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GEOTECHNICAL/CIVIL CONSULTANTS, LTD.
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mgallo

March 21, 2023
27382-49N

Sierra Ranchos Property Owners Association
P.O. Box 11513
Reno, Nevada 89510

Geotechnical Investigation
Sierra Ranchos Rehabilitation Project
Rancho Haven Community, Nevada

Introduction and Scope of Work

This report presents the results of our geotechnical investigation for the proposed Panhandle Road and Wrangler Road Rehabilitation project located in the Sierra Ranchos public development of the Rancho Haven community in Nevada. Nortech was retained by the Sierra Ranchos Property Owners Association (SRPOA) to address issues raised by "Administrative Warning Notices" [(WVI0-ENG19–(29,30)] initially issued by Washoe County in September 24, 2019, then was converted to "Violations Notices" in 2020 and resumed by the compliance officer in 2022. The project involves roadway rehabilitation by attaining suitable subgrade elevations and surface material quality and placement, and by improving the drainage conveyances to mitigate the extensive seasonal flooding conditions.

Since the drainage, flooding and erosion conditions are a major factor in the overall mitigation of the roadway and drainage improvements, we understand that Mr. Mike DiMartini is performing the hydrology study to delineate runoff discharge and design the needed drainage conveyances.

The project area is referred to as Sierra Ranchos by name, with most of the improvements on Panhandle Road and Wrangler Road. There are two separate notices, the first Panhandle Road and the second Wrangler Road, which have constituted a violation from the compliance officer. SRPOA met with the compliance officer September 2020 and applied for an excavation permit as requested. The issue was not resolved, and SRPOA has asked Nortech to assist by performing a site investigation, roadway recommendations, and material usage from drainage improvements to mitigate future flood damage and erosion.

Our scope of work included a site visit to Panhandle Road and Wrangler Road to excavate four, three-foot-deep test borings with a hand auger on Panhandle Road, and three, three-foot-deep test borings on Wrangler Road. Samples retrieved from the field investigation were tested in the laboratory for particle size analysis, expansive soil properties, compaction, and Resistance "R" Value. We are then to provide design and construction recommendations for grading, mitigation, and dealing with any expansive or otherwise poor subgrade soils, new roadway design sections, and general requirements.

Field Investigation and Laboratory Testing

We explored the subsurface conditions along the roadways by logging and sampling the seven test borings with a hand auger excavated to a minimum depth of 3 feet below the existing ground surface. The borings were taken along the roadway shoulders incrementally spaced to best construe surface conditions. The soil profiles were logged and representative samples were retrieved for laboratory examination and testing.

The samples retrieved were examined in the laboratory and representative specimens were tested for particle size analysis, Atterberg Limits, compaction and Resistance "R " Value. The generated site plan indicates the approximate locations of the test boring locations which is shown on Plate 1 and logs of the materials encountered are presented on Plates 2 through 5. The soils are classified in accordance with the Unified Soil Classification System which is described on Plate 6. Laboratory test results are shown on Figures 7 through 15. Our proposed roadway section is noted on Plate 16. In addition, images 17 through 18 denote the findings of administrative warning case number (WVIO-ENG 19-(29,30). In addition, Nortech has provided images 19 through 21 to reflect the most current state of the roadway conditions as of January 2023.

Site and Soil Conditions

The project area includes the two roads west of Dry Valley Road. The first road Panhandle, trends north-south and is offset 100 yards west of Dry Valley. Wrangler Road joins Dry Valley Road 75 yards above the northern end of Panhandle Road. However, Wrangler road trends north-west, where it transects Buckboard Circle. All roads underlying the project area have been subjected to past erosional events, which that have lead some roadway segments currently below the natural drainage grade. The western most portion of Panhandle Road includes drainage channels that appear to be poorly sized, allowing runoff to build up when abnormal and/or high flow rates occur.

The soils encountered in the test borings consisted of fairly uniform layers of brown, medium dense, silty sand with some gravel to depths of about 6 inches to one foot. Similar silty sand soils were encountered below this surface layer, but with little gravel content. The gravel in the surface layer is believed to be derived from spill-over of the roadway surfacing which mixed with the silty sands. At the time of our exploration (January 2023), no free ground water was encountered in any excavation. The subgrade at the end Panhandle Road consisted of a brown clayey sand, with minor gravel, whereas the subgrade on Wrangler Road was judged to be more like a select natural base. Atterberg tests were performed on the clayey sand, and low to negligible expansive properties were identified when coupled with grain size teats.

Observations Pertaining to Washoe County

Our field investigation took place January 5, 2023. Roadway conditions were poor, and travel was impeded due to surface defects such as potholes, washboards, ruts, and frozen sections of roadway. Photos are provided to document violation specific complaints reflecting the most current roadway conditions. WCC article 438 grading standard section 111.438.10 identifies the need for grading permits. Section 110.438.20 states no person shall do any grading in excess of fifty 50 cubic yards of material or 10,000 square feet of grading without first having obtained a grading permit from the building official as enforceable under the powers of Chapter 100. It should be noted upon our field visit of January 2023, no further grading or surface defects associated with grading were observed. Drainage channels were flowing with runoff due to snow melt. Photos 17 through 18 highlight the complaints from Washoe County, September 2019.

Photos 19 through 21 illustrate no recent grading excavations have been performed.

Approach Used in the Engineering Analyses and Material Recommendations

Typically, to determine an appropriate pavement section for a particular project, we utilize subgrade Resistance "R" Value test results combined with average daily traffic (ADT) data to determine the pavement section thicknesses. The pavement design for a project would then be based on the Asphalt Institute Thickness Design Manual, MS-1 and associated computer program input. However, for projects such as this, the traffic volumes are very low and the program would be ineffective for pavement section thicknesses. Therefore, we recommend a minimum pavement section thickness based on knowledge of the subgrade R-Value and support characteristics. In addition, for this project we do not have known pavement section thicknesses for any adjoining paved roads. Our design presented in a subsequent segment of this report will be based on an average of the existing roadway thicknesses.

Discussion and Conclusions

Based upon the results of our investigation we conclude that, from a geotechnical engineering standpoint, the roadway rehabilitation can proceed essentially as planned. We believe that in general, conventional site grading techniques and pavement and any concrete materials can be used to complete the project. No expansive or otherwise unsuitable soils were encountered in our investigation.

The road subgrades can be raised where needed by using new deepened drainage channel excavated material which we assume will be required by the associated hydrology engineers new study. We are recommending the use of recycled asphaltic concrete base (RAB) for the wearing surface with no flexible pavement section mat used. The RAB can be supported on the existing and/or newly raised and compacted roadway subgrade. Any of the native silty (and clayey) sand excavation material that is generated by excavation can be reused as fill if needed, and as available. Material can also be imported. All fill should be approved by the geotechnical engineer and be placed and compacted as recommended in subsequent sections of this report.

Recommendations

1. **Site Preparation and Grading:** Initially, areas to be developed, should be cleared of any surface vegetation and debris. These materials should be removed from the site. There are zones of existing gravel material at the present road surfaces which should be removed with care and stockpiled for later possible use, if needed. The subgrade should then be graded per the design plan elevations needed as determined by the hydrology study to accept our recommended RAB section which is presented later in this report. All stripped and any excavated subgrade soil surfaces should be moisture conditioned and compacted to at least 90 percent relative compaction (per ASTM D1557) prior to any fill placement or installation of structural components.

   Only select structural materials should be used for fill and backfill. Structural materials imported to the site should be free of organic and other deleterious matter, have low to negligible expansion potential and conform in general to the following requirements:

Sieve Size	Percent Passing (by dry weight)
6 inch	100
3/4 Inch	70 - 100
No. 4	50 - 100
No. 200	10 - 35

Liquid Limit = 35 maximum
Plasticity Index = 15 maximum

We anticipate that generally based on laboratory testing, the on-site, granular native materials generated by any excavation will be suitable for use as structural fill and backfill as available. All fill materials should be approved by the geotechnical engineer prior to use. Structural fill and backfill should be spread in 8- to 10-inch, moisture conditioned, loose lifts and compacted to at least 90 percent relative compaction.

2. **RAB Roadway Section:** As mentioned above, for projects such as this, where the traffic volumes are very low, we are recommending a minimum base section thickness based on knowledge of a high subgrade R-value and the performance of RAB on similar projects completed. Based on this criteria, our recommended base section is as follows:

RAB Roadway Section
Panhandle Road and Wrangler Road

Type 1, Recycled Asphaltic Concrete Base (RAB)	8"
Compacted Native/fill Subgrade (Minimum R-Value = 56)	6"

Prior to the placement of the RAB material, the upper 6 inches to native or fill subgrade elevation should be moisture conditioned (by scarification, if needed) and compacted to at least 90 percent relative compaction. Subsequently, the RAB material should be spread in thin, moisture conditioned layers and compacted to at least 95 percent. All subgrades and final grades should be rolled to provide smooth, firm non-yielding surfaces.

Type 1, RAB can be applied over the existing roads. RAB consists of existing broken out asphaltic concrete pavement slabs that are removed in projects where new pavement design sections are planned or where the previously paved area is to be used for other planned improvements. The slabs are crushed into a homogeneous mixture of asphaltic coated aggregates on the order of 1-1/2 inch to 2 inches in size. For roadways that are not planned to have a asphaltic concrete pavement section over a base material, the RAB is a preferable wearing surface over standard aggregate base material use as it has a binding affect by the asphaltic coating.

3. **Correcting Code Violations:** The roadway surface and drainage defects observed in the field apply to both Panhandle Road and Wrangler Road. Once the new drainage channels can be sized, and material can be excavated to the newly designed drainage channel depths and the final subgrades are established, the 8 inches of recycled asphalt base can be placed and compacted.

Additional Geotechnical Engineering and Testing Services

The recommendations presented in this report are based on the results of our field exploration and laboratory testing and our understanding of the proposed construction. This report has been prepared in accordance with current, generally accepted, geotechnical engineering standards of practice. It is believed that the soil information compiled presents an accurate representation of the soil conditions and variations to be expected within the area explored. However, there is a possibility that conditions other than those found in our investigation exist on-site. In the event unanticipated conditions are encountered during construction, we should be contacted immediately for consultation. We should be given budget allowances to evaluate the condition(s) and make timely new recommendations or modify our existing report to satisfy the project needs.

Sufficient field observation and construction review should also be provided during all phases of earthwork construction and material installation. We should review the final plans and specifications for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the Owner (SRPOA), Civil and Hydrology Engineers, General Contractor, Earthwork and Materials Sub-Contractors, Building Official and Geotechnical Engineer. The conference will allow all parties to review the project plans and specifications and recommendations presented in this report and discuss applicable material quality requirements and answer questions regarding the planned construction.

During construction, we should provide on-site observations, together with field and laboratory testing of the site preparation and grading, excavation, any over-excavation, fill placement, flatwork installation and RAB placement operations. These observations and tests would allow us to verify that the soil conditions are as anticipated and that the Contractor's work is in conformance with the plans and specifications.

We trust that this provides the information needed at this time; however, if you have any questions please contact our office.

Yours very truly,

NORTECH Geotechnical/Civil Consultants, Ltd.

Mat H. Butcher
Engineering Intern - OT8864

PROFESSIONAL ENGINEER-STATE OF NEVADA
NICHOLAS S. VESTBIE
Exp. 6-30-24
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Nicholas S. Vestbie
Civil Engineer - 5173

NSV/MHB llm

Enclosures:
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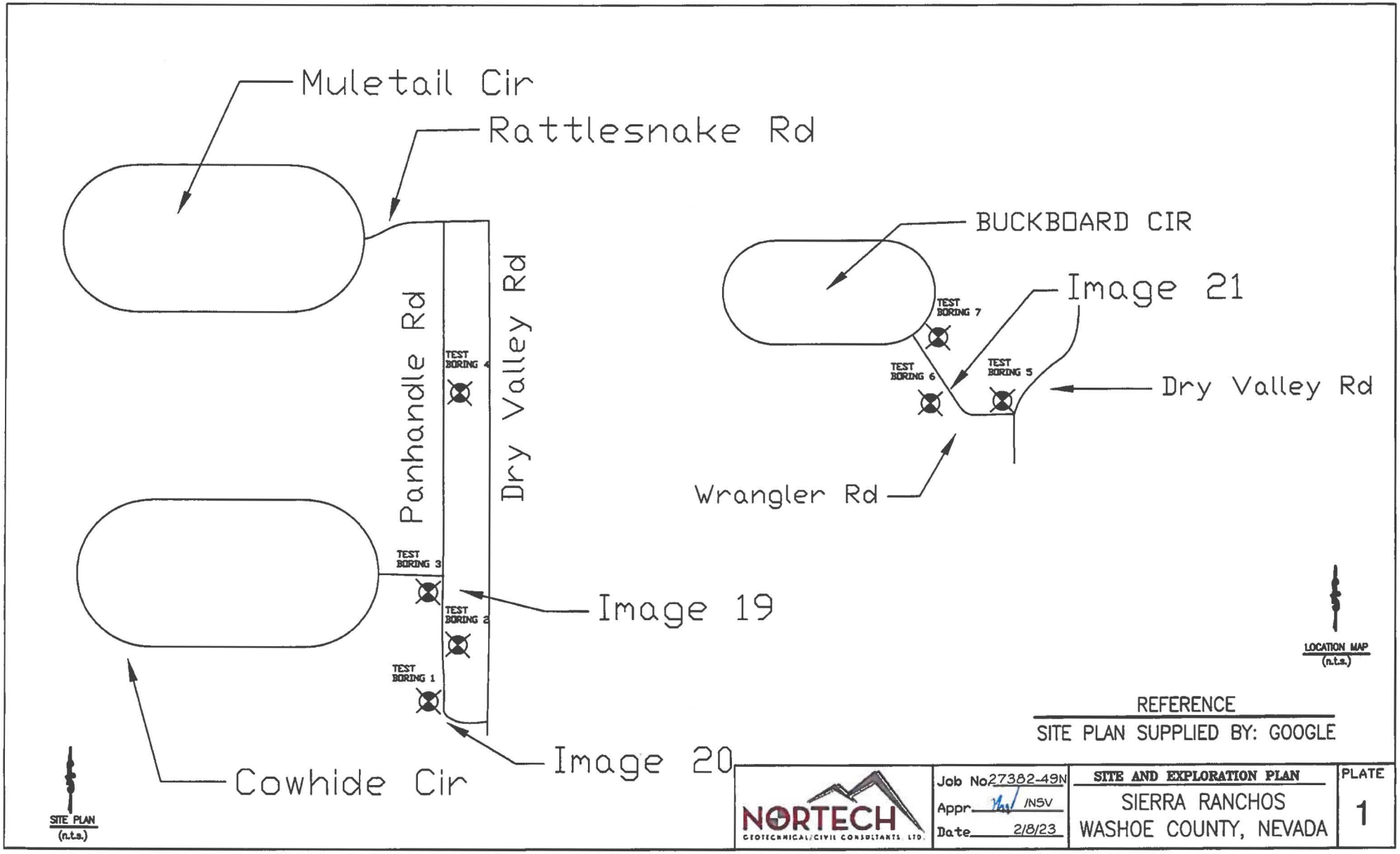

REFERENCE

SITE PLAN SUPPLIED BY: GOOGLE

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Date 2/8/23

SITE AND EXPLORATION PLAN
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WASHOE COUNTY, NEVADA

PLATE 1

Laboratory Tests (and other info.)	MAXIMUM DRY DENSITY (PCF)	MOISTURE CONTENT (%)	IN- SITU DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 1 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*SIEVE ANALYSIS (See Figure 7) TEST PIT LOCATION: LATITUDE: 39.863222 LONGITUDE: −119.928363 Estimated Error: 5 to 6' radius from mid point	115	9.5	112	5 10	*	**BROWN SILTY SAND (SM)** Cemented, with gravel, medium dense, moist, roots to 8" No Free Water Encountered

Laboratory Tests (and other info.)	MAXIMUM DRY DENSITY (PCF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 2 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*SIEVE ANALYSIS AND COMPACTION TESTING (See Figure 8 & 14) TEST PIT LOCATION: LATITUDE: 39.864300 LONGITUDE: −119.928520 Estimated Error: 5 to 6' radius from mid point	126	18.2	109	5 10	*	**DARK BROWN SILTY SAND (SM)** Cemented, with gravel, medium dense, moist, roots to 8" No Free Water Encountered

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LOGS OF TEST BORINGS 1 & 2

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PLATE
2

Laboratory Tests (and other info.)	MAXIMUM DRY DENSITY (PCF)	MOISTURE CONTENT (%)	IN- SITU DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 3 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*SIEVE ANALYSIS (See Figure 9) TEST PIT LOCATION: LATITUDE: 39.866324 LONGITUDE: −119.928537 Estimated Error: 5 to 6' radius from mid point	122	12.5	119	5 10	*	**BROWN SILTY SAND (SM)** Cemented, with gravel, medium dense, moist, roots to 8" No Free Water Encountered

Laboratory Tests (and other info.)	MAXIMUM DRY DENSITY (PCF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 4 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*SIEVE ANALYSIS AND ATTERBURG LIMITS TEST (See Figure 10 & 13) TEST PIT LOCATION: LATITUDE: 39.864300 LONGITUDE: −119.928520 Estimated Error: 5 to 6' radius from mid point	123	12.2	120	5 10	*	**BROWN CLAYEY SAND (SC)** Cemented, with gravel, medium stiff, moist, roots to 8" No Free Water Encountered

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LOGS OF TEST BORINGS 3 & 4

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PLATE 3

Laboratory Tests (and other info.)	MAXIMUM DRY DENSITY (PCF)	MOISTURE CONTENT (%)	IN- SITU DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 5 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*R-Value Test (See Figure 15) TEST PIT LOCATION: LATITUDE: 39.877837 LONGITUDE: -119.929640 Estimated Error: 5 to 6' radius from mid point	123	16.4	116	5 10	*	**BROWN SILTY SAND (SM)** Cemented, with gravel, medium dense, moist, roots to 8" No Free Water Encountered

Laboratory Tests (and other info.)	MAXIMUM DRY DENSITY (PCF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 6 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*SIEVE ANALYSIS (See Figure 11) TEST PIT LOCATION: LATITUDE: 39.879426 LONGITUDE: -119.931116 Estimated Error: 5 to 6' radius from mid point	123	10.2	117	5 10	*	**LIGHT BROWN SAND (SP-SM)** Poorly graded, with silt, moist, medium dense No Free Water Encountered

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LOGS OF TEST BORINGS 5 & 6

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PLATE
4

Laboratory Tests (and other info.)	DRIVING RESISTANCE BLOWS/FT.	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	DEPTH (FT.)	SAMPLE	Test Boring No.: 7 Equipment: Hand Auger Elevation: N/A Date: 1/5/23
*SIEVE ANALYSIS (See Figure 12)	123	11.6	118	2 4 6 8 10 12	*	**BROWN SILTY SAND (SM)** Cemented, with gravel, medium dense, moist, roots to 8" No Free Water Encountered

TEST PIT LOCATION:
LATITUDE: 39.877587
LONGITUDE: -119.927490
Estimated Error: 5 to 6' radius from mid point

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LOG OF TEST BORING 7

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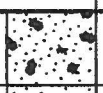
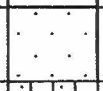
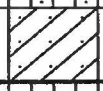
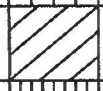
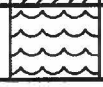
PLATE 5

MAJOR DIVISIONS					TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN # 200 SIEVE)	GRAVELS (MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE)	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 SIZE)	CLEAN SANDS WITH LITTLE OR NO FINES	SP		POORLY GRADED SANDS, GRAVELLY SANDS
			SW		WELL 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 (MORE THAN HALF IS SMALLER THAN # 200 SIEVE)	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 CLAY LIQUID LIMIT GREATER THAN 50		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OR HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

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UNIFIED SOIL CLASSIFICATION CHART

SIERRA RANCHOS
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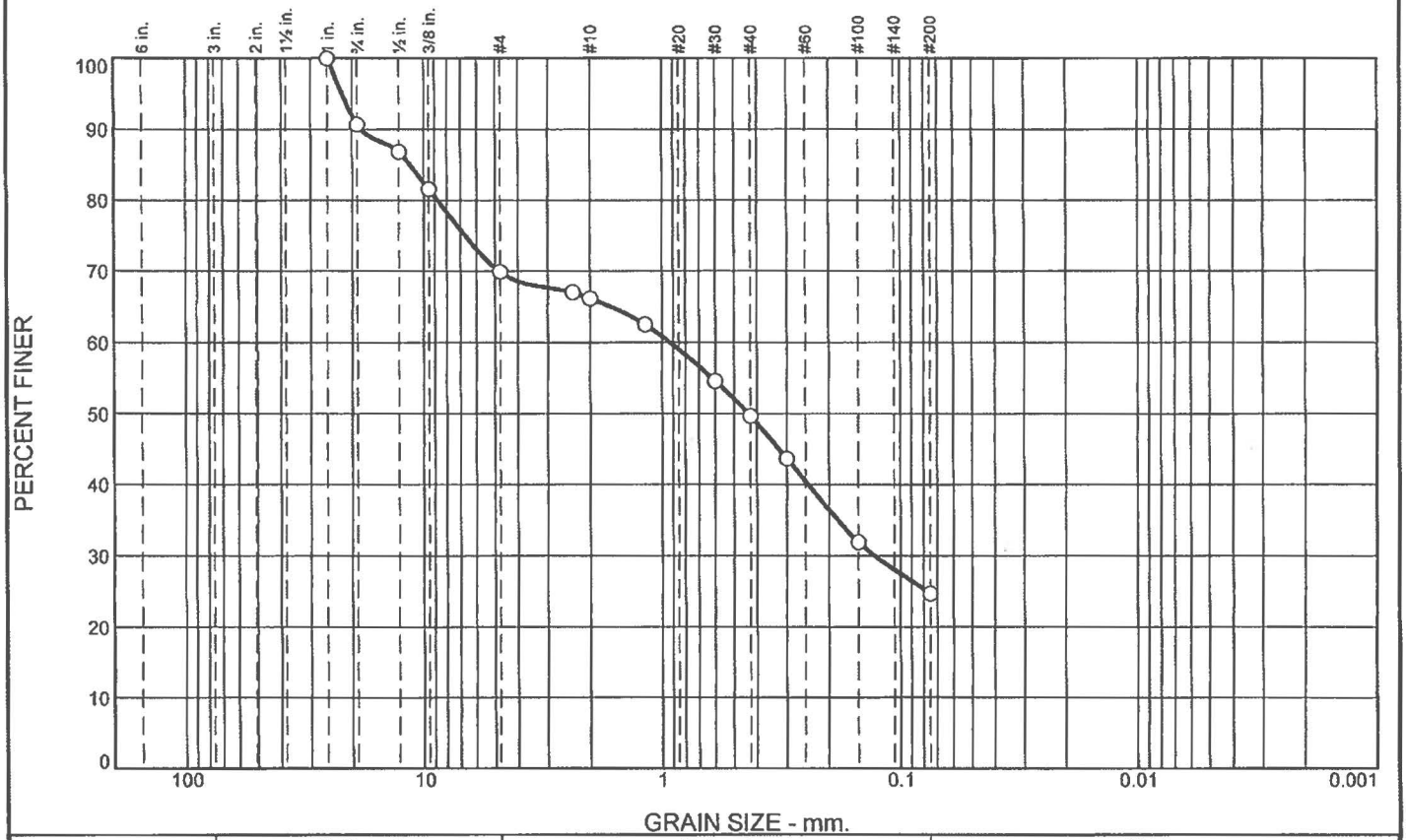
PLATE
6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.3	20.9	3.7	16.4	25.0	24.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	90.7		
.5	86.8		
.375	81.6		
#4	69.8		
#8	67.0		
#10	66.1		
#16	62.5		
#30	54.6		
#40	49.7		
#50	43.6		
#100	31.9		
#200	24.7		

* (no specification provided)

Soil Description

Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 18.3834 D_{85}= 11.3879 D_{60}= 0.9256
D_{50}= 0.4345 D_{30}= 0.1290 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

*Cemented Material

Source of Sample: Test Boring 1 **Depth:** 0'-1'
Sample Number: 807

Date: 1/11/23

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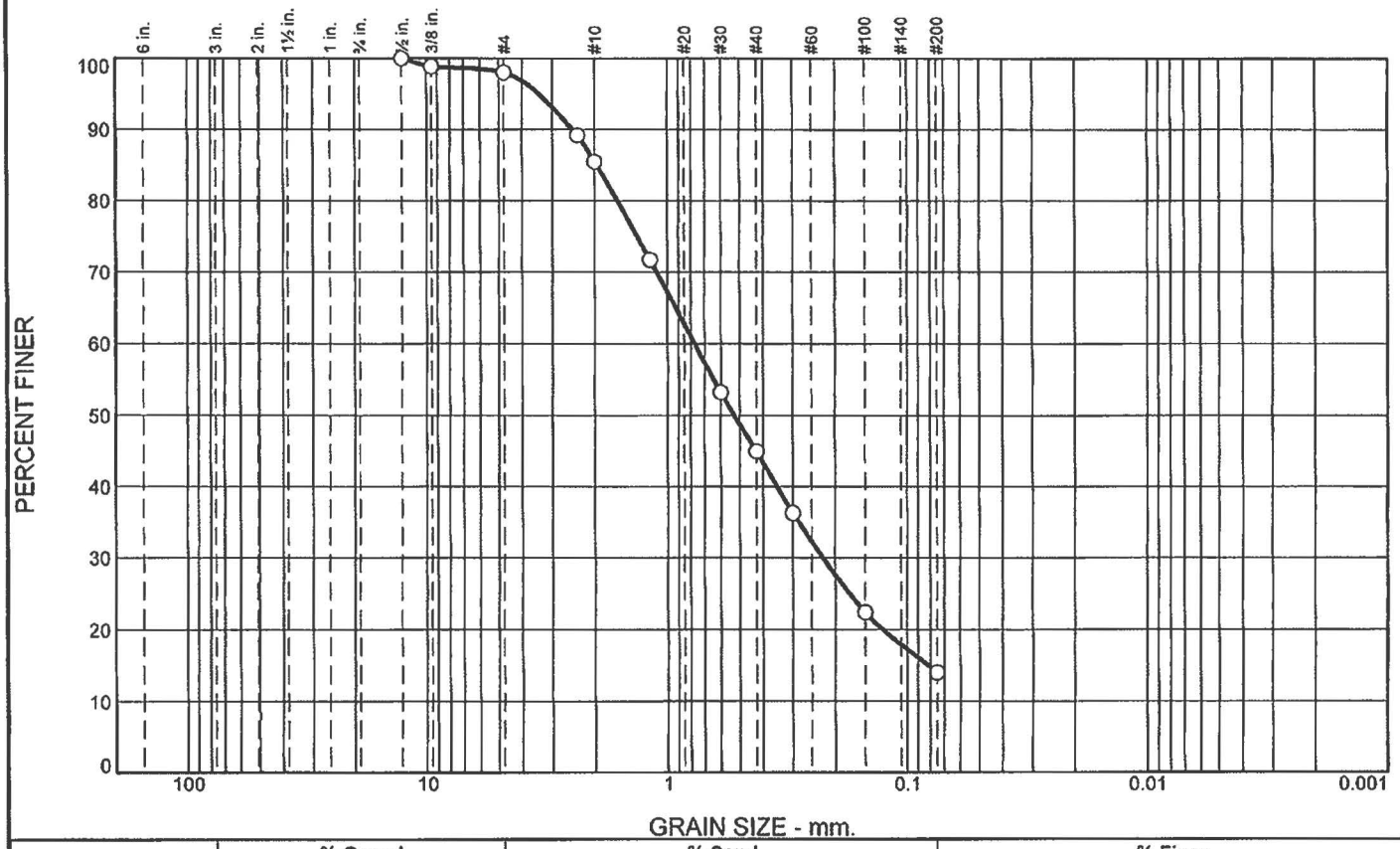
Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project

Project No: 27382-49N **Figure** 7

Tested By: Casey Mull **Checked By:** CM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.0	12.5	40.6	30.9	14.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100.0		
.375	98.8		
#4	98.0		
#8	89.2		
#10	85.5		
#16	71.7		
#30	53.2		
#40	44.9		
#50	36.3		
#100	22.4		
#200	14.0		

* (no specification provided)

Soil Description

Dark Brown silty sand

Atterberg Limits

PL= NP LL= NV PI=

Coefficients

D_{90}= 2.4731 D_{85}= 1.9619 D_{60}= 0.7735
D_{50}= 0.5267 D_{30}= 0.2249 D_{15}= 0.0816
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Source of Sample: Test Boring 2 **Depth:** 1'-2'
Sample Number: 808 **Date:** 1/11/23

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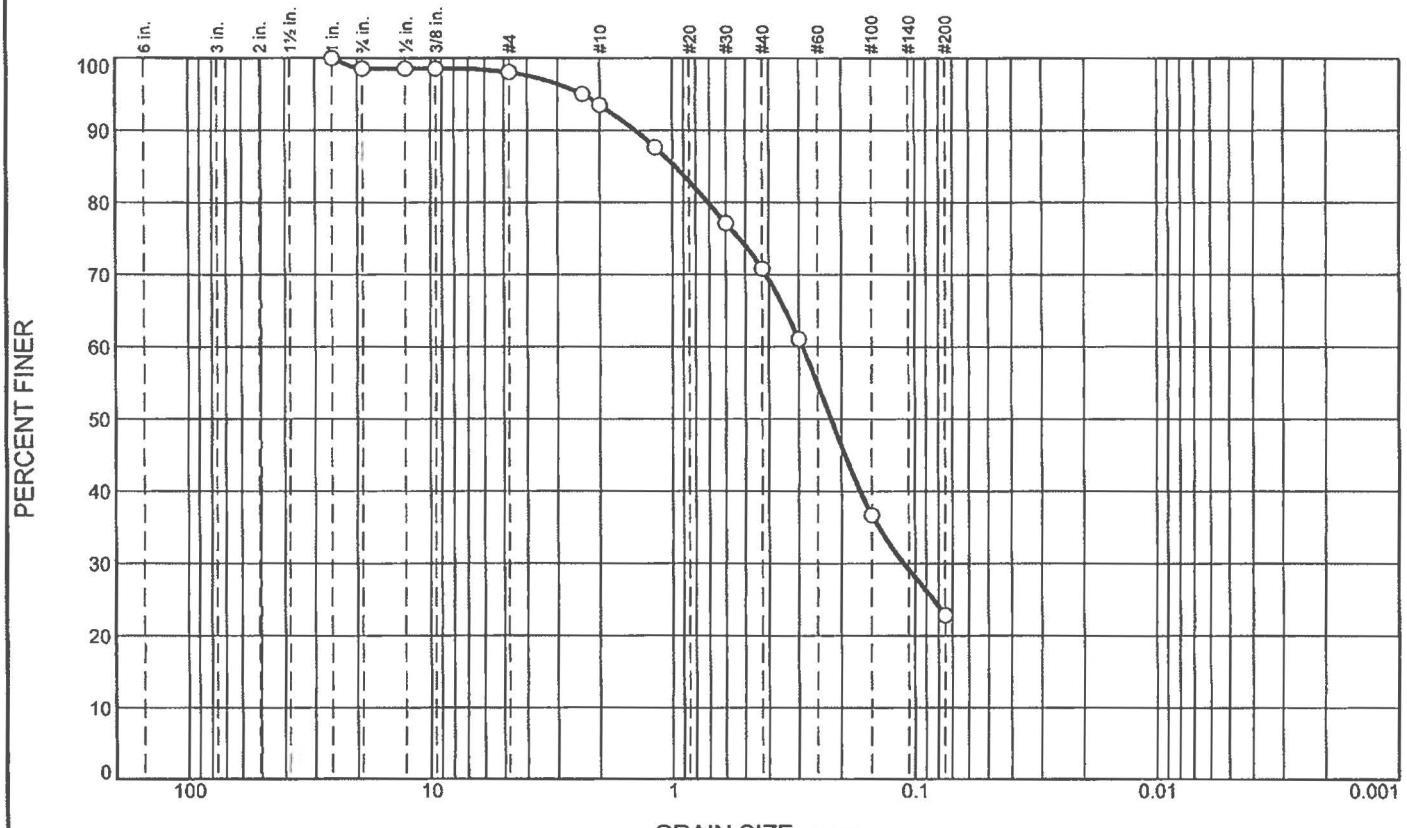
Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project
Project No: 27382-49N **Figure** 8

Tested By: Casey Mull **Checked By:** CM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.5	0.5	4.5	22.6	48.1	22.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	98.5		
.5	98.5		
.375	98.5		
#4	98.0		
#8	95.0		
#10	93.5		
#16	87.7		
#30	77.1		
#40	70.9		
#50	61.0		
#100	36.7		
#200	22.8		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= NP LL= NV PI=

Coefficients

D_{90}= 1.4278 D_{85}= 0.9758 D_{60}= 0.2904
D_{50}= 0.2206 D_{30}= 0.1114 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Source of Sample: Test Boring 3 **Depth:** 0'-1'
Sample Number: 809

Date: 1/11/23

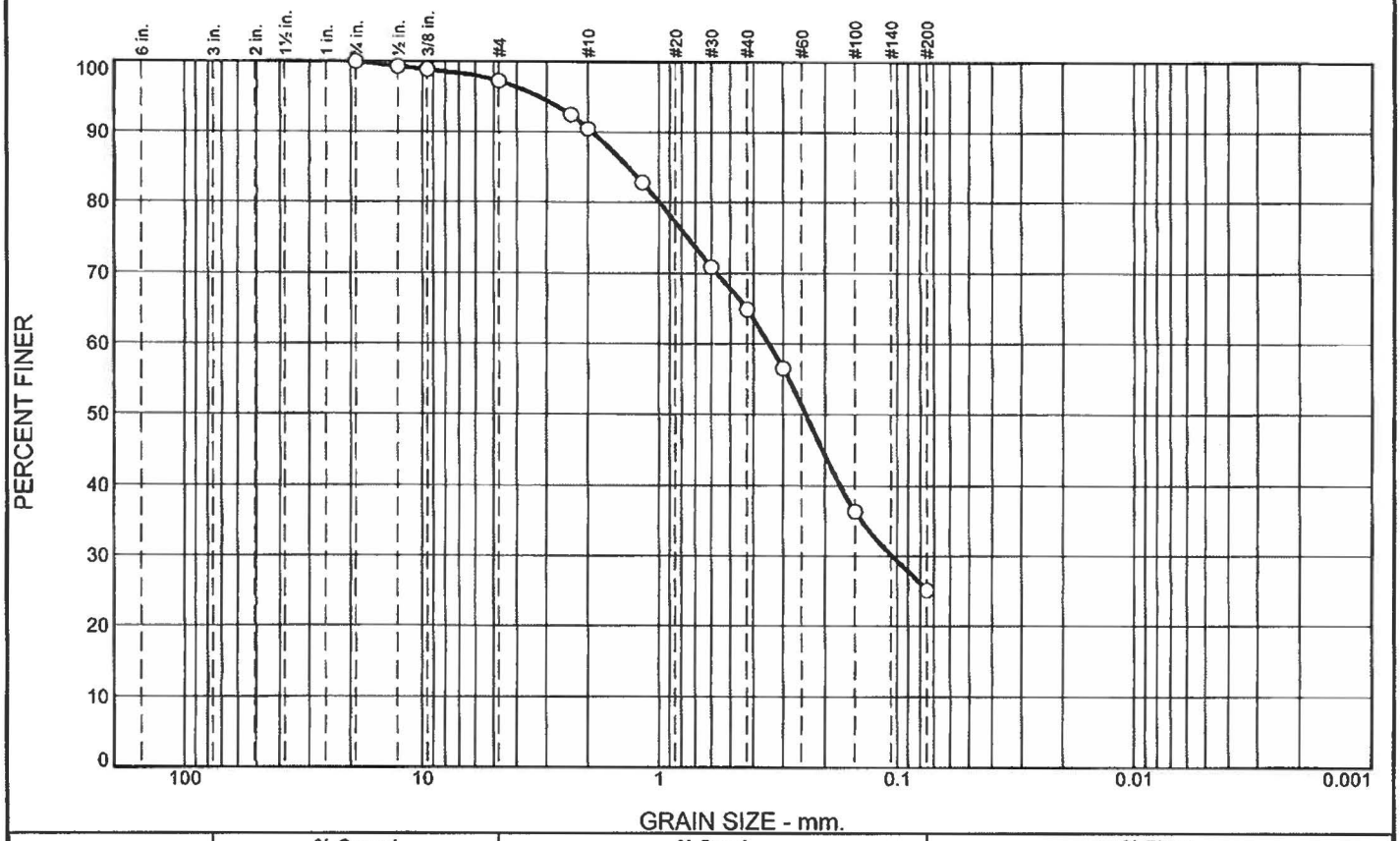
NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS LTD

Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project

Project No: 27382-49N **Figure** 9

Tested By: Casey Mull **Checked By:** CM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.8	6.7	25.6	39.8	25.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	99.3		
.375	98.8		
#4	97.2		
#8	92.5		
#10	90.5		
#16	82.8		
#30	70.9		
#40	64.9		
#50	56.5		
#100	36.3		
#200	25.1		

* (no specification provided)

Soil Description

Brown clayey sand

Atterberg Limits

PL= 17.0 LL= 36.1 PI= 19.1

Coefficients

D_{90}= 1.9310 D_{85}= 1.3616 D_{60}= 0.3436
D_{50}= 0.2402 D_{30}= 0.1051 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Source of Sample: Test Boring 4 **Depth:** 0'-1'
Sample Number: 810 **Date:** 1/11/23

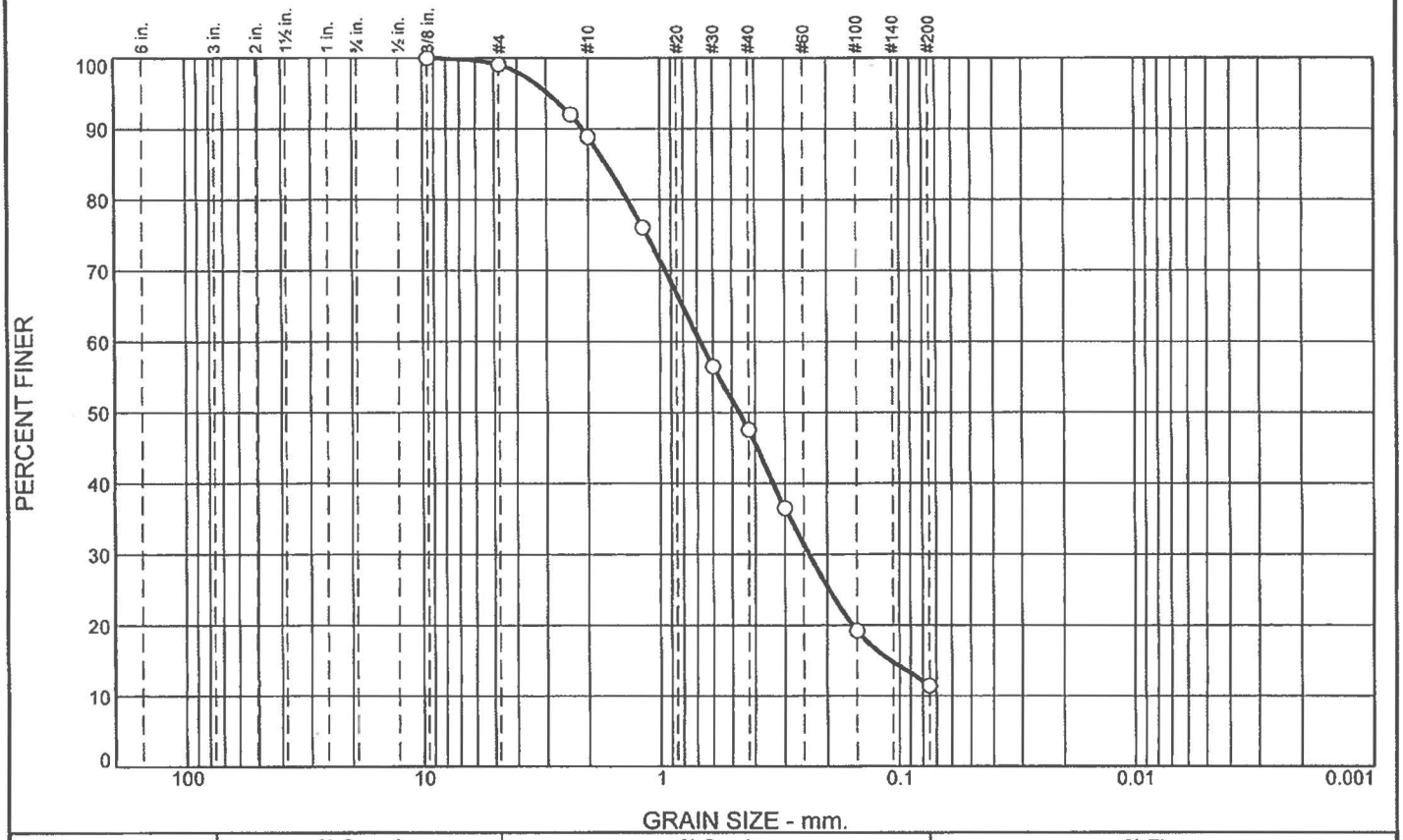
NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS LTD.

Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project

Project No: 27382-49N **Figure** 10

Tested By: Casey Mull

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	10.1	41.4	36.0	11.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.0		
#8	92.0		
#10	88.9		
#16	76.1		
#30	56.5		
#40	47.5		
#50	36.5		
#100	19.2		
#200	11.5		

* (no specification provided)

Soil Description

Light Brown poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI=

Coefficients

D_{90}= 2.1090 D_{85}= 1.6835 D_{60}= 0.6797
D_{50}= 0.4660 D_{30}= 0.2381 D_{15}= 0.1090
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Source of Sample: Test Boring 6 **Depth:** 0'-1'
Sample Number: 812

Date: 1/11/23

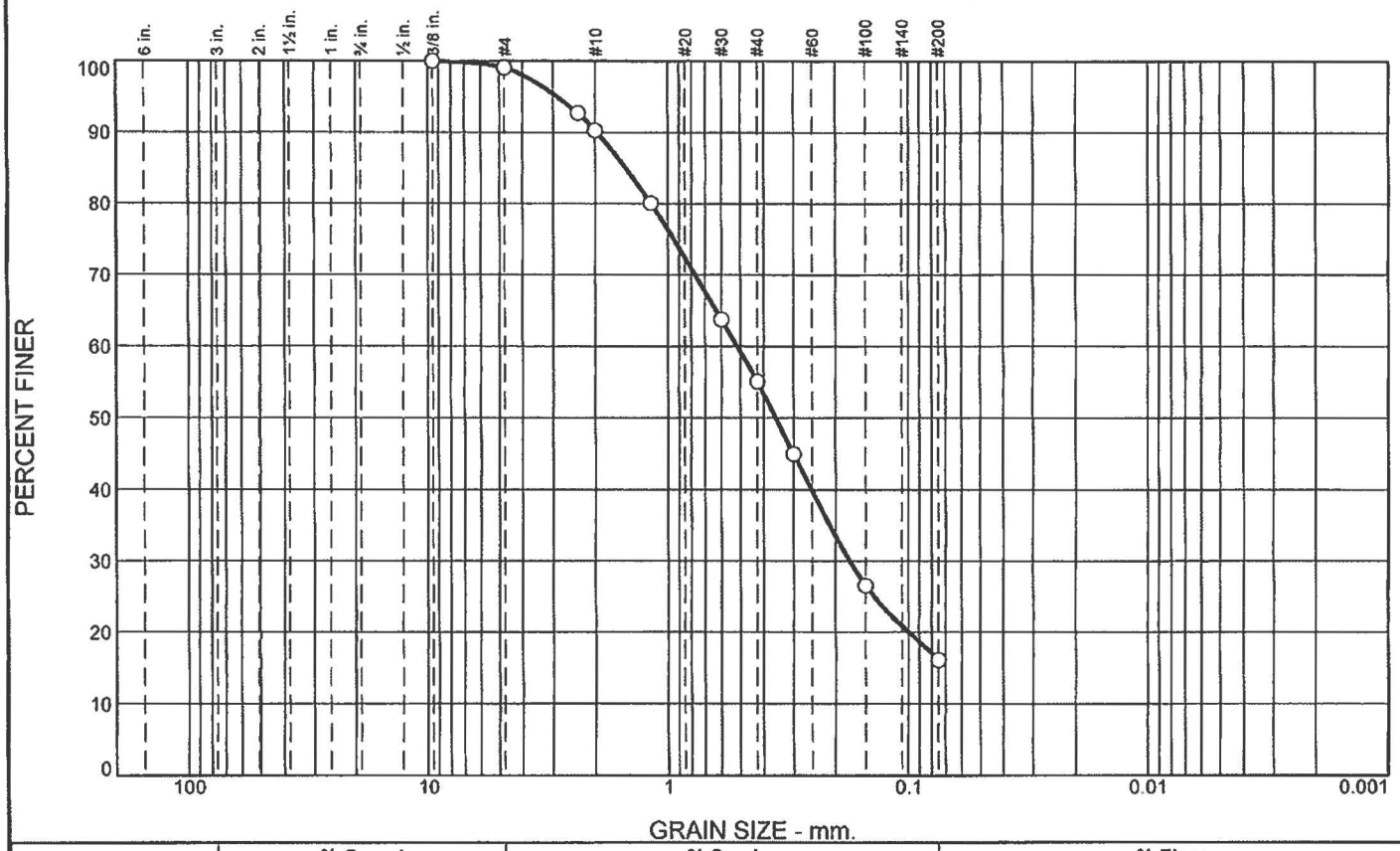
NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS, LTD.

Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project

Project No: 27382-49N **Figure** 11

Tested By: Casey Mull **Checked By:** CM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	8.8	35.1	39.0	16.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.0		
#8	92.7		
#10	90.2		
#16	80.0		
#30	63.7		
#40	55.1		
#50	45.0		
#100	26.5		
#200	16.1		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= NP LL= NV PI=

Coefficients

D_{90}= 1.9726 D_{85}= 1.5024 D_{60}= 0.5154
D_{50}= 0.3565 D_{30}= 0.1747 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Source of Sample: Test Boring 7 **Depth:** 0'-1'
Sample Number: 813 **Date:** 1/11/23

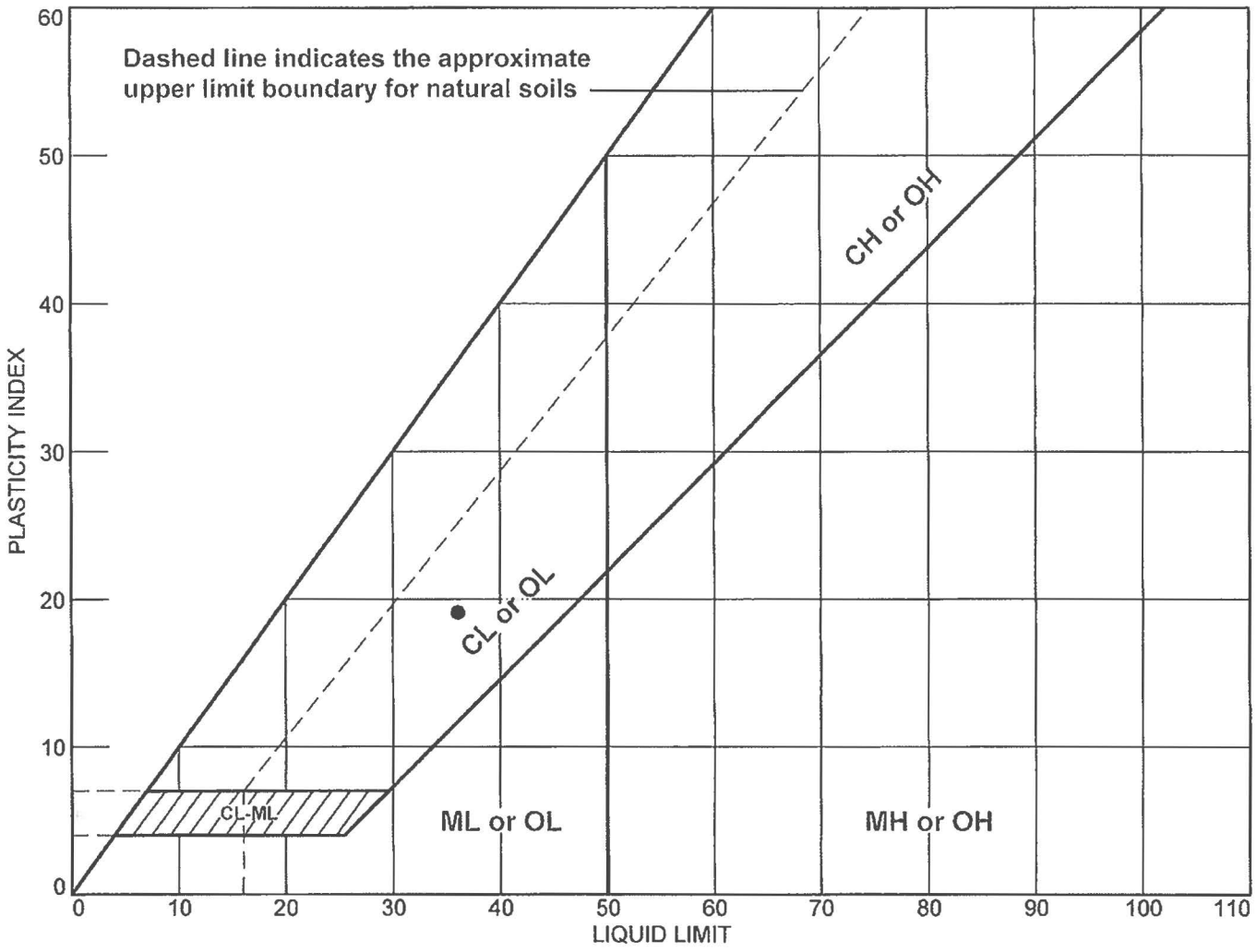
NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS LTD.

Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project

Project No: 27382-49N **Figure** 12

Tested By: Casey Mull **Checked By:** CM

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	Test Boring 4	810	0'-1'		17.0	36.1	19.1	SC

NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS, LTD.

Client: Sierra Ranchos Property Owners Association
Project: Sierra Ranchos Project
Project No.: 27382-49N **Figure** 13

Tested By: Andrew Mayse **Checked By:** CM

COMPACTION TEST REPORT

Curve No.: 808

Project No.: 27382-49N **Date:** 1/10/23
Project: Sierra Ranchos Project
Client: Sierra Ranchos Property Owners Association
Source of Sample: Test Boring 2 **Depth:** 1'-2'
Sample Number: 808
Remarks: Mechanical Rammer

MATERIAL DESCRIPTION

Description: Dark Brown silty sand

Classifications - **USCS:** SM **AASHTO:** A-1-b
Nat. Moist. = **Sp.G. =**
Liquid Limit = NV **Plasticity Index =** NP
%<No.10 = 85.5 % **%<No.40 =** 44.9 %
%<No.60 = 32.3 % **%<No.200 =** 14.0 %

TEST RESULTS
Maximum dry density = 126.0 pcf
Optimum moisture = 8.1 %

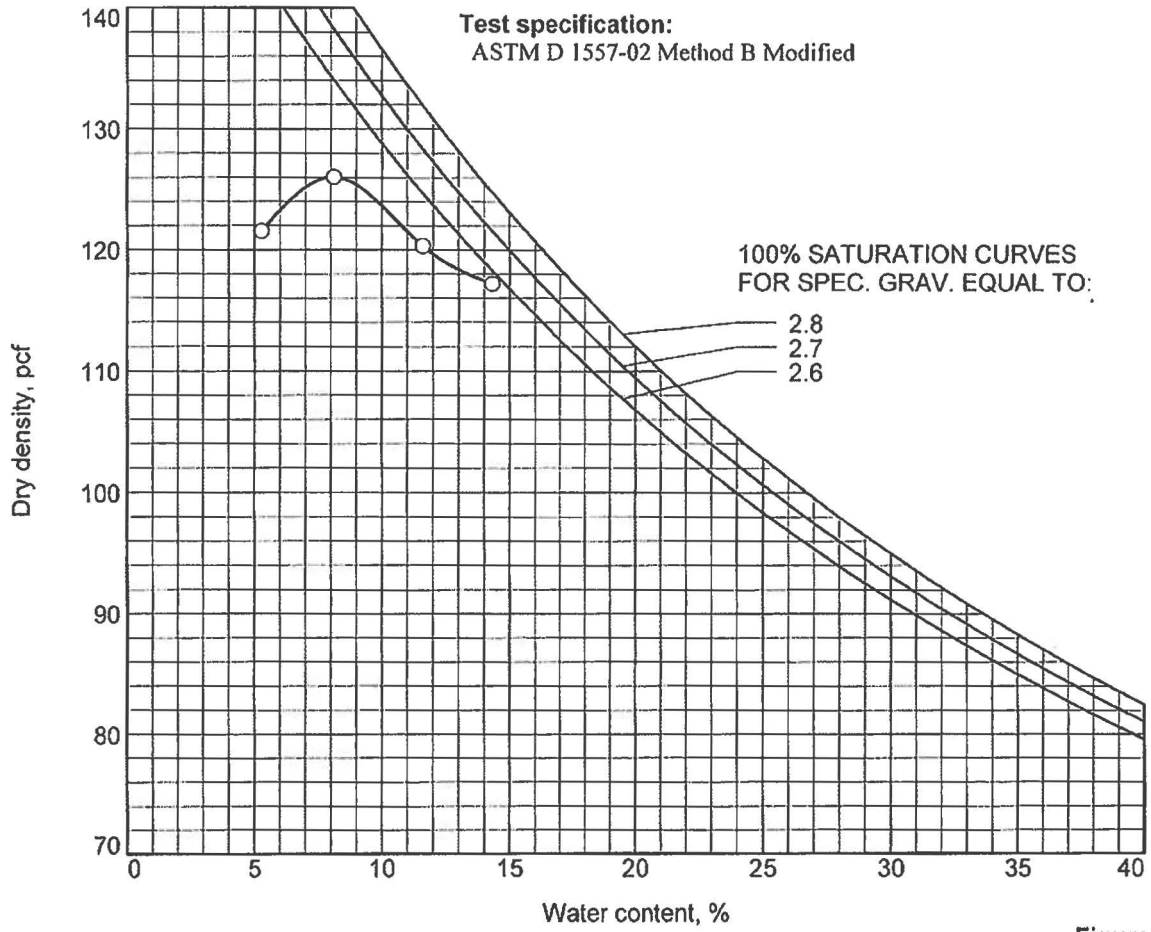
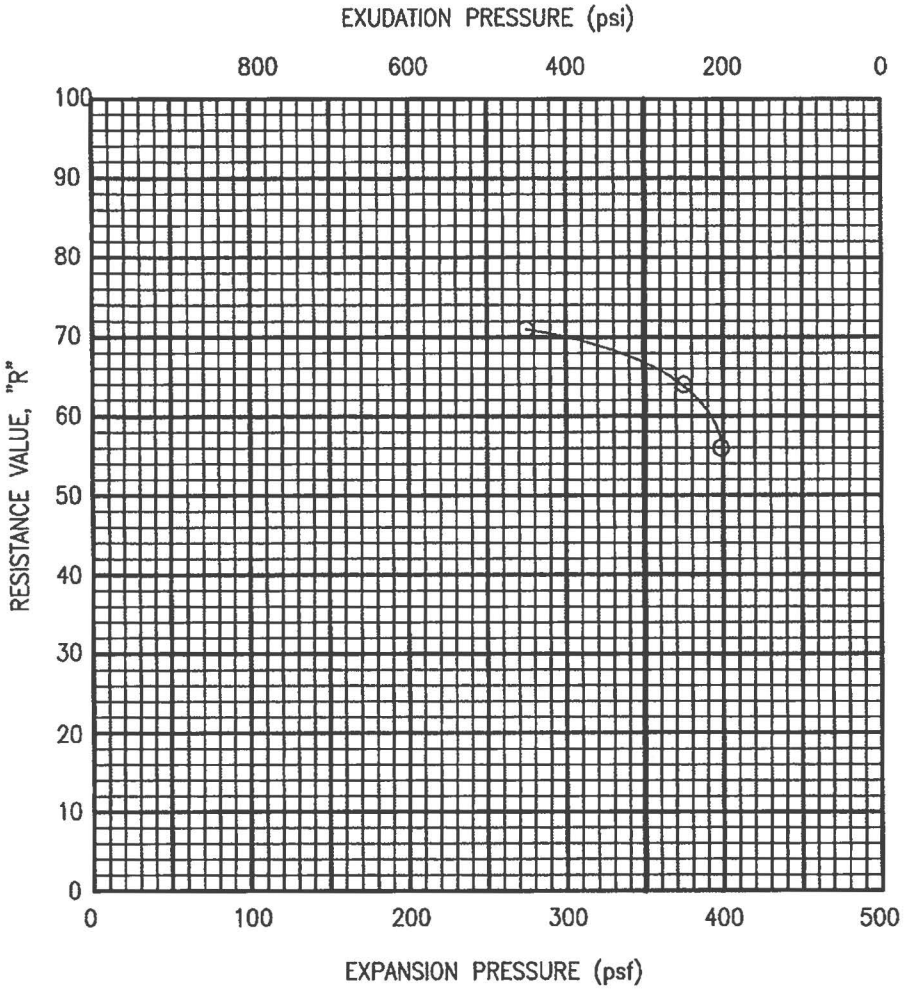


Figure 14

Nortech Consultants LTD

Tested By: Casey Mull **Checked By:** CM

LOCATION:	TP 5	DATE RECEIVED:	1-10-23
SAMPLE DEPTH:	1-2'	DATE TESTED:	1-13-23
SOIL TESTED	Light Brown Silty Sand (SM)	SAMPLED BY:	M. Butcher



"R" Value = 69

At Exudation Pressure = 300 (psi)

Remarks:

SPECIMEN NUMBER	1	2	3
EXUDATION PRESSURE (psi)	253	451	204
RESISTANCE VALUE, "R"	64	71	56
EXPANSION PRESSURE (psf)	373	272	402
MOISTURE AT TEST (%)	12.5	11.5	13.2
DRY DENSITY AT TEST (pcf)	124.5	126.3	121.4

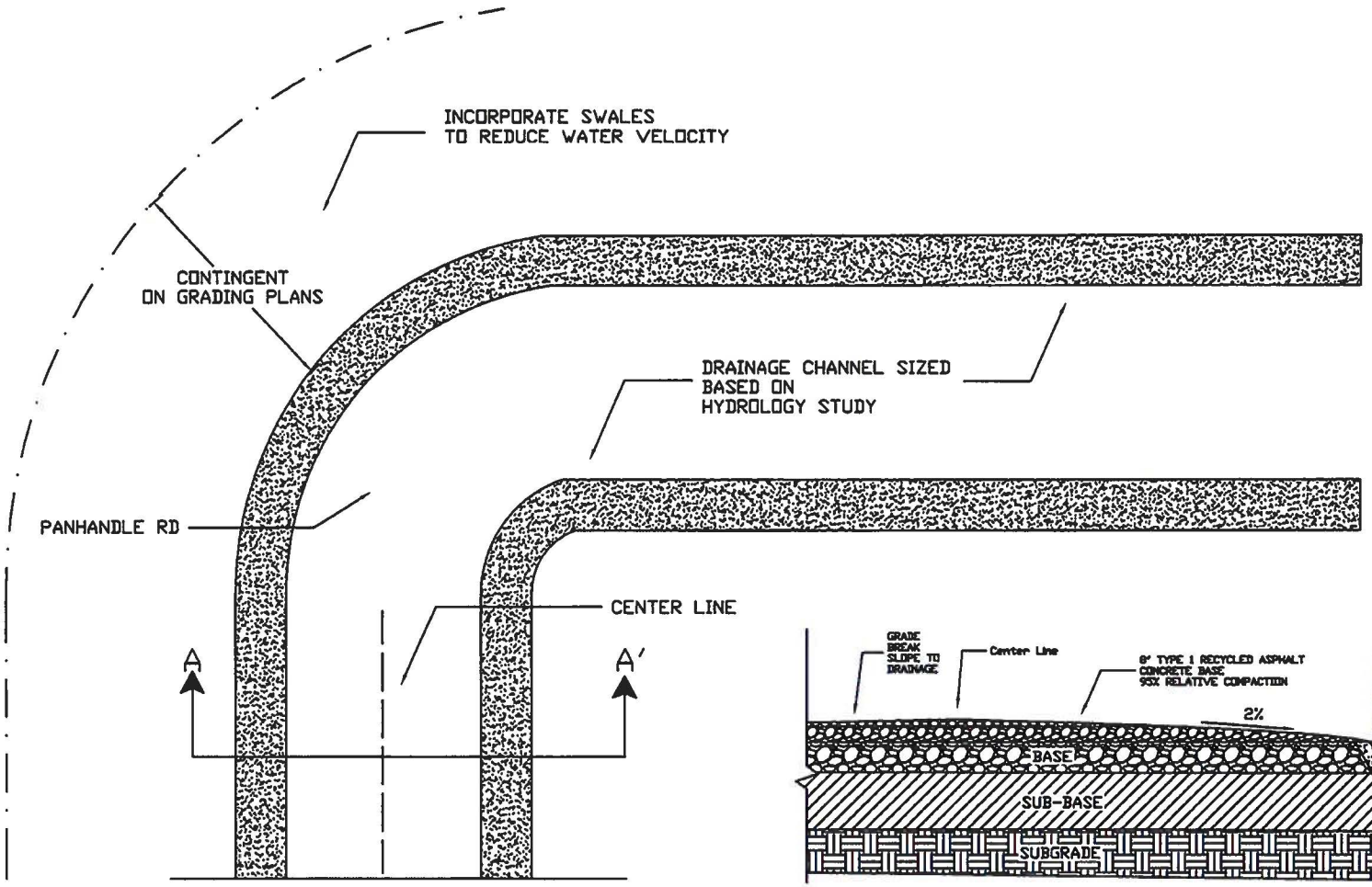
NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS, LTD.

Job # 27382-49N
Appr. /nsv
Date: 2/7/23

R-VALUE TEST RESULTS

SIERRA RANCHOS
WASHOE COUNTY, NEVADA

PLATE
15



SECTION A–A' THROUGH STANDARD DRIVEWAY APPOACH WITH DRAINAGE DITCH

NORTECH
GEOTECHNICAL/CIVIL CONSULTANTS, LTD.

Job No. 27382-49N
Appr. WL /nsv
Date 2/8/23

ROADWAY DETAIL

SIERRA RANCHOS
WASHOE COUNTY, NEVADA

PLATE
16

Image 17

390 x 4 = 1560 x 4 = 6240 ÷ 27 =

231 CUBIC YARDS OF DISTURBANCE

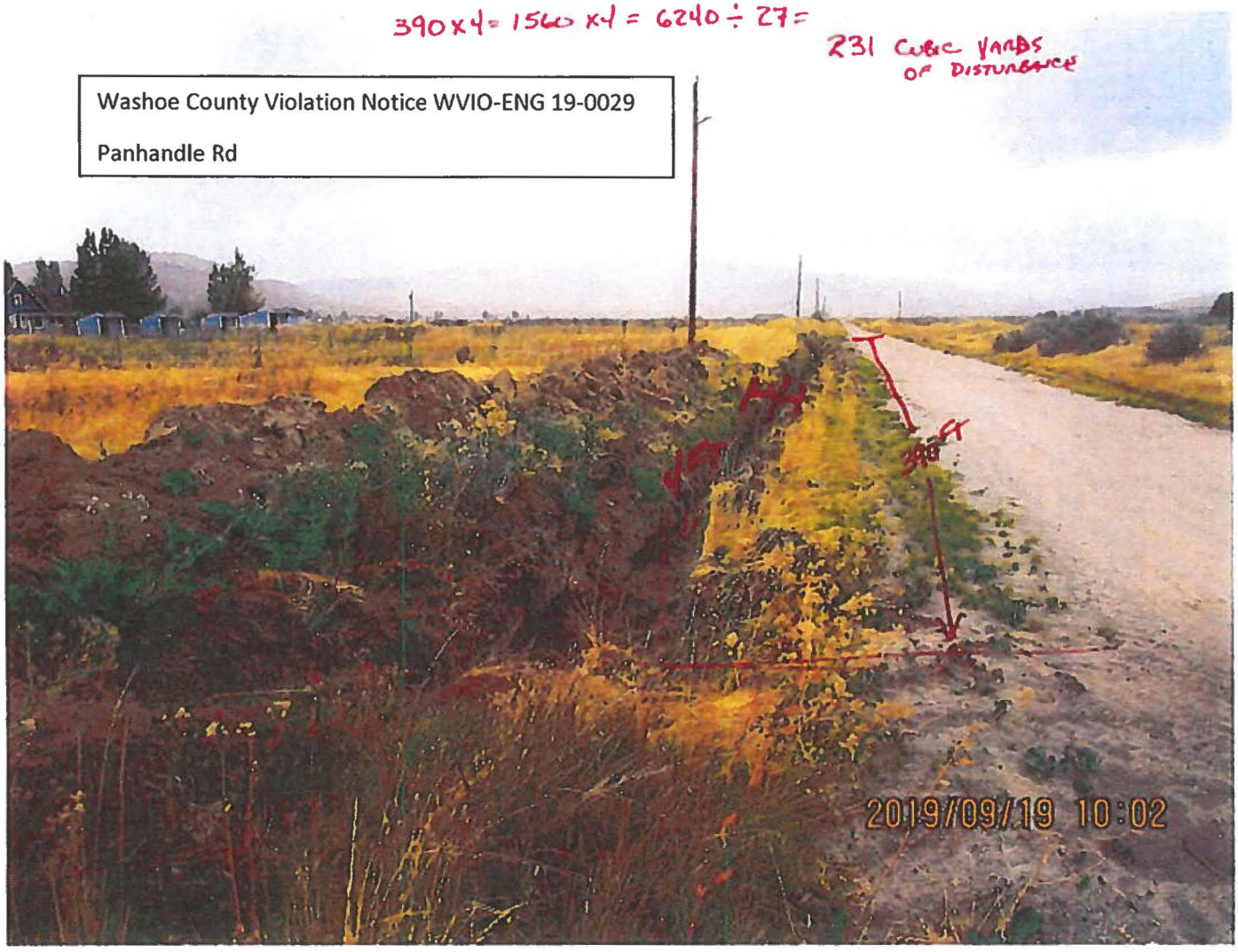
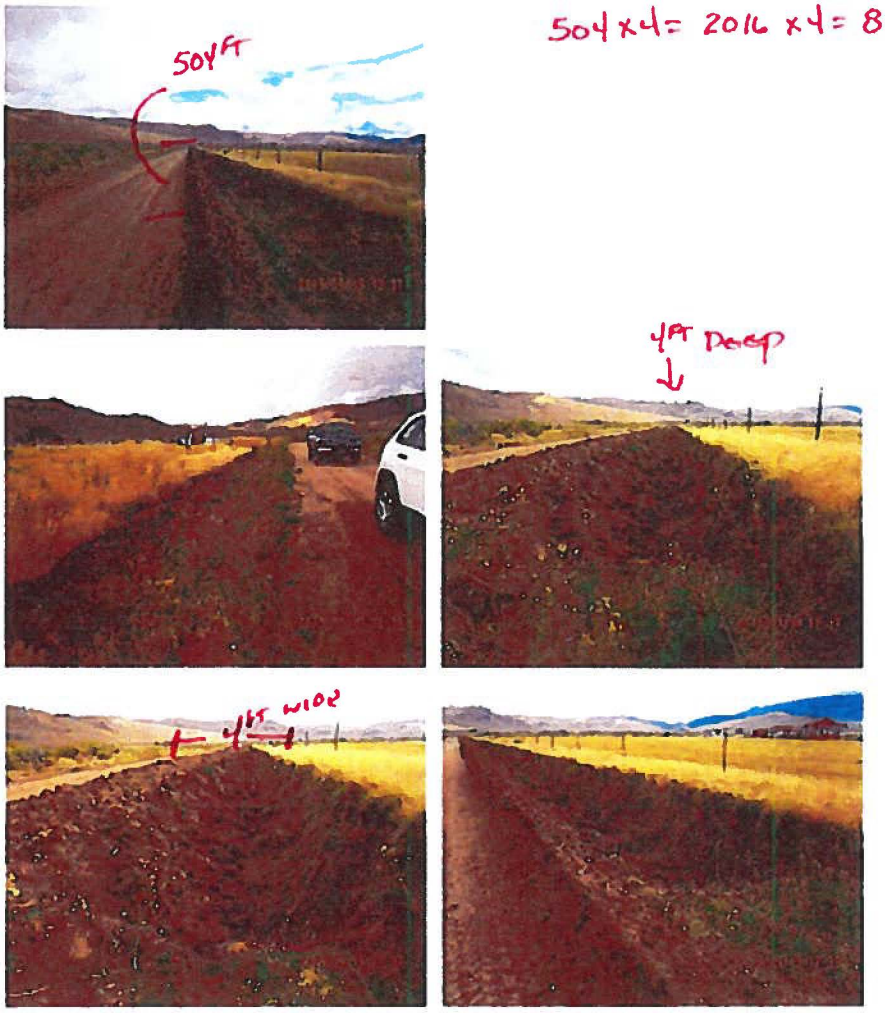


Image 18



Washoe County Violation Notice WVIO-ENG 19-0030

Wrangler Rd

Image 19


Panhandle Road facing South East. Poor drainage has caused roadway section to be cut by meandering drainage channels, leading to compromised roadway sections

Image 20

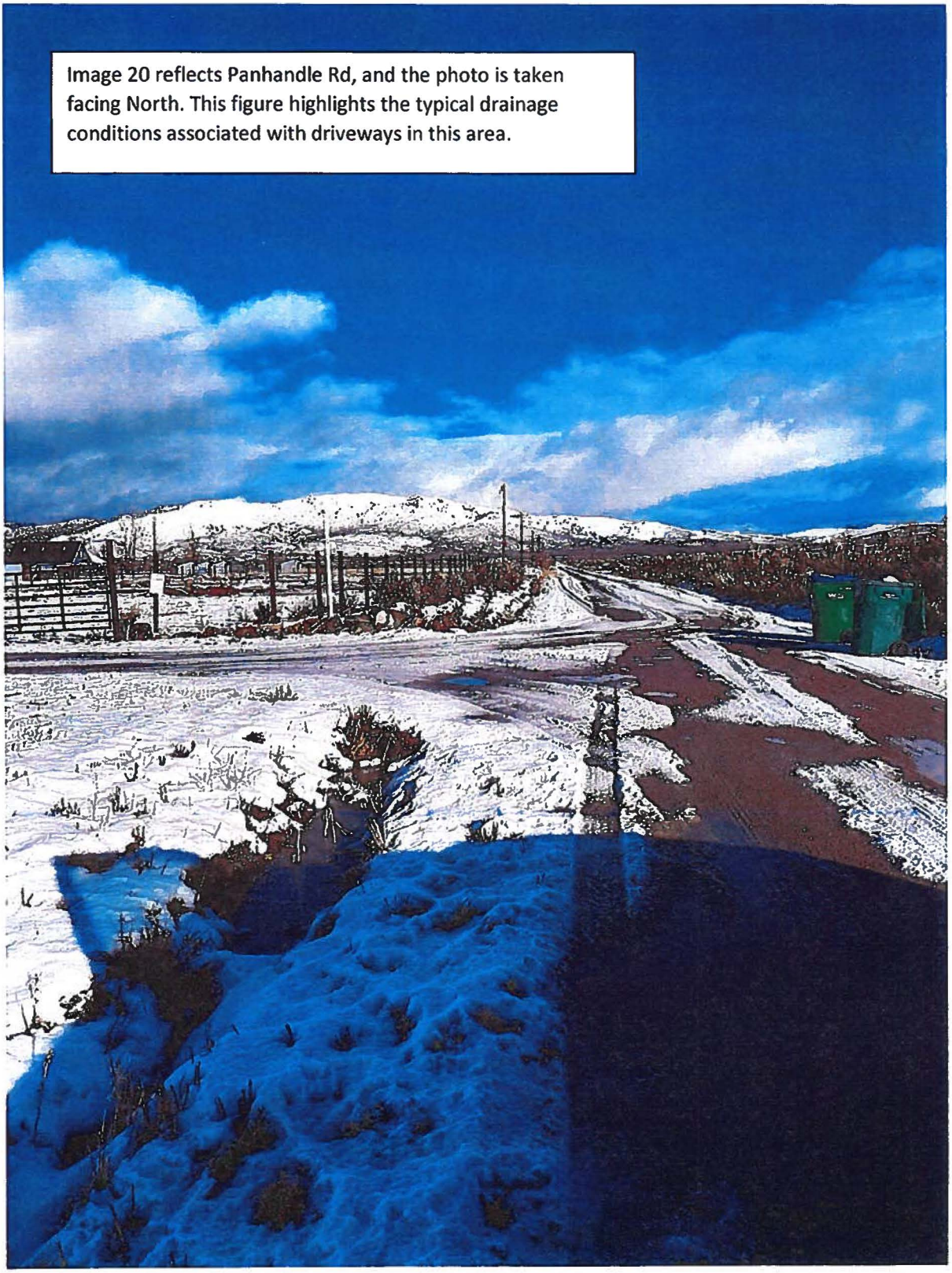
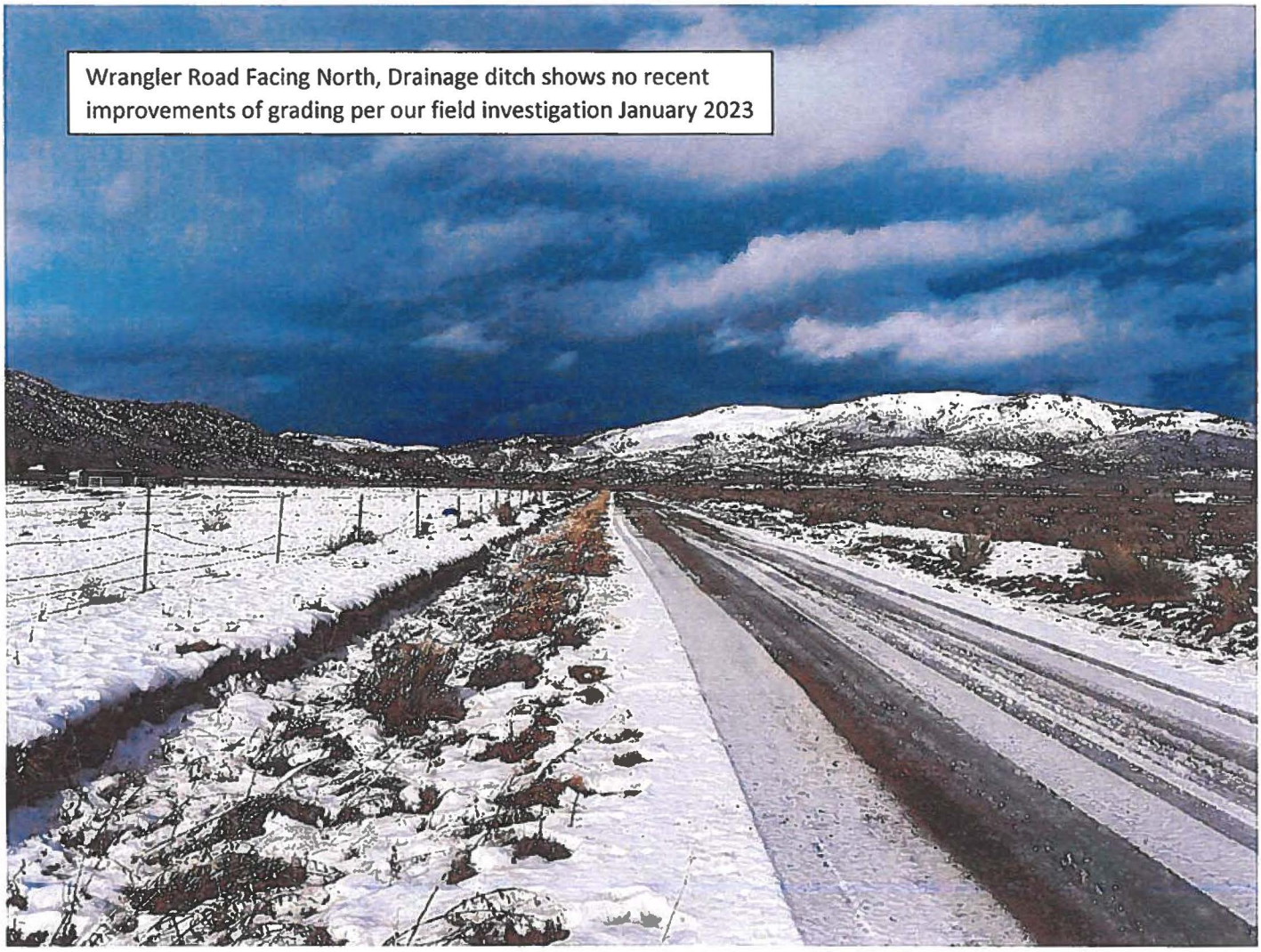


Image 20 reflects Panhandle Rd, and the photo is taken facing North. This figure highlights the typical drainage conditions associated with driveways in this area.

Image 21


Wrangler Road Facing North, Drainage ditch shows no recent improvements of grading per our field investigation January 2023