GEOTECHNICAL INVESTIGATION REPORT

STRUCTURE B-28 REPLACEMENT
PERSHING COUNTY, NEVADA

EA 74122

July 2020

| **NEVADA DEPARTMENT OF TRANSPORTATION** | MATERIALS DIVISION |
| GEOTECHNICAL SECTION | 1263 S STEWART ST, CARSON CITY, NEVADA 89712 |

STATE OF NEVADA

DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

GEOTECHNICAL SECTION

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Introduction

1.1 Project Description

The Nevada Department of Transportation (NDOT) plans to replace Structure B-28 on State Route 396 (SR 396), at the crossing of the Humboldt River, northeast of Lovelock. This report presents the findings, conclusions, and recommendations developed from our geotechnical engineering investigation for the proposed replacement.

1.2 Site History

Structure B-28 was originally constructed on timber piles in 1919. In 1954, the bridge was widened, and concrete filled steel pipe piles replaced the timber piles under NDOT Contract 907. The timber piles were cut one-foot below ground surface and the new piles were driven in offset locations.

The project Vicinity Map and Exploration Map are shown in Appendix A on Figures A-1 and A-2, respectively.

1.3 Purpose and Scope of Work

The purpose of this investigation was to evaluate the suitability of the project site from a geotechnical perspective, for the proposed replacement. The main objectives of the investigation were to characterize the subsurface materials, perform engineering analyses, develop geotechnical recommendations for design and construction, and document our findings, conclusions, and recommendations in this report. The investigation was conducted in accordance with American Association of State Highway and Traffic Administration (AASHTO) and Federal Highway Administration (FHWA) guidelines.

The scope of our geotechnical investigation includes the following:

- A review of published geologic and geotechnical information pertaining to the site vicinity;
- A field exploration consisting of drilling three borings to a maximum depth of 119 feet below ground surface (bgs), two cone penetration tests (CPT) to a maximum depth of 35½ feet bgs, and performing a geophysical survey to obtain information to evaluate the subsurface conditions and provide recommendations for the proposed repairs in the geotechnical report;
- Performing geotechnical laboratory testing on select soil samples collected from the borings;
- Engineering analyses to develop geotechnical design criteria and recommendations for the proposed project; and
- Preparation of this report.

2. Field Exploration and Laboratory Testing

2.1 Field Exploration

Three borings were drilled on August 20 through October 4, 2018 at the approximate locations shown on the Exploration Map to a maximum depth of approximately 119 feet bgs. The borings were located in the field based on estimated distances from existing landmarks. The borings were drilled utilizing a truck-mounted Diedrich D-120 drill rig equipped with a tricone mud rotary bit. Samples were collected using Modified California (3-inch outer diameter) and Standard Penetration Test (SPT) samplers driven by an automatic hammer with a weight of 140 pounds and a drop of 30 inches.

The number of blows required to drive the sampler were recorded for each 6-inch interval of the 18-inch drive. The cumulative blow count for the bottom 12 inches of drive is presented in the boring logs. The blow counts presented in the logs are uncorrected and are shown as they were recorded in the field. The blow counts were normalized for use in analysis utilizing corrections for sampler type, rod length, auger diameter, hammer efficiency, and overburden stress. Both the samples and drill cuttings were visually classified in the field based on the Unified Soil Classification System (USCS) in general accordance with ASTM D2488.

Additional exploration was performed on April 15 through 17, 2019 to assist FHWA in development of the in-situ scour testing device (ISTD). The exploration consisted of three borings to a maximum depth of approximately 20½ feet bgs. SPT samples were collected above groundwater, and thin-wall Shelby tube samples were collected in soft soil just below the ground water table, and the down-pressure required to advance the Shelby tube was recorded. FHWA performed ISTD testing in two borings near Abutment 1 in the clays encountered just below the groundwater table. Two CPT soundings were performed by Geo-Ex at the approximate locations shown on the Exploration Map to a maximum depth of 35½ feet bgs.

NDOT performed a geophysical survey of the site consisting of one Refraction Microtremor (ReMi) line. The line was orientated parallel to the highway on the shoulder, northeast of the bridge structure. The ReMi line was placed in general accordance with FHWA NHI-01-031. The purpose of the geophysical survey was to determine the shear wave velocity profile of the site and provide subsurface information between the borings. The ReMi lines were performed using a DAQLink III 12-channel seismograph with 10-Hz geophones spaced at 20-foot intervals, and Vibrascope Version 2.4.79 acquisition software. Passive energy sources consisted of vehicular traffic along Highway 95. The approximate locations of the ReMi lines are shown on the Exploration Map. Analysis and interpretation of the ReMi data was performed by Optim and one-dimensional shear wave velocity profiles for each of the surveys were generated.

The subsurface conditions encountered are summarized in Section 3.2. Logs of the borings were prepared based on the field logging and the results of laboratory testing in general accordance with ASTM D2487. The boring logs are presented in Appendix B. Previous borings are presented in Appendix D. Geophysical survey results are presented Appendix E.

2.2 Geotechnical Laboratory Testing

Laboratory testing was conducted on select soil samples recovered during the field exploration. Tests conducted include the following:

- Method of Test Sieve Analysis of Coarse and Fine Aggregate (Nev. T206);
- Standard Method of Test for Particle Size Analysis of Soils (AASHTO T88);
- Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock by Mass (ASTM D2216);
- Standard Test Methods for Laboratory Determination of Density (ASTM D7263);
- Method of Test for Determining the Liquid Limit, Plastic Limit, and Plasticity Index of Soil (Nev. T210, T211, and T212);
- Standard Method of Test for One-Dimensional Consolidation Properties of Soils (AASHTO T216);
- Standard Method of Test for Direct Shear of Soils under Consolidated Drained Conditions (AASHTO T236);
  Standard Method of Test for Determining Minimum Laboratory Soil Resistivity (AASHTO T288);
- Standard Method of Test for Determining pH of Soil for Use in Corrosion Testing (AASHTO T289);
- Standard Method of Test for Determining Water-Soluble Sulfate Ion Content in Soil (AASHTO T290);
- Standard Method of Test for Determining Water-Soluble Chloride Ion Content in Soil (AASHTO T291);
- Standard Method of Test for Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression (AASHTO T296);
- Standard Method of Test for Consolidated, Undrained Triaxial Compression Test on Cohesive Soils (AASHTO T297).

Geotechnical laboratory test results are presented in Appendix C.

3. Site and Subsurface Conditions

3.1 Site Conditions

The site is located approximately 4½ miles northeast of the town of Lovelock on SR 398 in Pershing County, Nevada. At the time of our exploration, the surrounding topography consisted of agricultural properties located on the Humboldt Rive flood plains. The project limits consisted of a two-lane bridge structure crossing the Humboldt River and the associated bridge approaches.

3.2 Subsurface Conditions

3.2.1 General Geology and Faulting

The site is located within the Basin and Range geomorphic province, in Upper Valley northwest of the Humboldt Range and southeast of the Trinity Range. The site area is mapped as being comprised of primarily Quaternary alluvium, however the site borders a mapped unit of playa, marsh, and alluvial flat deposits, marsh, and alluvial flat deposits from the Quaternary epoch. The nearest active fault with historic movement (last 150 years) is the Rainbow Mountain fault zone, located approximately 24 miles to the south. Other active faults nearby include the Pleasant Valley fault zone, Sou Hills section, located approximately 34 miles to the east. 35 miles southeast from the site is the Dixie Valley fault zone, 1954 section.

3.2.2 Subsurface Materials

The results of our field exploration and laboratory analyses indicate 6 to 8 inches of asphalt underlain by approximately 12 inches of aggregate base comprise the highway road section. Beneath the base, approximately 4 feet of embankment fill comprised of clayey GRAVEL (GC) was encountered. Native soil beneath the embankment fill consists of medium stiff to hard fat CLAY (CH) and sandy CLAY (CL), loose to very dense SAND (SP) and silty SAND (SM), and dense to very dense sandy GRAVEL (GP and GW) to the maximum depth explored, approximately 116½ feet bgs.

3.2.3 Groundwater Conditions

During our exploration groundwater encountered between 12½ and 15 feet bgs, elevation 3994½ and 3993 feet respectively.

4. Recommendations

It is our understanding that the proposed bridge structure is to be supported by 24-inch diameter driven pile foundations. Based on the results of this exploration, the site is suitable for the proposed improvements. Provided herein are the recommendations for use in design and construction of the driven pile foundations.

4.1 Earthwork

4.1.1 Temporary Excavations

Temporary excavations and shoring should conform to OSHA 1926. Based on the subsurface materials encountered in our exploration, the fill and native soils can be classified as Type C. Protection of workers, shoring design, and the stability of all temporary slopes are the sole responsibility of the contractor.

4.2 Driven Pile Foundations

Soil parameters used in the analysis of axial and lateral resistance of the driven pile foundations were developed considering the materials encountered in the exploration and are presented below in Table 1.

Table 1 Soil Parameters

Pier Parameters					
Classification	**Depth bgs (ft)**	**Approximate Elevation (ft)**	**Unit Weight (pcf)**	**Internal Friction Angle Φ (º)**	**Undrained Shear Strength (psf)**
Sandy Clay (CL)	0 - 20	3985-3965	110		1860
Sandy Gravel (GW)	20 – 28	3965-3957	125	38	
Sand and Silty Sand (SP-SM / SM)	28 – 56	3957-3929	125	35	
Clay (CH)	56 - 94	3929-3891	110		5100
Abutment Parameters					
Classification	**Depth bgs (ft)**	**Approximate Elevation (ft)**	**Unit Weight (pcf)**	**Internal Friction Angle Φ (º)**	**Undrained Shear Strength (psf)**
Sandy Clay (CL)	8 - 11	3999-3996	110		912
Clay (CH)	11 - 18	3996-3989	115		2855
Sandy Clay (CL)	18 - 42	3989-3965	110		1860
Sandy Gravel (GW)	42 - 50	3965-3957	125	38	
Sand and Silty Sand (SP-SM / SM)	50 - 78	3957-3929	125	35	
Clay (CH)	78 - 116	3929-3891	110		5100

Design loads were provided by the structural engineer for use in analysis. The loads applied at the head of the driven piles are summarized below in Table 2.

Table 2 Design Loads

Foundation	Loading	Axial (k)	Longitudinal Moment (k-ft)	Longitudinal Shear (k)	Transverse Moment (k-ft)	Transverse Shear (k-ft)
Abutment	Service I	197.58	0	0	75.99	6.08
	Strength I	290.81	0	0	0	0
	Strength II	338.62	0	0	0	0
	Extreme Event I	75.95	477.12	71.28	582.59	0
Pier	Service I	283.90	97.02	4.62	180.84	8.61
	Strength I	402.82	0	0	0	0
	Strength II	501.91	0	0	0	0
	Extreme Event I	125.03	4.11	10.33	14.19	0

Loss of support due to scour of foundation soils was incorporated into the analysis considering the recommendations provided by NDOT Hydraulics Section in the memo “Scour Analysis for B-28 (60% Submittal)”, August 12, 2019. The average flow scour was considered at the pier during the Extreme Event I earthquake check. The design, and check flood scour elevations were considered at the service, strength, and Extreme Event I flood check. Load combinations used in design were developed in accordance with FHWA “Design and Construction of Driven Pile Foundations”, 2016; and “Evaluating Scour at Bridges, Fifth Edition”, 2012.

Table 3 Design Scour Criteria

Foundation	Average Daily Flow Scour Elevation (ft)	Design Flood Scour Elevation (ft)	Check Flood Scour Elevation (ft)
Abutment	3983.87	3985.51	3985.51
Pier	3980.08	3974.54	3972.66

The axial resistance of the driven pile foundation soils was analyzed in accordance with the 2017 AASHTO LRFD Bridge Design Specifications (AASHTO 2017), using the Nordlund and Alpha methods. Dynamic testing of the piles should be performed to validate the 0.65 resistance factor utilized in this analysis.

Lateral resistance of the driven pile foundation soils was analyzed in accordance with AASHTO 2017, using the computer program LPILE (Ensoft, 2018). The abutment pile deflections consider the sloping ground surface, resulting in an estimated deflections of less than 2 inches. The pier pile deflections were analyzed considering the average flow scour elevation at the Extreme Event I limit state, and at the check flood scour elevation for the strength and service limit states, resulting in anticipated deflections of less than ¼ inches. The minimum depth to satisfy lateral demands was determined in accordance with FHWA “Design and Analysis of Laterally Loaded Deep Foundations”, 2018.

The results of the axial and lateral resistance analysis are presented in Appendix E.

Based on the results of our analysis, it is recommended that 24-inch diameter A 252 Grade 3 (Mod) driven piles with a minimum yield strength of 50 ksi, and a minimum wall thickness of ½ inches be incorporated into the design of the bridge substructure. Inside-flanged conical pile driving shoes or points should be welded to the pile to aid in drivability and preserve skin friction. Pile stress measured by dynamic testing should not exceed 90 percent of the pile yield strength during driving. Drivability analysis performed utilizing the computer program GRLWEAP (Pile Dynamics, Inc. 2010-3) indicates that preboring of the intermediate pier piles may be required. Presented below in Table 3 are the recommendations for the driven pile foundations.

Table 4 Driven Pile Summary

Pile Location	Pile Diameter (in.)	Top of Pile Elevation (ft)	Minimum Depth bgs to Satisfy Lateral Demands (ft)	Minimum Depth bgs to Satisfy Axial Demands (ft)	Minimum Tip Elevation (ft)	Design Tip Elevation (ft)	Minimum Driving Resistance (kips)
Abutment	24	3999	34	43	3965	3956	1,000
Pier	24	3985*	20	50	3965	3935	1,300

**Note: Top of pile elevation presented for the pier piles is the approximate intercept of the proposed channel invert and the pile, which extends to the bridge structure.*

4.3 Retaining Walls

The proposed abutments and associated wingwalls should be designed for a drained active earth pressure of 35 pounds per cubic foot (pcf) for level backfill, and 50 pcf for 2:1 (H:V) sloping backfill. A seismic increment pressure of 3 pcf for level backfill, and 20 pcf for 2:1 sloping backfill, should be added to the active earth pressure for the extreme limit state.

4.4 Corrosion

Soils corrosivity analysis is important for estimating and mitigating the deterioration of buried ferrous metals and concrete. We performed corrosion testing on samples from Borings V-1 and V-3 as an indicator of the corrosive properties of the soil. Test results are summarized below in Table 3 and presented in Appendix C.

Table 5 Soil Corrosion Results

Boring No.	Depth (ft.)	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfates (ppm)	Water Soluble Chlorides (ppm)
V-1	5	8.0		282	131
V-1	75	9.4	790	100	232
V-3	44	8.4	1,650		
V-3	82	9.9	1,400		

According to ACI 318, water soluble sulfates less than 1,000 parts per million is considered “not applicable”. A water-soluble chloride content of less than 500 ppm is generally non-corrosive to reinforced concrete.

The provided corrosion test results are only an indicator of potential soil corrosivity for the sample tested at the selected depth interval. It is possible that corrosion potential can vary by sample location and depth.

4.5 Seismic Design

The seismic design criteria for the site (40.2269°N, 118.4223°W), listed in the table below, were developed utilizing the USGS Seismic Design Tool in accordance with AASHTO 2017, considering the site location and the subsurface information obtained from our geotechnical investigation. Minimum seismic parameters for use in design are listed by county in the NDOT Structures Manual 12.3.5 and supersede the presented value.

Table 6 Seismic Design Criteria

Parameter	Mapped Value	NDOT Structures Manual Value
Site Class	D	D
Peak ground acceleration (PGA)	0.158 g	0.250 g
Mapped horizontal response spectral response at short period (S_S)	0.383 g	0.600 g
Mapped horizontal response spectral response at 1 sec period (S_1)	0.145 g	0.200 g
Peak ground acceleration coefficient (F_{PGA})	1.484	1.300
Site coefficient (F_a)	1.493	1.320
Site coefficient (F_v)	2.220	2.0
Mapped MCE peak ground acceleration (A_S)	0.283 g	0.325 g
Design Spectral Acceleration for short period (S_{DS})	0.572 g	0.792 g
Design Spectral Acceleration for 1 sec period (S_{D1})	0.322 g	0.400 g

5. References

American Association of State Highway and Transportation Officials (AASHTO), 2017, “LRFD Bridge Design Specifications, 8th Edition”

Federal Highway Association, 2012, “Evaluating Scour at Bridges, Fifth Edition”

Federal Highway Association, 2016, “Design and Construction of Driven Pile Foundations”

Federal Highway Association, 2018, “Design and Analysis of Laterally Loaded Deep Foundations”

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Loehr, Erik, et al, 2016, “FHWA NHI-16-072 Geotechnical Site Characterization”

Mayne, W. Paul, et al, 2002, “FHWA-NHI-01-031 Subsurface Investigation Manual”

Nevada Department of Transportation (NDOT), 2008, “Structures Manual”

Nevada Department of Transportation (NDOT), 2014, “Standard Specifications for Road and Bridge Construction”

Nevada Department of Transportation (NDOT), 2019, “Scour Analysis for B-28 (60% Submittal)”

Occupational Safety and Health Administration (OSHA), 2002, “OSHA Standards for the Construction Industry, 29 CFR Part 1926”

Sabatini, P.J., et al, 2002, “FHWA-IF-02-034 Evaluation of Soil and Rock Properties”

Stewart, John H., and Carlson, John E., 1978, “Geologic map of Nevada, Nevada Bureau of Mines and Geology, scale 1:500,00.”

U.S. Geologic Survey, October 8, 2019, U.S. Seismic Design Maps, https://earthquake.usgs.gov/ws/designmaps/

6. Limitations

This report has been prepared by NDOT Geotechnical Section under the supervision of those whose signatures appear herein. The interpretation of data, findings, and recommendations presented in this report were developed from our geotechnical investigation.

If the proposed project is modified or relocated, or if the subsurface conditions found during construction differ from those described in this report, NDOT Geotechnical Section should be contacted immediately to assess the new information or changed conditions and determine if our recommendations need revision.

Appendix A
Figures

1263 South Stewart Street
Carson City, Nevada 89712
Phone: (775) 888-7440
Fax: (775) 888-7201

Figure A-1 Vicinity Map

Location: Pershing County, NV

Project Name: B-28 Replacement

EA Number: 74122

1263 South Stewart Street
Carson City, Nevada 89712
Phone: (775) 888-7440
Fax: (775) 888-7201

Figure A-2 Exploration Map

Location: Pershing County, NV

Project Name: B-28 Replacement

EA Number: 74122

Appendix B
Logs of Borings

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	8/20/18
END DATE	8/29/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-1
GROUND ELEV. ft	4007.0
TOTAL DEPTH ft	116.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/8/18	ATD	15	3993

STATION	'P' 230+00
OFFSET	16.5 ft. right
ENGINEER	Callaghan
OPERATOR	Neusel
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
4006.0	1												AC	Asphalt	paved shoulder
4005.0	2												GC	FILL: Gray-brown sandy GRAVEL (GC)	bentonite, barite and polymer drilling mud
4004.0	3														
4003.0	4														
4002.0	5												CH	Gray-brown CLAY (CH), high plasticity, medium stiff to very stiff, moist to wet	4 ft-30 ft no downpressure little resistance
4001.0	6	A		1 2 3	5	40	35								
4000.0	7														
3999.0	8														
3998.0	9														
3997.0	10														
3996.0	11	B		4 8 13	21	80	27 33	87 84	100	98	52	29			
3995.0	12														
3994.0	13														
3993.0	14														end of drilling day 8/20
3992.0	15														
3991.0	16	C		4 4 6	10	93	41	79	100	99	58	36			
3990.0	17														
3989.0	18														
3988.0	19												CL-ML	Light brown sandy silty CLAY (CL-ML), medium still, wet	
3987.0	20														
3986.0	21	D		3 4 4	8	93	29 26	91 97	100	54	21	4			
3985.0	22														
3984.0	23														
3983.0	24														
3982.0	25												CL	Light brown CLAY (CL), low plasticity, stiff, wet	
3981.0	26	E		6 6 7	13	93	29 28		100	97	33	14			
3980.0	27														
3979.0	28														
3978.0	29												SP-SM		

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Poorly-graded Gravel
USCS Clayey Gravel
USCS Well-graded Gravel
USCS High Plasticity Clay
USCS Silty Clayey Sand
USCS Low Plasticity Silty Clay
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Sand with Silt

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	8/20/18
END DATE	8/29/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-1
GROUND ELEV. ft	4007.0
TOTAL DEPTH ft	116.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/8/18	ATD	15	3993

STATION	'P' 230+00
OFFSET	16.5 ft. right
ENGINEER	Callaghan
OPERATOR	Neusel
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3976.0	31	F	SPT	14 17 16	33	67	12		64	6	15	NP	SP-SM	Brown SAND (SP-SM) with gravel, trace silt, dense to very dense, moist	
3975.0	32														
3974.0	33														
3973.0	34														
3972.0	35														
3971.0	36	G	SPT	11 18 25	43	73	2		75	6	16	NP			37 ft-40 ft cobbly
3970.0	37														
3969.0	38														
3968.0	39												GP	Brown sandy GRAVEL (GP), subrounded, dense, moist	
3967.0	40														
3966.0	41	H	SPT	17 28 27	55	80	8		35	4	27	11			tip cored a cobble and keeper pushed to top of sample
3965.0	42														
3964.0	43														
3963.0	44												GW	Brown sandy GRAVEL (GW), fine- to coarse-subrounded gravel, dense, moist	
3962.0	45														end of drilling day 8/21
3961.0	46	I	SPT	22 29 30	59	40	4			1					
3960.0	47														loss of circulation, made drilling mud
3959.0	48														
3958.0	49														
3957.0	50														
3956.0	51	J	SPT	21 20 19	39	0									keeper pushed 1.1 ft into sampler
3955.0	52														loss of
3954.0	53												SC-SM	Dark gray silty clayey SAND (SC-SM), very loose to loose, wet	circulation, drill rig exhaused water supply, refilled water and made drilling mud
3953.0	54														
3952.0	55														
3951.0	56	K	SPT	4 1 2	3	0									smooth drilling to bottom of hole
3950.0	57														
3949.0	58														hammer weight pushed sampler 3 in.
3948.0	59														loss of

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Poorly-graded Gravel
USCS Clayey Gravel
USCS Well-graded Gravel
USCS High Plasticity Clay
USCS Silty Clayey Sand
USCS Low Plasticity Silty Clay
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Sand with Silt

BORING LOG

NEVADA DOT SAFE AND CONNECTED

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	8/20/18	STATION	'P' 230+00
END DATE	8/29/18	OFFSET	16.5 ft. right
PROJECT	Replace B-28	ENGINEER	Callaghan
LOCATION	SR 396 near Lovelock	OPERATOR	Neusel
E.A. #	74122	DRILL RIG	Diedrich D-120 (#1627)
BORING	V-1	METHOD	Mud Rotary
GROUND ELEV. ft	4007.0	HAMMER	Auto
TOTAL DEPTH ft	116.5	BACKFILLED	Yes DATE 10/22/18

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/8/18	ATD	15	3993

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3946.0	61	L		14 15 22	37	80	32 29	90 90	100	32	23	NP	SC-SM	Dark gray silty clayey SAND (SC-SM), very loose to loose, wet	circulation, made drilling mud
3945.0	62														drill #1627 broke down,
3944.0	63														end of drilling day 8/22,
3943.0	64														resumed drilling with #1082
3942.0	65														
3941.0	66	M		17 38 50/4"		85	12 20	106	82	21	25	5	SM	Black silty SAND (SM), very dense, moist	
3940.0	67														end of drilling day 8/23, end of drill week
3939.0	68														
3938.0	69														
3937.0	70													Black SAND (SP-SM) with gravel, trace silt, medium dense, moist	
3936.0	71	N		13 7 15	22	100	20		97	6	19	NP	SP-SM		ground water and sand flow into drill rods from this elevation
3935.0	72														
3934.0	73														quick conditions, clear water
3933.0	74														
3932.0	75													Brown silty SAND (SM), dense, wet	mid-sample, one blow traveled 4 in.
3931.0	76	O		3 10 20	30	87	31								
3930.0	77														
3929.0	78														
3928.0	79												SM		
3927.0	80														end of drilling day 8/27
3926.0	81	P		11 20 21	41	87	23		94	30	20	7			
3925.0	82														
3924.0	83														
3923.0	84													Gray CLAY (CH), high plasticity, hard to very hard, moist	
3922.0	85														
3921.0	86	Q		12 19 22/0"		170	35	84					CH		
3920.0	87														
3919.0	88														
3918.0	89														end of drilling

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Poorly-graded Gravel
USCS Clayey Gravel
USCS Well-graded Gravel
USCS High Plasticity Clay
USCS Silty Clayey Sand
USCS Low Plasticity Silty Clay
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Sand with Silt

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	8/20/18
END DATE	8/29/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-1
GROUND ELEV. ft	4007.0
TOTAL DEPTH ft	116.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/8/18	ATD	15	3993

STATION	'P' 230+00
OFFSET	16.5 ft. right
ENGINEER	Callaghan
OPERATOR	Neusel
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3916.0	91	R		15 23 26	49	120		35	100	86	68	45		Gray CLAY (CH), high plasticity, hard to very hard, moist	day 8/28
3915.0	92														
3914.0	93														
3913.0	94														
3912.0	95														
3911.0	96	S		15 20 23	43	120	36	83	100	100	62	39			
3910.0	97														
3909.0	98														
3908.0	99														
3907.0	100														
3906.0	101														
3905.0	102														
3904.0	103												CH		
3903.0	104														
3902.0	105														
3901.0	106	T		16 22 50/3"		125	38	81							last 30 blows traveled one inch
3900.0	107														
3899.0	108														
3898.0	109														
3897.0	110														
3896.0	111														
3895.0	112														
3894.0	113														
3893.0	114														
3892.0	115														
3891.0	116	U		17 30 44	74	107	38	82	100	100	55	35			
3890.0	117													Boring terminated at 116.5-ft bgs, groundwater encountered at 14.5-ft bgs.	bottom of hole
3889.0	118														
3888.0	119														

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Poorly-graded Gravel
USCS Clayey Gravel
USCS Well-graded Gravel
USCS High Plasticity Clay
USCS Silty Clayey Sand
USCS Low Plasticity Silty Clay
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Sand with Silt

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/1/18
END DATE	10/4/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-2
GROUND ELEV. ft	4007.6
TOTAL DEPTH ft	97.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/15/18	ATD	15	3993

STATION	'P' 232+57
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1087)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
4006.6	1												AC	Asphalt	paved shoulder
4005.6	2												GC	FILL: Brown clayey Gravel (GC)	bentonite, barite and polymer drilling mud
4004.6	3														
4003.6	4														
4002.6	5	A		6 9 5	14	87	17		90	43	27	9		Light brown clayey SAND (SC) with gravel, low plasticity, medium dense, moist	
4001.6	6												SC		
4000.6	7														
3999.6	8														
3998.6	9	B		2 2 3	5	60	27		96	40	20	3		Brown silty SAND (SM), loose, moist	end of drilling day 10/1
3997.6	10												SM		
3996.6	11														
3995.6	12														
3994.6	13														
3993.6	14													Light brown sandy CLAY (CL), medium stiff to stiff, medium plasticity, moist	
3992.6	15														
3991.6	16														
3990.6	17														
3989.6	18	C		5 5 6	11	87	29	102	100	82	27	10			
3988.6	19														
3987.6	20														
3986.6	21												CL		
3985.6	22														
3984.6	23	D		3 3 4	7	93	28	92	100	95	31	16			
3983.6	24														
3982.6	25														
3981.6	26														
3980.6	27														
3979.6	28														
3978.6	29	E		3 4 4	8	87	30	91	100	51	22	4			

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS High Plasticity Clay
USCS Clayey Gravel
USCS Poorly-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Gravel

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/1/18
END DATE	10/4/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-2
GROUND ELEV. ft	4007.6
TOTAL DEPTH ft	97.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/15/18	ATD	15	3993

STATION	'P' 232+57
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1087)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3976.6	31	F		13 15 19	34	73							GP	Black sandy GRAVEL (GP) with clay, dense, wet	
3975.6	32						26	93	100	26	21	NP			
3974.6	33	G		8 13 11	24	53	14		80	5	19	NP	SM	Black silty SAND (SM) with gravel, dense, wet	
3973.6	34														
3972.6	35	H		19 23 24	47	73	13		71	6	17	NP			
3971.6	36														
3970.6	37														
3969.6	38												CH	Black CLAY (CH) very soft, wet	strong organic odor
3968.6	39	I		2 3 2	5	133	69	57	100	98	62	36			sampler dropped 2-in by weight of hammer following final blow
3967.6	40														
3966.6	41														
3965.6	42														
3964.6	43														sample pushed through connector into drill rod
3963.6	44	J		0 0 0	0	133									
3962.6	45														end of drilling day 10/2
3961.6	46												CL	Black CLAY (CL), medium stiff, moist	strong organic odor
3960.6	47														
3959.6	48														sampler dropped 16-in by weight of hammer
3958.6	49	K		6 3 2	5	87	49	71	100	87	36	16			
3957.6	50														moderate organic odor
3956.6	51														
3955.6	52														
3954.6	53														
3953.6	54														
3952.6	55														
3951.6	56												SP	Black SAND (SP) with gravel, very dense, moist	
3950.6	57	L		39 43 41	84	80	18	112	99	2	19	NP			
3949.6	58														
3948.6	59														

Standard Penetration Test | Modified California Sampler | Ashpalt | USCS High Plasticity Clay | USCS Clayey Gravel | USCS Poorly-graded Sand | USCS Clayey Sand | USCS Poorly-graded Sand with Silt | USCS Silty Sand | USCS Low Plasticity Clay | USCS Poorly-graded Gravel

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/1/18
END DATE	10/4/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-2
GROUND ELEV. ft	4007.6
TOTAL DEPTH ft	97.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/15/18	ATD	15	3993

STATION	'P' 232+57
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1087)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3946.6	61												SP	Black SAND (SP) with gravel, very dense, moist	
3945.6	62														
3944.6	63														
3943.6	64														
3942.6	65	M		28 27 36	63	80	13	114	83	22	23	4			
3941.6	66														
3940.6	67														
3939.6	68														
3938.6	69														
3937.6	70												SM	Gray silty SAND (SM), very dense, moist	
3936.6	71														
3935.6	72														
3934.6	73	N		12 17 15	32	67	27		100	23	24	2			water and sand flow into drill stem from this elevation
3933.6	74														
3932.6	75														
3931.6	76														
3930.6	77														
3929.6	78														
3928.6	79														
3927.6	80												SP-SM	Light brown SAND (SP-SM) with gravel, trace silt, very dense, moist	
3926.6	81	O		20 27 40	67	80	17		75	11	18	NP			
3925.6	82														
3924.6	83														
3923.6	84												CH	Gray CLAY (CH), hard, moist	
3922.6	85														
3921.6	86														
3920.6	87														
3919.6	88														
3918.6	89	P		8 11 15	26	113	40		100	98	63	40			

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS High Plasticity Clay
USCS Clayey Gravel
USCS Poorly-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Gravel

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/1/18
END DATE	10/4/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-2
GROUND ELEV. ft	4007.6
TOTAL DEPTH ft	97.5

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/15/18	ATD	15	3993

STATION	'P' 232+57
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1087)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3916.6	91												CH	Gray CLAY (CH), hard, moist	
3915.6	92														
3914.6	93														
3913.6	94														
3912.6	95														end of drilling day 10/3
3911.6	96														
3910.6	97	Q		16 19 27	46	107									
3909.6	98													Boring terminated at 97.5-ft bgs, groundwater encountered at 15-ft bgs.	bottom of hole
3908.6	99														
3907.6	100														
3906.6	101														
3905.6	102														
3904.6	103														
3903.6	104														
3902.6	105														
3901.6	106														
3900.6	107														
3899.6	108														
3898.6	109														
3897.6	110														
3896.6	111														
3895.6	112														
3894.6	113														
3893.6	114														
3892.6	115														
3891.6	116														
3890.6	117														
3889.6	118														
3888.6	119														

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS High Plasticity Clay
USCS Clayey Gravel
USCS Poorly-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Silty Sand
USCS Low Plasticity Clay
USCS Poorly-graded Gravel

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/18/18
END DATE	10/18/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-3
GROUND ELEV. ft	4007.7
TOTAL DEPTH ft	118.9

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/18/18	ATD	15	3993

STATION	'P' 232+21
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
4006.7	1												AC	Asphalt	paved shoulder
4005.7	2												SC	FILL: Light brown sandy CLAY (SC), moist	bentonite, barite and polymer drilling mud
4004.7	3														
4003.7	4												CL	Dark brown sandy CLAY (CL)	
4002.7	5														
4001.7	6														
4000.7	7														
3999.7	8														
3998.7	9														
3997.7	10														
3996.7	11												CH	Brown CLAY (CH), high plasticity, very stiff, moist	
3995.7	12														
3994.7	13	A		4 6 10	16	80	32		89	88	64	37			
3993.7	14														
3992.7	15														
3991.7	16														
3990.7	17														
3989.7	18												CL-ML	Black sandy silty CLAY (CL-ML), medium stiff, moist	
3988.7	19														
3987.7	20	B		3 6 5	11	87	24		100	52	20	4			
3986.7	21														
3985.7	22														
3984.7	23														
3983.7	24												CL	Gray sandy CLAY (CL), low plasticity, medium stiff, wet	
3982.7	25														
3981.7	26														
3980.7	27														end of drilling day 10/9
3979.7	28	C		2 3 3	6	87	37	82	94	88	32	11			
3978.7	29														
		D		3 4	8	87	33	86	99	74	31	14			

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Well-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Low Plasticity Clay
USCS Silty Sand
USCS High Plasticity Clay
USCS Poorly-graded Gravel
USCS Low Plasticity Silty Clay
USCS Well-graded Gravel

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/18/18
END DATE	10/18/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-3
GROUND ELEV. ft	4007.7
TOTAL DEPTH ft	118.9

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/18/18	ATD	15	3993

STATION	'P' 232+21
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
				4										Gray sandy CLAY (CL), low plasticity, medium stiff, wet	
3976.7	31												CL		
3975.7	32														
3974.7	33	E		10 26 37	63	80	23	99	100	38	21	4		Brown clayey SAND (SC), very dense, moist	
3973.7	34												SC		
3972.7	35														
3971.7	36													Black CLAY (CH), high plasticity, medium stiff, wet	
3970.7	37	F		3 3 4	7	87	64	60	100	98	52	24	CH		moderate organic odor
3969.7	38														weight of hammer dropped sampler 2-in.
3968.7	39														
3967.7	40													Black CLAY (CL), medium plasticity, medium stiff, wet	
3966.7	41	G		2 2 3	5	120	77	53	100	75	41	19	CL		
3965.7	42														
3964.7	43													Black sandy GRAVEL (GW), subrounded, very dense, wet	
3963.7	44														
3962.7	45	H		21 26 24	50	67									infusion of fresh water
3961.7	46												GW		
3960.7	47														
3959.7	48														
3958.7	49	I		20 13 14	27	53	6		31	3					clean water in sample
3957.7	50														end of drilling week 10/10
3956.7	51													Black SAND (SW), loose, wet	lost circulation, made drilling mud
3955.7	52														
3954.7	53	J		2 3 3	6	0							SW		sampler dropped 2-in by weight of hammer
3953.7	54														
3952.7	55	K		4 4 3	7	0									end of drilling day 10/14
3951.7	56														
3950.7	57													Black SAND (SP-SM), trace silt, dense, moist	sampler dropped 2-in by weight of hammer
3949.7	58	L		21 21 23	44	67	20		91	8	15	NP	SP-SM		
3948.7	59														let sample set-up and fill sampler/casing

Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Well-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Low Plasticity Clay
USCS Silty Sand
USCS High Plasticity Clay
USCS Poorly-graded Gravel
USCS Low Plasticity Silty Clay
USCS Well-graded Gravel

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/18/18
END DATE	10/18/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-3
GROUND ELEV. ft	4007.7
TOTAL DEPTH ft	118.9

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/18/18	ATD	15	3993

STATION	'P' 232+21
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3946.7	61													Black SAND (SP-SM), trace silt, dense, moist	annulus with drilling fluid
3945.7	62													Black slity SAND (SM), dense, wet	end drilling day 10/15
3944.7	63	M		22 27 32	59	67	31		99	39	23	NP	SM		
3943.7	64														
3942.7	65														
3941.7	66													Black SAND (SP-SM), trace silt, very dense, wet	
3940.7	67														
3939.7	68	N		22 27 32	59	73	19		96	11	20	NP	SP-SM		
3938.7	69														
3937.7	70														
3936.7	71													Dark gray silty SAND (SM), very dense, moist	
3935.7	72														
3934.7	73														
3933.7	74	O		24 24 35	59	80	24	97	100	49	25	2	SM		
3932.7	75														
3931.7	76														
3930.7	77														
3929.7	78														
3928.7	79	P		39 50/5"		60	19		92	12	19	NP		Black sandy GRAVEL (GP), very dense, moist	
3927.7	80														
3926.7	81														
3925.7	82												GP		
3924.7	83	Q		18 22 26	48	80									
3923.7	84														
3922.7	85														sand fills drillhole to this elevation after each subsequent sample removed
3921.7	86													Gray CLAY (CH), high plasticity, hard, moist	
3920.7	87	R		12 18 25	43	120	39	80	100	100	63	41			
3919.7	88												CH		annulus filled with heavy mud during each
3918.7	89														

Standard Penetration Test
Modified California Sampler

Ashpalt
USCS Well-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Low Plasticity Clay
USCS Silty Sand
USCS High Plasticity Clay
USCS Poorly-graded Gravel
USCS Low Plasticity Silty Clay
USCS Well-graded Gravel

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

BORING LOG

Materials Division
Geotechnical Section
1263 S. Stewart St
Carson City, NV 89712

START DATE	10/18/18
END DATE	10/18/18
PROJECT	Replace B-28
LOCATION	SR 396 near Lovelock
E.A. #	74122
BORING	V-3
GROUND ELEV. ft	4007.7
TOTAL DEPTH ft	118.9

GROUNDWATER LEVEL			
DATE	TIME	DEPTH ft	ELEV. ft
10/18/18	ATD	15	3993

STATION	'P' 232+21
OFFSET	18 ft. left
ENGINEER	Callaghan
OPERATOR	Altamirano
DRILL RIG	Diedrich D-120 (#1627)
METHOD	Mud Rotary
HAMMER	Auto
BACKFILLED	Yes DATE 10/22/18

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	TYPE	BLOWS / 6"	Uncorrected N Value	Recovery (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	% PASSING NO.4	% PASSING NO.200	LIQUID LIMIT	PLASTICITY INDEX	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS
3916.7	91												CH	Gray CLAY (CH), high plasticity, hard, moist	sampler removal
3915.7	92														end drilling day 10/16
3914.7	93	S		14 18 24	42	100	38	82	100	100	65	41			
3913.7	94														
3912.7	95														
3911.7	96														
3910.7	97														
3909.7	98														
3908.7	99	T		16 25 29	54	113	37 36	83	100	100 92	71 68	46 44			
3907.7	100														
3906.7	101														
3905.7	102														
3904.7	103														
3903.7	104														
3902.7	105														
3901.7	106														
3900.7	107														
3899.7	108														
3898.7	109	U		16 29 50/2"		100									
3897.7	110														
3896.7	111														
3895.7	112														
3894.7	113														
3893.7	114														
3892.7	115														
3891.7	116														
3890.7	117														
3889.7	118														
3888.7	119	V		23 50/5"		64	40	79	100	100	57	38		Boring terminated at 120-ft bgs, groundwater encountered at 15-ft bgs.	bottom of hole

SMART SOIL LOG B-28 (KJ).GPJ NDOT SMART LOG 2018.10.10.GDT 2/5/19

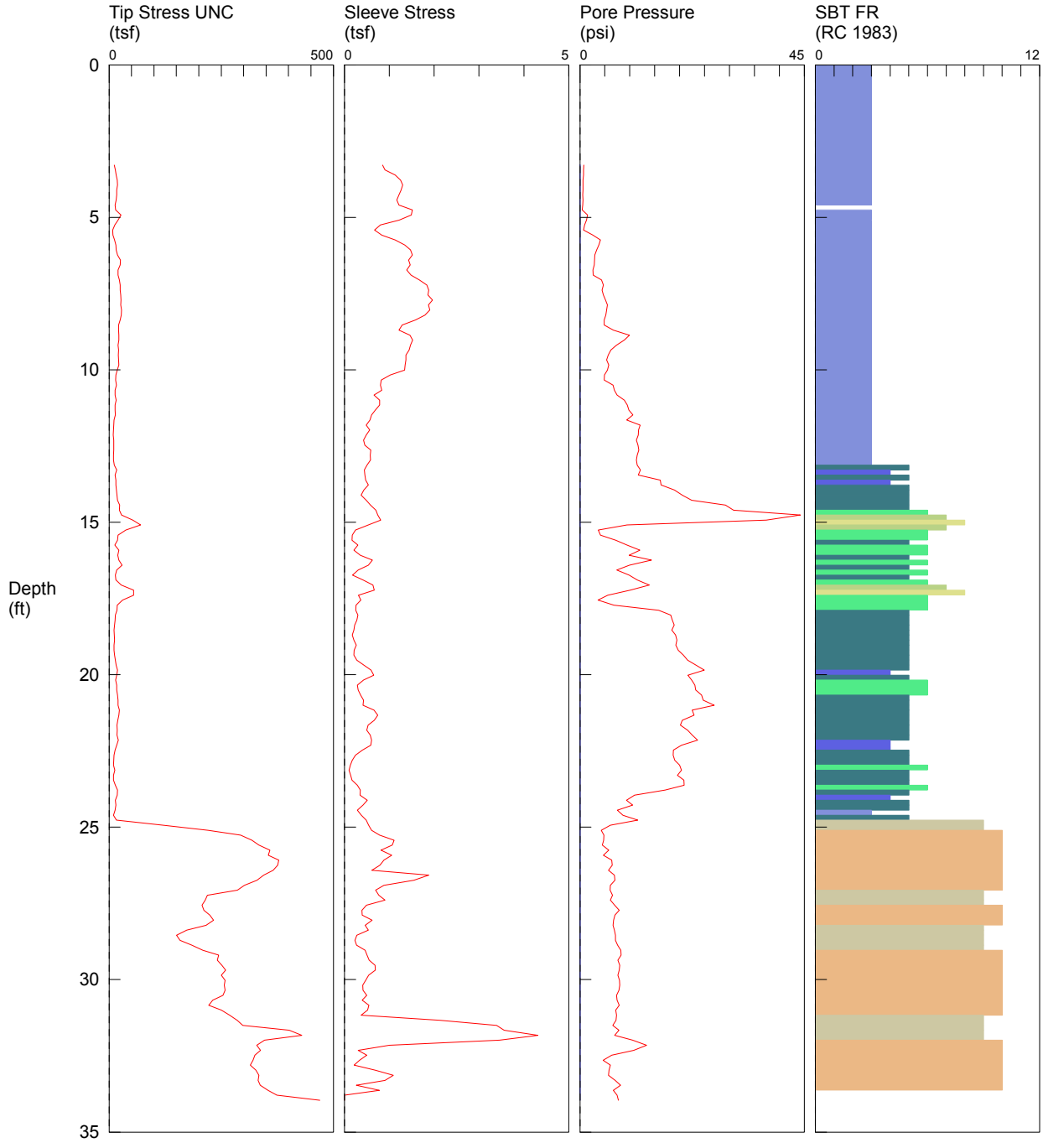
Standard Penetration Test
Modified California Sampler
Ashpalt
USCS Well-graded Sand
USCS Clayey Sand
USCS Poorly-graded Sand with Silt
USCS Low Plasticity Clay
USCS Silty Sand
USCS High Plasticity Clay
USCS Poorly-graded Gravel
USCS Low Plasticity Silty Clay
USCS Well-graded Gravel

Geo-Ex CPT

Customer Name: NVDOT
LOCATION: Lovelock, NV
TEST DATE: 4/15/2019 11:01:30 AM

SOUNDING
HOLE NUMBER: 1-CPT-1 (V-1)
TOTAL DEPTH: 33.957 ft

OPERATOR: Mike
CONE ID: DSG1111



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

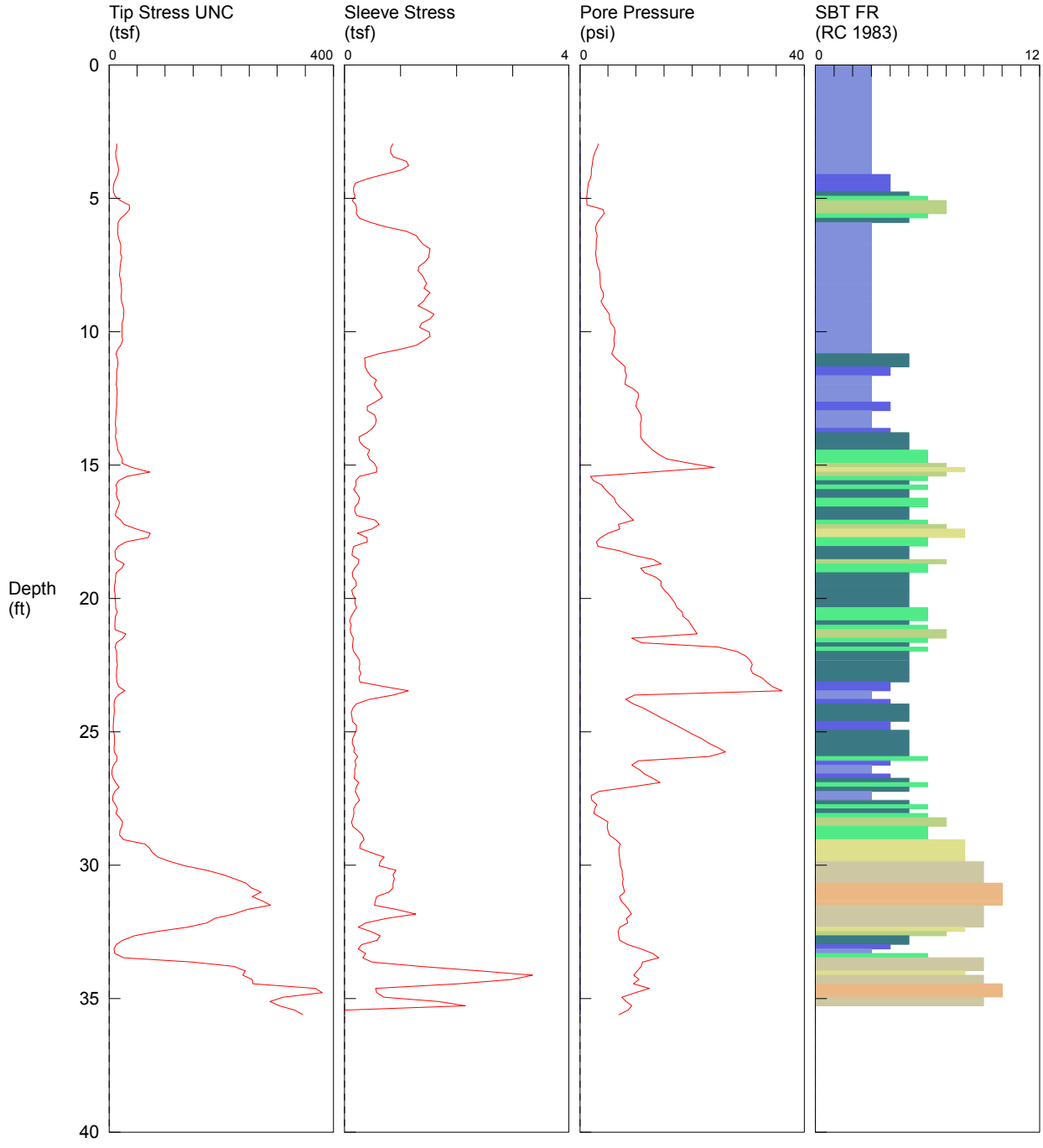
*SBT/SPT CORRELATION: UBC-1983

Geo-Ex CPT

Customer Name: NVDOT
LOCATION: Nevada
TEST DATE: 4/15/2019 11:48:46 AM

SOUNDING
HOLE NUMBER: 1-CPT-2
TOTAL DEPTH: 35.597 ft

OPERATOR: Mike
CONE ID: DSG1111



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

Appendix C
Laboratory Test Results

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-1 **Elevation (ft)** 4004 **Station** "P" 230 + 00, 16.5' Rt. **Date** 9/24/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
A	5.0 - 6.5	SPT			34.6											Ch
Ba	10.5 - 11.0	CMS			26.6	86.6										CU
Bb	11.0 - 11.5	CMS		CH	33.4	84.3	98.2	52	23	29						OC, G = 2.688
Ca	16.0 - 16.5	CMS		CH	40.5	78.6	99.3	58	22	36						OC, G = 2.747
Da	20.5 - 21.0	CMS			28.6	91.4										
Db	21.0 - 21.5	CMS		CL-ML	25.7	97.0	53.8	21	17	4						OC, G = 2.765
Ea	25.5 - 26.0	CMS			29.2											CU
Eb	26.0 - 26.5	CMS		CL	28.2		97.0	33	19	14						
F	30.0 - 31.5	SPT		SP-SM	11.8		6.1	15	NP	NP						
G	35.0 - 36.5	SPT		SP-SM	12.7		5.5	16	NP	NP						
H	40.0 - 41.5	SPT		GP	8.1		4.2	27	16	11						
I	45.0 - 46.5	SPT		GW	4.0		0.9									

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT N = $(N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-1 **Elevation (ft)** 4004 **Station** "P" 230 + 00, 16.5' Rt. **Date** 9/24/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
J																No Recovery
K																No Recovery
La	60.5 - 61.0	CMS			31.8	89.9										CU
Lb	61.0 - 61.5	CMS		SM	28.5	90.4	32.0	23	NP	NP						OC, G = 2.697
Ma	65.5 - 66.0	CMS			11.9											
Mb	66.0 - 66.5	CMS		SC-SM	19.9	105.6	21.0	25	20	5						
N	70.0 - 71.5	SPT		SP-SM	20.0		5.7	19	NP	NP						
O	75.0 - 76.5	SPT			31.2											Ch
P	80.0 - 81.5	SPT		SC-SM	22.8		30.0	27	20	7						
Qa	85.5 - 86.0	CMS			35.3	84.2										CU
Qb	86.0 - 86.5	CMS		CH	34.1		95.7	72	23	49						H, G = 2.762
Ra	90.0 - 90.5	CMS			36.2	83.6										CU

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SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-1 **Elevation (ft)** 4004 **Station** "P" 230 + 00, 16.5' Rt. **Date** 9/24/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. Peak	C psi Peak	Φ deg. Residual	C psi Residual	
Rb	90.5 - 91.0	CMS		CH		34.5	85.7	68	23	45						
Rc	91.0 - 91.5	CMS			35.0	84.4										CU
Sa	95.0 - 65.5	CMS			32.7	88.0										CU
Sb	95.5 - 96.0	CMS		CH	35.5	82.5	99.6	62	23	39						OC, G = 2.717
Sc	96.0 - 96.5	CMS			35.6	84.3										CU
Ta	105.5 - 106.0	CMS			38.0	81.4										CU
Tb	106.0 - 106.5	CMS		CH	36.6		92.4	86	18	68						H, G = 2.738
Ua	115.0 - 115.5	CMS			40.5	78.9										CU
Ub	115.5 - 116.0	CMS		CH	38.1	81.6	100.0	55	20	35						OC, G = 2.748
Uc	116.0 - 116.5	CMS			38.5	82.9										CU

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Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT $N = (N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
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RV = R - Value
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O = Organic Content
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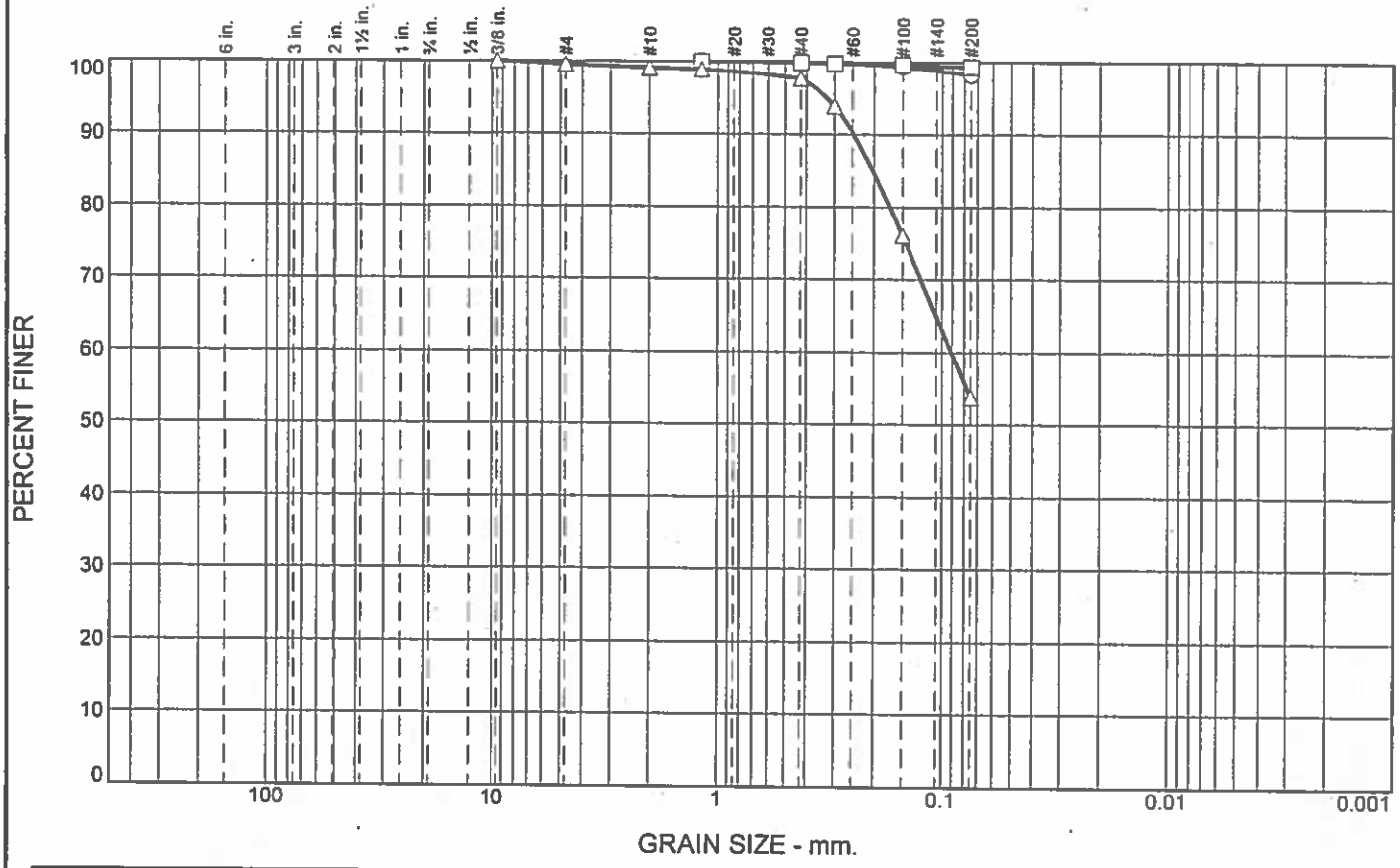
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	1.8	98.2		CH	A-7-6(32)	23	52
□	0.0	0.0	0.7	99.3		CH	A-7-6(40)	22	58
△	0.0	0.5	45.7	53.8		CL-ML	A-4(0)	17	21

SIEVE inches size	PERCENT FINER ○	□	△
3/8"			100.0
	GRAIN SIZE		
D_{60}			0.0908
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4			99.5
#10			99.1
#16	100.0	100.0	98.9
#40	99.9	99.9	97.6
#50	99.8	99.8	93.8
#100	99.3	99.6	76.1
#200	98.2	99.3	53.8

Material Description
○ fat clay
□ fat clay
△ sandy silty clay

REMARKS:
○
□
△

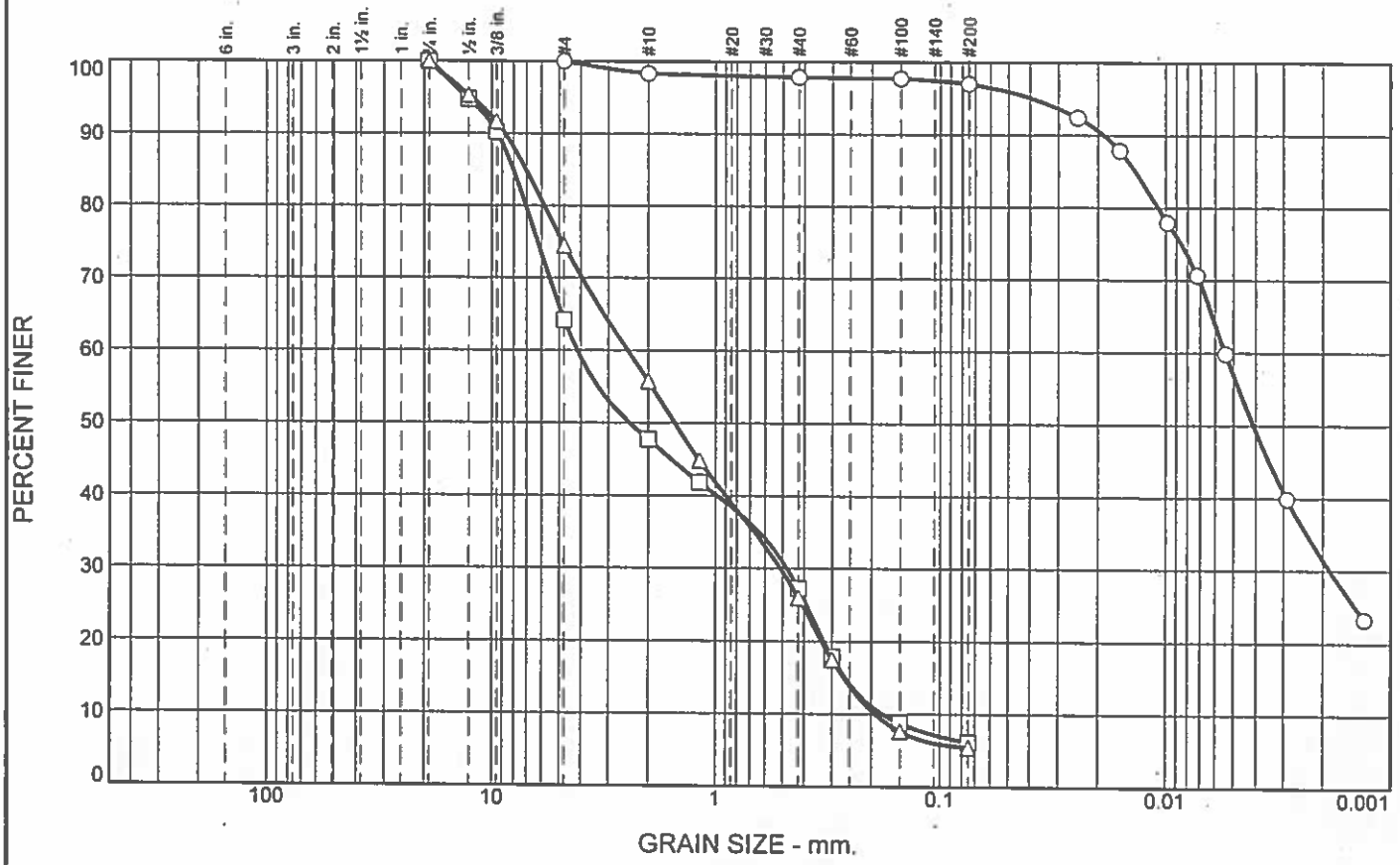
○ Source of Sample: V-1 Depth: 11.0' - 11.5' Sample Number: Bb
□ Source of Sample: V-1 Depth: 16.0' - 16.5' Sample Number: Ca
△ Source of Sample: V-1 Depth: 21.0' - 21.5' Sample Number: Db

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	3.0	65.5	31.5	CL	A-6(14)	19	33
□	0.0	35.8	58.1	6.1		SP-SM	A-1-a	NP	15
△	0.0	25.5	69.0	5.5		SP-SM	A-1-b	NP	16

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	100.0
1/2"		94.8	95.3
3/8"		90.2	91.6
GRAIN SIZE			
D_{60}	0.0054	4.1489	2.4620
D_{30}	0.0019	0.4778	0.5103
D_{10}		0.1783	0.1928
COEFFICIENTS			
C_c		0.31	0.55
C_u		23.28	12.77

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	64.2	74.5
#10	98.3	47.8	55.8
#16		41.8	44.9
#40	97.9	27.3	26.0
#50		17.9	17.5
#100	97.7	8.8	7.6
#200	97.0	6.1	5.5

Material Description

○ lean clay

□ poorly graded sand with silt and gravel

△ poorly graded sand with silt and gravel

REMARKS:

○

□

△

○ Source of Sample: V-1 Depth: 26.0' - 26.5' Sample Number: Eb

□ Source of Sample: V-1 Depth: 30.0' - 31.5' Sample Number: F

△ Source of Sample: V-1 Depth: 35.0' - 36.5' Sample Number: G

NEVADA DEPARTMENT OF TRANSPORTATION

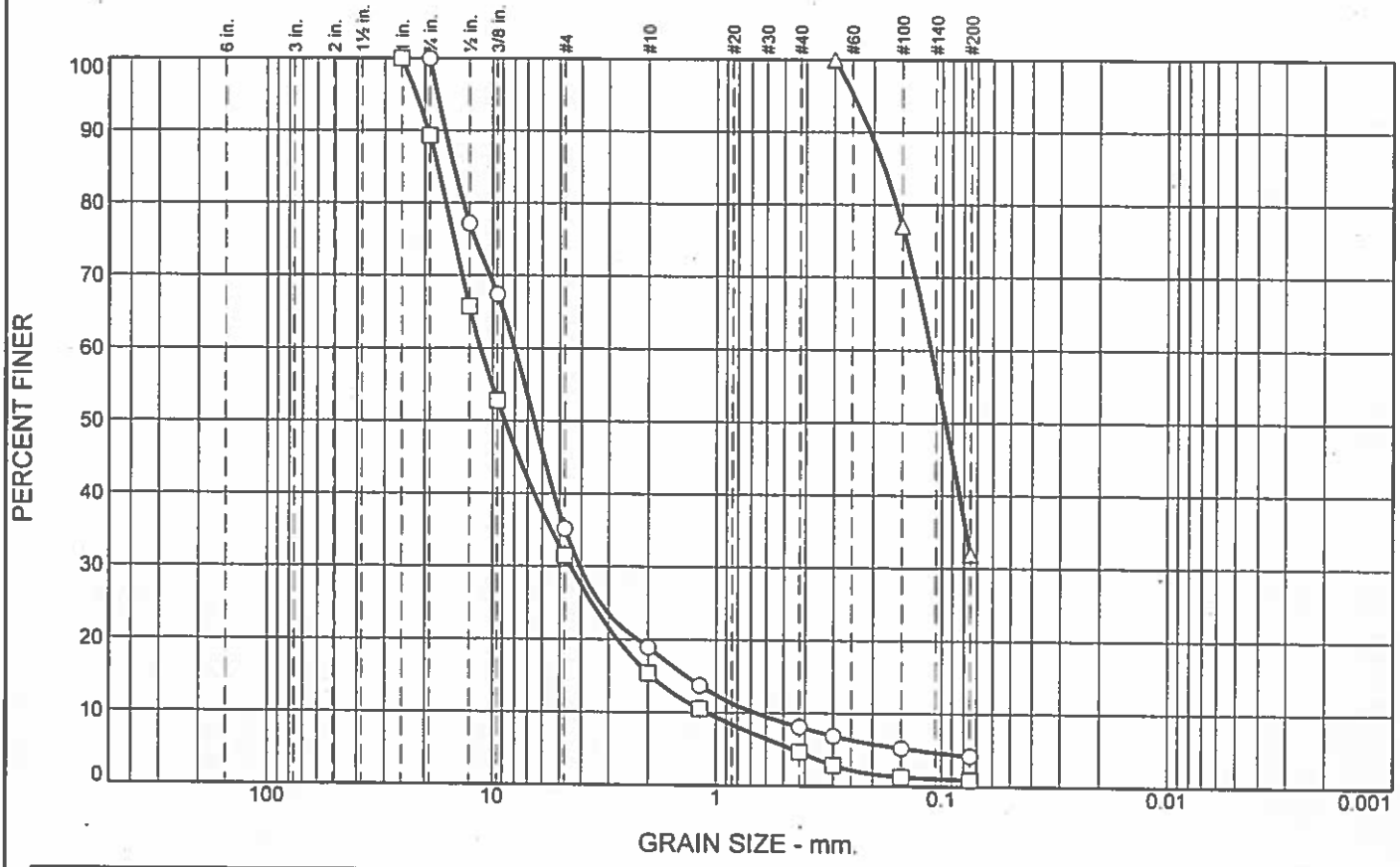
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	64.8	31.0	4.2		GP	A-2-6(0)	16	27
□	0.0	68.5	30.6	0.9		GW			
△	0.0	0.0	68.0	32.0		SM	A-2-4(0)	NP	23

SIEVE inches size	PERCENT FINER ○	□	△
1"		100.0	
3/4"	100.0	89.3	
1/2"	77.2	65.8	
3/8"	67.4	52.8	
	GRAIN SIZE		
D_{60}	7.9818	11.3163	0.1117
D_{30}	4.0690	4.4717	
D_{10}	0.6670	1.0963	
	COEFFICIENTS		
C_c	3.11	1.61	
C_u	11.97	10.32	

SIEVE number size	PERCENT FINER ○	□	△
#4	35.2	31.5	
#10	19.0	15.4	
#16	13.7	10.5	
#40	8.1	4.7	
#50	6.9	2.9	100.0
#100	5.3	1.3	77.1
#200	4.2	0.9	32.0

Material Description

○ poorly graded gravel with sand

□ well-graded gravel with sand

△ silty sand

REMARKS:

○

□

△

○ Source of Sample: V-1 Depth: 40.0' - 41.5' Sample Number: H

□ Source of Sample: V-1 Depth: 45.0' - 46.5' Sample Number: I

△ Source of Sample: V-1 Depth: 61.0' - 61.5' Sample Number: Lb

NEVADA DEPARTMENT OF TRANSPORTATION

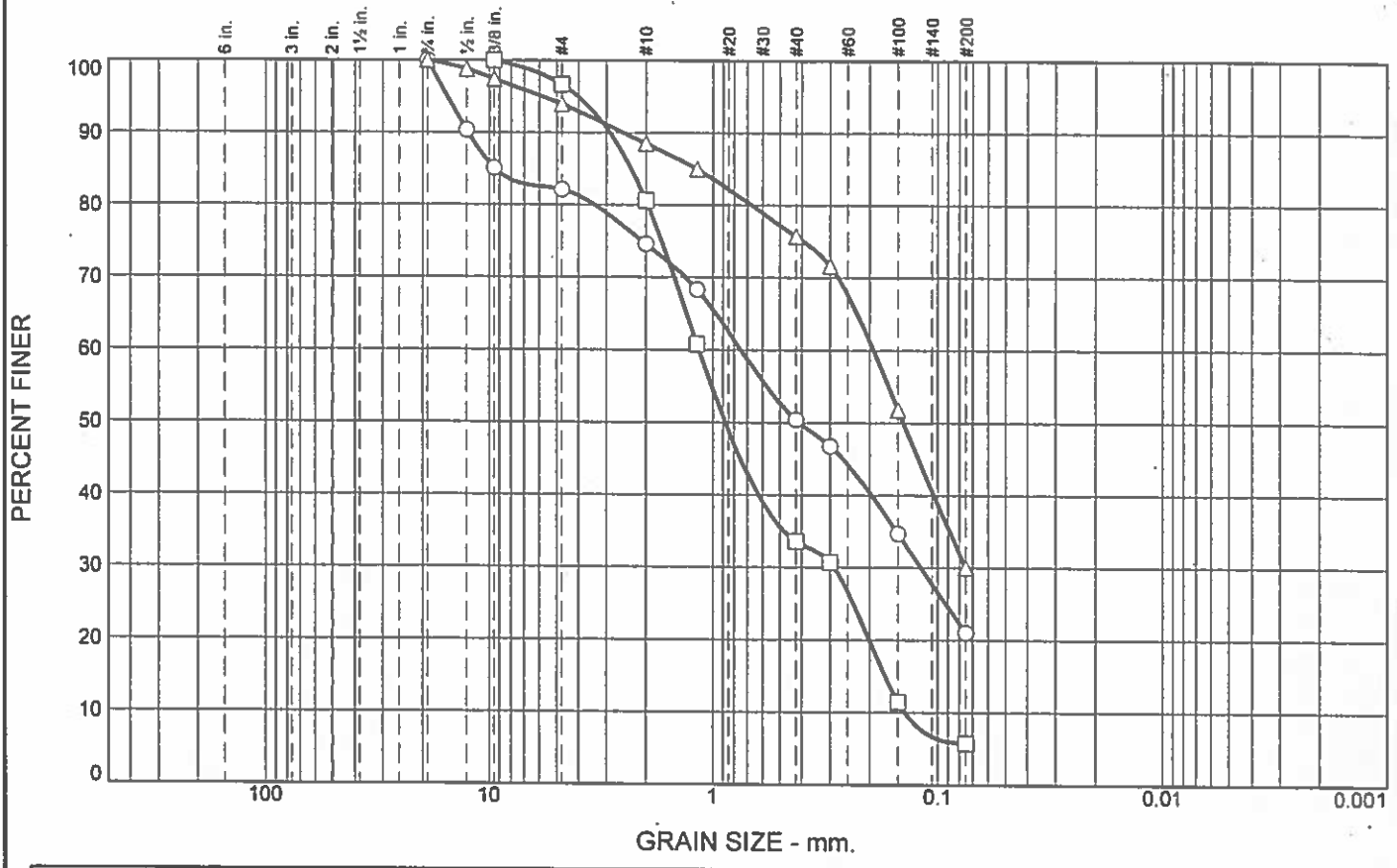
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	17.9	61.1	21.0		SC-SM	A-1-b	20	25
□	0.0	3.4	90.9	5.7		SP-SM	A-1-b	NP	19
△	0.0	6.1	63.9	30.0		SC-SM	A-2-4(0)	20	27

SIEVE inches size	PERCENT FINER ○	□	△
3/4"	100.0		100.0
1/2"	90.3		98.8
3/8"	85.1	100.0	97.4
	GRAIN SIZE		
D_{60}	0.7465	1.1570	0.1922
D_{30}	0.1184	0.2876	
D_{10}		0.1399	
	COEFFICIENTS		
C_c		0.51	
C_u		8.27	

SIEVE number size	PERCENT FINER ○	□	△
#4	82.1	96.6	93.9
#10	74.6	80.6	88.5
#16	68.3	60.8	85.0
#40	50.4	33.6	75.7
#50	46.8	30.7	71.7
#100	34.7	11.4	51.8
#200	21.0	5.7	30.0

Material Description

○ silty, clayey sand with gravel

□ poorly graded sand with silt

△ silty, clayey sand

REMARKS:

○

□

△

○ Source of Sample: V-1 Depth: 66.0' - 66.5' Sample Number: Mb

□ Source of Sample: V-1 Depth: 70.0' - 71.5' Sample Number: N

△ Source of Sample: V-1 Depth: 80.0' - 81.5' Sample Number: P

NEVADA DEPARTMENT OF TRANSPORTATION

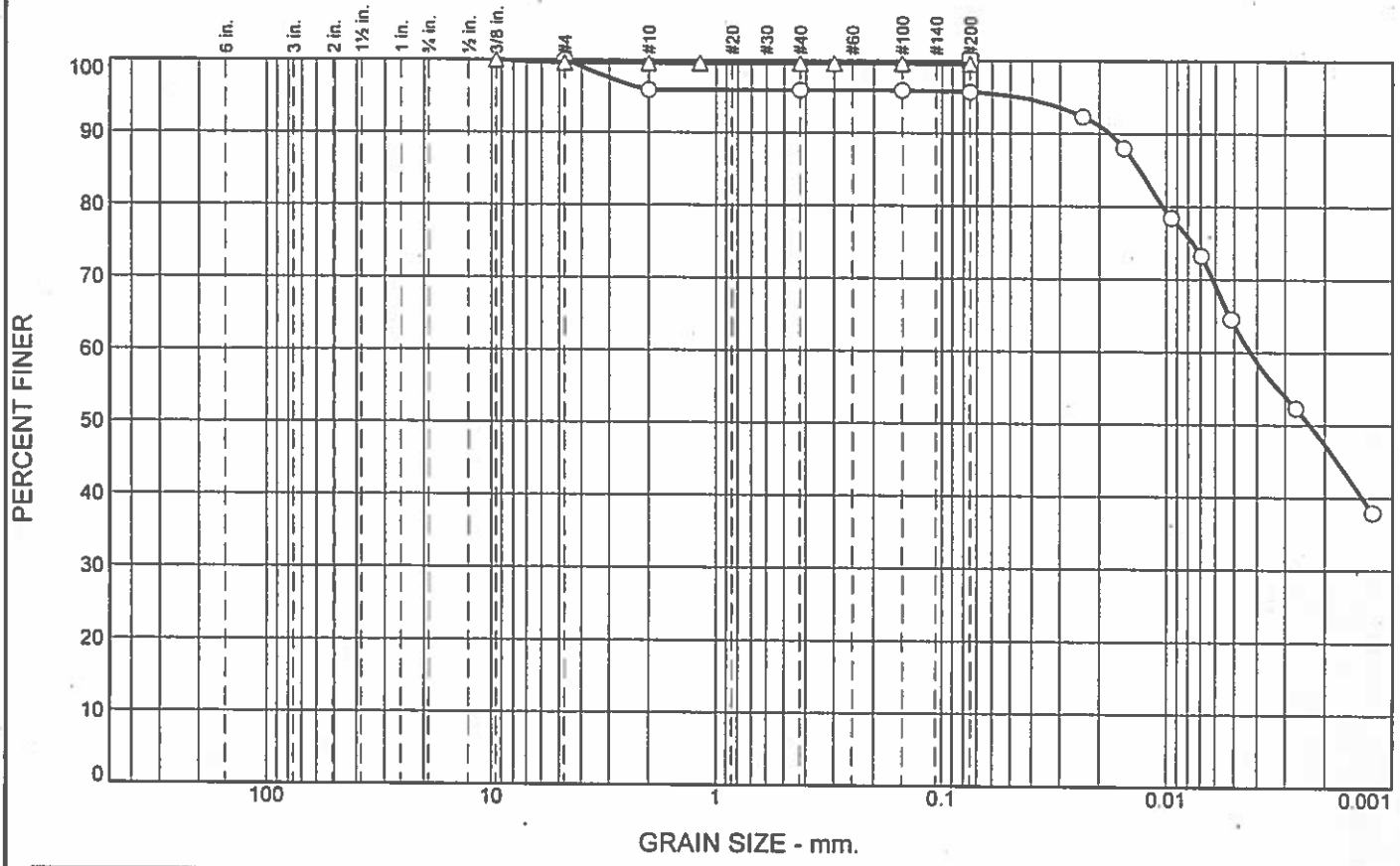
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	4.3	48.4	47.3	CH	A-7-6(54)	23	72
□	0.0	0.0	0.0	100.0		CH	A-7-6(52)	23	68
△	0.0	0.4	0.0	99.6		CH	A-7-6(45)	23	62

SIEVE inches size	PERCENT FINER ○	□	△
3/8"			100.0
	GRAIN SIZE		
D_{60}	0.0043		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0		99.6
#10	95.9		99.6
#16			99.6
#40	95.9		99.6
#50			99.6
#100	95.9		99.6
#200	95.7	100.0	99.6

Material Description
○ fat clay
□ fat clay
△ fat clay

REMARKS:
○
□
△

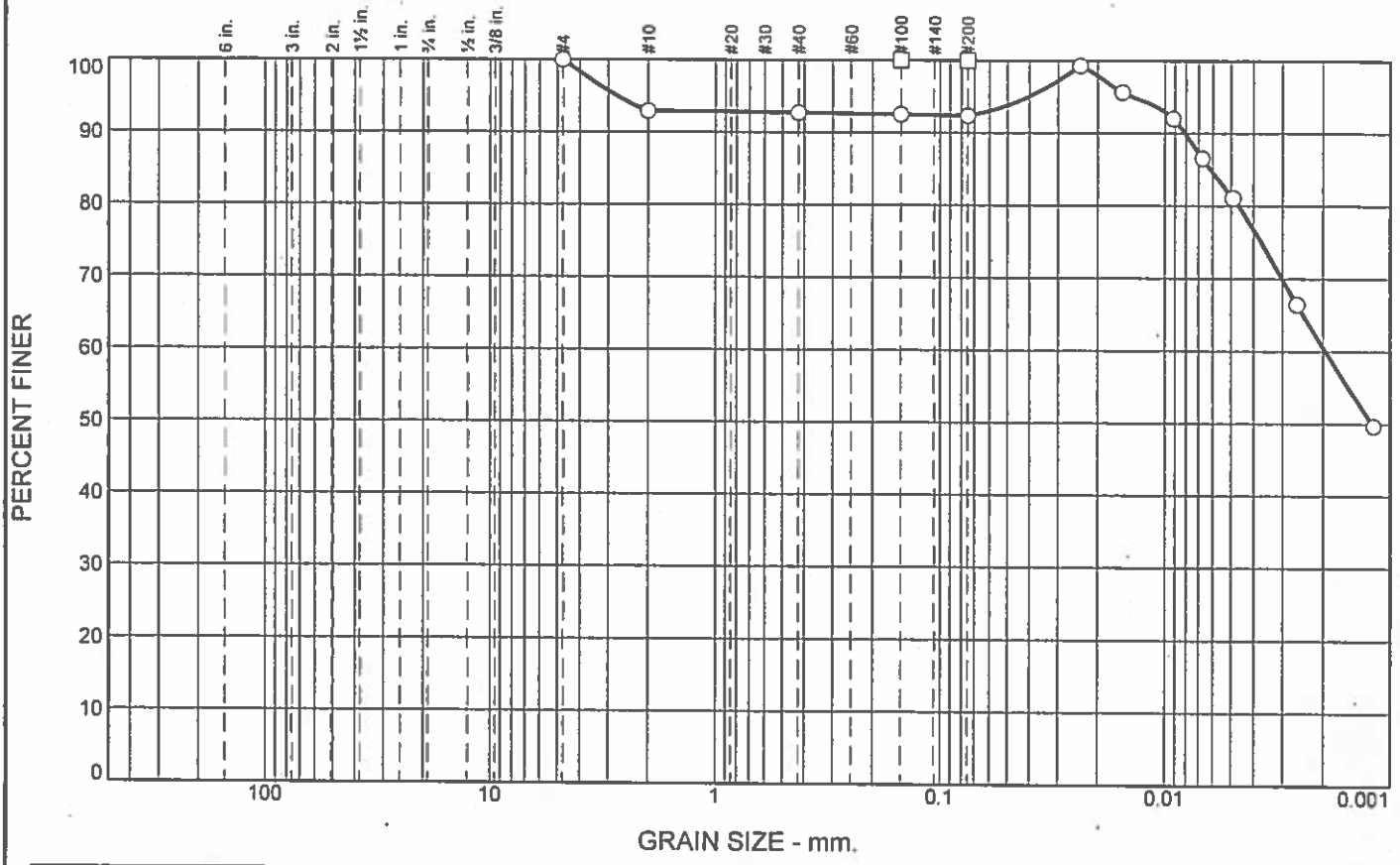
○ Source of Sample: V-1 Depth: 86.0' - 86.5' Sample Number: Qb
□ Source of Sample: V-1 Depth: 90.5' - 91.0' Sample Number: Rb
△ Source of Sample: V-1 Depth: 95.5' - 96.0' Sample Number: Sb

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	7.6	31.9	60.5	CH	A-7-6(69)	18	86
□	0.0	0.0	0.0	100.0		CH	A-7-6(39)	20	55

SIEVE inches size	PERCENT FINER ○	□	
	GRAIN SIZE		
D_{60}	0.0020		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	100.0		
#10	92.9		
#40	92.7		
#100	92.5	100.0	
#200	92.4	100.0	

Material Description

○ fat clay

□ fat clay

REMARKS:

○

□

○ Source of Sample: V-1 Depth: 106.0' - 106.5' Sample Number: Tb

□ Source of Sample: V-1 Depth: 115.5' - 116.0' Sample Number: Ub

NEVADA DEPARTMENT OF TRANSPORTATION

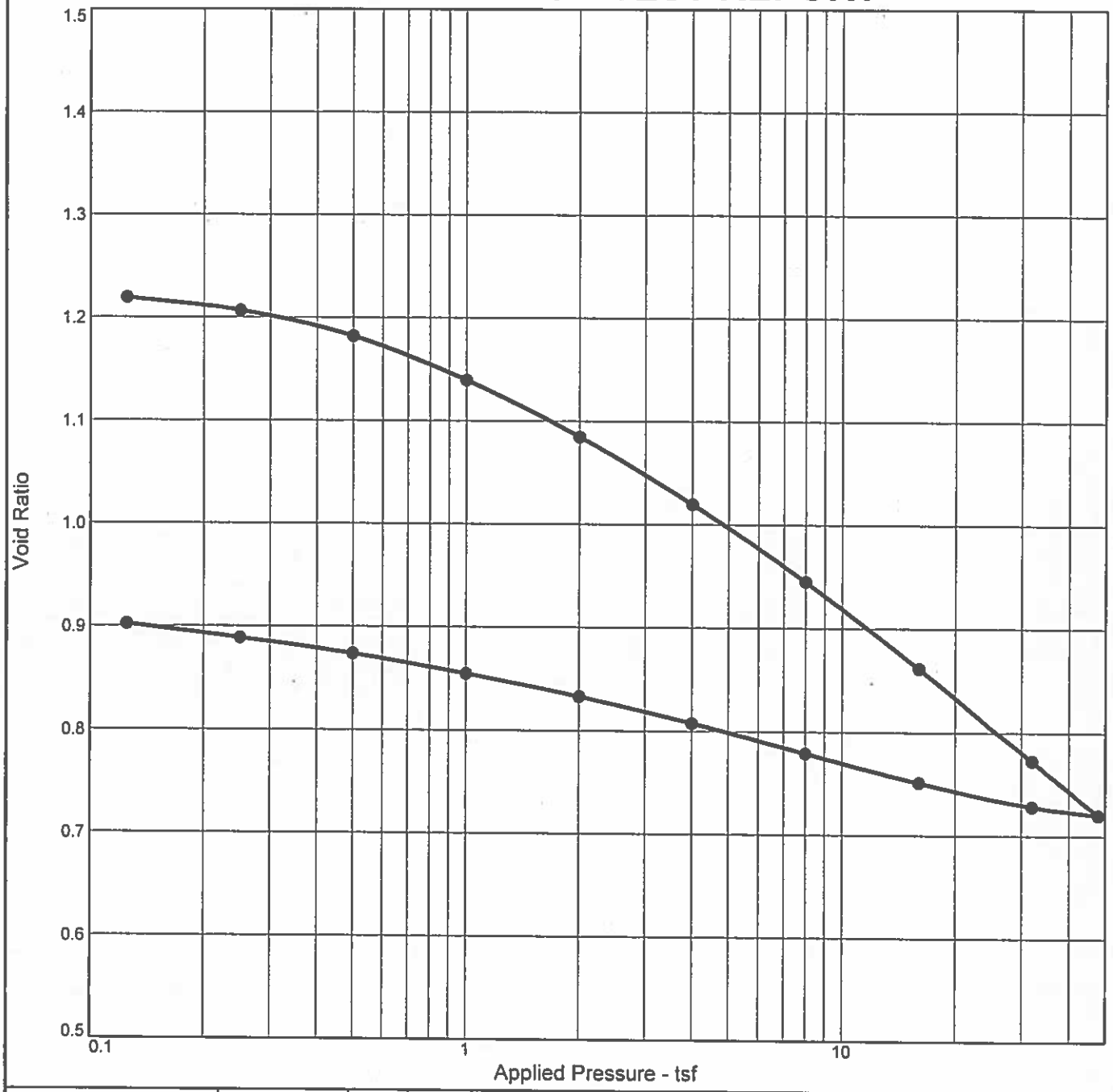
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
92.5 %	42.5 %	75.1	52	29	2.688	0.6	1.6	0.30		1.235

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(32)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

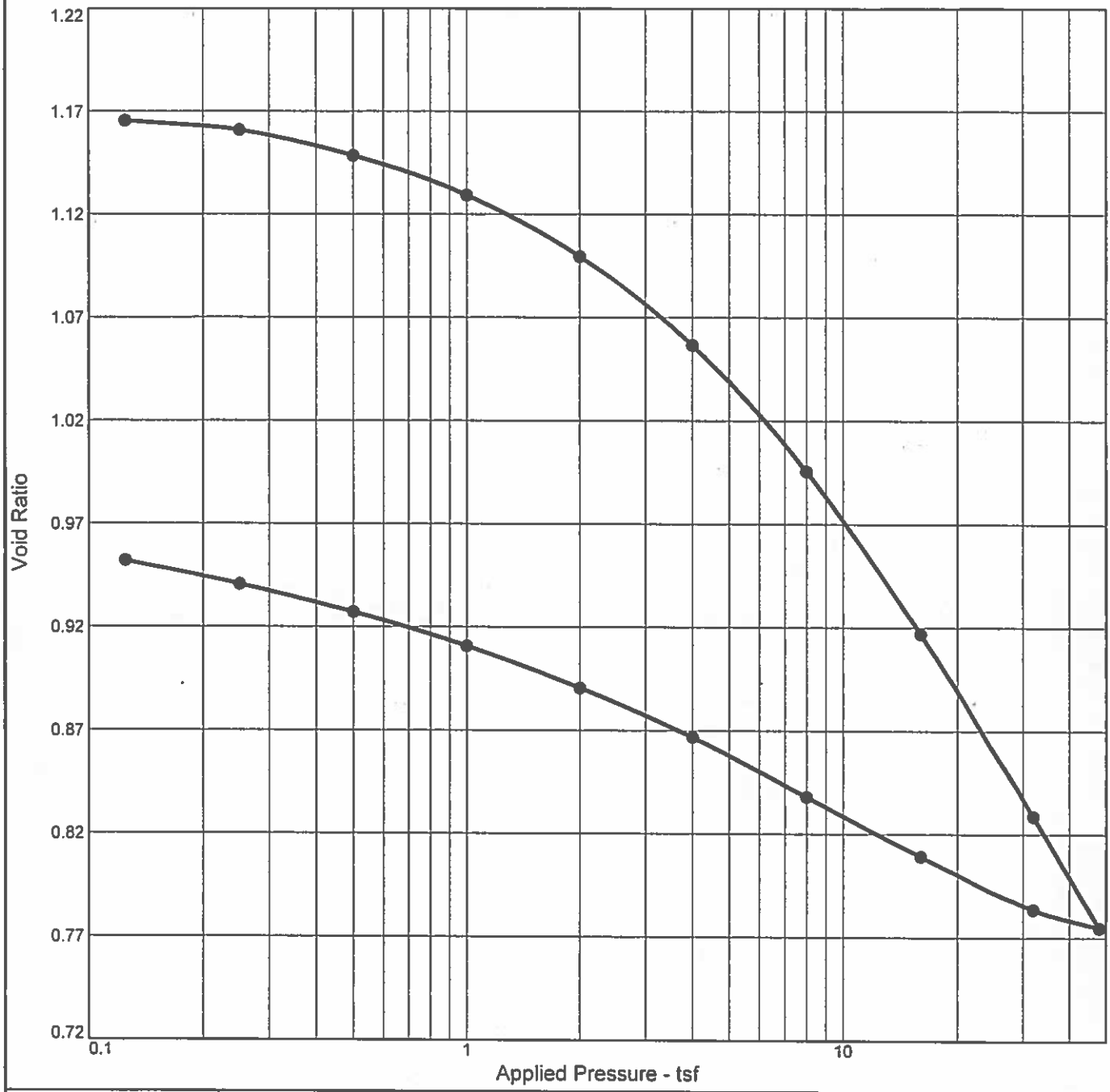
Source of Sample: V-1 **Depth:** 11.0' - 11.5' **Sample Number:** Bb a

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
93.3 %	40.5 %	77.4	52	29	2.688	0.6	3.0	0.31		1.168

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(32)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

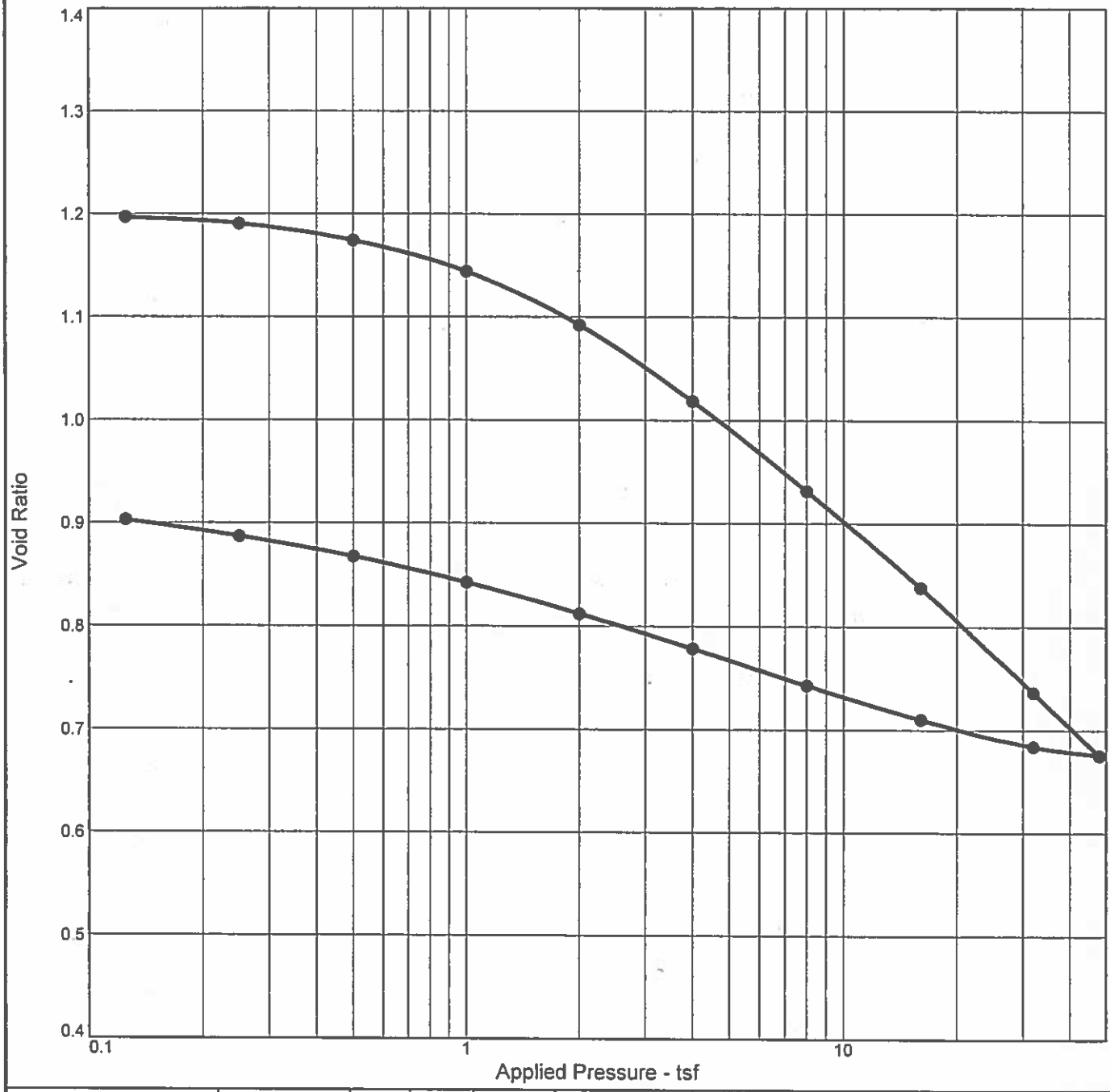
Source of Sample: V-1 **Depth:** 11.0' - 11.5' **Sample Number:** Bb b

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.1 %	43.4 %	77.4	58	36	2.747	0.8	2.5	0.34		1.214

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(40)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

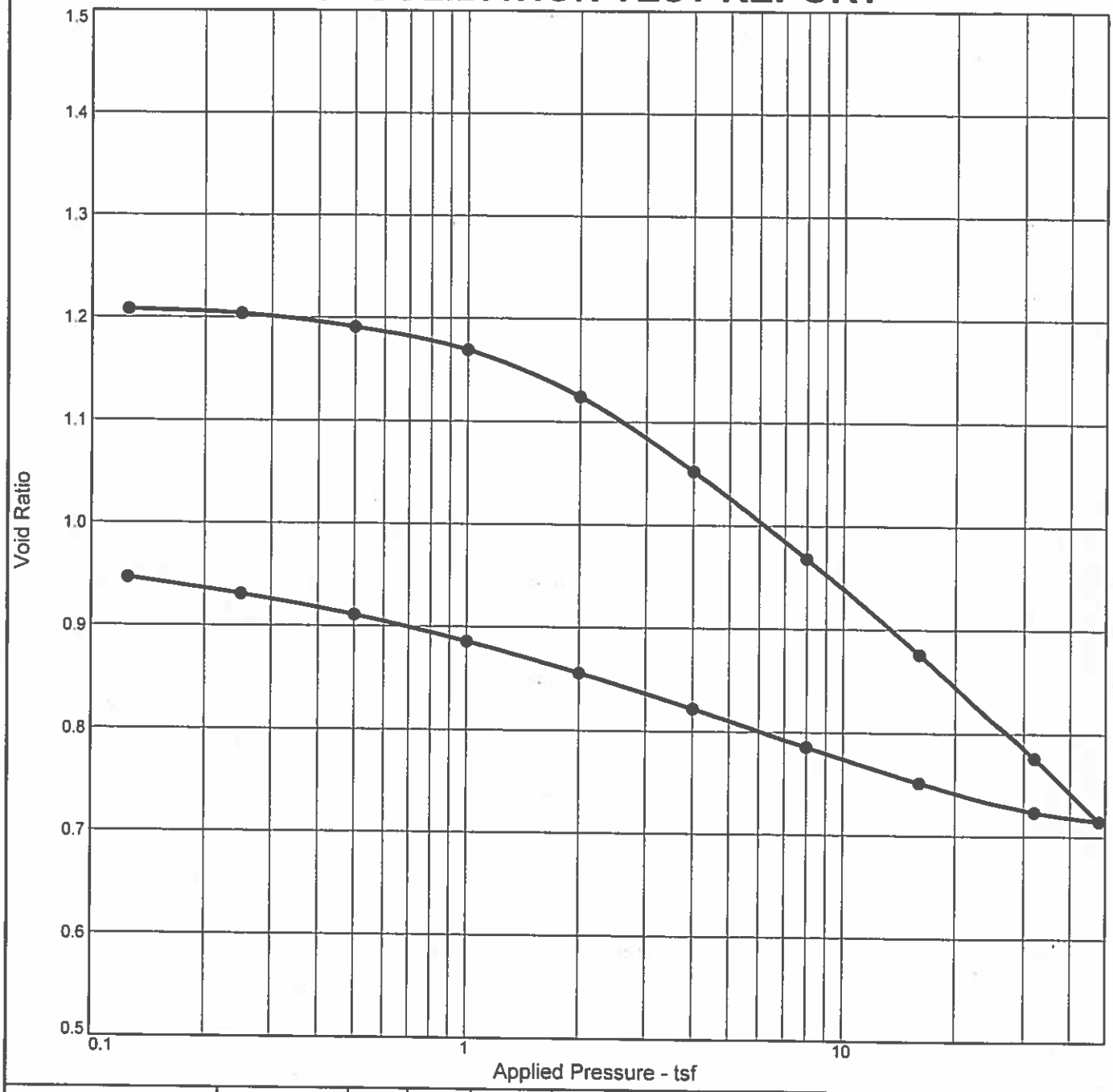
Source of Sample: V-1 **Depth:** 16.0' - 16.5' **Sample Number:** Ca a

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.4 %	43.1 %	77.4	58	36	2.747	0.8	2.8	0.35		1.215

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(40)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

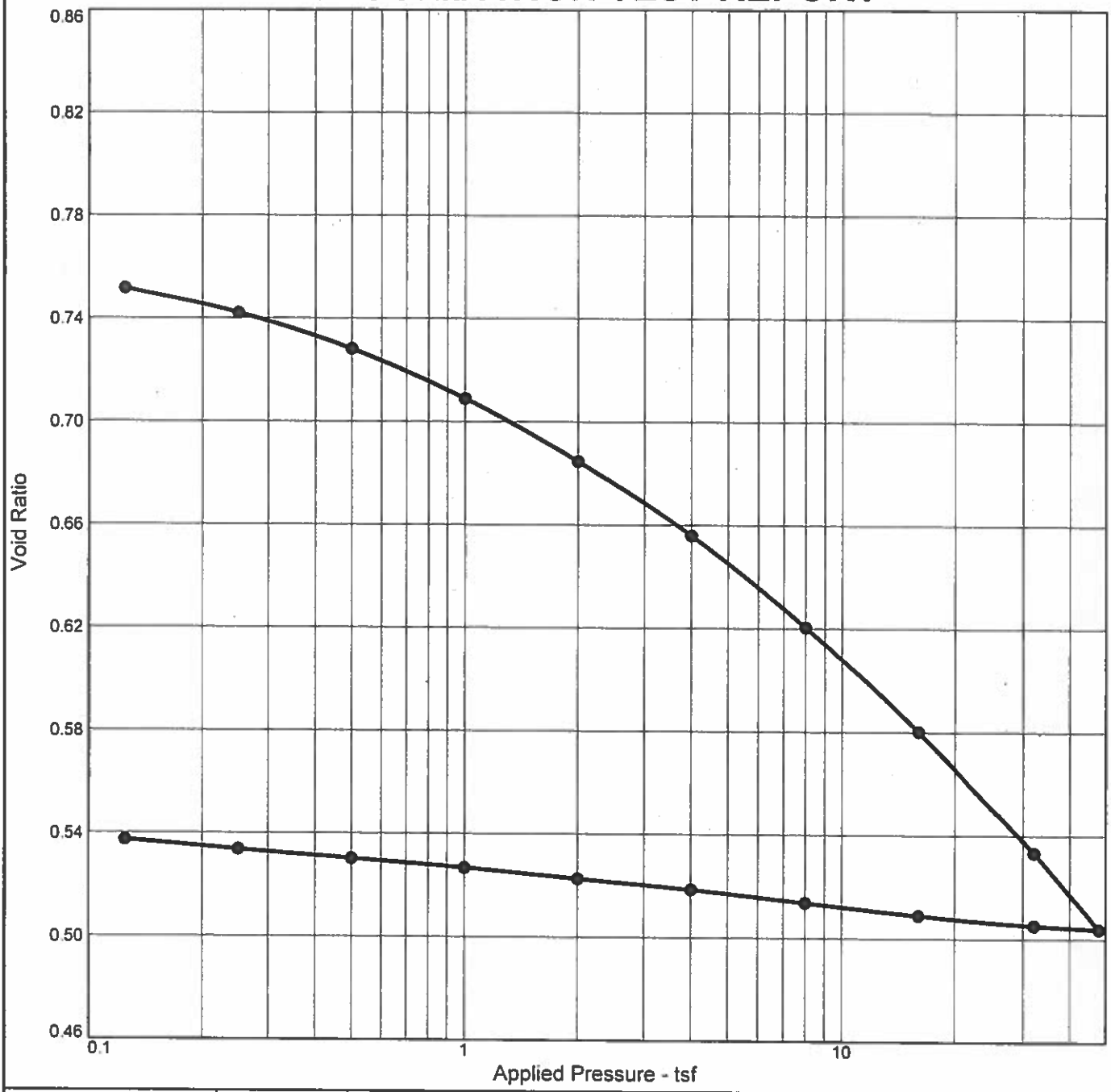
Source of Sample: V-1 **Depth:** 16.0' - 16.5' **Sample Number:** Ca b

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.4 %	27.1 %	97.2	21	4	2.765	1.1	2.4	0.17		0.776

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silty clay	CL-ML	A-4(0)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

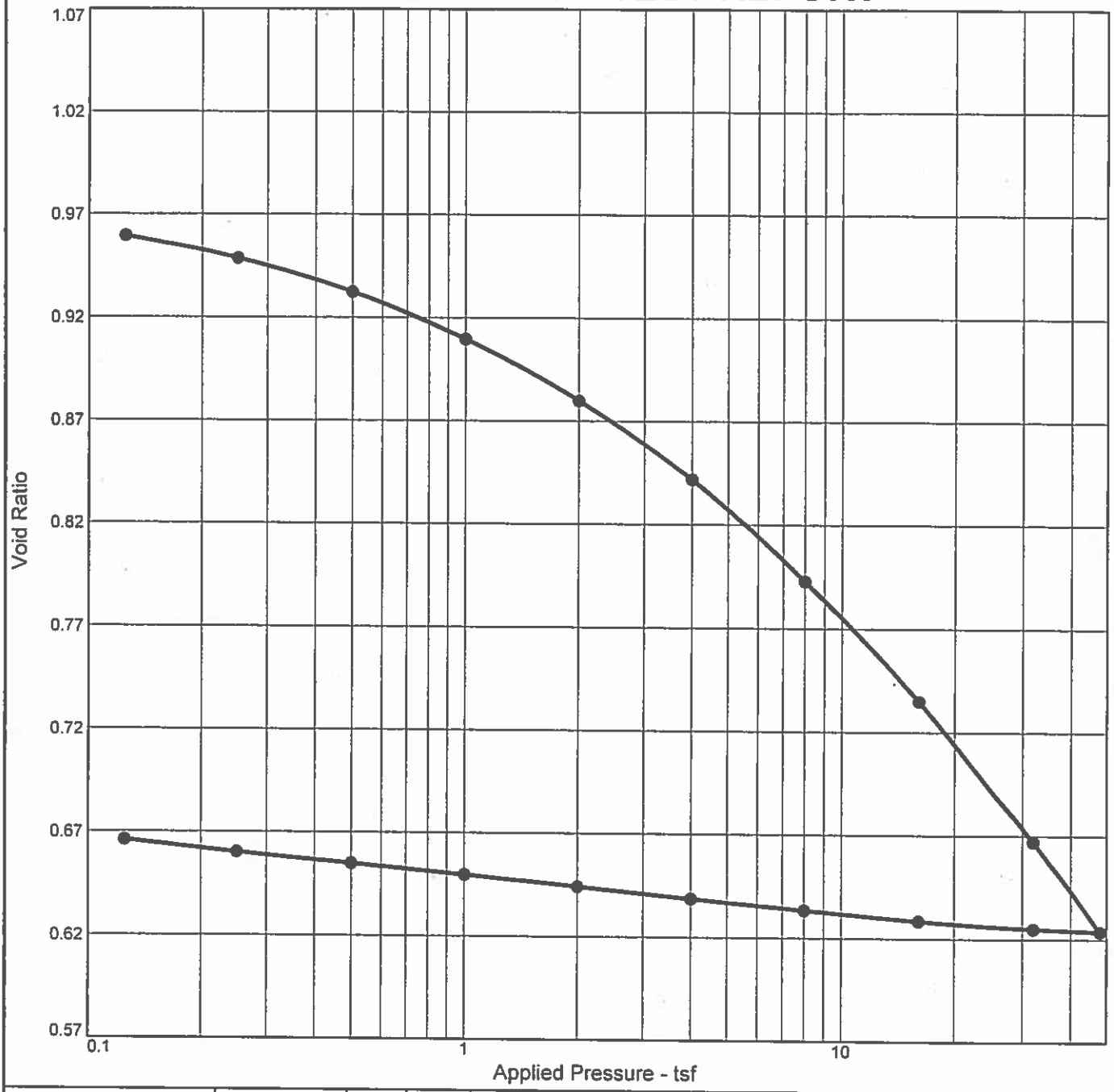
Source of Sample: V-1 **Depth:** 21.0' - 21.5' **Sample Number:** Db

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.4 %	35.4 %	85.1	23	NP	2.697	3.1	2.9	0.25		0.979

MATERIAL DESCRIPTION	USCS	AASHTO
silty sand	SM	A-2-4(0)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

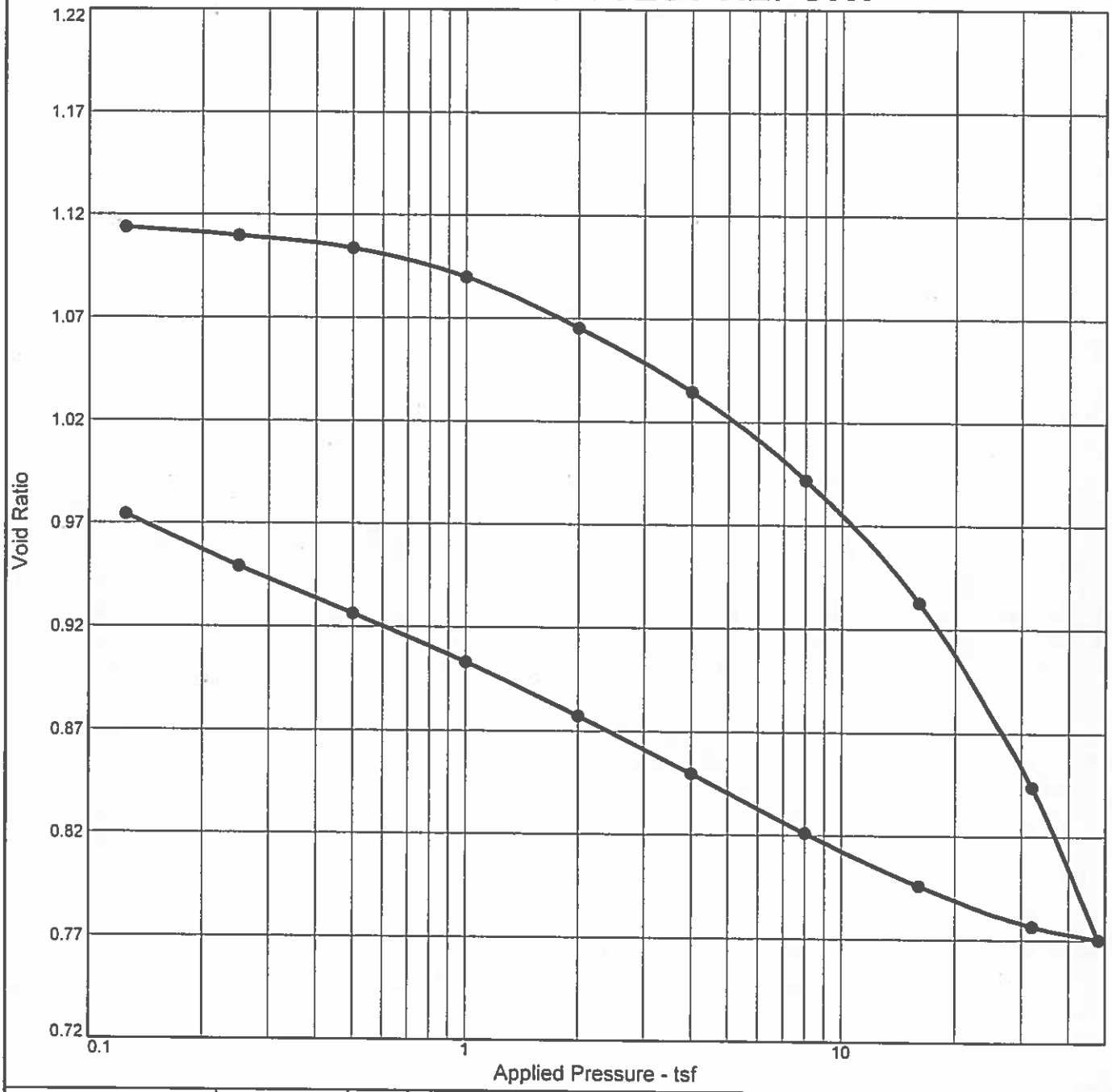
Source of Sample: V-1 **Depth:** 61.0' - 61.5' **Sample Number:** Lb

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
95.4 %	39.2 %	80.1	62	39	2.717	4.8	10.1	0.42		1.116

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(45)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

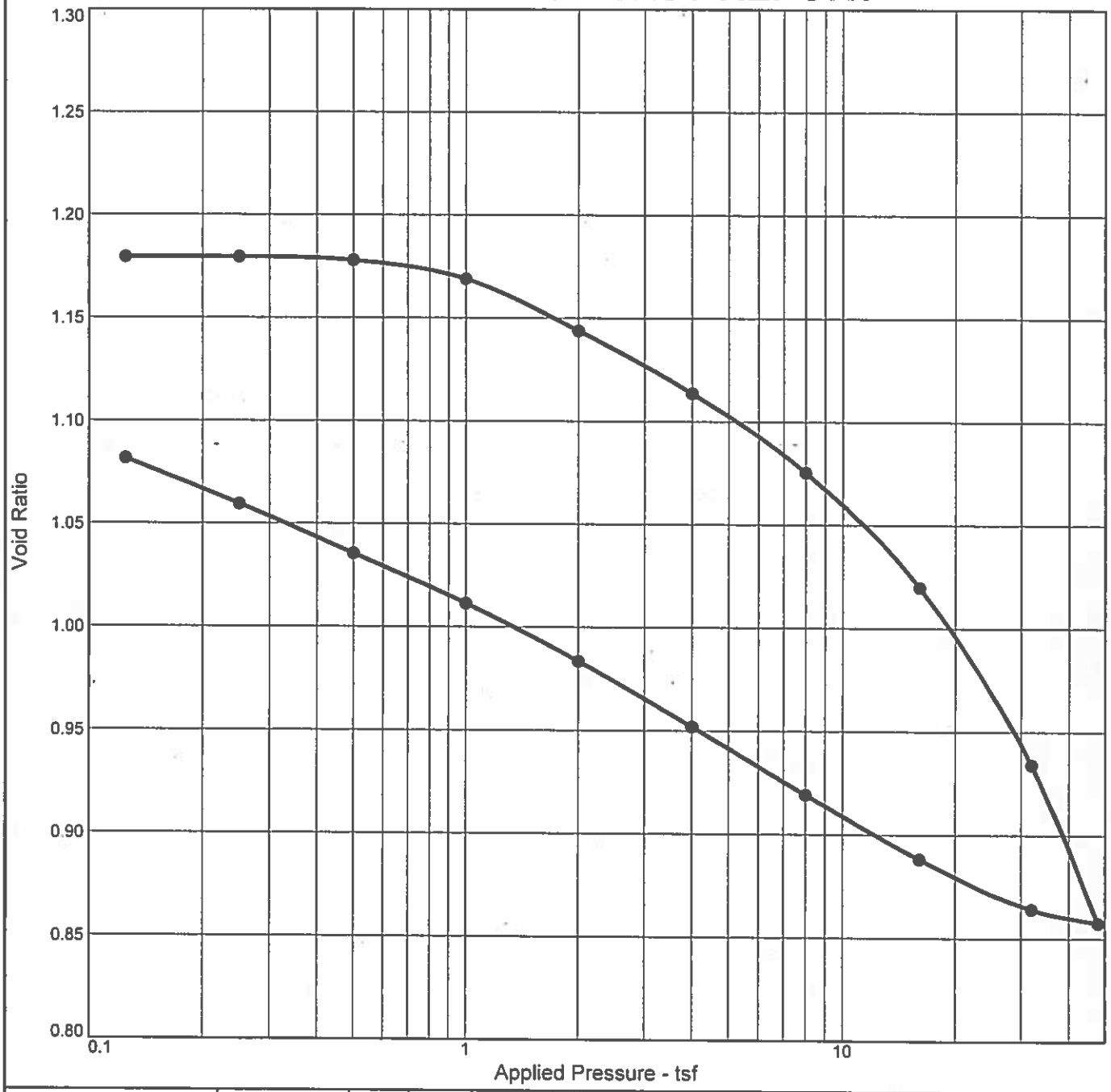
Source of Sample: V-1 **Depth:** 95.5' - 96.0' **Sample Number:** Sb

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
94.8 %	40.8 %	78.6	55	35	2.748	5.8	11.1	0.44		1.182

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(39)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

Source of Sample: V-1 **Depth:** 115.5' - 116.0' **Sample Number:** Ub

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-2 **Elevation (ft)** 4004 **Station** "P" 232 + 59 **Date** 10/31/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
A	4.0 - 5.5	SPT		SC	17.3		42.8	27	18	9						
B	8.0 - 9.5	SPT		SM	26.6		39.6	20	17	3						
Cb	17.5 - 18.0	CMS		CL	29.3	102.3	82.3	27	17	10						OC
Cc	18.0 - 18.5	CMS														UU, G = 2.642
Db	22.5 - 23.0	CMS		CL	28.4	92.1	94.5	31	15	16						H, OC
Dc	23.0 - 23.5	CMS									DS	32	0.7	30	0.9	
Eb	28.5 - 29.0	CMS														UU, G = 2.621
Ec	29.0 - 29.5	CMS		CL-ML	29.9	91.2	50.9	22	18	4						H, OC
Fb	30.5 - 31.0	CMS									DS	35	2.3	31	1.6	
Fc	31.5 - 32.0	CMS		SM	26.3	92.9	25.5	21	NP	NP						OC
G	32.0 - 33.5	SPT		SP-SM	13.8		5.0	19	NP	NP						
H	34.0 - 35.5	SPT		SP-SM	12.6		5.5	17	NP	NP						

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT N = $(N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-2 **Elevation (ft)** 4004 **Station** "P" 232 + 59 **Date** 10/31/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
Ia	38.0 - 38.5	CMS			75.6	54.7										UU, G = 2.589
Ib	38.5 - 39.0	CMS		CH	71.6	55.4	98.8	58	26	32						E
Ic	39.0 - 39.5	CMS		CH	69.1	56.8	98.1	62	26	36						H, OC
Ja	43.0 - 43.5	CMS														CU
Jb	43.5 - 44.0	CMS		CL	54.9	65.0	71.0	48	21	27						
Jc	44.0 - 44.5	CMS														CU, G = 2.640
Kb	48.5 - 49.0	CMS			46.7	73.6										
Kc	49.0 - 49.5	CMS		CL	49.2	71.0	87.2	36	20	16						OC
Lb	56.5 - 57.0	CMS														
Lc	57.0 - 57.5	CMS		SP	17.8	111.7	2.0	19	NP	NP						
Mb	64.5 - 65.0	CMS														
Mc	65.0 - 65.5	CMS		SC-SM	13.4	114.3	22.3	23	19	4						OC

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT $N = (N_{cse})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
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RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-2 **Elevation (ft)** 4004 **Station** "P" 232 + 59 **Date** 10/31/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
N	72.0 - 73.5	SPT		SM	26.5		22.5	24	22	2						
O	80.0 - 81.5	SPT		SP-SM	16.8		11.1	18	NP	NP						
P	88.0 - 89.5	SPT		CH	40.0		97.5	63	23	40						
Qa	96.5 - 97.0	CMS														
Qb	97.0 - 97.5	CMS		CH	37.4	77.2	93.8	71	23	48						H, OC

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

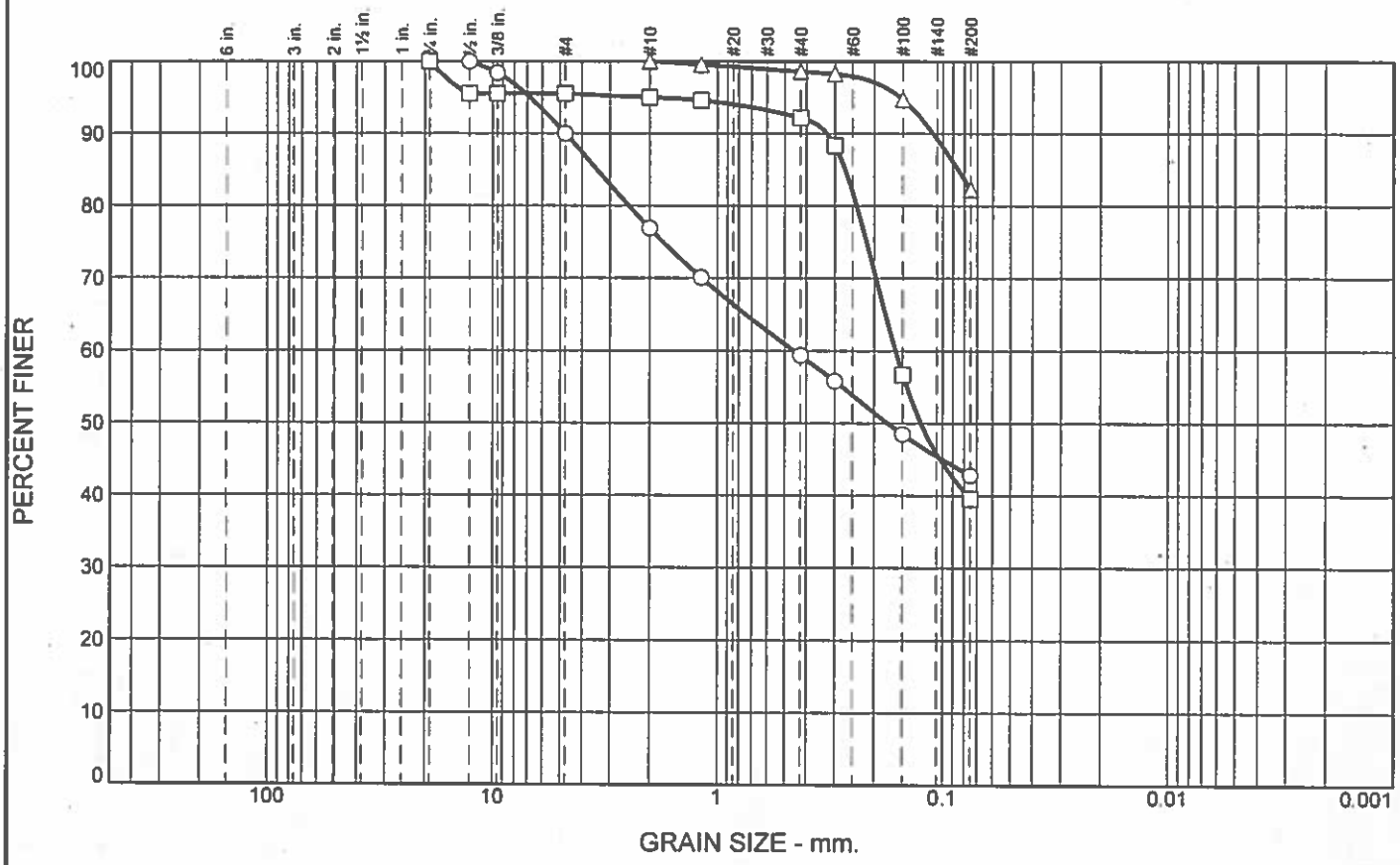
N = Field SPT $N = (N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

* = Average of subsamples

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	10.0	47.2	42.8		SC	A-4(1)	18	27
□	0.0	4.4	56.0	39.6		SM	A-4(0)	17	20
△	0.0	0.0	17.7	82.3		CL	A-4(6)	17	27

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	
1/2"	100.0	95.6	
3/8"	98.4	95.6	
	GRAIN SIZE		
D_{60}	0.4534	0.1614	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	90.0	95.6	
#10	76.9	95.0	100.0
#16	70.1	94.6	99.6
#40	59.4	92.2	98.6
#50	55.8	88.3	98.3
#100	48.5	56.7	94.7
#200	42.8	39.6	82.3

Material Description
○ clayey sand
□ silty sand
△ lean clay with sand

REMARKS:
○
□
△

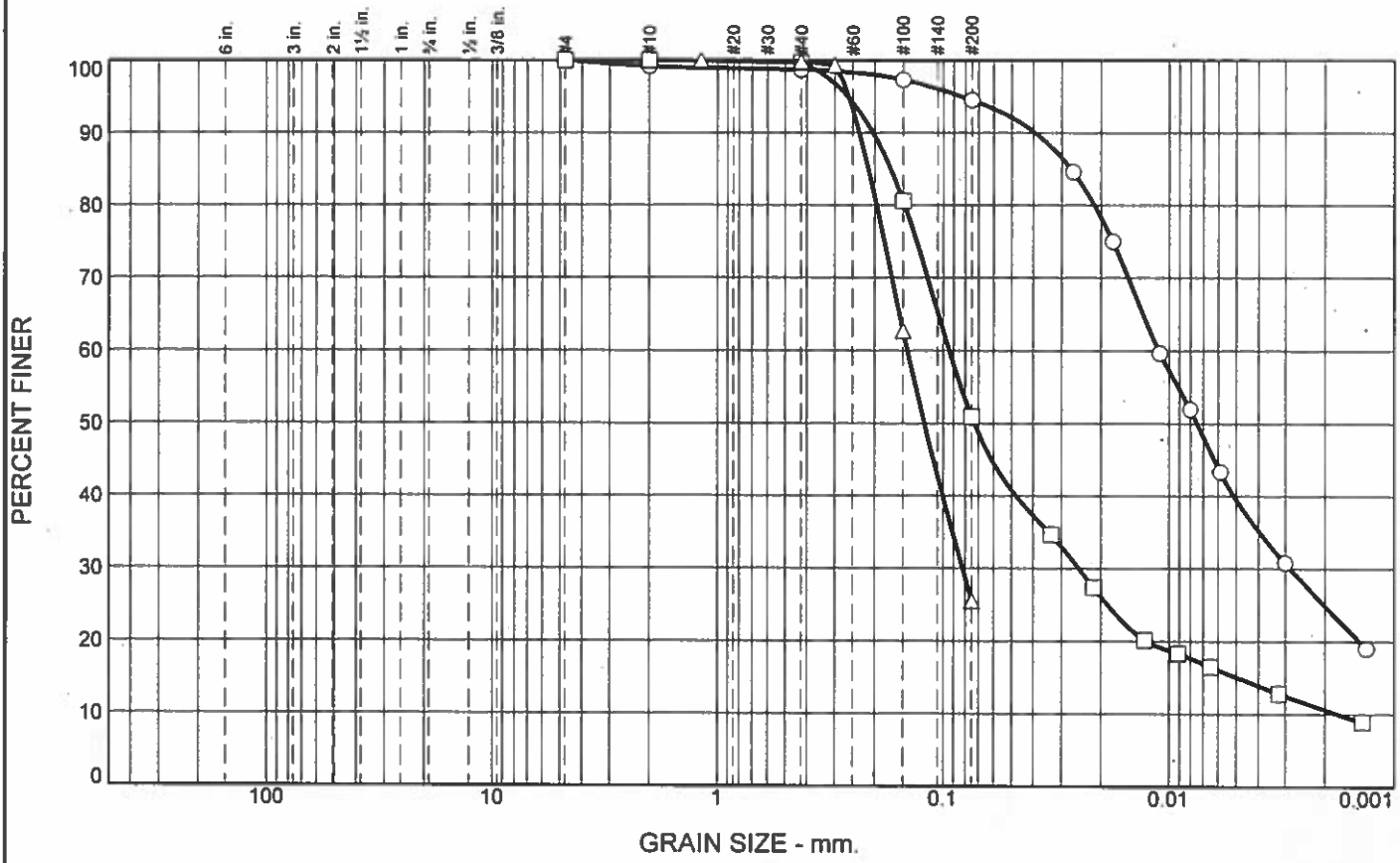
○ Source of Sample: V-2 Depth: 4.0' - 5.5' Sample Number: A
□ Source of Sample: V-2 Depth: 8.0' - 9.5' Sample Number: B
△ Source of Sample: V-2 Depth: 17.5' - 18.0' Sample Number: Cb

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	5.5	69.6	24.9	CL	A-6(14)	15	31
□	0.0	0.0	49.1	40.3	10.6	CL-ML	A-4(0)	18	22
△	0.0	0.0	74.5	25.5		SM	A-2-4(0)	NP	21

SIEVE inches size	PERCENT FINER ○	□	△
	GRAIN SIZE		
D_{60}	0.0111	0.0940	0.1436
D_{30}	0.0029	0.0251	0.0821
D_{10}		0.0018	
	COEFFICIENTS		
C_c		3.82	
C_u		53.65	

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	
#10	99.2	100.0	
#16			100.0
#40	98.7	99.6	99.8
#50			99.3
#100	97.3	80.6	62.7
#200	94.5	50.9	25.5

Material Description
○ lean clay
□ sandy silty clay
△ silty sand

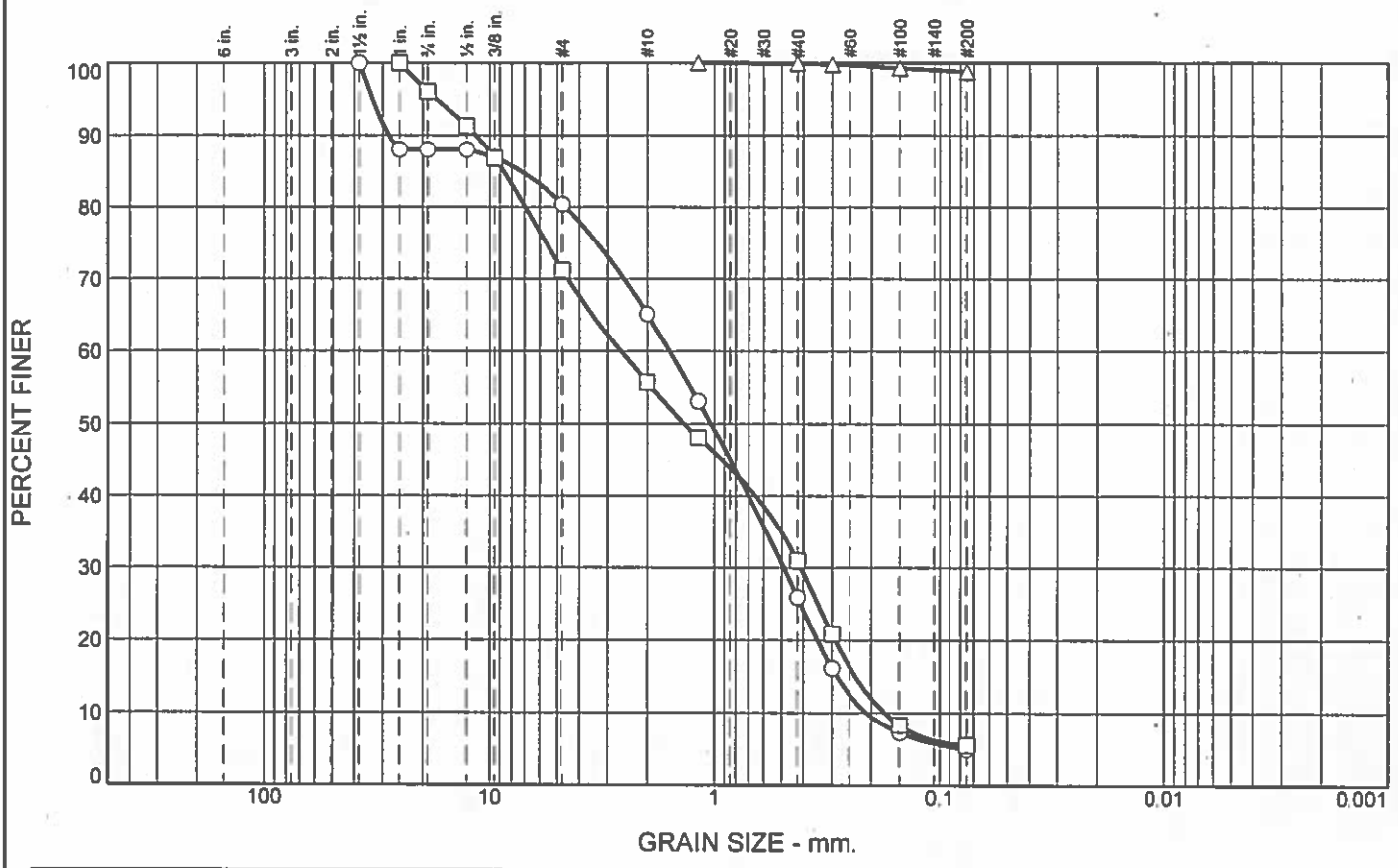
REMARKS:
○
□
△

○ Source of Sample: V-2 Depth: 22.5' - 23.0' Sample Number: Db
□ Source of Sample: V-2 Depth: 29.0' - 29.5' Sample Number: Ec
△ Source of Sample: V-2 Depth: 31.5' - 32.0' Sample Number: Fc

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	19.6	75.4	5.0		SP-SM	A-1-b	NP	19
□	0.0	28.8	65.7	5.5		SP-SM	A-1-b	NP	17
△	0.0	0.0	1.2	98.8		CH	A-7-6(37)	26	58

SIEVE inches size	PERCENT FINER ○	□	△
1.5"	100.0		
1"	88.0	100.0	
3/4"	88.0	96.0	
1/2"	88.0	91.3	
3/8"	86.9	86.8	
	GRAIN SIZE		
D_{60}	1.5828	2.6225	
D_{30}	0.4882	0.4099	
D_{10}	0.2095	0.1745	
	COEFFICIENTS		
C_c	0.72	0.37	
C_u	7.55	15.03	

SIEVE number size	PERCENT FINER ○	□	△
#4	80.4	71.2	
#10	65.1	55.7	
#16	53.1	48.0	100.0
#40	25.9	31.0	99.9
#50	16.1	20.9	99.8
#100	7.3	8.3	99.3
#200	5.0	5.5	98.8

Material Description

○ poorly graded sand with silt and gravel

□ poorly graded sand with silt and gravel

△ fat clay

REMARKS:

○

□

△

○ Source of Sample: V-2 Depth: 32.0' - 33.5' Sample Number: G

□ Source of Sample: V-2 Depth: 34.0' - 35.5' Sample Number: H

△ Source of Sample: V-2 Depth: 38.5' - 39.0' Sample Number: Ib

NEVADA DEPARTMENT OF TRANSPORTATION

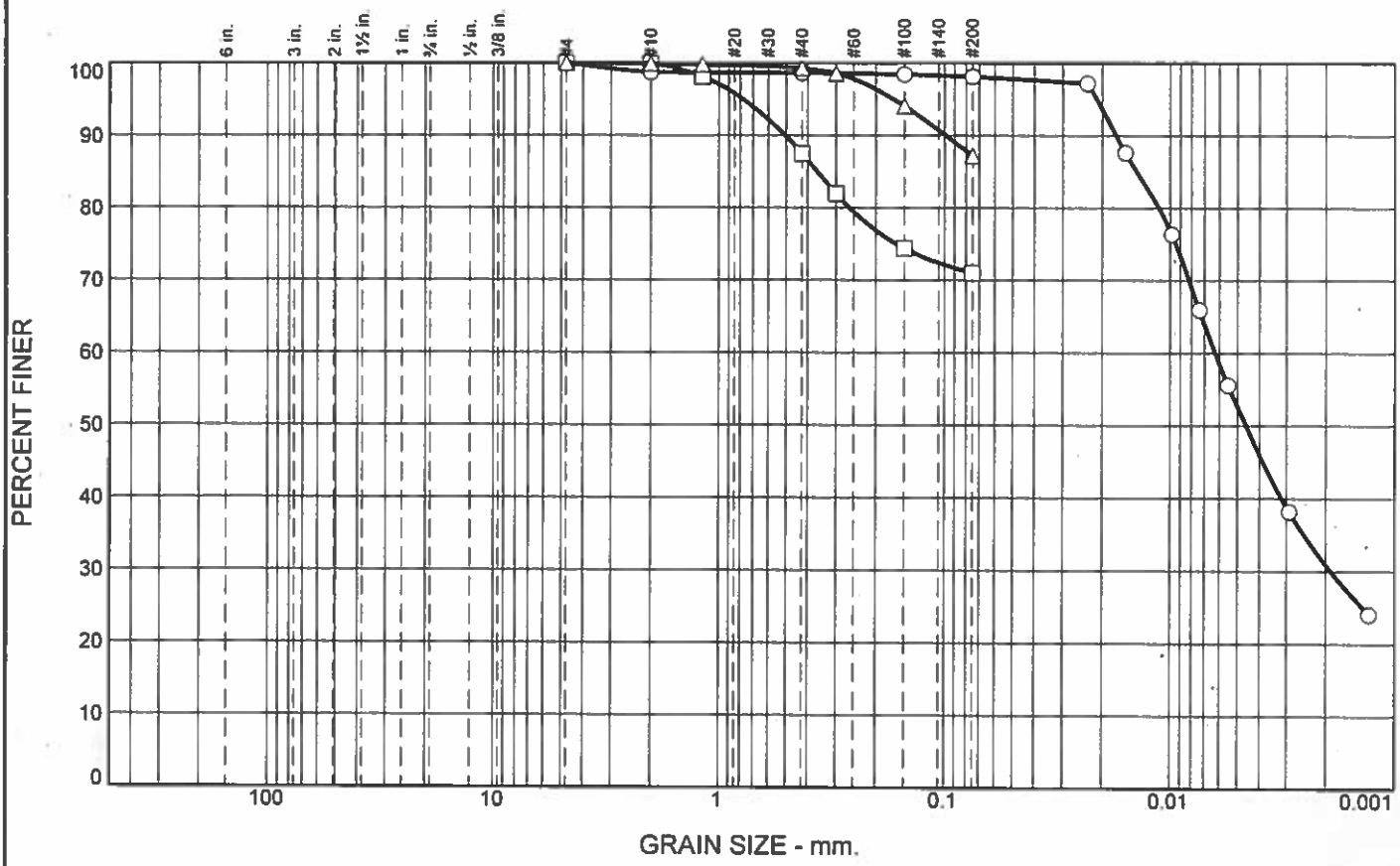
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	1.9	67.2	30.9	CH	A-7-6(41)	26	62
□	0.0	0.0	29.0	71.0		CL	A-7-6(18)	21	48
△	0.0	0.0	12.8	87.2		CL	A-6(14)	20	36

SIEVE inches size	PERCENT FINER ○	□	△
	GRAIN SIZE		
D_{60}	0.0063		
D_{30}	0.0019		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	100.0
#10	98.7	99.9	99.9
#16		98.1	99.8
#40	98.6	87.5	99.3
#50		82.0	98.6
#100	98.4	74.4	94.0
#200	98.1	71.0	87.2

Material Description
○ fat clay
□ lean clay with sand
△ lean clay

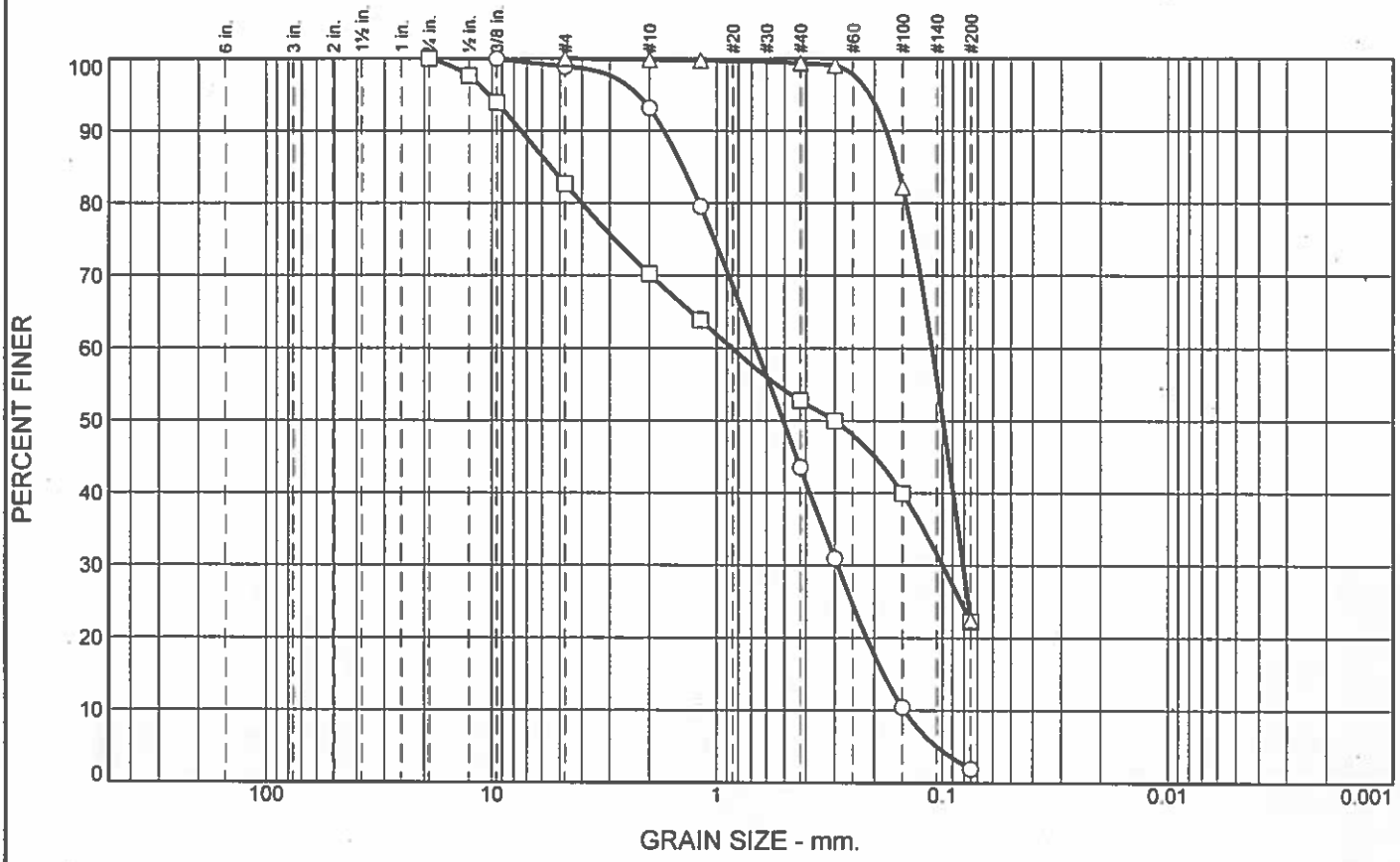
REMARKS:
○
□
△

○ Source of Sample: V-2 Depth: 39.0' - 39.5' Sample Number: Ic
□ Source of Sample: V-2 Depth: 43.5' - 44.0' Sample Number: Jb
△ Source of Sample: V-2 Depth: 49.0' - 49.5' Sample Number: Kc

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.1	96.9	2.0		SP	A-1-b	NP	19
□	0.0	17.3	60.4	22.3		SC-SM	A-2-4(0)	19	23
△	0.0	0.0	77.5	22.5		SM	A-2-4(0)	22	24

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	
1/2"		97.6	
3/8"	100.0	93.9	
	GRAIN SIZE		
D_{60}	0.6655	0.8517	0.1108
D_{30}	0.2918	0.0993	0.0808
D_{10}	0.1469		
	COEFFICIENTS		
C_c	0.87		
C_u	4.53		

SIEVE number size	PERCENT FINER ○	□	△
#4	98.9	82.7	100.0
#10	93.1	70.2	99.8
#16	79.5	63.9	99.7
#40	43.6	52.8	99.3
#50	31.0	50.0	99.1
#100	10.4	40.0	82.2
#200	2.0	22.3	22.5

Material Description

○ poorly graded sand

□ silty, clayey sand with gravel

△ silty sand

REMARKS:

○

□

△

○ Source of Sample: V-2 Depth: 57.0' - 57.5' Sample Number: Lc

□ Source of Sample: V-2 Depth: 65.0' - 65.5' Sample Number: Mc

△ Source of Sample: V-2 Depth: 72.0' - 73.5' Sample Number: N

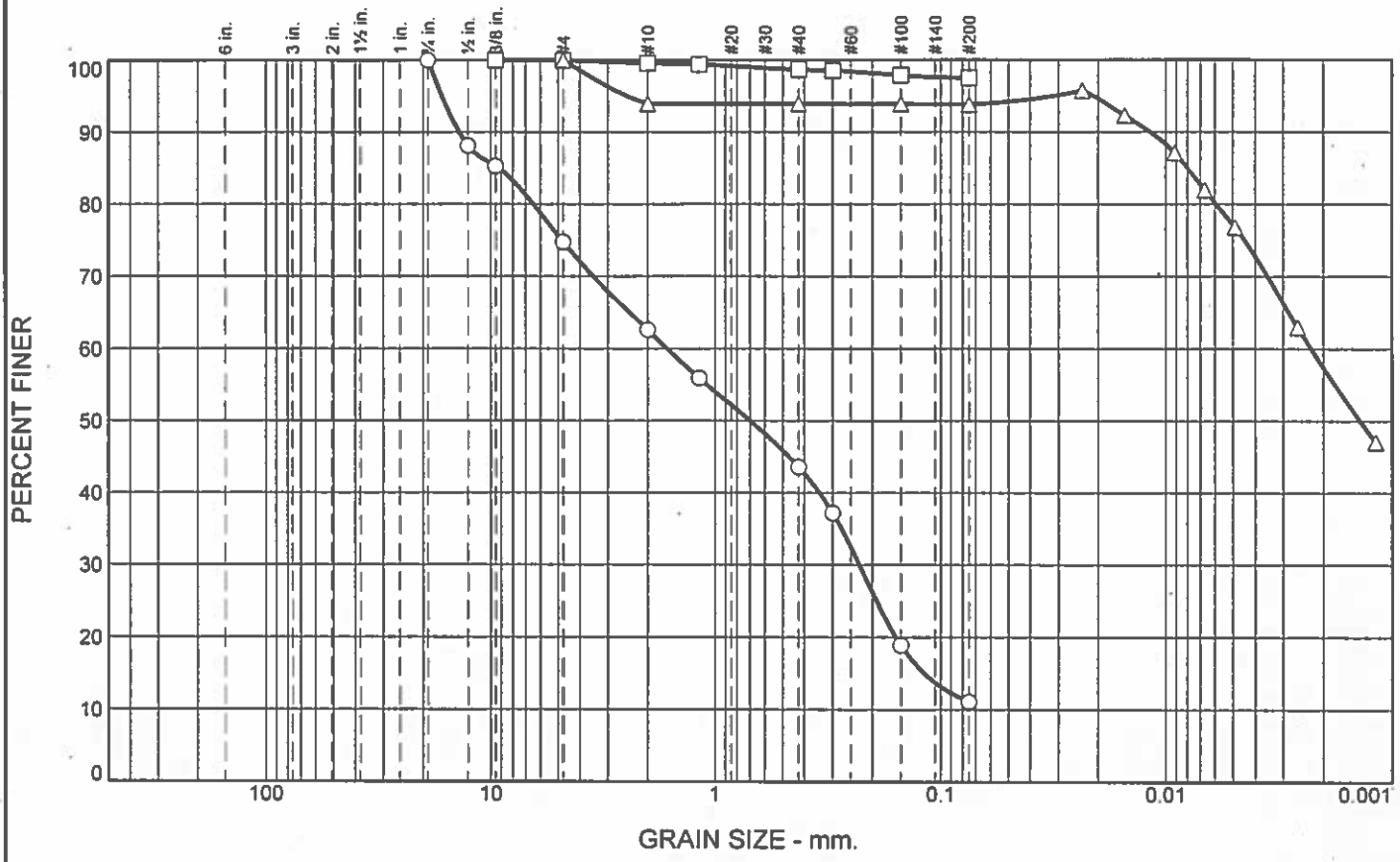
NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	25.2	63.7	11.1		SP-SM	A-1-b	NP	18
□	0.0	0.0	2.5	97.5		CH	A-7-6(45)	23	63
△	0.0	0.0	6.2	36.4	57.4	CH	A-7-6(51)	23	71

SIEVE inches size	PERCENT FINER ○	□	△
3/4"	100.0		
1/2"	88.1		
3/8"	85.3	100.0	
	GRAIN SIZE		
D_{60}	1.6354		0.0023
D_{30}	0.2285		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	74.8	100.0	100.0
#10	62.6	99.6	93.9
#16	55.9	99.4	
#40	43.6	98.7	93.9
#50	37.2	98.5	
#100	18.9	97.9	93.9
#200	11.1	97.5	93.8

Material Description

○ poorly graded sand with silt and gravel

□ fat clay

△ fat clay

REMARKS:

○

□

△

○ Source of Sample: V-2 Depth: 80.0' - 81.5' Sample Number: O

□ Source of Sample: V-2 Depth: 88.0' - 89.5' Sample Number: P

△ Source of Sample: V-2 Depth: 97.0' - 97.5' Sample Number: Qb

NEVADA DEPARTMENT OF TRANSPORTATION

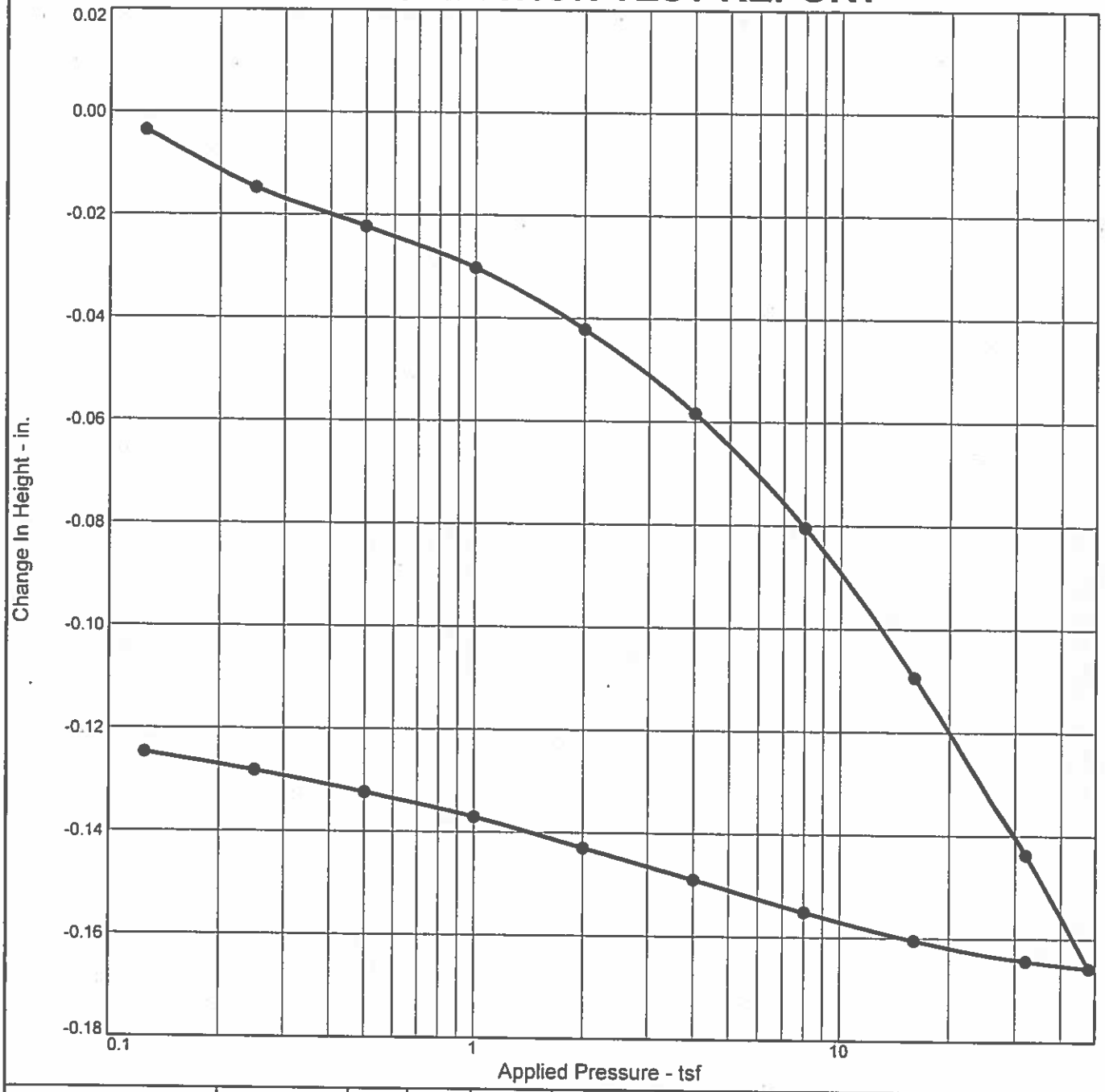
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.7 %	29.3 %	93.1	27	10	2.674	0.9	0.2	0.04		0.793

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay with sand	CL	A-4(6)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

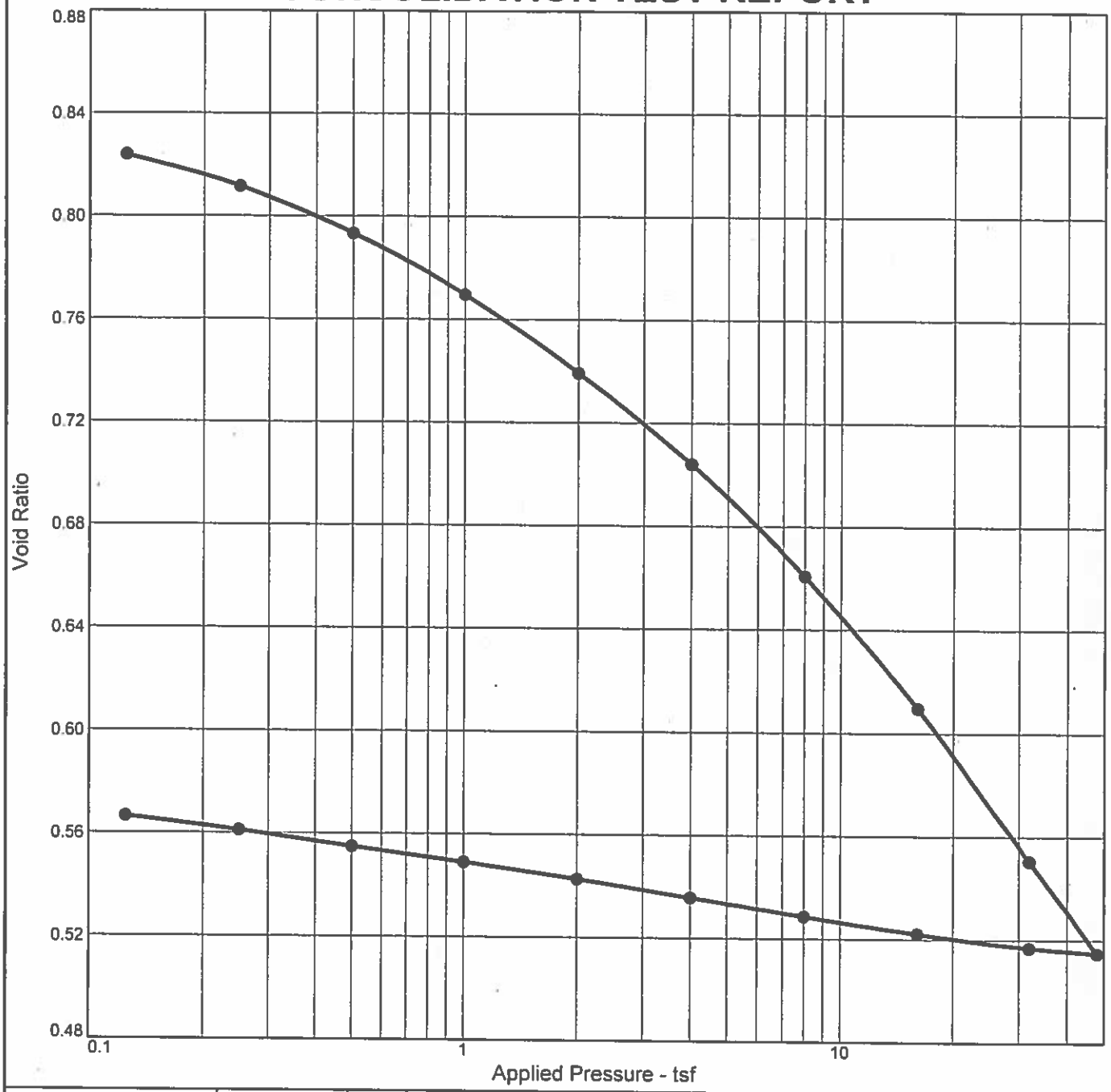
Source of Sample: V-2 **Depth:** 17.5' - 18.0' **Sample Number:** Cb

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.9 %	30.0 %	92.4	31	16	2.734	1.1	2.1	0.20		0.847

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(14)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

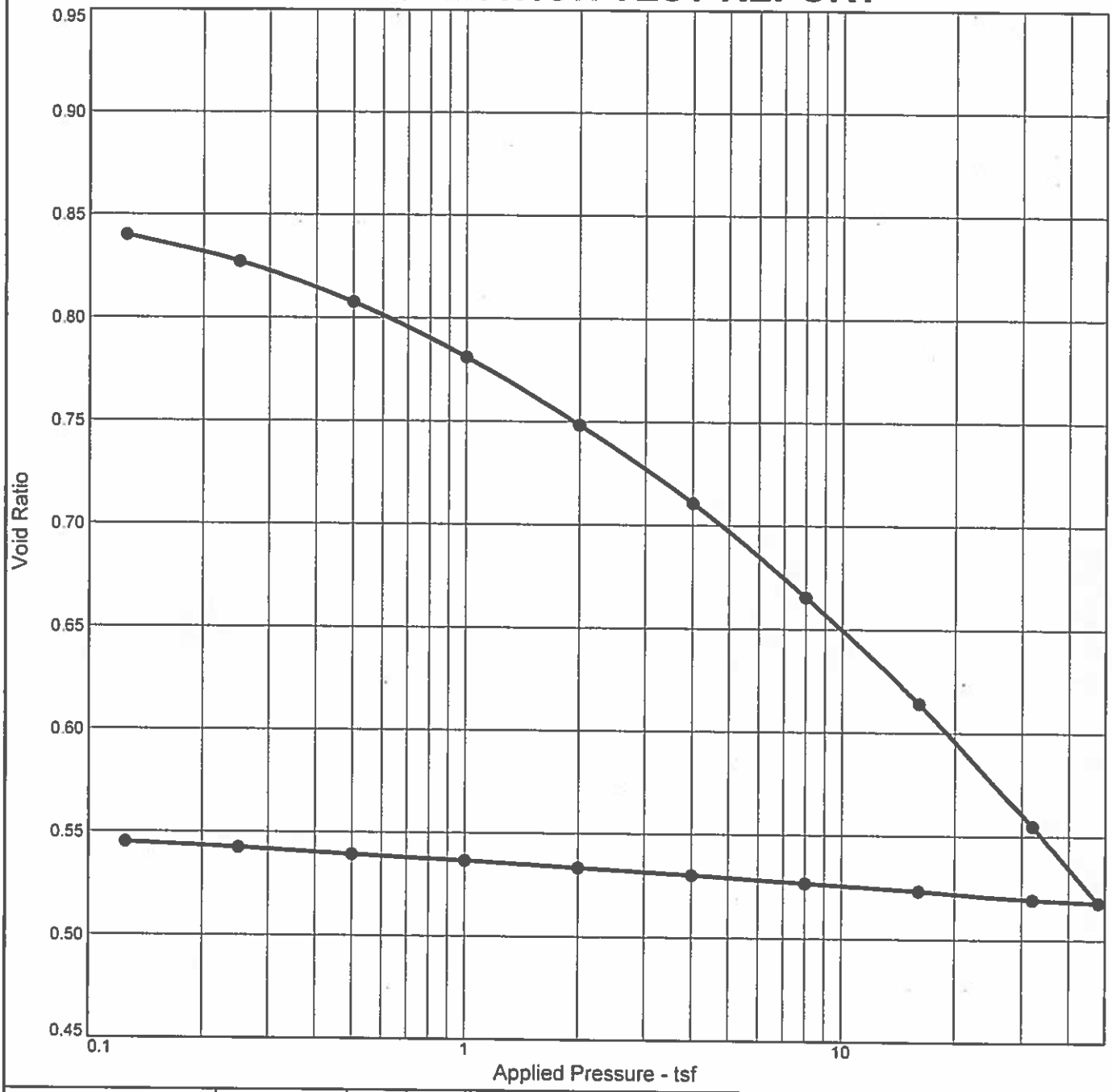
Source of Sample: V-2 **Depth:** 22.5' - 23.0' **Sample Number:** Db

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.3 %	31.4 %	90.4	22	4	2.696	1.5	2.1	0.21		0.861

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silty clay	CL-ML	A-4(0)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

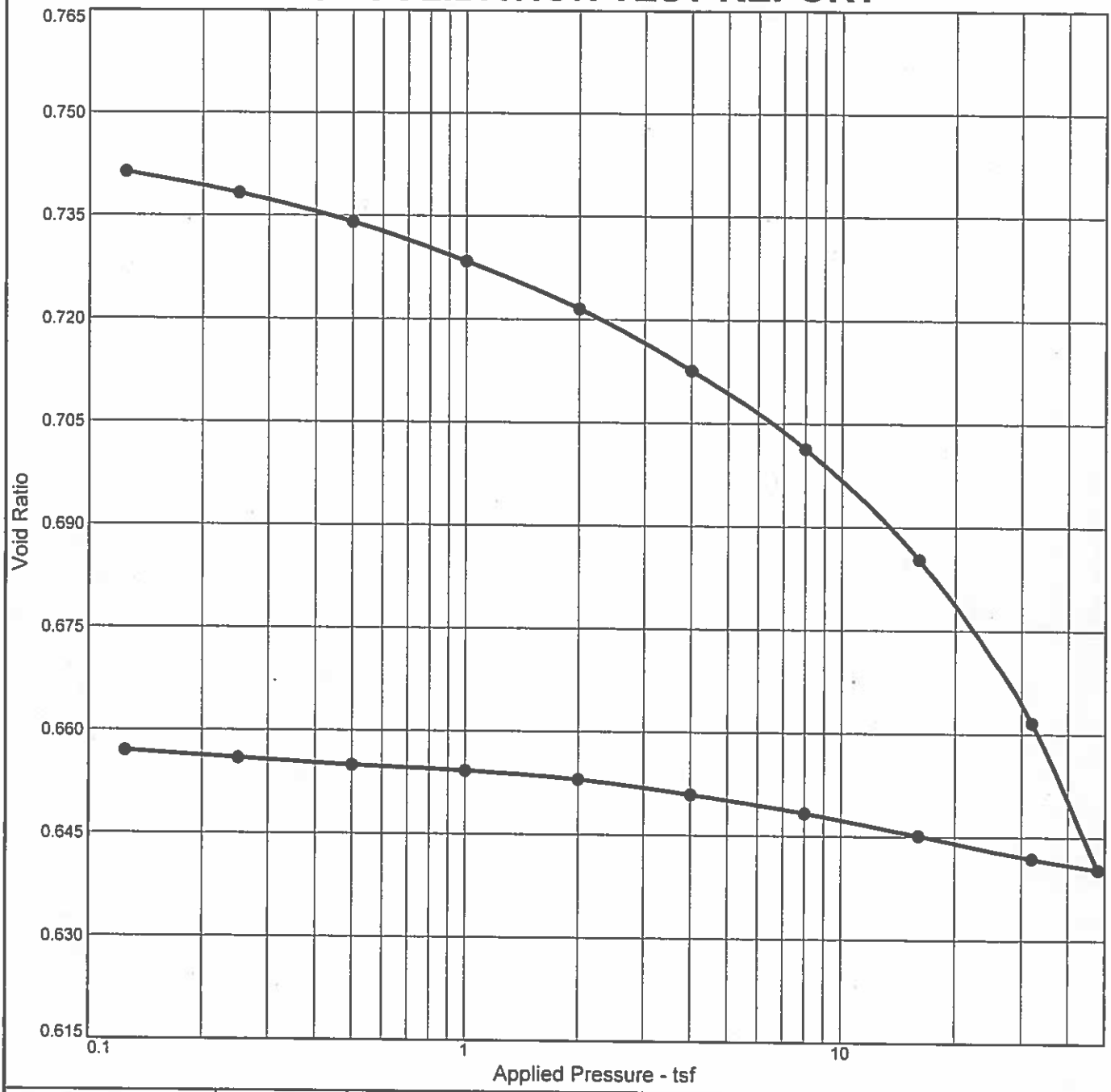
Source of Sample: V-2 **Depth:** 29.0' - 29.5' **Sample Number:** Ec

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
95.9 %	27.2 %	94.5	21	NP	2.649	1.6	17.7	0.12		0.750

MATERIAL DESCRIPTION	USCS	AASHTO
silty sand	SM	A-2-4(0)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

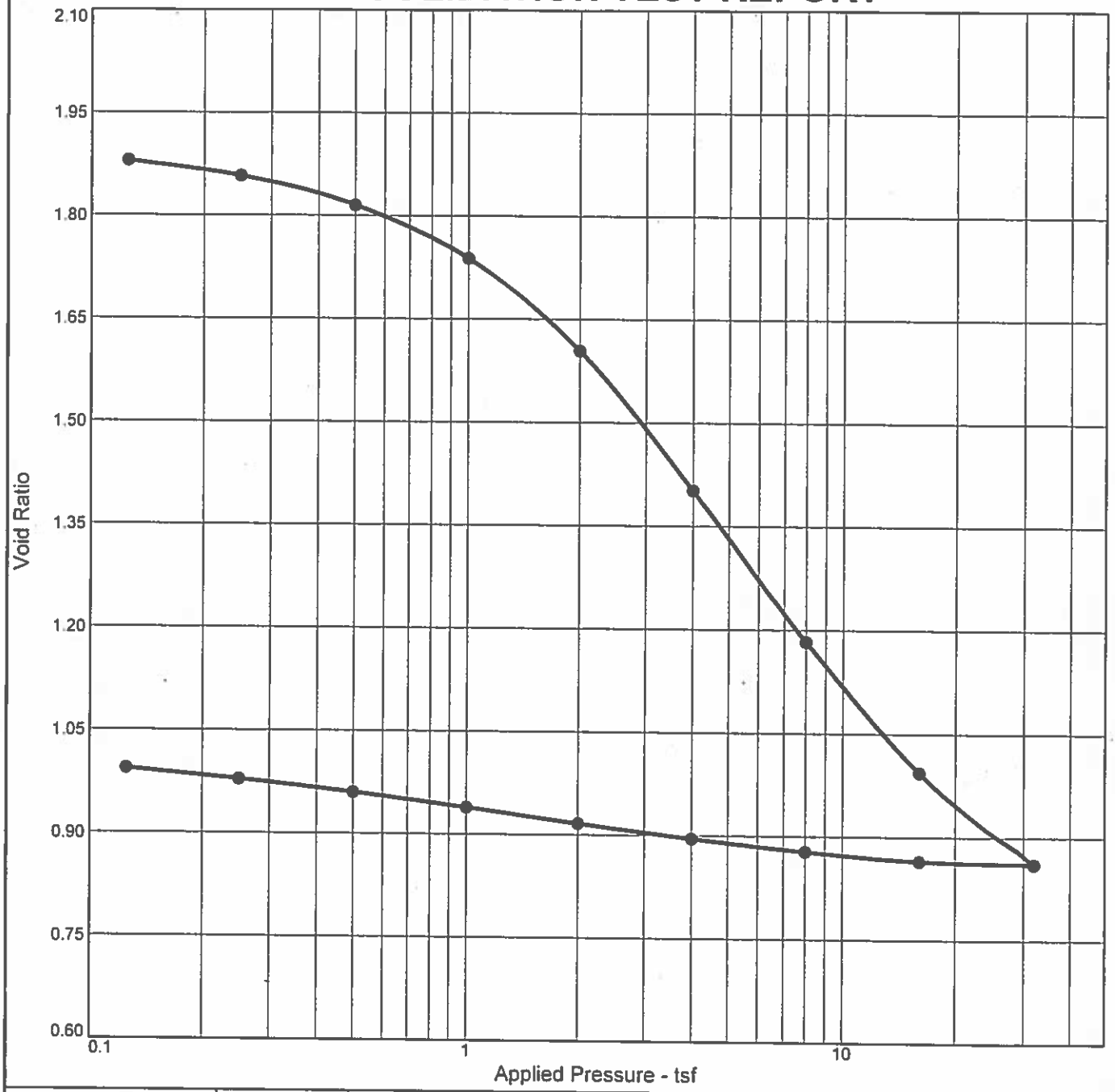
Source of Sample: V-2 **Depth:** 31.5' - 32.0' **Sample Number:** Fc

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.1 %	68.5 %	58.1	62	36	2.710	2.0	1.4	0.74		1.912

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(41)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

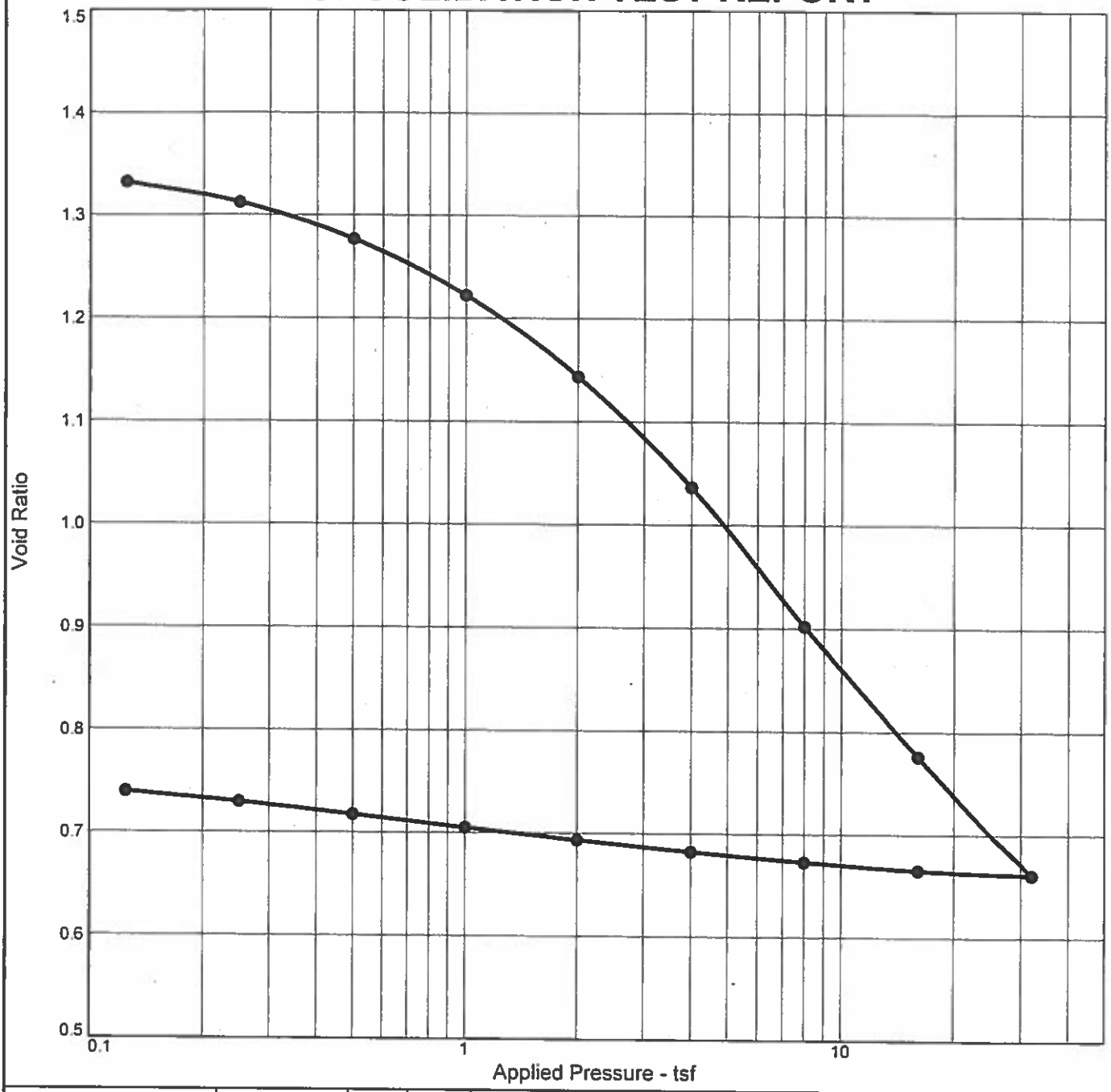
Source of Sample: V-2 **Depth:** 39.0' - 39.5' **Sample Number:** Ic

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.0 %	49.8 %	71.5	36	16	2.704	2.5	1.2	0.46		1.361

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(14)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

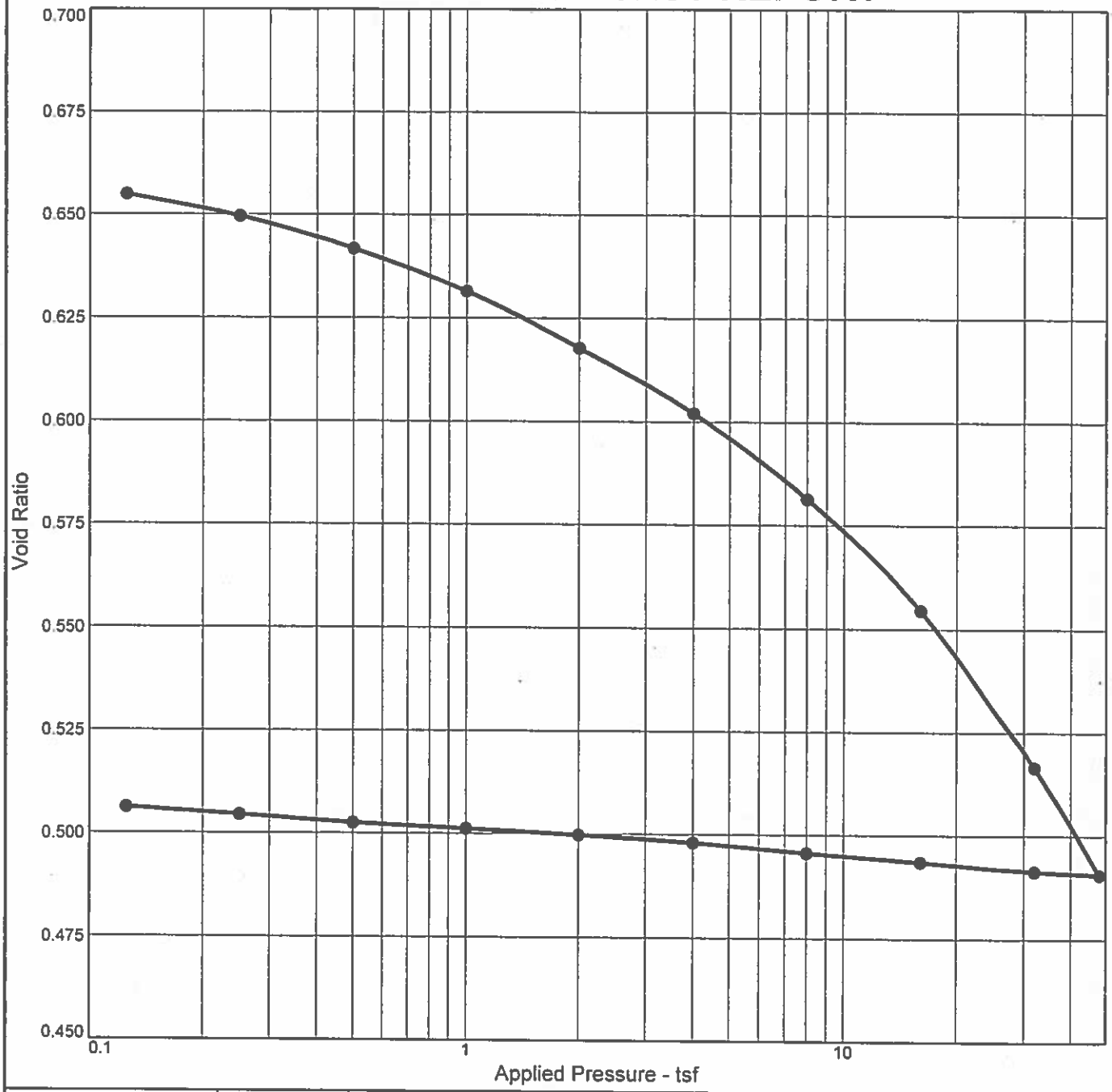
Source of Sample: V-2 **Depth:** 49.0' - 49.5' **Sample Number:** Kc

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.7 %	24.1 %	101.0	23	4	2.698	3.3	5.0	0.15		0.667

MATERIAL DESCRIPTION	USCS	AASHTO
silty, clayey sand with gravel	SC-SM	A-2-4(0)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

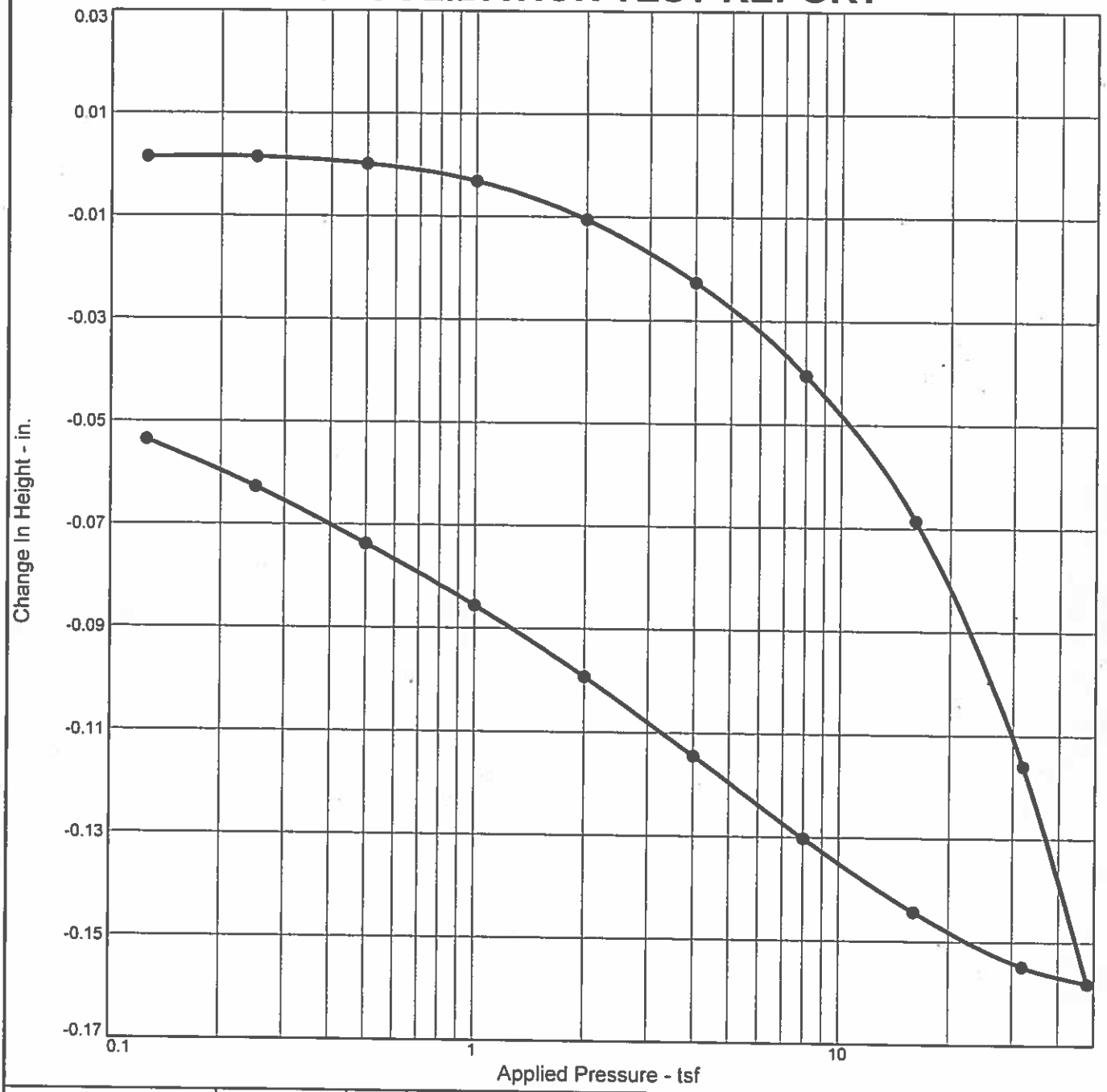
Source of Sample: V-2 **Depth:** 65.0' - 65.5' **Sample Number:** Mc

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.1 %	40.6 %	79.1	71	48	2.698	4.9	12.1	0.51		1.128

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(51)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

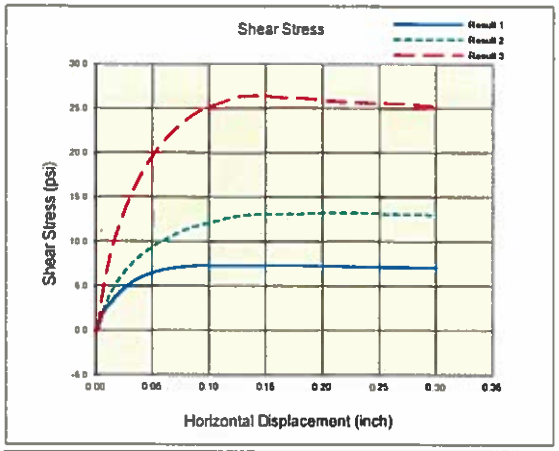
Source of Sample: V-2 **Depth:** 97.0' - 97.5' **Sample Number:** Qb

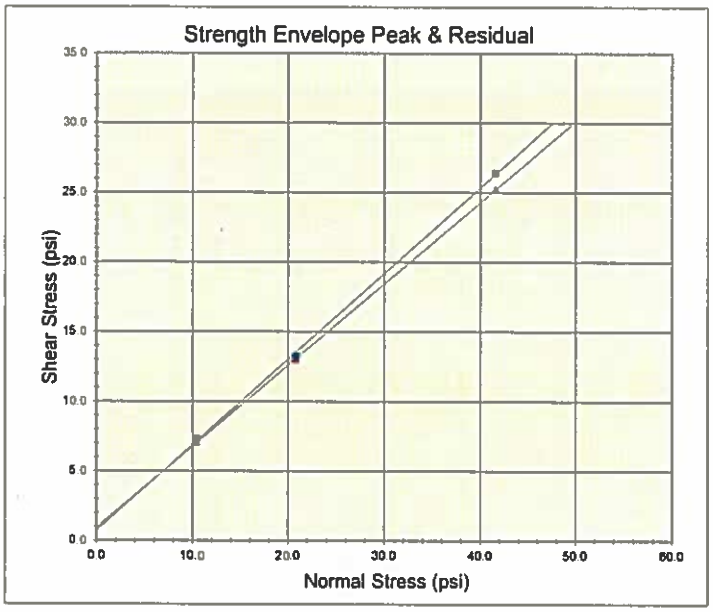
Remarks:

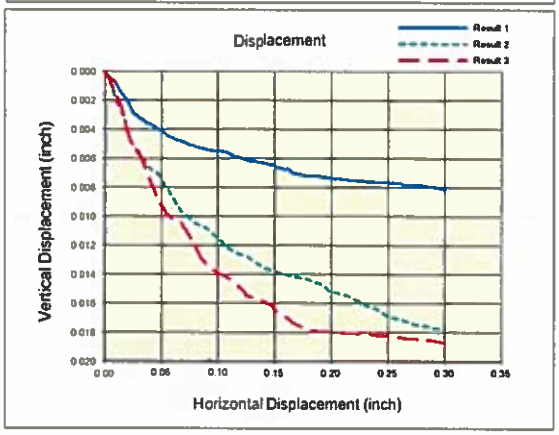
NEVADA DEPARTMENT OF TRANSPORTATION

Figure

DIRECT SHEAR TEST REPORT







Strength Parameters				
	Peak		Residual
Friction Angle =	32	degrees	30
Cohesion =	0.72	psi	0.93

Project: FL-7-18 Boring: V-2 Sample: Dc

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	4/9/2019	4/9/2019	4/9/2019
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	23.00	23.00	23.00
Moisture (%)	31.1	31.3	32.3
Dry Unit Wt (pcf)	89.7	90.2	89.7
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0055
Normal Stress (psi)	10.41	20.82	41.61
Peak Shear Stress(psi)	7.33	13.23	26.43
Residual Shear Stress(psi)	7.0	13.0	25.2
Residual Point Picked @(in)	0.300	0.300	0.300
Time @ Peak Failure (min)	30.4	38.1	26.6

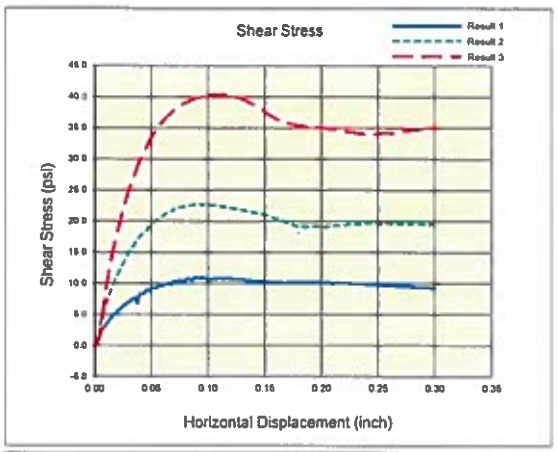
Specimen Comments

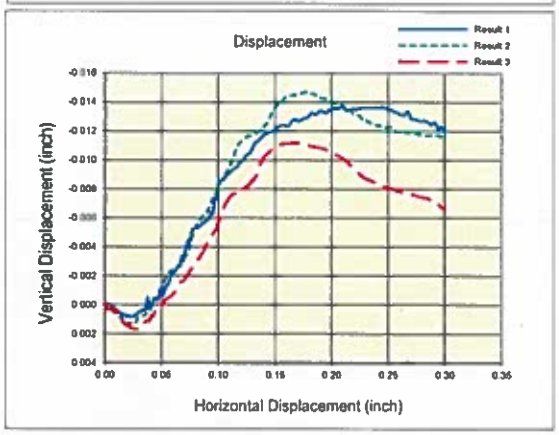
a Brown silty/clay material sheared @ 1,500 psf
b Brown silty/clay material sheared @ 3,000 psf
c Brown silty/clay material sheared @ 6,000 psf

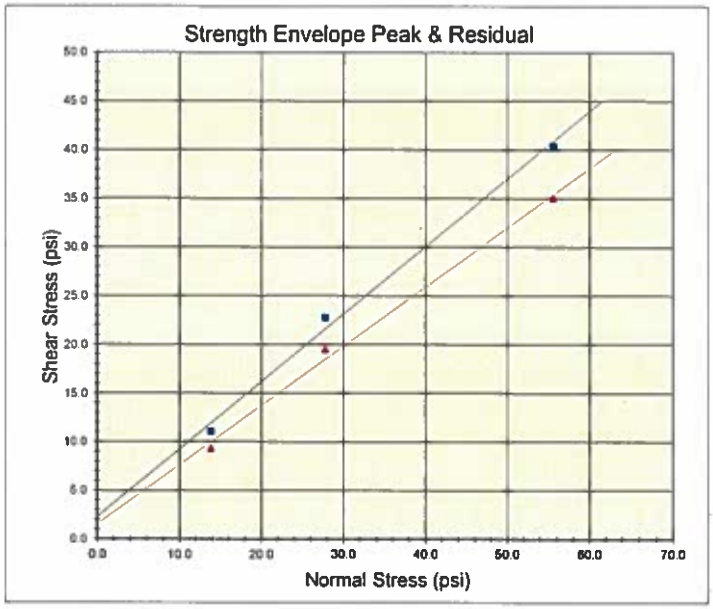
Geotechnical Section
NEVADA DOT

DigiShear Report v4b __ V-2 Dc

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	35	degrees	31
Cohesion =	2.28	psi	1.56

Project: FL-7-18 Boring: V-2 Sample: Fb

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	4/11/2019	4/12/2019	4/11/2019
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	30.50	30.50	30.50
Moisture (%)	24.6	25.0	24.7
Dry Unit Wt (pcf)	97.2	97.8	97.0
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0054
Normal Stress (psi)	13.84	27.80	55.55
Peak Shear Stress(psi)	11.08	22.80	40.44
Residual Shear Stress(psi)	9.3	19.5	35.0
Residual Point Picked @(in)	0.300	0.300	0.300
Time @ Peak Failure (min)	17.3	17.6	20.6

Specimen Comments

a Sandy material sheared @ 2,000 psf
b Sandy material sheared @ 4,000 psf
c Sandy material sheared @ 8,000 psf

Geotechnical Section
NEVADA DOT

DigiShear Report v4b __ V-2 Fb

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-3 **Elevation (ft)** 4004 **Station** "P" 232 + 27 **Date** 10/31/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
A	12.0 - 13.5	SPT		CH	32.4		87.8	64	27	37						
Bb	19.5 - 20.0	CMS		CL-ML	23.7		51.7	20	16	4						
Bc	20.0 - 20.5	CMS									DS	30	2.3	32	0.7	
Cb	27.5 - 28.0	CMS		CL	36.8	81.9	88.2	32	21	11						OC
Cc	28.5 - 29.0	CMS			36.1	81.8										G = 2.629
Db	29.5 - 30.0	CMS		CL	33.0	86.2	74.2	31	17	14						
Dc	30.0 - 30.5	CMS									DS	35	0.9	34	0.5	
Eb	32.5 - 33.0	CMS		SC-SM	23.4	99.1	37.7	21	17	4						
Ec	33.0 - 33.5	CMS			13.1	112.5										G = 2.696
Fb	36.5 - 37.0	CMS		CH	64.0	59.6	97.6	52	28	24						
Fc	37.0 - 37.5	CMS									DS	23	3.7	23	3.7	
Gb	40.5 - 41.0	CMS		CL	77.0	53.3	75.4	41	22	19						OC

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT $N = (N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

* = Average of subsamples

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-3 **Elevation (ft)** 4004 **Station** "P" 232 + 27 **Date** 10/31/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
Gc	41.0 - 41.5	CMS			73.2	55.6										CU, G = 2.655
H	44.0 - 45.5	SPT			16.4		6.7									Ch
I	48.0 - 49.5	SPT		GW	5.8		2.8									
J																No Recovery
K																No Recovery
L	57.0 - 58.5	SPT		SP-SM	19.6		7.7	15	NP	NP						
M	62.0 - 63.5	SPT		SM	30.6		38.6	23	NP	NP						
N	67.0 - 68.5	SPT		SP-SM	19.0		10.6	20	NP	NP						
Ob	73.5 - 74.0	CMS		SM	23.8	97.3	48.6	25	23	2						OC
Oc	74.0 - 74.5	CMS									DS	34	3.3	34	1.6	
Pc	78.5 - 79.0	CMS		SM	19.0		12.1	19	NP	NP						
Q	82.0 - 83.5	SPT			21.7		12.6									Ch

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

N = Field SPT $N = (N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

SUMMARY OF RESULTS
N.D.O.T. GEOTECHNICAL SECTION

EA/Cont # 74122 **Job Description** B-28 on SR 396

Boring No. V-3 **Elevation (ft)** 4004 **Station** "P" 232 + 27 **Date** 10/31/2018

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMP-LER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST					COMMENTS
											TEST TYPE	Φ deg. (Peak)	C psi (Peak)	Φ deg. (Residual)	C psi (Residual)	
Ra	86.0 - 86.5	CMS			42.2	78.0										CU, G = 2.580
Rb	86.5 - 87.0	CMS		CH	39.3	79.5	100.0	63	22	41						OC
Rc	87.0 - 87.5	CMS			38.2	81.4										CU, G = 2.643
Sb	92.5 - 93.0	CMS		CH	37.7	82.3	100.0	65	24	41						
Sc	93.0 - 93.5	CMS			36.0	84.3										UU, G = 2.626
Ta	98.0 - 98.5	CMS		CH	36.7	83.0	100.0	71	25	46						OC
Tb	98.5 - 99.0	CMS		CH	36.1	83.1	92.2	68	24	44						
Tc	99.0 - 99.5	CMS			38.9	80.3										UU, G = 2.644
Uc	109.0 - 109.5	CMS			40.6	79.2										UU, G = 2.592
Vb	118.5 - 119.0	CMS		CH	39.6	78.7	100.0	57	24	33						OC
Vc	119.0 - 119.5	CMS														CU, G = 2.573

CMS = California Modified Sampler 2.42" ID
SPT = Standard Penetration 1.38" ID
CS = Continuous Sample 3.23" ID
RC = Rock Core
PB = Pitcher Barrel
CSS = Calif. Split Spoon 2.42" ID
CPT = Cone Penetration Test
TP = Test Pit
P = Pushed, not driven
R = Refusal
Sh = Shelby Tube 2.87" ID

U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler

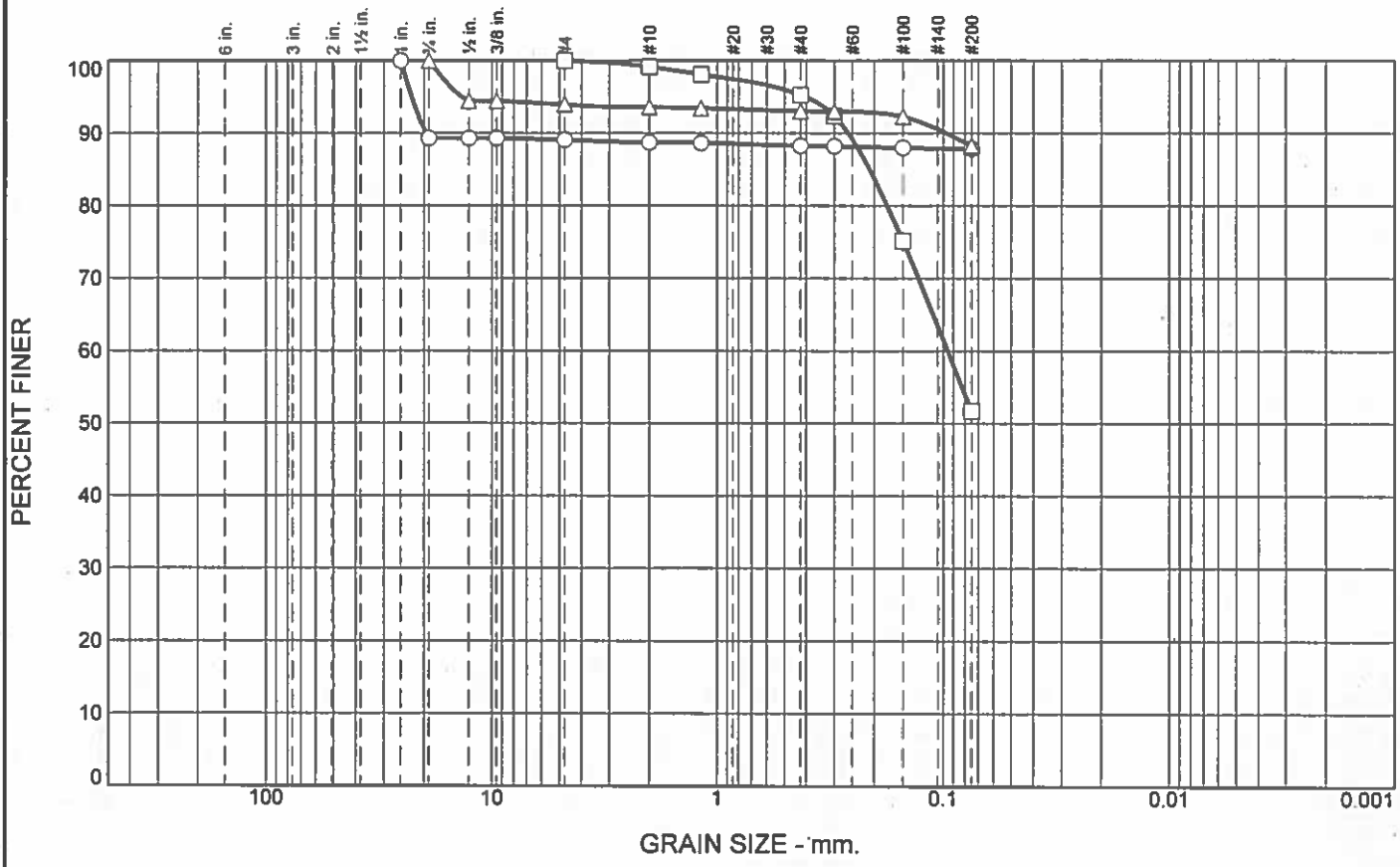
N = Field SPT $N = (N_{cor})(0.62)$

H = Hydrometer
S = Sieve
G = Specific Gravity
PI = Plasticity Index
LL = Liquid Limit
PL = Plastic Limit
NP = Non-Plastic
OC = Consolidation
Ch = Chemical
RV = R - Value
MD = Moisture Density

CM = Compaction
E = Swell/Pressure on Expansive Soils
SL = Shrinkage Limit
UW= Unit Weight
W = Moisture Content
K = Permeability
O = Organic Content
D = Dispersive
RQD = Rock Quality Designation
X = X-Ray Defraction
HCpot = Hydro-Collapse Potential

*** = Average of subsamples**

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	10.9	1.3	87.8		CH	A-7-6(37)	27	64
□	0.0	0.0	48.3	51.7		CL-ML	A-4(0)	16	20
△	0.0	6.0	5.8	88.2		CL	A-6(9)	21	32

SIEVE inches size	PERCENT FINER ○	□	△
1"	100.0		
3/4"	89.3		100.0
1/2"	89.3		94.4
3/8"	89.3		94.4
GRAIN SIZE			
D_{60}		0.0952	
D_{30}			
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	89.1	100.0	94.0
#10	88.7	99.2	93.6
#16	88.7	98.1	93.4
#40	88.3	95.3	93.0
#50	88.2	92.3	93.0
#100	88.0	75.1	92.3
#200	87.8	51.7	88.2

Material Description
○ fat clay
□ sandy silty clay
△ lean clay

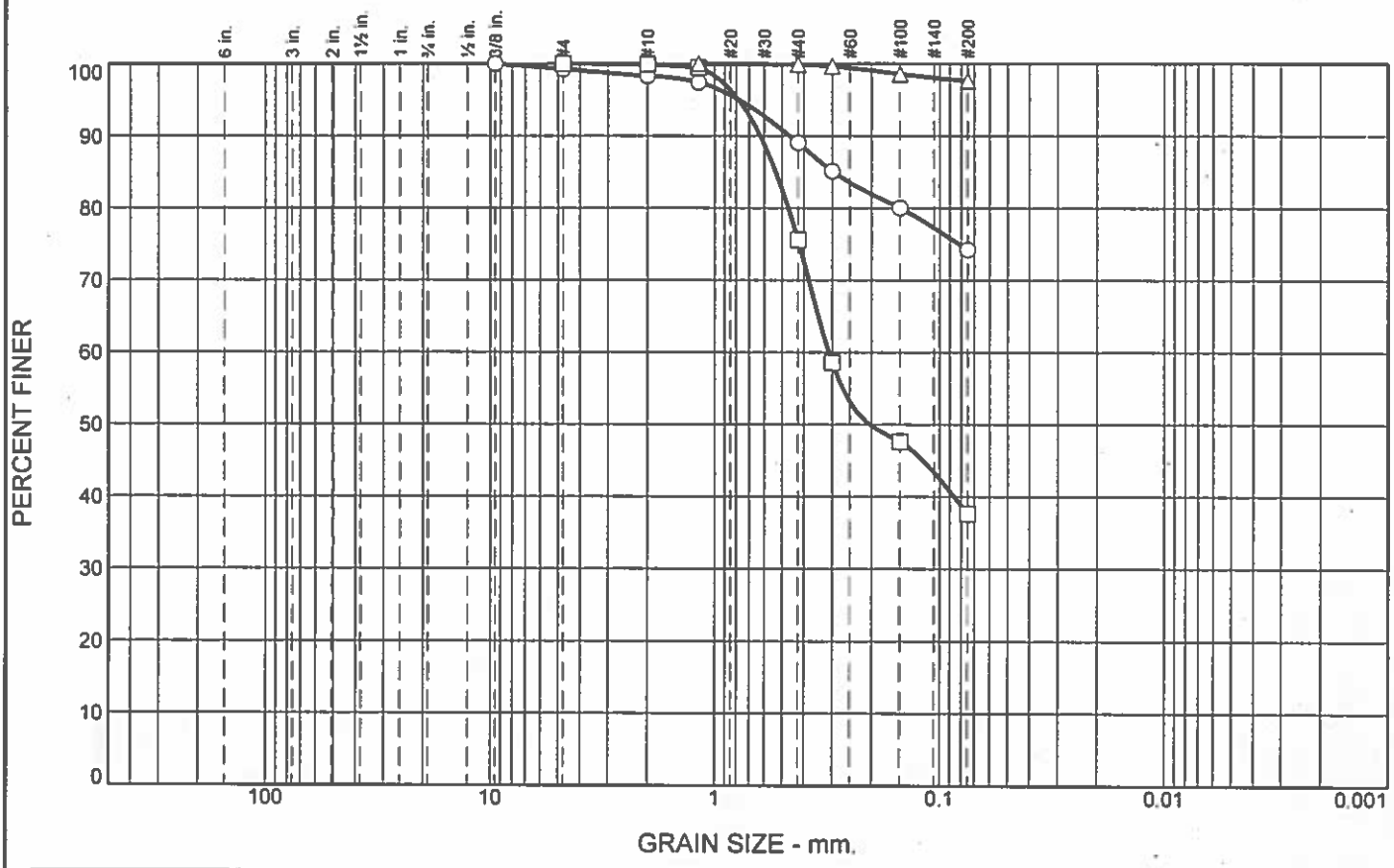
REMARKS:
○
□
△

○ Source of Sample: V-3 Depth: 12.0' - 13.5' Sample Number: A
□ Source of Sample: V-3 Depth: 19.5' - 20.0' Sample Number: Bb
△ Source of Sample: V-3 Depth: 27.5' - 28.0' Sample Number: Cb

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.8	25.0	74.2		CL	A-6(8)	17	31
□	0.0	0.0	62.3	37.7		SC-SM	A-4(0)	17	21
△	0.0	0.0	2.4	97.6		CH	A-7-6(28)	28	52

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0		
	GRAIN SIZE		
D_{60}		0.3106	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.2	100.0	
#10	98.3	99.9	
#16	97.4	99.4	100.0
#40	89.1	75.6	99.9
#50	85.1	58.6	99.6
#100	80.0	47.6	98.6
#200	74.2	37.7	97.6

Material Description
○ lean clay with sand
□ silty, clayey sand
△ fat clay

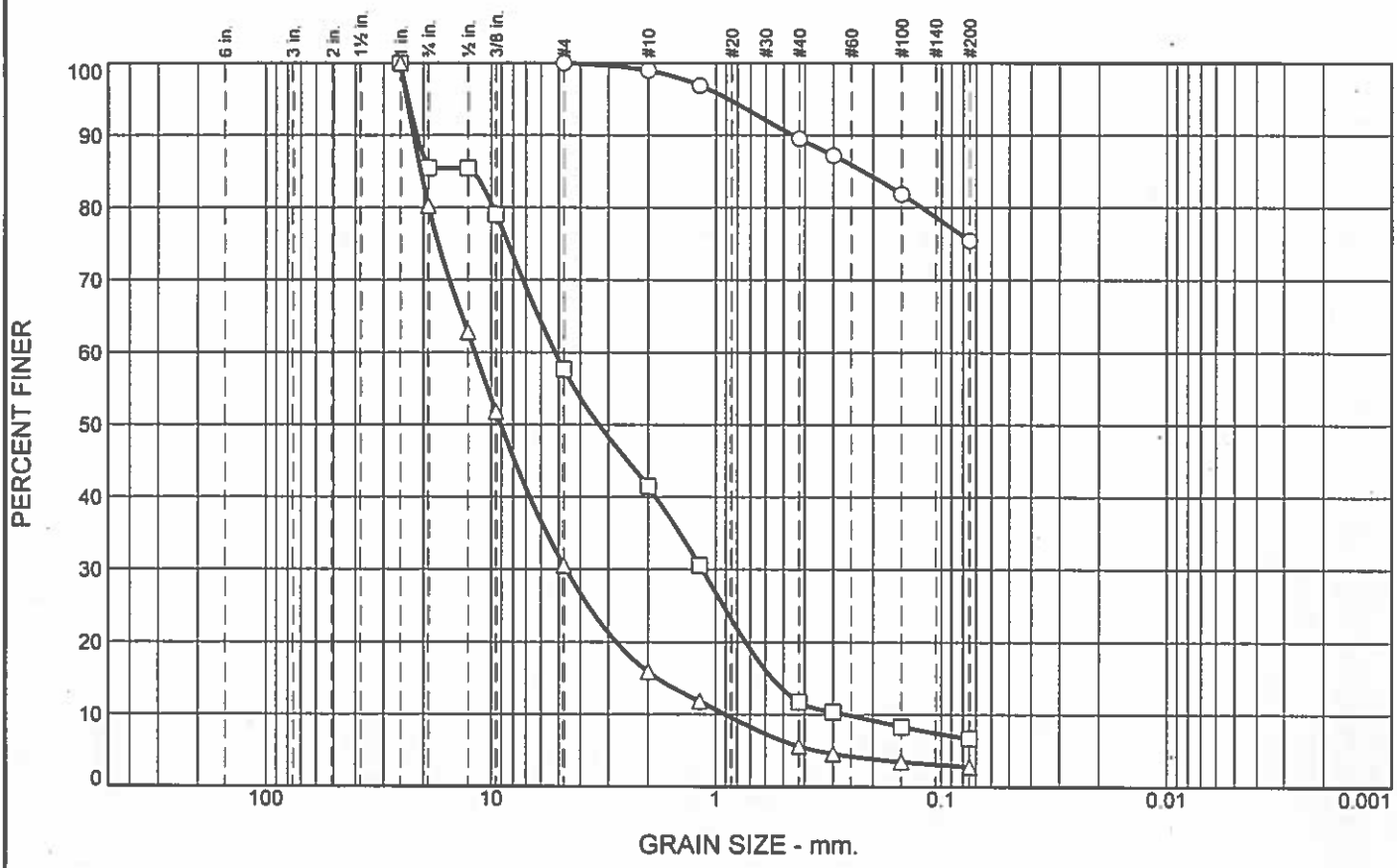
REMARKS:
○
□
△

○ Source of Sample: V-3 Depth: 29.5' - 30.0' Sample Number: Db
□ Source of Sample: V-3 Depth: 32.5' - 33.0' Sample Number: Eb
△ Source of Sample: V-3 Depth: 36.5' - 37.0' Sample Number: Fb

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	24.6	75.4		CL	A-7-6(14)	22	41
□	0.0	42.3	51.0	6.7					
△	0.0	69.4	27.8	2.8		GW			

SIEVE inches size	PERCENT FINER ○	□	△
1"		100.0	100.0
3/4"		85.5	80.2
1/2"		85.5	62.8
3/8"		79.0	51.8
GRAIN SIZE			
D_{60}		5.1906	11.7972
D_{30}		1.1487	4.6418
D_{10}		0.2620	0.9043
COEFFICIENTS			
C_c		0.97	2.02
C_u		19.81	13.05

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	57.7	30.6
#10	99.0	41.5	15.9
#16	96.9	30.6	11.8
#40	89.5	11.7	5.6
#50	87.2	10.3	4.6
#100	81.8	8.3	3.5
#200	75.4	6.7	2.8

Material Description

○ lean clay with sand

□

△

REMARKS:

○

□

△

○ Source of Sample: V-3 Depth: 40.5' - 41.0' Sample Number: Gb

□ Source of Sample: V-3 Depth: 44.0' - 45.5' Sample Number: H

△ Source of Sample: V-3 Depth: 48.0' - 49.5' Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

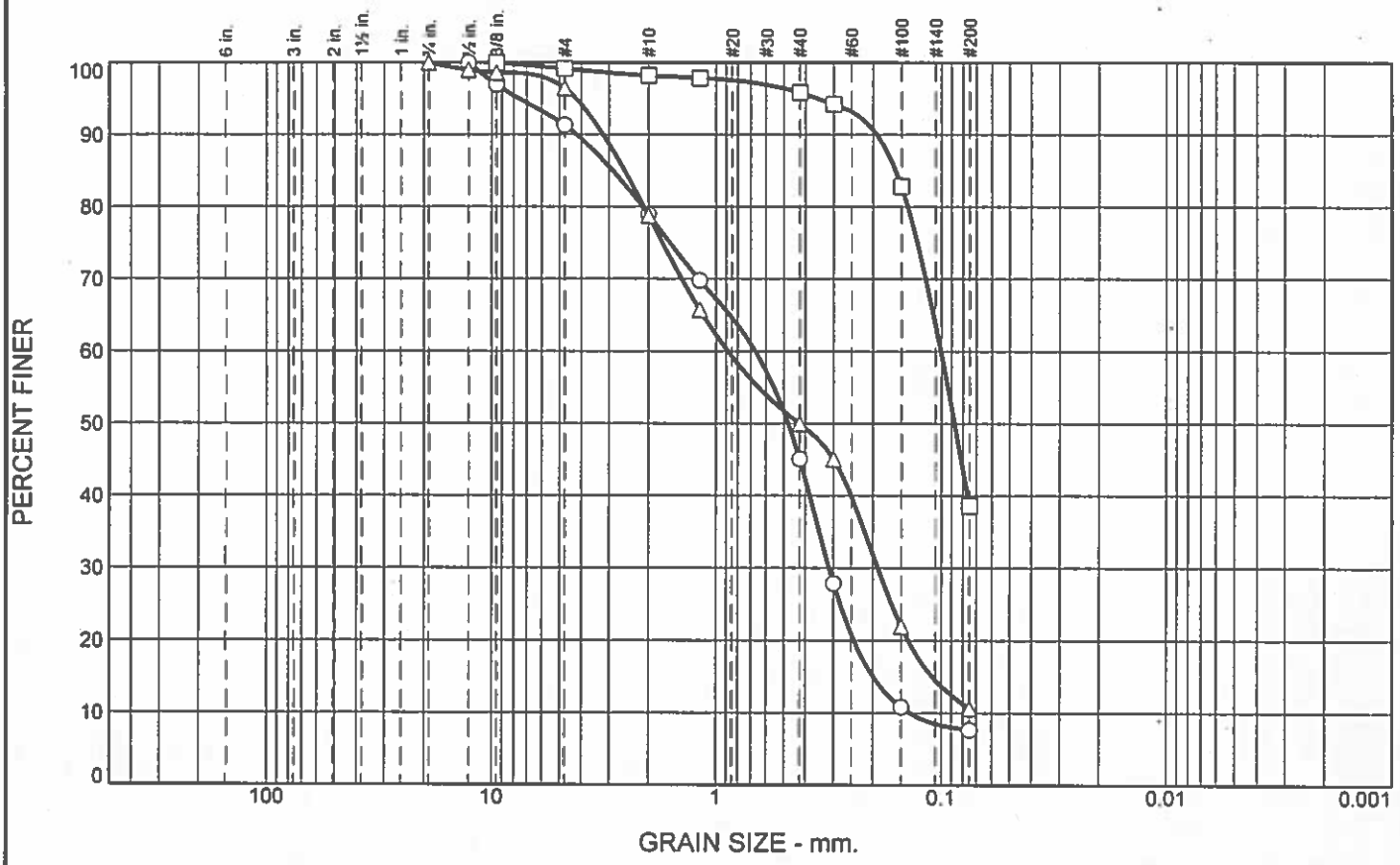
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	8.7	83.6	7.7		SP-SM	A-1-b	NP	15
□	0.0	0.8	60.6	38.6		SM	A-4(0)	NP	23
△	0.0	3.6	85.8	10.6		SP-SM	A-1-b	NP	20

SIEVE inches size	PERCENT FINER ○	□	△
3/4"			100.0
1/2"	100.0		99.0
3/8"	96.9	100.0	98.6
	GRAIN SIZE		
D_{60}	0.6679	0.1003	0.8854
D_{30}	0.3140		0.1901
D_{10}	0.1368		
	COEFFICIENTS		
C_c	1.08		
C_u	4.88		

SIEVE number size	PERCENT FINER ○	□	△
#4	91.3	99.2	96.4
#10	78.9	98.2	78.8
#16	69.8	97.8	65.7
#40	45.1	95.8	49.9
#50	27.9	94.2	45.1
#100	10.8	82.8	21.9
#200	7.7	38.6	10.6

Material Description

○ poorly graded sand with silt

□ silty sand

△ poorly graded sand with silt

REMARKS:

○

□

△

○ Source of Sample: V-3 Depth: 57.0' - 58.5' Sample Number: L

□ Source of Sample: V-3 Depth: 62.0' - 63.5' Sample Number: M

△ Source of Sample: V-3 Depth: 67.0' - 68.5' Sample Number: N

NEVADA DEPARTMENT OF TRANSPORTATION

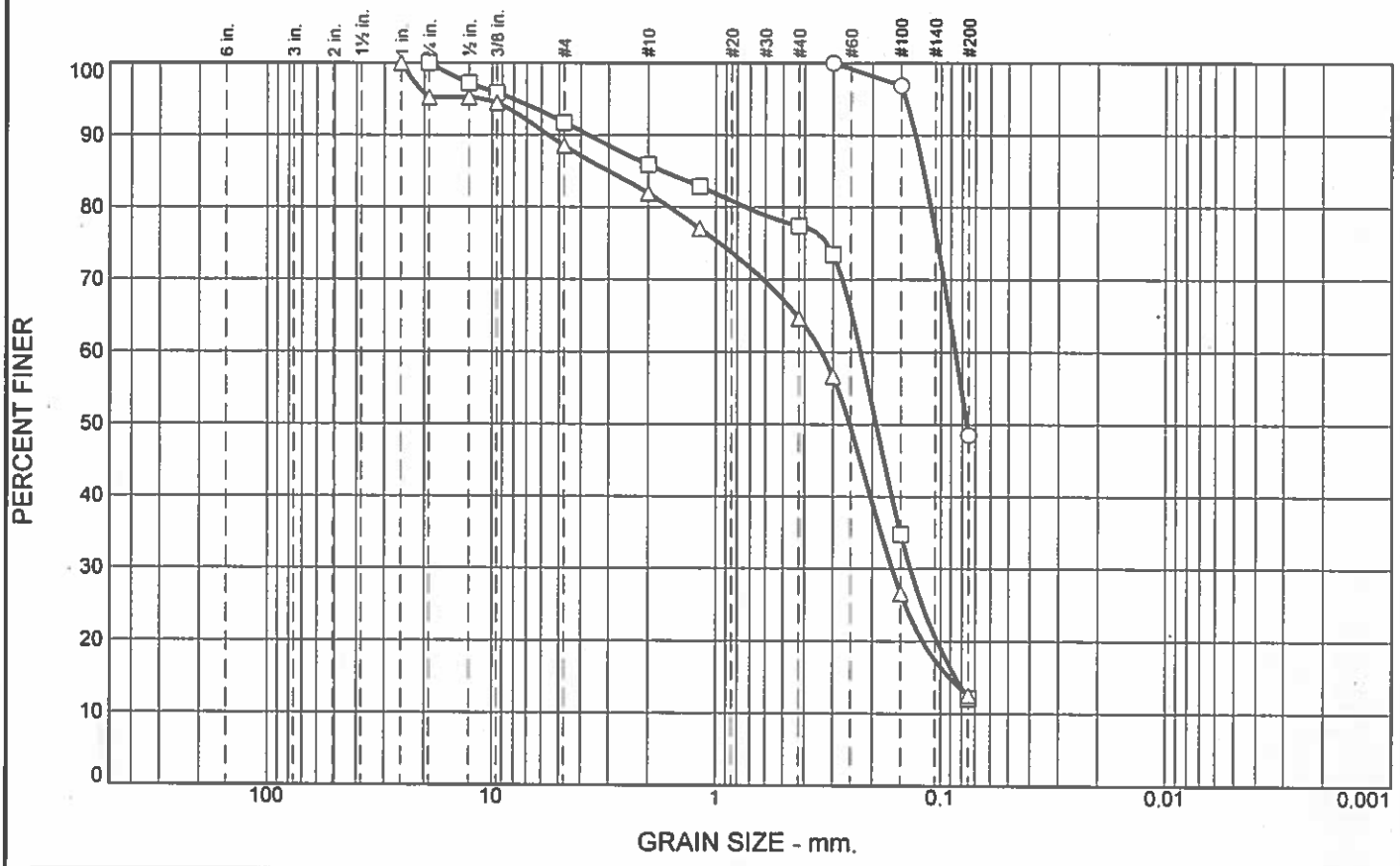
Client: K. Jermstad

Project: B-28 on SR 396

Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	51.4	48.6		SM	A-4(0)	23	25
□	0.0	8.3	79.6	12.1		SM	A-2-4(0)	NP	19
△	0.0	11.5	75.9	12.6					

SIEVE inches size	PERCENT FINER ○	□	△
1"			100.0
3/4"		100.0	95.2
1/2"		97.2	95.2
3/8"		95.8	94.4
	GRAIN SIZE		
D_{60}	0.0858	0.2255	0.3366
D_{30}		0.1361	0.1636
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4		91.7	88.5
#10		85.9	81.9
#16		82.9	77.0
#40		77.4	64.7
#50	100.0	73.5	56.7
#100	96.9	34.8	26.6
#200	48.6	12.1	12.6

Material Description
○ silty sand
□ silty sand
△

REMARKS:
○
□
△

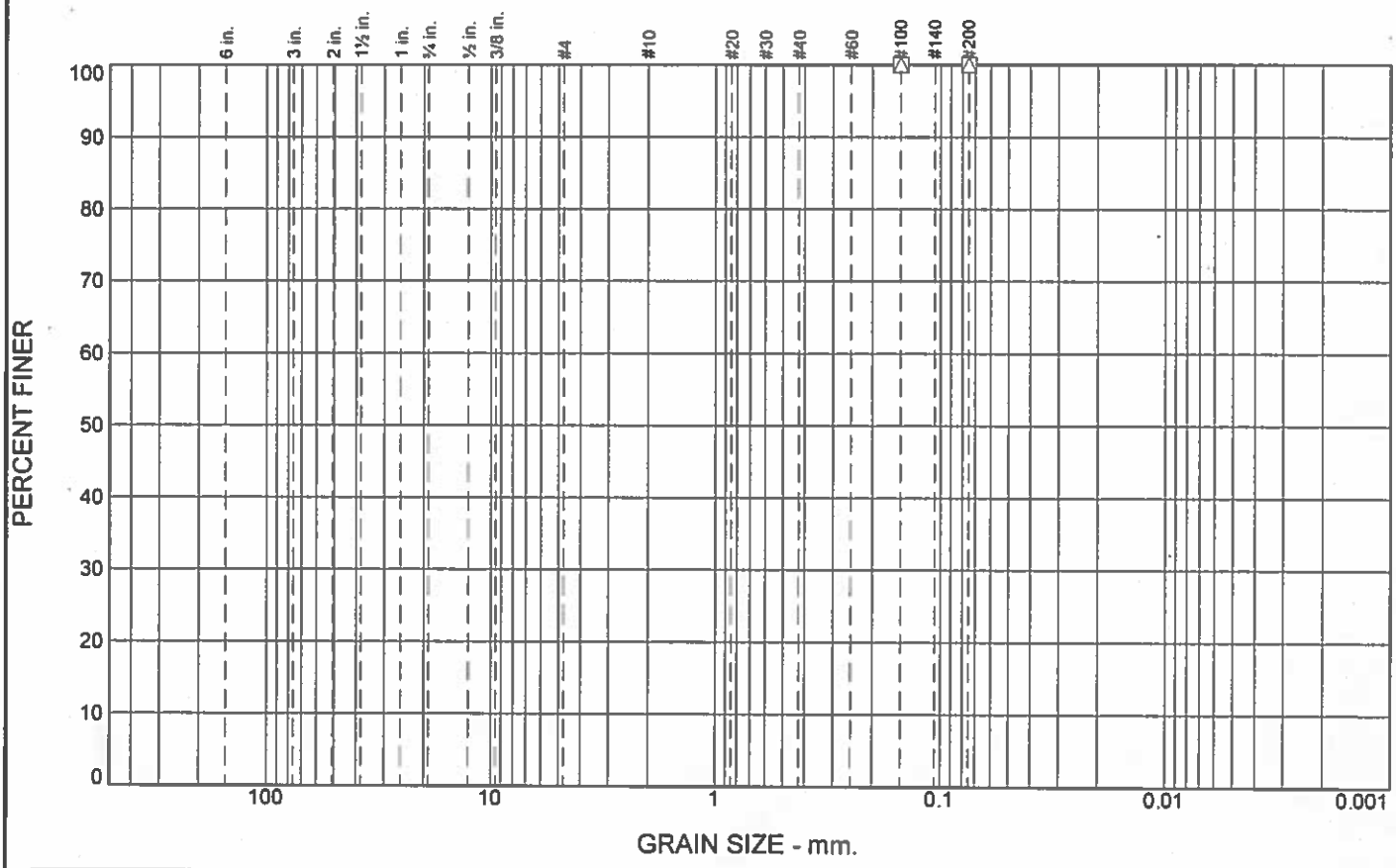
○ Source of Sample: V-3 Depth: 73.5' - 74.0' Sample Number: Ob
□ Source of Sample: V-3 Depth: 78.5' - 79.0' Sample Number: Pc
△ Source of Sample: V-3 Depth: 82.0' - 83.5' Sample Number: Q

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	0.0	100.0		CH	A-7-6(47)	22	63
□	0.0	0.0	0.0	100.0		CH	A-7-6(47)	24	65
△	0.0	0.0	0.0	100.0		CH	A-7-6(54)	25	71

SIEVE inches size	PERCENT FINER ○	□	△
GRAIN SIZE			
D_{60}			
D_{30}			
D_{10}			
COEFFICIENTS			
C_C			
C_U			

SIEVE number size	PERCENT FINER ○	□	△
#100	100.0	100.0	100.0
#200	100.0	100.0	100.0

Material Description
○ fat clay
□ fat clay
△ fat clay

REMARKS:
○
□
△

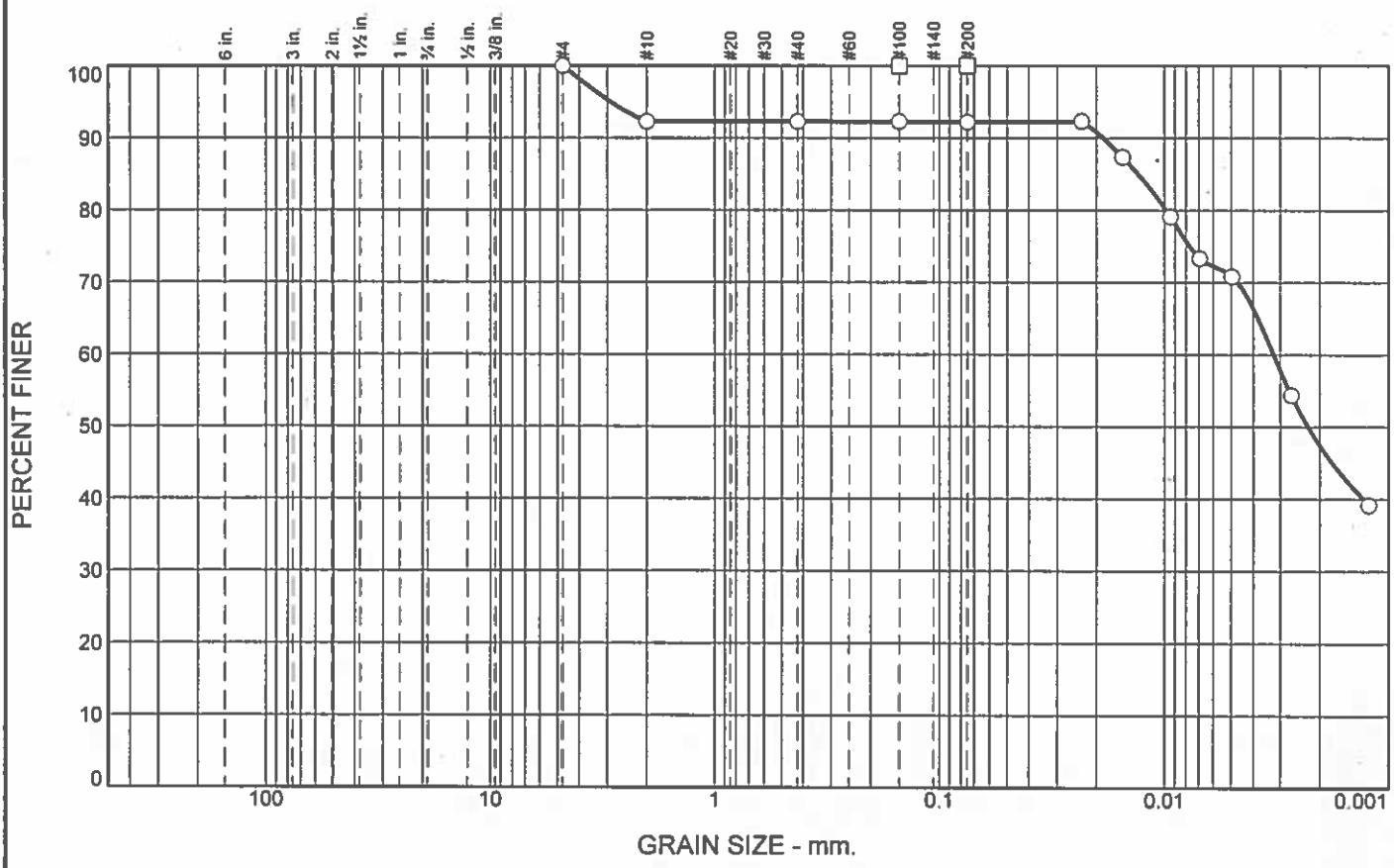
○ Source of Sample: V-3 Depth: 86.5' - 87.0' Sample Number: Rb
□ Source of Sample: V-3 Depth: 92.5' - 93.0' Sample Number: Sb
△ Source of Sample: V-3 Depth: 98.0' - 98.5' Sample Number: Ta

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	7.8	44.8	47.4	CH	A-7-6(46)	24	68
□	0.0	0.0	0.0	100.0		CH	A-7-6(38)	24	57

SIEVE inches size	PERCENT FINER ○	□	
	GRAIN SIZE		
D_{60}	0.0032		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	100.0		
#10	92.3		
#40	92.3		
#100	92.3	100.0	
#200	92.2	100.0	

Material Description
○ fat clay
□ fat clay

REMARKS:
○
□

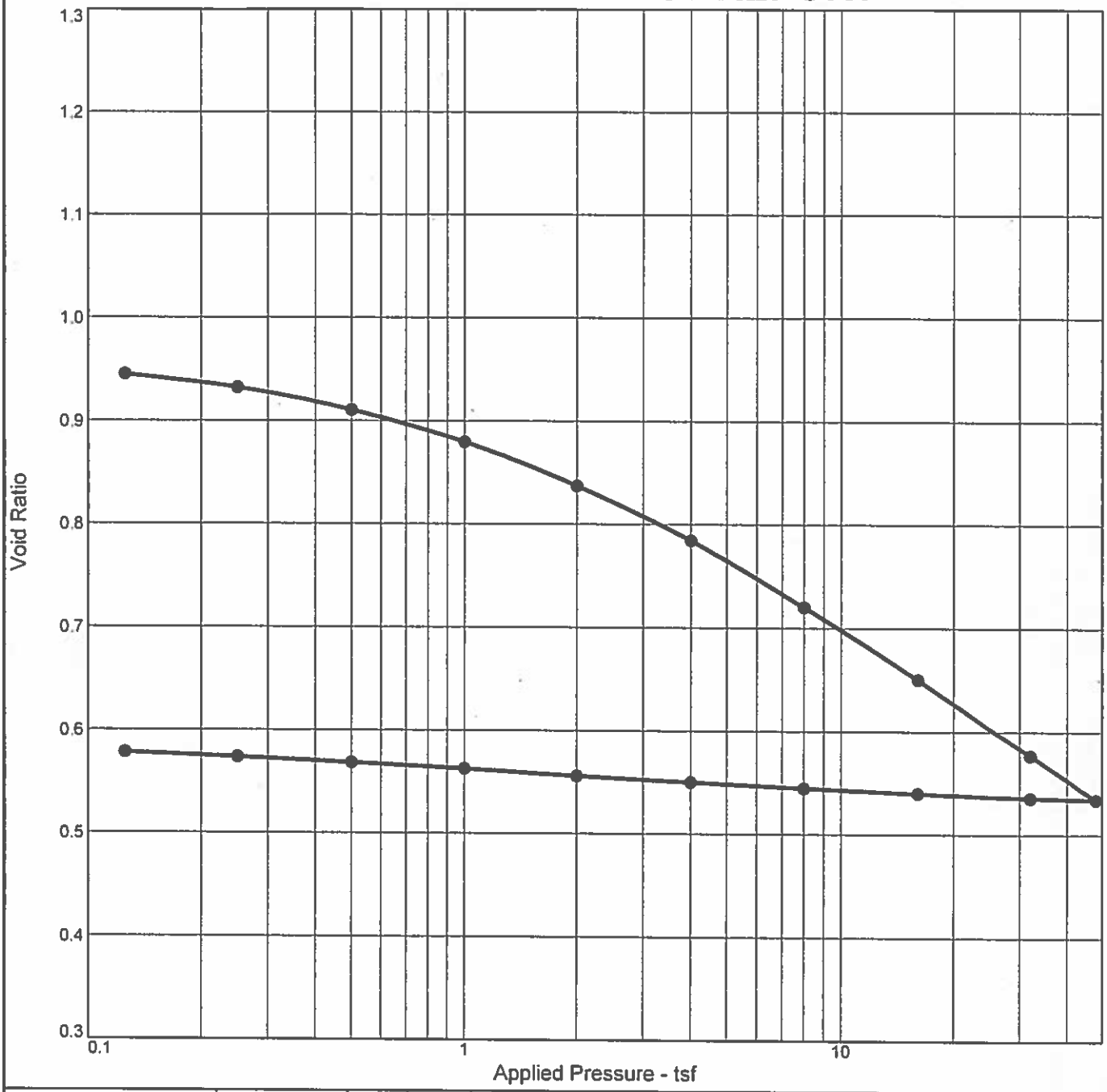
○ Source of Sample: V-3 Depth: 98.5' - 99.0' Sample Number: Tb
□ Source of Sample: V-3 Depth: 118.5' - 119.0' Sample Number: Vb

NEVADA DEPARTMENT OF TRANSPORTATION

Client: K. Jermstad
Project: B-28 on SR 396
Project No.: EA 74122

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.7 %	35.7 %	85.9	32	11	2.711	1.4	1.4	0.25		0.971

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(9)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

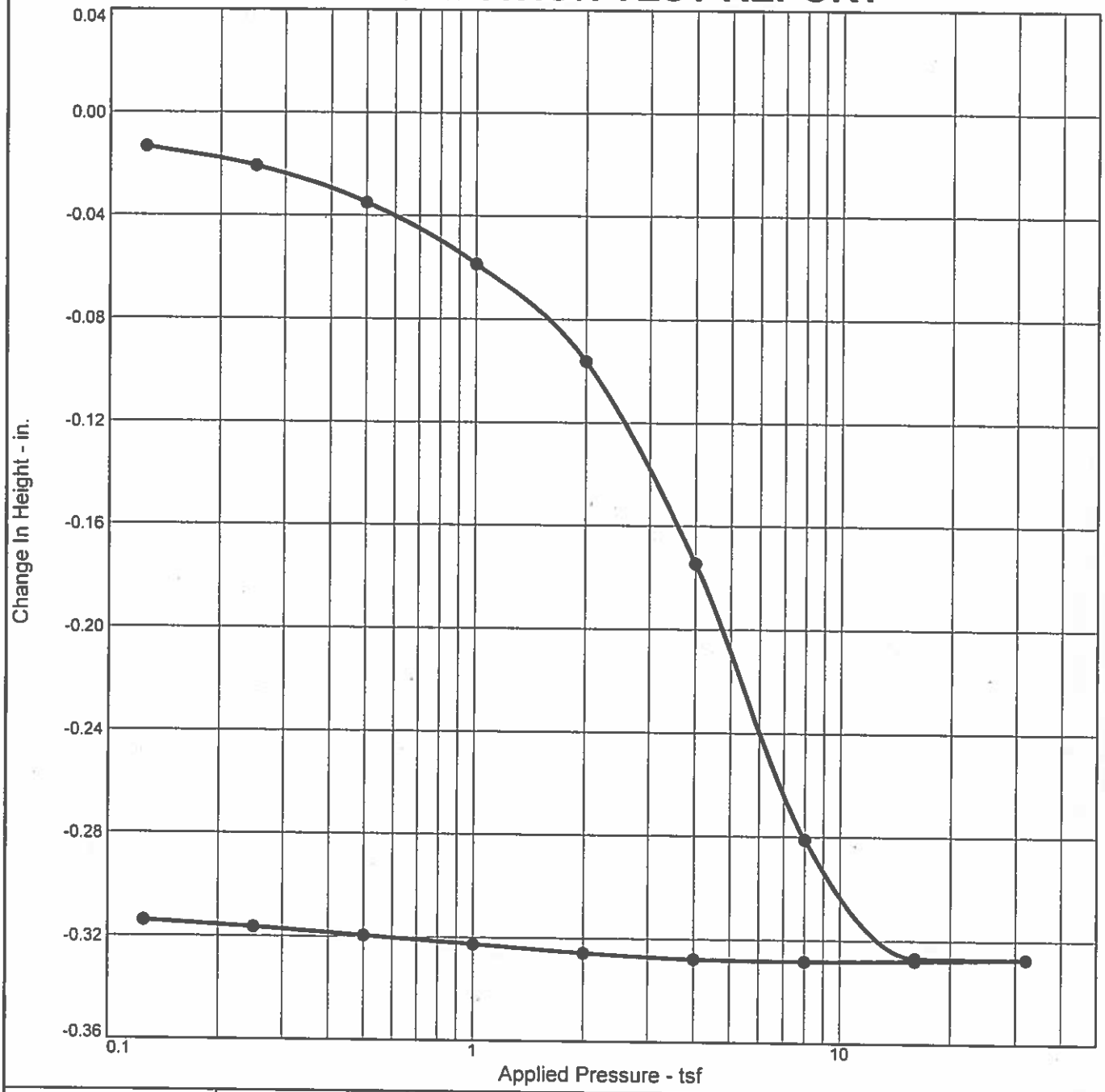
Source of Sample: V-3 **Depth:** 27.5' - 28.0' **Sample Number:** Cb

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.7 %	73.6 %	54.8	41	19	2.647	2.0	16.6	0.01		2.015

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay with sand	CL	A-7-6(14)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

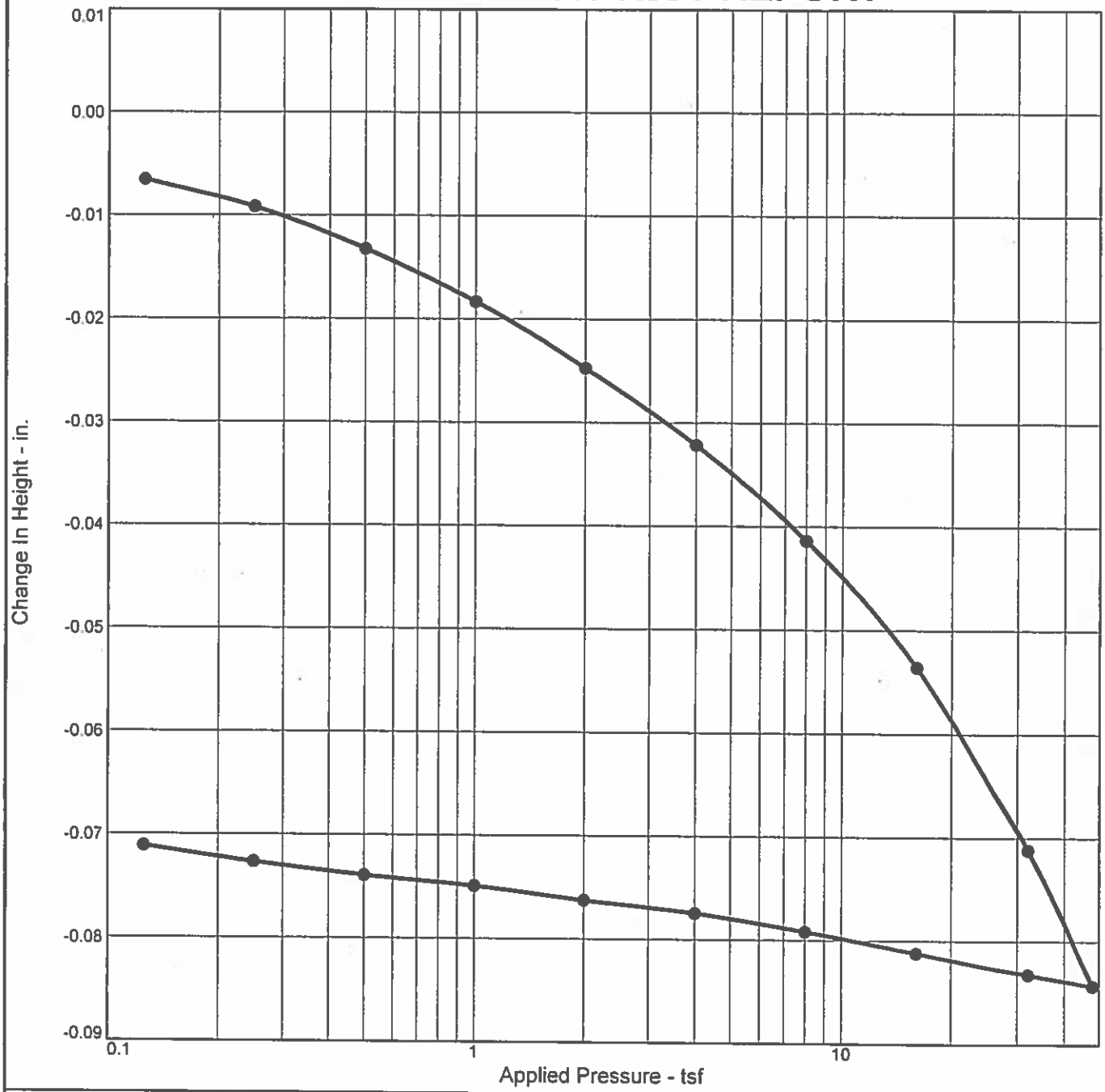
Source of Sample: V-3 **Depth:** 40.5' - 41.0' **Sample Number:** Gb

Remarks:
Test bottomed out at 32 tsf

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.2 %	26.1 %	97.4	25	2	2.706	3.7	6.1	0.13		0.734

MATERIAL DESCRIPTION	USCS	AASHTO
silty sand	SM	A-4(0)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

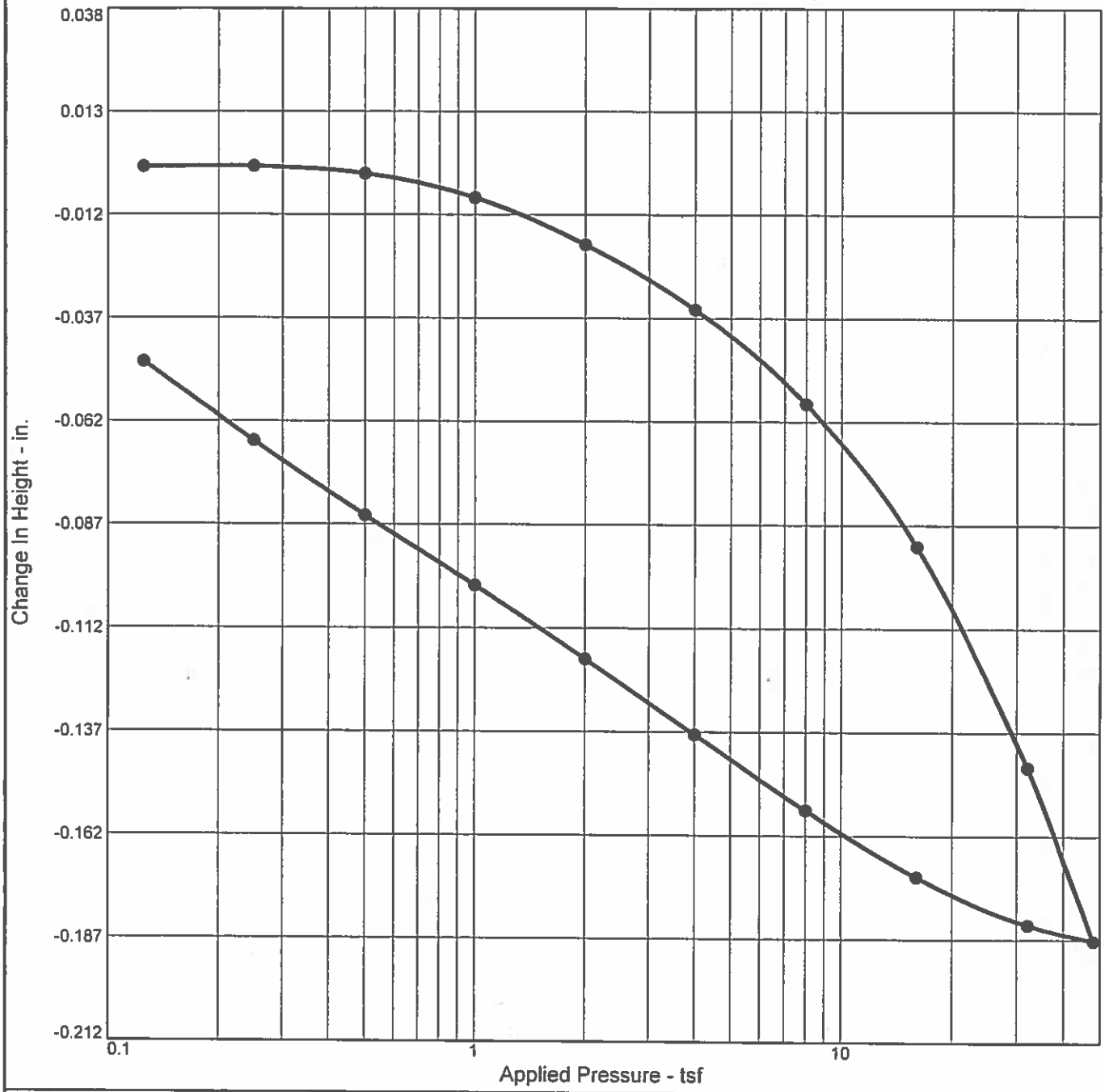
Source of Sample: V-3 **Depth:** 73.5' - 74.0' **Sample Number:** Ob

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.0 %	42.3 %	77.9	63	41	2.675	4.3	9.8	0.51		1.143

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(47)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

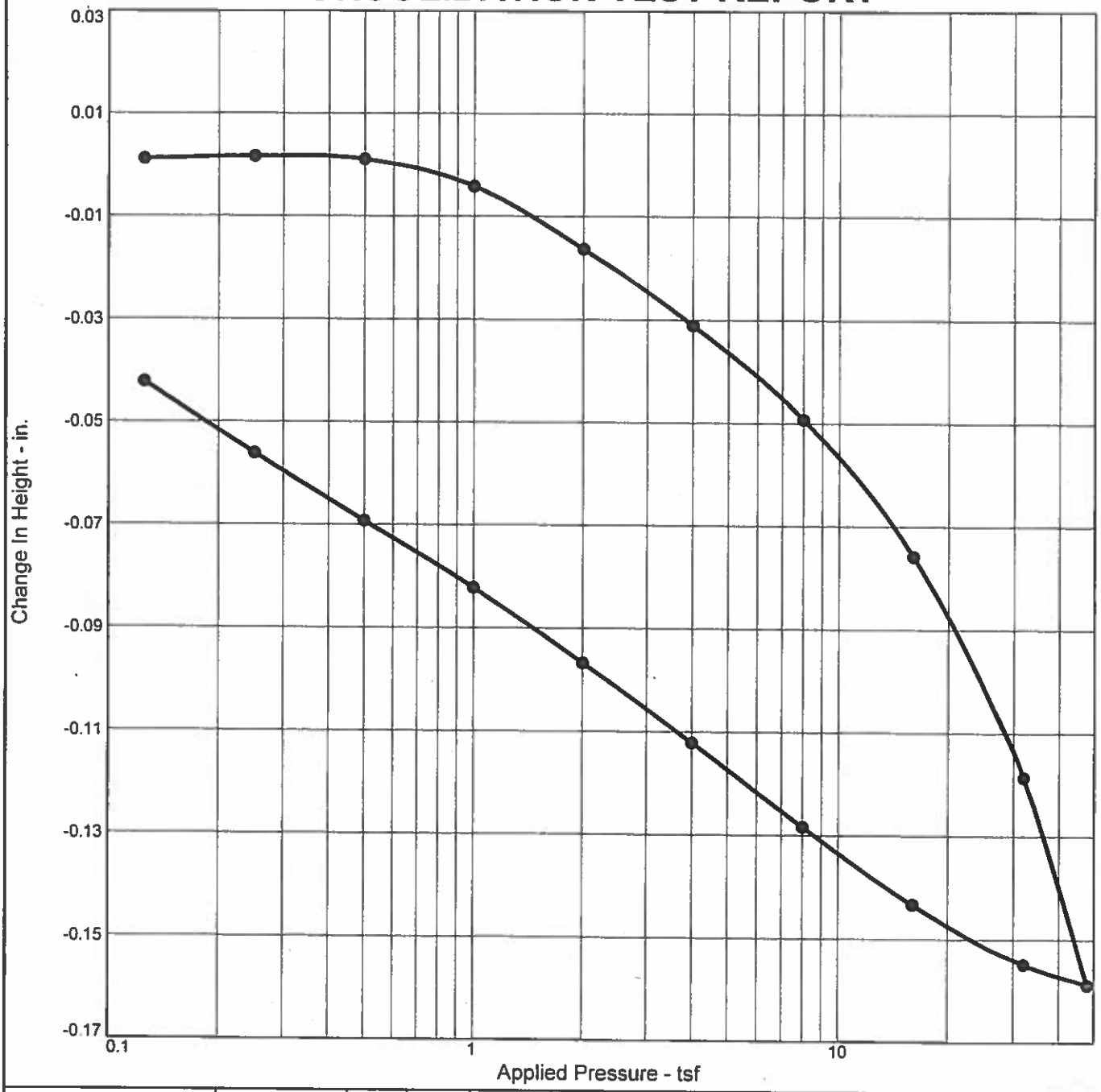
Source of Sample: V-3 **Depth:** 86.5' - 87.0' **Sample Number:** Rb

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.5 %	40.3 %	79.4	71	46	2.711	4.9	11.9	0.49		1.132

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(54)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

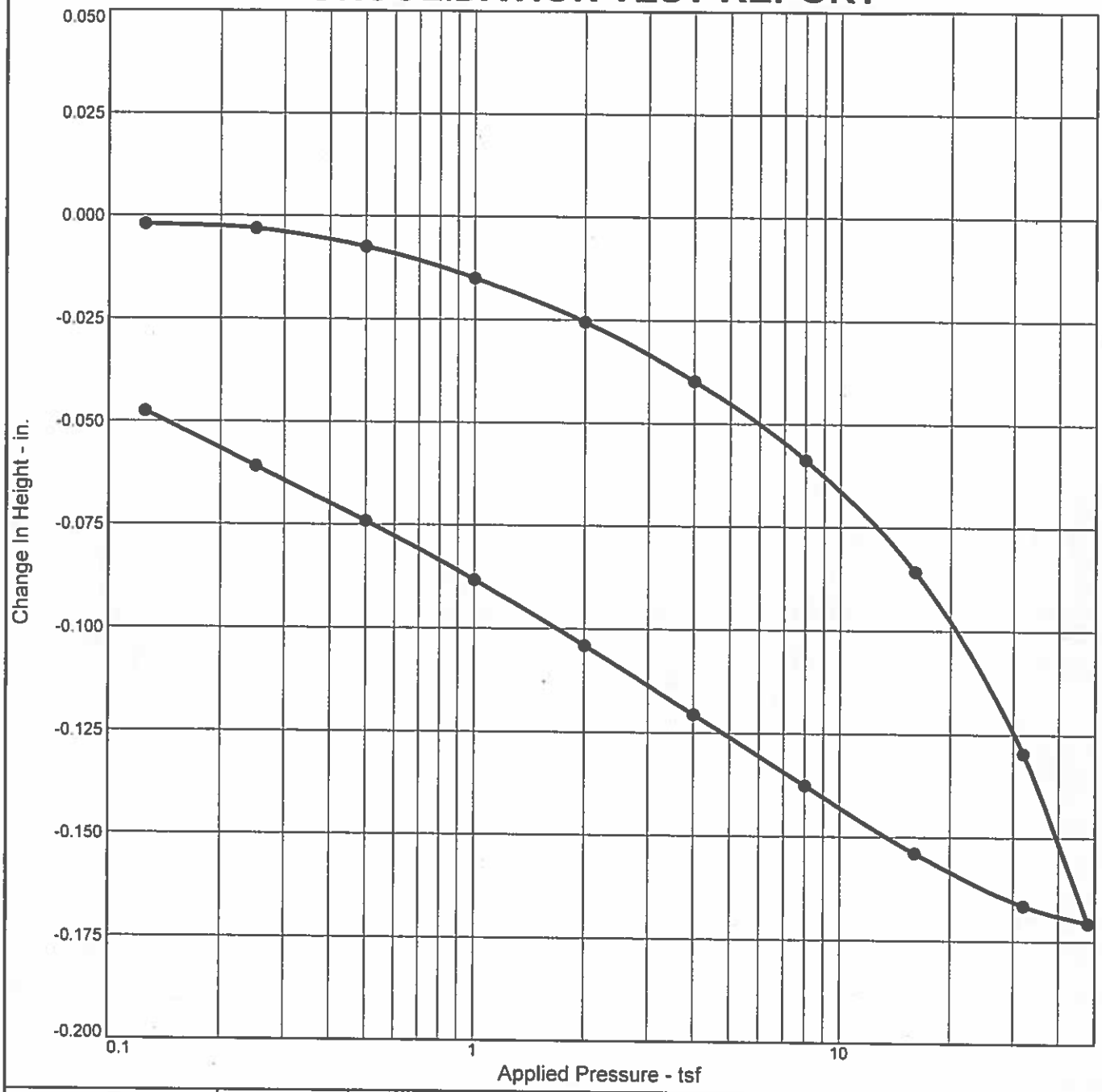
Source of Sample: V-3 **Depth:** 98.0' - 98.5' **Sample Number:** Ta

Remarks:

NEVADA DEPARTMENT OF TRANSPORTATION

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.6 %	42.3 %	77.1	57	33	2.691	5.9	10.0	0.51		1.178

MATERIAL DESCRIPTION	USCS	AASHTO
fat clay	CH	A-7-6(38)

Project No. EA 74122 **Client:** K. Jermstad

Project: B-28 on SR 396

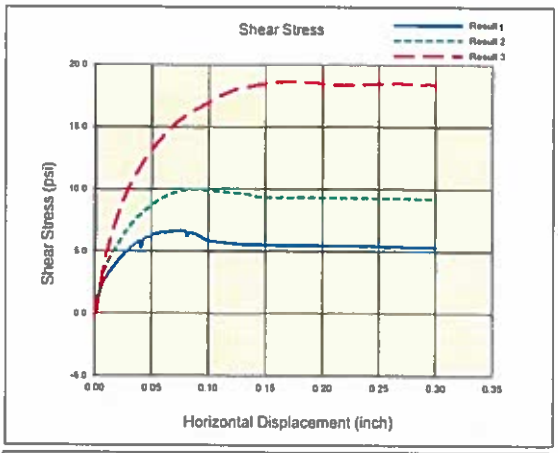
Source of Sample: V-3 **Depth:** 118.5' - 119.0' **Sample Number:** Vb

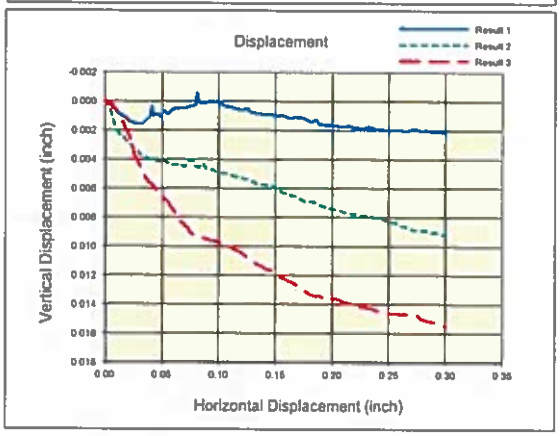
Remarks:

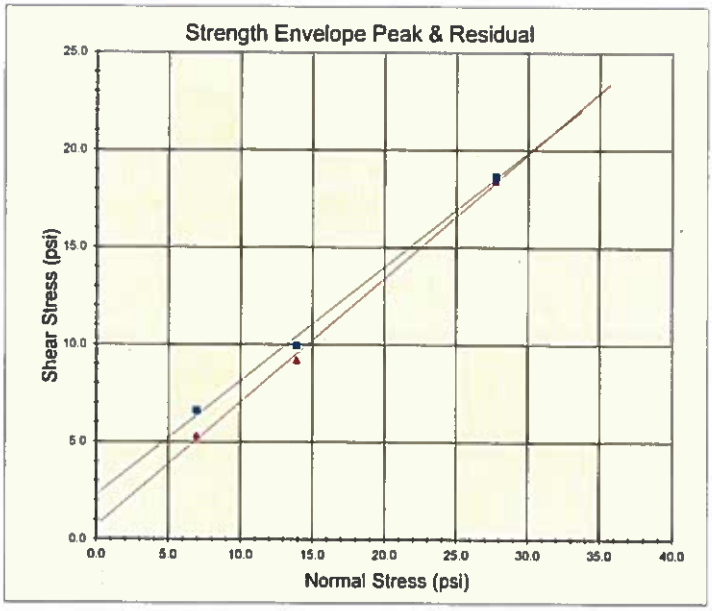
NEVADA DEPARTMENT OF TRANSPORTATION

Figure

DIRECT SHEAR TEST REPORT







Strength Parameters				
	Peak		Residual
Friction Angle =	30	degrees	32
Cohesion =	2.29	psi	0.70

Project: FL-7-18 Boring: V-3 Sample: Bc

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	3/6/2019	3/5/2019	3/4/2019
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	20.00	20.00	20.00
Moisture (%)	31.6	33.1	29.7
Dry Unit Wt (pcf)	90.6	89.0	91.6
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0055
Normal Stress (psi)	6.94	13.88	27.72
Peak Shear Stress(psi)	6.65	9.96	18.67
Residual Shear Stress(psi)	5.3	9.2	18.4
Residual Point Picked @(in)	0.291	0.291	0.291
Time @ Peak Failure (min)	14.0	15.9	31.0

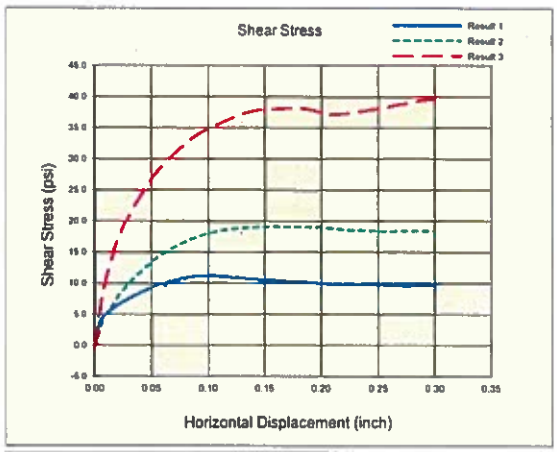
Specimen Comments

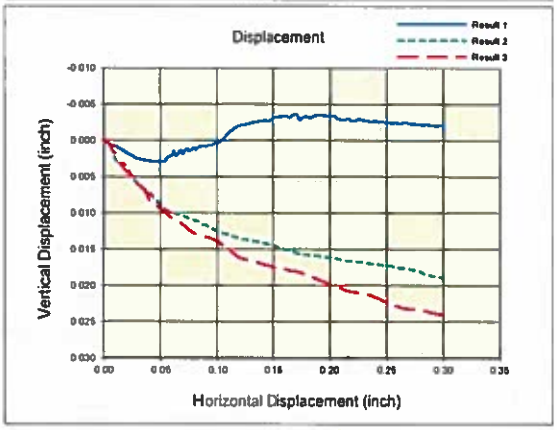
a Clay/Silty soil sheared @ 1000 psf
b Clay/Silty soil sheared @ 2000 psf
c Clay/Silty soil sheared @ 4000 psf

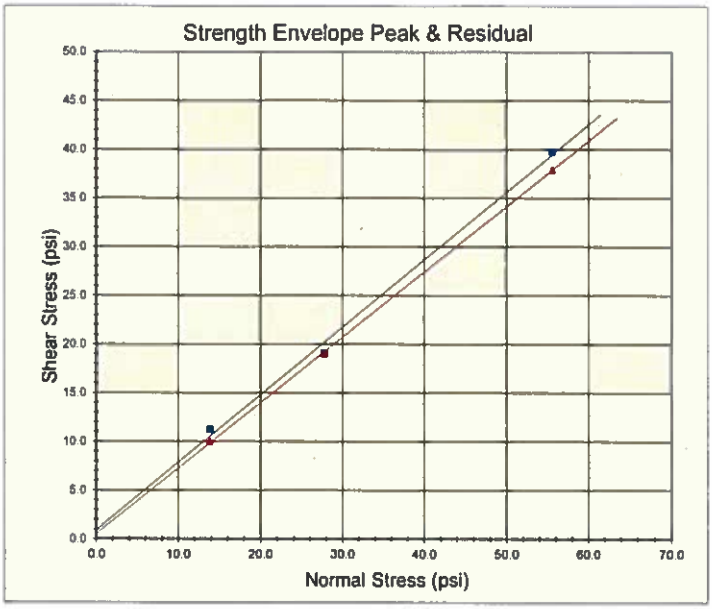
Geotechnical Section
NEVADA DOT

DigiShear Report v4b __ V-3 Bc

DIRECT SHEAR TEST REPORT







Strength Parameters	Peak		Residual
Friction Angle =	35	degrees	34
Cohesion =	0.91	psi	0.53

Project: FL-7-18 Boring: V-3 Sample: Dc

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	3/13/2019	3/15/2019	3/14/2019
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	30.00	30.00	30.00
Moisture (%)	19.5	30.5	32.1
Dry Unit Wt (pcf)	100.8	90.2	89.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0054	0.0054
Normal Stress (psi)	13.87	27.76	55.50
Peak Shear Stress(psi)	11.24	19.10	39.77
Residual Shear Stress(psi)	10.0	19.0	37.9
Residual Point Picked @(in)	0.198	0.198	0.191
Time @ Peak Failure (min)	18.4	26.6	54.5

Specimen Comments

a Sandy/Clay sheared @ 2000 psf

b Sandy clay sheared @ 4000 psf

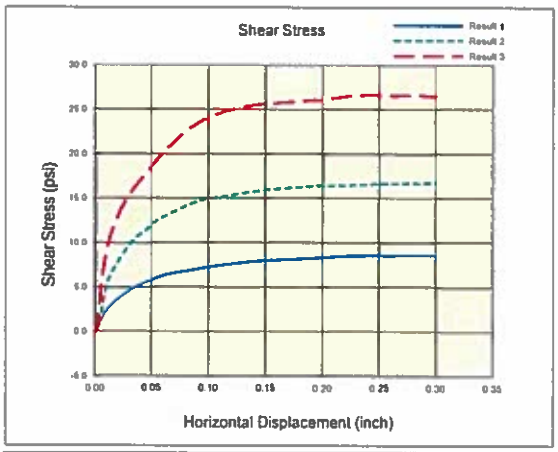
c Sandy clay sheared @ 8000 psf

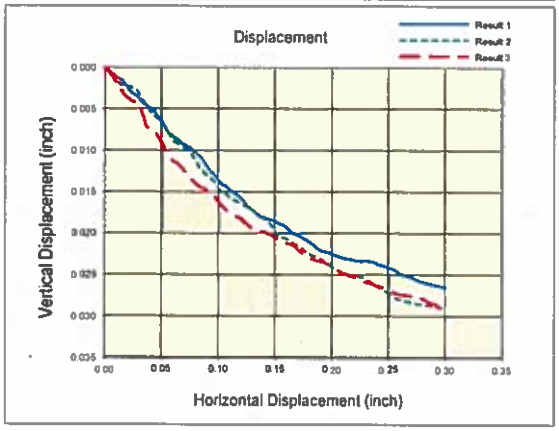
Geotechnical Section

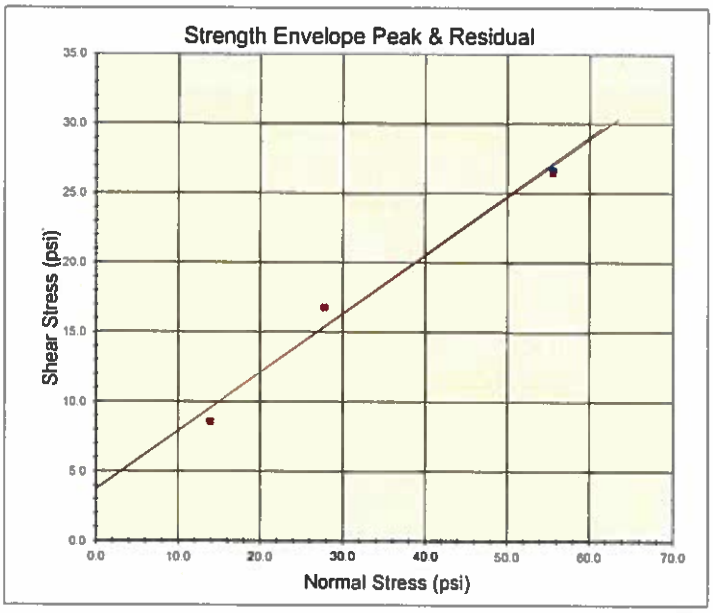
NEVADA DOT

DigiShear Report v4b __ V-3 Dc

DIRECT SHEAR TEST REPORT







Strength Parameters	Peak		Residual
Friction Angle =	23	degrees	23
Cohesion =	3.65	psi	3.72

Project: FL-7-18 Boring: V-3 Sample: Fc

Specimen:	Result 1 a	Result 2 b	Result 3 c
Date Tested	3/18/2019	3/20/2019	3/19/2019
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	37.00	37.00	37.00
Moisture (%)	68.8	63.8	67.1
Dry Unit Wt (pcf)	56.8	60.8	58.1
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0055	0.0054
Normal Stress (psi)	13.86	27.75	55.54
Peak Shear Stress(psi)	8.58	16.78	26.67
Residual Shear Stress(psi)	8.6	16.8	26.5
Residual Point Picked @(in)	0.300	0.300	0.300
Time @ Peak Failure (min)	51.8	54.0	51.8

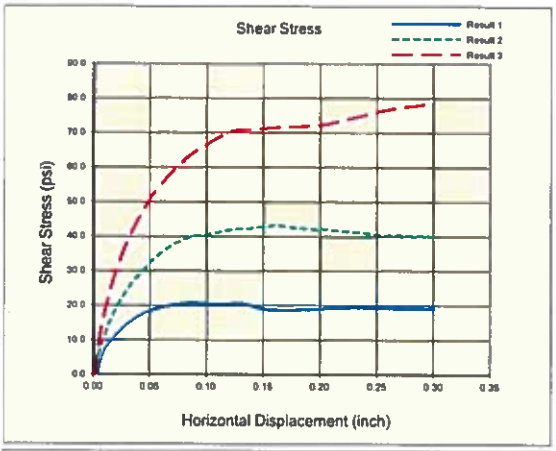
Specimen Comments

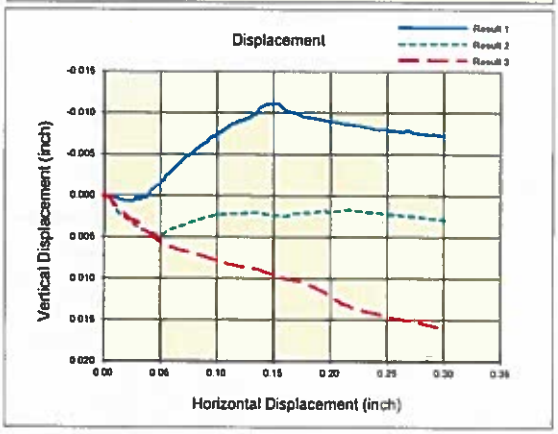
a Silty/Clay sheared @ 2000 psf
b Silty/Clay sheared @ 4000 psf
c Silty/Clay sheared @ 8000 psf

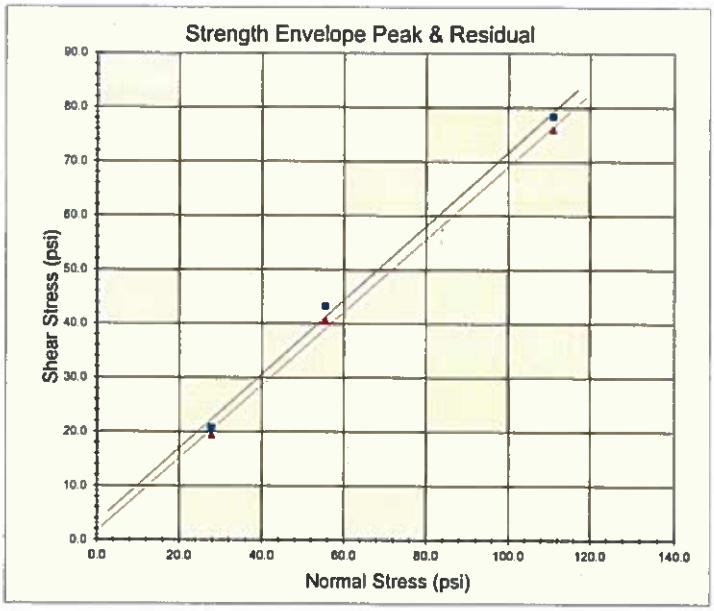
Geotechnical Section
NEVADA DOT

DigiShear Report v4b __ V-3 Fc

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	34	degrees	34
Cohesion =	3.26	psi	1.62

Project: FL-7-18 Boring: V-3 Sample: Oc

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	4/3/2019	4/5/2019	4/4/2019
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	74.00	74.00	74.00
Moisture (%)	25.0	27.1	27.4
Dry Unit Wt (pcf)	97.7	96.6	96.6
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0054	0.0055
Normal Stress (psi)	27.80	55.53	111.02
Peak Shear Stress(psi)	20.90	43.28	78.50
Residual Shear Stress(psi)	19.4	40.6	76.0
Residual Point Picked @(in)	0.249	0.249	0.249
Time @ Peak Failure (min)	15.9	29.9	54.6

Specimen Comments

a Dark sandy material sheared @ 4,000 psf
b Dark sandy material sheared @ 8,000 psf
c Dark sandy material sheared @ 16,000 psf

Geotechnical Section
NEVADA DOT

DigiShear Report v4b __ V-3 Oc

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL SECTION

CHEMICAL ANALYSIS

EA No.: 74122

Project: B-28 on SR 396

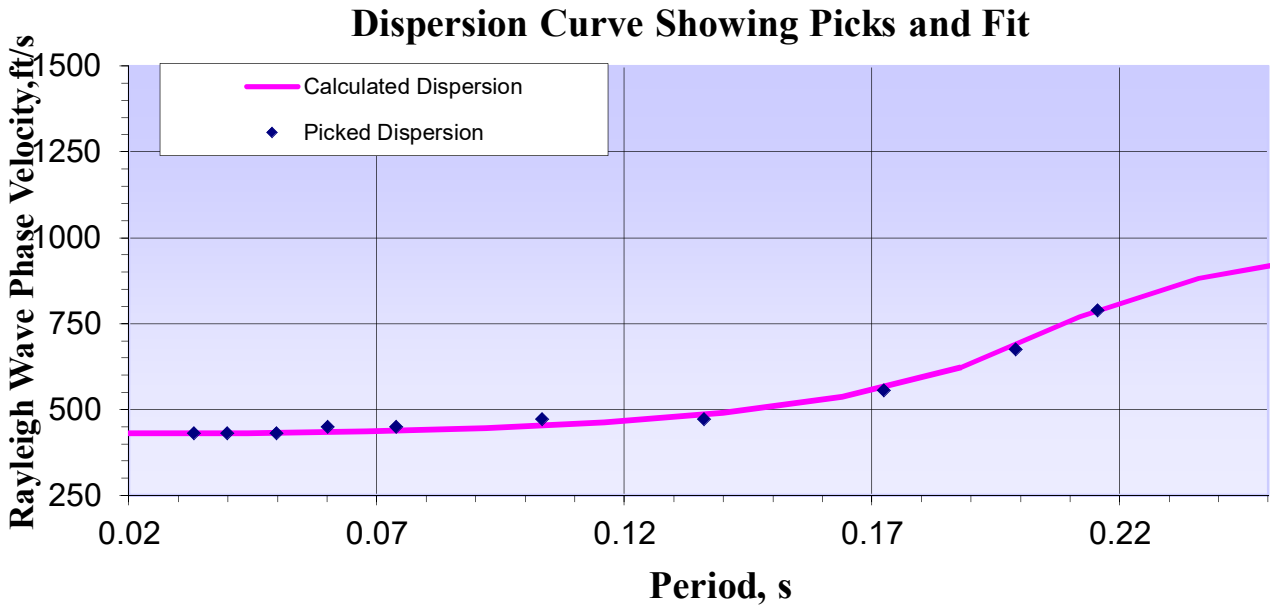
Sample ID	Date Tested	Chlorides ppm AASHTO T 291 A	Sulfates ppm AASHTO T 290 B	pH AASHTO T 289	Resistivity ohm - cm AASHTO T 288
V-1 A	10/23/18	131	282	8.0	
V-1 O	10/24/18	232	100	9.4	790
V-3, H	3/4/19			8.2	1,650
V-3, Q	3/4/19			9.9	1,400

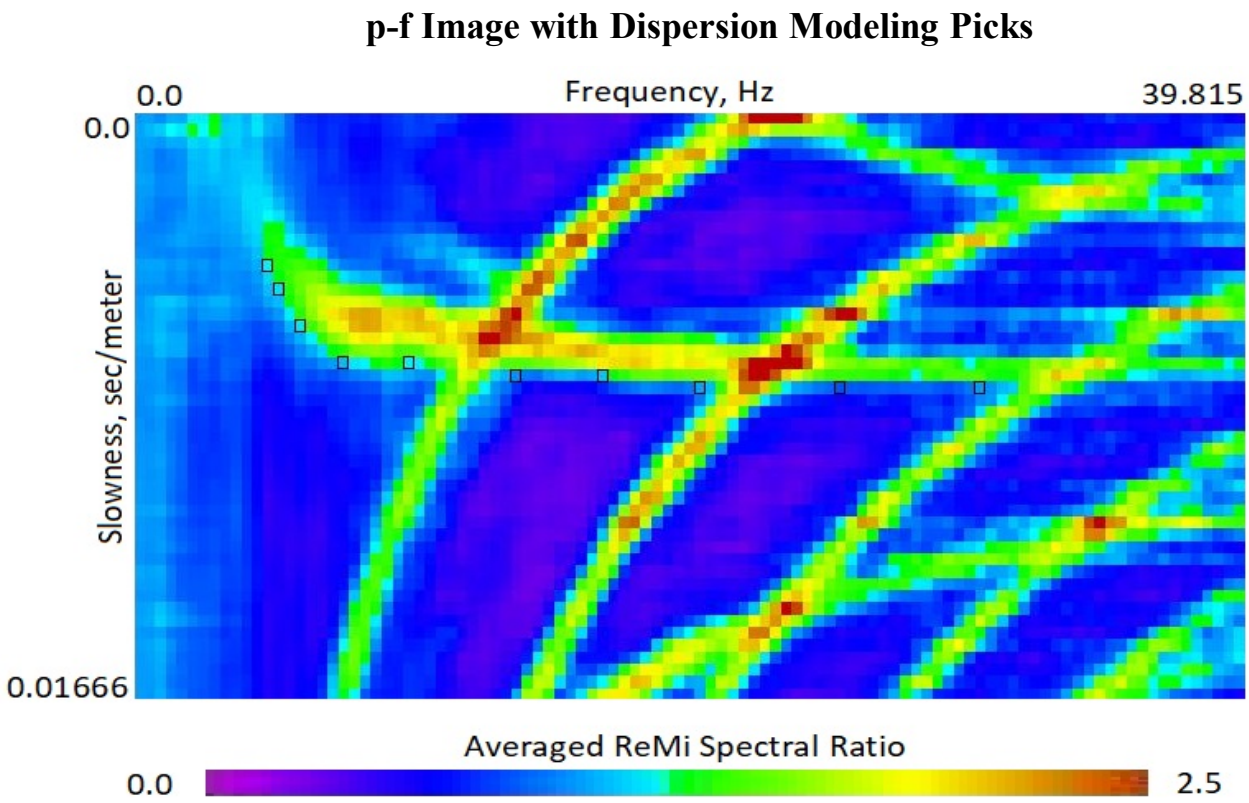
Test	Parameter			Test Method
Depth (ft)				
Moisture Content	Water Content	ω (%)		ASTM D2216
Unit Weight	Dry Density	Υ_d (pcf)		
Atterberg Limits	Liquid Limit	LL (%)		ASTM D4318
	Plastic Limit	PL (%)		ASTM D4318
	Plasticity Index	PI (%)		ASTM D4318
Hydrometer Analysis	Silt Faction	% Silt		ASTM D7928
	Clay Faction	% Clay		ASTM D7928
	Percent Fines	P200 (%)		ASTM D1140
Sieve Analysis	Avg. Grain Size	D_{50} (in)		ASTM C136
	Soil Classification	Soil Classification		USCS
				AASHTO
Permeability	Permeability	k (in/s)		ASTM D5084
Consolidation	Initial Void Ratio	e_0		
	Compression Index	C_c (psf)		ASTM D2453
	Recompression Index	C_r (psf)		ASTM D2454
	Overconsolidation Ratio	OCR		ASTM D2453
	Preconsolidation Pressure	P_c (psi)		
Unconfined Compression Test	Undrained Shear Strength	s_u (psi)		ASTM D2166
	Unconfined Compressive Strength	q_u (psi)		ASTM D2166
Mineralogy	Clay Type	Clay Type		Chemistry Lab
Pocket Penetrometer	Penetrometer Pressure	Q_p (tsf)		-
Erosion Function Apparatus	Critical Shear Stress	EFA	τ_c (psf)	ASTM WK57549
	Critical Velocity		v_c (ft/s)	
Ex-Situ Scour Testing Device	Critical Shear Stress	ESTD	τ_c (psi)	Hydraulics Lab
	Other (TBD)		v_c (ft/s)	
In-Situ Scour Testing Device	Critical Shear Stress	ISTD	τ_c (psi)	Hydraulics Lab
	Other (TBD)		v_c (ft/s)	
Standard Penetration Test	Blow Count	N (bpf)		ASTM D1587
Cone Penetrometer Test	Tip Resistance	q_t (psf)		ASTM D5778
	Sleeve Friction	f_s (psf)		ASTM D5778
	Pore Pressure	u (psi)		ASTM D5778

NV	
12-14.5	14.5-17
19%	38%
-	88.7
-	43%
-	24%
-	19%
-	45%
-	52%
-	96%
-	1.85E-04
-	CL
-	A-7-6(20)
-	1.18E-04
-	0.863
-	
-	
-	5.44
-	52.78
-	2.86
-	5.71
-	
-	
0.125	-
3.28	-
-	-
-	-
-	-
-	-

Appendix D
Geophysical Survey Results

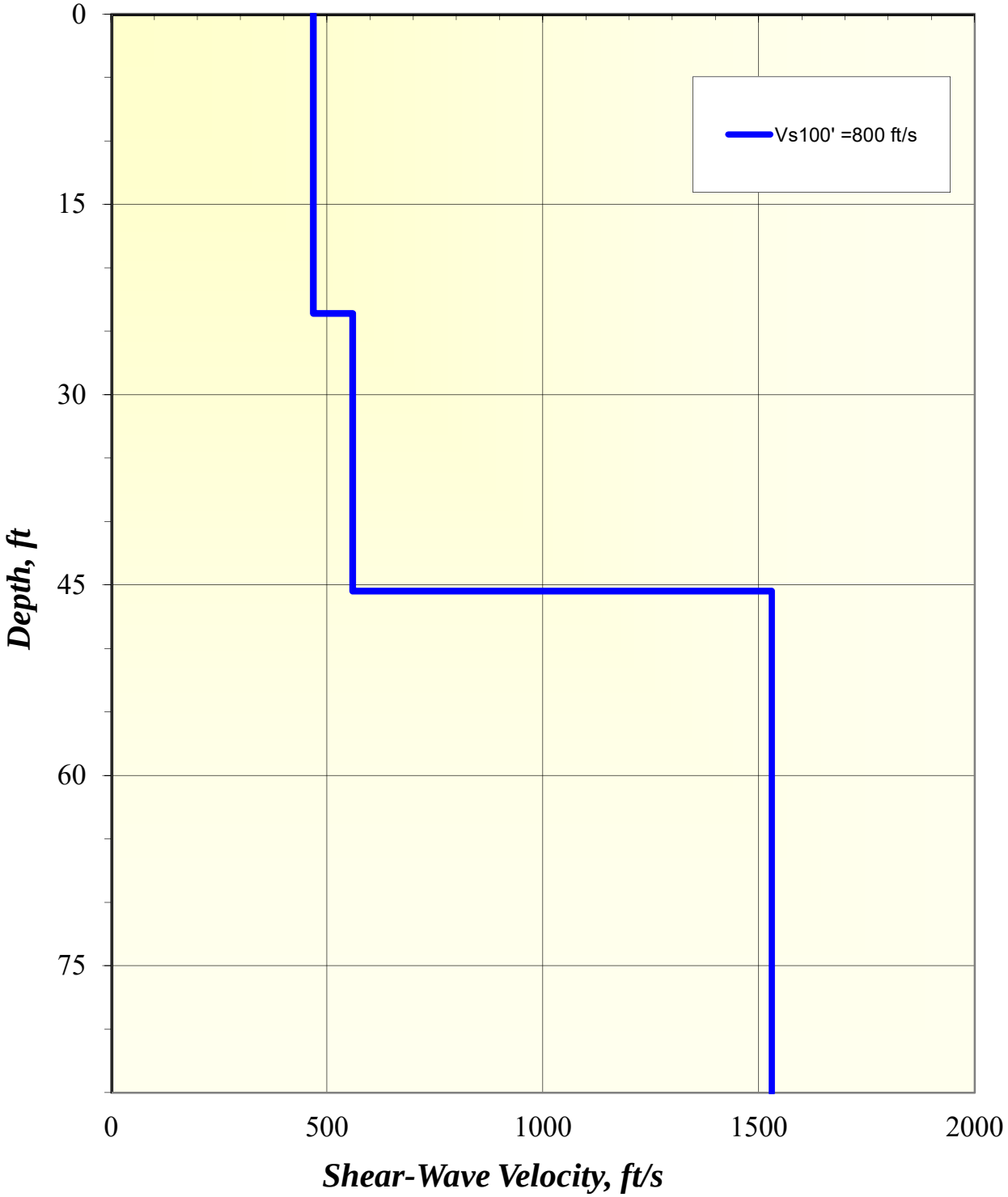
Dispersion Curve and Slowness Diagram



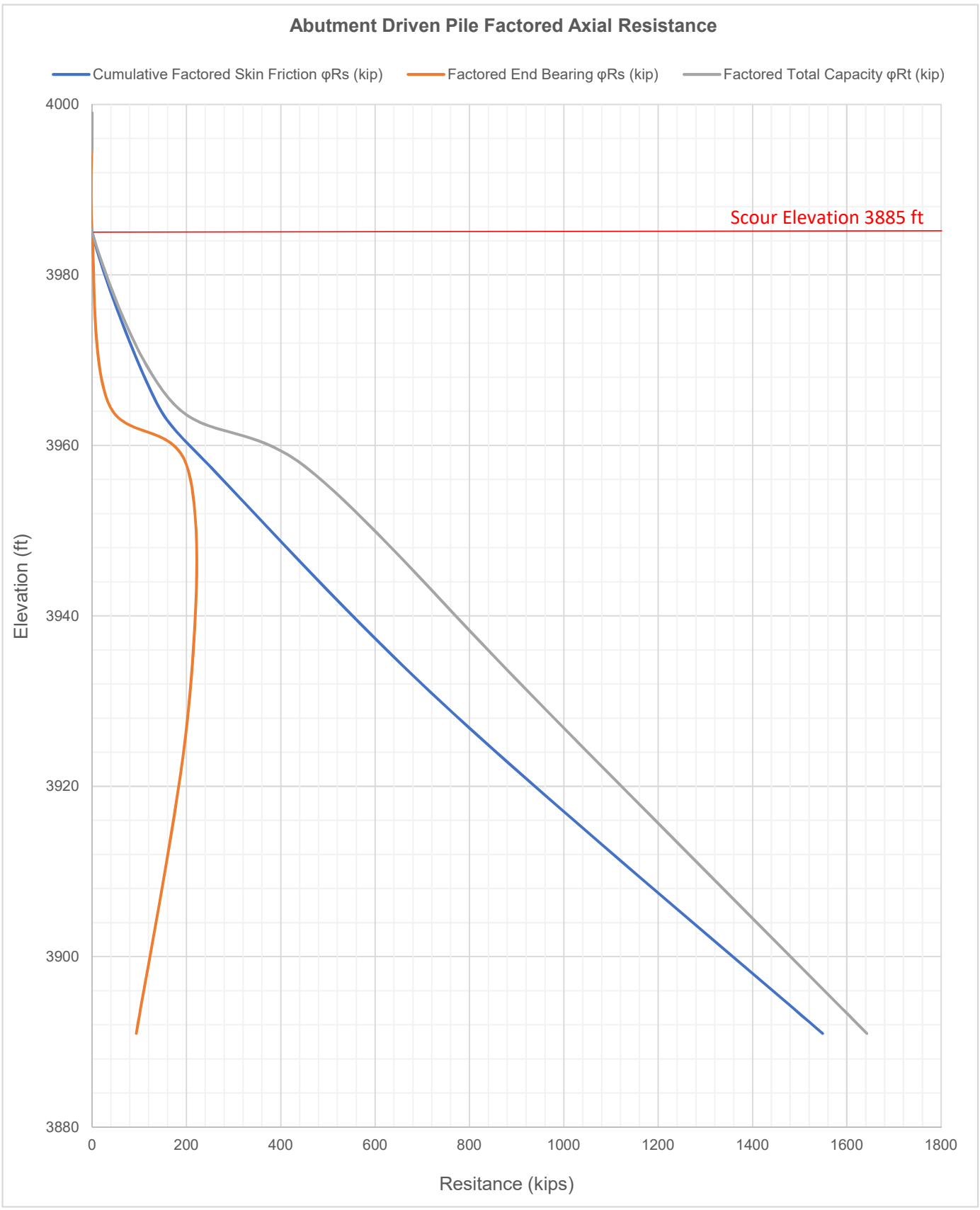


Shear Wave Velocity Profile

Lovelock B28 Bridge Ln-02



Appendix E
Driven Pile Analysis



NEVADA DOT

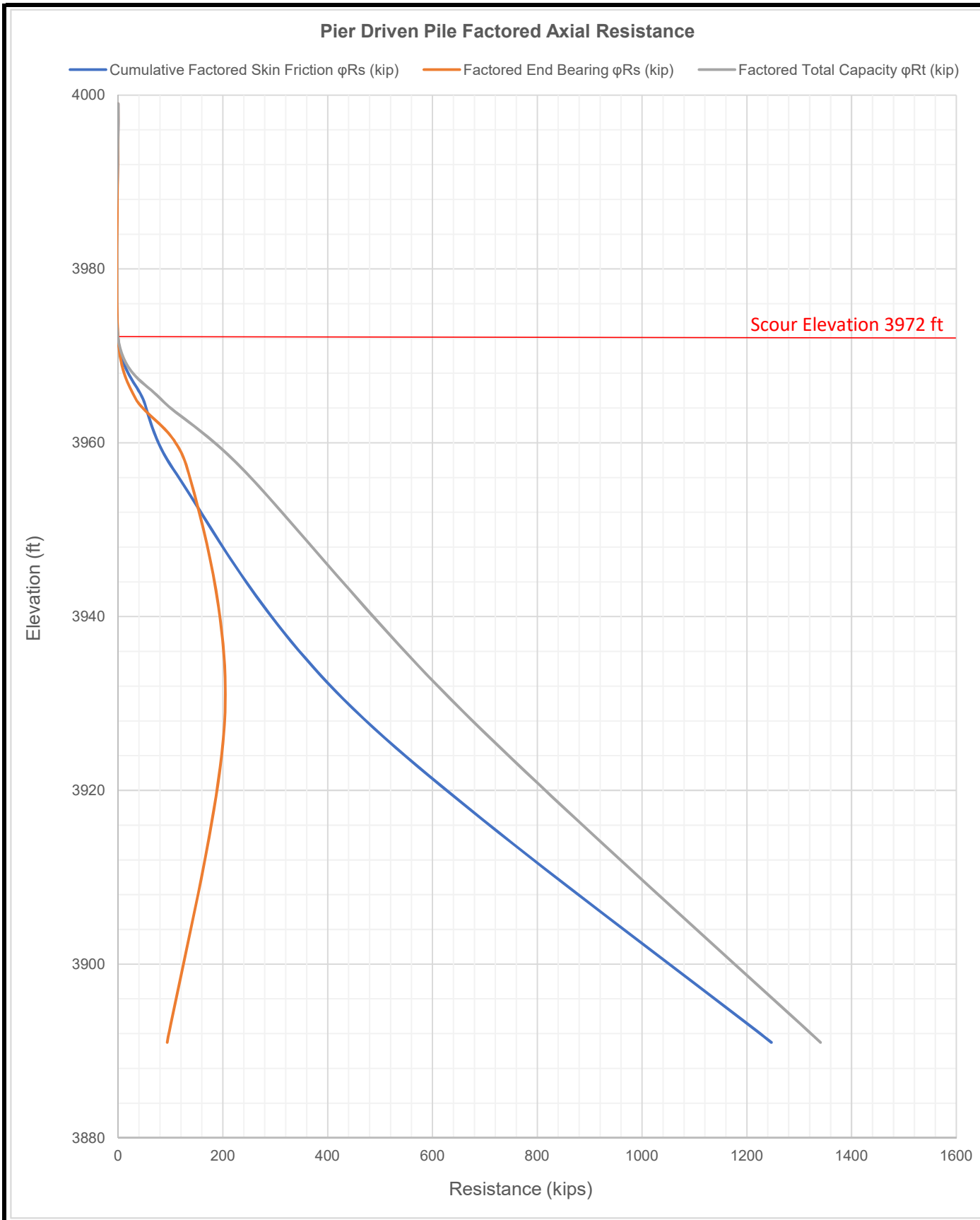
1263 South Stewart Street

Carson City, Nevada 89712

Phone: (775) 888-7440

Fax: (775) 888-7201

Figure Title	Abutment Axial
Location:	Pershing Co. NV
Project Name:	B-28 Replacement
EA Number:	74122



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Carson City, Nevada 89712

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Fax: (775) 888-7201

Figure Title	Pier Axial
Location:	Pershing Co. NV
Project Name:	B-28 Replacement
EA Number:	74122

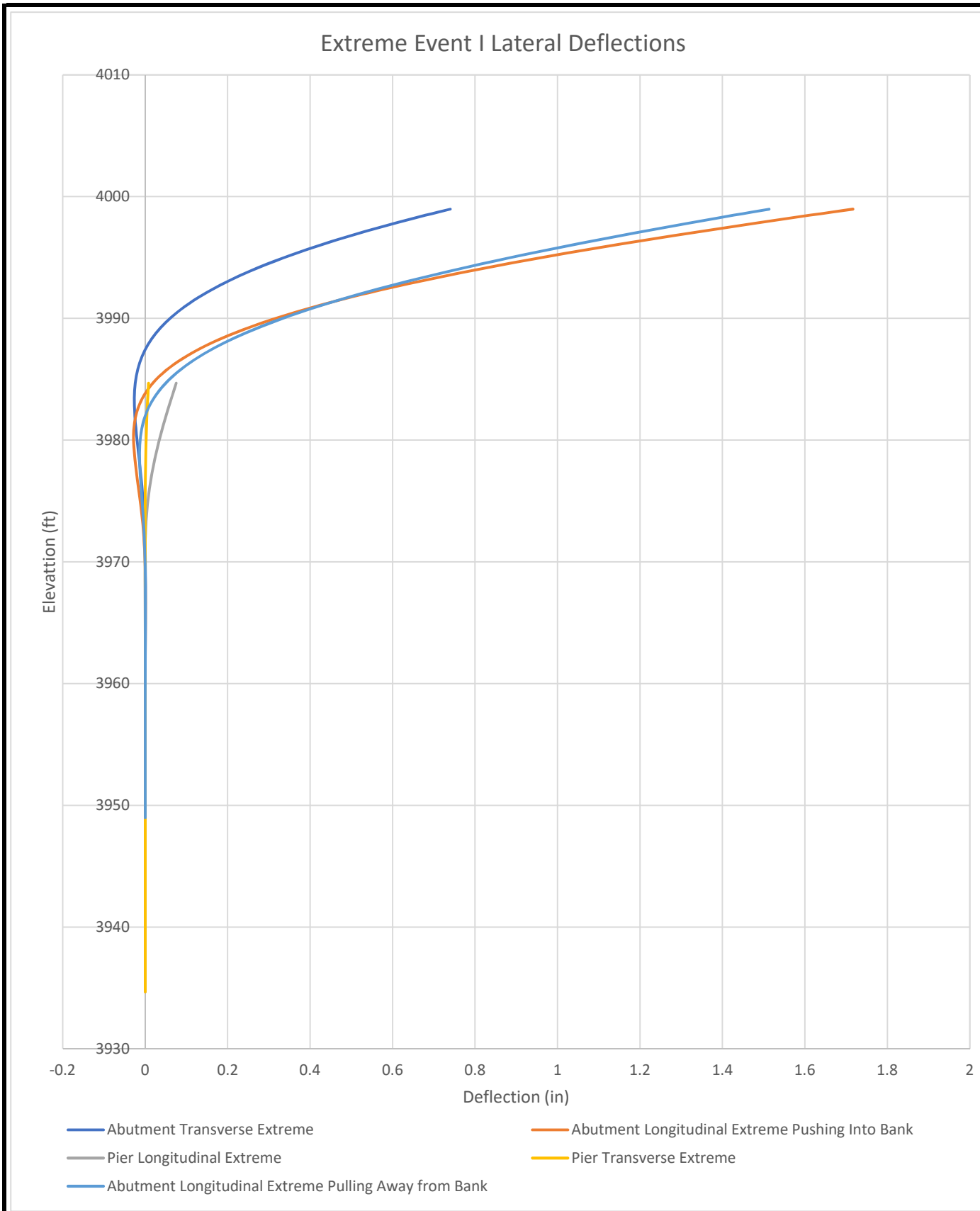

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Figure Title	Lateral Pile
Location:	Pershing Co, NV
Project Name:	B-28 Replacement
EA Number:	74122

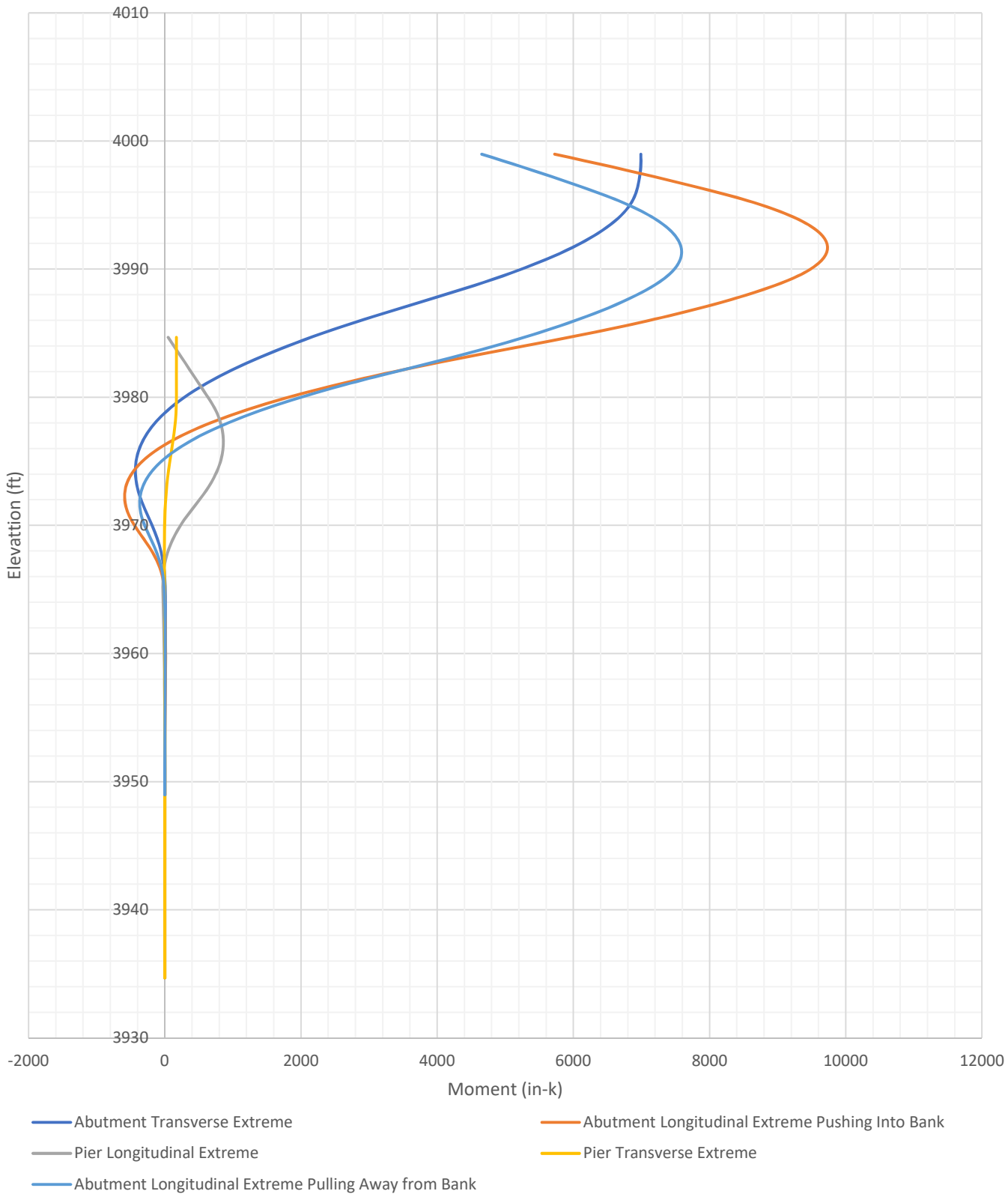

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Figure Title	Lateral Pile
Location:	Pershing Co, NV
Project Name:	B-28 Replacement
EA Number:	74122

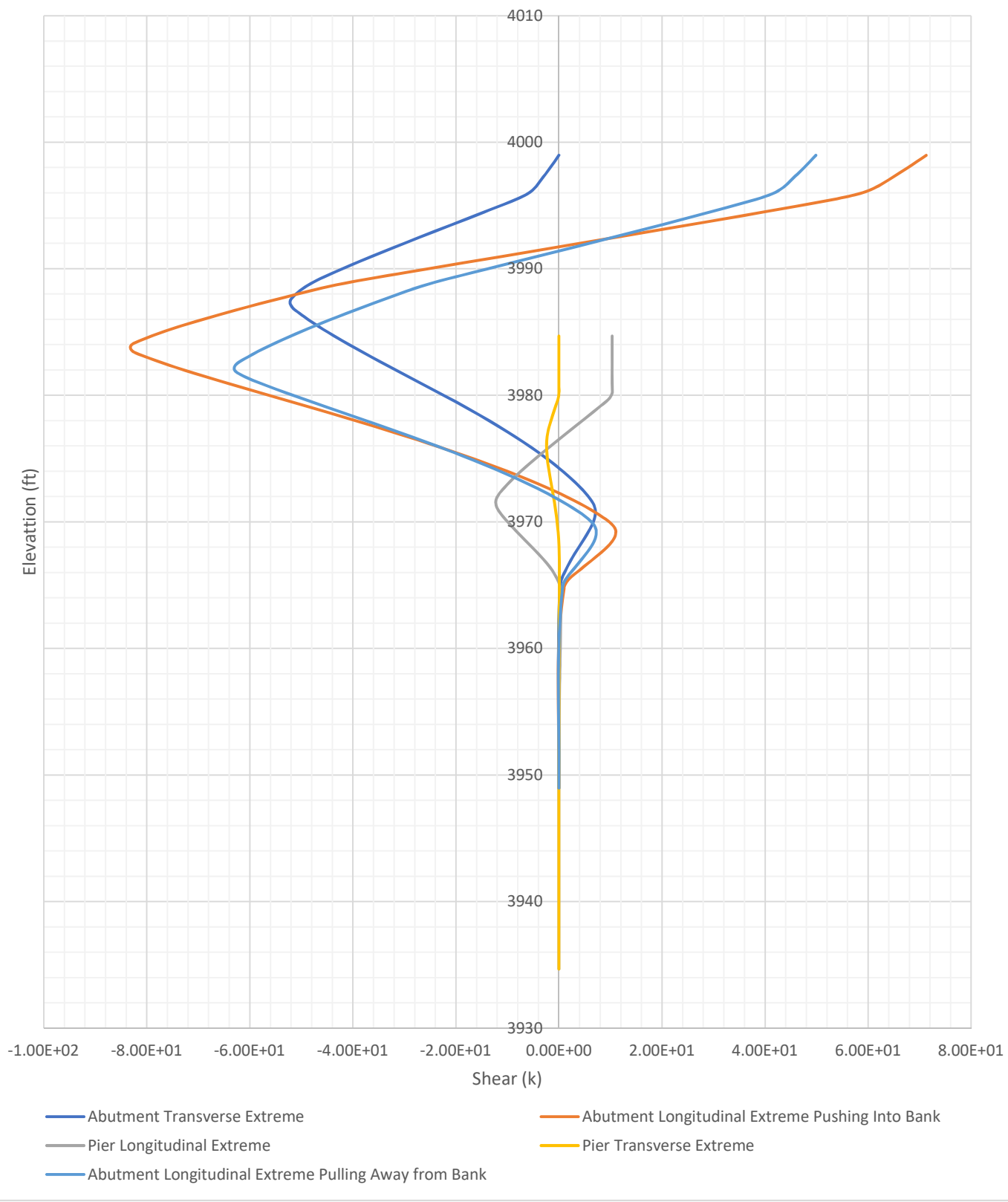

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Figure Title	Lateral Pile
Location:	Pershing Co, NV
Project Name:	B-28 Replacement
EA Number:	74122

NEVADA DEPARTMENT OF TRANSPORTATION

Materials Division
Geotechnical Section
1263 Stewart St, Carson City, NV 89712