30 or greater can also be used as bedding material. Prior to placing the pipes, the pipe trench subgrade should be observed by a representative of the project geotechnical engineer. If the exposed subgrade is loose or unstable, the unsuitable subgrade soil must be excavated and replaced with bedding material. Bedding must be placed uniformly on each side of the pipe and mechanically compacted. Flooding or jetting to densify the bedding materials is allowed unless clayey material is encountered at the bottom of trench. The fill should be placed in loose lifts not to exceed 8 inches, moisture-conditioned within optimum and 3% above optimum moisture content, and mechanically compacted to at least 90% relative compaction in accordance with ASTM D1557. Thinner lifts may be necessary to achieve the recommended level of compaction of the backfill due to equipment limitations.

5.2.4. Temporary Excavation

Temporary excavations must be properly sloped or shored. Based on the earth materials encountered in our borings, excavation of 5 feet or less in depth may be performed with vertical sidewalls. Deeper excavation up to a depth of 15 feet can be accomplished in accordance with the Occupational Safety and Health Administration (OSHA) requirements for Type B soils and shall be laid back at 1H:1V gradient.

The contractor is responsible for maintaining the stability of the cuts and personnel safety in the field during construction. All excavations shall be performed in accordance with applicable requirements established by the State, County, or local government. The regulatory requirement may supersede the recommendations presented in this section. The Geotechnical Engineer of Record's representative should be present during all excavations.

5.3. RETAINING WALLS

5.3.1. Wall Backfill

The backfill behind the walls should be placed and compacted per recommendations provided in Section 5.2 of this report. Retaining wall backfill and typical subdrain details for conditions of native soil, imported sand, or crushed rock are provided in Appendix D.

5.3.2. Lateral Earth Pressure

For design of the conventional retaining walls and their footings, the lateral earth pressures may be assumed to be equal to hydrostatic pressure of an equivalent liquid with the densities listed in the following Table 1. Active pressure should be used for lateral earth pressure of level backfill behind the wall. The passive pressure and friction factor should be used for design of the footings for lateral loads.

TABLE 1. EARTH LATERAL PRESSURES AND RESISTANCE FACTORS

Active Pressure – Drained Soil (Equivalent Fluid Density)	35 pcf
Active Pressure – Undrained Soil (Equivalent Fluid Density)	80 pcf
Passive Pressure (Equivalent Fluid Density)	300 pcf
Friction Factor	0.35

The retaining walls should be designed to resist any lateral surcharges due to the traffic or construction loads. Surcharge loads within a 1H:1V plane extending up from the base of the wall should be included in the design lateral pressures by taking 35% of the surcharge pressure applied as a uniform load along the height of the wall.

5.3.3. Wall Foundation

The footing for the retaining wall should be embedded a minimum of 18 inches below the lowest adjacent finish grade supported on at least 12 inches of soil compacted to at least 90% relative compaction in accordance with ASTM D1557. The retaining wall may be supported on strip footings designed using a maximum allowable bearing pressure of 2,000 psf. A one-third increase in the bearing capacity may be used when considering wind or seismic loads. Also, foundations on or adjacent to slopes shall comply with the requirements addressed in Section 1808.7 of CBC 2016.

The footings may be designed for resisting against lateral loads using the passive pressure and friction factor values provided in Table 1. When combining both frictional and passive resistance, the passive resistance should be reduced by one-third. The recommended value may be increased by one-third for short-term loading.

Settlements: Based on the results of our investigation, total settlements due to wall loads are expected to be less than 1.0 inch, and maximum differential settlements are expected to be of the order of ½ inch over a 50-foot span.

5.4. SURFACE DRAINAGE

Inadequate control of run-off water and/or heavy irrigation after construction of the proposed developments may lead to adverse conditions. Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during grading, landscaping and building construction. Positive surface drainage should be provided to direct surface water away from wall and toward a suitable drainage device.

5.5. SOIL CORROSIVITY

A representative bulk sample obtained from the borings drilled within the subject project site was tested for pH, minimum resistivity, soluble chloride content and soluble sulfate content. The test results indicate that the onsite soils show moderate sulfate exposure. As such, Type II Portland cement may be used for the concretes in contact with onsite soils. The measured resistivity and pH indicate that onsite soils are severely corrosive to buried ferrous metals. Further interpretation of the corrosivity test results and providing corrosion design and construction recommendations are referred to corrosion specialists.

5.6. PAVEMENT DESIGN

Pavement sections have been designed in accordance with the procedures presented in Caltrans Highway Design Manual (HDM). Laboratory test results obtained from the bulk samples collected from the shallow subsurface soils of the proposed pavement areas indicate R-values of 25 and 26. R-value of 25 was selected for the purpose of flexible pavement design in the proposed ride and park lot and right turn pocket lane. A flexible section consisting of asphalt concrete (AC) over aggregate base (AB), or a full-depth AC section may be used. The pavement sections listed in Table 2 have been developed for a range of traffic index (TI) values.

TABLE 2. FLEXIBLE PAVEMENT DESIGN (R VALUE=25)

Location	TI	AC/AB (in/in)	Full Depth AC (in)
Ride and Park Lot	4	3.0/5.0	5.5
	5	3.0/6.5	6.5
Right Turn Pocket	7	4.0/11.0	9.0
	8	5.0/12.0	10.5
	9	5.5/14.5	12.0

The subgrade shall be over-excavated to a minimum depth of 12 inches and the bottom of over-excavation shall be scarified to a minimum depth of 8 inches and compacted to a minimum of 90% relative compaction per ASTM D1557. The over-excavation should laterally extend at least 2 feet beyond the perimeter of the proposed pavement area. The over-excavated area shall be backfilled and compacted to a minimum of 90% relative compaction per ASTM D1557. The base material shall consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB) as specified in the Greenbook and compacted to a minimum of 95% relative compaction per ASTM D1557.

5.7. Review of Construction Plans

Recommendations contained in this report are based on preliminary plans. The geotechnical consultant should review the final construction plans and specifications in order to confirm that the general intent of the recommendations contained in this report have been implemented into the final construction documents. Recommendations contained in this report may require modification or additional recommendations may be necessary based on the final design.

5.8. Geotechnical Observation and Testing

It is recommended that inspection and testing be performed by the geotechnical consultant during the following stages of construction:

- Grading operations, including over-excavation and placement of compacted fill;
- Observation of retaining wall foundation excavation and backfilling behind the wall;
- Excavations and backfilling for utility trenches; and
- When any unusual subsurface conditions are encountered.

6. CLOSURE

This report is intended for use by Willdan Engineering and its consultants for design and construction associated with the proposed Long Valley Road/Valley Circle Boulevard/US-101 on-ramp improvement project at the location indicated on Figure 1 in Appendix A.

The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses, combined with an extrapolation of subsurface conditions between and beyond the boring/exploration locations.

Services performed by Willdan Geotechnical have been conducted in accordance with generally accepted professional geotechnical engineering principles and practices at this time. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

7. REFERENCES

- State of California Geological Survey (CGS), 1997 Seismic Hazard Zone Report for the Calabasas 7.5 Minute Quadrangles, Los Angeles and Ventura Counties, California. Seismic Hazard Zone Report 06.
- American Society for Testing and Materials (ASTM), Annual Book of Standards, Soil and Rock; Dimension Stone; Geosynthetics, Vol. 04.08.
- California Building Code, CBC 2016.

APPENDIX A. FIGURES

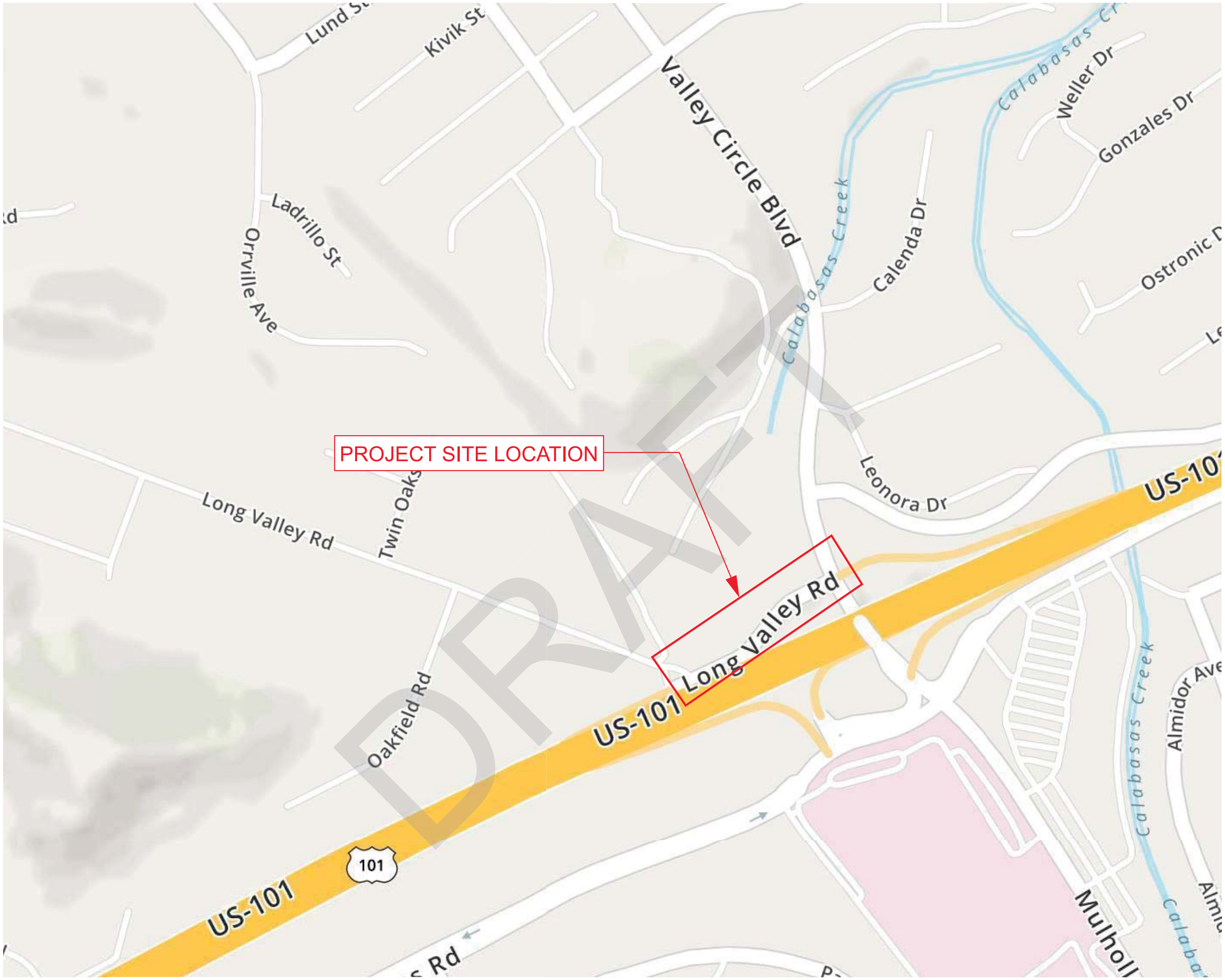

FIGURE 1. SITE LOCATION MAP

LONG VALLEY RD/VALLEY CIRCLE BLVD/US-101 ON-RAMP IMPROVEMENTS
HIDDEN HILLS, CALIFORNIA

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Drawn By: MR	Date: 08-08-2019
Approved By: MR	Project No.: 108760-1000-007

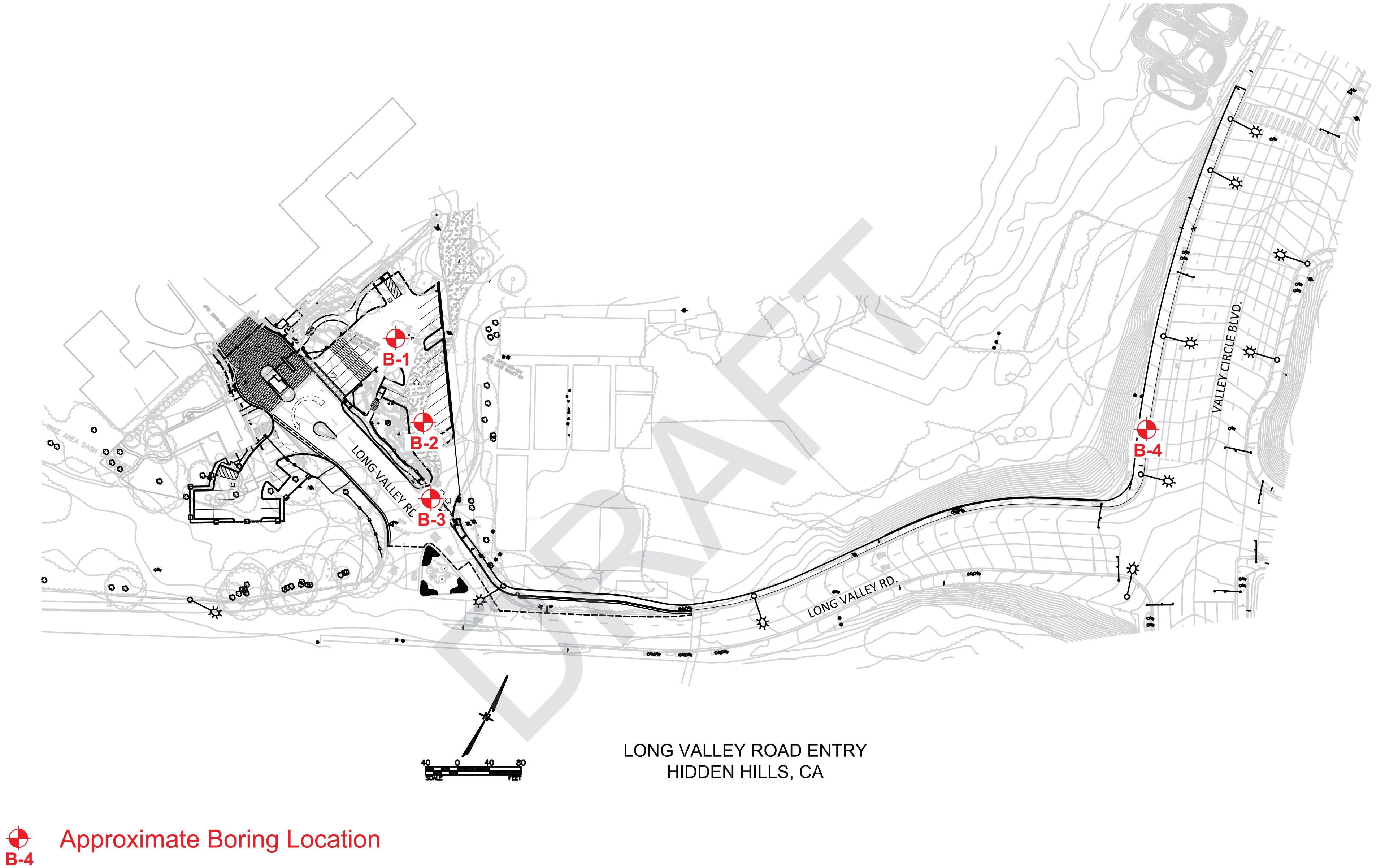

FIGURE 2. BORING LOCATION PLAN

LONG VALLEY RD/VALLEY CIRCLE BLVD/US-101 ON-RAMP IMPROVEMENTS
HIDDEN HILLS, CALIFORNIA

WILLDAN Geotechnical — extending your reach

Drawn By: MR	Date: 08-08-2019
Approved By: MR	Project No.: 108760-1000-007

APPENDIX B. BORING LOGS

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

GRANULAR SOILS

RELATIVE DENSITY	BLOWS/FOOT*	
	SPT	CD
VERY LOOSE	0 - 4	0 - 8
LOOSE	5 - 10	9 - 18
MEDIUM DENSE	11 - 30	19 - 54
DENSE	31 - 50	55 - 90
VERY DENSE	OVER 50	OVER 90

FINE-GRAINED SOILS

CONSISTENCY	BLOWS/FOOT*	
	SPT	CD
SOFT	0 - 4	0 - 4
FIRM	5 - 8	5 - 9
STIFF	9 - 15	10- 18
VERY STIFF	16 - 30	19 - 39
HARD	OVER 30	OVER 39

*Conversion between California Drive (CD) and Standard Penetration Test (SPT) blow count has been calculated using "Foundation Engineering Hand Book" by H.Y. Fang.

STANDARD PENETRATION TEST SAMPLE
Split Barrel sampler in accordance with

MODIFIED CALIFORNIA SAMPLE
2.416" inside diameter

SHELBY TUBE SAMPLE

BULK SAMPLE

WATER TABLE

TEST TYPE Results shown in Appendix B	OTHER
Corrosion Analysis	CA
Sieve Analysis	SA
Unconfined Compression	UC
Hydrometer Analysis	HA
Expansion Index	EI
California Bearing Ratio	CBR
% Passing #200 Sieve	W
Pocket Penetrometer	PP
Direct Shear	DS
Direct Shear (Remolded)	DS_R
Atterberg Limits	AL
Consolidation	CN
Consolidation (Remolded)	CN_R
R-Value	R
Undrained-Unconsolidated Shear	UU
Maximum Density Curve	Max

EXPLORATION LOG KEY

BORING LOG B-1

Borehole Location: **See Figure 2**	Approximate Grade Elevation:	Sheet **1** of **1**
Borehole Coordinates: **34.1596N 118.6403W**	Date Started: **08/05/19**	Date Finished: **08/05/19**
Drilling Equipment: **CME 75**	Total Depth: **6.5 ft**	Depth to Groundwater: **GW Not Encountered.**
Drilling Method: **Hollow Stem Auger**	Borehole Diameter: **8"**	
Driller: **Choice Drilling, Inc.**	Logged By: **RC**	Checked By: **AM/MR**
Hammer Information: **140 lb and 30" Drop Height**		

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		3" of Aggregate Base							
			Silty SAND with Gravel (SM), medium dense, brown, moist			B-1 R-1	13/15/16			
			Sandy CLAY (CL), very stiff, dark brown, moist							
	5					R-2	9/13/15			
			Total Depth 6.5 ft GW Not Encountered. Backfilled with Bentonite.							
	10									
	15									

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FIGURE A-2

BORING LOG B-2

Borehole Location: **See Figure 2**	Approximate Grade Elevation:	Sheet **1** of **1**	
Borehole Coordinates: **34.1593N 118.64W**	Date Started: **08/05/19**	Date Finished: **08/05/19**	
Drilling Equipment: **CME 75**	Total Depth: **6.5 ft**	Depth to Groundwater: **GW Not Encountered.**	
Drilling Method: **Hollow Stem Auger**	Borehole Diameter: **8"**		
Driller: **Choice Drilling, Inc.**	Logged By: **RC**	Checked By: **AM/MR**	
Hammer Information: **140 lb and 30" Drop Height**			

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		3" deteriorated asphalt							
			Sandy CLAY (CL), very stiff, brown, moist							
						B-1 R-1	7/12/15			R
	5					R-2	7/7/16			
			Total Depth 6.5 ft GW Not Encountered. Backfilled with Bentonite and Patched with Cold Asphalt.							
	10									
	15									

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Long Valley Rd./ Valley Circle Blvd./US-101 On-Ramp Improvements Hidden Hills, California

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FIGURE A-3

BORING LOG B-3

Borehole Location: **See Figure 2**	Approximate Grade Elevation:	Sheet **1** of **1**
Borehole Coordinates: **34.1592N 118.6399W**	Date Started: **08/05/19**	Date Finished: **08/05/19**
Drilling Equipment: **CME 75**	Total Depth: **6.5 ft**	Depth to Groundwater: **GW Not Encountered.**
Drilling Method: **Hollow Stem Auger**	Borehole Diameter: **8"**	
Driller: **Choice Drilling, Inc.**	Logged By: **RC**	Checked By: **AM/MR**
Hammer Information: **140 lb and 30" Drop Height**		

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		4.5" Deteriorated Asphalt, 6" Aggregate Base							
			Sandy CLAY (CL), very stiff, brown, moist							
						R-1	7/11/18	13	113	R
	5					R-2	7/9/11			
			Total Depth 6.5 ft GW Not Encountered. Backfilled with Bentonite and Patched with Cold Asphalt.							
	10									
	15									

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TEST BORING LOGS 108760-1000.GPJ ARROYO.GDT 8/16/19

WILLDAN Geotechnical	**Long Valley Rd./ Valley Circle Blvd./US-101 On-Ramp Improvements Hidden Hills, California**	**Project Number: 108760-1000-007**
		FIGURE A-4

BORING LOG B-4

Borehole Location: **See Figure 2**	Approximate Grade Elevation:	Sheet **1** of **1**
Borehole Coordinates: **34.1603N 118.6381W**	Date Started: **08/05/19**	Date Finished: **08/05/19**
Drilling Equipment: **CME 75**	Total Depth: **11.5 ft**	Depth to Groundwater: **GW Not Encountered.**
Drilling Method: **Hollow Stem Auger**	Borehole Diameter: **8"**	
Driller: **Choice Drilling, Inc.**	Logged By: **RC**	Checked By: **AM/MR**
Hammer Information: **140 lb and 30" Drop Height**		

Elevation (ft)	Depth (ft)	Lithology	Description	Remarks	Sampler	Number	Blows/6"	Moisture Content (%)	Dry Density (pcf)	Additional Tests
	0		Poorly Graded SAND with Silt and Gravel (SP-SM), dense, brown, moist							
										CA
						R-1	17/36/41	7.5	111	SA
	5		trace of clay at 5 feet			R-2	11/17/39	5.1	103	DS
	10		Sandy CLAY (CL), hard, brown, moist			R-3	9/18/27			
			Total Depth 11.5 ft GW Not Encountered. Backfilled with Bentonite.							
	15									

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TEST BORING LOGS 108760-1000.GPJ ARROYO.GDT 8/16/19

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Long Valley Rd./ Valley Circle Blvd./US-101 On-Ramp Improvements Hidden Hills, California

Project Number: 108760-1000-007

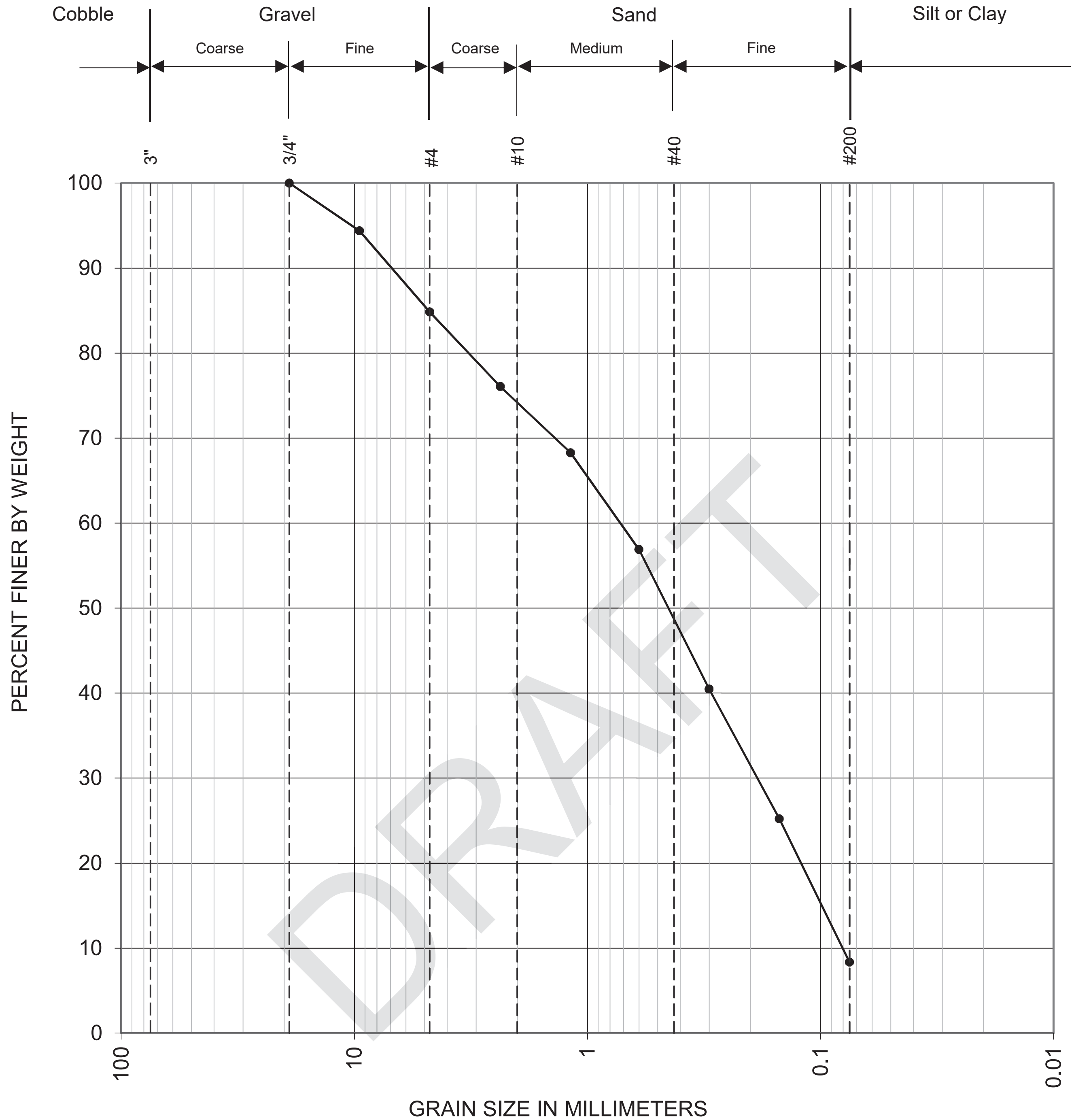
APPENDIX C. LABORATORY TEST RESULTS

TABLE C-1. SUMMARY OF LABORATORY TEST RESULTS

Long Valley Rd./Valley Circle Blvd./US-101 On-Ramp Improvements, Hidden Hills, California

Willdan Geotechnical Project No. 108760-1000-007

Sample		USCS Soil Description	Gradation (ASTM D422)	R-Value (CTM 301)	Direct Shear (ASTM D3080)				Corrosivity (CTM 422, 417, 643)			
					Peak		Ultimate					
Boring No.	Depth (ft)		(% G : S : F)		c (psf)	ϕ (°)	c (psf)	ϕ (°)	pH	Soluble Sulfate (ppm)	Soluble Chloride (ppm)	Minimum Resistivity (ohm-cm)
B-2	1.0 - 5.0	Sandy CLAY (CL)		26								
B-3	1.0 - 5.0	Sandy CLAY (CL)		25								
B-4	0.0 - 5.0	Poorly Graded SAND with Silt and Gravel (SP-SM)							7.90	615	120	944
	2.5 - 4.0	Poorly Graded SAND with Silt and Gravel (SP-SM)	15 : 77 : 8									
	5.0 - 6.5	Poorly Graded SAND with Silt and Gravel (SP-SM)			260	35.0	95	35.0				



Boring No.	Sample No.	Depth	USCS Symbol	Classification	Natural W %	LL	PL	PI
B-4	R-1	2.5-4'	SP-SM	Poorly Graded SAND with Silt and Gravel				

% +3"	% Gravel	% Sand	% Fines
0	15	77	8

C_u	C_c
9.21	0.62

Project Name: Long Valley Rd/Valley Cl/US-101 On-Ramp Improvements   Project No.: 108760-1000-007

PARTICLE SIZE CURVE

(ASTM D6913)

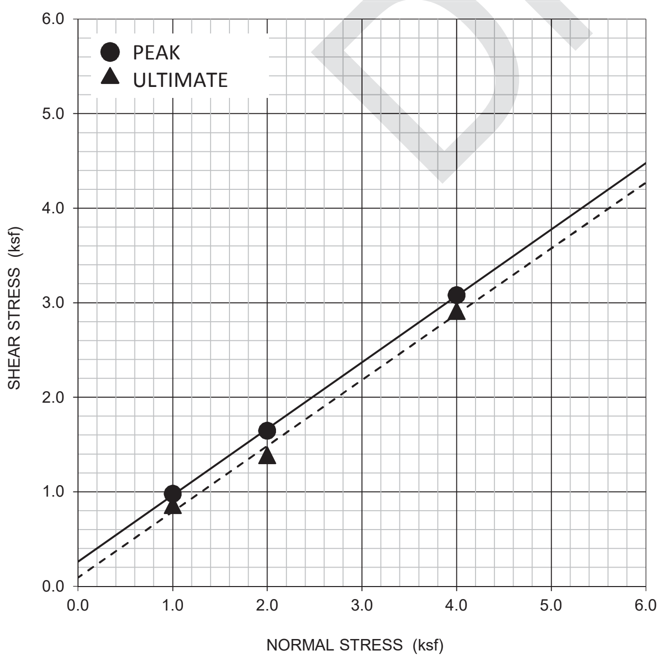
WILLDAN Geotechnical | extending your reach

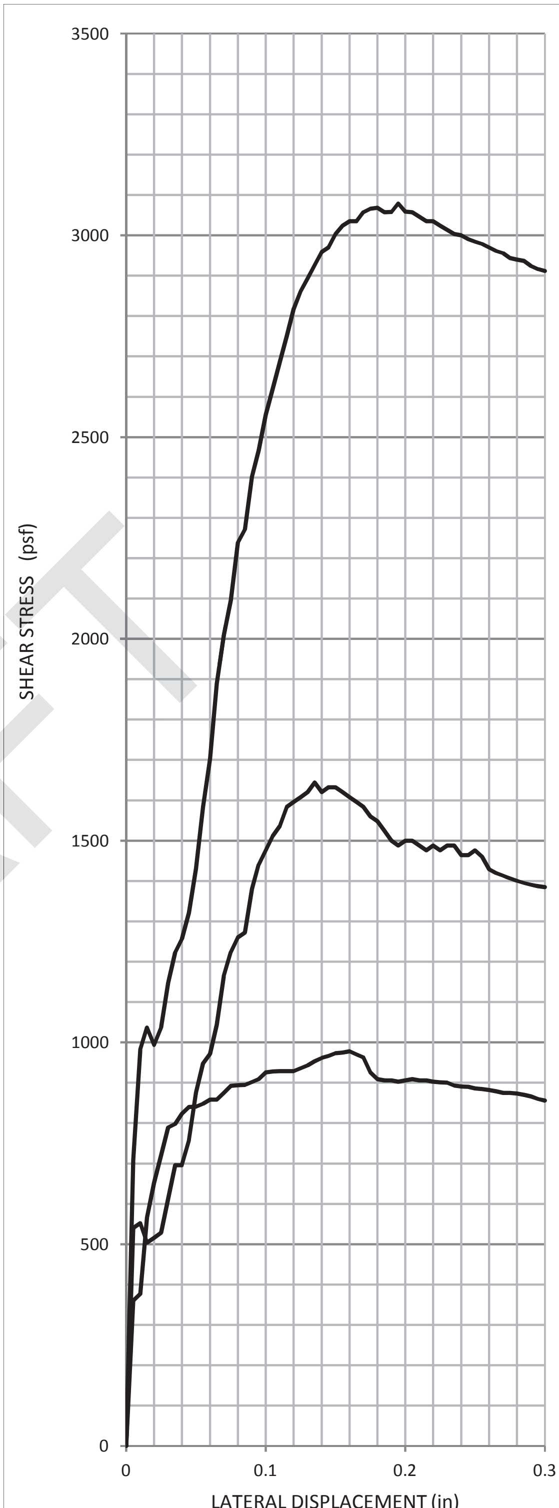
Project Name :	Long Valley Rd/Valley Cl/US-101 On-Ramp Improvements	Project No. :	108760-1000-007
Boring / Sample No :	B-4 Depth : 5' ft	Tested By :	RC Date: 8-Aug-19
Sample Descriptions / Classification :	Poorly Graded SAND with Silt and Gravel (SP-SM)	Sampled By :	RC Date: 5-Aug-19

Applied Normal Load (ksf)	1.0		2.0		4.0	
Shear Stress,Peak (ksf)	0.978		1.644		3.079	
Shear Stress,Ultimate(ksf)	0.856		1.385		2.911	
Density and Saturation	Initial	Final	Initial	Final	Initial	Final
Wet Wt. of Soil + Ring (g)	170.03	192.5	171.1	192.5	174.5	194.0
Dry Wt. of Soil + Ring (g)		163.9		164.9		168.1
Weight of Water (g)	6.1	28.6	6.2	27.6	6.4	25.9
Weight of Ring (g)		44.2		43.8		42.4
Weight of Dry Soil (g)		119.7		121.1		125.7
Moisture Content (%)	5.1	23.9	5.1	22.8	5.1	20.6
Wet Density (pcf)	104.5	123.1	105.7	123.5	109.7	125.9
Dry Density (pcf)		99.4		100.6		104.4
Specific Gravity (Assumed)	2.68					
Specimen Thickness (in)	1.00					
Specimen Diameter (in)	2.416					
Degree of Saturation (%)	20.0	93.7	20.6	92.1	22.7	91.6
Void Ratio		0.683		0.663		0.602

Lateral Displacement, d_h (in)		0.3
Displacement Rate, d_r (in/min)		0.03
Elapsed Time of Test, t_e (min)		10.00
Specimen	Undisturbed	X
	Remolded	-
	Reconstituted	-

SHEAR STRESS	PEAK	ULTIMATE
Cohesion, c (psf)	260	95
Friction Angle, ϕ (degree)	35.0	35.0





Remarks : ______

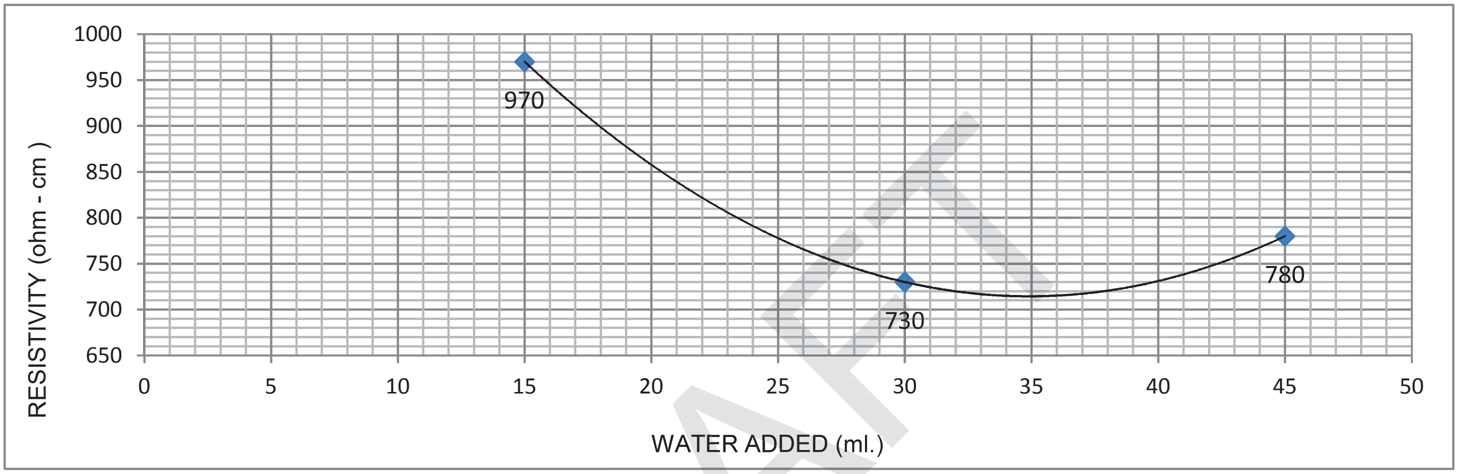
DIRECT SHEAR TEST
(ASTM D3080)

WILLDAN Geotechnical | extending your reach

Project Name :	Long Valley Rd/Valley Cl/US-101 On-Ramp Improvements	Project No.:	108760-1000-007		
Sample Location / Source :	B-4	Tested by :	RMC	Date:	8/12/2019
Sample Depth / No. :	0.0' - 5.0'	Sampled by:		Date:	
Sample Description / Classification :	Poorly Graded SAND with Silt and Gravel (SP-SM)				

A. MINIMUM RESISTIVITY (CTM 643)

WATER ADDED, (ml)	15	30	45	
RESISTIVITY MEASURED, (ohm-cm)	970	730	780	
TEMPERATURE MEASURED, (^{0}C)	29			
MINIMUM RESISTIVITY (ohm-cm)	715			
MIN. RESISTIVITY CORRECTED , $R_{min\,-15.5}$ (ohm-cm)	944			



B. SULFATE CONTENT OF SOILS (CTM 417)

SOIL - WATER RATIO	100 : 300
SO_4 DILUTION (ALIQUOT : DISTILLED H_2O)	5 : 20
FACTOR	15
SULFATE READING (ppm)	41
WATER SOLUBLE SULFATES, (ppm)	615

C. CHLORIDE CONTENT OF SOILS (CTM 422, SILVER NITRATE METHOD)

CHLORIDE DILUTION (ALIQUOT:DISTILLED H_2O)	50 : 50
NUMBER OF DIGITS REQUIRED	40
WATER SOLUBLE CHLORIDES, (ppm)	120

D. pH OF SOILS (CTM 643)

pH VALUE	7.90

REMARKS :

CORROSION TESTS

(CTM 417, 422, 643)

WILLDAN Geotechnical *extending your reach*

Project Name: Long Valley Rd/Valley Circle Blvd/US-101 Ramp Improvements   Willdan Project No.: 108760-1000-007

'R' VALUE CA 301

Client: Willdan Geotechnical   Date: 8/12/19   By: LD

Client's Job No.: 108760-1000   Sample No.: B-2 @ 0 - 5'

GLA Reference: 2005-224   Soil Type: Sandy CLAY (CL)

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**150**	**70**	**100**	
Initial Moisture Content	%	**7.8**	**7.8**	**7.8**	
Water Added	ml	**50**	**80**	**65**	
Moisture at Compaction	%	12.3	15.0	13.7	
Sample & Mold Weight	gms	**3215**	**3202**	**3211**	
Mold Weight	gms	**2102**	**2098**	**2104**	
Net Sample Weight	gms	1113	1104	1107	
Sample Height	in.	**2.49**	**2.55**	**2.51**	
Dry Density	pcf	120.6	114.1	117.6	
Pressure	lbs	**9100**	**3500**	**5830**	
Exudation Pressure	psi	725	279	464	
Expansion Dial	x 0.0001	**72**	**10**	**46**	
Expansion Pressure	psf	312	43	199	
Ph at 1000lbs	psi	**28**	**45**	**33**	
Ph at 2000lbs	psi	**62**	**110**	**80**	
Displacement	turns	**3.17**	**3.91**	**3.48**	
R' Value		55	23	42	
Corrected 'R' Value		**55**	**23**	**42**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**26**
By Epansion Pressure :	**35**
TI = 5	

Geo-Logic ASSOCIATES

Project Name: Long Valley Rd/Valley Circle Blvd/US-101 Ramp Improvements   Willdan Project No.: 108760-1000-007

'R' VALUE CA 301

Client: Willdan Geotechnical   Date: 8/12/19   By: LD

Client's Job No.: 108760-1000   Sample No.: B-3 @ 0 - 5'

GLA Reference: 2005-224   Soil Type: Sandy CLAY (CL)

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**90**	**70**	**150**	
Initial Moisture Content	%	**9.7**	**9.7**	**9.7**	
Water Added	ml	**40**	**58**	**30**	
Moisture at Compaction	%	13.4	15.0	12.5	
Sample & Mold Weight	gms	**3155**	**3189**	**3210**	
Mold Weight	gms	**2075**	**2093**	**2096**	
Net Sample Weight	gms	1080	1096	1114	
Sample Height	in.	**2.44**	**2.52**	**2.48**	
Dry Density	pcf	118.3	114.6	121.0	
Pressure	lbs	**4880**	**3510**	**7120**	
Exudation Pressure	psi	389	279	567	
Expansion Dial	x 0.0001	**44**	**11**	**86**	
Expansion Pressure	psf	191	48	372	
Ph at 1000lbs	psi	**31**	**48**	**22**	
Ph at 2000lbs	psi	**86**	**115**	**51**	
Displacement	turns	**3.17**	**3.59**	**3.08**	
R' Value		40	21	63	
Corrected 'R' Value		**40**	**21**	**63**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**25**
By Epansion Pressure :	**41**
TI = 9	

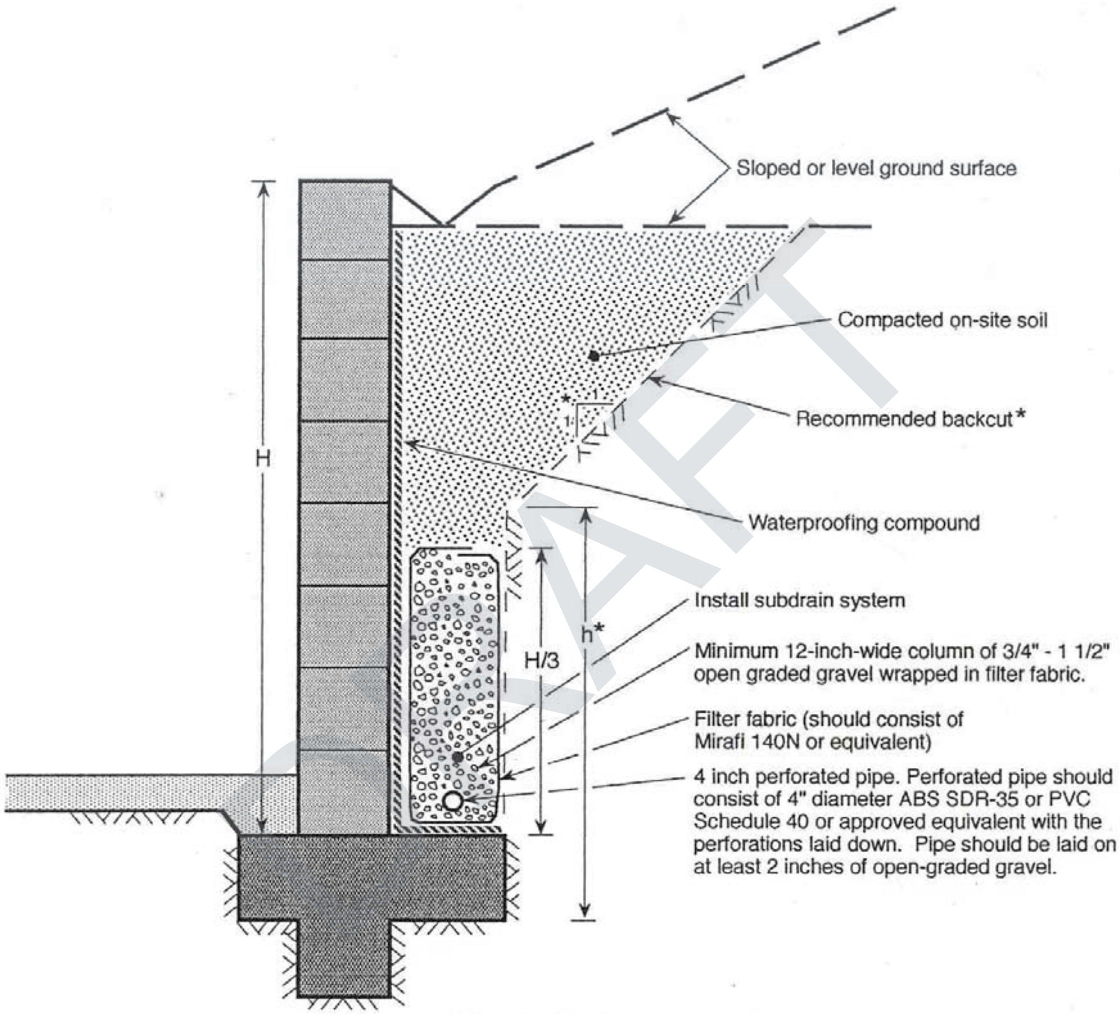
Geo-Logic ASSOCIATES

R-VALUE TEST
(CTM 301)

WILLDAN Geotechnical | extending your reach

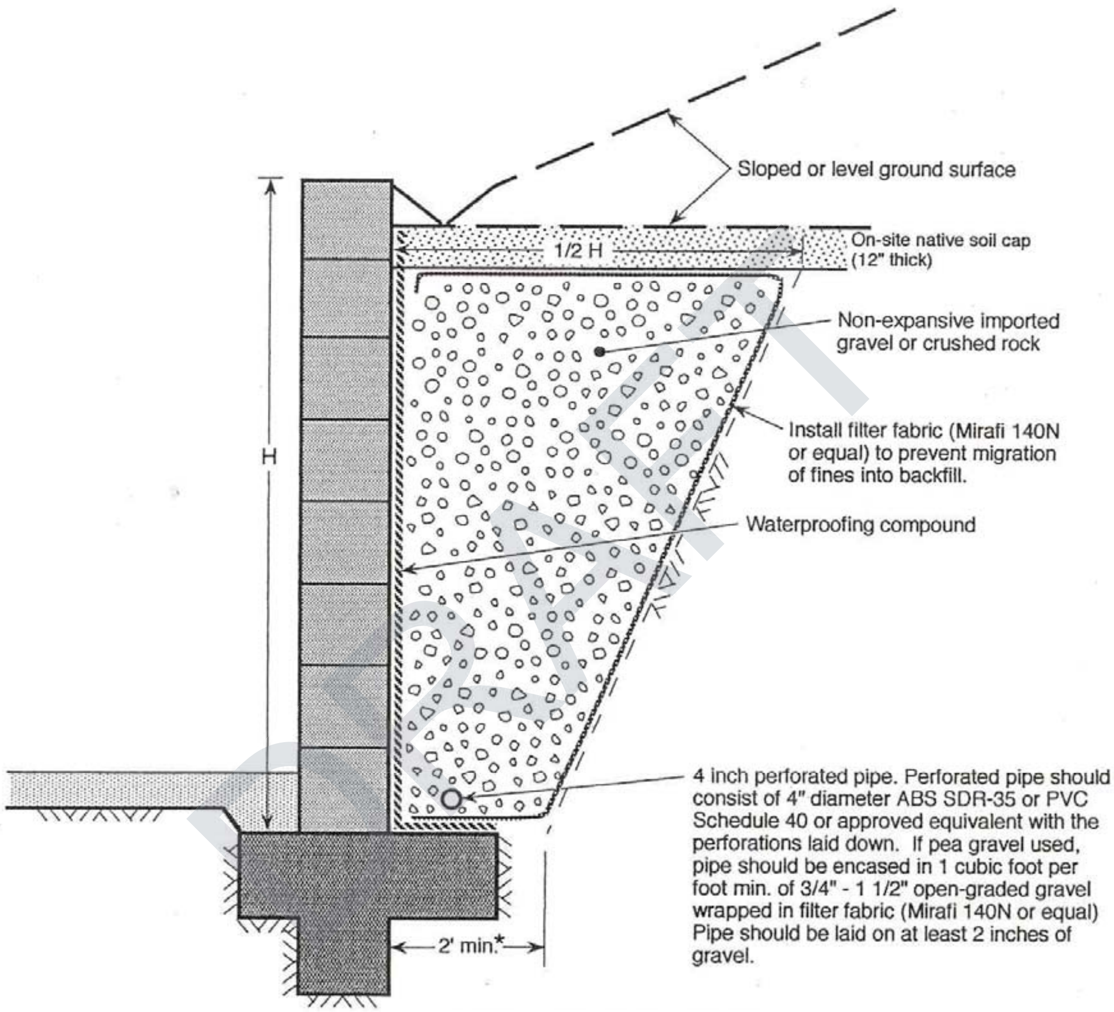
APPENDIX D. TYPICAL RETAINING WALL BACKFILL DETAILS

NATIVE SOIL BACKFILL



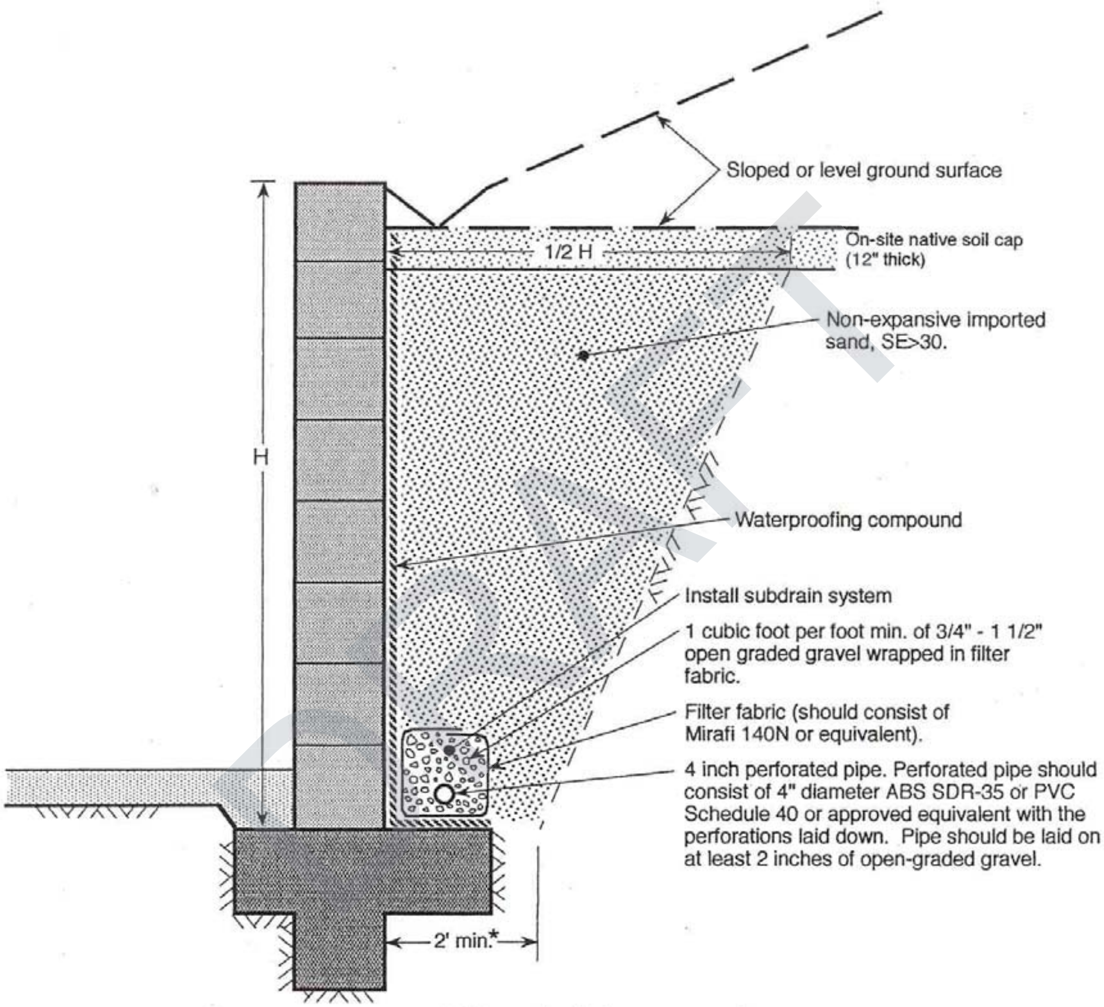
* Vertical height (h) and slope angle of backcut per soils report. Based on geologic conditions, configuration of backcut may require revisions (i.e. reduced vertical height, revised slope angle, etc.)

IMPORTED GRAVEL OR CRUSHED ROCK BACKFILL



* At base of wall, the non-expansive backfill materials should extend to a min. distance of 2' or to a horizontal distance equal to the heel width of the footing, whichever is greater.

IMPORTED SAND BACKFILL



* At base of wall, the non-expansive backfill materials should extend to a min. distance of 2' or to a horizontal distance equal to the heel width of the footing, whichever is greater.