Pourroy Road Widening Project
From Pourroy Road/ Pourroy Road Intersection
To 900-Feet North of This Intersection
Community of French Valley, and

Murrieta Hot Springs Road Sidewalk Project
500-Feet North and South of Chandler Drive
Community of Murrieta Hot Springs

Project No. D3-0094

Final Soils Investigation Report

Dated: March 3, 2023, Revised December 27, 2023, 2nd Revision September 19, 2024

Notice regarding this Report:

This report is provided for reference only.

Although this information represents the latest information available, the County of Riverside Transportation Department does not guarantee the accuracy of this data.

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

FINAL SOILS INVESTIGATION
POURROY ROAD
IMPROVEMENT PROJECT
FRENCH VALLEY AREA
RIVERSIDE COUNTY, CALIFORNIA

PROJECT NO. 63892.1RR
MARCH 3, 2023
REVISED DECEMBER 27, 2023
2ND REVISION SEPTEMBER 19, 2024

Prepared For:

ADVANTEC Consulting Engineers, Inc.
21700 Copley Drive, Suite 300
Diamond Bar, California 91765

Attention: Mr. Chris Buscarino

March 3, 2023
Revised December 27, 2023
2nd Revision September 19, 2024

ADVANTEC Consulting Engineers, Inc.
21700 Copley Drive, Suite 300
Diamond Bar, California 91765

Project No. 63892.1RR

Attention: Mr. Chris Buscarino

Subject: Final Soils Investigation, Pourroy Road Improvement Project, French Valley Area, Riverside County, California.

LOR Geotechnical Group, Inc., is pleased to present this revised report summarizing our soil investigation for the subject project. This report was based upon a scope of services discussed in verbal communications with you. The purpose of the previous revision and this second revision is to incorporate responses to comments generated by the County of Riverside.

In summary, it is our opinion that the proposed project is feasible from a soil engineering perspective, provided the recommendations presented in the attached report are incorporated into design and construction. The following executive summary reviews some of the important elements of the project. However, this summary should not be solely relied upon.

To provide adequate support for the proposed retaining wall, we recommend that the footings be founded on a minimum of 24 inches of engineered compacted fill or entirely upon competent bedrock. Competent bedrock is anticipated to be present at depths of approximately 2 to 2.5 feet.

Our observations and laboratory testing of a representative sample of the onsite earth materials anticipated for backfill and support of the wall indicate that they have a very low expansion potential and negligible soluble sulfate content.

LOR Geotechnical Group, Inc.

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Table of Contents

INTRODUCTION

During February and March of 2023, a Preliminary Soils Investigation was performed by LOR Geotechnical Group, Inc., for the Pourroy Road Improvement Project, in the French Valley Area of Riverside County, California. The purpose of this investigation was to evaluate the subsurface conditions encountered in our exploratory borings and to provide soil engineering design recommendations for the proposed improvements. The scope of our services included:

- Review of available pertinent geotechnical literature, reports, maps, and agency information pertinent to the study area;
- Interpretation of aerial photographs of the site and surrounding regions dated 1938 through 2022;
- A subsurface field investigation to determine the physical soil conditions pertinent to the proposed development;
- Laboratory testing of selected soil samples obtained during the field investigation;
- Development of geotechnical recommendations for site grading and foundation design; and
- Preparation of this report summarizing our findings, and providing conclusions and recommendations for site development which has been revised to include responses/additional information requested by the County of Riverside.

The approximate location of the site is shown on the attached Index Map, Enclosure A-1, within Appendix A.

To orient our investigation at the site, a Site Plan was provided for our use. These plans were utilized as a base map for our Site Plan Enclosure A-2, located with Appendix A.

PROJECT CONSIDERATIONS

Based upon the plans provided, the project will consist of a Caltrans Type 1 retaining wall.

AERIAL PHOTO ANALYSIS

The aerial photographs reviewed consisted of vertical aerial photograph images of varying scales. We reviewed imagery available from Google Earth Pro (2023) computer software and from online Historic Aerials (2023).

To summarize briefly, the area was vacant, natural land comprised of gently rolling hillside in 1938. Grading of the site was associated with the residential development to the west which was present in late 2012 to early 2013 photographs. It appears that the grading on the site consisted of cut grading. The general configuration seen today was present in the early 2014 photograph. The final configuration and roadway were present in the early 2016 photograph.

No evidence for the presence of faults traversing the site areas or mass movement features was noted during our review of the photographs covering the site areas and nearby vicinity.

EXISTING SITE CONDITIONS

The project area consists of two sections of proposed improvements comprised of an approximately 214 linear foot and an approximately 270 linear foot areas separated by approximately 33 linear feet along the east side of Pourroy Road beginning just north of the westward bend in the roadway at Tucalota Park. The existing area consists of a 2 horizontal to 1 vertical cut slope up to approximately 15 feet in height. Along the top and toe of this eastward ascending slope, a concrete v-ditch is present. Minor vegetation is present in the area.

FIELD INVESTIGATION

Our field exploration program was conducted on February 20, 2023 and consisted of excavating 2 exploratory borings advanced to refusal depths of approximately 3.5 and 5 feet below the existing ground surface. The approximate location of our exploratory borings are presented on the attached Site Plan, Enclosure A-2, within Appendix A.

The subsurface conditions encountered in the exploratory boring were logged by a geologist from this firm. Bulk samples were obtained at selected intervals and returned to our geotechnical laboratory in sealed containers for further testing and evaluation.

A detailed description of the field exploration program and the boring log are presented in Appendix B.

LABORATORY TESTING PROGRAM

Selected samples obtained during the field investigation were subjected to laboratory testing to evaluate their physical and engineering properties. Laboratory testing included in-place density and moisture content, laboratory compaction characteristics, direct shear, and soluble sulfate content. A detailed description of our geotechnical laboratory testing program are presented in Appendix C.

SUBSURFACE CONDITIONS

As noted during our field reconnaissance and as encountered within our exploratory borings, the area is underlain by igneous bedrock of granitic composition. The bedrock was observed to be severely weathered at the surface, become much less weathered quickly with depth. Refusal was experienced within our excavations at depths of approximately 3.5 to 5 feet.

Groundwater was not encountered within our exploratory borings as advanced to a maximum depth of approximately 5 feet below the existing ground surface.

In order to estimate the approximate depth to groundwater in the site area, a search was conducted for local groundwater (well) level measurements within the Cooperative Well Measuring Program, Fall 2022 (Watermaster Support Services et al., 2023). This database contains depth to groundwater measurements dating back to 1993. We also conducted a search of the water well database information provided in the California Department of Water Resources (CDWR) Water Library Data website (CDWR, 2023).

No nearby water wells were found from either database.

Because the site is underlain by bedrock at shallow depths, groundwater may be present only as groundwater seeps within bedrock fractures at the site. Groundwater may seep into the bedrock beneath the site region along fractures and joints within the bedrock, the presence of hard bedrock beneath the site generally precludes the development of groundwater conditions or a groundwater table in these areas. Any groundwater that might be encountered during site development would likely be the result of infiltration of surface

waters/irrigation waters traveling downward into the bedrock along these joints and fractures.

A more detailed description of the subsurface soil conditions, as encountered within our exploratory borings, is presented on the Boring Log, within Appendix B.

SECONDARY SEISMIC HAZARDS

Liquefaction/Lateral Spreads: The site does not lie within an area identified by the County of Riverside for a potential for liquefaction (CRTLMA, 2024). The potential for liquefaction generally occurs during strong ground shaking within granular loose sediments where the groundwater is usually less than 50 feet below the ground surface. As the site is underlain by relatively shallow igneous bedrock, the possibility of liquefaction at the site is considered nil.

Lateral spreads are one of the most common forms of permanent ground movements associated with liquefaction during earthquakes. This type of deformation generally occurs on very gently sloping ground or on virtually flat ground adjacent to stream channels. Lateral spreads are landslides involving a significant component of fluid flow with a basal zone of translation frequently consisting of liquefied gravel, sand, silt or weakened sensitive clay (Morton and Sadler,1989). Areas of coastal or alluvial flood plains are where lateral spreads most frequently occur and the most common materials involved are un-cemented silts and (or) sands with near surface water tables. As the site is underlain by relatively shallow igneous bedrock and the possibility of liquefaction to occur at the site is nil, the possibility of lateral spreads is also considered nil.

SOILS AND SEISMIC DESIGN CRITERIA (California Building Code 2022)

Design requirements for structures can be found within Chapter 16 of the 2022 California Building Code (CBC) based on building type, use, and/or occupancy. The classification of use and occupancy of all proposed structures at the site, shall be the responsibility of the building official.

Site Classification

Chapter 20 of the ASCE 7-16 defines six possible site classes for earth materials that underlie any given site. Bedrock is assigned one of three of these six site classes and these are: A, B, or C. Soil is assigned as C, D, E, or F. Per ASCE 7-16, Site Class A and Site Class B shall be measured on-site or estimated by a geotechnical engineer, engineering geologist or seismologist for competent rock with moderate fracturing and weathering. Site Class A and Site Class B shall not be used if more than 10 feet of soil is between the rock surface and bottom of the spread footing or mat foundation. Site Class C can be used for very dense soil and soft rock with Ñ values greater than 50 blows per foot. Site Class D can be used for stiff soil with Ñ values ranging from 15 to 50 blows per foot. Site Class E is for soft clay soils with Ñ values less than 15 blows per foot. Our current investigation, mapping by others, and our experience in the site region indicates that the materials beneath the site are considered Site Class C very dense soil/soft rock.

CBC Earthquake Design Summary

Earthquake design criteria have been formulated in accordance with the 2022 CBC and ASCE 7-16 for the site based on the results of our investigation to determine the Site Class and an assumed Risk Category II. However, these values should be reviewed and the final design should be performed by a qualified structural engineer familiar with the region. In addition, the building official should confirm the Risk Category utilized in our design (Risk Category II). Our design values are provided below:

CBC 2022 SEISMIC DESIGN SUMMARY* Site Location** (USGS WGS84) 33.5709, -117.1016, Risk Category II	
Site Class Definition Chapter 20 ASCE 7	C
S_s Mapped Spectral Response Acceleration at 0.2s Period	1.393
S_1 Mapped Spectral Response Acceleration at 1s Period	0.517
S_{MS} Adjusted Spectral Response Acceleration at 0.2s Period	1.671
S_{M1} Adjusted Spectral Response Acceleration at 1s Period	0.766
S_{DS} Design Spectral Response Acceleration at 0.2s Period	1.114
S_{D1} Design Spectral Response Acceleration at 1s Period	0.511
F_a Short Period Site Coefficient at 0.2s Period	1.2
F_v Long Period Site Coefficient at 1s Period	1.483
PGA_M Site-modified peak ground acceleration	0.724
Seismic Design Category	D
*Values obtained from OSHPD Seismic Design Maps tool **Midpoint between the two proposed development areas	

CONCLUSIONS

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc., that the proposed development of the site for the proposed use is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

It should be noted that the subsurface conditions encountered in our exploratory borings are indicative of the locations explored and the subsurface conditions may vary. If conditions are encountered during the construction of the project that differ significantly from those presented in this report, this firm should be notified immediately so we may assess the impact to the recommendations provided.

Rippability of Bedrock Units

The rippability of the bedrock units at the subject site was estimated based on the relative ease, or lack of, excavation during our boring exploration. The bedrock units that underlie the site are anticipated to be rippable by conventional earthmoving equipment down to the depths explored. Excavations deeper than this may require specialized methods, such as D8R or larger dozer using a multi or single shank ripper. It is also anticipated that some larger non-rippable rock "floaters" may be encountered. These may require special handling. Excavations in these materials may require specialized methods.

If a more precise estimation of the rippability of the bedrock units is required, a seismic refraction investigation should be conducted at the site. Such a study should involve the measuring of the seismic velocities of the underlying bedrock units, as they increase with depth, then comparing these to estimates of velocities verses ease of excavation charts.

In summary, the most important consideration for the proposed grading should include selecting an experienced, well-qualified contractor. The success to excavating the bedrock materials at the site will require the contractor to have knowledge of the appropriate ripper-equipment selection (i.e., down pressure available at the tip, tractor flywheel horsepower, tractor gross weight, etc.), ripping techniques (i.e., single- or multi-shank teeth, pass spacing, tandem pushing, etc.). It should also be noted that while in some areas where deeper cuts may be possible with standardized earthmoving equipment, specialized methods may increase the speed of the excavations at the site.

Foundation Support

To provide adequate support for the proposed retaining wall we recommend that a compacted fill mat be constructed beneath footings or footings rest entirely upon competent bedrock. The compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils.

Conventional foundation systems utilizing either individual spread footings and/or continuous wall footings will provide adequate support for the anticipated downward and lateral loads when utilized in conjunction with the recommended fill mat or when founded entirely within competent bedrock.

Soil Expansiveness

Our observations of the on-site soils indicates a very low expansion potential. Therefore, specialized foundation design and construction procedures to specifically resist expansive soil activity are anticipated at this time and are provided within.

Careful evaluation of onsite soils and any import fill for their expansion potential should be conducted during the grading operation.

Sulfate Protection

The results of the soluble sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels indicate that soluble sulfate concentrations in the sample was less than 0.10 percent by weight. These concentrations indicate an exposure class S0 for sulfate (ACI 318). Therefore, no specific recommendations are given for concrete elements to be in contact with the onsite soils.

RECOMMENDATIONS

Slope Construction

Preliminary data indicates that slopes may be laid back to the proposed 2 horizontal to 1 vertical above the walls. Cut slopes should expose competent bedrock.

Short-term slope construction and maintenance are the responsibility of the contractor, and should be a consideration of their methods of operation and the actual soil conditions encountered.

Slope Protection

Since the site soils are susceptible to erosion by running water, measures should be provided to prevent surface water from flowing over slope faces. This may require a collection system for the noted drain pipes from the rear yards of the adjacent residences which should outlet to approved non-nuisance area. This should be evaluated by the project engineer. Slopes at the project should be planted with a deep rooted ground cover as soon as possible after completion.

The use of succulent ground covers such as iceplant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, the watering system should be monitored to assure proper operation and to prevent over watering. Rodent populations should be controlled to eliminate any burrowing which provides a conduit for surface water (rain and/or irrigation water) to enter the subsurface soils.

Other methods such as the use of jute netting may be considered.

Short-Term Excavations

Following the California Occupational and Safety Health Act (CAL-OSHA) requirements, excavations 5 feet deep and greater should be sloped or shored. All excavations and shoring should conform to CAL-OSHA requirements.

Short-term excavations 5-feet deep and greater shall conform to Title 8 of the California Code of Regulations, Construction Safety Orders, Section 1504 and 1539 through 1547. Based on our exploratory borings, it appears that Stable Rock is the predominant type of soil on the project and all short-term excavations should be based on this type of soil. Deviation from the standard short-term slopes are permitted using Option 4, Design by a Registered Professional Engineer (Section 1541.1).

Preparation of Foundation Areas

All footings should rest upon at least 24 inches of properly compacted fill material placed over competent bedrock or entirely within competent bedrock. Based on the results of this investigation, such materials are present at depths of approximately 2 to 2.5 feet. Competent bedrock is defined as relatively unweathered, hard, bedrock. In areas where the required fill thickness is not accomplished by the recommended removals or by site rough grading, the footing areas should be further subexcavated to a depth of at least 24 inches below the proposed footing base grade, with the subexcavation extending at least 5 feet beyond the footing lines.

Foundation Design

The proposed improvements may be safely founded on conventional shallow foundations, either individual spread footings and/or continuous wall footings, bearing on a minimum of 24 inches of engineered compacted fill or embedded at least 12-inches into competent

bedrock. All foundations should have a minimum width of 12 inches and should be established a minimum of 12 inches below lowest adjacent grade.

For the minimum width and depth, spread foundations may be designed using an allowable bearing pressure of 2,000 pounds per square foot (psf). This bearing pressure may be increased by 500 psf for each additional foot of width, and by 500 psf for each additional foot of depth, up to a maximum of 4,000 psf.

The above values are net pressures; therefore, the weight of the foundations and the backfill over the foundations may be neglected when computing dead loads. The values apply to the maximum edge pressure for foundations subjected to eccentric loads or overturning. The recommended pressures apply for the total of dead plus frequently applied live loads, and incorporate a factor of safety of at least 3.0. The allowable bearing pressures may be increased by one-third for temporary wind or seismic loading. The resultant of the combined vertical and lateral seismic loads should act within the middle one-third of the footing width. The maximum calculated edge pressure under the toe of foundations subjected to eccentric loads or overturning should not exceed the increased allowable pressure.

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 400 pounds per square foot per foot of depth. Base friction may be computed at 0.40 times the normal load. Base friction and passive earth pressure may be combined without reduction. These values are for dead load plus live load and may be increased by one-third for wind or seismic.

Settlement

Total settlement of individual foundations will vary depending on the width of the foundation and the actual load supported. Maximum settlement of shallow foundations designed and constructed in accordance with the preceding recommendations are estimated to be on the order of 0.5 inch. Differential settlement between adjacent footings should be about one-half of the total settlement. Settlement of all foundations is expected to occur rapidly, primarily as a result of elastic compression of supporting soils as the loads are applied, and should be essentially completed shortly after initial application of the loads.

Wall Pressures

The design of footings for retaining structures should be performed in accordance with the recommendations described earlier under Preparation of Foundation Areas and Foundation Design. For design of retaining wall footings, the resultant of the applied loads should act in the middle one-third of the footing, and the maximum edge pressure should not exceed the basic allowable value without increase.

For design of retaining walls unrestrained against movement at the top, we recommend an active pressure of 40 pounds per square foot (psf) per foot of depth be used. The pseudostatic earth pressure developed at a rate of 15 psf per foot of depth should be utilized for flexible walls. The pseudostatic earth pressure does not include static earth pressures. The location of the seismic force can be assumed to act at a distance of H/3 above the base of the wall, do not use the inverted triangle. A horizontal seismic acceleration coefficient (kh) of 0.29 may be used.

This assumes level backfill consisting of compacted, non-expansive, soils placed against the structures and within the back cut slope extending upward from the base of the stem at 35 degrees from the vertical or flatter. Retaining structures subject to uniform surcharge loads within a horizontal distance behind the structures equal to the structural height should be designed to resist additional lateral loads equal to 0.44 times the surcharge load. Any isolated or line loads from adjacent foundations or vehicular loading will impose additional wall loads and should be considered individually.

To avoid over stressing or excessive tilting during placement of backfill behind walls, heavy compaction equipment should not be allowed within the zone delineated by a 45 degree line extending from the base of the wall to the fill surface. The backfill directly behind the walls should be compacted using light equipment such as hand operated vibrating plates and rollers. No material larger than three inches in diameter should be placed in direct contact with the wall.

Construction Monitoring

Post investigative services are an important and necessary continuation of this investigation. Project plans and specifications should be reviewed prior to construction to confirm that the intent of the recommendations presented herein have been incorporated into the design. Verification testing including soluble sulfates and expansion index should be performed during the site grading.

During construction, sufficient and timely geotechnical observation and testing should be provided to correlate the findings of this investigation with the actual subsurface conditions exposed during construction. Items requiring observation and testing include, but are not necessarily limited to, the following:

1. Excavations, including approval of the bottom of excavation prior to backfilling.

2. Foundation excavations, including footings.

3. Placement of engineered compacted backfill.

LIMITATIONS

This report contains geotechnical conclusions and recommendations developed solely for use by ADVANTEC Consulting Engineers, Inc., and their design consultants, for the purposes described earlier. It may not contain sufficient information for other uses or the purposes of other parties. The contents should not be extrapolated to other areas or used for other facilities without consulting LOR Geotechnical Group, Inc.

The recommendations are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations, and a surficial site reconnaissance. The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed and tested by the project geotechnical consultant.

If parties other than LOR Geotechnical Group, Inc., provide construction monitoring services, they must be notified that they will be required to assume responsibility for the geotechnical phase of the project being completed by concurring with the recommendations provided in this report or by providing alternative recommendations.

Our report was prepared using generally accepted geotechnical engineering practices under the direction of a state licensed geotechnical engineer. No warranty, expressed or implied, is made as to conclusions and professional advice included in this report. Any persons using this report for bidding or construction purposes should perform such independent investigations as deemed necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Governmental Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a significant amount of time without a review by LOR Geotechnical Group, Inc., verifying the suitability of the conclusions and recommendations.

CLOSURE

It has been a pleasure to assist you with this project. We look forward to being of further assistance to you as construction begins. Should conditions be encountered during construction that appear to be different than indicated by this report, please contact this office immediately in order that we might evaluate their effect.

Should you have any questions regarding this report, please do not hesitate to contact this firm at your convenience.

Respectfully submitted,
LOR Geotechnical Group, Inc.

Andrew A. Tardie, PG 10144
Vice President

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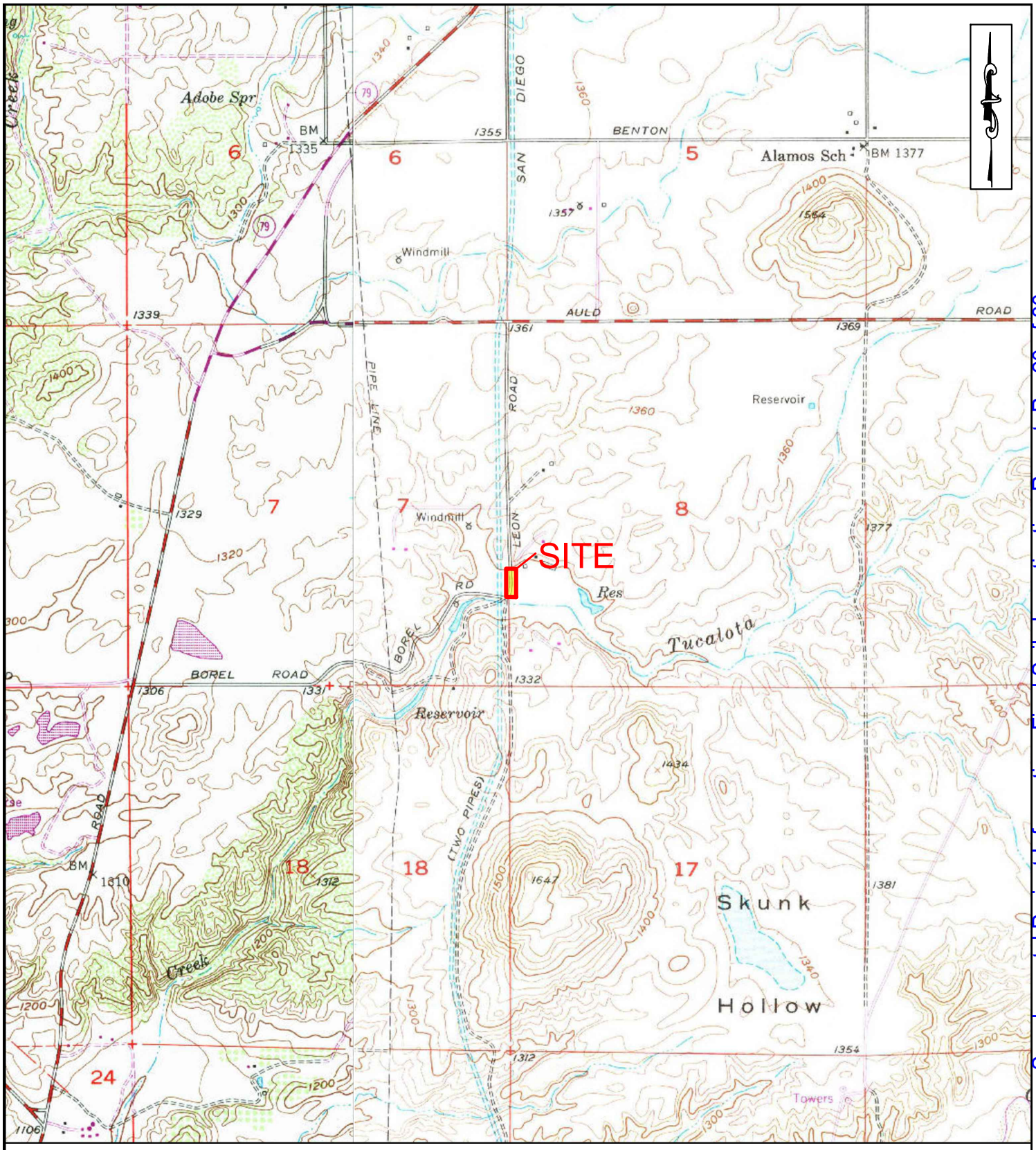
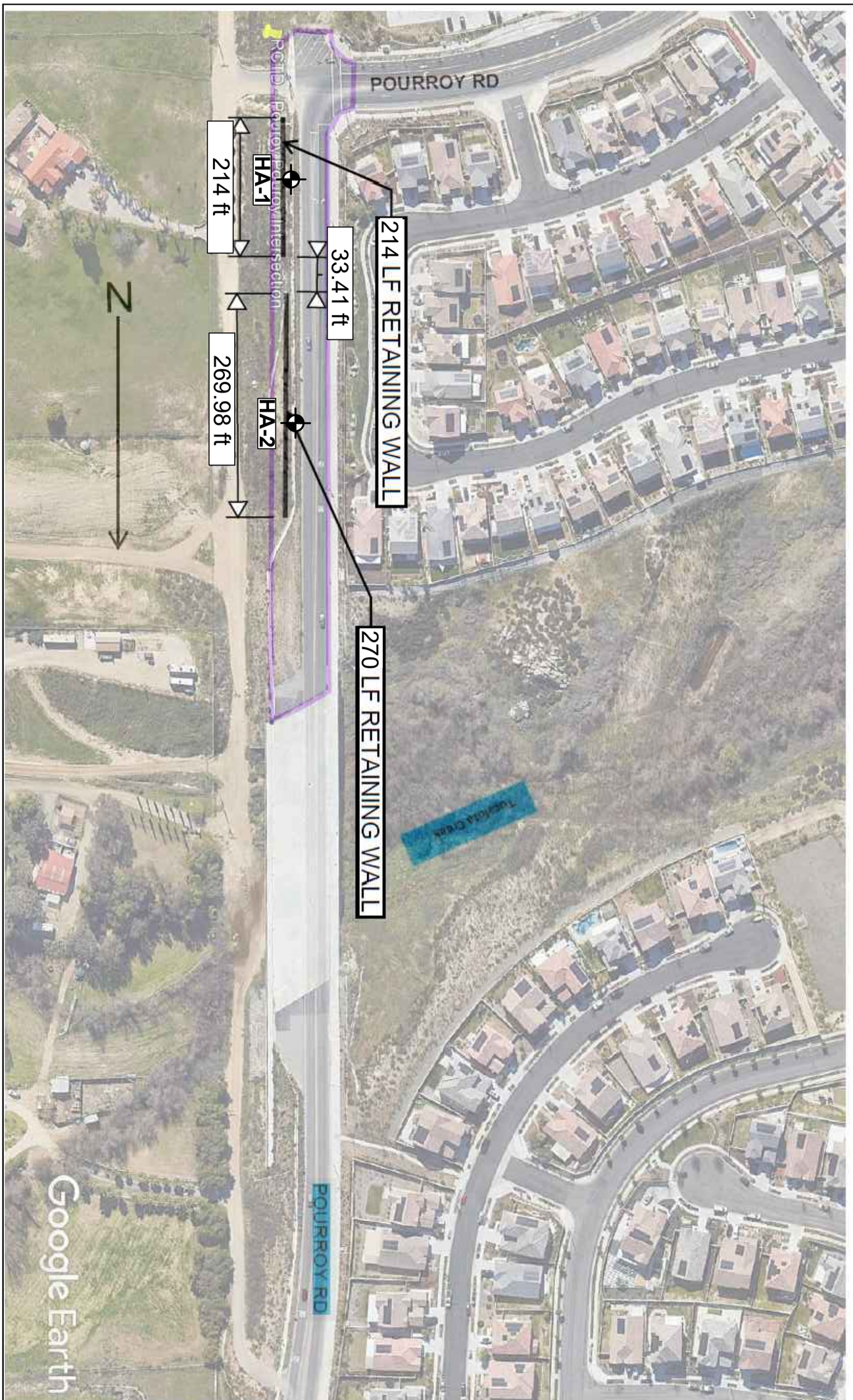
APPENDIX A

Index Map and Site Plan



INDEX MAP

PROJECT:	Pourroy Road Improvement Project, French Valley Area, Riverside County	**PROJECT NO.:**	63892.1R
CLIENT:	ADVANTEC Consulting Engineers, Inc.	**ENCLOSURE:**	A-1
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2023 rev. December 2023
		SCALE:	1" ≈ 2,000'



Legend

(Locations Approximate)

Map Symbols

HA-2 - Exploratory Hand-Auger Boring

SITE PLAN

PROJECT:	Pourroy Road Improvement Project, French Valley Area, Riverside County	**PROJECT NO.:**	63892.1R
CLIENT:	ADVANTEC Consulting Engineers, Inc.	**ENCLOSURE:**	A-2
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2023 rev. December 2023
		SCALE:	1" ≈ 140'

APPENDIX B

Field Investigation Program and Boring Logs

APPENDIX B
FIELD INVESTIGATION

Subsurface Exploration

The site was investigated on February 20, 2023 and consisted of the excavation and logging of 2 exploratory borings to refusal depths of approximately 3.5 and 5 feet below the existing ground surface. The approximate location of the boring is shown on Enclosure A-2, within Appendix A.

The drilling exploration was conducted using 4-inch diameter hand auger equipment. The materials encountered were continuously logged by a geologist from this firm who inspected the site, created detailed logs of the borings, obtained undisturbed, as well as disturbed, soil samples for evaluation and testing, and classified the soils by visual examination in accordance with the Unified Soil Classification System.

Relatively undisturbed samples of the subsoils were obtained at a maximum interval of 5 feet. Samples were recovered by using a California split barrel sampler of 2.50-inch inside diameter and 3.25-inch outside diameter. The samplers were driven by a 35-pound hammer dropped from a height of 30± inches.

The undisturbed soil samples were retained in brass sample rings of 2.42 inches in diameter and 1.00 inch in height, and placed in sealed plastic containers. Disturbed soil samples were obtained at selected levels within the borings and placed in sealed containers for transport to our geotechnical laboratory.

All samples obtained were taken to our geotechnical laboratory for storage and testing. Detailed logs of the borings are presented on the enclosed Boring Logs, Enclosures B-1 and B-2. A Boring Log Legend is presented on Enclosure B-i. A Soil Classification Chart is presented as Enclosure B-ii.

CONSISTENCY OF SOIL

SANDS

SPT BLOWS	CONSISTENCY
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Over 50	Very Dense

COHESIVE SOILS

SPT BLOWS	CONSISTENCY
0-2	Very Soft
2-4	Soft
4-8	Medium
8-15	Stiff
15-30	Very Stiff
30-60	Hard
Over 60	Very Hard

SAMPLE KEY

Symbol	Description
	INDICATES CALIFORNIA SPLIT SPOON SOIL SAMPLE INDICATES BULK SAMPLE INDICATES SAND CONE OR NUCLEAR DENSITY TEST INDICATES STANDARD PENETRATION TEST (SPT) SOIL SAMPLE

TYPES OF LABORATORY TESTS

1	Atterberg Limits
2	Consolidation
3	Direct Shear (undisturbed or remolded)
4	Expansion Index
5	Hydrometer
6	Organic Content
7	Proctor (4", 6", or Cal216)
8	R-value
9	Sand Equivalent
10	Sieve Analysis
11	Soluble Sulfate Content
12	Swell
13	Wash 200 Sieve

BORING LOG LEGEND

PROJECT: Proposed Roadway Wideing, French Valley Area, Riverside County, California	**PROJECT NO.:** 63892.1
CLIENT: ADVANTEC Consulting Engineers, Inc.	**ENCLOSURE:** B-i
LOR GEOTECHNICAL GROUP, INC.	**DATE:** March 2023

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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 SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO.200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

PARTICLE SIZE LIMITS

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
12"	3"	3/4"	No . 4	No. 10	No. 40	200	

(U.S. STANDARD SIEVE SIZE)

SOIL CLASSIFICATION CHART

PROJECT: Proposed Roadway Wideing, French Valley Area, Riverside County, California	**PROJECT NO.:** 63892.1
CLIENT: ADVANTEC Consulting Engineers, Inc.	**ENCLOSURE:** B-ii
LOR GEOTECHNICAL GROUP, INC.	**DATE:** March 2023

LOG OF HAND AUGER HA-1

DEPTH IN FEET	TEST DATA: LABORATORY TESTS	TEST DATA: MOISTURE CONTENT (%)	TEST DATA: DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0	3, 7, 11						@ 0 feet, IGNEOUS BEDROCK: GRANTIC, severly weathered, coarse to medium grained, brown, damp.
		11.5					@ 2 feet, becomes moderately weathered. rings disturbed.
							@ 2.5 feet, becomes less weathered.
		6.8					@ 4 feet, becomes slightly weathered, rings disturbed, difficult to excavate.
5							END OF BORING @ 5' due to refusal No fill No groundwater Bedrock @ 0'

PROJECT:	Proposed Roadway Widening	**PROJECT NO:**	63892.1
CLIENT:	ADVANTEC Consulting Engineers, Inc.	**ELEVATION:**	--
LOR GEOTECHNICAL GROUP INC.		**DATE DRILLED:**	February 20, 2023
		EQUIPMENT:	Hand Auger
		HOLE DIA.: 4"	**ENCLOSURE:** B-1

LOG OF HAND AUGER HA-2

DEPTH IN FEET	TEST DATA: LABORATORY TESTS	TEST DATA: MOISTURE CONTENT (%)	TEST DATA:	TEST DATA: DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0		7.3		111.9				@ 0 feet, IGNEOUS BEDROCK: **GRANTIC, severly weathered, coarse to medium grained, brown, damp.**
								@ 1.5 feet, becomes moderately weathered.
								@ 2.5 feet, becomes slightly weathered, difficult to excavate.
								END OF BORING @ 3.5' due to refusal
								No fill **No groundwater** **Bedrock @ 0'**
5								

PROJECT:	Proposed Roadway Widening	**PROJECT NO:**	63892.1
CLIENT:	ADVANTEC Consulting Engineers, Inc.	**ELEVATION:**	--
LOR GEOTECHNICAL GROUP INC.		**DATE DRILLED:**	February 20, 2023
		EQUIPMENT:	Hand Auger
		HOLE DIA.: 4"	**ENCLOSURE:** B-2

APPENDIX C

Laboratory Testing Program and Test Results

APPENDIX C
LABORATORY TESTING

General

Selected samples obtained from our boring was tested in our geotechnical laboratory to evaluate the physical properties of the soils affecting foundation design and construction procedures. The laboratory testing program performed in conjunction with our investigation in-place density and moisture content, laboratory compaction characteristics, direct shear, and soluble sulfate content. Descriptions of the laboratory tests are presented in the following paragraphs:

Moisture Density Tests

The moisture content and dry density information provides an indirect measure of soil consistency for each stratum, and can also provide a correlation between soils on this site. The dry unit weight and field moisture content were determined for selected undisturbed samples, in accordance with ASTM D 2922 and ASTM D 2216, respectively, and the results are shown on the Boring Logs, Enclosures B-1 and B-2 for convenient correlation with the soil profile.

Laboratory Compaction

Selected soil samples were tested in the laboratory to determine compaction characteristics using the ASTM D 1557 compaction test method. The results are presented in the following table:

LABORATORY COMPACTION				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Maximum Dry Density (pcf)**	**Optimum Moisture Content (percent)**
B-1	0-3	Bedrock	137.5	6.5

Direct Shear Tests

Shear tests are performed with a direct shear machine in general accordance with ASTM D 3080 at a constant rate-of-strain (usually 0.04 inches/minute). The machine is designed to test a sample partially extruded from a sample ring in single shear. Samples are tested at varying normal loads in order to evaluate the shear strength parameters, and angle of internal friction and cohesion. Samples are tested in their existing undisturbed condition and soaked to represent the worse case conditions expected in the field.

The results of the shear tests are presented in the following table:

DIRECT SHEAR TESTS				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Angle of Internal Friction (degrees)**	**Apparent Cohesion (psf)**
B-1	0-3	Bedrock	33	350

Soluble Sulfate Content

The soluble sulfate content of selected subgrade soils was evaluated and the concentration of soluble sulfates in the soils was determined by measuring the optical density of a barium sulfate precipitate. The precipitate results from a reaction of barium chloride with water extractions from the soil samples. The measured optical density is correlated with readings on precipitates of known sulfate concentrations. The test results are presented on the following table:

SOLUBLE SULFATE CONTENT TESTS			
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.C.S.)**	**Sulfate Content (percent by weight)**
B-1	0-3	Bedrock	< 0.005