GEOTECHNICAL REPORT

I-580 MP CC 8.72 TO WA 5.99
LAKEVIEW INTERCHANGE RETAINING WALLS AND LAKEVIEW AND BELLEVUE BRIDGES SEISMIC RETROFITS

WASHOE & CARSON CITY COUNTIES, NEVADA

OCTOBER 2014

NEVADA DOT
GEOTECHNICAL ENGINEERING
MATERIALS DIVISION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION
GEOTECHNICAL SECTION

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OCTOBER 2014
E.A. Nos. 73637, 73801, 60616

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INTRODUCTION

General

The Nevada Department of Transportation (NDOT) is planning a roadway improvement project along Interstate 580 (old U.S. 395) from the southbound off-ramp at North Carson Street (MP CC 8.49) to just south of the Bowers Mansion Interchange (MP WA 5.99) in Washoe and Carson City counties. This project involves cold milling and paving the mainline and ancillary roadways within the project limits.

In addition, NDOT plans to improve the existing geometric design and roadside safety issues of the ramps at the Lakeview Interchange. The new geometric designs for the ramps will require widening of the roadway, and as a result, retaining structures are proposed.

Furthermore, seismic retrofits of the bridges at the Bellevue and Lakeview Interchanges are scheduled to be included as part of this project. The bridge at the Bellevue Interchange is identified as Bridge No. I-1261. The bridges at the Lakeview Interchange are identified as Bridge Nos. I-812 N&S.

A Location Sketch of the project area can be found in Appendix A.

Scope

A geotechnical investigation was conducted to determine the general soil and groundwater conditions for the planned improvements at the Lakeview and Bellevue Interchanges. The scope of this investigation included the following:

- research of available background information including geologic literature pertaining to the site, past NDOT construction contracts, and other geotechnical reports and soil boring data;
- geotechnical field investigations including site reconnaissance, drilling and logging soil borings along the proposed ramp alignments at the Lakeview Interchange, and geophysical surveys; and
- laboratory testing of select soil samples from soil borings, analysis of field and laboratory data, and report preparation.

The purpose of this geotechnical report is to summarize and evaluate the findings of the geotechnical investigation and to present geotechnical design criteria and construction recommendations for the proposed improvements at the Lakeview Interchange and the proposed seismic retrofits for the bridges at the Lakeview and Bellevue Interchanges.

Other Reports and Investigations

Existing geotechnical reports associated with the project area are listed below.

- A foundation investigation report titled, "Bellevue Road Grade Separation H-1261," dated September 18, 1967 was prepared by Sprout Engineers & Associates Inc. for the purpose of establishing the foundation design for the proposed Bellevue structure.
- A foundation and soils report titled, "Bellevue Interchange Ramps R1-R2-R3-R4," dated March 14, 1972 was prepared by NDOT for providing foundation recommendations for the ramps.
- A report was prepared by Kleinfelder and titled, "Final Geotechnical Investigation Report, Proposed Carson City Freeway, U.S. 395 (North Part), Carson City, Nevada" dated July 15, 1999. Improvements were made to I-580 (U.S. 395) within the project limits south of the Lakeview Interchange as part of the Carson City Freeway project.

Original construction of the Lakeview Interchange including construction of bridges, on- and off-ramps, access roads, and frontage roads and realignment of the highway in the vicinity of the interchange began in 1963 under NDOT Contract 1144. No geotechnical report exists, but boring logs for the Lakeview structures I-812N and I-812S were found in the construction plans. Boring logs from NDOT Contract 1144 are included in Appendix B of this report. Construction records indicate the presence of artesian springs and shallow groundwater in the vicinity of Lakeview Hill and Lakeview Interchange. Contract 1144 records document groundwater mitigation measures performed during construction of the improvements.

Original construction of current I-580 from north of the Lakeview Interchange to near the Bower's Mansion Interchange, including original construction of the Bellevue Bridge in 1969, was constructed under NDOT Contract 1280. The as-built construction plans show a stabilizing platform for the I-580 roadway due to high groundwater and saturated sub-grade soils.

Original construction of the Bellevue Interchange Ramps and the parking area southeast of the interchange were built under NDOT Contract 1456 in 1972.

Review of previous construction plans indicate that the roadway fill materials originated primarily from cuts along the roadway alignments, excavation for drainage ditches, and other project excavation during construction, and also from the adjacent Duck Hill.

NDOT Contract 2172 details the reconstruction of the Hobart Ditch in 1986, which runs adjacent to the Lakeview Interchange southbound on-ramp.

NDOT headquarters construction contract QA-007-11 details water seepage mitigation that was constructed on I-580 over Lakeview Hill between mileposts CC 9.50 and WA 0.30 in 2011.

PROJECT DESCRIPTION

The project description presented in this report is based on preliminary project plans provided by the NDOT Roadway Design and Structures Divisions.

The ramps at the Lakeview Interchange are scheduled for improvements which require widening of the roadway and the need for retaining structures. The Lakeview Interchange ramps are identified as Ramp 1 (the southbound on-ramp), Ramp 2 (the southbound off-ramp), Ramp 3 (the northbound off-ramp), and Ramp 4 (the northbound on-ramp). The alignments for the new geometric designs of the ramps are depicted on the Boring Location Maps located in Appendix A.

The existing Ramp 1 roadway and southbound I-580 roadway between Ramp 1 and the Carson Street off-ramp are to be widened up to 10 feet along the proposed R1a alignment to accommodate an auxiliary lane. A retaining structure is needed to widen the roadway between stations “R1a” 14+50 and “R1a” 36+30 to avoid disturbance of the adjacent drainage channel identified as the Hobart Ditch. The maximum proposed wall height is 6 feet and will retain the roadway and embankment fill.

The existing Ramp 2 roadway and southbound I-580 roadway approaching Ramp 2 are to be widened up to 2 feet. A retaining structure is needed to widen the roadway between stations “R2a” 8+90 (“LSe 100+50) and “R2a” 15+23 (“LSe” 106+80) because of the proximity of adjacent roadway U.S. 395A and the existing reinforced concrete box that transversely crosses under the R2a alignment near station 9+15. The proposed wall height is 4 feet and the wall will retain the roadway and embankment fill.

The existing Ramp 4 roadway is to be widened up to 2 feet. A retaining structure is proposed for the widening of the roadway between stations “R4a” 8+60 (“Le” 100+20) and “R4a” 10+60 (“Le” 102+20). The proposed wall height is 5 feet and the wall will retain the roadway and embankment fill. Alternatively, the existing reinforced concrete box that transversely crosses under the R4a alignment near station 9+45 may be lengthened and the roadway embankment may be widened in lieu of the proposed retaining structure.

Design of the proposed retaining structures along the R1a, R2a, and R4a alignments calls for a cast-in-place concrete cantilever retaining wall with an integral barrier rail atop the wall.

The Lakeview structures, I-812 N&S, are three-span concrete bridges. Each bridge has a north and a south abutment founded on one row of seven piles, three of which are battered. Each bridge has two piers. Each pier consists of three columns, each of which is founded on two rows of two vertical piles. All piles are 12 ¾-inch diameter driven steel pipe piles filled with cast-in-place reinforced concrete. The seismic retrofit at the Lakeview structures will consist of wrapping the columns with composite casing. This will require excavation to the top of the existing piers' pile caps.

The Bellevue structure, I-1261, is a two span concrete bridge with an east and west abutment and center pier. Each abutment is founded on two rows of piles – one row consists of six battered piles and one row consists of five vertical piles. The center pier is founded on three rows of seven vertical piles. All piles are 12 ¾-inch diameter driven steel pipe piles filled with cast-in-place reinforced concrete. The seismic retrofit and rehabilitation at the Bellevue structure is to consist of the items of work listed below.

- Remove fascia panels from bridge and abutments. Remove attachment hardware and repair concrete at connection points.
- Remove existing bituminous wearing surface and polymer concrete overlay. Replace with ¾" polymer concrete overlay.
- Remove portion of bridge rail and modify bridge rail.
- Remove portion of existing wing walls and guardrail-bridge connection.
- Remove expansion joints and back wall and construct end diaphragm extension.
- Construct new approach/anchor slab at each end of bridge.
- Construct new bridge rail on approach slab.
- Construct new expansion joints.
- Remove portion of abutment walls/wing walls and construct abutment wall overlay.
- Repair delaminations and spalls on wing walls.
- Repair superstructure and abutments.
- Apply fine surface finish to all vertical concrete surfaces.
- Prepare and paint superstructure, approach barrier rails, and abutments.

GEOLOGIC CONDITIONS AND SEISMICITY

Local Geology

The project site is located in southern Washoe County and northern Carson City County and is mapped in four different geologic units as depicted on the *Carson City Quadrangle Geologic Map*.

Washoe County and Carson City County areas have topography typical of the Basin and Range physiographic province, characterized by long mountain ranges separated by alluviated basins. Washoe Valley is a north-trending structural depression bounded by the Carson Range on the west and the Virginia Range on the east. The floor of the valley is occupied by Washoe Lake, a shallow natural lake resulting from the saturated condition of the basin-fill sediments.

The portion of the I-580 roadway embankment north of Eastlake Boulevard in Washoe Valley, including Lakeview Interchange Ramps 2 and 4 and the Bellevue Interchange, is founded on Quaternary alluvial fan deposits that originated from the Carson Range. The *Carson City Quadrangle Geologic Map* shows the general map unit in this area to be Alluvial-plain deposits of Washoe Valley (Qa). This unit is described as tan to orange-brown, moderately to poorly bedded, angular to subrounded, fine to coarse granodioritic sand.

The portion of the I-580 roadway embankment south of Eastlake Boulevard in Washoe Valley, including Lakeview Interchange Ramp 3 and the frontage road on the west (FRWA65), to approximately the Lakeview Summit (elevation 5,160 feet) and Carson City County line is founded on Quaternary older pediment gravel (Qop). This unit is described as grayish-orange to dark yellow-brown small cobble to muddy sandy pebble gravel. The composition is similar to nearby bedrock, and the deposits are slightly eroded and weakly to moderately weathered.

The portion of I-580 roadway embankment just south-east of the Lakeview Summit in Carson City County, including Lakeview Interchange Ramp 1, is founded on Cretaceous hornblende-biotite granodiorite (Kgd). This unit is described as grayish white to gray and greenish gray, medium- to coarse-grained, equigranular to porphyritic, and locally foliated and lineated that locally grades into quartz monzonite and quartz diorite. The chemical composition of the granitic rock varies locally, and the depth and degree of bedrock weathering is highly variable even within small areas. Near surface granitic rock is decomposed to medium- to very coarse-grained sandy material, mush with minor silt, some with clay coatings, and variably abundant hard blocks. The surficial weathered and decomposed granitic rock is underlain by deeper, unmodified, fresh bedrock. Additionally, the Hobart Ditch and the proposed location for the auxiliary lane extending Lakeview Interchange ramp Ramp 1 to the Carson Street exit off-ramp, is mapped as Pediment and alluvial-fan deposits (Qpa) consisting of grayish-orange, tan and gray-brown granular muddy coarse sand and sandy gravel.

Faulting and Seismicity

The *Quaternary Fault Map of Nevada* (Bell) shows numerous Quaternary faults within 10 miles of the project site. The region is an extremely active tectonic area as evidenced by a series of Holocene aged faults located at the base of the Carson and Virginia Ranges. These faults generally consist of a parallel series (en echelon) of normal faults that drop down toward the valley and are typical of “mountain building” tectonics in the northern Nevada area. These geologically young and historically active faults are probable locations for near-future seismic activity and are capable of producing moderate- to large-magnitude events.

The referenced maps and documents indicate that the Kings Canyon Fault Zone trends northeast through the project site, crossing I-580 in the vicinity of Lakeview Hill. Several other faults are located within a five-mile radius of the site and include the Carson City Fault Zone, Mount Rose Fault Zone, Little Valley fault, and an unnamed fault on the west side of the Virginia Range.

Holocene faults bounding the Washoe Valley basin on the west, at the foot of the Carson Range, have been active recently enough to displace late Pleistocene landslides east of Slide Mountain. A northeast-trending Holocene fault scarp about one to two miles southeast of the Lakeview interchange along the southern border of the Virginia Range shows evidence of movement as recent as 300 years ago.

FIELD INVESTIGATION

Geotechnical field investigations were conducted intermittently between July 9th, 2012 and February 25th, 2014. Approximate soil borehole and geophysical survey locations were obtained using plan view alignment and mapping information provided by NDOT Roadway Design and physical measurements taken in the field. The borehole and geophysical survey locations are depicted on the Boring Location Maps and Geophysical Survey Location Maps, respectively, which are included in Appendix A. The station and offset of each borehole is provided on the Boring Logs in Appendix B. Ground elevations provided in this report were obtained from field measurements from survey monuments including 406009M, 450009M, and 1214001M. Elevations are based on vertical datum NGVD 29. Locations and elevations should be considered accurate only to the degree implied by the method used to determine locations and elevations.

Soil Boreholes

The subsurface conditions were explored by drilling 12 boreholes along the proposed R1a, R2a, and R4a alignments and along the LSe alignment. Drilling was performed using an NDOT Diedrich D-120 drill rig (Drill Rig Unit #1082) equipped with a 140-pound automatic hammer. Hollow Stem Continuous Flight Augering methods were used to explore all boreholes. All boreholes were backfilled with grout. The details of subsurface conditions encountered during our exploration are shown in the Boring Logs in Appendix B. A Key to Boring Logs precedes the Boring Logs in Appendix B.

Logs of the subsurface conditions, as encountered during the field investigation, were recorded by NDOT Geotechnical Engineering staff. All soil samples were examined and identified in the field in accordance with ASTM D 2488. Additional soil classification was subsequently performed on soil samples using the Unified Soil Classification System (USCS) in accordance with ASTM D 2487 upon completion of laboratory testing. Where soil tests are not listed in the appropriate column of the Boring Logs, the USCS symbols and terminology are based solely on visual-manual identification (ASTM D 2488) rather than laboratory classification.

Representative bulk soil samples were obtained from auger cuttings at depths indicated on the Boring Logs. Drive samples were obtained using both a Standard Penetration Testing sampler (SPT, ASTM D 1586) and a California Modified sampler (CMS, ASTM D 3550) at locations noted on the Boring Logs. The drive samples were advanced using a 140-pound automatic hammer with a drop of 30 inches. Sampler driving resistance, expressed as blow count per one foot of penetration (N-value), is presented on the Boring Logs at the respective depths. The N-value is an indication of the apparent density of coarse-grained soils and the consistency of fine-grained soils. The field blow counts presented on the Boring Logs have not been corrected for hammer efficiency, overburden pressure, rod length, etc. The energy transfer ratio from the hammer into the drill string for the NDOT Drill Rig Unit #1082 is 87.5% (SPT energy calibration by Gregg Drilling and Testing, Inc., June 18, 2009). Therefore, a factor of 1.45 shall be applied to the field blow counts to correct for hammer efficiency.

Five boreholes were drilled along the alignment of R1a, the proposed alignment for the Lakeview Interchange southbound on-ramp and auxiliary lane on I-580. These boreholes are identified as LCA1 through LCA5. These boreholes were drilled from the shoulder of the existing roadway to depths ranging from 26 to 36.5 feet.

Four boreholes were drilled along the R2a and LSe alignments, for the Lakeview Interchange southbound off-ramp. These boreholes are identified as LSF1 through LSF4. These boreholes were drilled from the shoulder of the existing roadway to depths ranging from 21 to 26 feet.

Three boreholes were drilled along the alignment of R4a, the proposed alignment for the Lakeview Interchange northbound on-ramp. These boreholes are identified as LNN1 through LNN3. These boreholes were drilled from the shoulder of the existing roadway to depths ranging from 21.5 to 26.5 feet.

Geophysical Survey

Geophysical surveys were conducted using refraction microtremor (ReMi) methods and equipment at the project site on October 1, 2012, November 27, 2012, and February 25, 2014 to develop subsurface shear-wave velocity profiles at the survey sites. The process uses ambient noise energy to produce surface wave data, more specifically Rayleigh waves.

Noise data was obtained along five geophysical survey lines using a cable with 12 geophones spaced 20 feet apart. Locations of the survey lines are shown on the Geophysical Location Maps in Appendix A. Each survey line was laid out to minimize variations in geophone elevations along the line. Variation in elevation along these survey lines are considered negligible.

Two survey lines, Line 1 and Line 2, were run adjacent to the R1a alignment, along the outside of the existing barrier rail. Line 1 was set at an approximate average elevation of 5144 feet. Line 2 was set at an approximate average elevation of 5081 feet.

One survey line, Line 3, was run adjacent to the R4a alignment, along the bottom of the existing embankment fill. Line 3 was set at an approximate average elevation of 5069 feet.

One survey line, Line 4, was run adjacent to the R2a alignment, along the top of the existing embankment fill. Line 4 was set at an approximate average elevation of 5075 feet.

One survey line, Line 5, was run adjacent to the P alignment, along the bottom of existing embankment fill, just southeast of the Bellevue Structure. Line 5 was set at an approximate average elevation of 5031 feet.

LABORATORY ANALYSES

Soil samples were tested at the NDOT Materials and Testing Laboratory in Carson City, Nevada. Soils were classified using the USCS in accordance with ASTM D 2487. Individual laboratory test results for soil samples can be found in Appendix C of this report.

The laboratory testing program for selected samples is listed below.

- Particle size gradations through No. 200 sieve (NV T 206)
- Hydrometer (AASHTO T 88)
- Atterberg Limits (NV T 210 and T 212)
- Natural Moisture Content (AASHTO T 265)
- Soil Unit Weight
- Soil Resistivity (AASHTO T 288, some tests deviated from AASHTO T 288 by using a small 4 pin soil box)
- Water-soluble Chlorides in Soil (AASHTO T 291 A)
- Water-soluble Sulfates in Soil (AASHTO T 290 B)
- Soil pH (AASHTO T 289)
- Direct Shear (AASHTO T 236)

SUBSURFACE CONDITIONS

Soil Conditions

Details of the subsurface conditions encountered during our field investigation at the project site can be found in the Boring Logs in Appendix B. Following is a summary of the subsurface conditions.

Chemical analyses were performed on 10 soil samples taken in the upper 10 feet of the boreholes. Results of the chemical analyses can be found in the Chemical Analysis Table in Appendix C. Nine of the samples were taken from fill material, and one sample was taken from native material in borehole LCA3. Results of the chemical analyses indicate that soluble sulfates in on-site fill and native soils are zero and are noncorrosive to concrete. Results of the chemical analyses indicates that on-site fill soils are corrosive to metals with resistivity ranging from 945 to 2,400 ohm-cm and soluble chlorides ranging from 110 to 480 parts per million (ppm). The pH of on-site fill soils range from 5.7 to 7.4. Results of the chemical analyses for the one soil sample taken from native material in borehole LCA3 indicates that that material has low corrosion potential with a resistivity of 6,670 ohm-cm, soluble chlorides of 45 ppm, and pH of 8.1.

R1a Alignment

In boreholes LCA1 through LCA5 explored along the R1a alignment, approximately 12 inches of asphalt pavement was observed. Existing embankment fill ranges from approximately 3 to 20 feet deep. The embankment fill can be classified as predominately brown, dense, moist silty sand and silty sand with gravel with few occurrences of poorly graded sand with silt and gravel. Below the embankment fill, a layer of brown clayey sand, approximately 1 to 5 feet thick, was encountered in 3 of the 5 boreholes - LCA1, LCA2, and LCA5. The underlying native soils sampled from boreholes LCA1 through LCA5 can be classified as predominately silty sand with occurrences of silty sand with gravel, poorly graded sand with silt and gravel, and silty clayey sand. The native soils vary in color including brown, gray, white, black, yellow, and orange. The native soils also vary in density from medium dense to very dense. The native material encountered along the R1a alignment is consistent with the mapped geologic unit. The depth and degree of weathering of the once near surface granitic bedrock is highly variable and has decomposed to predominately sand-sized materials.

Drilling was generally easy and required only head pressure from the drill rig to penetrate the fill material and in the upper portions of native material in the boreholes along the R1a alignment. Drive samples indicate that native materials become very dense with some refusal blow counts in the lower portion of the boreholes explored, with the exception of LCA5. In LCA3, all drive samples below a depth of 3.5 feet encountered refusal. Refusal is defined as greater than 50 blows with less than 6 inches of penetration or greater than 10 blows with no progress. In addition, drilling became more difficult below a depth of 30 feet in LCA2, below a depth of 14 feet in LCA3, and between the depths of 12 and 15.5 feet in LCA4. Drilling down pressure was increased to 300 to 400 pounds per square inch (psi) and drilling penetration was slow.

Heaving sands were encountered in the bottom of borehole LCA5 below a depth of 25 feet.

After completion of drilling each LCA borehole, the augers were removed from the boreholes and the holes were left open, but were capped for safety, until the holes were backfilled 4 to 7 days later. The groundwater level and borehole depth was measured prior to backfilling the boreholes. Generally, the groundwater level fluctuated from 1 to 6 feet and caving was noted below the groundwater level in each borehole. The boreholes were generally stable above the groundwater level in the time period prior to backfilling.

R2a Alignment

In boreholes LSF1 through LSF4 explored along the R2a alignment, approximately 6 to 8 inches of asphalt pavement was observed. Existing embankment fill ranges from approximately 6 to 12 feet deep. The embankment fill can be classified as predominately brown, medium dense to dense, moist silty sand. Below the embankment fill, a layer of clayey sand and silty clayey sand, approximately 2 to 8 feet thick, was encountered in 3 of the 4 boreholes - LSF1, LSF2, and LSF3. This clayey sand and silty sand has low to medium plasticity, is medium dense to dense, and varies in color from black to gray to brown. The underlying native soils can be classified as predominately silty sand and poorly graded sand with silt with an occurrence of well-graded sand with silt. The native soils vary in color including predominately brown and gray with little black, red, and orange. The native soils also vary in density from medium dense to dense. The underlying native material encountered along the R2a alignment is analogous with the mapped quaternary alluvium geologic unit. This unit is described as moderately to poorly bedded, angular to subrounded, fine to coarse granodioritic sand.

Drilling was easy and required only head pressure from the drill rig to penetrate the materials for the entire depth of the boreholes along the R2a and LSe alignments, and no drive samples met refusal.

Heaving sands were encountered in the bottom of boreholes LSF1 and LSF3 below a depth of 17 feet and 24 feet respectively.

R4a Alignment

In boreholes LNN1 through LNN3 explored along the R4a alignment, approximately 7 inches of asphalt pavement was observed. Existing embankment fill ranges from approximately 8 to 12 feet deep. The embankment fill can be classified as predominately yellowish brown, medium dense to dense, moist silty sand. Below the embankment fill, a layer approximately 2.5 feet thick of loose to medium dense clayey sand with medium plasticity was encountered in boreholes LNN1 and LNN2, and a layer approximately 5 feet thick of loose silty clayey sand with low plasticity was encountered in borehole LNN3. The underlying native soils can be classified as silty sand, poorly graded sand with silt, and well-graded sand with silt. The native soils vary in color including predominately yellowish brown, gray, and grayish brown with little black. The native soils also vary in density from loose to very dense, but are predominately medium dense. The underlying native material encountered along the R4a alignment is analogous with the mapped quaternary alluvium geologic unit. This unit is described as moderately to poorly bedded, angular to subrounded, fine to coarse granodioritic sand.

Drilling was easy and used only head pressure and up to 100 psi down pressure from the drill rig to penetrate the materials for the entire depth of the boreholes along the R4a alignment, and no drive samples met refusal.

Heaving sands were encountered in the bottom of borehole LNN2 below a depth of 23 feet.

Bellevue Interchange

Boring logs from the boreholes explored for the original construction of the Bellevue Interchange indicate that the native soils below the fill consist of loose to slightly compact silty sand between elevations of 5030 feet and 5022 feet. Below an elevation of 5022 feet to the bottoms of borings, soils are generally dense sand.

Lakeview Interchange

Boring logs from the boreholes explored for original construction of the Lakeview Interchange indicate that native soils below the fill consist of mixtures of decomposed granite, sand, silt, and clay. Soils are generally loose near the original ground surface at approximately an elevation of 5070 feet. Soils generally increase in density with depth, becoming medium dense at about an elevation of 5050 feet and dense at about an elevation of 5030 feet.

Groundwater Conditions

During our geotechnical investigation, groundwater was encountered in every borehole. Groundwater level was estimated at the time of drilling, and groundwater level measurements were taken after drilling and are recorded on the Boring Logs in Appendix B.

Along the R1a alignment, groundwater was encountered at elevations ranging from 5052 feet in borehole LCA1 to 5140 feet in borehole LCA5.

Along the R2a alignment, groundwater was encountered at elevations ranging from 5062 feet in borehole LSF1 to 5068 feet in borehole LSF4.

Along the R4a alignment, groundwater was encountered at elevations ranging from 5058 feet in borehole LNN3 to 5063 feet in borehole LNN1.

Groundwater measurements taken during drilling operations and intermittently prior to backfilling of the boreholes demonstrate fluctuations in the groundwater level over short periods of time. In addition, evidence of iron staining and oxidation was present in many of the boreholes, which indicates fluctuations in the groundwater level.

Boring logs for the boreholes explored at the Bellevue Bridge abutments and pier show the ground water table at an elevation of approximately 5027 feet in all three boreholes, measured on August 25, 1967. Boring logs from six boreholes explored for ramps at the Bellevue Interchange show ground water surface elevations between 5028 and 5032 feet, measured in March 1972.

Boring logs for the boreholes explored for original construction of the Lakeview Interchange indicate the ground water table at an elevation of 5070 feet on March 30, 1960.

NDOT construction records and maintenance experience indicate the presence of several artesian springs on and around the area of Lakeview Hill.

The NDOT Geotechnical Section has been monitoring and recording the groundwater levels in several shallow wells on Lakeview Hill intermittently since September 2010. Five wells are currently being monitored; they are identified as monitor well #4, #5, #8, #12, and #13. The measured depth to free water below the ground surface and the date of the measurement is shown graphically in Appendix B on the Lakeview Hill Monitor Wells Depth to Water chart. The approximate locations of these wells are shown on the Lakeview Hill Monitor Wells Map provided in Appendix A. In general, the groundwater levels in the monitor wells fluctuate seasonally with higher water levels occurring in the spring and the lower levels occurring at the end of summer. The following table presents the shallowest and deepest recorded groundwater depths (and the date recorded) with respect to the ground surface in each monitor well:

Monitor Well	Shallowest Recorded Depth	Deepest Recorded Depth
#4	8.51 feet (03/22/11)	14.88 feet (10/06/10)
#5	6.33 feet (03/22/11)	13.52 feet (10/06/10)
#8*	0.24 feet (03/22/11)	7.05 feet (09/19/13)
#12	0.68 feet (04/05/11)	7.51 feet (09/22/14)
#13	0.60 feet (03/22/11)	6.23 feet (09/22/14)

Table 1. Monitor well groundwater depths from ground surface.

*No readings were taken in Monitor Well #8 after 06/02/14.

Fluctuations in the level of the groundwater and soil moisture conditions as noted in this report may change due to seasonal fluctuations, variations in precipitation, and other factors.

Site Class Definition

The results of the geophysical surveys are represented by one-dimensional shear wave velocity profiles located in the Geophysical Survey Data in Appendix B. An Optim Software and Data Solutions representative performed interpretations of the noise data collected at the site using the most current SeisOpt ReMi software. The Rayleigh wave noise data is converted from time domain to frequency domain using wavefield transformation techniques. This process produces a slowness-frequency spectral image. This image is used to select a “fundamental mode” dispersion curve that represents the minimum phase velocity of the Rayleigh wave energy. A forward modeling process is then used to produce a shear wave velocity profile.

The shear wave velocity profiles depict variations in the shear wave velocities to a depth of 100 feet and provide the average shear wave velocity for the upper 100 feet of the soil profile, v_{s100}. The ReMi equipment and methods provide effective means to obtain subsurface information by estimating subsurface shear wave velocity profiles with 20% accuracy. Geophysical survey results can be used to characterize the subsurface material at the site.

For Lines 1 and 2, along the R1a alignment, the average shear wave velocity for the upper 100 feet of the soil profile, v_{s100}, is estimated to be 1,260 and 1,220 feet per second, respectively, which indicates a Site Class Definition of C as defined by Table 3.10.3.1-1 of AASHTO LRFD Bridge Design Specifications (AASHTO).

For Line 3, along the R4a alignment, v_{s100} is estimated to be 846 feet per second which indicates a Site Class Definition of D.

For Line 4, along the R2a alignment, v_{s100} is estimated to be 696 feet per second which indicates a Site Class Definition of D.

For Line 5, along the P alignment, v_{s100} is estimated to be 843 feet per second which indicates a Site Class Definition of D.

SUMMARY OF ANALYSES AND GEOTECHNICAL DESIGN CRITERIA

Seismic Coefficients

Table 2 provides approximate seismic coefficients for the project site determined by interpolation from figures provided in AASHTO Article 3.10.2.1, seismic coefficients at the Lakeview structures' location determined from United States Geological Survey (USGS) 2002 hazard data provided on the USGS website, and minimum seismic coefficients for Washoe and Carson City counties in accordance with the *NDOT Structures Manual* Figure 12.3-H.

Source	**Peak Ground Acceleration (PGA) Coefficient**	**Short-Period Spectral Acceleration Coefficient (S_s)**	**Long-Period Spectral Acceleration Coefficient (S_l)**
AASHTO Article 3.10.2.1	0.60	1.25	0.50
USGS 2002 hazard data	0.61	1.47	0.55
NDOT Structures Manual Figure 12.3-H	0.50	1.25	0.50

Table 2. Seismic Coefficients.

It is recommended to use the seismic coefficients determined from the USGS 2002 hazard data for seismic design. The reference document for this data is the 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design.

The appropriate Site Class, provided on the previous page, should be used to determine Site Factors specified in AASHTO Article 3.10.3.2 to be used to characterize the seismic hazard specified in AASHTO Article 3.10.4.

Bellevue Bridge, I-1261, Seismic Retrofit

The geotechnical analyses and design criteria presented in the following sections are provided at the request of the structural engineer for the analysis of the Bellevue Bridge seismic retrofit.

Pile driving records indicate that pier pile lengths vary between 11 and 29 feet, east abutment pile lengths vary between 26 and 29 feet, and west abutment pile lengths vary between 19 and 24 feet. Pile driving records also indicate that pre-drilling through the embankment fill was performed prior to driving piles at the abutments.

Soil Parameters for Design and Analysis

Based on the boring logs and as-built plans from Contract 1280 the recommended soil parameters for analysis for the seismic retrofit at the Bellevue Bridge, I-1261, are summarized in Table 3 below. Note that the ground water surface is assumed to be at an elevation of 5027 feet.

Location	**Soil Type**	**Top Elevation (ft)**	**Bottom Elevation (ft)**	**Effective Soil Unit Weight, γ' (pcf)**	**Angle of Internal Friction, ø (°)**	***Cohesion, c (psf)**	**Modulus of subgrade reaction, k (lb/in^3)**
Abutments	Fill	5050	5030	120	36	100	90
	Native	5030	5027	110	25	100	20
	Native	5027	5022	58	25	100	20
	Native	5022	4993	68	36	100	60
Pier	Fill	5036	5027	120	36	100	90
	Fill	5027	5025	68	36	100	90
	Native	5025	5022	58	25	100	20
	Native	5022	4993	68	36	100	60

Table 3. Soil Parameters at the Bellevue Bridge.
*Assumed apparent cohesion.

During a dynamic event such as an earthquake, loose, saturated cohesionless soil deposits may experience a sudden loss of strength and stiffness. This phenomenon is called soil liquefaction. A potentially liquefiable layer of loose to slightly compact silty sand was identified between elevations of 5030 feet and 5022 feet in the boring logs from 1967 at the locations of all three substructures.

Liquefaction at the center pier is considered to be negligible. During construction of the Bellevue Bridge in 1969, the potentially liquefiable native soil in the vicinity of the center pier was excavated to an elevation of 5025 feet. The soil was removed and replaced with engineered fill above an elevation of 5025 feet. The remaining 3-foot thick layer of potentially liquefiable soil is assumed to have densified by displacement of pile volume and by vibration during pile driving. This assumption is supported by methods for mitigating liquefaction-induced downdrag presented in Kavazanjian, et al. (1997). In addition, pile driving records indicate that driving resistances generally increased as subsequent piles were driven at the pier.

Construction records do not indicate that any potentially liquefiable soil was excavated at the abutments, and driving records do not indicate increased driving resistances as subsequent piles were driven.

Liquefaction analysis was performed using the Simplified Procedure originally developed by Seed and Idriss (Kavazanjian, et al. 1997). For seismic analysis, all soil within and above the liquefiable zone shall not be considered to provide axial or lateral resistance for the piles at the abutments. It is estimated that post-liquefaction settlement of about 2 inches can occur in the 8-foot layer of liquefiable soil at abutments after an earthquake of Magnitude 6 or greater. Settlement of the liquefiable soils may result in subsidence of the overlying embankment fill.

Pile Axial Compression Resistance, Uplift Resistance, and Downdrag

Nominal (ultimate) axial resistance for a single pile was analyzed using the computer program DRIVEN which utilizes the Nordlund/Thurman and Tomlinson methods. The piles in the pier pile group are spaced roughly 3 pile diameters apart (center to center) and the piles in the abutment pile groups are spaced greater than 3 pile diameters apart; therefore, no axial group reduction factor needs to be applied. The estimate of nominal axial compression resistance versus pile tip depths for a single 12 ¾-inch closed-ended, vertical pipe pile are presented for the pier piles and abutment piles in Figures 1 and 2, respectively, on the following page. The nominal axial compression resistance is plotted as total capacity, which is the sum of the skin friction and end bearing. The geotechnical resistance factor, φ, for pile axial resistance in compression for the Extreme Event I limit state shall be taken as 1.0. Note, that axial resistance is ignored within the embankment fill and the liquefiable zone at the abutments.

Nominal (ultimate) uplift resistance versus pile depth for a single 12 ¾-inch, closed–ended, vertical pipe pile is plotted as skin friction on Figures 1 and 2. The geotechnical resistance factor, φ, for uplift resistance of piles for the Extreme Event I limit state shall be taken as 0.8 in accordance with AASHTO 10.5.5.3.3.

Downdrag induced by post-liquefaction settlement at the abutments was estimated by summing the negative skin friction in the liquefiable zone. It is assumed that the negative skin friction in the overlying embankment fill does not contribute to downdrag loads, just as with positive shaft resistance is ignored in the embankment fill. The nomimnal downdrag load on a single 12 ¾-inch, closed-ended, vertical pipe pile at the abutments is estimated to be on the order of 7 kips.

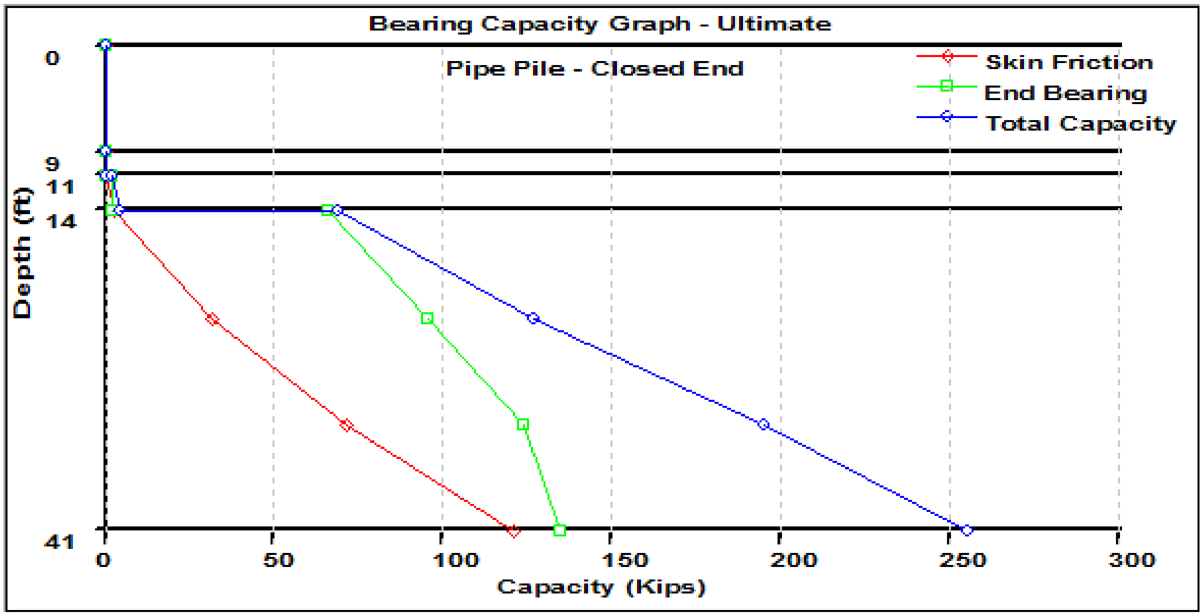

Figure 1. Bellevue Bridge I-1261 Pier. Bottom of pile cap (top of pile) is at a depth of 11 feet (elevation of 5025 feet).

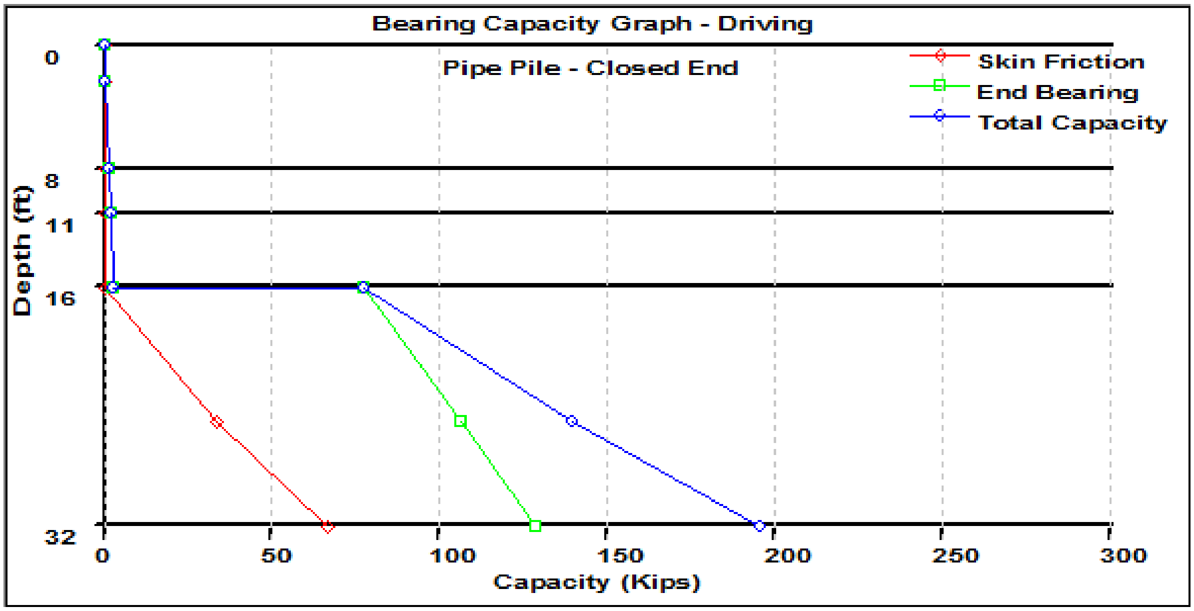

Figure 2. Bellevue Bridge I-1261 Abutments. Bottom of pile cap (top of pile) is at a depth of 2.5 feet (elevation of 5033.5 feet at the West Abutment and 5035.9 feet at the East Abutment).

Pier Pile Axial Stiffness

At the pier, the recommended axial stiffness coefficient for a 12 ¾-inch closed-ended, vertical pipe pile was determined to be 350 kips/inch, in accordance with Section 6.2.2.2(c) of the *Seismic Retrofitting Manual for Highway Structures*.

Pier Pile—Head Lateral Stiffness

At the pier, the recommended lateral pile-head stiffness is 200 kips/inch, determined in accordance with Section 6.2.2.2(b) of the *Seismic Retrofitting Manual for Highway Structures*.

Soil Stiffness of Fill at the Abutments

It is recommended to use the NDOT adopted soil stiffness of 70 ksf per foot of movement for dynamic modeling. This stiffness is based on test results for large movements and is applicable for displacements in the range of 1 to 3 inches.

Anchor Slab Passive Earth Pressure and Sliding Resistance

A "waffle" type anchor/approach slab is proposed to be constructed at each end of the bridge to resist lateral displacement of the superstructure in both longitudinal and transverse directions. The proposed waffle slab will be cast-in-place on existing embankment fill and/or imported fill material, and fill material placed in the areas between and outside the vertical stems will be approved material placed and compacted in accordance with the specifications of this project. The proposed waffle slab will be 5 to 5.5 feet in height.

The passive earth pressure can be assumed to act uniformly along the vertical surfaces. The maximum passive earth pressure on the vertical surfaces ($\mathrm{p_p}$) can be estimated using the following equation:

$$\mathrm{p_p} = 5.0\ ksf\ \times \frac{\mathrm{h_e}}{5.5\ ft} \quad (ksf)$$

where: $\mathrm{h_e}$ = effective height of the vertical surface (ft)

Passive earth pressure resisting lateral movement in the transverse direction shall be ignored on the outsides of the anchor slab where the fill material is sloped down and away from the anchor slab.

It is estimated that approximately 1 inch of movement of the proposed waffle slab is required to mobilize maximum passive pressure.

The coefficient of friction, tan δ, to calculate nominal sliding resistance between the anchor slab mass and the fill below the anchor slab can be assumed to be equal to tan ø of the fill, or 0.7. Sliding resistance along the sides of the anchor slab shall be ignored.

Lakeview Bridges, I-812 N/S, Seismic Retrofit

The geotechnical analyses and design criteria presented in the following sections are provided at the request of the structural engineer for the analysis of the Lakeview Bridges (I-812N&S) seismic retrofit. Pile driving records indicate that all piles were driven to a tip elevation of approximately 5052 feet.

Soil Parameters for Design and Analysis

Based on the boring logs and as-built plans from Contract 1144, the original construction of the Lakeview Interchange, the recommended soil parameters for analysis at Bridges I-812N&S, are summarized in Table 4 below. Note that the ground water surface is assumed to be at an elevation of 5070 feet.

Location	Soil Type	Top Elevation (ft)	Bottom Elevation (ft)	Effective Soil Unit Weight, γ' (pcf)	Angle of Internal Friction, ø (°)	*Cohesion, c (psf)	Modulus of subgrade reaction, k (lb/in^3)
Abutments	Fill	5089	5070	120	36	100	90
	Native	5070	5050	58	28	1,000	25
	Native	5050	5030	68	30	1,000	35
Piers	Fill	5074	5070	120	36	100	90
	Fill	5070	5068	58	36	100	90
	Native	5068	5050	58	28	1,000	25
	Native	5050	5030	68	30	1,000	35

Table 4. Soil Parameters at the Lakeview Bridges.
*Assumed apparent cohesion.

Boring logs indicate low soil penetration resistance in native soils between elevations of 5070 feet and 5040 feet and a groundwater surface at an elevation of 5070 feet. However, boring logs also show a significant presence of clay in the soil profile. Therefore, the potential for liquefaction at the Lakeview Interchange is considered to be low.

Pile Axial Compression Resistance, Uplift Resistance, and Downdrag

The piles were designed for 30 ton capacity and an ultimate capacity of 60 ton (FS=2). It is recommended to use the 60 tons for the nominal single-pile axial compression capacity for the seismic retrofit analysis. The piles are predominately friction piles with little to no end bearing; therefore, it can be assumed that the nominal uplift resistance of a single pile is approximately 60 tons. Because the potential for liquefaction is low, liquefaction induced downdrag on piles can be considered negligible.

Cantilever Retaining Walls along R1a, R2a, and R4a Alignments

Preliminary plans indicate that the proposed cast-in-place concrete cantilever retaining walls will be a maximum of 6 feet in height and will retain the roadway and embankment fill. Final embankment fill geometry in front of the wall shall not be steeper than 2H:1V slope.

Retained Soil and Lateral Earth Pressures

The retaining walls will be backfilled with NDOT Granular Backfill material in accordance with NDOT *Standard Specifications for Road and Bridge Construction* (Standard Specifications) Section 207 and NDOT *Standard Plans for Road and Bridge Construction* (Standard Plans) Drawing R-1.1.4. For our analyses, it was assumed that the Granular Backfill will be free draining. Backfill beyond the limits of Granular Backfill will consist of existing or new roadway embankment fill.

Lateral earth pressures were analyzed using the following backfill soil material properties: angle of internal friction (ϕ_f) equal to 34°, unit weight of soil (γ) equal to 120 pcf, and cohesion (c) equal to 0. Earth pressure coefficients were calculated assuming a level backslope.

Static Lateral Earth Pressure

The cast-in-place concrete cantilever retaining walls along the R1a, R2a, and R4a alignments shall be designed using the Coulomb active earth pressure coefficient, k_a, of

0.26. This value was calculated assuming the angle of friction between backfill and the wall, δ, equal to 18°.

Seismic Lateral Earth Pressure

Calculation of the seismic lateral earth pressure was analyzed in accordance with AASHTO Article 11.6.5.2. Seismic design of the proposed retaining walls shall use a seismic active pressure coefficient, k_{ae}, of 0.5. This value was determined using the following assumptions: backfill is level, vertical acceleration coefficient is equal to 0, horizontal acceleration coefficient equals 0.3, and angle of friction between backfill and wall equals 18 degrees. The seismic horizontal acceleration coefficient, k_h, used to calculate seismic earth pressures is the site-adjusted peak ground acceleration after being adjusted for limited amounts of permanent deformation determined appropriate for the wall ($k_h = ½\, k_{h0}$, where $k_{h0} = F_{pga}\, PGA = A_s$).

Vehicular Live Load Surcharge

Constant horizontal earth pressure due to vehicular live load surcharge was evaluated in accordance with AASHTO Article 3.11.6.4. It is recommended that the equivalent height of soil for vehicular loading on retaining walls parallel to traffic, h_e, be taken as 2.0 feet. Constant horizontal active earth pressure due to vehicular live load surcharge on the retaining walls shall be taken as 62.4 psf. These values assume that the distance from the backface of wall to the edge of traffic is greater than 1.0 foot.

Other anticipated surcharge loads resulting in lateral loads on the retaining walls and need to be considered in the design.

Foundation Sliding Resistance

The retaining walls will generally be founded in the embankment fill, with the exception of a few small sections of the wall along the R1a alignment that may bear on native soils. Existing embankment fill along the proposed retaining wall alignments are generally sloped at 2H:1V.

For design purposes, it is assumed that the cantilever retaining wall foundations will be cast-in-place against existing embankment fill and/or imported embankment fill material placed and compacted in accordance with the specifications of this project. Therefore, the coefficient of friction, tan δ, used to calculate nominal sliding resistance between cast-in-place-concrete footings and embankment fill shall be taken as 0.7.

Soil providing passive resistance in front of the retaining walls will be sloped down and away from the wall at a 2H:1V slope, and it is likely to become loose or disturbed and the contact between the soil and wall may not be tight. Therefore, passive resistance of soil in front of the retaining structures shall be neglected in accordance with AASHTO Article 11.6.3.5.

Scour Design Considerations

Drainage channels run along the toes of the existing embankments along the wall alignments. The NDOT Hydraulics Section has determined that design scour is negligible. Therefore, no changes to the foundation conditions need to be considered for the analyses.

Foundation Embedment Depth

To protect against frost heave, it is recommended that the cast-in-place concrete retaining structures' spread footings be embedded at least 2 feet.

Movement and Stability at the Service Limit State

Retaining walls shall be designed to meet settlement and overall stability requirements in accordance with AASHTO Article 11.6.2.

Settlement

For the cantilever retaining walls on this project, the factored bearing resistance at the Service I Limit State is defined as the net bearing pressure that is estimated to produce 1 inch of total settlement. For this project, total settlement is considered to be the immediate elastic settlement. Long term primary consolidation settlement and secondary settlement is considered to be negligible.

Settlement analyses were performed in accordance with AASHTO Article 10.6.2.4 and *Geotechnical Engineering Circular 6, Shallow Foundations*. The estimated settlement was calculated using the Hough method for normally consolidated, cohesionless soils based on the results of laboratory and in situ testing. Review of the borehole soil profiles indicates that borehole LCA5 contained the loosest soils along the proposed cantilever retaining walls alignments. Borehole LCA5 soil profile was used to provide a conservative settlement estimate to determine the limiting bearing resistance for the Service I Limit State.

The factored bearing resistance for the Service I Limit State was determined to be 2 ksf. This value applies to retaining walls with effective footing widths between 4 and 8 feet. The resistance factor, φ, for the service limit states shall be taken as 1.0. Therefore, nominal and factored resistances at the service limit states are equal.

Overall Stability

Overall Stability of the retaining walls on a 2H:1V embankment slope was evaluated using the Normal Method of Slices and a resistance factor, φ, of 0.65. The embankment soil was analyzed assuming the following soil properties: $\phi_f = 34°$, $\gamma = 120$ pcf, and $c = 100$ psf. It was determined that the factored resisting forces exceeded the driving forces; therefore, the overall stability requirements are met for the Service I Limit State.

Soil Bearing Resistance and Stability at the Strength Limit State

Retaining walls shall be designed to ensure stability against bearing capacity failure, overturning, and sliding in accordance with AASHTO Article 11.6.3.

Bearing Capacity

Bearing capacity for the proposed retaining structures was analyzed using preliminary geometry provided by NDOT Structures Division. Analysis of bearing resistance assumes strip footings founded on 2H:1V sloped embankment fill, an embedment depth of 18 inches, and the groundwater level within a depth of one footing width below the wall foundation.

Nominal bearing resistance at the Strength I limit State was analyzed using the theoretical estimation in accordance with AASHTO Article 10.6.3.1.2a. The nominal bearing resistance was determined to be on the order of 10 ksf for effective footing widths between 4 and 8 feet. The bearing resistance factor for the Strength I limit state, φ_b, is 0.55 used in accordance with AASHTO Table 11.5.6-1. The factored bearing resistance at the Strength I Limit State shall be taken to be 6 ksf.

Overturning

The location of the resultant of the reaction forces shall be within the middle two-thirds of the base width.

Sliding

The resistance factor, φ_τ, for the shear resistance between cast-in-place concrete and sand to calculate the factored sliding resistance shall be taken as 1.0 (AASHTO T.11.5.7-1).

Seismic Design at the Extreme Event Limit State

Retaining walls shall be designed to meet overall, external, and internal stability requirements during seismic loading in accordance with AASHTO Article 11.6.5. Seismic analysis for the concrete cantilever retaining walls shall use an Extreme Event limit state resistance factor equal to 1.0 except as noted in Table 5 below, in accordance with AASHTO Article 11.5.8.

Analysis	Resistance Factor, φ
Overall Stability	0.9
Bearing Resistance	0.8

Table 5. Extreme Event limit state resistance factors.

Overall Stability of the retaining walls on a 2H:1V embankment slope were evaluated using the Pseudostatic Method and a resistance factor, φ, of 0.9. The embankment soil was analyzed assuming the following soil properties: $\phi_f = 34°$, $\gamma = 120$ pcf, and c = 100 psf. It was determined that the factored resisting moments exceeded the driving moments; therefore, the overall stability requirements are met for the Extreme Event I Limit State.

Nominal bearing resistance at the Extreme Event I limit state is the same as the nominal bearing resistance at the Strength I Limit State: 10 ksf for effective footing widths between 4 and 8 feet. The bearing resistance factor for the Extreme I limit state, φ_b, is 0.8. Therefore, the factored bearing resistance at the Extreme Event I Limit State shall be taken to be 8 ksf.

For seismic eccentricity evaluation, the location of the resultant of the reaction forces shall be within the middle two-thirds of the base for $\gamma_{EQ} = 0.0$ and within the middle eight-tenths of the base for $\gamma_{EQ} = 1.0$. For values of γEQ between 0.0 and 1.0, the resultant location restriction shall be obtained by linear interpolation.

Cable Barrier Rail

The height of the fill at the end terminal at station “LSe” 95+70 is estimated to be about 15 feet. The height of fill at the end terminal at station “LSe” 137+89 is estimated to be about 2 feet.

It can be assumed that the cable barrier rail will be founded primarily in fill material above groundwater from the proposed end terminal at station “LSe” 95+70 to approximately station “LSe” 110+00. Fill material sampled along the R2a and R4a alignments can be described as moist, medium dense to dense silty sand. The following parameters are recommended for the foundation design of the cable barrier rail between stations “LSe” 95+70 and “LSe” 110:

- The design water table is below the foundation elements;
- moist unit weight of soil is 120 pcf;
- angle of internal friction of soil is 34°; and
- cohesion is 0.

Fill heights are assumed to be shallow along the cable barrier rail alignment north of approximately station “LSe” 110 to the end terminal at station “LSe” 137+89. It can be assumed that the cable barrier rail will be founded primarily in underlying native soils. The ground water level is near the surface and the site can be considered to be wet. Native soils underlying the fill along the R2a and R4a alignment are generally clayey sand and silty clayey sand with low to medium plasticity. Densities varied from loose to dense. Near surface native soils described in the boring logs for the Lakeview and Bellevue structures are generally loose silty sands. The following parameters are recommended for the foundation design of the cable barrier rail between stations “LSe” 110 and “LSe” 137+89:

- The design water table is at the ground surface;
- saturated unit weight of soil is 110 pcf (corresponding effective unit weight of 50 pcf);
- angle of internal friction of soil is 30°; and
- cohesion is 0.

The frost depth shall be taken as 24 inches.

CONSTRUCTION RECOMMENDATIONS

Excavations

Construction of the planned improvements will require soil excavation. All structure excavation shall conform to NDOT Standard Specifications for Road and Bridge Construction (Standard Specifications), contract Special Provisions, and current OSHA safety regulations for sloping the sides of excavations, using shoring and bracing, and for using other safety features. Fill materials can generally be classified as OSHA Class C soils defined by granular soils including gravel, sand, and sandy loam. Underlying native materials along the investigated alignments can generally be classified as OSHA Class C soils defined by submerged soil or soil from which water is freely seeping. The maximum allowable slope for excavations less than 20 feet in Class C soils is 1.5:1 (horizontal: vertical). Soil classifications may change at various locations based on the soil conditions exposed during construction. Soil classifications may be reclassified by a competent person as necessary. When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that reduction is achieved. The working area may require the contractor to provide temporary shoring for excavations.

Groundwater, Springs, and Saturated Subgrade

Unstable foundation conditions may be encountered in excavations during construction due to groundwater seepage or soft, wet, pumping, or yielding conditions which prevent proper compaction of the foundation soils. Soft, wet, pumping, or yielding subgrade conditions may be encountered in drainage channels, particularly after wet periods.

Construction records from previous projects, maintenance experience, and past investigations indicate the presence of artesian springs on and around the area of Lakeview Hill. Artesian springs may be encountered in excavations in the vicinity of Lakeview Hill. In addition, shallow groundwater has been observed in the monitor wells on Lakeview Hill. Historically, the springs and shallow groundwater conditions have required recurring mitigation to address issues related to construction of improvements, roadway safety, and maintenance. The contractor shall be prepared and responsible to mitigate the effects of artesian springs on construction activities should these springs be encountered during construction.

Dewatering is the Contractor’s responsibility. We recommend that the contractor protect any subgrade from exposure to water and any unnecessary construction traffic.

Widening of Embankment

Roadway embankment fill slopes constructed with NDOT Borrow material shall be constructed no steeper that 2H:1V. Fill placed against existing embankments shall be placed by continuously benching as the work is brought up in layers in accordance with Subsection 203.03.12 of the Standard Specifications to provide a level surface for placement and to provide for proper compaction of the fill.

Earthen drainage channels run along the toes of the existing embankments adjacent the roadways proposed for widening. Soft, wet, pumping, or yielding subgrade conditions may be encountered during construction activities, particularly during construction of the first layer of the embankment widening and after wet periods. When the embankment foundation will not support the mass of heavy hauling and spreading equipment, the Contractor shall choose equipment that will least disturb the subgrade. Necessary use of lighter hauling vehicles or different methods of embankment construction other than originally contemplated shall not be the basis for a claim for extra compensation as stated in Subsection 203.03.14 of the Standard Specifications. Furthermore, the embankment foundation may not be able to be compacted to the required density. When the natural ground material is encountered that cannot be compacted to the required density, compaction requirements will be determined by the Engineer as stated in Subsection 203.03.15 of the Standard Specifications.

Retaining Walls

Construction of the proposed retaining walls along the sloped roadway embankments presents construction space limitations that need to be considered due to the close proximity of the adjacent drainage channels and other infrastructure at the toe of the embankments and the need to maintain traffic on the travel way at the top of the embankments.

Heavy construction equipment and vehicles shall not operate behind the back face of the retaining walls within a distance equal to one-half the wall height on the surface of the backfill. Backfill material located within three feet of the backface of the wall shall be compacted using a minimum of three passes of a lightweight roller or walk-behind vibratory plate.

Buried gabion baskets that were installed in the Hobart Ditch under NDOT Contract 2172 may be encountered during excavation for the retaining wall along the R1a alignment between stations 18+00 and 33+00. Gabion wire mesh and rock infill within excavation limits and below the footprint of the proposed retaining wall will need to be removed, and care should be taken not to damage the gabion baskets outside the footprint of the proposed retaining wall. Any sub-excavation resulting from gabion removal below the retaining wall footprint shall be backfilled with Backfill material. The Backfill material shall be placed and compacted in accordance with Section 207 of the Standard Specifications.

Monitor Well

The existing monitor well #13 at station “LSe” 71+00, 16 feet left needs to be protected from damage during construction activities and returned to its original condition following construction.

GEOTECHNICAL REPORT LIMITATIONS

Recommendations contained in this report are based on the information obtained from our field investigations, laboratory tests, and observations of our geotechnical engineer. The nature and extent of variations may not be evident until the construction takes place. If conditions are encountered during construction which differ from those described in this report, or if the scope of construction is altered significantly, the NDOT Geotechnical Section must be notified in order that a review of our recommendations can be provided.

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APPENDIX A:
MAPS

Location Sketch
Boring Location Maps
Geophysical Survey Location Maps
Lakeview Hill Monitor Wells

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	STP-580-1(032)	CARSON CITY WASHOE	1A

PRELIMINARY
SUBJECT TO REVISION
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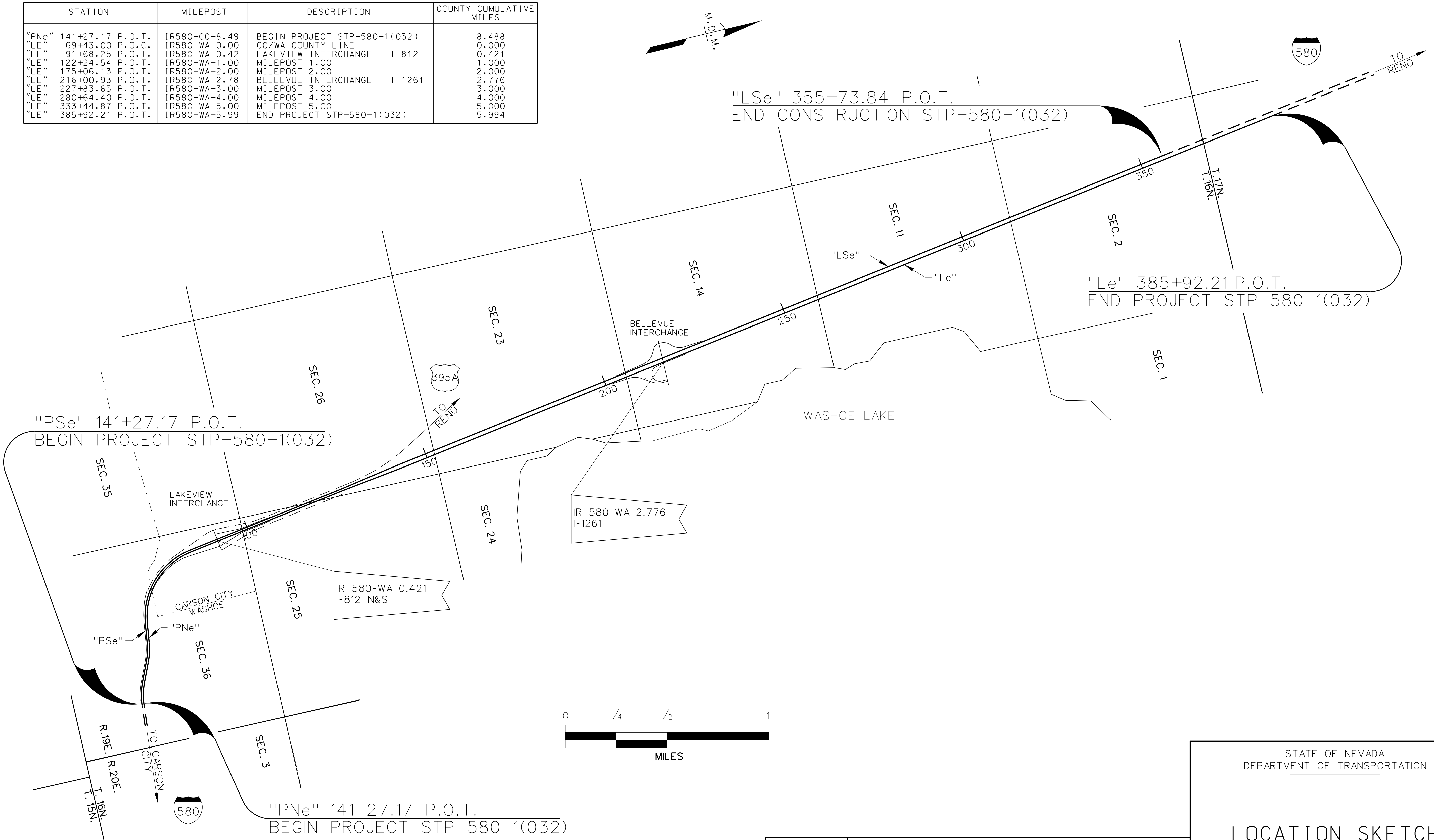
MILEPOST TABULATION

STATION	MILEPOST	DESCRIPTION	COUNTY CUMULATIVE MILES
"PNe" 141+27.17 P.O.T.	IR580-CC-8.49	BEGIN PROJECT STP-580-1(032)	8.488
"LE" 69+43.00 P.O.C.	IR580-WA-0.00	CC/WA COUNTY LINE	0.000
"LE" 91+68.25 P.O.T.	IR580-WA-0.42	LAKEVIEW INTERCHANGE - I-812	0.421
"LE" 122+24.54 P.O.T.	IR580-WA-1.00	MILEPOST 1.00	1.000
"LE" 175+06.13 P.O.T.	IR580-WA-2.00	MILEPOST 2.00	2.000
"LE" 216+00.93 P.O.T.	IR580-WA-2.78	BELLEVUE INTERCHANGE - I-1261	2.776
"LE" 227+83.65 P.O.T.	IR580-WA-3.00	MILEPOST 3.00	3.000
"LE" 280+64.40 P.O.T.	IR580-WA-4.00	MILEPOST 4.00	4.000
"LE" 333+44.87 P.O.T.	IR580-WA-5.00	MILEPOST 5.00	5.000
"LE" 385+92.21 P.O.T.	IR580-WA-5.99	END PROJECT STP-580-1(032)	5.994



NEVADA DOT	DESIGN DIVISION		
	DESIGNER	DAN WINTERS	PHONE (775) 888-7658
	COORDINATOR	KEVIN MAXWELL	PHONE (775) 888-7651

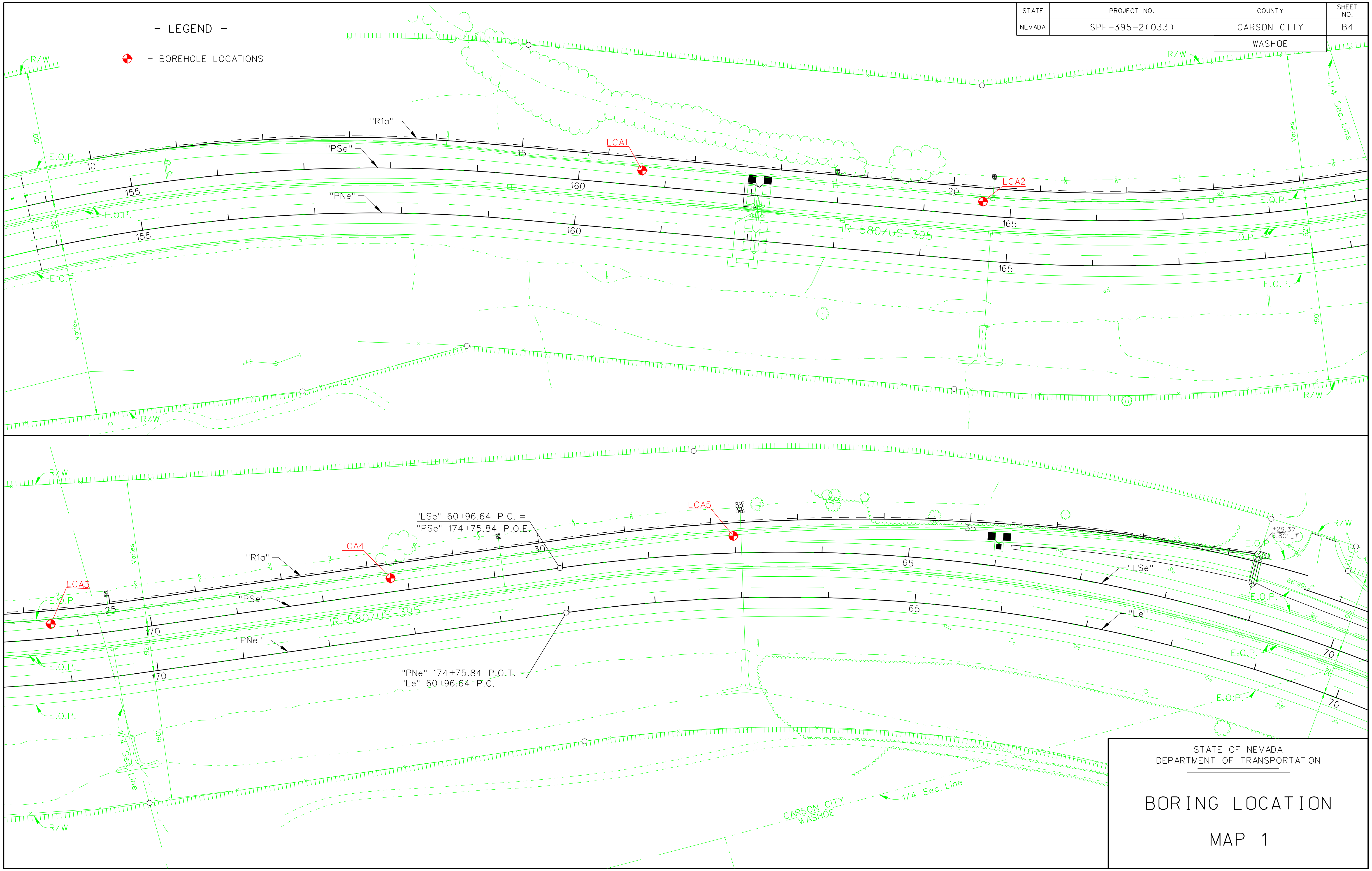
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LOCATION SKETCH

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPF-395-2(033)	CARSON CITY WASHOE	B4

- LEGEND -

● - BOREHOLE LOCATIONS



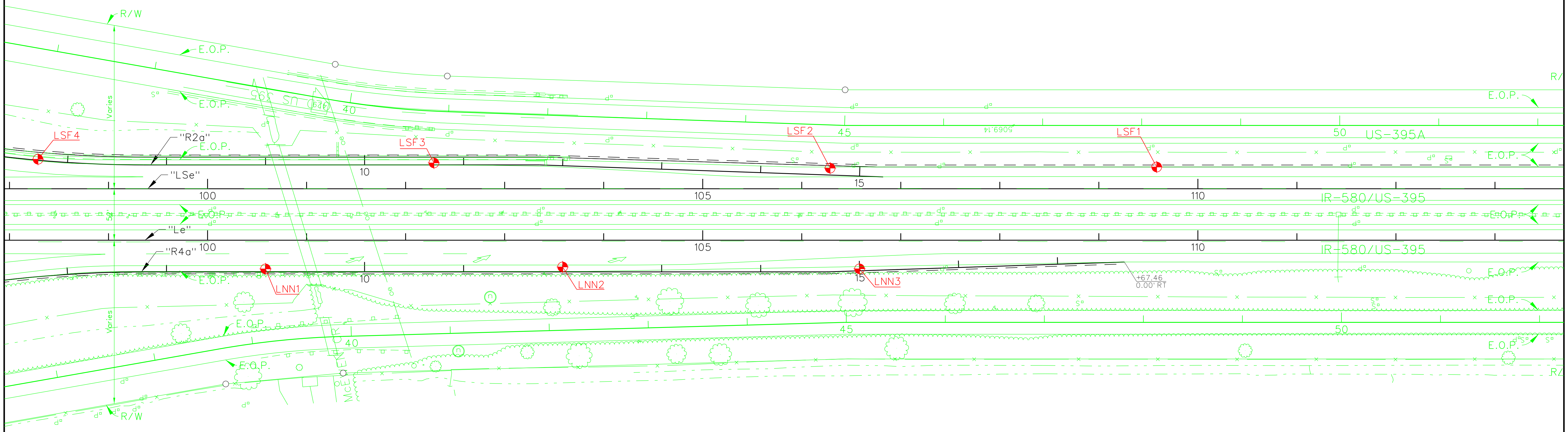
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BORING LOCATION MAP 1

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPF-395-2(033)	WASHOE	B7

- LEGEND -

⊕ - BOREHOLE LOCATIONS



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

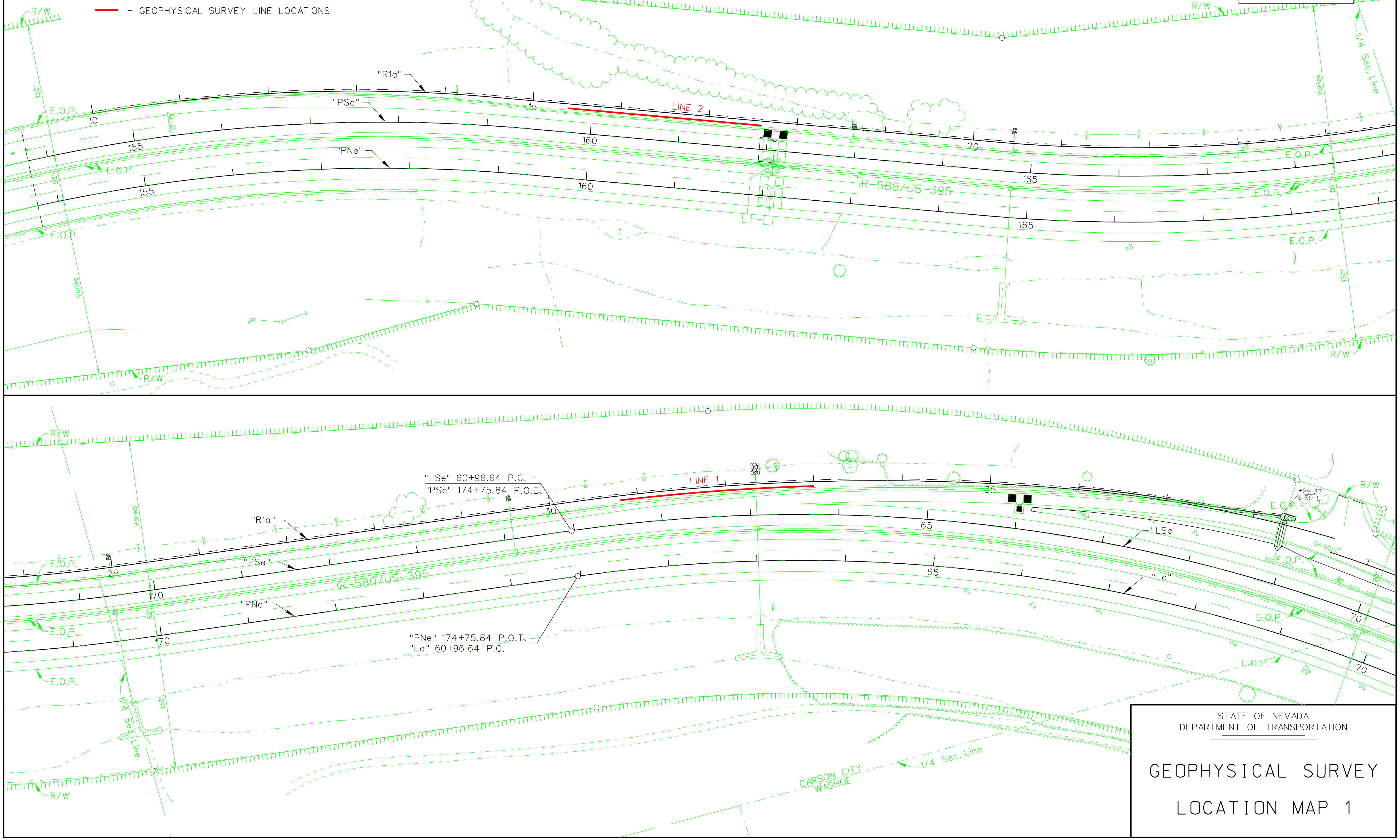
BORING LOCATION

MAP 2

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPF-395-2(033)	CARSON CITY WASHOE	G4

- LEGEND -

▬ - GEOPHYSICAL SURVEY LINE LOCATIONS



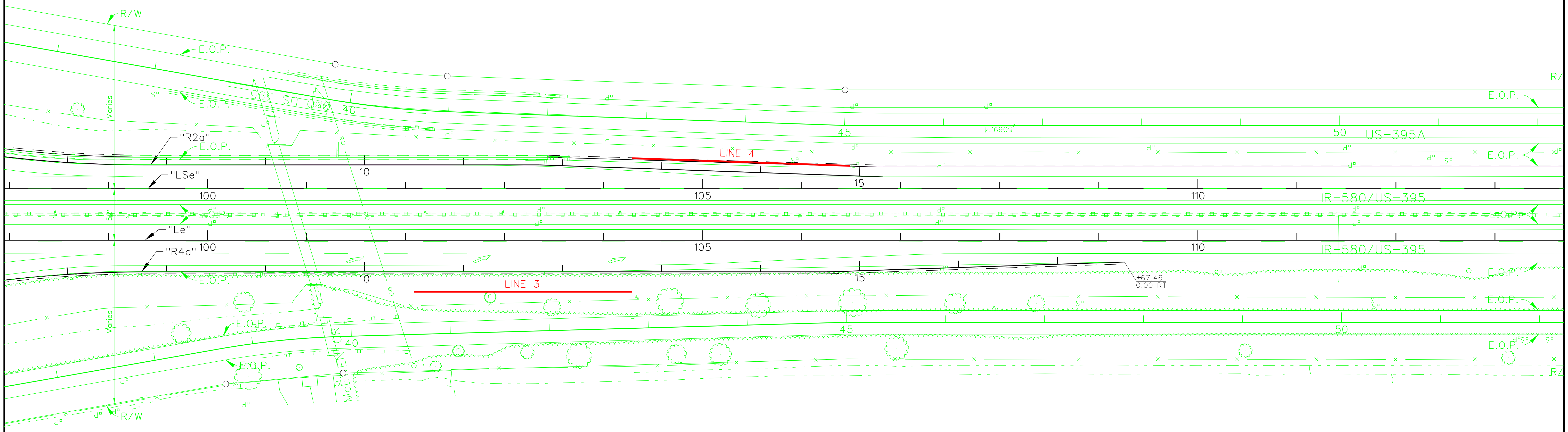
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GEOPHYSICAL SURVEY LOCATION MAP 1

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPF-395-2(033)	WASHOE	G7

- LEGEND -

— - GEOPHYSICAL SURVEY LINE LOCATIONS

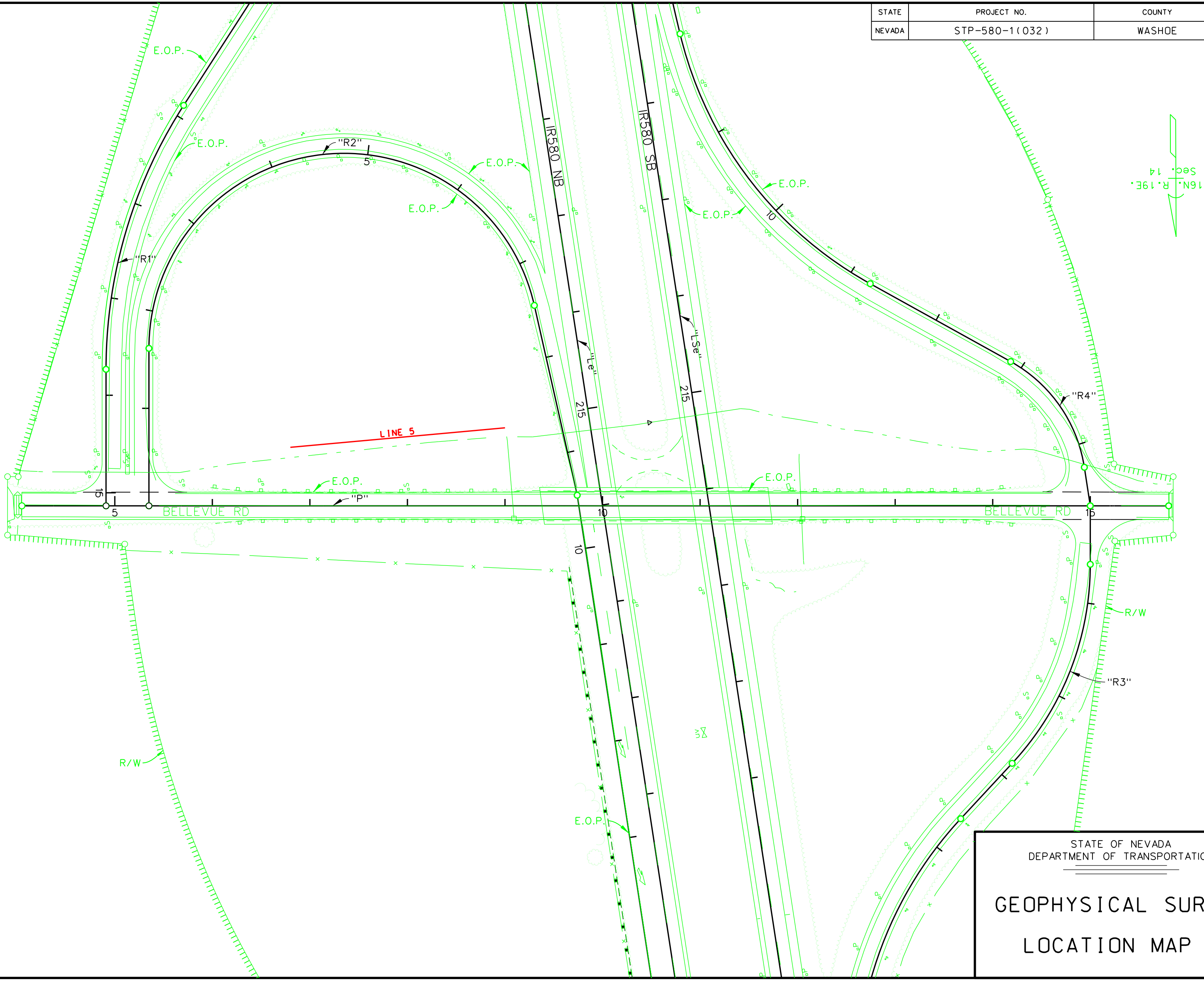


STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GEOPHYSICAL SURVEY
LOCATION MAP 2

IP_PWP:dms08820\73637 IR580 Boring Log.dgn

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	STP-580-1(032)	WASHOE	G8



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GEOPHYSICAL SURVEY LOCATION MAP 3

155.624953:1.000000 PLOT SCALE

h9010vth

LAKEVIEW HILL MONITOR WELLS

Legend

- ● MONITOR WELLS
- ▬ HIGH PRESSURE MAIN
- ● State Cumulative
- ○ Interstate
- ○ State Route
- ○ US Route

SYSTEM

- ▬ IR - Interstate

1:2,000

0 330 660 Feet

Created 05/15/2014
P.Baker

THIS MAP IS FOR DISPLAY PURPOSES ONLY.
MAP COMPILED WITH DATA FROM THE
TRIMBLE GEO XT HANDHELD GPS UNIT.
THET DATA IS NOT SURVEY GRADE.
NOT ALL FEATURES PORTRAYED DUE TO
SCALE.

NEVADA DOT
FIELD EXPLORATION

APPENDIX B:
SUBSURFACE EXPLORATION DATA

Key to Boring Logs
Boring Logs
Geophysical Survey Data
Lakeview Hill Monitor Well Depth to Water Data
Contract 1144 Boring Logs

KEY TO BORING LOGS

PARTICLE SIZE LIMITS

CLAY	SILT	SAND			GRAVEL		COBBLES	BOULDERS
		FINE	MEDIUM	COARSE	FINE	COARSE		

.002 mm #200 #40 #10 #4 ¾ inch 3 inch 12 inch

USCS GROUP	TYPICAL SOIL DESCRIPTION
GW	Well graded gravels, gravel-sand mixtures, little or no fines
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
SW	Well graded sands, gravelly sands, little or no fines
SP	Poorly graded sands, gravelly sands, little or no fines
SM	Silty sands, poorly graded sand-silt mixtures
SC	Clayey sands, poorly graded sand-clay mixtures
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL	Organic silts and organic silt-clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
CH	Inorganic clays of high plasticity, fat clays
OH	Organic clays of medium to high plasticity
PT	Peat and other highly organic soils

MOISTURE CONDITION CRITERIA

Description	Criteria
Dry	Absence of moisture, dusty, dry to touch.
Moist	Damp, no visible free water.
Wet	Visible free water, usually below groundwater table.

∇ ▼ Groundwater Elevation Symbols

SOIL CEMENTATION CRITERIA

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Won't break or crumble w/finger pressure

STANDARD PENETRATION CLASSIFICATION* (after Peck, *et al.*, 1974)

GRANULAR SOIL		CLAYEY SOIL	
BLOWS/FT N_{60}	DENSITY	BLOWS/FT N_{60}	CONSISTENCY
0 - 4	VERY LOOSE	0 - 1	VERY SOFT
5 – 10	LOOSE	2 - 4	SOFT
11 - 30	MEDIUM DENSE	5 - 8	MEDIUM STIFF
31 - 50	DENSE	9 - 15	STIFF
OVER 50	VERY DENSE	16 - 30	VERY STIFF
		31 - 60	HARD
		OVER 60	VERY HARD

* SPT N_{60}-values are only reliable for sands, and should serve only as estimates for other materials such as gravels, silts and clays.

California Modified Sampler field blow counts ($N_{\text{CMS field}}$) for ($6 < N_{\text{CMS field}} < 50$) can be converted to $N_{\text{SPT field}}$ by:

$(N_{\text{CMS field}})(0.62) = N_{\text{SPT field}}$

SPT field blow counts ($N_{\text{SPT field}}$) can be converted to N_{60} by:

$(N_{\text{SPT field}})(ETR/60) = N_{60}$

ETR = Energy Transfer Ratio

Field blow counts from 140 lb hammer with 30 inch free fall

TEST ABBREVIATIONS

CD	CONSOLIDATED DRAINED	O	ORGANIC CONTENT
CH	CHEMICAL (CORROSIVENESS)	OC	CONSOLIDATION
CM	COMPACTION	PI	PLASTICITY INDEX
CU	CONSOLIDATED UNDRAINED	RQD	ROCK QUALITY DESIGNATION
D	DISPERSIVE SOILS	RV	R-VALUE
DS	DIRECT SHEAR	S	SIEVE ANALYSIS
E	EXPANSIVE SOIL	SL	SHRINKAGE LIMIT
G	SPECIFIC GRAVITY	U	UNCONFINED COMPRESSION
H	HYDROMETER	UU	UNCONSOLIDATED UNDRAINED
HC	HYDRO-COLLAPSE	UW	UNIT WEIGHT
K	PERMEABILITY	W	MOISTURE CONTENT

SOIL COLOR DESIGNATIONS ARE FROM THE MUNSELL SOIL/ROCK COLOR CHARTS.

EXAMPLE: <u>(7.5 YR 5/3) BROWN</u>

SAMPLER NOTATION

CMS	CALIF. MODIFIED SAMPLER[1]
CPT	CONE PENETRATION TEST
CS	CONTINUOUS SAMPLER[2]
PB	PITCHER BARREL
RC	ROCK CORE[3]
SH	SHELBY TUBE[4]
SPT	STANDARD PENETRATION TEST[5]
TP	TEST PIT

1- I.D.= 2.421 inch

2- I.D.=3.228 inch with tube; 3.50 inch w/o tube

3- NXB I.D.= 1.875 inch

4- I.D.= 2.875 inch

5- I.D.= 1.375 inch, O.D.= 2.00 inch

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 2

START DATE 7/9/12
END DATE 7/9/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA1
E.A. # 73637
GROUND ELEV. 5079.9 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/9/12	28.0	5051.9
7/11/12	26.3	5053.6

STATION "R1a" 16+40
OFFSET 15 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/17/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
	1.0								**12" Asphalt Pavement** 1.0	Started drilling at 9:00 am 7/9. Finished drilling at 1:00 pm 7/9. Weather hot and sunny. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, head pressure only, entire depth.
	2.5	A	SPT	15 16 17	33	100	W, S, PI	SM	**Silty SAND** dense, dry to moist, brown, nonplastic. A: W=5.8%, 16.9% fines.	
	3.5									
5074.9	5.0 5	B	CMS	12 21 21	42	95	W, S, PI, UW, DS	SP SM	4.2 B1: W=8.4%, 14.6% fines, 112.2 pcf dry UW. **Poorly graded SAND with Silt** dense, dry to moist, brown, nonplastic. 5.0 B2: W=6.1%, 11.8% fines, 110.3 pcf dry UW, 44 degree peak friction angle with 3.1 psi cohesion.	
	6.5	C	SPT	11 13 22	35	100	W, S, PI	SM	**Silty SAND** dense, dry to moist, brown, nonplastic, . C: W=5.4%, 15.6% fines.	
	7.5									
	9.0	D	CMS	13 25 16	41	100	W, CH		D: W=7.4%, chlorides=285 ppm , sulfates=0 , pH=5.7 , resistivity=1,301 ohm-cm.	
5069.9	10 10.5	E	SPT	12 18 15	33	60	W, S, PI		**Silty SAND with Gravel** dense, moist, brown, nonplastic. E: W=6.4%, 20.9% fines. 11.0	
	11.5							SP SM	**Poorly graded SAND with Silt and Gravel** dense, moist, brown, nonplastic.	
	13.0	F	CMS	11 20 25	45	100	W, S, PI, UW, DS		F1: W=8.2%, 10.1% fines, 105.1 pcf dry UW, 12.2 34 degrees peak friction angle with 1.9 psi cohesion. **Silty SAND with Gravel** dense, moist, brown , nonplastic.	
	14.5	G	SPT	13 10 10	20	80	W, S, PI		F2: W=7.6%, 15.8% fines. G: W=6.8%, 17.2% fines.	
5064.9	15 15.5								**Silty SAND** medium dense, moist, brown, nonplastic.	
	17.0	H	CMS	9 9 5	14	100	W, S, PI, UW	SM	H1: W= 11.5%, 21.9% fines, 114.7 pcf dry UW. H2: W= 10.1%, 18.9% fines, 111.5 pcf dry UW.	
	18.5	I	SPT	4 5 6	11	85	W, S, PI		**Silty SAND with Gravel** medium dense, moist, brown, nonplastic.	
									I: W=7.0%, 15.8% passing No. 200 sieve. **Silty SAND** dense, moist, brown, nonplastic.	

NEVADA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 2 OF 2

START DATE 7/9/12
END DATE 7/9/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA1
E.A. # 73637
GROUND ELEV. 5079.9 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/9/12	28.0	5051.9
7/11/12	26.3	5053.6

STATION "R1a" 16+40
OFFSET 15 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/17/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT		Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot					
	20.2								20.5 J1: W=11.1%, 19.9% passing No. 200 sieve.	20' approximate depth of embankment fill.
	20.2–21.7	J	CMS	13 29 30	59	100	W, S, PI	SC	**Clayey SAND with Gravel** very dense, moist, brown, low plastic. J2: W=6.7%, 12.3% fines, 9% PI.	
	21.7–22.5								22.0	21.5' to 22.5', drill was grinding.
	22.5–24.0	K	SPT	14 13 22	35	85	W, S, PI	SM	**Silty SAND with Gravel** dense, moist, brown, low plastic. K: W=5.7%, 15.3% fines, 5% PI.	
5054.9	25 ▼								**Silty SAND** very dense, moist to wet, grayish brown, nonplastic.	
	27.5 ▽									
	27.5–29.0	L	SPT	29 28 30	58	100	W, S, PI		L: W=7.9%, 16.6% fines.	28' approximate depth of free water encountered during drilling.
5049.9	30							SP SM	30.0 **Poorly graded SAND with Silt and Gravel** very dense, wet, grayish brown, nonplastic.	
5044.9	35 35.0–36.5	M	SPT	38 33 27	60	95	W, S, PI		M: W=11.3%, 8.8% fines.	
	36.5								36.5 **Boring termintated at a depth of 36.5 feet.** Groundwater measured at a depth of 28.0 feet immediately after finishing drilling. On 7/11/12, bottom of hole measured at a depth of 31.0 feet due to caving and groundwater measured at 26.3 feet. On 7/17/12, bottom of hole measured at a depth of 20.2 feet due to caving and no free water in hole. Hole was backfilled with grout on 7/17/12.	

NEVADA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 2

START DATE 7/9/12
END DATE 7/10/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA2
E.A. # 73637
GROUND ELEV. 5094.4 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/10/12	13.2	5081.2
7/17/12	12.2	5082.2

STATION "R1a" 20+35
OFFSET 16 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/17/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	1.0								**12" Asphalt Pavement** 1.0	Started drilling at 2:00 pm 7/9. Finished drilling at 11:30 am 7/10. Weather hot and sunny. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, head pressure only, 0 to 30'.
	2.5	A	SPT	22 15 13	28	100	W. S, PI	SM	**Silty SAND** loose to dense, dry to moist, brown, nonplastic. A: W=4.9%, 16.9% fines.	
	3.5									
5089.4	5.0	B	CMS	14 18 13	31	100	CH		B: W=6.1%, chlorides=480 ppm, sulfates=0, pH=7.1, resistivity=945 ohm-cm.	
	6.0									
	7.5	C	SPT	4 4 6	10	85	W. S, PI		C: W=10.4%, 21.6% fines.	
	8.5									
5084.4	10.0	D	CMS	6 6 4	10	100	W. S, PI, UW, DS		D1: W=14.1%, 24.6% fines, 99.8 pcf dry UW. D2: W=11.6%, 21.5% fines, 101.7 pcf dry UW, 35 degree peak friction angle with 0.8 psi cohesion. 10.5	10' approximate depth of embankment fill. At 10', stopped drilling at 2:45 pm on 7/9, resumed at 8:30 am on 7/10.
	11.0							SC	**Clayey SAND** loose to medium dense, moist to wet, brown, medium plasticity.	
	12.5	E	SPT	2 2 3	5	80	W. S, PI		E: W=18.8%, 25.8% fines, 13% PI.	
	13.5									13' approximate depth of free water encountered during drilling.
5079.4	15.0	F	CMS	4 7 8	15	0			15.0	F: 0 recovery.
	16.5	G	CMS	5 12 18	30	100	W. S, PI, UW		**Silty SAND** medium dense to very dense, wet, mostly brown with some gray from 15' to 25', nonplastic. G1: W= 18.8%, 25.8% fines, 107.9 pcf dry UW. G2: W=12.4%, 18.6% fines.	
	17.5									
	19.0	H	SPT	12 11 21	32	100	W. S, PI		H: W=10.4%, 23.6% fines.	
	20.0									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 2 OF 2

START DATE 7/9/12
END DATE 7/10/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA2
E.A. # 73637
GROUND ELEV. 5094.4 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/10/12	13.2	5081.2
7/17/12	12.2	5082.2

STATION "R1a" 20+35
OFFSET 16 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/17/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
	21.5	I	SPT	25 23 27	50	95	W. S, PI		I: W=13.5%, 20.5% fines.	
	22.5									
	23.0	J	SPT	90	90	100	W. S, PI		J: W=10.9%, 20.0% fines.	
5069.4	25							SM		
	27.5									
	29.0	K	SPT	19 24 27	51	100	W. S, PI		K: W=16.6%, 17.5% fines.	
5064.4	30									30' to 32.5', 300 psi down pressure.
	32.5									
	33.8	L	SPT	28 59 50/.3'	50/.3'	100	W. S, PI		L: W=16.1%, 18.8% fines.	
									33.8 **Boring termintated at a depth of 33.8 feet.** Groundwater measured at a depth of 13.2 feet immediately after finishing drilling. On 7/11/12, bottom of hole measured at a depth of 17.0 feet due to caving and groundwater measured at 12.0 feet. On 7/17/12, bottom of hole measured at a depth of 14.7 feet due to caving and groundwater measured at 12.2 feet. Hole was backfilled with grout on 7/17/12.	
5059.4	35									

NEVADA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 2

START DATE 7/10/12
END DATE 7/11/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA3
E.A. # 73637
GROUND ELEV. 5110.4 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

STATION "R1a" 24+30
OFFSET 15 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/16/2012

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/10/12	11.0	5099.4
7/16/12	7.9	5102.5

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	1.0								**12" Asphalt Pavement** 1.0	Start drilling at 12:45 pm 7/10.
	2.5	A	CMS	15 38 27	65	100	W, S, PI	SM	**Silty SAND** very dense, dry to moist, brown, nonplastic. A: W=4.6%, 13.3% fines.	Finish drilling at 11:00 am 7/11. Weather hot and sunny. 3" tri-wing bit.
	3.5								3.5	All samplers used sand catchers.
	4.0	B	SPT	84/0.5'	84/0.5'	100			**Weathered Bedrock** very dense, excavates to a brown **Silty Sand** consistency. B: 0.5' pulverized rock/decomposed granite recovered in sampler.	Easy drilling, head pressure only, 0 to 14'.
5105.4	5									3' approximate depth of embankment fill.
	6.0 6.2	C	CMS	50/0.2'	50/0.2'	0				C: >10 blows with no progress, 0 recovery. D: >10 blows with no progress, 0 recovery.
	▼ 8.5 8.6	D	SPT	25/0.1'	25/0.1'	0			E: Moist, brown Silty SAND, W=2.7%, chlorides=45 ppm, sulfates=0, pH=8.1, resistivity=6,670 ohm-cm.	E: Sample from auger cuttings from approximately 8' to 9' depth.
5100.4	10									
	▽ 11.0 11.1	F	CMS	50/0.1'	50/0.1'	0				F: 0 recovery. 11.0' depth of groundwater measured during drilling.
	13.5 13.7	G	SPT	50/0.2'	50/0.2'	100				14' to 18', 300 psi down pressure, slow penetration.
5095.4	15									At 15', stopped drilling at 2:30 pm on 7/10, resumed at 9:00 am on 7/11.
	18.0 18.1	H	SPT	25/0.1'	25/0.1'	0				H: 0.3' of slough recovered in sampler, silty fine sand. 18' to 19', 400 psi down

BORING LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

SHEET 2 OF 2

START DATE 7/10/12
END DATE 7/11/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA3
E.A. # 73637
GROUND ELEV. 5110.4 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/10/12	11.0	5099.4
7/16/12	7.9	5102.5

STATION "R1a" 24+30
OFFSET 15 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/16/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT		Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot					
										pressure, slow penetration - 1 foot/2 minutes. 19' to 26', 300 psi down pressure, slow penetration. 23', hard to get drill rods out of hole, got stuck in auger I: 0.1' slough measured when sampler hit bottom. 0.3' slough recovered in sampler.
	23.0 23.1	I	SPT	50/0.1	50/0.1	0				
5085.4	25									
									26.0 **Boring termintated at a depth of 26.0 feet.** Groundwater measured at a depth of 11.0 feet during drilling on 7/10/12 and prior to resuming drilling on 7/11/12. On 7/16/12, bottom of hole measured at a depth of 19.0 feet due to caving and groundwater measured at 7.9 feet. Hole was backfilled with grout on 7/16/12.	
5080.4	30									
5075.4	35									

BORING LOG

SHEET 1 OF 2

DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING

START DATE 7/11/12
END DATE 7/12/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA4
E.A. # 73637
GROUND ELEV. 5129.6 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/12/12	6.0	5123.6
7/16/12	9.3	5120.3

STATION "R1a" 28+25
OFFSET 16 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/16/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
	1.0								**12" Asphalt Pavement** 1.0	Started drilling at 12:30 pm 7/11.
	2.5	A	SPT	16 14 12	26	100	W, S, PI	SM	**Silty SAND** medium dense to very dense, color and moisture content varies, nonplastic fines. A: brown, dry to moist, W=5.9%, 18.2% fines.	Finished drilling at 10:30 am 7/12. Weather hot and sunny.
	3.5									3" tri-wing bit. All samplers used sand catchers.
5124.6	5 5.0	B	CMS	7 9 12	21	100	W, S, PI, UW, DS, CH		B: brown, moist B1: W=9.5%, 19.5%fines, 103.1 pcf dry UW, 33 degree peak friction angle with 2.0 psi cohesion. B2: W=10.0%, chlorides=240 ppm, sulfates=0, pH=7.4, resisitivity=1,600 ohm-cm.	Easy drilling, head pressure only, 0 to 12'.
▽	6.0									5' approximate depth of embankment fill.
	7.5	C	SPT	9 11 9	20	100	W, S, PI		C: grayish brown with orange, moist, W=9.2%, 13.0% fines.	Orange color in samples likely due to iron staining/oxidation caused by fluctuations in the groundwater level.
	8.5									
▼ 5119.6	10 10.0	D	CMS	8 10 15	25	100	W, S, PI, UW, DS		D: brown fines, multicolored sand-brown, gray, white, black, yellow/orange, wet, W=19.8%, 19.5% fines, 107.4 pcf dry UW, 37 degree peak friction angle with 3.6 psi cohesion.	8' approximate depth of free water encountered during drilling.
	11.0									
	11.2	E	SPT	50/0.2'	50/0.2'	100	W, S, PI			
5114.6	15 16.0								E: brown fines, multicolored sand-brown, gray, white, black, yellow/orange, wet.	12' to 13', 300 psi down pressure, very slow penetration - 1"/1 minute. 13' to 15.5', 400 psi down pressure, very slow penetration - 2"/1 minute. 15.5' to 26', head pressure only, easy drilling.
	17.5	F	SPT	3 5 11	16	95	W, S, PI		F: grayish brown, wet, W=22%, 35% fines.	
	18.5									Below 17.5' constant slough in the hole consisting of grayish brown sand.
	20.0	G	SPT	7 10 16	26	85	W, S, PI		G: orangish brown, wet, W=18.5%, 21.4% fines.	

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 2 OF 2

START DATE 7/11/12
END DATE 7/12/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA4
E.A. # 73637
GROUND ELEV. 5129.6 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

STATION "R1a" 28+25
OFFSET 16 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/16/2012

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/12/12	6.0	5123.6
7/16/12	9.3	5120.3

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
										At 20', stopped drilling at 2:30 pm on 7/11, resumed at 9:30 am on 7/12.
	23.5	H	SPT	10 22 34	56	85	W, S, PI		H: orangish brown, wet, W=12.8%, 14.4% fines.	G and H: 1.1' of slough consisting of grayish brown sand recovered in sampler. Entire length of sampler was full with slough plus recovered sample.
5104.6	25 25.0									H: 0.3' slough measured when sampler hit bottom. 26' to bottom, 300 psi down pressure.
	28.5 28.8	I	SPT	50/0.3'	50/0.3'	100			28.8 I: orangish brown, wet.	I: 0.3' slough measured when sampler hit bottom. 0.6' of slough consisting of grayish brown sand recovered in sampler. Entire length of sampler was full with slough plus recovered sample.
									Boring termintated at a depth of 28.8 feet. Groundwater measured at a depth of 6.0 feet prior to resuming drilling on 7/12/12. On 7/16/12, bottom of hole measured at a depth of 14.8 feet due to caving and groundwater measured at 9.3 feet. Hole was backfilled with grout on 7/16/12.	
5099.6	30									
5094.6	35									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

START DATE 7/12/12
END DATE 7/12/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA5
E.A. # 73637
GROUND ELEV. 5146.4 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/12/12	7.0	5139.4
7/16/12	13.3	5133.1

STATION "R1a" 32+25
OFFSET 15 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/16/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
	2.0								**12" Asphalt Pavement** 1.0 **Silty SAND with Gravel** very dense, brown, nonplastic, dry to moist.	Started drilling at 12:00 pm 7/12. Finished drilling at 2:30 pm 7/12. Weather hot and sunny. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, head pressure only entire hole'.
	3.5	A	SPT	9 18 18	36	85	W, S, PI	SM	A: W=5.2%, 19.2% fines.	
	4.5								**Silty SAND** medium dense to very dense.	
5141.4	5 6.0	B	CMS	19 29 31	60	100	W, S, PI, UW, DS, CH		B1: brown, nonplastic, moist, W=8.2%, 16.2% fines, 114.6 pcf dry UW, 36 degree peak friction angle with 4.6 psi cohesion. B2: gray, nonplastic, moist, W=7.4%, chlorides=190 ppm, sulfates=0, pH=6.8, resistivity=1,850 ohm-cm.	
5136.4	▽ 10 11.0									7' depth of groundwater measured during drilling. 11' approximate depth of embankment fill.
	12.5	C	SPT	5 4 4	8	85	W, S, PI		C: dark brown, low plastic, wet, W=11.9%, 22.1% fines, 2% PI.	
	▼ 13.5								13.0 **Clayey SAND** medium dense, wet, brown to dark brown, medium plasticity.	
5131.4	15 15.0	D	CMS	6 5 7	12	55	W, S, PI	SC	D: W=14.3%, 27.8% fines, 14% PI.	D: Observed some sample falling out of sampler when withdrawing it from the hole.
	16.0								15.5 **Silty SAND** medium dense, wet, grayish brown, nonplastic.	
	17.5	E	SPT	4 6 7	13	100	W, S, PI	SM	E: W=21.0%, 19.6% fines.	
									19.0	

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 2 OF 2

START DATE 7/12/12
END DATE 7/12/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound On-Ramp and Auxillary Lane to Carson St
BORING LCA5
E.A. # 73637
GROUND ELEV. 5146.4 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
7/12/12	7.0	5139.4
7/16/12	13.3	5133.1

STATION "R1a" 32+25
OFFSET 15 feet right
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 07/16/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
	21.0								**Silty, Clayey SAND** medium dense, wet, grayish brown, low plastic.	
	22.5	F	SPT	5 5 4	9	100	W, S, PI	SC SM	F: W=18.3%, 22.9% fines, 6% PI.	
5121.4	25 25.2								25.2	G: Drilled to 26.0'. 0.8' heaving measured when sampler hit bottom at 25.2'. Did not drive sample. Recovered 2.4' (entire length of sampler) of brown sand that heaved into the sampler.
	26.0	G	SPT	-	-		W, S, PI	SP SM	**Poorly graded SAND with Silt** wet, brown, nonplastic. G: W=25.2%, 6.8% fines. 26.0	
									Boring termintated at a depth of 26.0 feet. Groundwater measured at a depth of 7 feet during drilling. On 7/16/12, bottom of hole measured at a depth of 14.4 feet due to caving and groundwater measured at 13.3 feet. Hole was backfilled with grout on 7/16/12.	
5116.4	30									
5111.4	35									

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 1

START DATE 11/7/12
END DATE 11/7/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound Off-Ramp
BORING LSF1
E.A. # 73637
GROUND ELEV. 5070.6 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

STATION "LSe" 110+25
OFFSET 22 feet left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Baker
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/27/2012

GROUNDWATER LEVEL

DATE	DEPTH ft	ELEV. ft
11/7/12	14.0	5056.6

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
									0.7 **8" Asphalt Pavement**	Started drilling at 9:40 am. Finished drilling at 12:00 pm. Weather sunny. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, head pressure only entire depth. 6' approximate depth of embankment fill. C: 0.2' slough measured when sampler hit bottom. Orange color in samples likely due to iron staining/oxidation caused by fluctuations in the goundwater level. 14' approximate depth of free water encountered during drilling. G and H: Measured 0.1' slough/heaving when sampler hit bottom. G: 0.6' slough/heaved sands in sample above 1.5' of in-situ sample. H: Entire sampler was full of slough/ heaved sands above 1.5' of in-situ sample. Drilling 17'-19.5' of depth, no cuttings came out of hole. Inner rod got stuck when pulling out for sample H.
	2.0							SM	**Silty SAND** medium dense, moist, brown (10 YR 4/3), nonplastic.	
	3.5	A	SPT	7 7 10	17	100	W, S, PI		A: W=10.7%, 19.6% fines.	
	4.5									
5065.6	5 6.0	B	CMS	14 12 11	23	100	W, UW, CH		B: W=10.2%, 107.6 pcf dry UW.	
	7.0							SC SM	6.5 **Silty Clayey SAND** dense, moist, grayish brown (10 YR 5/2) with little orange, low plastic.	
	8.5	C	SPT	8 10 9	19	95	W, S, PI		C: W=12.0%, 25.3% fines.	
	9.5							SM	9.0 **Silty SAND** loose, moist, gray and brown with little orange, low plastic to nonplastic.	
5060.6	10 11.0	D	CMS	4 4 6	10	95	W, S, PI, UW, DS		D1: W=16.4%, 32.1% fines, 101.9 pcf dry UW, 31 degree peak friction angle with 2.0 psi cohesion. 11.5 D2: W=22.7%, 24.7% fines, 88.9 pcf dry UW.	
	12.0							SW SM	**Well-graded SAND with Silt** medium dense, moist to wet, brown, gray, and red, nonplastic.	
	13.5	E	SPT	2 6 8	14	95	W, S, PI		E: W=18.7%, 8.8% fines.	
	∇ 14.5							SM	14.0 **Silty SAND** dense, wet, gray (10 YR 5/1), nonplastic.	
5055.6	15 16.0	F	SPT	8 12 12	24	100	W, S, PI		F: W=21.3%, 13.5% fines.	
	17.0							SP SM	16.5 **Poorly graded SAND with Silt** dense, wet, gray, nonplastic.	
	18.5	G	SPT	12 16 16	32	100	W, S, PI		G: W=21.2%, 10.9% fines.	
	19.5							SM	19.0 **Silty SAND** very dense, wet, gray with brown, nonplastic.	
5050.6	20 21.0	H	SPT	13 16 23	39	100	W, S, PI		H: W=20.1%, 23.7% fines. 21.0 **Boring terminated ar a depth of 21.0 feet.** On 11/27, hole was redrilled and backfilled with grout to a depth of 21.0 feet.	
5045.6	25									

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DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 1

START DATE 11/14/12
END DATE 11/14/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound Off-Ramp
BORING LSF2
E.A. # 73637
GROUND ELEV. 5074.7 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
11/14/12	17.0	5057.7

STATION "R2a" 14+70
OFFSET 7 feet left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/27/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT		Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot					
									0.6 **7" Asphalt Pavement**	Started drilling at 9:00 am. Finished drilling at 11:00 am. Weather cool, mostly sunny. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, head pressure only entire depth. 6' approximate depth of embankment fill.
	2.0							SM	**Silty SAND** dense, moist, brown, nonplastic. A: W=8.8%, 20.0% fines. B1: W=9.8%, 12.9% fines, 105.0 pcf dry UW. B2: Chlorides=110 ppm, sulfates=0, pH=7.0, resistivity=2,400 ohm-cm. 6.5	
	3.5	A	SPT	10 11 12	23	100	W, S, PI			
	4.5									
5069.7	5 6.0	B	CMS	12 19 19	38	100	W, S, PI, UW CH			
	7.0							SC SM	**Silty Clayey SAND** medium dense, moist, gray to black, low plastic. C: W=14.8%, 33.0% fines, PI=4%. 9.0	
	8.5	C	SPT	9 10 6	16	100	W, S, PI			
	9.5							SC	**Clayey SAND** medium dense, moist, gray, low plastic. D1: W=14.3%, 19.7% fines, 112.9 pcf dry UW, PI=9%, 36 degree peak friction angle with 1.8 psi cohesion. 11.0	
5064.7	10 11.0	D	CMS	8 9 8	17	100	W, S, PI, UW, DS			
	12.0							SC SM	**Silty Clayey SAND** medium dense, moist, brown, low plastic. E: W=14.0%, 23.7% fines, PI=6%. 14.0	
	13.5	E	SPT	4 6 7	13	80	W, S, PI			
	14.5							SP SM	**Poorly graded SAND with Silt** dense, moist to wet, brown and gray, nonplastic. F: W=16.3%, 11.5% fines. G: W=19.9%, 10.3% fines. 19.0	17' approximate depth of free water encountered during drilling. G, H, and I: 0 slough measured when sampler hit bottom. H and I: About 0.2' of slough recovered in sampler. Orange color in samples likely due to iron staining/oxidation caused by fluctuations in the goundwater level.
5059.7	15 16.0	F	SPT	11 13 11	24	100	W, S, PI			
	▽ 17.0									
	18.5	G	SPT	11 12 15	27	100	W, S, PI			
	19.5							SM	**Silty SAND** dense, wet, yellowish brown and gray with some orange, nonplastic. H: W=17.7%, 14.7% fines. I: W=20.3%, 17.4% fines. 23.5	
5054.7	20 21.0	H	SPT	16 14 15	29	100	W, S, PI			
	22.0									
	23.5	I	SPT	12 15 18	33	100	W, S, PI			
5049.7	25								**Boring terminated at a depth of 23.5 feet.** Removed auger immediately after drilling, bottom of hole measured at a depth of 14 feet due to caving and no free water in the hole. On 11/27, hole was redrilled and backfilled with grout to a depth of 23.5 feet.	

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DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 1

START DATE 11/14/12
END DATE 11/14/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound Off-Ramp
BORING LSF3
E.A. # 73637
GROUND ELEV. 5078.6 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
11/14/12	18.0	5060.6
11/14/12	17.7	5060.9

STATION "R2a" 10+70
OFFSET 2 feet left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/28/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group		MATERIAL DESCRIPTION	REMARKS
									0.6	**7" Asphalt Pavement**	Started drilling at 11:30 am. Finished drilling at 1:00 pm. Weather cool, sunny, breezy. 3" tri-wing bit. SPT samplers used sand catchers. Easy drilling, head pressure only entire depth.
	2.0							SM		**Silty SAND** very dense to dense, dry to moist, brown to yellowish brown, nonplastic to low plastic.	
	3.5	A	SPT	11 20 26	46	100	W, S, PI			A: W=9.4%, 22.1% fines, PI=1%.	
	4.5										
5073.6	5 6.0	B	CMS	20 18 16	34	100	W, S, PI, UW, CH			B1: W=10.0%, 37.6% nonplastic fines, 115.4 pcf dry UW. B2: chlorides=190 ppm, sulfates=0, pH=7.0, resistivity=1,900 ohm-cm.	
	7.0										
	8.5	C	SPT	7 10 9	19	55	W, S, PI			C: with gravel, fractured cobble piece wedged in outside of shoe. W=9.6%, 17.2% nonplastic fines.	
	9.5										
5068.6	10 11.0	D	CMS	9 15 10	25	100	W, S, PI, UW, DS, O		10.7	D1: W=13.5%, 24.8% fines, PI=3%, 118.4 pcf dry UW, 39 degree peak friction angle with 1.1 psi cohesion. D2: 21.9% nonplastic fines.	10' approximate depth of embankment fill.
	12.0							SC		**Clayey SAND** medium dense, moist, black, gray, and brown, medium to low plastic. D3: Black, W=17.8%, 38.1% fines, PI=12%, 3.5% organic content.	
	13.5	E	SPT	5 6 7	13	95	W, S, PI			E: Gray, W=14.6%, 29.6% fines, PI=8%.	
	14.5										
5063.6	15 16.0	F	SPT	6 5 4	9	100	W, S, PI		16.5	F: Brown, W=21.2%, 28.3% fines, PI=5%.	
	17.0							SP SM		**Poorly graded SAND with Silt** dense, moist to wet, gray and brown, nonplastic.	18' approximate depth of free water encountered during drilling.
	▼ 18.5	G	SPT	9 13 15	28	95	W, S, PI		19.0	G: W=17.8%, 11.1% fines.	
	19.5							SM		**Silty SAND** medium dense to dense, wet, gray and brown with some orange, nonplastic.	H: 0 slough measured when sampler hit bottom.
5058.6	20 21.0	H	SPT	6 5 7	12	85	W, S, PI			H: W=21.1%, 17.5% fines.	Orange color in samples likely due to iron staining/oxidation caused by fluctuations in the goundwater level.
	24.5									I: W=20.2%, 12.7% fines.	
5053.6	25 26.0	I	SPT	12 14 15	29	100	W, S, PI		26.0		I: Sampler sunk 0.5' when placed in hole. Entire sampler was full of slough/heaved sands above 1.5' of in-situ sample.
										Boring terminated at a depth of 26.0 feet. Measured groundwater at a depth of 17.7 feet shortly after drilling and before removing auger. After removing auger, bottom of hole measured at a depth of 16 feet due to caving and no free water in the hole. On 11/28, hole was redrilled and backfilled with grout to a depth of 26.0 feet.	

NV_DOT LSF.GPJ NV_DOT.GDT 3/8/13

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 1

START DATE 11/15/12
END DATE 11/15/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Southbound Off-Ramp
BORING LSF4
E.A. # 73637
GROUND ELEV. 5082.5 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
11/15/12	24.0	5058.5
11/15/12	20.1	5062.4

STATION "R2a" 6+70
OFFSET 1 foot left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/28/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
	2.0								0.5 **6" Asphalt Pavement** **Silty SAND** dense and medium dense, brown, gray, and black, nonplastic and low plastic.	Started drilling at 9:00 am. Finished drilling at 10:45 am.
	3.5	A	SPT	8 12 11	23	100	W, S, PI		Dense, brown. A: W=7.5%, 17.0% nonplastic fines.	Weather cool. 3" tri-wing bit.
	4.5									SPT samplers used sand catchers.
5077.5	5 6.0	B	CMS	9 15 16	31	95	W, S, PI, UW, DS		B1: W=9.4%, 14.4% nonplastic fines, 108.9 pcf dry UW, 36 degree peak friction angle with 2.6 psi cohesion. B2: W=9.4%, 19.4% nonplastic fines.	Easy drilling, head pressure only entire depth.
	7.0									
	8.5	C	SPT	9 12 13	25	95	W, S, PI		C: W=10.2%, 20.4% nonplastic fines.	
	9.5								Gray.	
5072.5	10 11.0	D	CMS	16 21 22	43	95	W, S, PI, UW, DS		D1: W=10.7%, 20.1% nonplastic fines, 112.9 pcf dry UW, 46% peak friction angle with 1.0 psi cohesion.	
	12.0								Medium dense, black.	
	13.5	E	SPT	8 4 4	8	100	W, S, PI	SM	E: W=12.6%, 25.1% fines, PI=3.	12' approximate depth of embankment fill.
	14.5									
5067.5	15 16.0	F	CMS	6 8 9	17	100				
	17.0									
	18.5	G	SPT	4 5 4	9	100	W, S, PI		Gray.	
	19.5								G: W=19.5%, 20.5% fines, PI=5.	
5062.5	▼ 20 21.0	H	SPT	7 12 12	24	85	W, S, PI		Dense. H: W=17.3%, 15.7% nonplastic fines.	
	▽ 24.5								I: W=19.0%, 17.8% nonplastic fines.	24' approximate depth of free water encountered during drilling.
5057.5	25 26.0	I	SPT	8 15 13	28	100	W, S, PI		26.0	
									Boring terminated at a depth of 26.0 feet. Measured groundwater at a depth of 20.1 feet shortly after drilling and before removing auger. After removing auger, bottom of hole measured at a depth of 18.3 feet due to caving and no free water in the hole. On 11/28, hole was redrilled and backfilled with grout to a depth of 26.0 feet.	

NEVADA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 1

START DATE 10/31/12
END DATE 10/31/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Northbound On-Ramp
BORING LNN1
E.A. # 73637
GROUND ELEV. 5080.5 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/31/12	18.0	5062.5

STATION "R4a" 9+00
OFFSET 3 feet left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/20/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT		Percent Recov'd	LAB TESTS	USCS Group		MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot						
									0.6	**7" Asphalt Pavement**	Started drilling at 9:00 am. Finished drilling at 11:15 am. Weather cloudy, breezy, cool. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, 100 psi down pressure entire depth.
	2.5 4.0	A	SPT	9 13 16	29	85	W, S, PI	SM		**Silty SAND** with gravel in the top 4 feet of depth, medium dense to very dense, moist, dark yellowish brown (10 YR 3/4) to yellowish brown (10 YR 5/4) with dark gray (10 YR 4/1) below 11 feet depth, nonplastic. A: W=9.7%, 16.8% fines.	
5075.5	5										
	5.0 6.5	B	SPT	8 9 7	16	100	Ch			B: W=9.0%, chlorides=440 ppm, sulfates=0, pH=7.1, resistivity=1,250 ohm-cm.	
	7.5 9.0	C	CMS	16 26 34	60	100	W, S, PI, DS, UW			C1: W=7.4%, 17.5% fines, 109.8 pcf dry UW, 40 degree peak friction angle with 0.7 psi cohesion. C2: W=8.8%, 13.7% fines, 120.6 pcf dry UW.	
5070.5	10										
	10.0 11.5	D	SPT	14 18 22	40	100	W, S, PI			D: W=9.5%, 19.2% fines.	
									12.5		12' approximate depth of embankment fill.
	12.5 14.0	E	SPT	6 2 5	7	95	W, S, PI	SC		**Clayey SAND** loose, moist, black (10 YR 2.5/1), medium plastic fines. E: W=24.4%, 43.9% fines, PI=14.	
5065.5	15								15.0		
	15.0 16.5	F	CMS	6 9 10	19	100	W, S, PI, DS, UW	SM		**Silty SAND** medium dense, moist, grayish brown (10 YR 5/2) to dark grayish brown (10 YR 4/2), nonplastic to low plastic fines. F1: W=12.4%, 16.4% fines, 103.3 pcf dry UW, 35 degree peak friction angle with 2.0 psi cohesion, PI=1%. F2: W=11.4%, 14.0% fines, 106.6 pcf dry UW.	
								SW SM	17.0		
▽	17.5 19.0	G	SPT	6 5 7	12	85	W, S, PI	SC SM	18.0	**Well-graded SAND with Silt** medium dense, moist to wet, dark gray (10 YR 4/1), nonplastic fines. G1: W=16.3%, 8.9% fines.	18' approximate depth of free water encountered during drilling.
									19.5	**Silty Clayey, SAND** medium dense, wet, gray (10 YR 5/1), low plastic fines. G2: W=19.3%, PI=6%.	
5060.5	20										
	20.0 21.5	H	SPT	7 13 8	21	85	W, S, PI	SW SM		**Well-graded SAND with Silt** dense, wet, dark grayish brown (10 YR 4/2), nonplastic fines. H: W=19.7%, 9.6% fines.	
									23.0		
5055.5	25							SP SM		**Poorly graded SAND with Silt** very dense, wet, dark gray (10 YR 4/1) and yellowish brown (10 YR 5/4), nonplastic fines.	
	25.0 26.5	I	SPT	7 20 23	43	100	W, S, PI			I: W=16.0%, 6.7% fines.	
									26.5	**Boring terminated at a depth of 26.5 feet.** On 11/01/12, bottom of hole measured at a depth of 16.4 feet due to caving and no free water in hole. On 11/27/12, hole was redrilled and backfilled with grout to a depth of 26.5 feet.	

BORING LOG

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

SHEET 1 OF 1

START DATE 10/31/12
END DATE 11/1/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Northbound On-Ramp
BORING LNN2
E.A. # 73637
GROUND ELEV. 5077.5 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
10/31/12	16.0	5061.5

STATION "R4a" 12+00
OFFSET 5 feet left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/20/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT 6 inch Increments	BLOW COUNT Last 1 foot	Percent Recov'd	LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
	2.5								0.6 **7" Asphalt Pavement** **Silty SAND** medium dense to dense, dry to moist, yellowish brown (10 YR 5/4) to brown (10 YR 4/3), nonplastic.	Started drilling at 12:00 pm 10/31. Finished drilling at 9:30 am 11/1. Weather cloudy, breezy, cool. 3" tri-wing bit.
	4.0	A	SPT	10 12 11	23	100	W, S, PI	SM	A: W=7.8%, 16.1% fines.	All samplers used sand catchers.
5072.5	5.0									
	6.5	B	CMS	14 21 25	46	100	W, S, PI, DS, UW		B1: W=9.5%, 13.2% fines, 115.8 pcf dry UW, 44 degree peak friction angle with 3.3 psi cohesion. B2: W=10.1%, 19.6% fines, 121.6 pcf dry UW.	Easy drilling, head pressure entire depth.
	7.5									
	9.0	C	SPT	9 11 13	24	100	W, S, PI		C: W=9.4%, 16.5% fines.	
5067.5	10.0									
	11.5	D	CMS	11 8 7	15	100	W, S, PI, DS, UW		D1: W=9.5%, 18.1% fines, 106.3 pcf dry UW, 32 degree peak friction angle with 3.8 psi cohesion. 10.7	10' approximate depth of embankment fill.
	12.5							SC	**Clayey SAND** medium dense, moist, yellowish brown (10 YR 5/4), medium plasticity. D2: W=12.7%, 24.2% fines, 107.4 pcf dry UW, PI=8%.	
	14.0	E	SPT	3 5 6	11	100	W, S, PI		E1: W= 15.7%, PI=19%. 13.2 **Silty SAND** medium dense to dense, moist to wet, yellowish brown (10 YR 5/4), low plastic to nonplastic.	
5062.5	15.0									
	▽ 16.5	F	CMS	8 11 17	28	80	W, S, PI, DS, UW		E2: W=11.7%, 21.3% fines, PI=3%. F: W=18.1%, 15.5% fines, 102.4 pcf dry UW, 38 degree peak friction angle with 3.5 psi cohesion, PI=1%.	16' approximate depth of free water encountered during drilling.
	17.5									
	19.0	G	SPT	11 10 9	19	95	W, S, PI	SM	G: W=20.4%, 18.2% fines.	At 15', stopped drilling at 1:00 pm on 10/31, resumed at 9:30 am on 11/1.
5057.5	20.0									
	21.5	H	SPT	5 7 11	18	100	W, S, PI		H: W=21.0%, 15.2% fines.	
									23.0 **Poorly Graded SAND with Silt** dense, wet, yellowish brown (10 YR 5/4), nonplastic.	Heaving sands below a depth of 23'.
5052.5	25.0							SP SM	I: W=22.6%, 9.5% fines.	
	26.5	I	SPT	5 11 13	24	100	W, S, PI		26.5	I: 0.4' slough/heaving measured when sampler hit bottom. Entire sampler was full of slough/heaved sands above 1.5' of in-situ sample.
									Boring terminated at a depth of 26.5 feet. Removed auger immediately after drilling, bottom of hole measured at a depth of 15.4 feet due to caving and no free water in hole. On 11/20/12, hole was redrilled and backfilled with grout to a depth of 26.5 feet.	

NEVADA
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING

BORING LOG

SHEET 1 OF 1

START DATE 11/1/12
END DATE 11/1/12
JOB DESCRIPTION US395/IR580 Lakeview Interchange Ramp Realign
LOCATION Northbound On-Ramp
BORING LNN3
E.A. # 73637
GROUND ELEV. 5074.7 (ft)
HAMMER DROP SYSTEM Auto, ETR=87.5%

GROUNDWATER LEVEL		
DATE	DEPTH ft	ELEV. ft
11/1/12	16.0	5058.7
11/1/12	17.1	5057.6

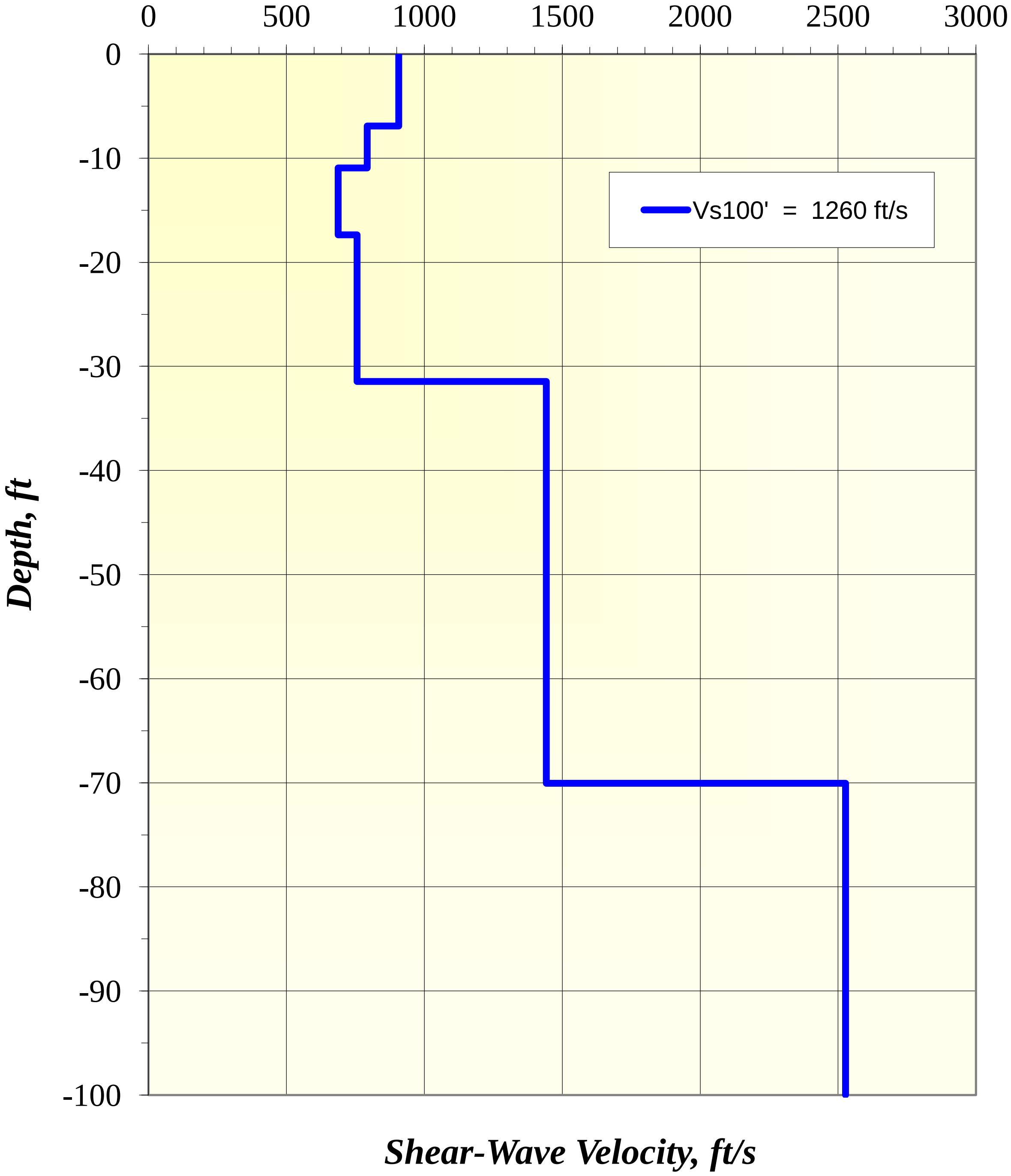
STATION "R4a" 15+00
OFFSET 2 feet left
ENGINEER Ablahani
EQUIPMENT Diedrich D120, Rig#1082
OPERATOR Altamirano
DRILLING METHOD 6-inch Hollow Stem Auger
BACKFILLED Yes DATE 11/05/2012

ELEV. (ft)	DEPTH (ft)	SAMPLE		BLOW COUNT			LAB TESTS	USCS Group	MATERIAL DESCRIPTION	REMARKS
		NO.	TYPE	6 inch Increments	Last 1 foot	Percent Recov'd				
									0.6 **7" Asphalt Pavement**	Started drilling at 10:00 am. Finished drilling at 11:30 am. Weather cloudy, sprinkling. 3" tri-wing bit. All samplers used sand catchers. Easy drilling, head pressure entire depth.
	2.5							SM	**Silty SAND** dense, moist, light yellowish brown (10 YR 6/4) and dark brown (10 YR 3/3), nonplastic.	
	4.0	A	SPT	12 17 16	33	85	W, S, PI		A: W=8.5%, 17.0% fines.	
5069.7	5.0 5									
	6.5	B	CMS	8 14 18	32	85	W, S, PI, DS, UW		B1: W=7.3%, 13.4% fines, 104.4 pcf dry UW, 40 degree peak friction angle with 2.2 psi cohesion. B2: W=9.4%, 13.5% fines, 114.1 pcf dry UW.	
									8.0	
5064.7	10.0 10							SC SM	**Silty Clayey SAND** loose, moist, yellowish brown (10 YR 5/4) and dark gray (10 YR 4/1), low plasticity.	8' approximate depth of embankment fill.
	11.5	C	SPT	2 2 4	6	100	W, S, PI		C: W=14.5%, 24.8% fines, PI=5%.	
									13.0	
5059.7	15.0 15							SP SM	**Poorly Graded SAND with Silt** medium dense, moist to wet, yellowish brown (10 YR 5/4), nonplastic.	
	▽ 16.5 ▼	D	SPT	8 8 9	17	85	W, S, PI		D: W=21.4%, 11.9% fines.	16' approximate depth of free water encountered during drilling.
									18.0	
5054.7	20.0 20							SM	**Silty SAND** dense, wet, yellowish brown (10 YR 5/4), nonplastic.	
	21.5	E	SPT	13 15 17	32	100	W, S, PI		E: W=17.9%, 13.9: fines. 21.5	
									Boring terminated at a depth of 21.5 feet. Groundwater measured at a depth of 17.1 feet immediately after drilling on 11/01/12. Left auger in hole until backfilled with grout on 11/05/12.	
5049.7	25									

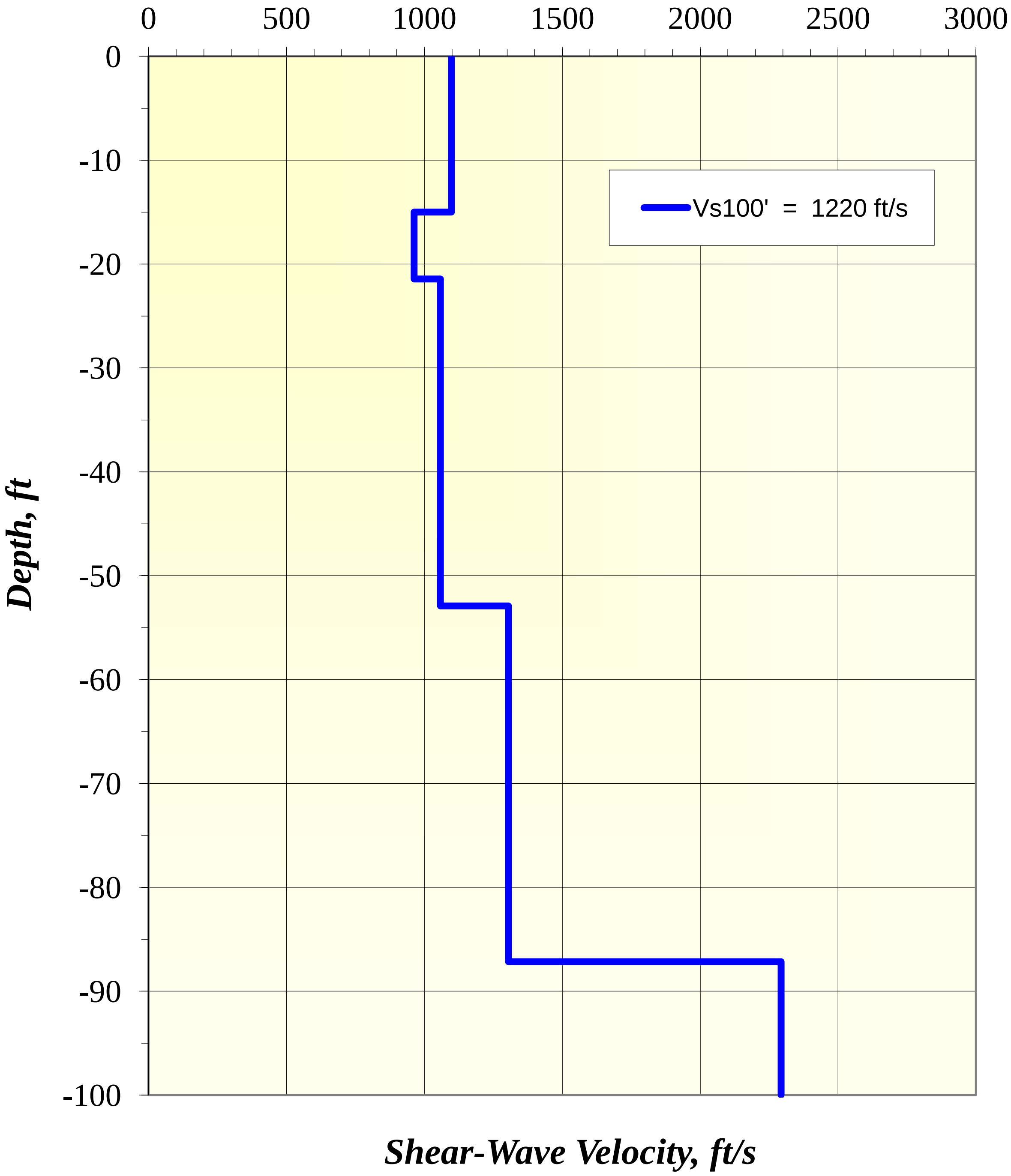
GEOPHYSICAL SURVEY DATA

Line 1: Shear Wave Velocity Profile

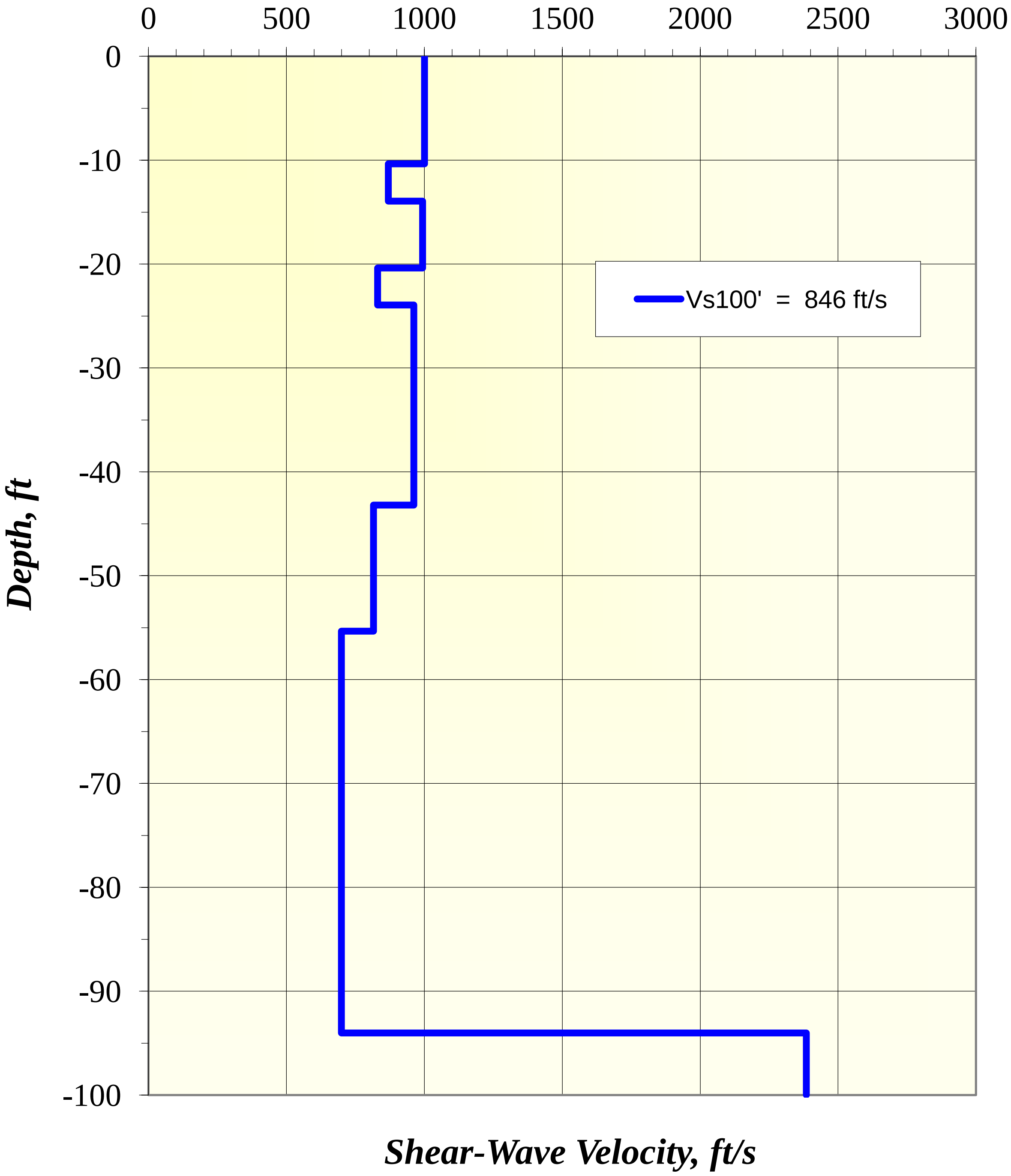
Ground Surface Elevation 5144 feet



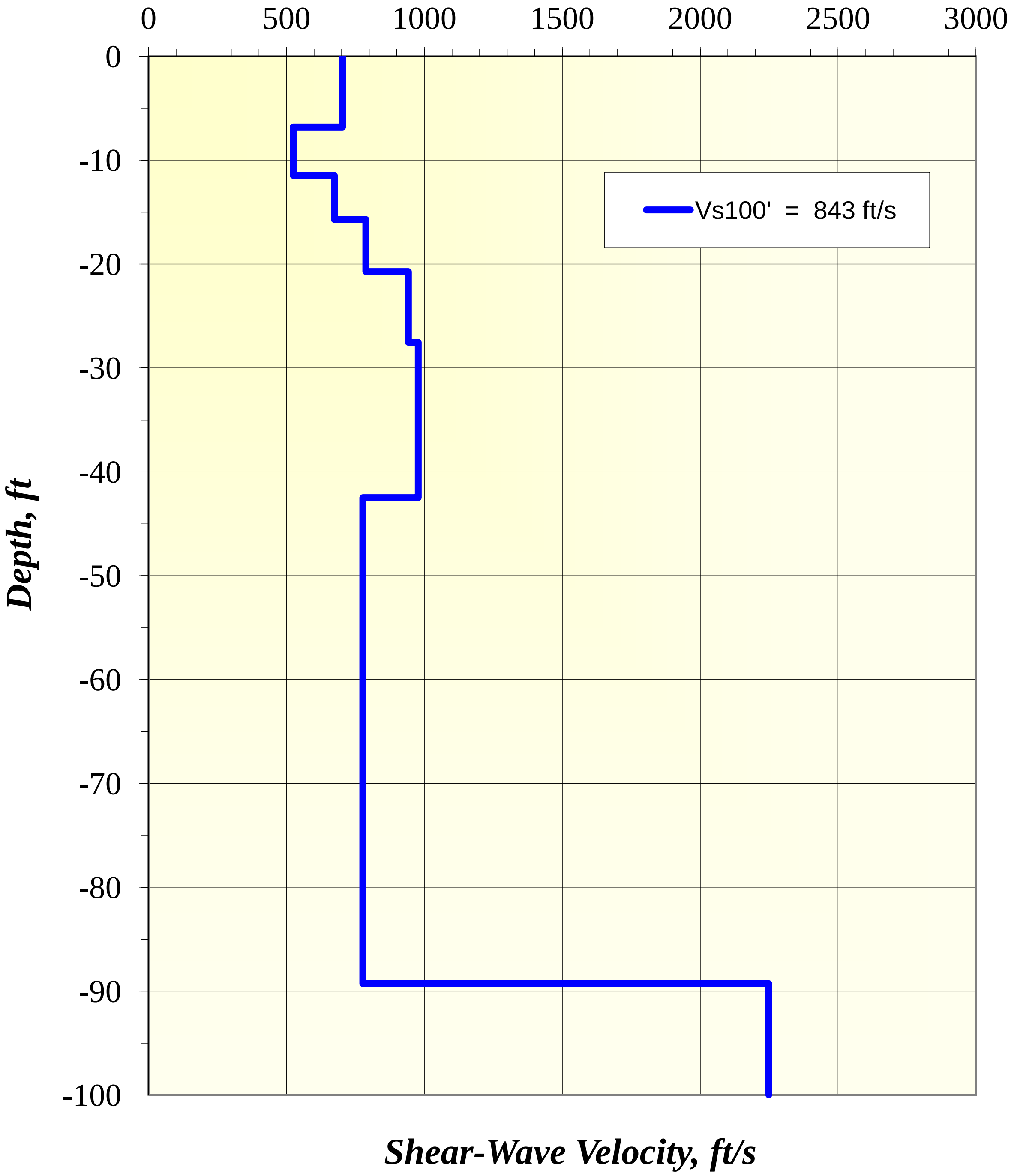
GEOPHYSICAL SURVEY DATA
Line 2: Shear Wave Velocity Profile
Ground Surface Elevation 5081 feet



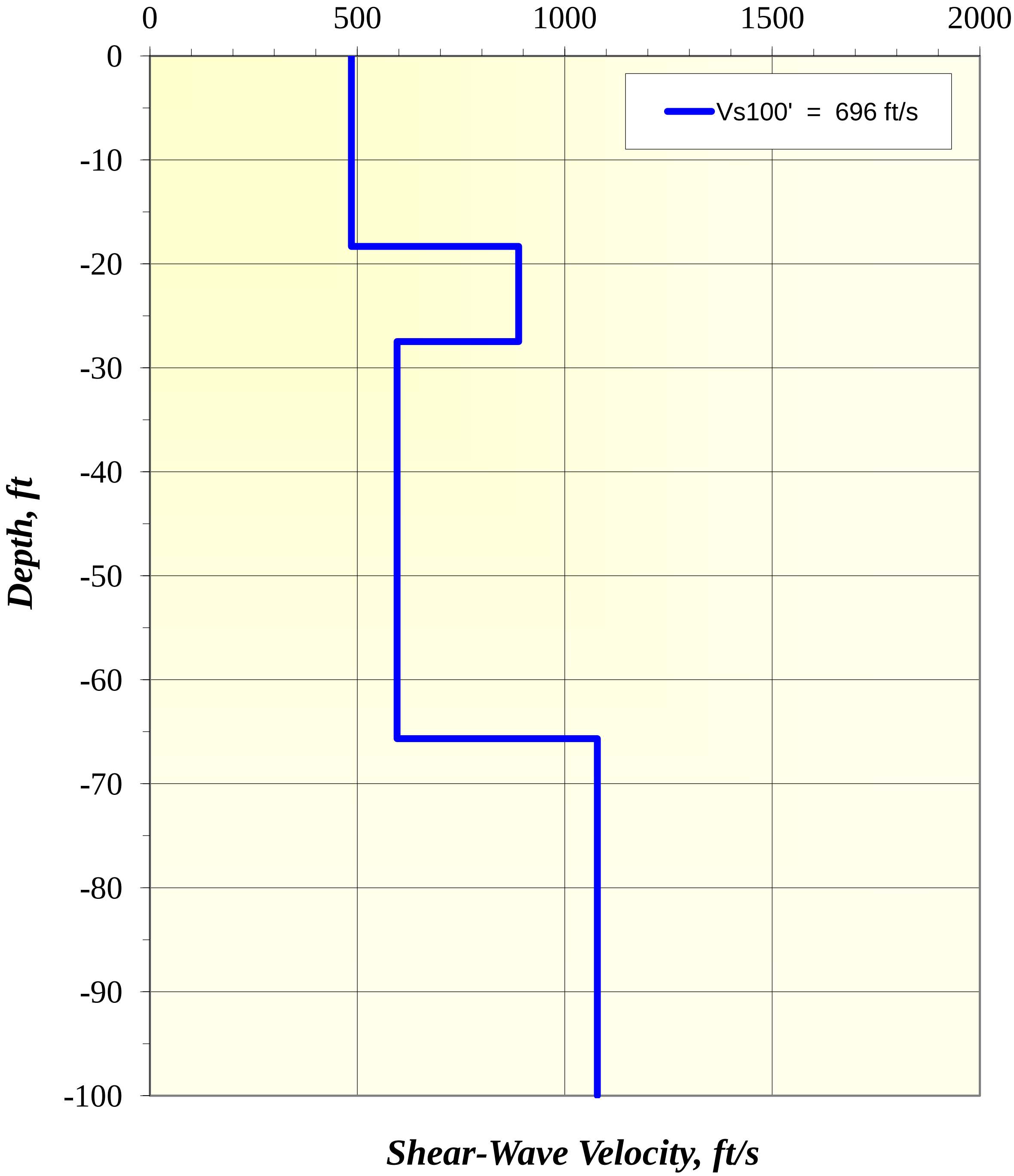
GEOPHYSICAL SURVEY DATA
Line 3: Shear Wave Velocity Profile
Ground Surface Elevation 5069 feet

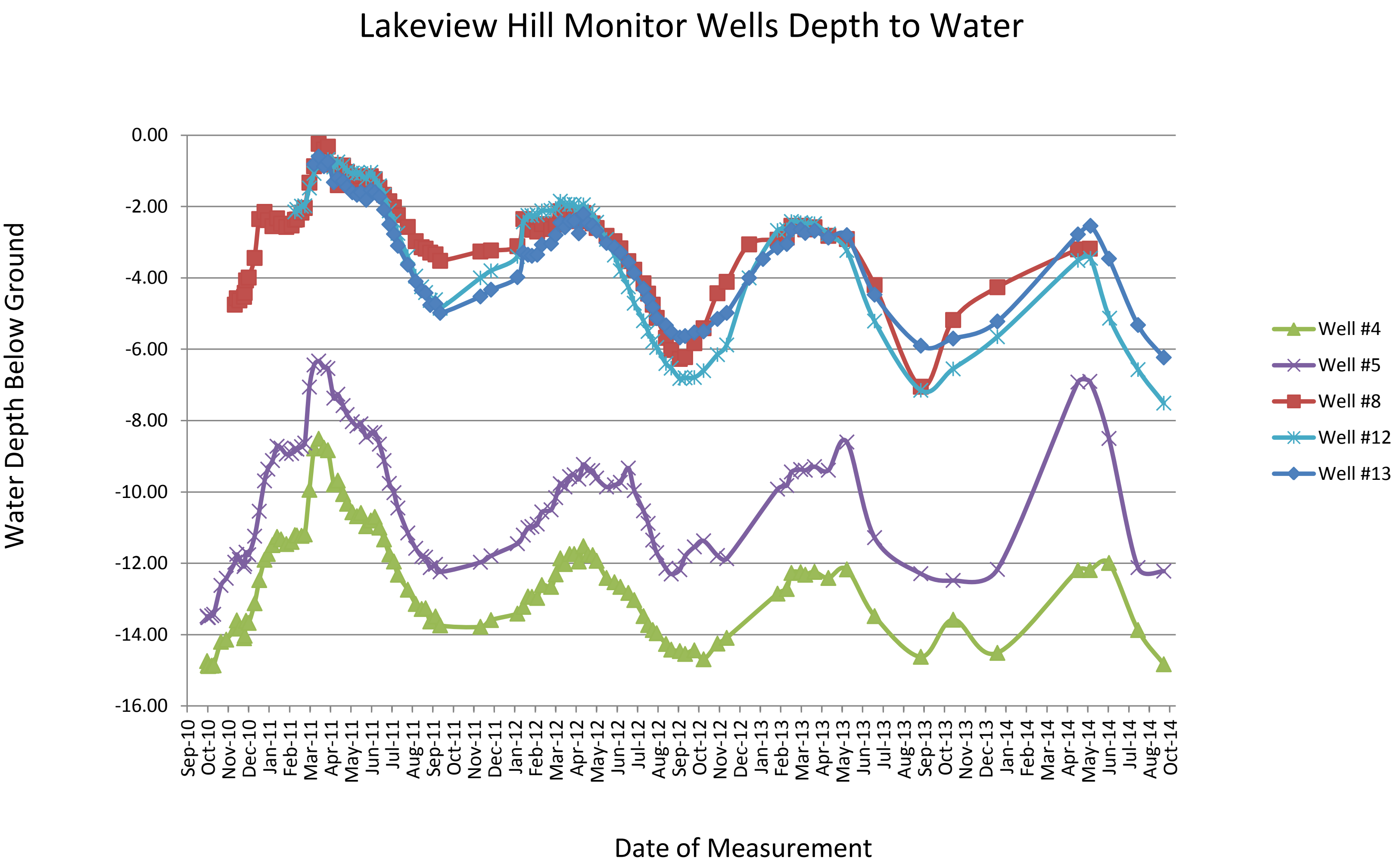


GEOPHYSICAL SURVEY DATA
Line 4: Shear Wave Velocity Profile
Ground Surface Elevation 5075 feet



GEOPHYSICAL SURVEY DATA
Line 5: Shear Wave Velocity Profile
Ground Surface Elevation 5031 feet





Lakeview Hill Monitor Wells Depth to Water
Water Depth Below Ground
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
-16.00
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
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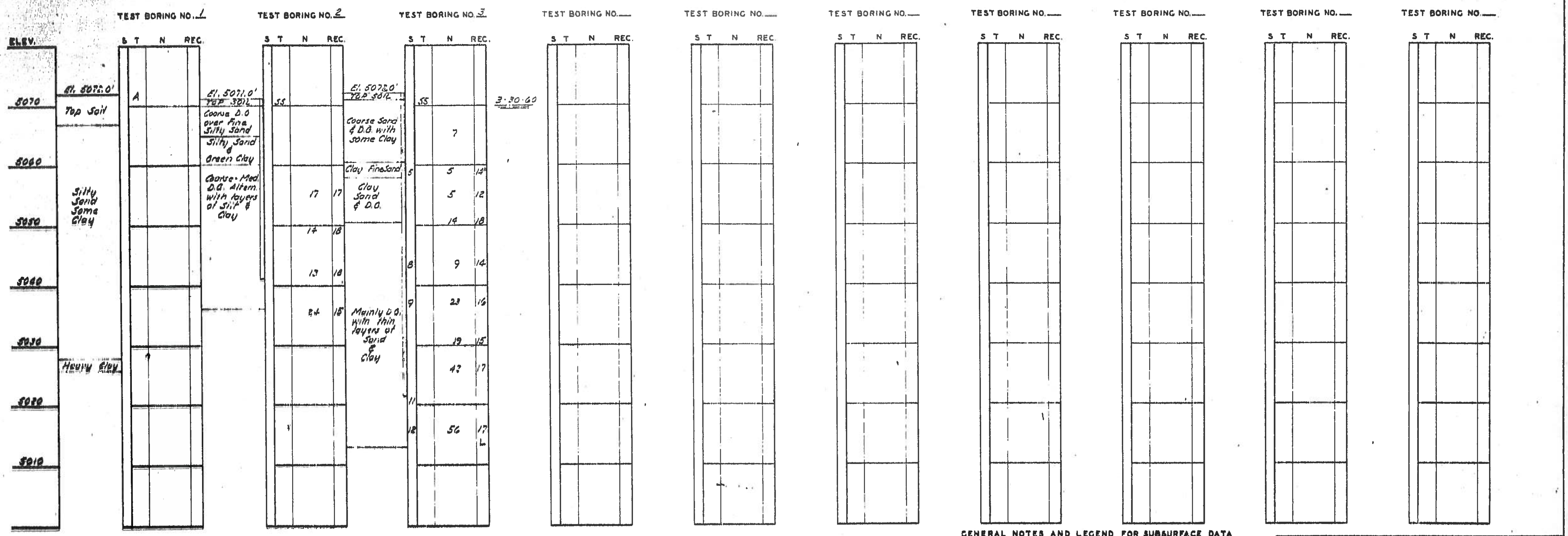
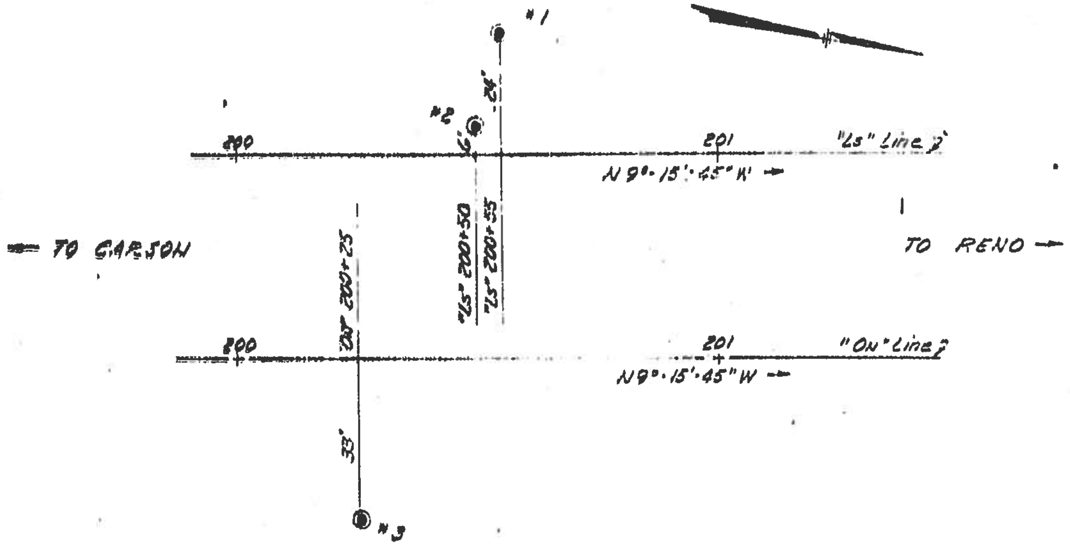
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Oct-14
Date of Measurement
Well #4
Well #5
Well #8
Well #12
Well #13

FED ROAD DIV NO	STATE	PROJECT NO	COUNTY	CONTROL SECTION	STATE ROUTE	SHEET NO	TOTAL SHEETS
7	NEVADA	F-003-2(4)	WASHOE	WA-04	3	76	





GENERAL NOTES AND LEGEND FOR SUBSURFACE DATA

FOR THE DESIGN OF THE STRUCTURE, AND TO OBTAIN RELATIVE DATA CONCERNING THE CHARACTER OF THE MATERIAL IN AND UPON WHICH THE FOUNDATION MIGHT BE BUILT, BORINGS AND/OR SOUNDINGS WERE MADE AT POINTS APPROXIMATELY AS INDICATED ON THIS DRAWING WITH THE LOG OF SUCH EXPLORATION DATA AS INTERPRETED FOR SUCH DESIGN PURPOSE AS SHOWN. THE EXPLORATIONS WERE MADE BY ORDINARY AND CONVENTIONAL METHODS AND CARE DEEMED ADEQUATE FOR SUCH PURPOSE. HOWEVER, SINCE IT IS A MATTER OF COMMON KNOWLEDGE THAT THE EXACT CHARACTER OF ANY MATERIAL AND ITS REACTION IS DIFFICULT TO DETERMINE FROM SUCH SUBSURFACE EXPLORATION AND THAT THE KIND AND CHARACTER OF THE MATERIAL AT THE SITE WHERE THE FOUNDATIONS ARE BUILT MAY VARY FROM THAT INDICATED BY THE LOG, THEY ARE MADE AVAILABLE TO THE BIDDERS SIMPLY FOR WHAT THEY ARE WORTH, WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED, THAT THE MATERIAL TO BE ENCOUNTERED IN BUILDING THE FOUNDATION WILL CONFORM THEREWITH. IF THE LOG IS USED BY THE CONTRACTOR IN MAKING HIS BID, IT IS HEREBY EXPRESSLY STIPULATED THAT THE STATE OF NEVADA, DEPARTMENT OF HIGHWAYS ACCEPTS NO RESPONSIBILITY FOR SAID USE.

◉ — INDICATES THE TEST LOCATION AND NUMBER
(7-14-59) — INDICATES THE 24 HOUR WATER TABLE READING ON THE DATE SHOWN
S --- INDICATES THE SAMPLE NUMBER
N --- REPRESENTS THE NUMBER OF BLOWS FOR EACH SIX INCHES OF PENETRATION OR FRACTION THEREOF WHEN USING A 140 LB. WEIGHT FALLING FREE FOR 30 INCHES ON A 2-INCH O.D. SPLIT SPOON SAMPLER.
T --- TYPE OF SAMPLE OR METHOD OF ADVANCING TEST BORING
S.S. --- SPLIT SPOON SAMPLER – 1-3/8" I.D., 2" O.D.
S.T. --- SHELBY TUBE SAMPLE – 2" O.D.
C --- CORE BORING – 1-3/8" MIN. DIA.
L --- LOST SAMPLE
A --- AUGER TYPE BIT OR SAMPLER – FOR DISTURBED SAMPLE ONLY.
R.B. --- ROCK BIT —USED ONLY FOR PENETRATING HARD STRATAS.
F.T. --- FISH TAIL BIT – USED FOR ADVANCING HOLE IN SOIL.
QU --- UNCONFINED COMPRESSIVE STRENGTH IN TON PER SQ. FT.
N.M.C. --- NATURAL MOISTURE CONTENT OF THE SAMPLE.
L.L. --- LIQUID LIMIT
P.L. --- PLASTIC LIMIT
P.I. --- PLASTICITY INDEX
▌ --- DEPTH OF CASING USED
REC. --- RECOVERY OF CORE BORING IN INCHES
C.A. --- CHEMICAL ANALYSIS

ESTIMATED PILE TIP ELEVATIONS

TYPE OF PILE	TEST BORING NUMBERS									
	1	2	3	4	5	6	7	8	9	10
Steel shell	Abuts.			5040.'±						
Steel shell	Piers			5040.'±						

NORMAL ALLOWABLE BEARING VALUE T/FT²

ELEV.	TEST BORING NUMBERS									
	1	2	3	4	5	6	7	8	9	10
Abuts.	27 Tons / Pile									
Piers	30 Tons / Pile									

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS

I-812N & I-812S

LOG OF TEST BORINGS

APPENDIX C:
LABORATORY TEST RESULTS

Summary of Results
Particle Size Distribution Reports
Direct Shear Test Reports
Chemical Analysis Table

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

EA/Cont # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 1 **Elevation (ft)** 5079.9 **Station** "R1a" 16+40 **Date** 7/9/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	1.0 - 2.5	SPT	33	SM	5.8		16.9	24	NP	NP						
B1	3.7 - 4.2	CMS	42	SM	8.4	112.2	14.6	28	NP	NP						
B2	4.2 - 4.7	CMS		SP-SM	6.1	110.3	11.8	26	NP	NP	DS	44	3.1	44	1.2	
C	5.0 - 6.5	SPT	35	SM	5.4		15.6	27	NP	NP						
D	7.5 - 9.0	CMS	41		7.4											Ch
E	9.0 - 10.5	SPT	33	SM	6.4		20.9	26	NP	NP						
F1	11.7 - 12.2	CMS	45	SP-SM	8.2	105.1	10.1	24	NP	NP	DS	34	1.9	34	1.6	
F2	12.2 - 13.0	CMS		SM	7.6		15.8	27	NP	NP						
G	13.0 - 14.5	SPT	20	SM	6.8		17.2	25	NP	NP						
H1	15.7 - 16.2	CMS	14	SM	11.5	114.7	21.9	25	NP	NP						
H2	16.2 - 16.7	CMS		SM	10.1	111.5	18.9	23	NP	NP						
I	17.0 - 18.5	SPT	11	SM	7.0		15.8	22	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 1 **Elevation (ft)** 5079.9 **Station** "R1a" 16+40 **Date** 7/10/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
J1	20.0 - 20.5	CMS	59	SM	11.1		19.9	26	NP	NP						
J2	20.5 - 21.0	CMS		SC	6.7		12.3	31	22	9						
K	22.5 - 24.0	SPT	35	SM	5.7		15.3	31	26	5						
L	27.5 - 29.0	SPT	58	SM	7.9		16.6	22	NP	NP						
M	35.0 - 36.5	SPT	60	SP-SM	11.3		8.8	20	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 2 **Elevation (ft)** 5094.4 **Station** "R1a" 20+35 **Date** 7/10/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	1.0 - 2.5	SPT	28	SM	4.9		16.9	21	NP	NP						
B	3.5 - 5.0	CMS	31		6.1											Ch
C	6.0 - 7.5	SPT	10	SM	10.4		21.6	25	NP	NP						
D1	8.7 - 9.2	CMS	10	SM	14.1	99.8	24.6	27	NP	NP						
D2	9.2 - 9.7	CMS		SM	11.6	101.7	21.5	23	NP	NP	DS	35	0.8	35	0.8	
E	11.0 - 12.5	SPT	5	SC	18.8		25.8	34	21	13						
G1	15.2 - 15.7	CMS	30	SM	18.8	107.9	38.0	23	NP	NP						
G2	16.0 - 16.5	CMS		SM	12.4		18.6	23	NP	NP						
H	17.5 - 19.0	SPT	32	SM	10.4		23.6	23	NP	NP						
I	20.0 - 21.5	SPT	50	SM	13.5		20.5	20	NP	NP						
J	22.5 - 23.0	SPT	R	SM	10.9		20.0	20	NP	NP						
K	27.5 - 29.0	SPT	51	SM	16.6		17.5	21	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
$N = (N_{css})(0.62)$

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 # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 2 **Elevation (ft)** 5094.4 **Station** "R1a" 20+35 **Date** 7/10/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
L	32.5 - 33.8	SPT	R	SM	16.1		18.8	21	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 3 **Elevation (ft)** 5110.4 **Station** "R1a" 24+30 **Date** 7/11/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	1.3 - 2.5	CMS	65	SM	4.6		13.3	21	NP	NP						
E	8.0 - 9.0	Auger			2.7											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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 4 **Elevation (ft)** 5129.6 **Station** "R1a" 28+25 **Date** 7/12/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	1.0 - 2.5	SPT	26	SM	5.9		18.2	21	NP	NP						
B1	3.7 - 4.2	CMS	21	SM	9.5	103.1	19.5	22	NP	NP	DS	33	2.0	33	1.2	
B2	4.2 - 5.0	CMS			10.0											Ch
C	6.0 - 7.5	SPT	20	SM	9.2		13.0	19	NP	NP						
D	9.2 - 9.7	CMS	25	SM	19.8	107.4	19.5	22	NP	NP	DS	37	3.6	36	0.0	
F	16.0 - 17.5	SPT	16	SM	22.0		35.2	21	NP	NP						
G	18.5 - 20.0	SPT	26	SM	18.5		21.4	20	NP	NP						
H	23.5 - 25.0	SPT	56	SM	12.8		14.4	24	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 $N = (N_{css})(0.62)$

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 # 73637 **Job Description** US 395 Lakeview - Washoe

Boring No. LCA 5 **Elevation (ft)** 5146.4 **Station** "R1a" 32+25 **Date** 7/12/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.0 - 3.5	SPT	36	SM	5.2		19.2	21	NP	NP						
B1	4.7 - 5.2	CMS	60	SM	8.2	114.6	16.2	22	NP	NP	DS	36	4.6	31	1.9	
B2	5.2 - 6.0	CMS			7.4											Ch
C	11.0 - 12.5	SPT	8	SM	11.9		22.1	21	19	2						
D	13.5 - 14.3	CMS	12	SC	14.3		27.8	30	16	14						
E	16.0 - 17.5	SPT	13	SM	21.0		19.6	24	NP	NP						
F	21.0 - 22.5	SPT	9	SC-SM	18.3		22.9	23	17	6						
G	25.2 - 26.0	SPT		SP-SM	25.2		6.8	19	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_{css})(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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LSF 1 **Elevation (ft)** 5070.6 **Station** "LSe" 110+25 **Date** 11/7/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.0 - 3.5	SPT	17	SM	10.8		19.6	19	NP	NP						
B1	4.7 - 5.2	CMS	23													Ch
B2	5.2 - 5.7	CMS			10.2	107.6										Ch
C	7.0 - 8.5	SPT	19	SC-SM	12.0		25.3	26	20	6						
D1	9.7 - 10.2	CMS	10	SM	16.4	101.9	32.1	30	24	6	DS	31	2.0	31	1.9	
D2	10.2 - 10.7	CMS		SM	22.7	88.9	24.6	23	NP	NP						
E	12.0 - 13.5	SPT	14	SW-SM	18.7		8.8	31	NP	NP						
F	14.5 - 16.0	SPT	24	SM	21.3		13.5	24	NP	NP						
G	17.0 - 18.5	SPT	32	SP-SM	21.2		10.9	23	NP	NP						
H	19.5 - 21.0	SPT	39	SM	20.1		23.7	26	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LSF 2 **Elevation (ft)** 5074.7 **Station** "R2a" 14+70 **Date** 1/14/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.0 - 3.5	SPT	23	SM	8.8		20.0	20	NP	NP						
B1	4.7 - 5.2	CMS	38	SM	9.8	105.9	12.9	20	NP	NP						
B2	5.2 - 6.0	CMS														Ch
C	7.0 - 8.5	SPT	16	SC-SM	14.8		33.0	25	21	4						
D1	9.7 - 10.2	CMS	17	SC	14.3	112.9	19.7	30	21	9	DS	36	1.8	36	0.7	
E	12.0 - 13.5	SPT	13	SC-SM	14.0		23.7	27	21	6						
F	14.5 - 16.0	SPT	24	SP-SM	16.3		11.5	25	NP	NP						
G	17.0 - 18.5	SPT	27	SP-SM	19.9		10.3	21	NP	NP						
H	19.5 - 21.0	SPT	29	SM	17.7		14.7	22	NP	NP						
I	22.0 - 23.5	SPT	33	SM	20.3		17.4	25	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LSF 3 **Elevation (ft)** 5078.6 **Station** "R2a" 10+70 **Date** 1/14/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.0 - 3.5	SPT	46	SM	9.4		22.1	21	20	1						
B1	5.2 - 5.7	CMS	34	SM	10.0	115.4	37.6	21	NP	NP						
B2	5.7 - 6.2	CMS														Ch
C	7.0 - 8.5	SPT	19	SM	9.6		17.2	22	NP	NP						
D1	9.7 - 10.2	CMS	25	SM	13.5	118.4	24.8	24	21	3	DS	39	1.1	36	0.4	
D2	10.2 - 10.7	CMS		SM			21.9	19	NP	NP						
D3	10.7 - 11.0	CMS		SC	17.8		38.1	35	23	12						O = 3.5%
E	12.0 - 13.5	SPT	13	SC	14.6		29.6	31	23	8						
F	14.5 - 16.0	SPT	9	SC	21.2		28.3	32	27	5						
G	17.0 - 18.5	SPT	28	SP-SM	17.8		11.1	22	NP	NP						
H	19.5 - 21.0	SPT	12	SM	21.1		17.5	20	NP	NP						
I	24.5 - 26.0	SPT	29	SM	20.2		12.7	24	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LSF 4 **Elevation (ft)** 5082.5 **Station** "R2a" 6+70 **Date** 11/15/2012

SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLER TYPE	N BLOWS per ft.	SOIL GROUP	W%	DRY UW pcf	% PASS #200	LL %	PL %	PI %	STRENGTH TEST TEST TYPE	Φ deg. Peak	C psi Peak	Φ deg. Residual	C psi Residual	COMMENTS
A	2.0 - 3.5	SPT	23	SM	7.5		17.0	19	NP	NP						
B1	4.7 - 5.2	CMS	31	SM	9.4	108.9	14.4	19	NP	NP	DS	36	2.6	31	2.1	
B2	5.2 - 5.7	CMS		SM	9.3		19.4	17	NP	NP						
C	7.0 - 8.5	SPT	25	SM	10.2		20.4	17	NP	NP						
D1	10.2 - 10.7	CMS	43	SM	10.7	112.9	20.1	20	NP	NP	DS	46	1.0	33	1.5	
E	12.0 - 13.5	SPT	8	SM	12.6		25.1	22	19	3						
G	17.0 - 18.5	SPT	9	SM	19.5		20.5	31	26	5						
H	19.5 - 21.0	SPT	24	SM	17.3		15.7	20	NP	NP						
I	24.5 - 26.0	SPT	28	SM	19.0		17.8	20	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LNN 1 **Elevation (ft)** 5080.5 **Station** "R4a" 9+00 **Date** 10/31/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.5 - 4.0	SPT	29	SM	9.7		16.8	19	NP	NP						
B	5.0 - 6.5	SPT	16		9.0											Ch
C1	7.7 - 8.2	CMS	60	SM	7.4	109.8	17.5	19	NP	NP	DS	40	0.7	35	1.0	
C2	8.2 - 8.7	CMS		SM	8.8	120.6	13.7	23	NP	NP						
D	10.0 - 11.5	SPT	40	SM	9.5		19.2	22	NP	NP						
E	13.0 - 14.0	SPT	7	SC	24.4		43.9	35	21	14						
F1	15.2 - 15.7	CMS	19	SM	12.4	103.3	16.4	24	23	1	DS	35	2.00	35	1.00	
F2	15.7 - 16.2	CMS		SM	11.4	106.6	14.0	24	NP	NP						
G1	17.5 - 18.0	SPT	12	SW-SM	16.3		8.9	27	NP	NP						
G2	18.0 - 19.0	SPT			19.3			27	21	6						
H	20.0 - 21.5	SPT	21	SW-SM	19.7		9.6	33	NP	NP						
I	25.0 - 26.5	SPT	43	SP-SM	16.0		6.7	20	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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LNN 2 **Elevation (ft)** 5077.5 **Station** "R4a" 12+00 **Date** 11/1/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.5 - 4.0	SPT	23	SM	7.8		16.1	21	NP	NP						
B1	5.2 - 5.7	CMS	46	SM	9.5	115.8	13.2	20	NP	NP	DS	44	3.3	37	0.0	
B2	5.7 - 6.2	CMS		SM	10.1	121.6	19.6	22	NP	NP						
C	7.5 - 9.0	SPT	24	SM	9.4		16.5	21	NP	NP						
D1	10.2 - 10.7	CMS	15	SM	9.5	106.3	18.1	21	NP	NP	DS	32	3.8	32	3.1	
D2	10.7 - 11.2	CMS		SC	12.7	107.4	24.2	26	18	8						
E1	12.5 - 13.2	SPT	11		15.7			35	16	19						
E2	13.2 - 14.0	SPT		SM	11.7		21.3	25	22	3						
F	15.5 - 16.0	CMS	28	SM	18.1	102.4	15.5	26	25	1	DS	38	3.5	33	1.6	
G	17.5 - 19.0	SPT	19	SM	20.4		18.2	21	NP	NP						
H	20.0 - 21.5	SPT	18	SM	21.0		15.2	29	NP	NP						
I	25.0 - 26.5	SPT	24	SP-SM	22.6		9.5	22	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
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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 = $(N_{css})(0.62)$

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 # 73637 **Job Description** US 395 / I-580 Lakeview - Washoe

Boring No. LNN 3 **Elevation (ft)** 5074.7 **Station** "R4a" 15+00 **Date** 11/1/2012

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.	C psi	Φ deg.	C psi	
												Peak		Residual		
A	2.5 - 4.0	SPT	33	SM	8.5		17.0	22	NP	NP						
B1	5.2 - 5.7	CMS	32	SM	7.3	104.4	13.4	20	NP	NP	DS	40	2.2	33	2.0	
B2	5.7 - 6.2	CMS		SM	9.4	114.1	13.5	22	NP	NP						
C	10.0 - 11.5	SPT	6	SC-SM	14.5		24.8	25	20	5						
D	15.0 - 16.5	SPT	17	SP-SM	21.4		11.9	23	NP	NP						
E	20.0 - 21.5	SPT	32	SM	17.9		13.9	21	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

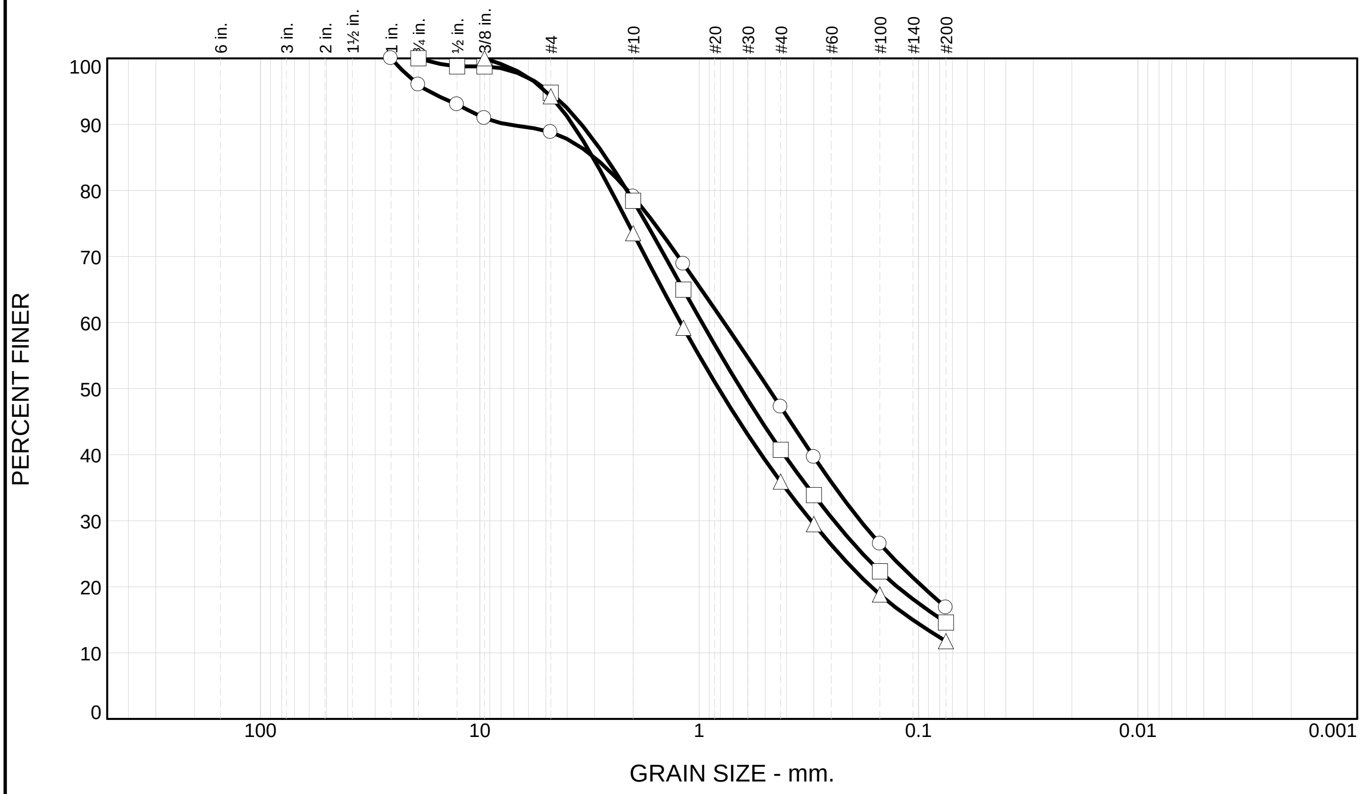
U = Unconfined Compressive
UU = Unconsolidated Undrained
CD = Consolidated Drained
CU = Consolidated Undrained
DS = Direct Shear
Φ = Friction
C = Cohesion
N = No. of blows per ft., sampler
N = Field SPT N = $(N_{css})(0.62)$

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	11.2	71.9	16.9		SM	A-1-b	NP	24
□	0.0	5.2	80.2	14.6		SM	A-1-b	NP	28
△	0.0	5.7	82.5	11.8		SP-SM	A-1-b	NP	26

SIEVE	PERCENT FINER		
inches size	○	□	△
1"	100.0		
3/4"	96.0	100.0	
1/2"	93.0	98.8	
3/8"	90.9	98.8	100.0
	GRAIN SIZE		
D_{60}	0.7697	0.9711	1.2165
D_{30}	0.1841	0.2427	0.3088
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE	PERCENT FINER		
number size	○	□	△
#4	88.8	94.8	94.3
#10	79.1	78.4	73.5
#16	68.9	65.0	59.2
#40	47.2	40.7	35.9
#50	39.6	33.9	29.5
#100	26.5	22.3	18.8
#200	16.9	14.6	11.8

Material Description

○ silty sand

□ silty sand

△ poorly graded sand with silt

REMARKS:

○

□

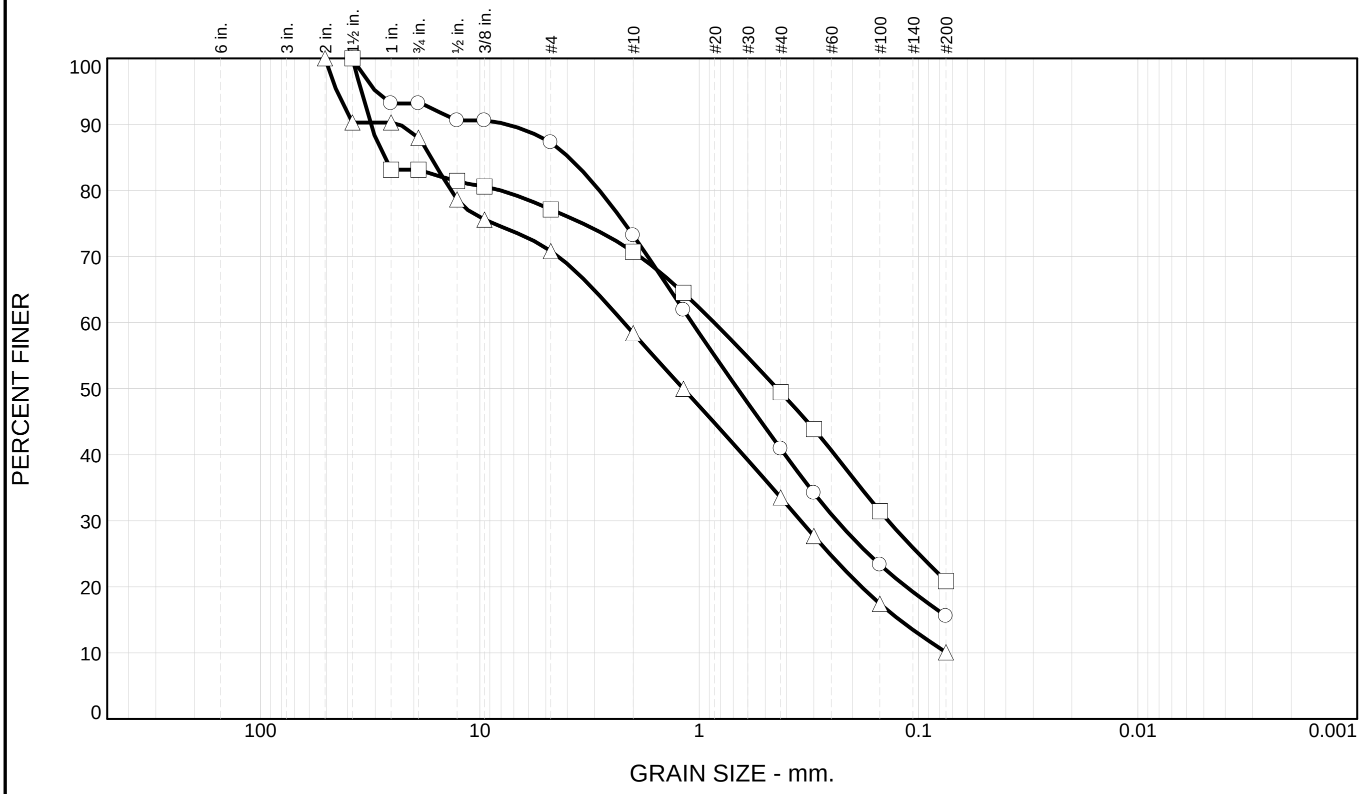
△

○ Source of Sample: LCA 1 Depth: 1.0 - 2.5' Sample Number: A
□ Source of Sample: LCA 1 Depth: 3.7 - 4.2' Sample Number: B1
△ Source of Sample: LCA 1 Depth: 4.2 - 4.7' Sample Number: B2

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	12.7	71.7	15.6		SM	A-1-b	NP	27
□	0.0	22.9	56.2	20.9		SM	A-1-b	NP	26
△	0.0	29.2	60.7	10.1		SP-SM	A-1-b	NP	24

SIEVE inches size	PERCENT FINER ○	□	△
2"			100.0
1.5"	100.0	100.0	90.3
1"	93.2	83.1	90.3
3/4"	93.2	83.1	88.0
1/2"	90.6	81.4	78.6
3/8"	90.6	80.6	75.6
	GRAIN SIZE		
D_{60}	1.0788	0.8539	2.2075
D_{30}	0.2356	0.1376	0.3446
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	87.3	77.1	70.8
#10	73.2	70.7	58.4
#16	61.9	64.5	50.0
#40	40.9	49.4	33.5
#50	34.2	43.9	27.7
#100	23.3	31.4	17.4
#200	15.6	20.9	10.1

Material Description

○ silty sand

□ silty sand with gravel

△ poorly graded sand with silt and gravel

REMARKS:

○

□

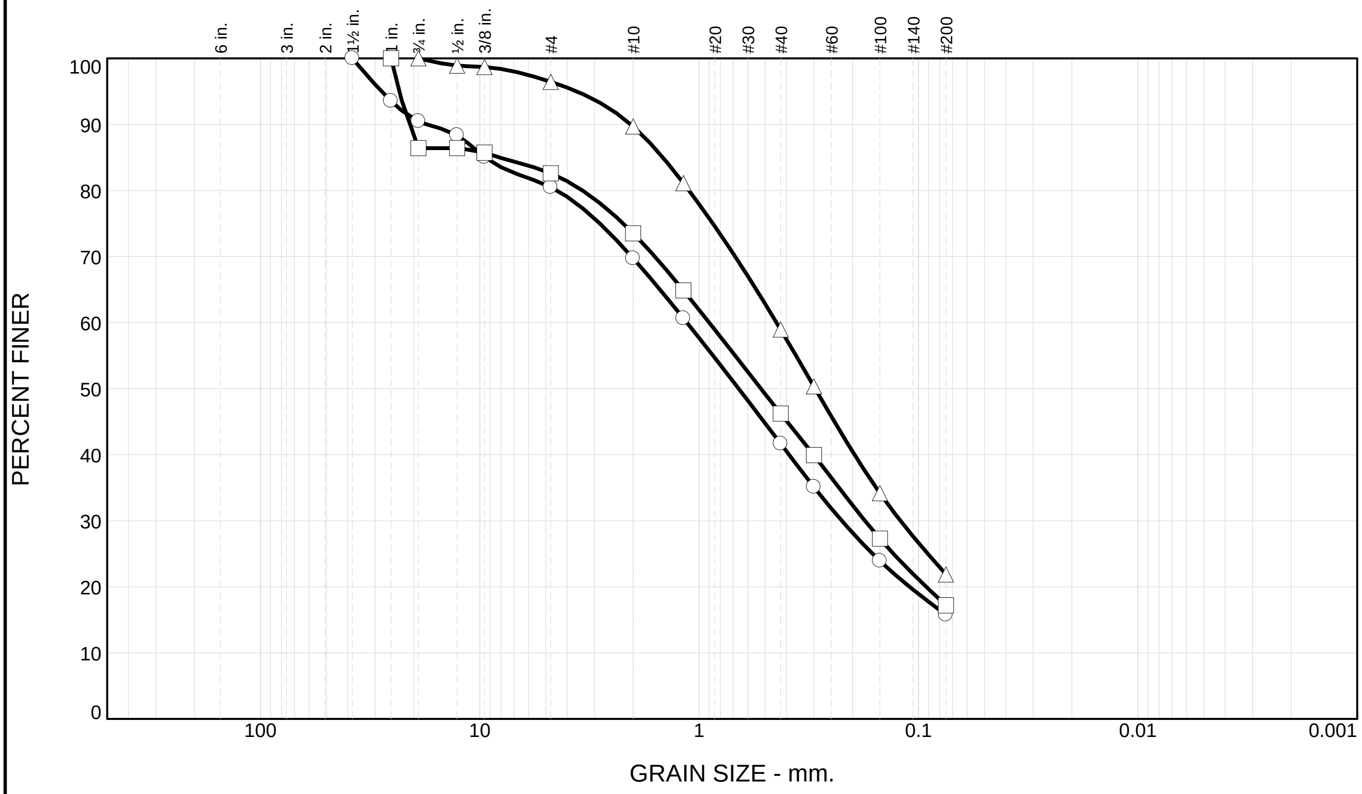
△

○ Source of Sample: LCA 1 Depth: 5.0 - 6.5' Sample Number: C
□ Source of Sample: LCA 1 Depth: 9.0 - 10.5' Sample Number: E
△ Source of Sample: LCA 1 Depth: 11.7 - 12.2' Sample Number: F1

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	19.5	64.7	15.8		SM	A-1-b	NP	27
□	0.0	17.4	65.4	17.2		SM	A-1-b	NP	25
△	0.0	3.6	74.5	21.9		SM	A-2-4(0)	NP	25

SIEVE inches size	PERCENT FINER ○	□	△
1.5"	100.0		
1"	93.5	100.0	
3/4"	90.5	86.4	100.0
1/2"	88.4	86.4	98.9
3/8"	85.1	85.7	98.7
	GRAIN SIZE		
D_{60}	1.1384	0.9002	0.4441
D_{30}	0.2238	0.1755	0.1209
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	80.5	82.6	96.4
#10	69.7	73.5	89.7
#16	60.6	64.9	81.1
#40	41.7	46.2	58.9
#50	35.1	39.9	50.3
#100	23.9	27.3	34.2
#200	15.8	17.2	21.9

Material Description

○ silty sand with gravel

□ silty sand with gravel

△ silty sand

REMARKS:

○

□

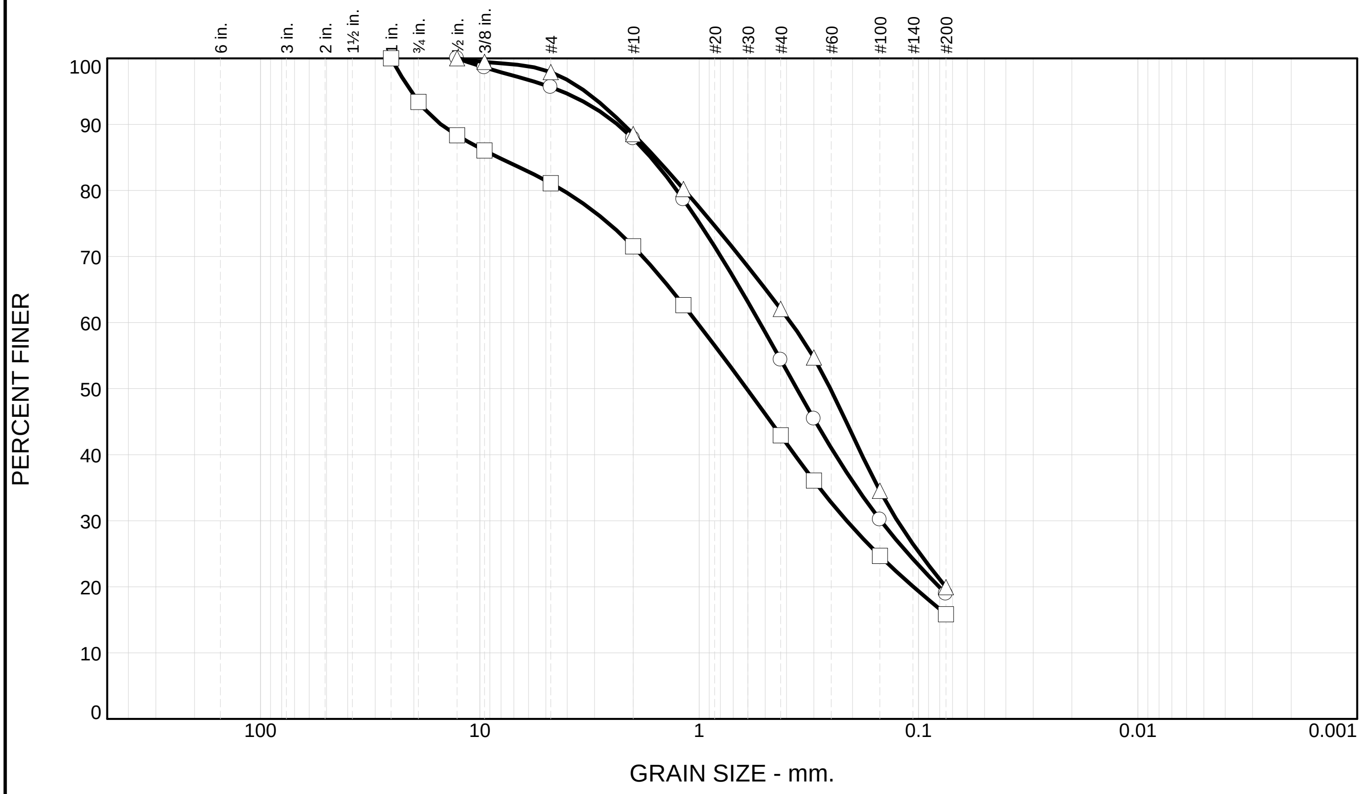
△

○ Source of Sample: LCA 1 Depth: 12.2 - 13.0' Sample Number: F2
□ Source of Sample: LCA 1 Depth: 13.0 - 14.5' Sample Number: G
△ Source of Sample: LCA 1 Depth: 15.7 - 16.2' Sample Number: H1

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	4.4	76.7	18.9		SM	A-2-4(0)	NP	23
□	0.0	18.9	65.3	15.8		SM	A-1-b	NP	22
△	0.0	2.1	78.0	19.9		SM	A-2-4(0)	NP	26

SIEVE inches size	PERCENT FINER ○	□	△
1"		100.0	
3/4"		93.4	
1/2"	100.0	88.3	100.0
3/8"	98.6	86.1	99.5
	GRAIN SIZE		
D_{60}	0.5294	1.0222	0.3819
D_{30}	0.1487	0.2125	0.1249
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	95.6	81.1	97.9
#10	87.9	71.5	88.5
#16	78.6	62.6	80.2
#40	54.4	42.9	62.1
#50	45.4	36.1	54.7
#100	30.2	24.7	34.5
#200	18.9	15.8	19.9

Material Description

○ silty sand

□ silty sand with gravel

△ silty sand

REMARKS:

○

□

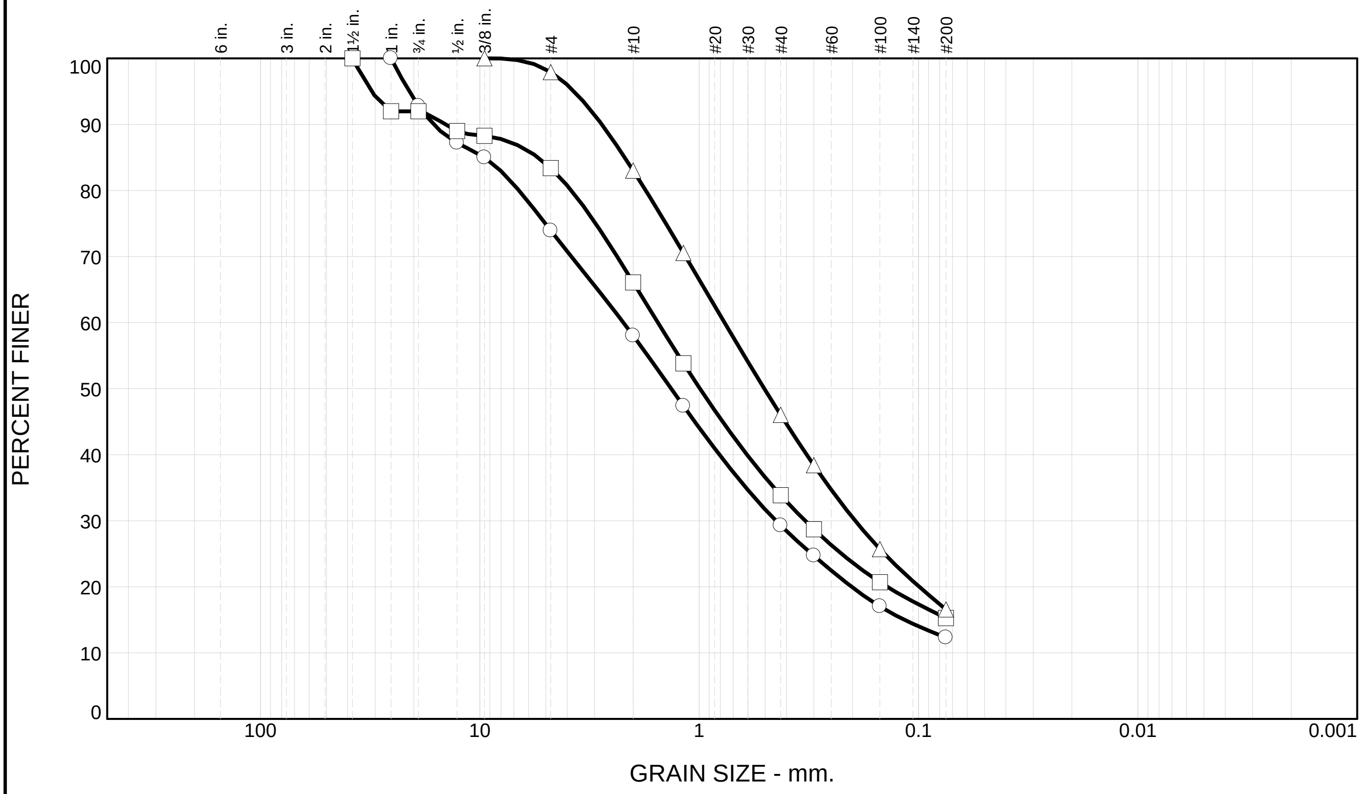
△

○ Source of Sample: LCA 1 Depth: 16.2 - 16.7' Sample Number: H2
□ Source of Sample: LCA 1 Depth: 17.0 - 18.5' Sample Number: I
△ Source of Sample: LCA 1 Depth: 20.0 - 20.5' Sample Number: J1

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	26.1	61.6	12.3		SC	A-2-4(0)	22	31
□	0.0	16.6	68.1	15.3		SM	A-1-b	26	31
△	0.0	2.1	81.3	16.6		SM	A-1-b	NP	22

SIEVE inches size	PERCENT FINER ○	□	△
1.5"		100.0	
1"	100.0	92.0	
3/4"	92.8	92.0	
1/2"	87.2	89.0	
3/8"	85.0	88.3	100.0
	GRAIN SIZE		
D_{60}	2.2168	1.5438	0.7663
D_{30}	0.4468	0.3290	0.1944
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	73.9	83.4	97.9
#10	58.0	66.1	83.0
#16	47.4	53.8	70.5
#40	29.3	33.9	46.0
#50	24.7	28.7	38.4
#100	17.0	20.7	25.7
#200	12.3	15.3	16.6

Material Description

○ clayey sand with gravel

□ silty sand with gravel

△ silty sand

REMARKS:

○

□

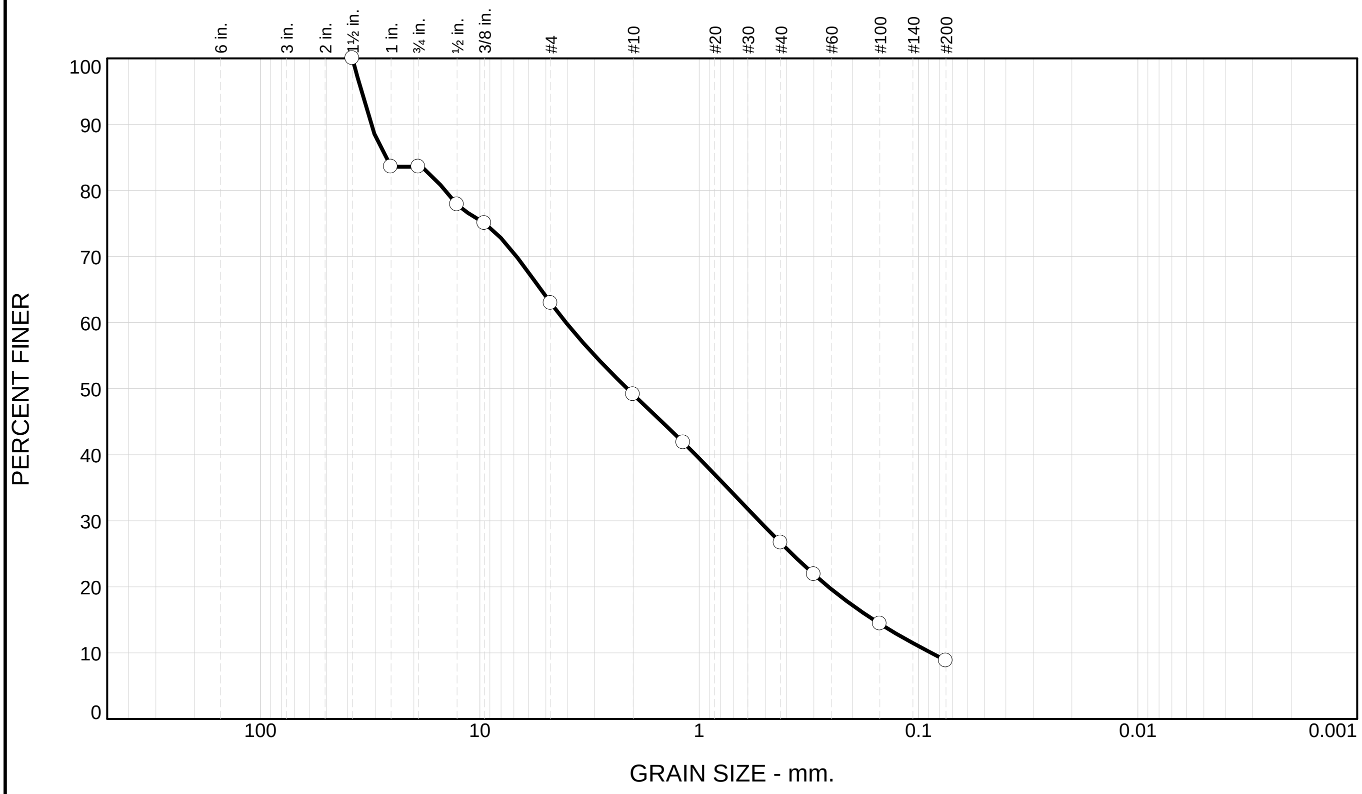
△

○ Source of Sample: LCA 1 Depth: 20.5 - 21.0' Sample Number: J2
□ Source of Sample: LCA 1 Depth: 22.5 - 24.0' Sample Number: K
△ Source of Sample: LCA 1 Depth: 27.5 - 29.0' Sample Number: L

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	37.1	54.1	8.8		SP-SM	A-1-a	NP	20

SIEVE inches size	PERCENT FINER ○		
1.5"	100.0		
1"	83.6		
3/4"	83.6		
1/2"	77.9		
3/8"	75.1		
	GRAIN SIZE		
D_{60}	4.0479		
D_{30}	0.5332		
D_{10}	0.0876		
	COEFFICIENTS		
C_c	0.80		
C_u	46.21		

SIEVE number size	PERCENT FINER ○		
#4	62.9		
#10	49.1		
#16	41.8		
#40	26.7		
#50	21.9		
#100	14.4		
#200	8.8		

Material Description

○ poorly graded sand with silt and gravel

REMARKS:

○

○ Source of Sample: LCA 1 Depth: 35.0 - 36.5' Sample Number: M

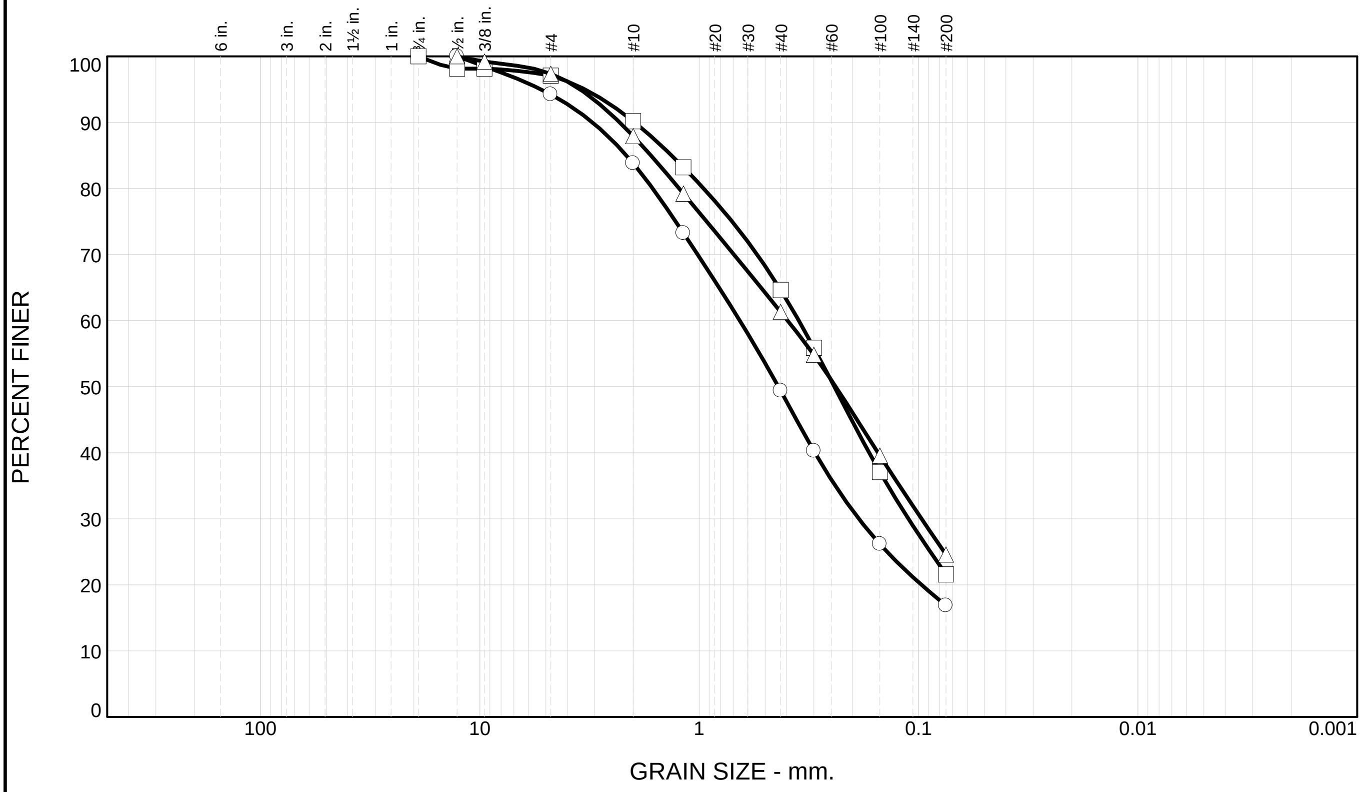
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	5.8	77.3	16.9		SM	A-1-b	NP	21
□	0.0	2.9	75.5	21.6		SM	A-2-4(0)	NP	25
△	0.0	2.6	72.8	24.6		SM	A-2-4(0)	NP	27

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	
1/2"	100.0	98.1	100.0
3/8"	98.5	98.1	99.2

	GRAIN SIZE ○	□	△
D_{60}	0.6530	0.3514	0.3952
D_{30}	0.1872	0.1112	0.0968
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	94.2	97.1	97.4
#10	83.8	90.2	87.9
#16	73.2	83.2	79.2
#40	49.4	64.6	61.3
#50	40.3	55.9	54.8
#100	26.2	37.1	39.5
#200	16.9	21.6	24.6

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

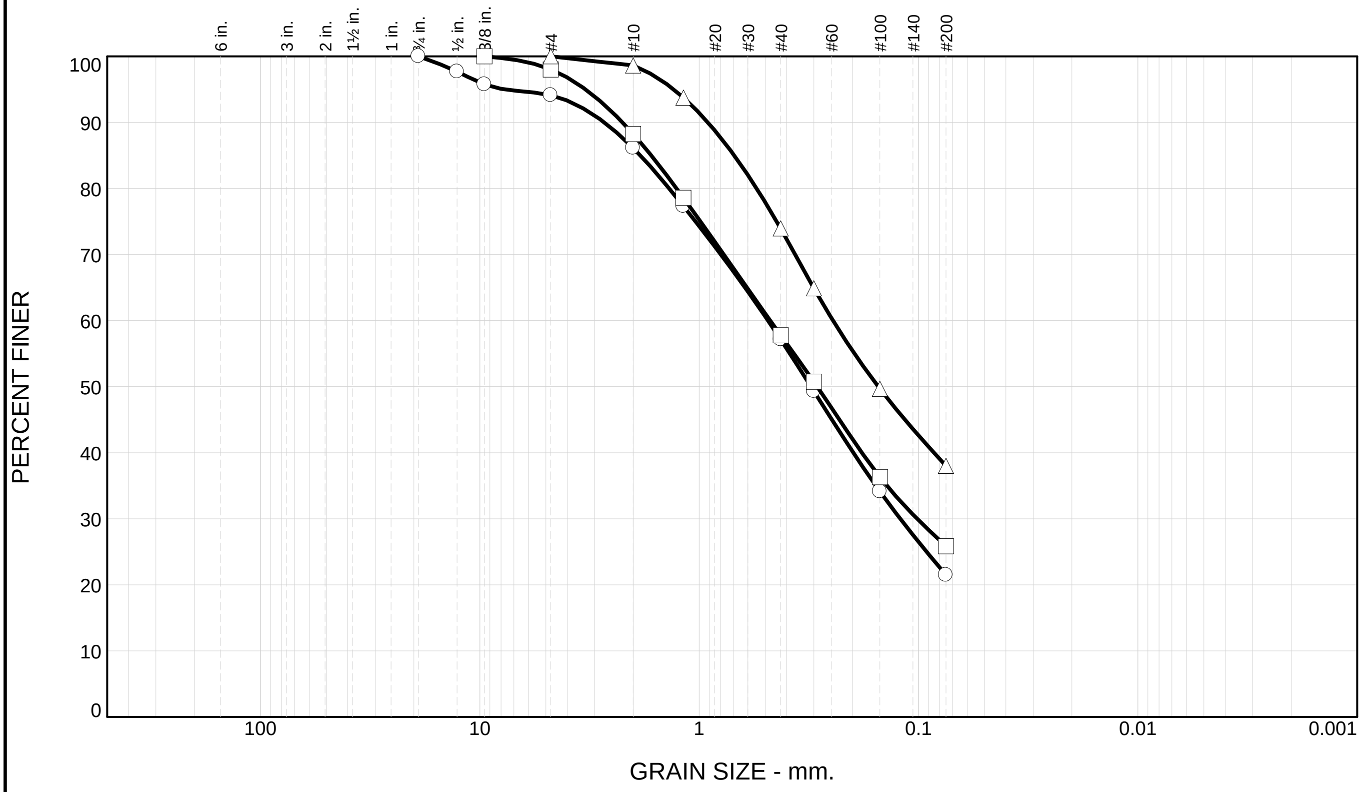
△

○ Source of Sample: LCA 2 Depth: 1.0 - 2.5' Sample Number: A
□ Source of Sample: LCA 2 Depth: 6.0 - 7.5' Sample Number: C
△ Source of Sample: LCA 2 Depth: 8.7 - 9.2' Sample Number: D1

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	5.9	72.6	21.5		SM	A-2-4(0)	NP	23
□	0.0	2.0	72.2	25.8		SC	A-2-6(0)	21	34
△	0.0	0.0	62.0	38.0		SM	A-4(0)	NP	23

SIEVE inches size	PERCENT FINER		
	○	□	△
3/4"	100.0		
1/2"	97.7		
3/8"	95.7	100.0	
	GRAIN SIZE		
D_{60}	0.4852	0.4745	0.2455
D_{30}	0.1211	0.1014	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	○	□	△
#4	94.1	98.0	100.0
#10	86.1	88.3	98.6
#16	77.3	78.6	93.8
#40	57.1	57.8	73.9
#50	49.3	50.7	64.9
#100	34.1	36.3	49.7
#200	21.5	25.8	38.0

Material Description
○ silty sand

□ clayey sand

△ silty sand

REMARKS:
○

□

△

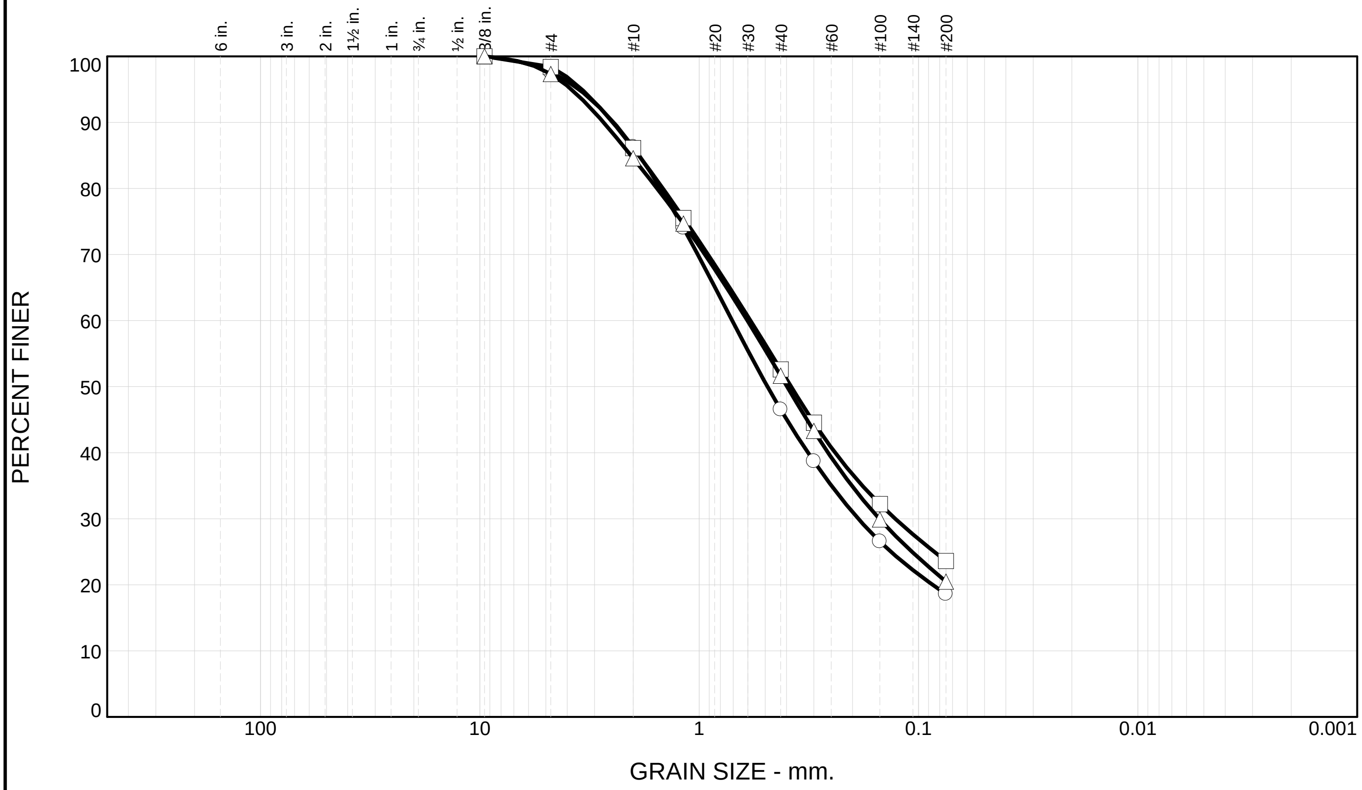
○ Source of Sample: LCA 2 Depth: 9.2 - 9.7' Sample Number: D2
□ Source of Sample: LCA 2 Depth: 11.0 - 12.5' Sample Number: E
△ Source of Sample: LCA 2 Depth: 15.2 - 15.7' Sample Number: G1

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.4	79.0	18.6		SM	A-1-b	NP	23
□	0.0	1.6	74.8	23.6		SM	A-2-4(0)	NP	23
△	0.0	2.7	76.8	20.5		SM	A-2-4(0)	NP	20

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.7071	0.5836	0.6027
D_{30}	0.1882	0.1276	0.1511
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	97.6	98.4	97.3
#10	86.3	86.1	84.6
#16	74.0	75.5	74.7
#40	46.5	52.6	51.6
#50	38.7	44.5	43.3
#100	26.5	32.2	29.9
#200	18.6	23.6	20.5

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

△

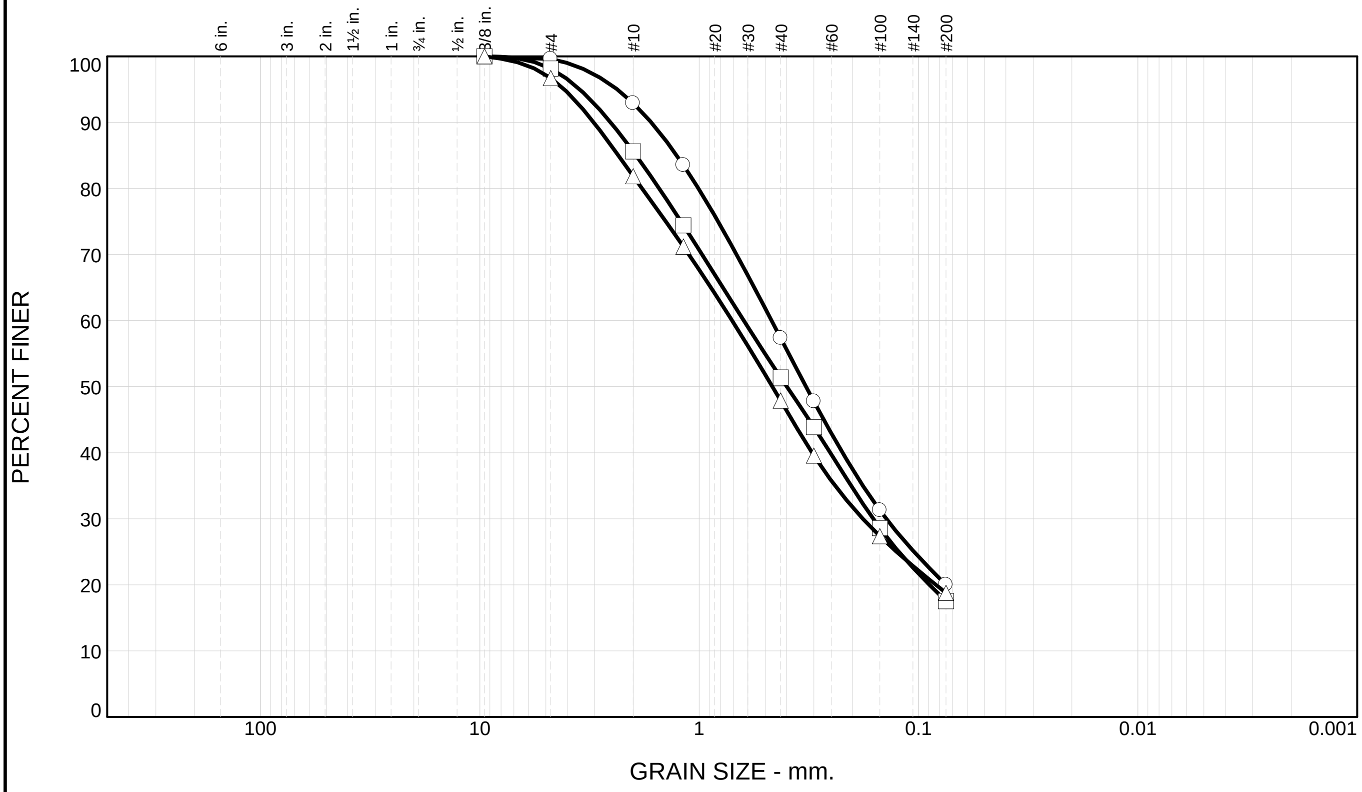
○ Source of Sample: LCA 2 Depth: 16.0 - 16.5' Sample Number: G2
□ Source of Sample: LCA 2 Depth: 17.5 - 19.0' Sample Number: H
△ Source of Sample: LCA 2 Depth: 20.0 - 21.5' Sample Number: I

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.4	79.6	20.0		SM	A-2-4(0)	NP	20
□	0.0	1.9	80.6	17.5		SM	A-2-4(0)	NP	21
△	0.0	3.3	77.9	18.8		SM	A-1-b	NP	21

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0	100.0	100.0

	GRAIN SIZE ○	□	△
D_{60}	0.4676	0.6262	0.7077
D_{30}	0.1404	0.1610	0.1794
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.6	98.1	96.7
#10	92.9	85.6	81.9
#16	83.5	74.4	71.2
#40	57.3	51.4	47.9
#50	47.8	43.9	39.6
#100	31.3	28.6	27.4
#200	20.0	17.5	18.8

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

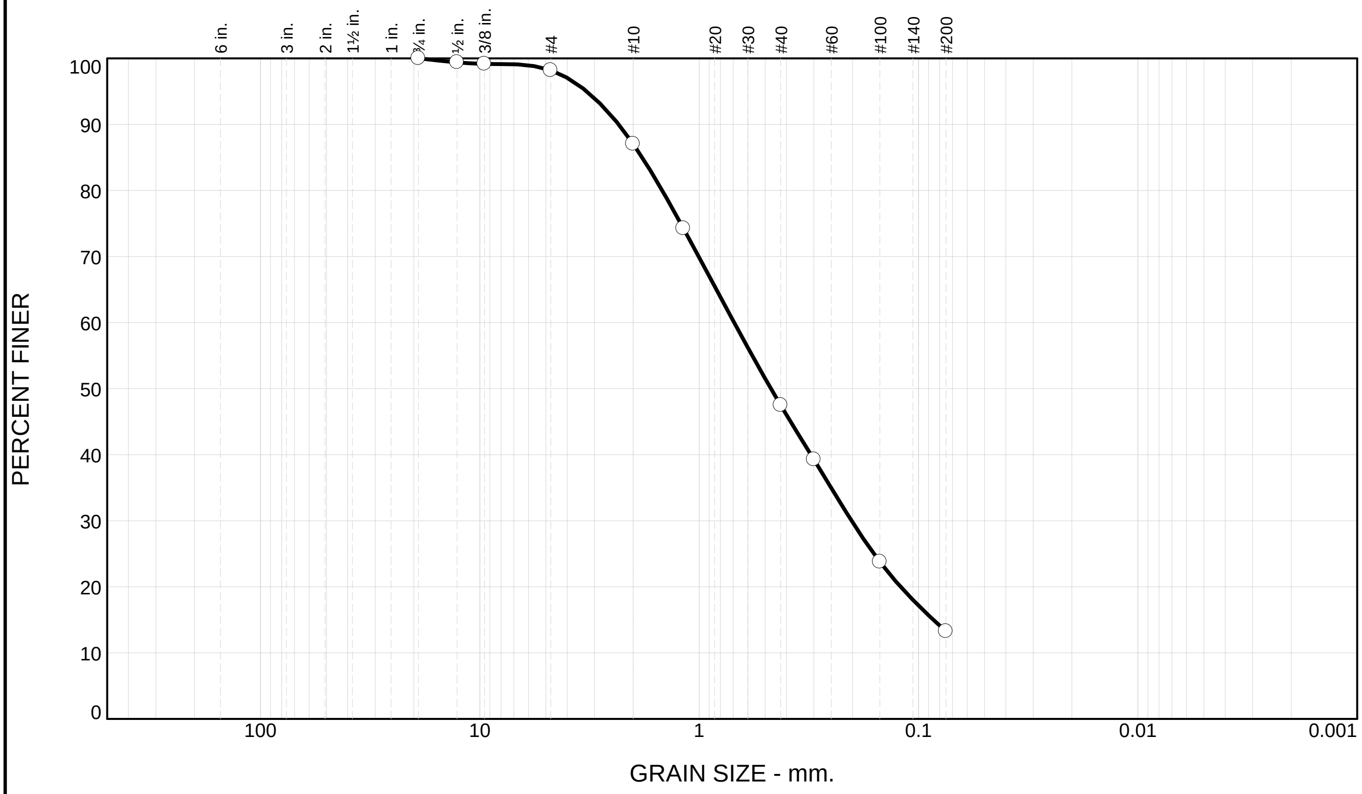
△

○ Source of Sample: LCA 2 Depth: 22.5 - 23.0' Sample Number: J
□ Source of Sample: LCA 2 Depth: 27.5 - 29.0' Sample Number: K
△ Source of Sample: LCA 2 Depth: 32.5 - 33.8' Sample Number: L

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.8	84.9	13.3		SM	A-1-b	NP	21

SIEVE inches size	PERCENT FINER ○		
3/4"	100.0		
1/2"	99.4		
3/8"	99.2		

	GRAIN SIZE		
D_{60}	0.6925		
D_{30}	0.2019		
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	98.2		
#10	87.0		
#16	74.3		
#40	47.5		
#50	39.3		
#100	23.8		
#200	13.3		

Material Description

○ silty sand

REMARKS:

○

○ Source of Sample: LCA 3 Depth: 1.3 - 2.5' Sample Number: A

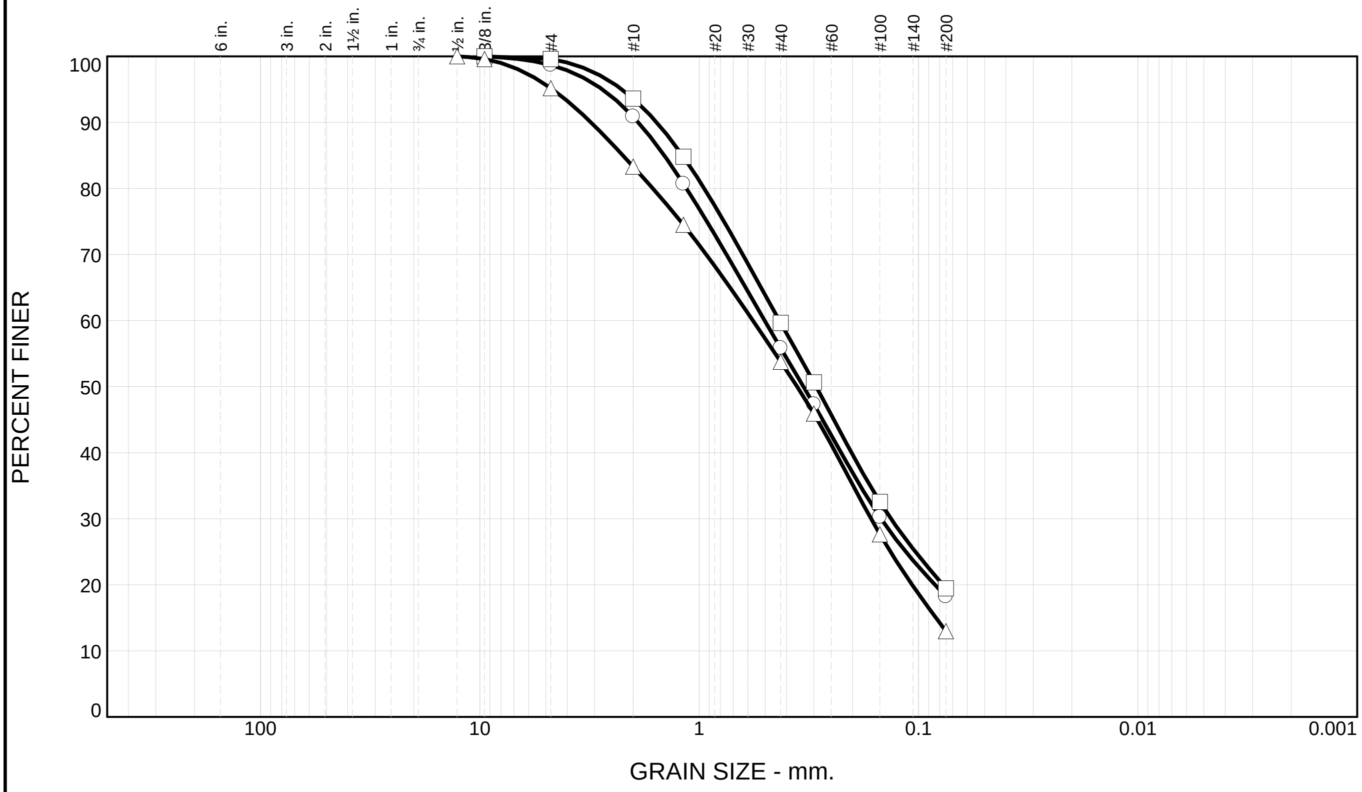
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.3	80.5	18.2		SM	A-2-4(0)	NP	21
□	0.0	0.4	80.1	19.5		SM	A-2-4(0)	NP	22
△	0.0	4.8	82.2	13.0		SM	A-2-4(0)	NP	19

SIEVE inches size	PERCENT FINER ○	□	△
1/2"			100.0
3/8"	100.0	100.0	99.6
	GRAIN SIZE		
D_{60}	0.5030	0.4309	0.5689
D_{30}	0.1482	0.1335	0.1646
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.7	99.6	95.2
#10	90.9	93.6	83.3
#16	80.7	84.8	74.5
#40	55.8	59.6	53.8
#50	47.3	50.7	45.9
#100	30.3	32.6	27.6
#200	18.2	19.5	13.0

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

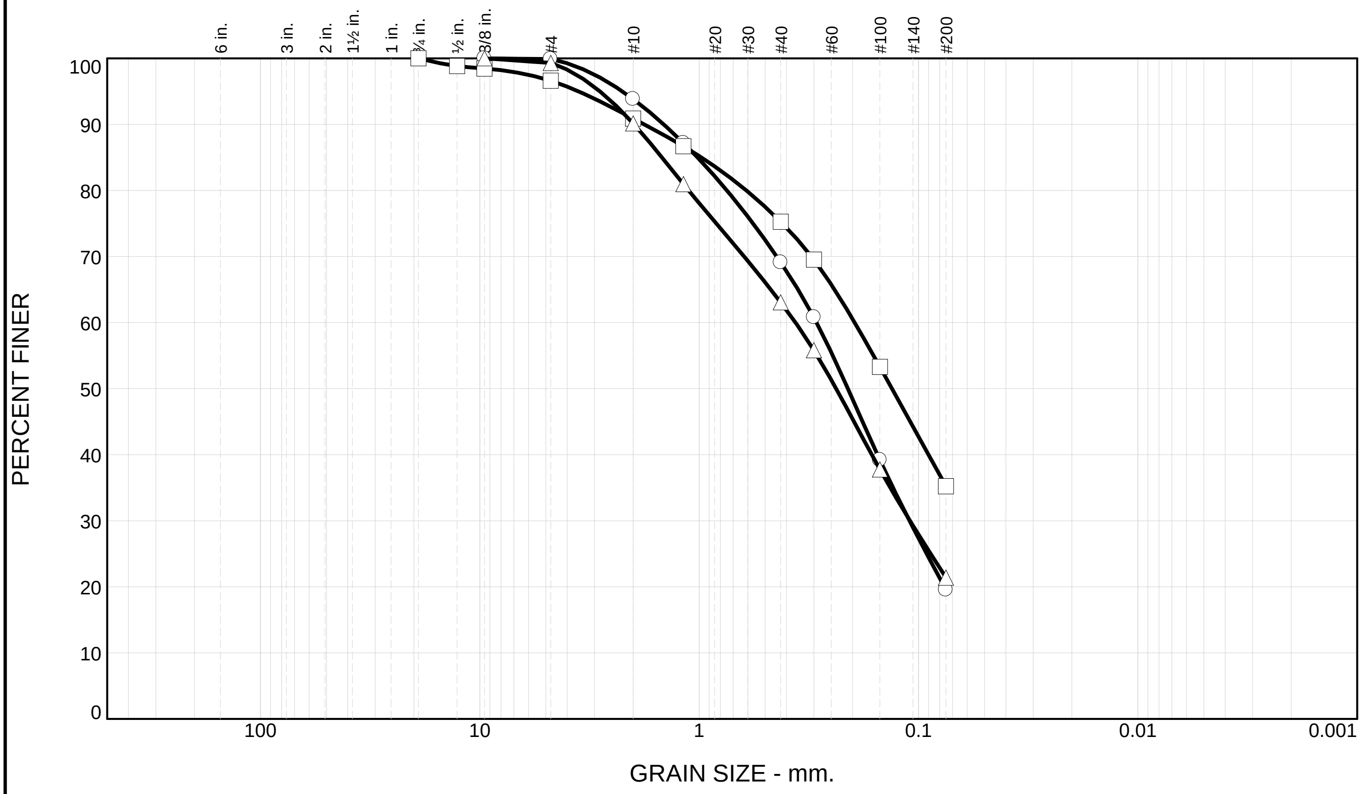
△

○ Source of Sample: LCA 4 Depth: 1.0 - 2.5' Sample Number: A
□ Source of Sample: LCA 4 Depth: 3.7 - 4.2' Sample Number: B1
△ Source of Sample: LCA 4 Depth: 6.0 - 7.5' Sample Number: C

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.1	80.4	19.5		SM	A-2-4(0)	NP	22
□	0.0	3.4	61.4	35.2		SM	A-2-4(0)	NP	21
△	0.0	0.7	77.9	21.4		SM	A-2-4(0)	NP	20

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	
1/2"		98.8	
3/8"	100.0	98.5	100.0
	GRAIN SIZE		
D_{60}	0.2914	0.1954	0.3638
D_{30}	0.1099		0.1094
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.9	96.6	99.3
#10	93.8	90.9	90.1
#16	87.2	86.7	81.0
#40	69.1	75.3	63.1
#50	60.8	69.5	55.8
#100	39.2	53.3	37.8
#200	19.5	35.2	21.4

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

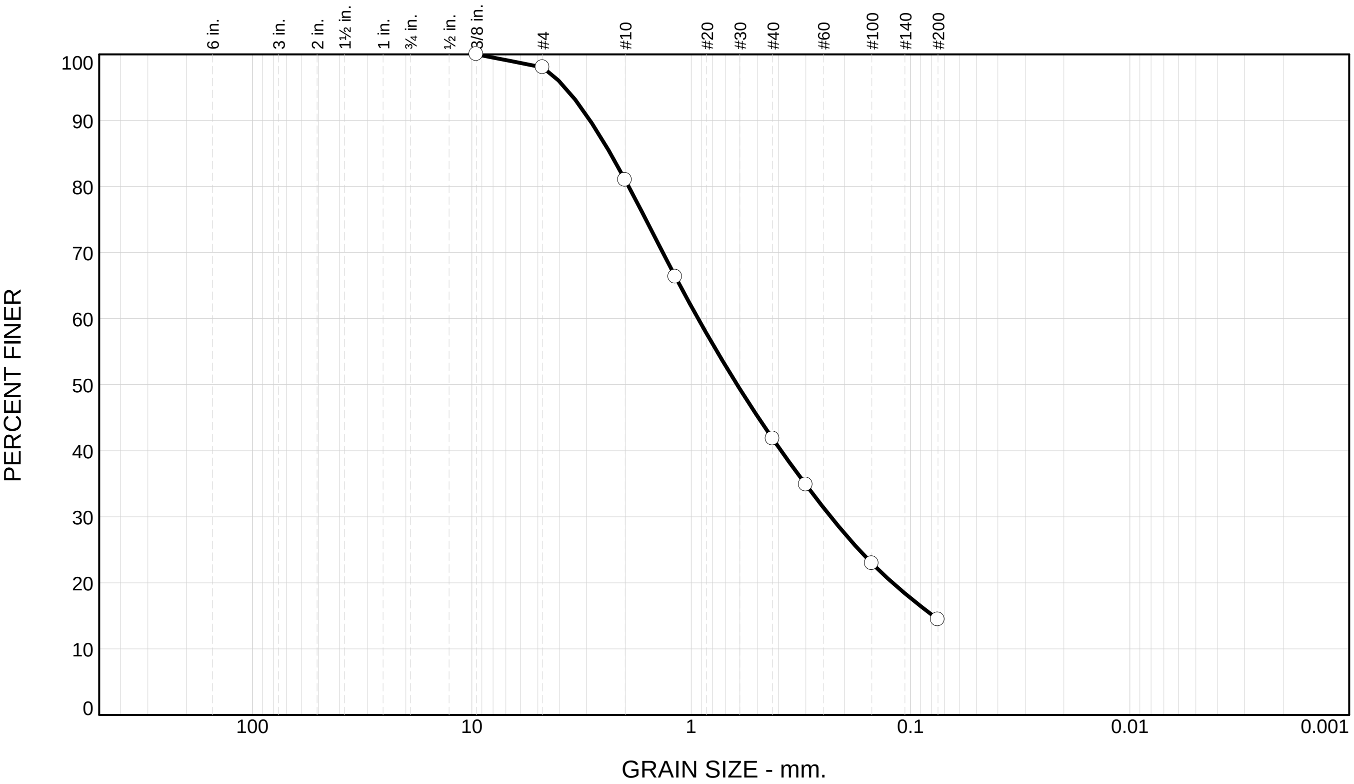
△

○ Source of Sample: LCA 4 Depth: 9.2 - 9.7' Sample Number: D
□ Source of Sample: LCA 4 Depth: 16.0 - 17.5' Sample Number: F
△ Source of Sample: LCA 4 Depth: 18.5 - 20.0' Sample Number: G

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.0	83.6	14.4		SM	A-1-b	NP	24

SIEVE inches size	PERCENT FINER ○		
3/8"	100.0		
	GRAIN SIZE		
D_{60}	0.9303		
D_{30}	0.2311		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#4	98.0		
#10	81.0		
#16	66.3		
#40	41.8		
#50	34.9		
#100	22.9		
#200	14.4		

Material Description

○ silty sand

REMARKS:

○

○ Source of Sample: LCA 4 Depth: 23.5 - 25.0' Sample Number: H

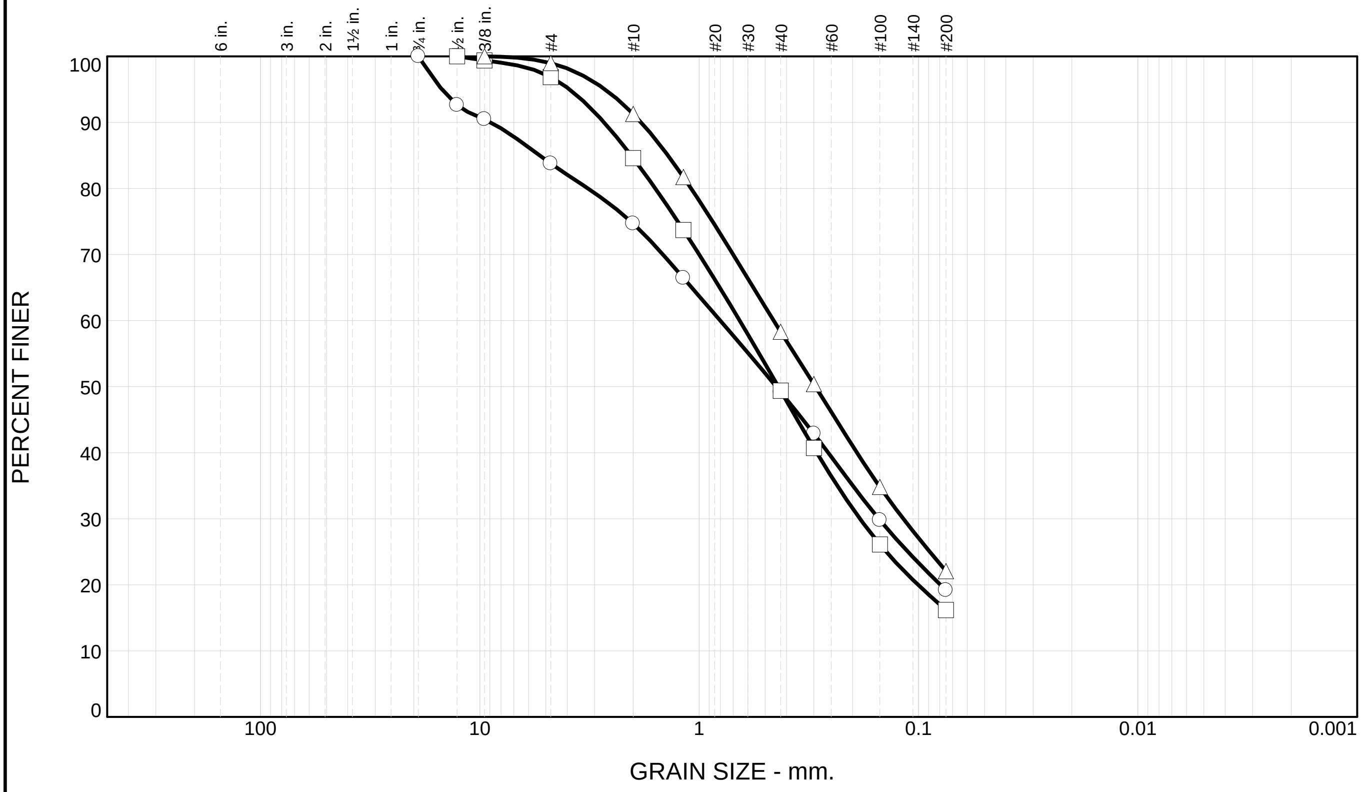
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	16.2	64.6	19.2		SM	A-1-b	NP	21
□	0.0	3.1	80.7	16.2		SM	A-1-b	NP	22
△	0.0	1.0	76.9	22.1		SM	A-2-4(0)	19	21

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
3/4"	100.0		
1/2"	92.6	100.0	
3/8"	90.5	99.4	100.0
	GRAIN SIZE		
D$_{60}$	0.8015	0.6534	0.4575
D$_{30}$	0.1519	0.1850	0.1173
D$_{10}$			
	COEFFICIENTS		
C$_c$			
C$_u$			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	83.8	96.9	99.0
#10	74.7	84.6	91.3
#16	66.4	73.7	81.7
#40	49.2	49.4	58.3
#50	42.9	40.7	50.4
#100	29.8	26.1	34.8
#200	19.2	16.2	22.1

Material Description
○ silty sand with gravel

□ silty sand

△ silty sand

REMARKS:
○

□

△

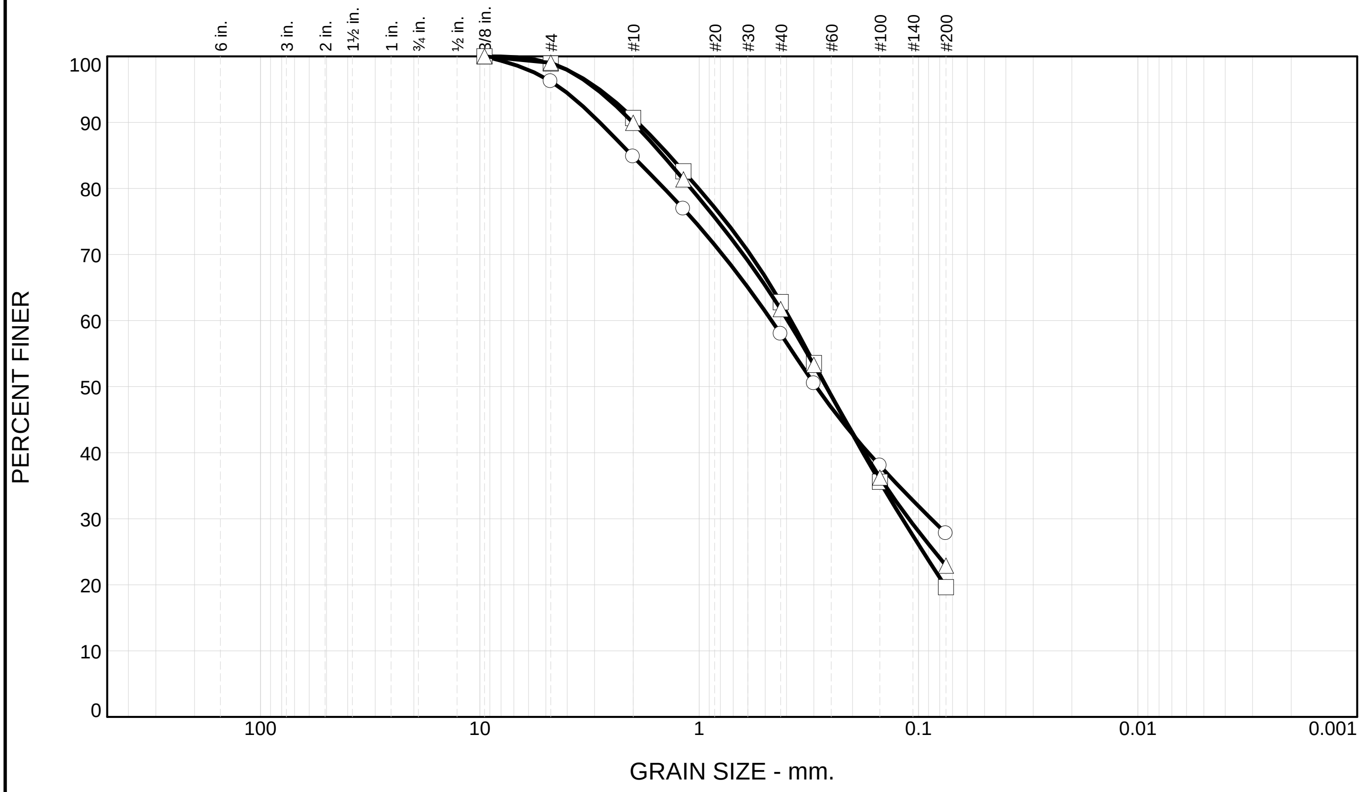
○ Source of Sample: LCA 5 Depth: 2.0 - 3.5' Sample Number: A
□ Source of Sample: LCA 5 Depth: 4.7 - 5.2' Sample Number: B1
△ Source of Sample: LCA 5 Depth: 11.0 - 12.5' Sample Number: C

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	3.8	68.4	27.8		SC	A-2-6(1)	16	31
□	0.0	1.1	79.3	19.6		SM	A-2-4(0)	NP	24
△	0.0	1.0	76.1	22.9		SC-SM	A-2-4(0)	16	23

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0	100.0	100.0

	GRAIN SIZE ○	□	△
D_{60}	0.4675	0.3811	0.3943
D_{30}	0.0876	0.1185	0.1107
D_{10}			

	COEFFICIENTS ○	□	△
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	96.2	98.9	99.0
#10	84.8	90.7	89.9
#16	76.9	82.6	81.4
#40	58.0	62.8	61.7
#50	50.5	53.6	53.3
#100	38.0	35.6	36.2
#200	27.8	19.6	22.9

Material Description

○ clayey sand

□ silty sand

△ silty, clayey sand

REMARKS:

○

□

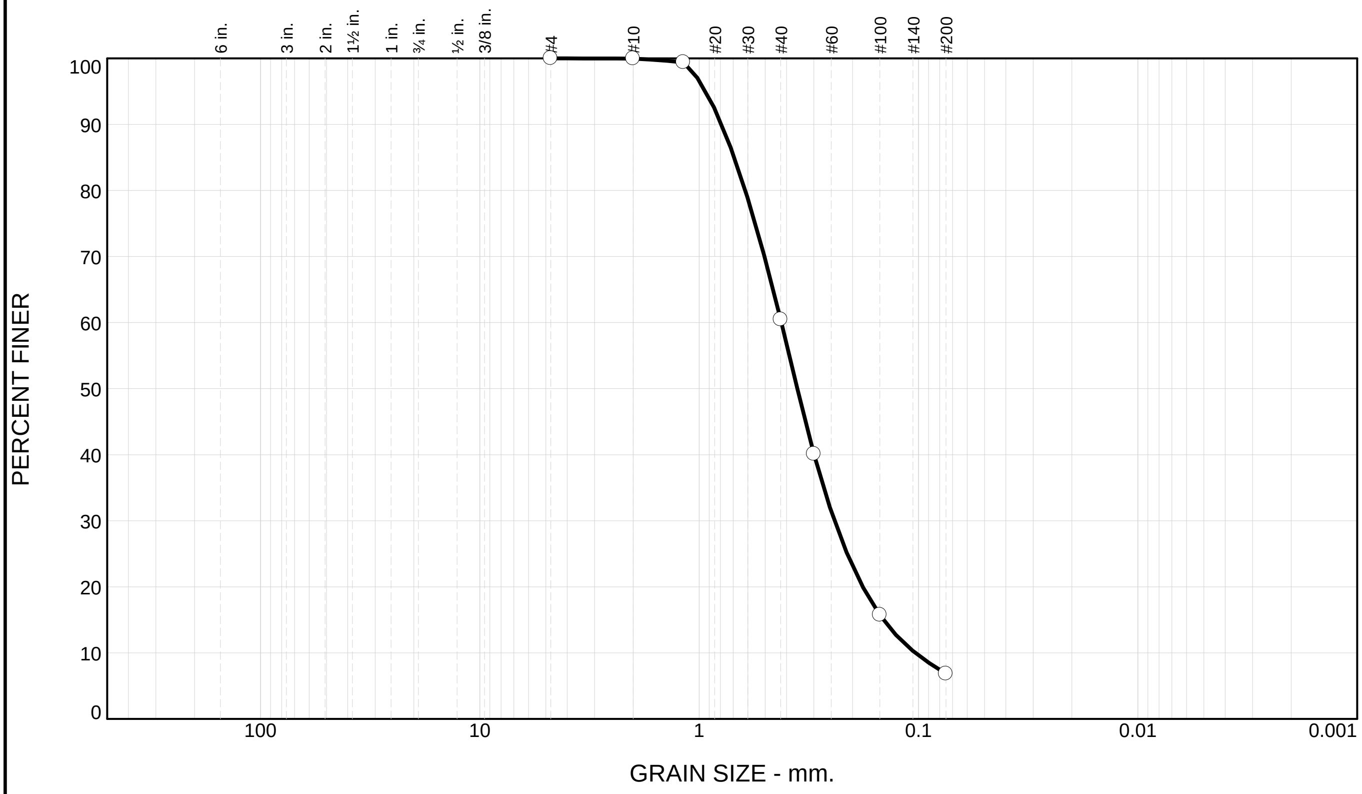
△

○ Source of Sample: LCA 5 Depth: 13.5 - 14.3' Sample Number: D
□ Source of Sample: LCA 5 Depth: 16.0 - 17.5' Sample Number: E
△ Source of Sample: LCA 5 Depth: 21.0 - 22.5' Sample Number: F

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.0	93.2	6.8		SP-SM	A-3	NP	19

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.4217		
D_{30}	0.2416		
D_{10}	0.1034		
	COEFFICIENTS		
C_c	1.34		
C_u	4.08		

SIEVE number size	PERCENT FINER ○		
#4	100.0		
#10	100.0		
#16	99.4		
#40	60.5		
#50	40.1		
#100	15.7		
#200	6.8		

Material Description

○ poorly graded sand with silt

REMARKS:

○

○ Source of Sample: LCA 5 Depth: 25.2 - 26.0' Sample Number: G

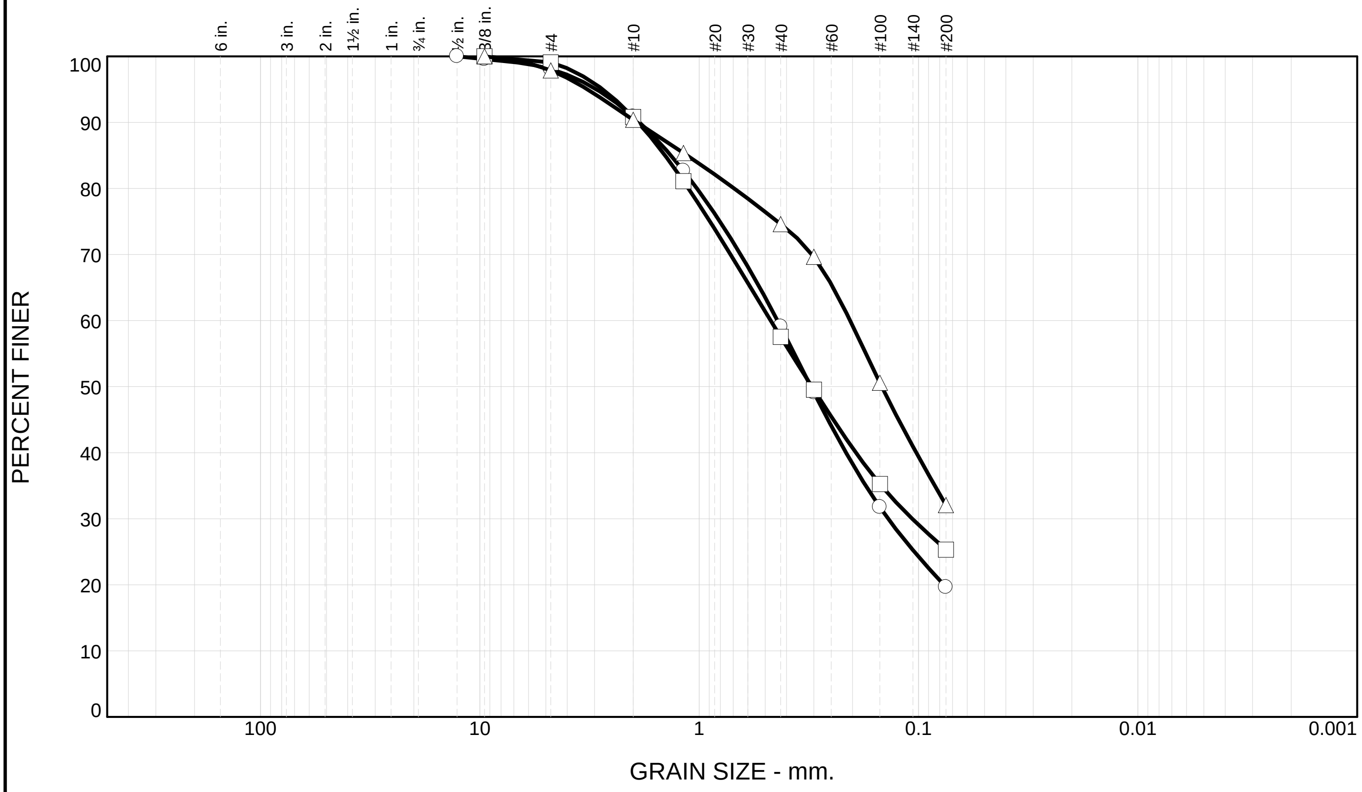
NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.9	78.5	19.6		SM	A-2-4(0)	NP	19
□	0.0	0.9	73.8	25.3		SC-SM	A-2-4(0)	20	26
△	0.0	2.1	65.8	32.1		SM	A-2-4(0)	24	30

SIEVE inches size	PERCENT FINER ○	□	△
1/2"	100.0		
3/8"	99.6	100.0	100.0
	GRAIN SIZE		
D_{60}	0.4392	0.4720	0.2050
D_{30}	0.1375	0.1069	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.1	99.1	97.9
#10	90.9	90.8	90.4
#16	82.7	81.1	85.4
#40	59.1	57.5	74.6
#50	49.1	49.5	69.6
#100	31.8	35.3	50.6
#200	19.6	25.3	32.1

Material Description

○ silty sand

□ silty, clayey sand

△ silty sand

REMARKS:

○

□

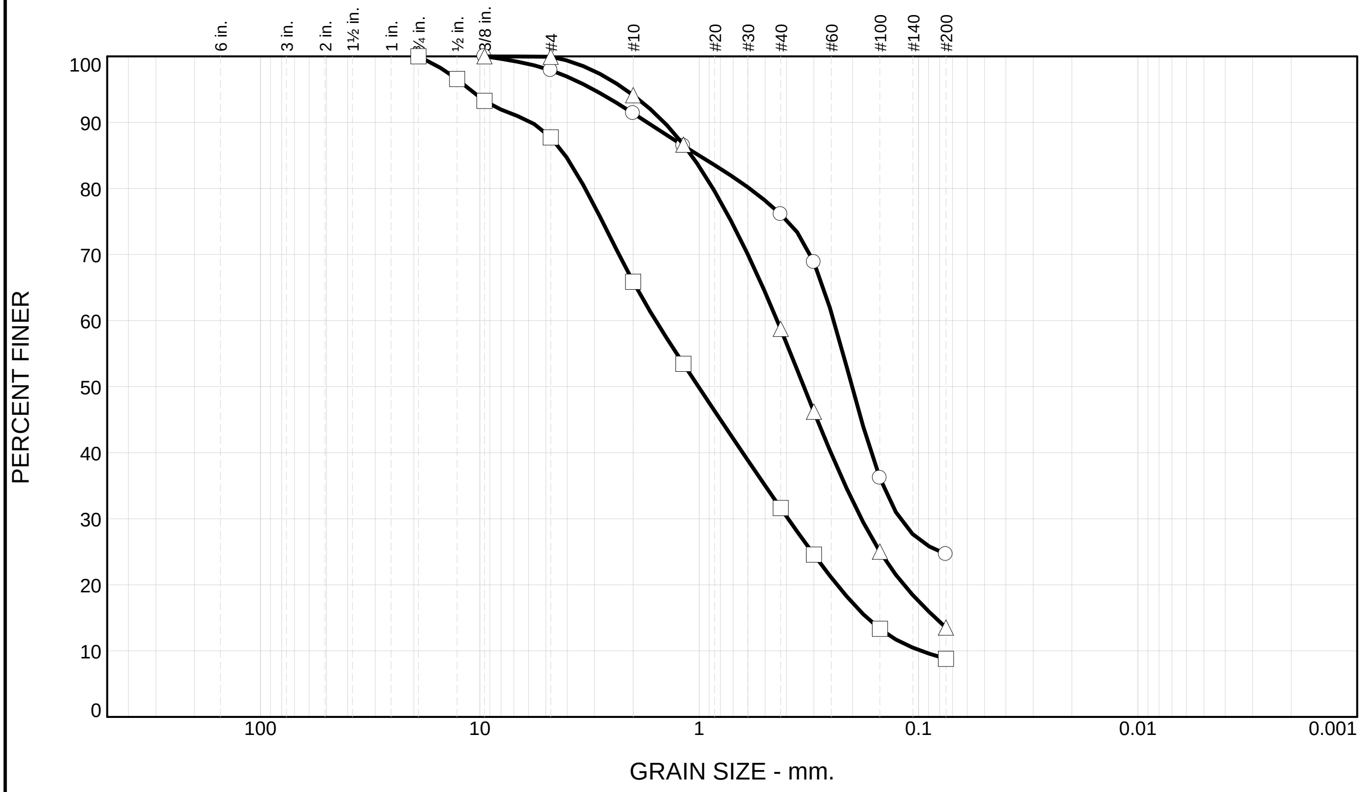
△

○ Source of Sample: LSF 1 Depth: 2.0 - 3.5' Sample Number: A
□ Source of Sample: LSF 1 Depth: 7.0 - 8.5' Sample Number: C
△ Source of Sample: LSF 1 Depth: 9.7 - 10.2' Sample Number: D1

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.1	73.3	24.6		SM	A-2-4(0)	NP	23
□	0.0	12.3	78.9	8.8		SW-SM	A-1-b	NP	31
△	0.0	0.1	86.4	13.5		SM	A-2-4(0)	NP	24

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
3/4"		100.0	
1/2"		96.6	
3/8"	100.0	93.3	100.0
	GRAIN SIZE		
D_{60}	0.2435	1.5803	0.4407
D_{30}	0.1214	0.3929	0.1821
D_{10}		0.0974	
	COEFFICIENTS		
C_c		1.00	
C_u		16.22	

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	97.9	87.7	99.9
#10	91.4	65.9	94.1
#16	86.5	53.4	86.6
#40	76.1	31.6	58.7
#50	68.8	24.6	46.2
#100	36.2	13.3	25.0
#200	24.6	8.8	13.5

Material Description

○ silty sand

□ well-graded sand with silt

△ silty sand

REMARKS:

○

□

△

○ Source of Sample: LSF 1	Depth: 10.2 - 10.7'	Sample Number: D2
□ Source of Sample: LSF 1	Depth: 12.0 - 13.5'	Sample Number: E
△ Source of Sample: LSF 1	Depth: 14.5 - 16.0'	Sample Number: F

NEVADA DEPARTMENT OF TRANSPORTATION

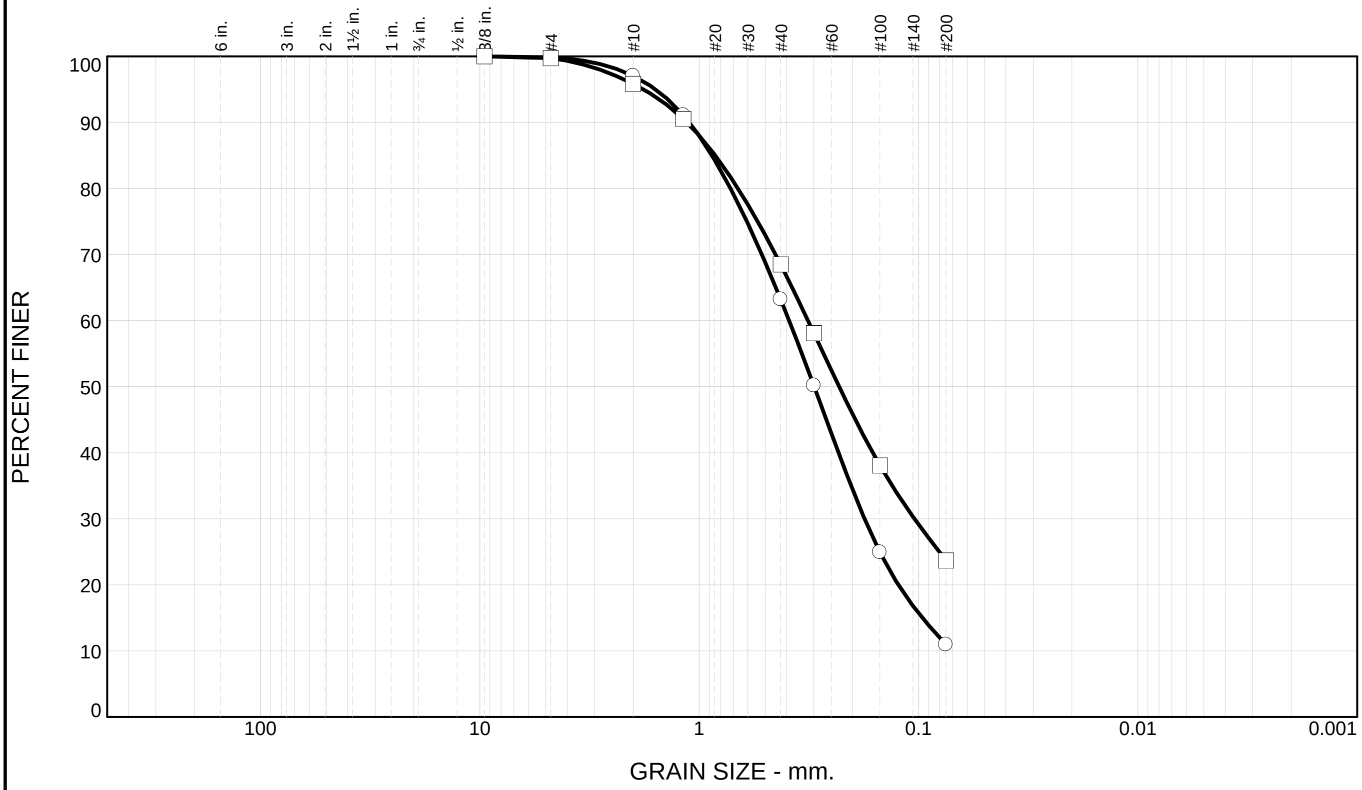
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.2	88.9	10.9		SP-SM	A-2-4(0)	NP	23
☐	0.0	0.3	76.0	23.7		SM	A-2-4(0)	NP	26

SIEVE inches size	PERCENT FINER ○	☐	
3/8"	100.0	100.0	
	GRAIN SIZE		
D_{60}	0.3889	0.3192	
D_{30}	0.1763	0.1043	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	☐	
#4	99.8	99.7	
#10	97.0	95.8	
#16	91.1	90.5	
#40	63.2	68.5	
#50	50.2	58.1	
#100	24.9	38.1	
#200	10.9	23.7	

Material Description

○ poorly graded sand with silt

☐ silty sand

REMARKS:

○

☐

○ Source of Sample: LSF 1 Depth: 17.0 - 18.5' Sample Number: G

☐ Source of Sample: LSF 1 Depth: 19.5 - 21.0' Sample Number: H

NEVADA DEPARTMENT OF TRANSPORTATION

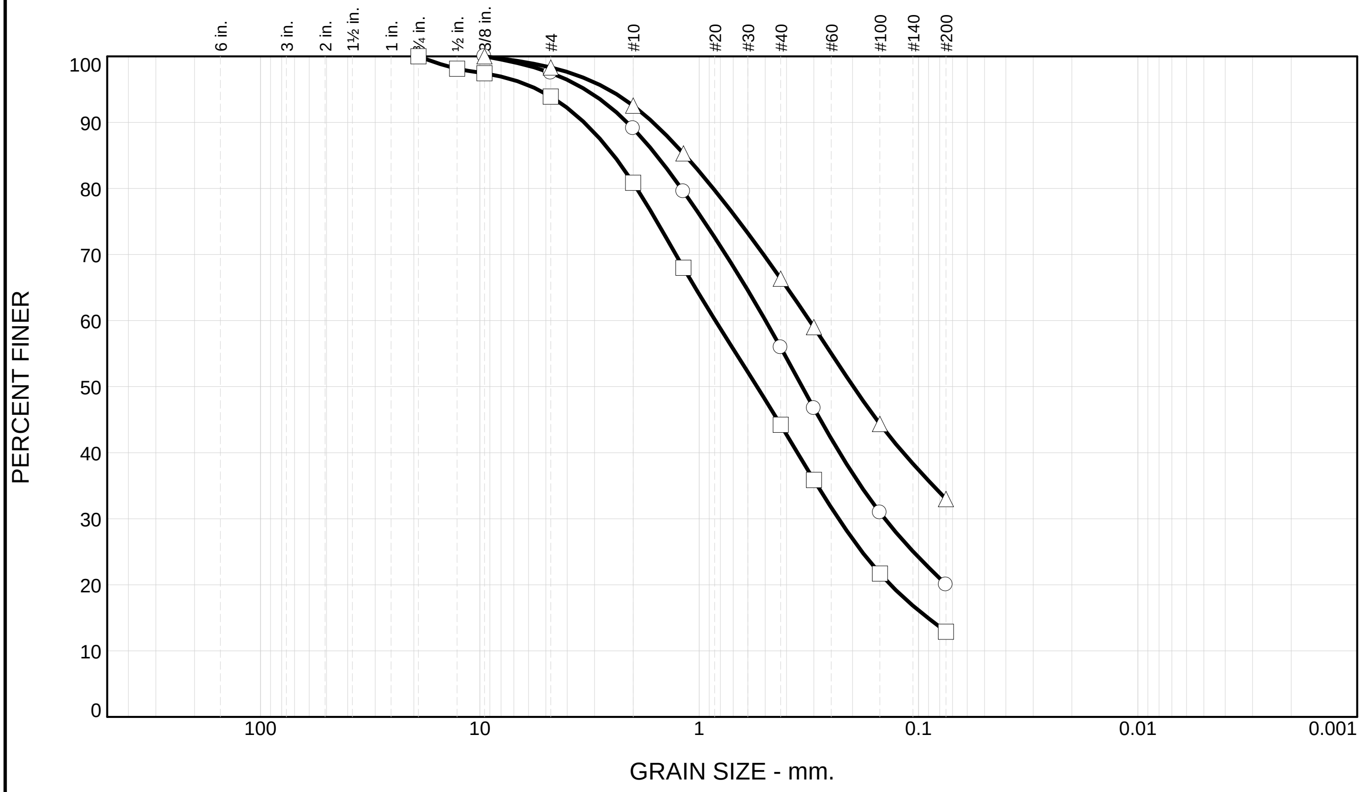
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	2.5	77.5	20.0		SM	A-2-4(0)	NP	20
□	0.0	6.1	81.0	12.9		SM	A-1-b	NP	20
△	0.0	1.7	65.3	33.0		SC-SM	A-2-4(0)	21	25

SIEVE inches size	PERCENT FINER ○	□	△
3/4"		100.0	
1/2"		98.1	
3/8"	100.0	97.4	100.0
	GRAIN SIZE		
D60	0.4980	0.8437	0.3141
D30	0.1426	0.2315	
D10			
	COEFFICIENTS		
Cc			
Cu			

SIEVE number size	PERCENT FINER ○	□	△
#4	97.5	93.9	98.3
#10	89.1	80.9	92.5
#16	79.5	68.0	85.3
#40	55.9	44.2	66.3
#50	46.7	35.9	59.0
#100	30.9	21.7	44.4
#200	20.0	12.9	33.0

Material Description

○ silty sand

□ silty sand

△ silty, clayey sand

REMARKS:

○

□

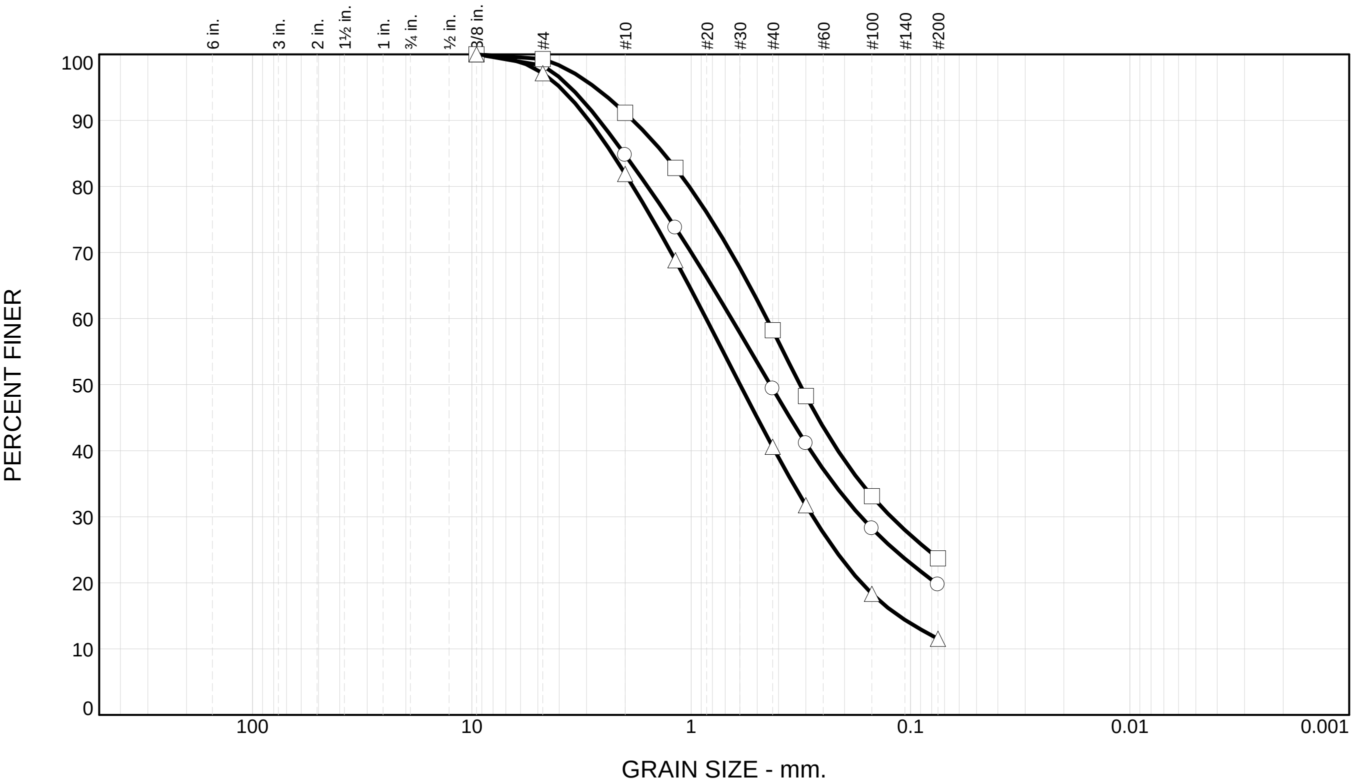
△

○ Source of Sample: LSF 2 Depth: 2.0 - 3.5' Sample Number: A
□ Source of Sample: LSF 2 Depth: 4.7 - 5.2' Sample Number: B1
△ Source of Sample: LSF 2 Depth: 7.0 - 8.5' Sample Number: C

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.7	78.6	19.7		SC	A-2-4(0)	21	30
□	0.0	0.7	75.6	23.7		SC-SM	A-2-4(0)	21	27
△	0.0	2.9	85.6	11.5		SP-SM	A-1-b	NP	25

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0	100.0	100.0
	GRAIN SIZE		
D$_{60}$	0.6553	0.4521	0.8546
D$_{30}$	0.1682	0.1228	0.2786
D$_{10}$			
	COEFFICIENTS		
C$_c$			
C$_u$			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.3	99.3	97.1
#10	84.8	91.1	81.9
#16	73.7	82.8	68.8
#40	49.4	58.2	40.6
#50	41.1	48.3	31.7
#100	28.2	33.1	18.3
#200	19.7	23.7	11.5

Material Description

○ clayey sand

□ silty, clayey sand

△ poorly graded sand with silt

REMARKS:

○

□

△

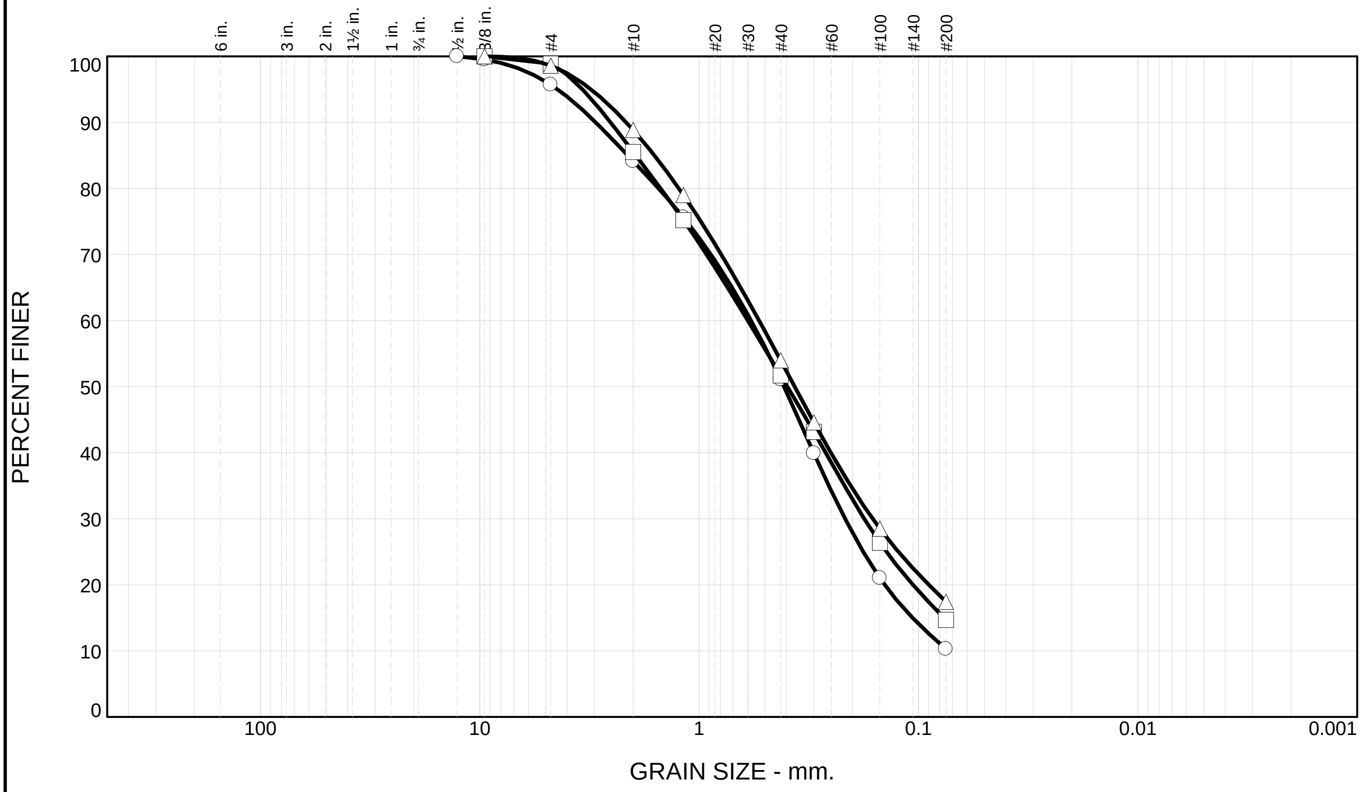
○ Source of Sample: LSF 2 Depth: 9.7 - 10.2' Sample Number: D1
□ Source of Sample: LSF 2 Depth: 12.0 - 13.5' Sample Number: E
△ Source of Sample: LSF 2 Depth: 14.5 - 16.0' Sample Number: F

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	4.3	85.4	10.3		SP-SM	A-3	NP	21
□	0.0	1.1	84.2	14.7		SM	A-2-4(0)	NP	22
△	0.0	1.4	81.2	17.4		SM	A-2-4(0)	NP	25

SIEVE inches size	PERCENT FINER ○	□	△
1/2"	100.0		
3/8"	99.5	100.0	100.0

	GRAIN SIZE		
D_{60}	0.5799	0.5998	0.5330
D_{30}	0.2160	0.1768	0.1619
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	95.7	98.9	98.6
#10	84.1	85.5	88.9
#16	75.6	75.2	79.0
#40	51.1	51.7	54.0
#50	39.9	43.1	44.6
#100	21.0	26.4	28.5
#200	10.3	14.7	17.4

Material Description

○ poorly graded sand with silt

□ silty sand

△ silty sand

REMARKS:

○

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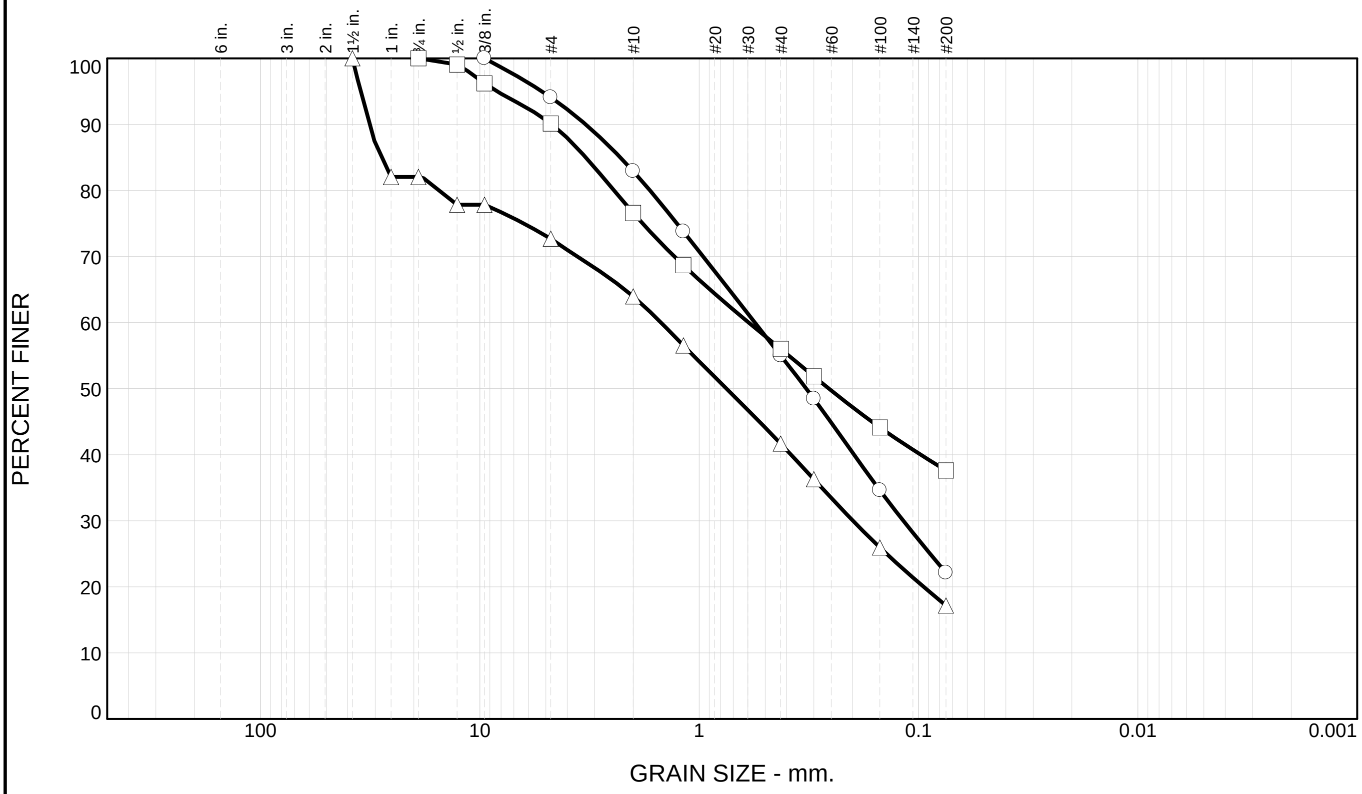
○ Source of Sample: LSF 2 Depth: 17.0 - 18.5' Sample Number: G
□ Source of Sample: LSF 2 Depth: 19.5 - 21.0' Sample Number: H
△ Source of Sample: LSF 2 Depth: 22.0 - 23.5 Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	5.9	72.0	22.1		SM	A-2-4(0)	22	21
□	0.0	9.9	52.5	37.6		SM	A-4(0)	NP	21
△	0.0	27.3	55.5	17.2		SM	A-1-b	NP	22

SIEVE inches size	PERCENT FINER ○	□	△
1.5"			100.0
1"			82.0
3/4"		100.0	82.0
1/2"		99.1	77.8
3/8"	100.0	96.2	77.8
	GRAIN SIZE		
D_{60}	0.5571	0.5945	1.4938
D_{30}	0.1173		0.1990
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	94.1	90.1	72.7
#10	82.9	76.6	64.0
#16	73.8	68.7	56.5
#40	55.0	56.0	41.7
#50	48.5	51.9	36.3
#100	34.6	44.1	25.9
#200	22.1	37.6	17.2

Material Description

○ silty sand

□ silty sand

△ silty sand with gravel

REMARKS:

○

□

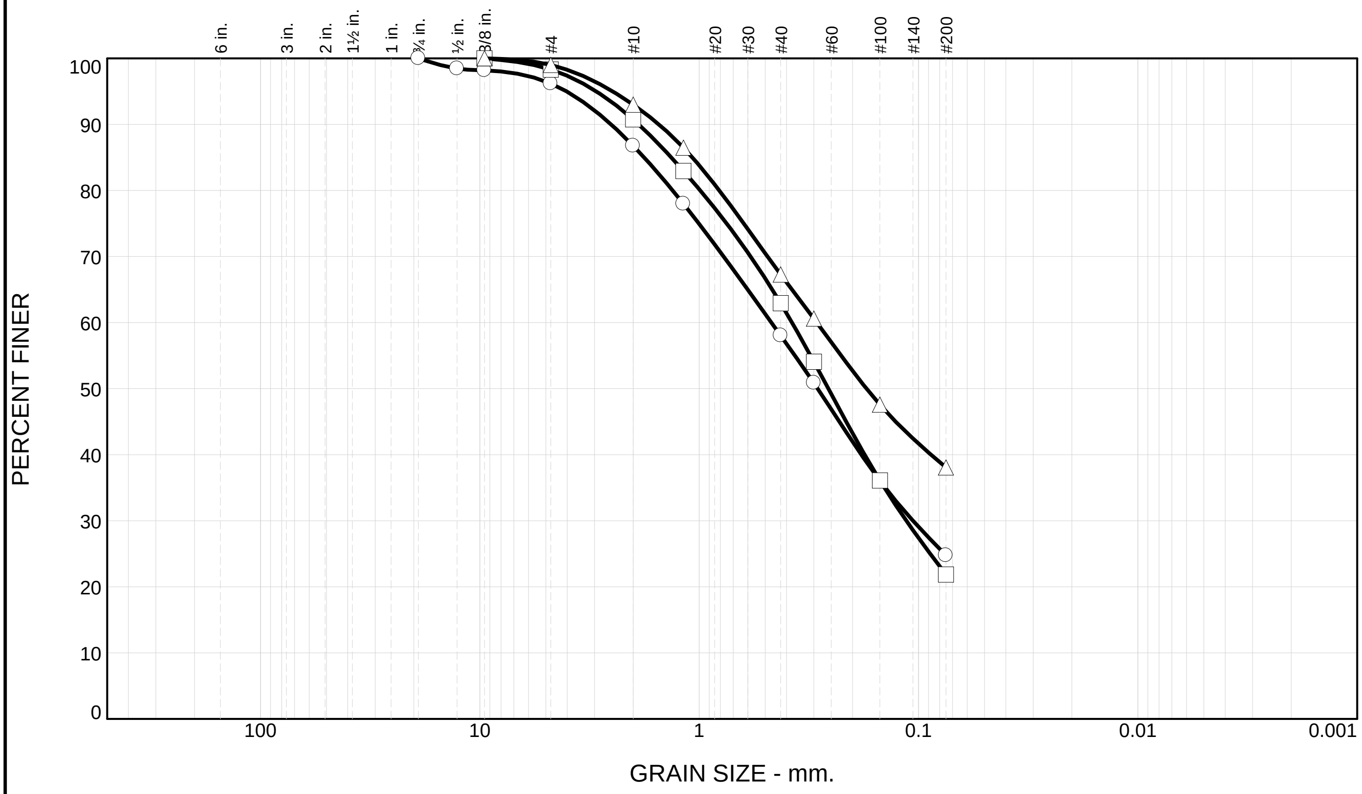
△

○ Source of Sample: LSF 3 Depth: 2.0 - 3.5' Sample Number: A
□ Source of Sample: LSF 3 Depth: 5.2 - 5.7' Sample Number: B1
△ Source of Sample: LSF 3 Depth: 7.0 - 8.5' Sample Number: C

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	3.8	71.4	24.8		SM	A-2-4(0)	21	24
□	0.0	1.7	76.4	21.9		SM	A-2-4(0)	NP	19
△	0.0	1.0	60.9	38.1		SC	A-6(1)	23	35

SIEVE inches size	PERCENT FINER ○	□	△
3/4"	100.0		
1/2"	98.4		
3/8"	98.2	100.0	100.0
	GRAIN SIZE		
D_{60}	0.4685	0.3772	0.2908
D_{30}	0.1059	0.1136	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	96.2	98.3	99.0
#10	86.8	90.8	93.0
#16	78.0	83.0	86.5
#40	58.0	62.9	67.3
#50	50.9	54.1	60.6
#100	36.0	36.1	47.6
#200	24.8	21.9	38.1

Material Description

○ silty sand

□ silty sand

△ clayey sand

REMARKS:

○

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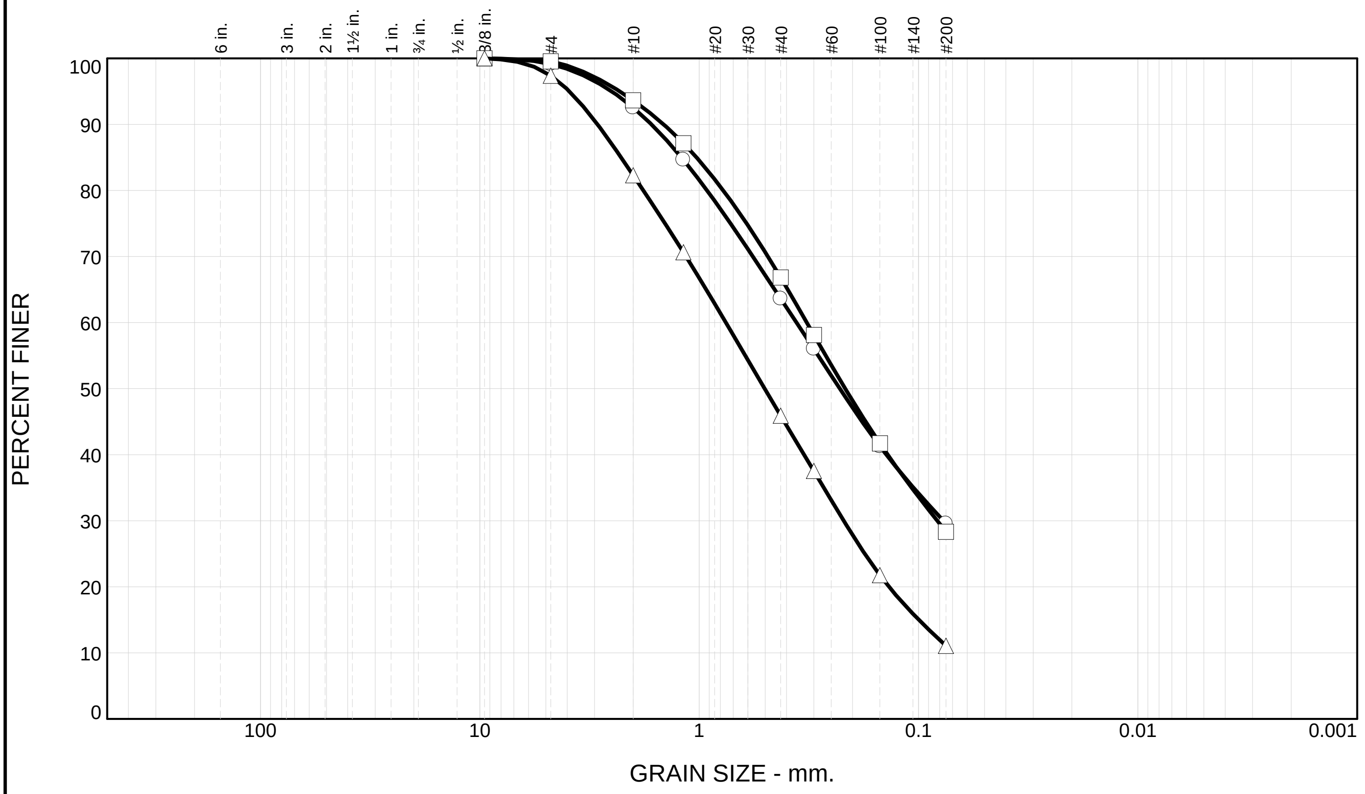
△

○ Source of Sample: LSF 3 Depth: 9.7 - 10.2' Sample Number: D1
□ Source of Sample: LSF 3 Depth: 10.2 - 10.7' Sample Number: D2
△ Source of Sample: LSF 3 Depth: 10.7 - 11.0' Sample Number: D3

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.9	69.5	29.6		SC	A-2-4(0)	23	31
□	0.0	0.4	71.3	28.3		SC	A-2-6(1)	17	32
△	0.0	2.6	86.3	11.1		SP-SM	A-1-b	NP	22

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
3/8"	100.0	100.0	100.0

	GRAIN SIZE ○	GRAIN SIZE □	GRAIN SIZE △
D_{60}	0.3600	0.3232	0.7555
D_{30}	0.0771	0.0822	0.2194
D_{10}			

	COEFFICIENTS ○	COEFFICIENTS □	COEFFICIENTS △
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	99.1	99.6	97.4
#10	92.5	93.6	82.3
#16	84.6	87.1	70.6
#40	63.6	66.8	45.9
#50	56.0	58.1	37.5
#100	41.3	41.7	21.8
#200	29.6	28.3	11.1

Material Description

○ clayey sand

□ clayey sand

△ poorly graded sand with silt

REMARKS:

○

□

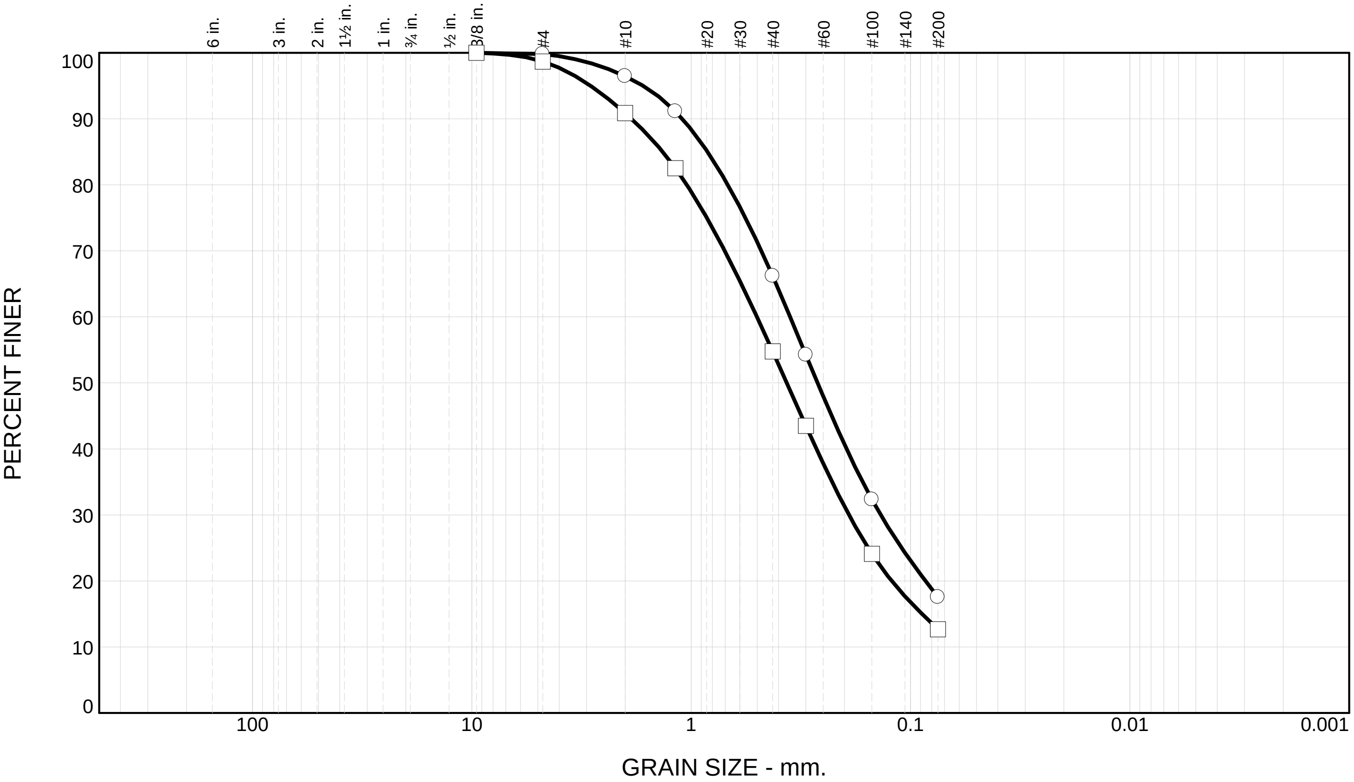
△

○ Source of Sample: LSF 3 Depth: 12.0 - 13.5' Sample Number: E
□ Source of Sample: LSF 3 Depth: 14.5 - 16.0' Sample Number: F
△ Source of Sample: LSF 3 Depth: 17.0 - 18.5' Sample Number: G

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.2	82.3	17.5		SM	A-2-4(0)	NP	20
☐	0.0	1.3	86.0	12.7		SM	A-2-4(0)	NP	24

SIEVE inches size	PERCENT FINER ○	PERCENT FINER ☐	
3/8"	100.0	100.0	

	GRAIN SIZE ○	GRAIN SIZE ☐	
D_{60}	0.3540	0.5014	
D_{30}	0.1368	0.1908	
D_{10}			

	COEFFICIENTS ○	COEFFICIENTS ☐	
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER ☐	
#4	99.8	98.7	
#10	96.4	90.9	
#16	91.1	82.5	
#40	66.2	54.8	
#50	54.2	43.5	
#100	32.3	24.1	
#200	17.5	12.7	

Material Description

○ silty sand

☐ silty sand

REMARKS:

○

☐

○ Source of Sample: LSF 3 Depth: 19.5 - 21.0' Sample Number: H

☐ Source of Sample: LSF 3 Depth: 24.5 - 26.0' Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

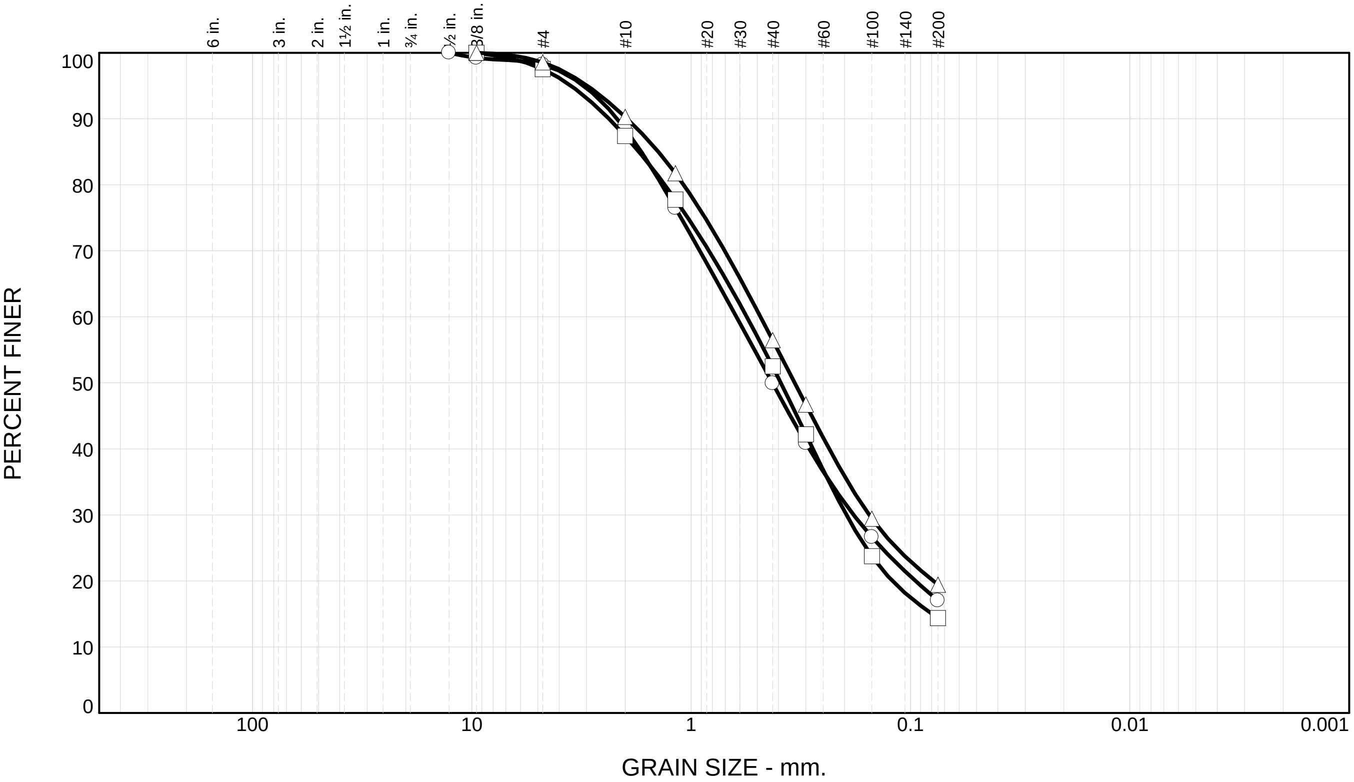
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.8	81.2	17.0		SM	A-1-b	NP	19
□	0.0	2.5	83.1	14.4		SM	A-2-4(0)	NP	19
△	0.0	1.5	79.1	19.4		SM	A-2-4(0)	NP	17

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
1/2"	100.0		
3/8"	99.2	100.0	100.0
	GRAIN SIZE		
D60	0.6217	0.5573	0.4827
D30	0.1816	0.1960	0.1544
D10			
	COEFFICIENTS		
Cc			
Cu			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	98.2	97.5	98.5
#10	88.5	87.4	90.3
#16	76.5	77.8	81.7
#40	49.9	52.5	56.5
#50	40.9	42.2	46.7
#100	26.6	23.7	29.4
#200	17.0	14.4	19.4

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

△

○ Source of Sample: LSF 4	Depth: 2.0 - 3.5'	Sample Number: A
□ Source of Sample: LSF 4	Depth: 4.7 - 5.2'	Sample Number: B1
△ Source of Sample: LSF 4	Depth: 5.2 - 5.7'	Sample Number: B2

NEVADA
DEPARTMENT OF
TRANSPORTATION

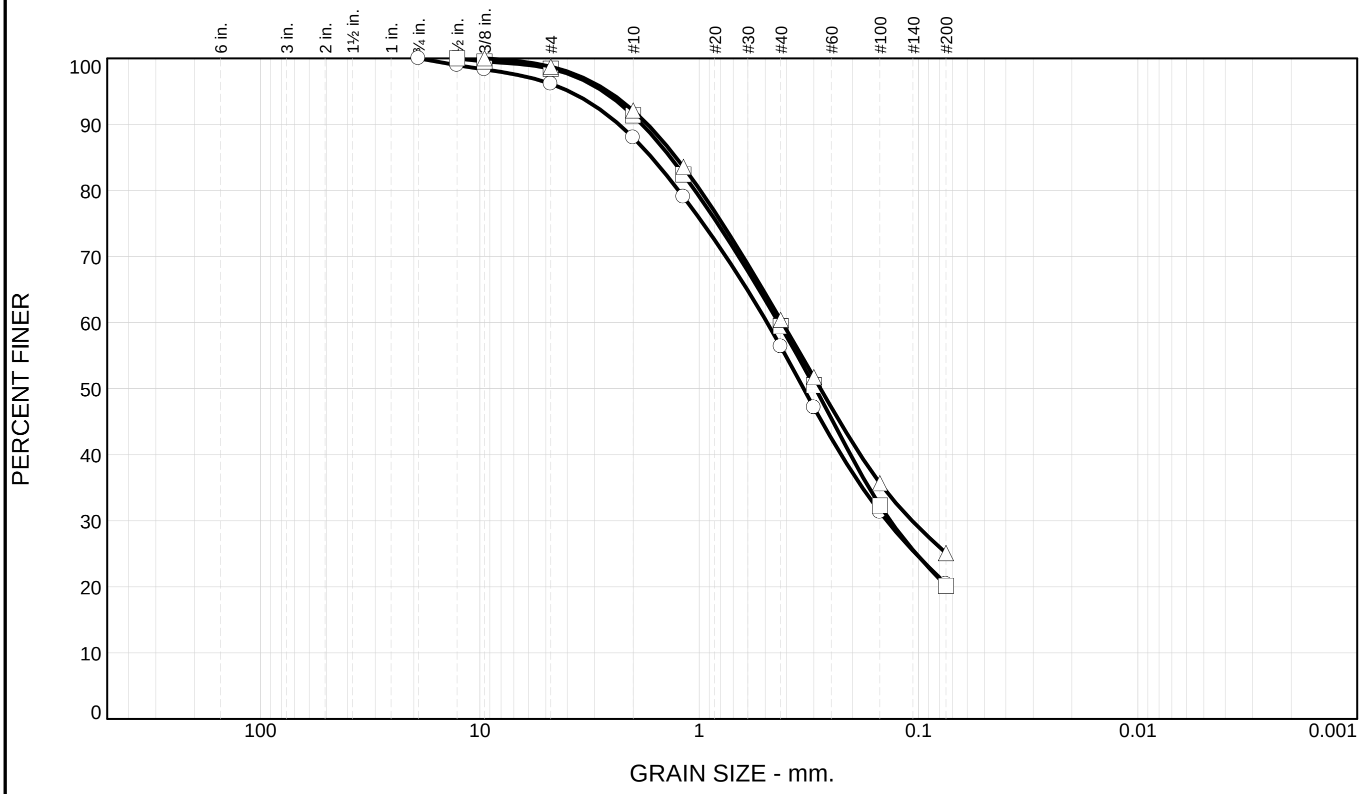
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	3.8	75.8	20.4		SM	A-2-4(0)	NP	17
□	0.0	1.6	78.3	20.1		SM	A-2-4(0)	NP	20
△	0.0	1.3	73.6	25.1		SM	A-2-4(0)	19	22

SIEVE inches size	PERCENT FINER ○	□	△
3/4"	100.0		
1/2"	99.0	100.0	
3/8"	98.3	99.5	100.0
	GRAIN SIZE		
D_{60}	0.4899	0.4345	0.4181
D_{30}	0.1396	0.1346	0.1070
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	96.2	98.4	98.7
#10	88.0	91.4	92.1
#16	79.0	82.4	83.6
#40	56.4	59.5	60.4
#50	47.1	50.5	51.7
#100	31.3	32.3	35.7
#200	20.4	20.1	25.1

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

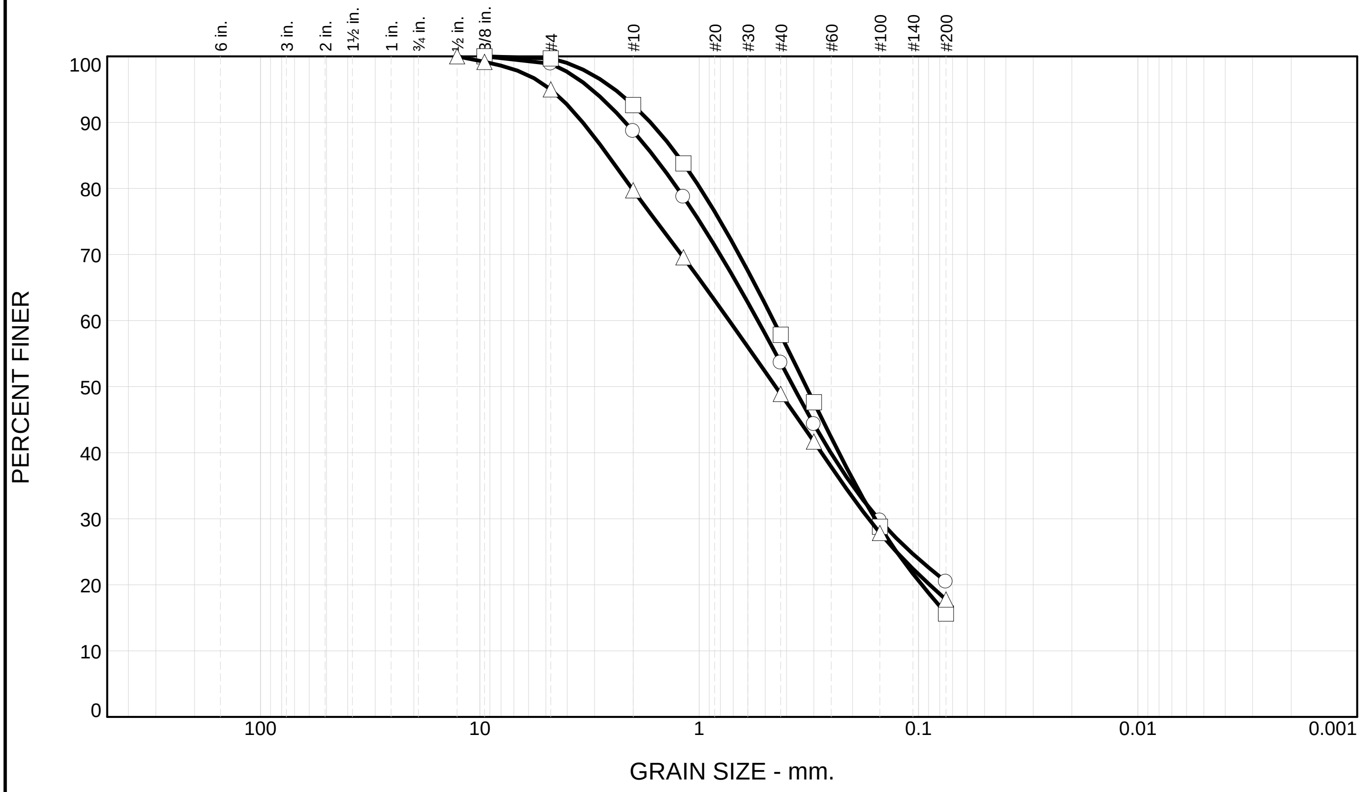
△

○ Source of Sample: LSF 4 Depth: 7.0 - 8.5' Sample Number: C
□ Source of Sample: LSF 4 Depth: 10.2 - 10.7' Sample Number: D1
△ Source of Sample: LSF 4 Depth: 12.0 - 13.5' Sample Number: E

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.1	78.4	20.5		SM	A-2-4(0)	26	31
□	0.0	0.3	84.0	15.7		SM	A-2-4(0)	NP	20
△	0.0	5.0	77.2	17.8		SM	A-1-b	NP	20

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
1/2"			100.0
3/8"	100.0	100.0	99.2
	GRAIN SIZE		
D_{60}	0.5399	0.4580	0.7296
D_{30}	0.1526	0.1580	0.1690
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	98.9	99.7	95.0
#10	88.7	92.6	79.7
#16	78.7	83.8	69.6
#40	53.6	57.8	48.9
#50	44.3	47.6	41.7
#100	29.7	28.8	27.8
#200	20.5	15.7	17.8

Material Description
○ silty sand

□ silty sand

△ silty sand

REMARKS:
○

□

△

○ Source of Sample: LSF 4	Depth: 17.0 - 18.5'	Sample Number: G
□ Source of Sample: LSF 4	Depth: 19.5 - 21.0'	Sample Number: H
△ Source of Sample: LSF 4	Depth: 24.5 - 26.0'	Sample Number: I

NEVADA DEPARTMENT OF TRANSPORTATION

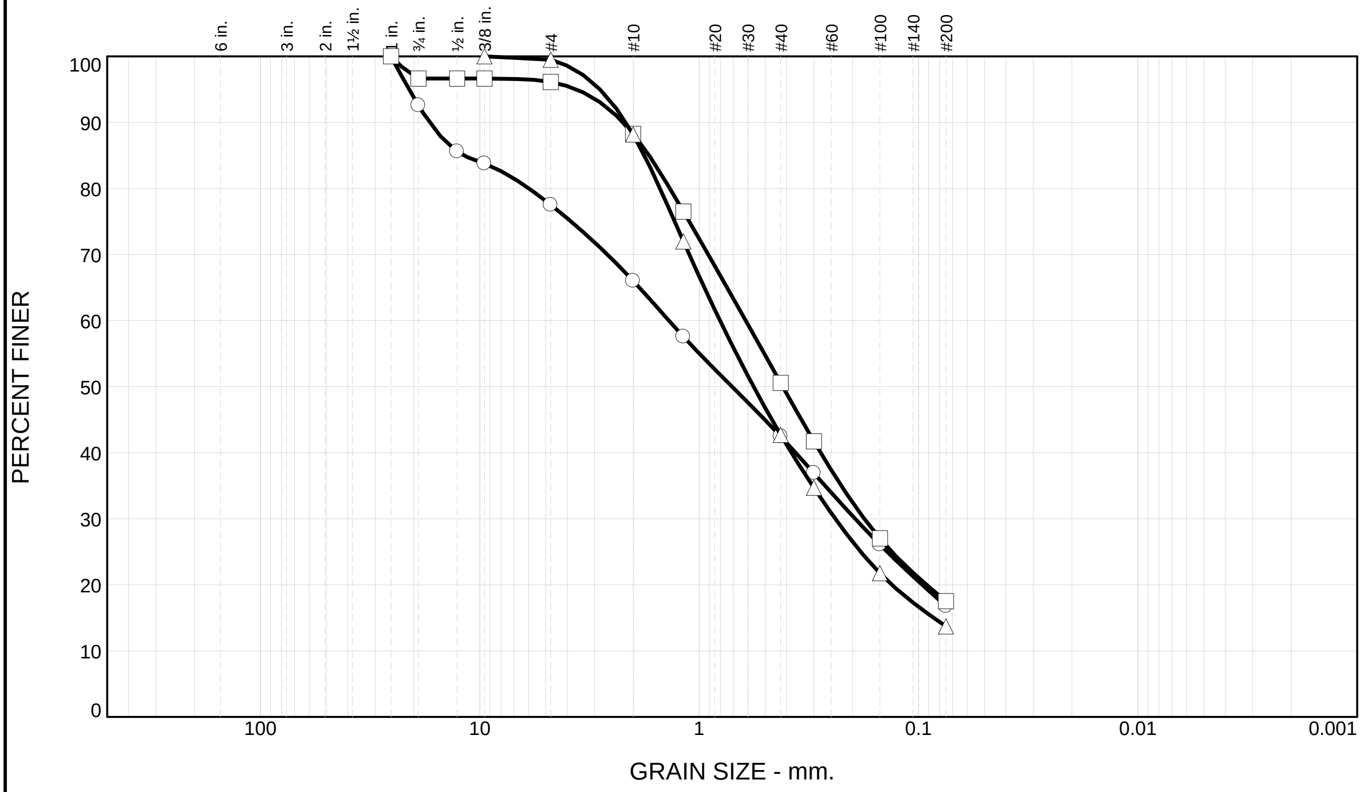
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	22.5	60.7	16.8		SM	A-1-b	NP	19
□	0.0	3.9	78.6	17.5		SM	A-2-4(0)	NP	19
△	0.0	0.5	85.8	13.7		SM	A-1-b	NP	23

SIEVE inches size	PERCENT FINER ○	□	△
1"	100.0	100.0	
3/4"	92.6	96.6	
1/2"	85.6	96.6	
3/8"	83.8	96.6	100.0
	GRAIN SIZE		
D_{60}	1.3751	0.6135	0.8037
D_{30}	0.1945	0.1767	0.2397
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	77.5	96.1	99.5
#10	66.0	88.3	88.2
#16	57.6	76.5	72.0
#40	42.5	50.6	42.7
#50	36.9	41.7	34.7
#100	26.1	27.0	21.8
#200	16.8	17.5	13.7

Material Description

○ silty sand with gravel

□ silty sand

△ silty sand

REMARKS:

○

□

△

○ Source of Sample: LNN 1	Depth: 2.5 - 4.0'	Sample Number: A
□ Source of Sample: LNN 1	Depth: 7.7 - 8.2'	Sample Number: C1
△ Source of Sample: LNN 1	Depth: 8.2 - 8.7'	Sample Number: C2

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

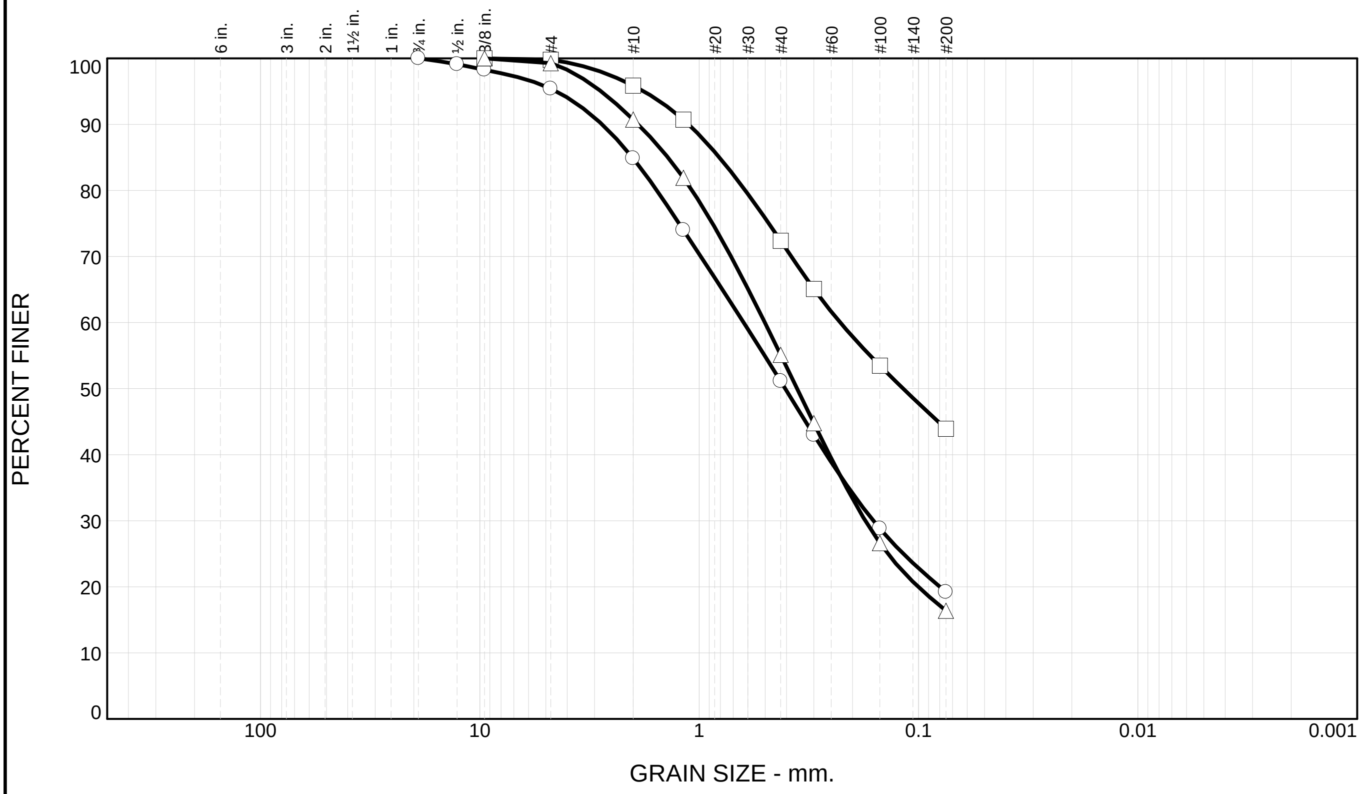
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	4.6	76.2	19.2		SM	A-2-4(0)	NP	22
□	0.0	0.2	55.9	43.9		SC	A-6(3)	21	35
△	0.0	0.7	82.9	16.4		SM	A-2-4(0)	23	24

SIEVE inches size	PERCENT FINER ○	□	△
3/4"	100.0		
1/2"	99.1		
3/8"	98.3	100.0	100.0
	GRAIN SIZE		
D_{60}	0.6265	0.2274	0.5018
D_{30}	0.1607		0.1748
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	95.4	99.8	99.3
#10	84.9	95.9	90.7
#16	74.0	90.7	81.9
#40	51.1	72.4	55.1
#50	43.0	65.1	44.8
#100	28.8	53.5	26.6
#200	19.2	43.9	16.4

Material Description

○ silty sand

□ clayey sand

△ silty sand

REMARKS:

○

□

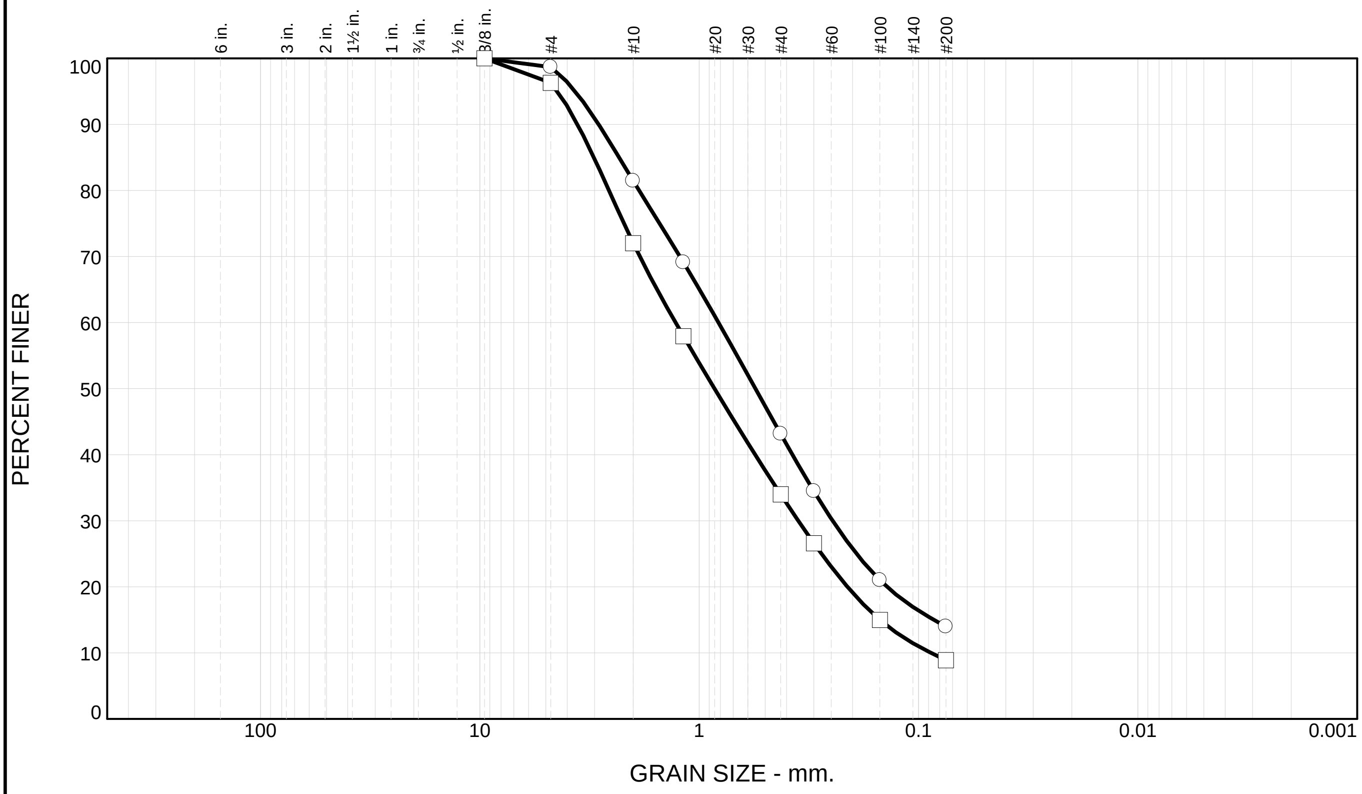
△

○ Source of Sample: LNN 1 Depth: 10.0 - 11.5' Sample Number: D
□ Source of Sample: LNN 1 Depth: 13.0 - 14.0' Sample Number: E
△ Source of Sample: LNN 1 Depth: 15.2 - 15.7' Sample Number: F1

NEVADA DEPARTMENT OF TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.3	84.7	14.0		SM	A-1-b	NP	24
□	0.0	3.7	87.4	8.9		SW-SM	A-1-b	NP	27

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	
3/8"	100.0	100.0	
	GRAIN SIZE		
D_{60}	0.8167	1.2819	
D_{30}	0.2464	0.3536	
D_{10}		0.0877	
	COEFFICIENTS		
C_c		1.11	
C_u		14.62	

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	
#4	98.7	96.3	
#10	81.5	72.0	
#16	69.1	57.9	
#40	43.1	34.0	
#50	34.5	26.6	
#100	21.0	15.0	
#200	14.0	8.9	

Material Description

○ silty sand

□ well-graded sand with silt

REMARKS:

○

□

○ Source of Sample: LNN 1 Depth: 15.7 - 16.2' Sample Number: F2

□ Source of Sample: LNN 1 Depth: 17.5 - 18.0' Sample Number: G1

NEVADA
DEPARTMENT OF
TRANSPORTATION

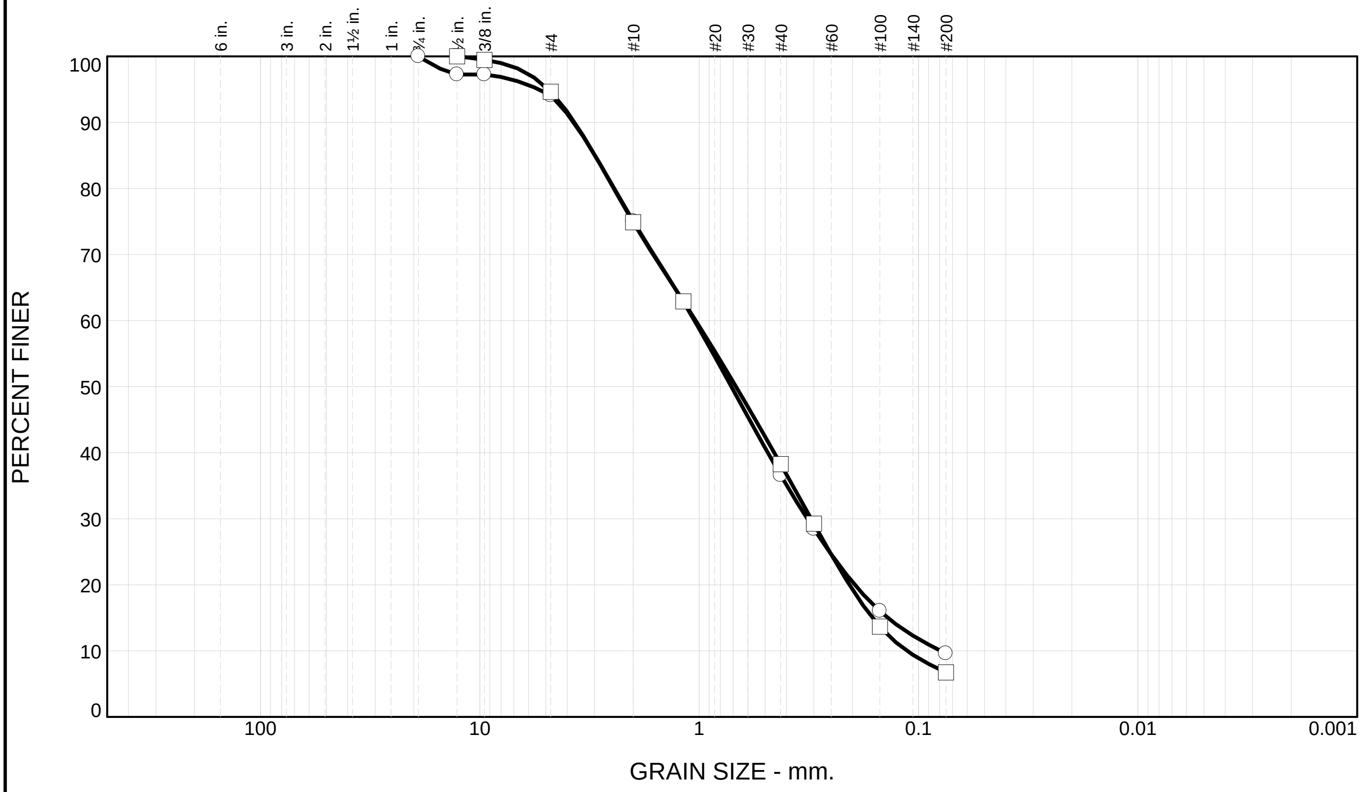
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	5.9	84.5	9.6		SW-SM	A-1-b	NP	33
☐	0.0	5.4	87.9	6.7		SP-SM	A-1-b	NP	20

SIEVE inches size	PERCENT FINER ○	☐	
3/4"	100.0		
1/2"	97.2	100.0	
3/8"	97.2	99.5	
	GRAIN SIZE		
D_{60}	1.0514	1.0376	
D_{30}	0.3216	0.3088	
D_{10}	0.0792	0.1129	
	COEFFICIENTS		
C_c	1.24	0.81	
C_u	13.28	9.19	

SIEVE number size	PERCENT FINER ○	☐	
#4	94.1	94.6	
#10	75.0	74.9	
#16	62.8	62.9	
#40	36.6	38.3	
#50	28.5	29.3	
#100	16.0	13.7	
#200	9.6	6.7	

Material Description

○ well-graded sand with silt

☐ poorly graded sand with silt

REMARKS:

○

☐

○ Source of Sample: LNN 1 Depth: 20.0 - 21.5' Sample Number: H

☐ Source of Sample: LNN 1 Depth: 25.0 - 26.5' Sample Number: I

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

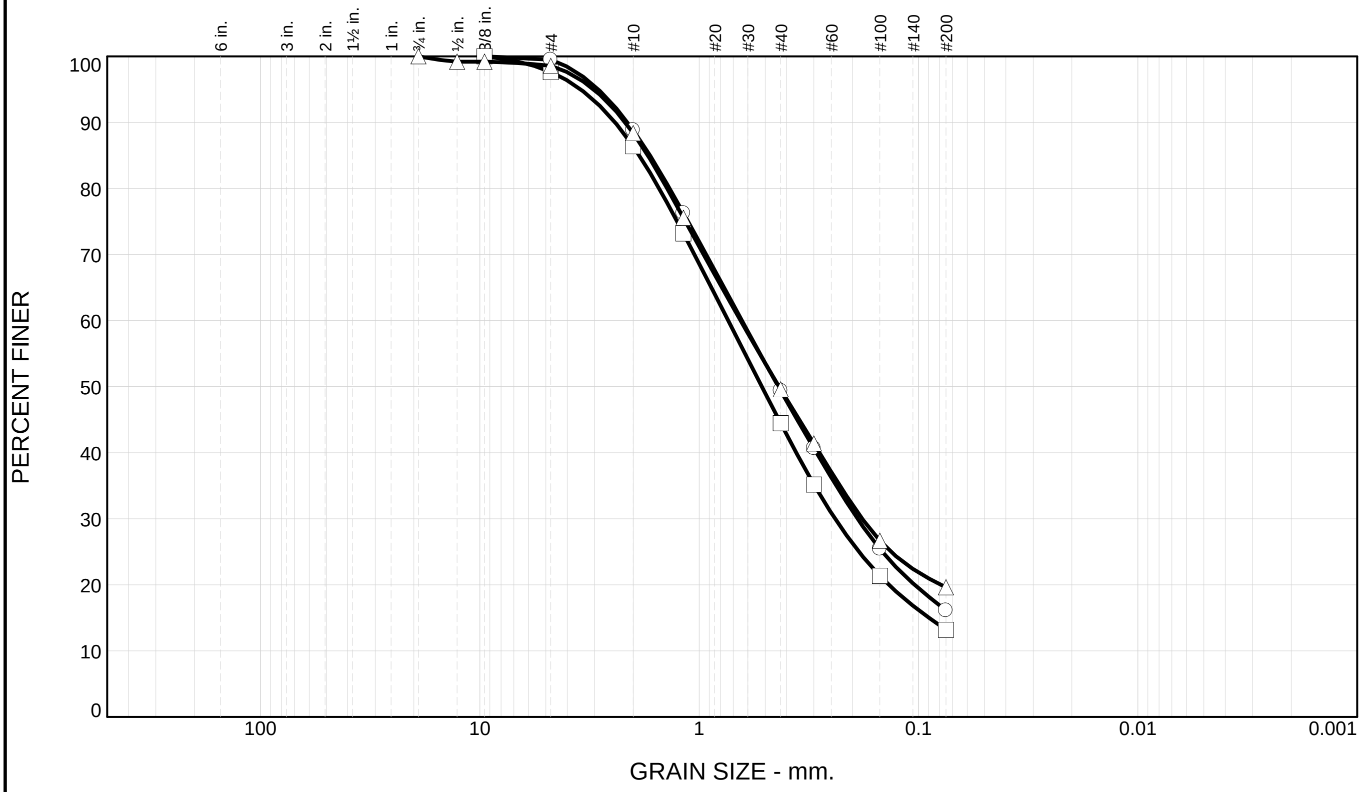
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.5	83.4	16.1		SM	A-1-b	NP	21
□	0.0	2.4	84.4	13.2		SM	A-1-b	NP	20
△	0.0	1.4	79.0	19.6		SM	A-1-b	NP	22

SIEVE inches size	PERCENT FINER ○	□	△
3/4"			100.0
1/2"			99.2
3/8"	100.0	100.0	99.2
	GRAIN SIZE		
D_{60}	0.6383	0.7370	0.6477
D_{30}	0.1896	0.2402	0.1806
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.5	97.6	98.6
#10	88.8	86.4	88.4
#16	76.3	73.2	75.5
#40	49.4	44.5	49.6
#50	40.7	35.2	41.4
#100	25.4	21.3	26.7
#200	16.1	13.2	19.6

Material Description
○ silty sand

□ silty sand

△ silty sand

REMARKS:
○

□

△

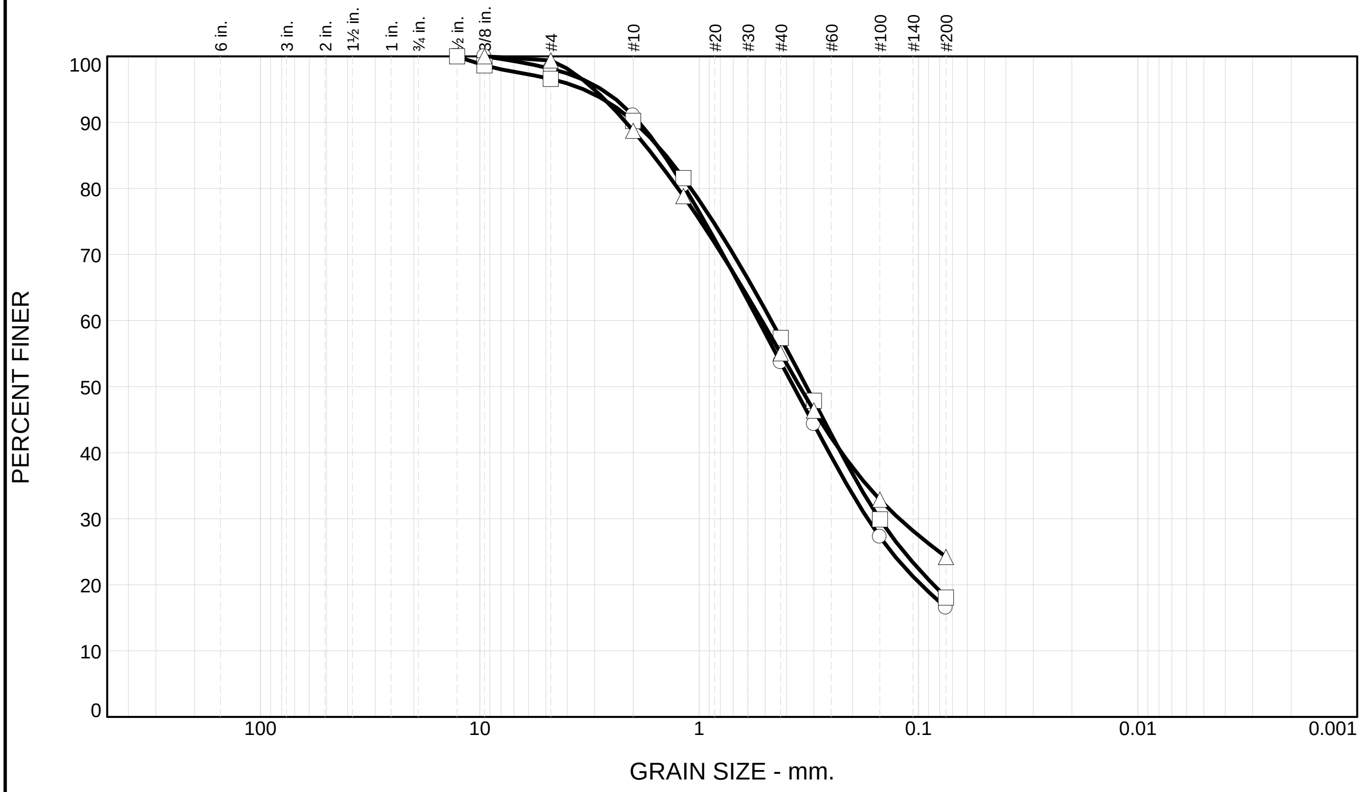
○ Source of Sample: LNN 2 Depth: 2.5 - 4.0' Sample Number: A
□ Source of Sample: LNN 2 Depth: 5.2 - 5.7' Sample Number: B1
△ Source of Sample: LNN 2 Depth: 5.7 - 6.2' Sample Number: B2

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.9	81.6	16.5		SM	A-2-4(0)	NP	21
□	0.0	3.4	78.5	18.1		SM	A-2-4(0)	NP	21
△	0.0	0.6	75.2	24.2		SC	A-2-4(0)	18	26

SIEVE inches size	PERCENT FINER		
	○	□	△
1/2"		100.0	
3/8"	100.0	98.6	100.0
	GRAIN SIZE		
D_{60}	0.5364	0.4694	0.5178
D_{30}	0.1707	0.1507	0.1224
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	○	□	△
#4	98.1	96.6	99.4
#10	91.0	90.2	88.7
#16	80.4	81.6	78.8
#40	53.7	57.4	55.1
#50	44.3	47.9	46.4
#100	27.2	29.9	32.9
#200	16.5	18.1	24.2

Material Description

○ silty sand

□ silty sand

△ clayey sand

REMARKS:

○

□

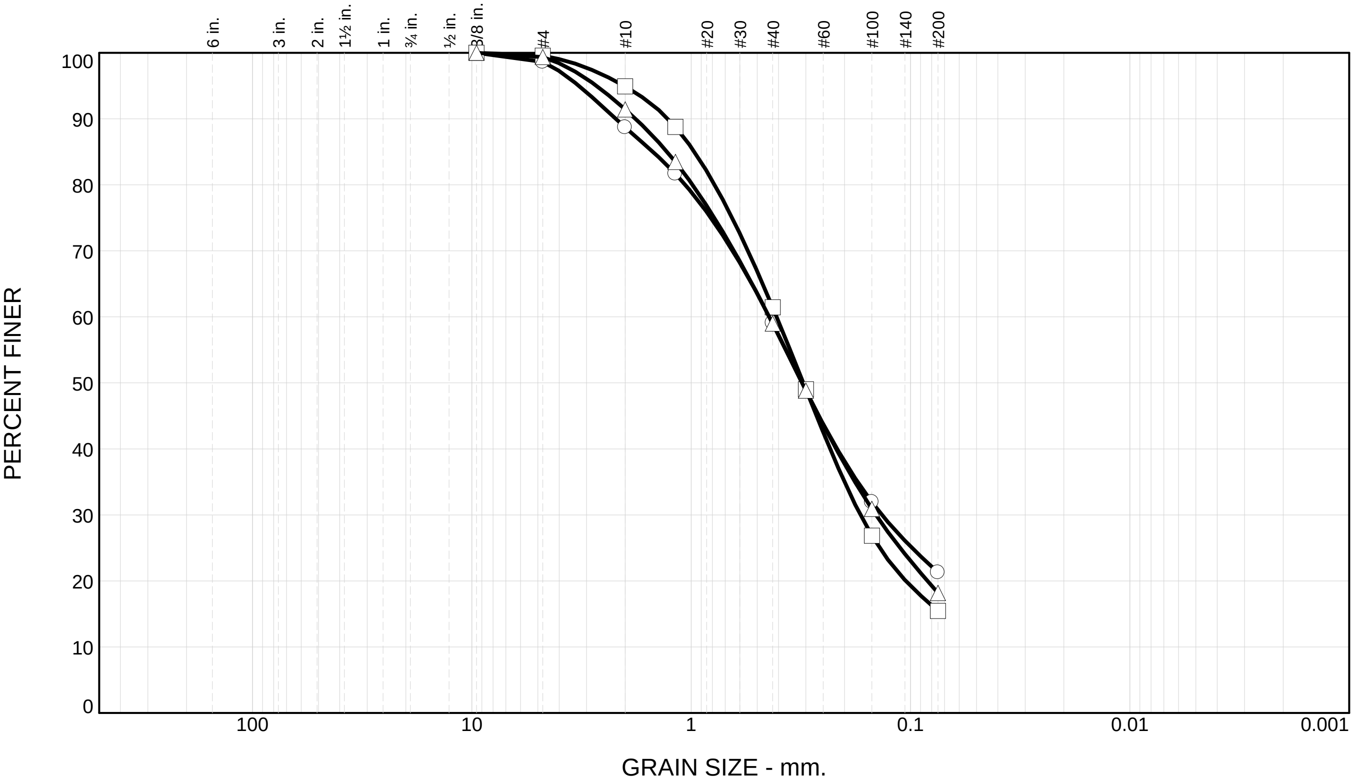
△

○ Source of Sample: LNN 2 Depth: 7.5 - 9.0' Sample Number: C
□ Source of Sample: LNN 2 Depth: 10.2 - 10.7' Sample Number: D1
△ Source of Sample: LNN 2 Depth: 10.7 - 11.2' Sample Number: D2

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.4	77.3	21.3		SM	A-2-4(0)	22	25
□	0.0	0.4	84.1	15.5		SM	A-2-4(0)	25	26
△	0.0	0.6	81.2	18.2		SM	A-2-4(0)	NP	21

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.4392	0.4076	0.4404
D_{30}	0.1350	0.1693	0.1438
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.6	99.6	99.4
#10	88.7	94.9	91.4
#16	81.7	88.8	83.5
#40	59.1	61.4	59.0
#50	48.8	49.0	48.8
#100	31.9	26.9	30.9
#200	21.3	15.5	18.2

Material Description
○ silty sand

□ silty sand

△ silty sand

REMARKS:
○

□

△

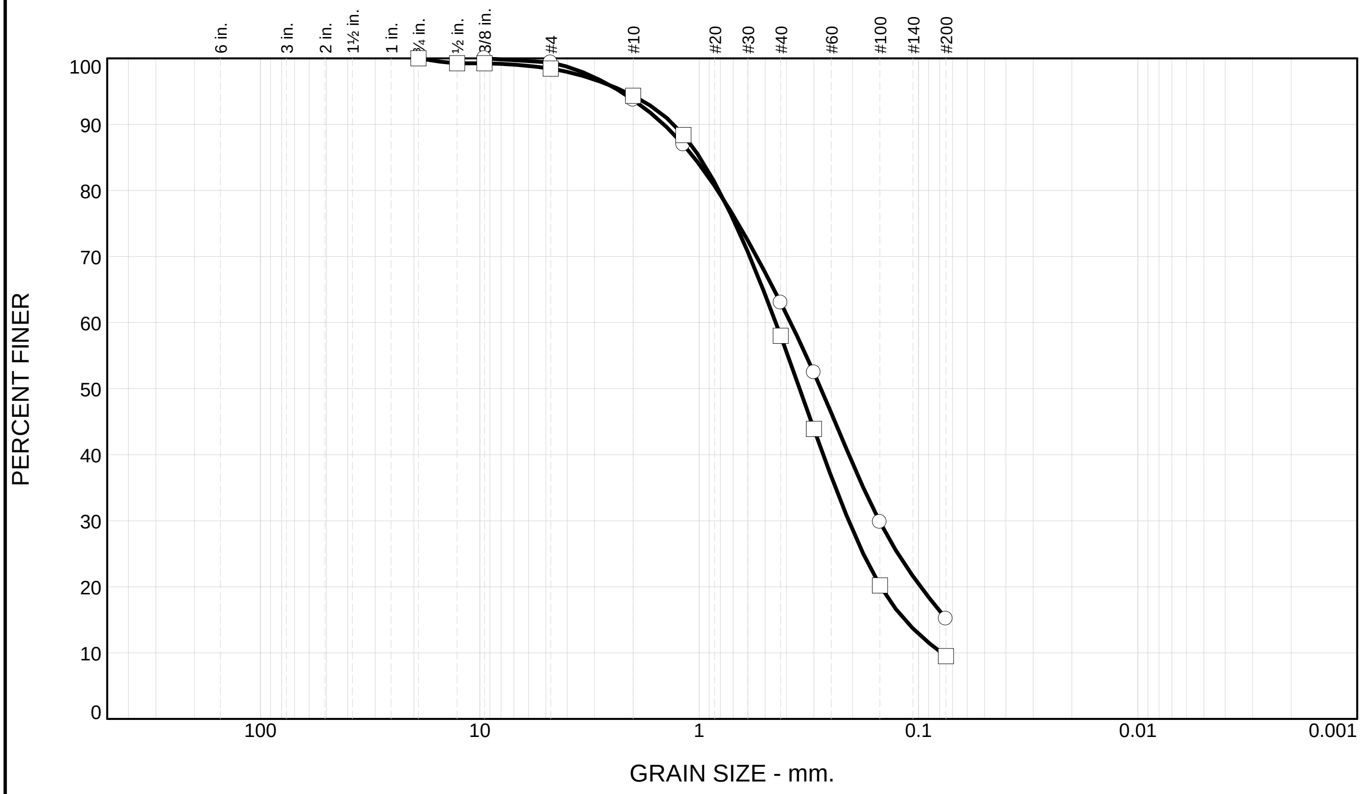
○ Source of Sample: LNN 2 Depth: 13.2 - 14.0' Sample Number: E2
□ Source of Sample: LNN 2 Depth: 15.5 - 16.0' Sample Number: F
△ Source of Sample: LNN 2 Depth: 17.5 - 19.0' Sample Number: G

NEVADA
DEPARTMENT OF
TRANSPORTATION

Client: A. Ablahani
Project: US 395 Lakeview - Washoe

Project No.: EA 73637 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.6	84.2	15.2		SM	A-2-4(0)	NP	29
□	0.0	1.5	89.0	9.5		SP-SM	A-3	NP	22

SIEVE inches size	PERCENT FINER ○	□	
3/4"		100.0	
1/2"		99.3	
3/8"	100.0	99.3	
	GRAIN SIZE		
D60	0.3832	0.4473	
D30	0.1510	0.2081	
D10		0.0785	
	COEFFICIENTS		
Cc		1.23	
Cu		5.70	

SIEVE number size	PERCENT FINER ○	□	
#4	99.4	98.5	
#10	93.7	94.3	
#16	86.9	88.4	
#40	63.0	58.0	
#50	52.4	43.9	
#100	29.8	20.2	
#200	15.2	9.5	

Material Description

○ silty sand

□ poorly graded sand with silt

REMARKS:

○

□

○ Source of Sample: LNN 2 Depth: 20.0 - 21.5' Sample Number: H

□ Source of Sample: LNN 2 Depth: 25.0 - 26.5' Sample Number: I

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

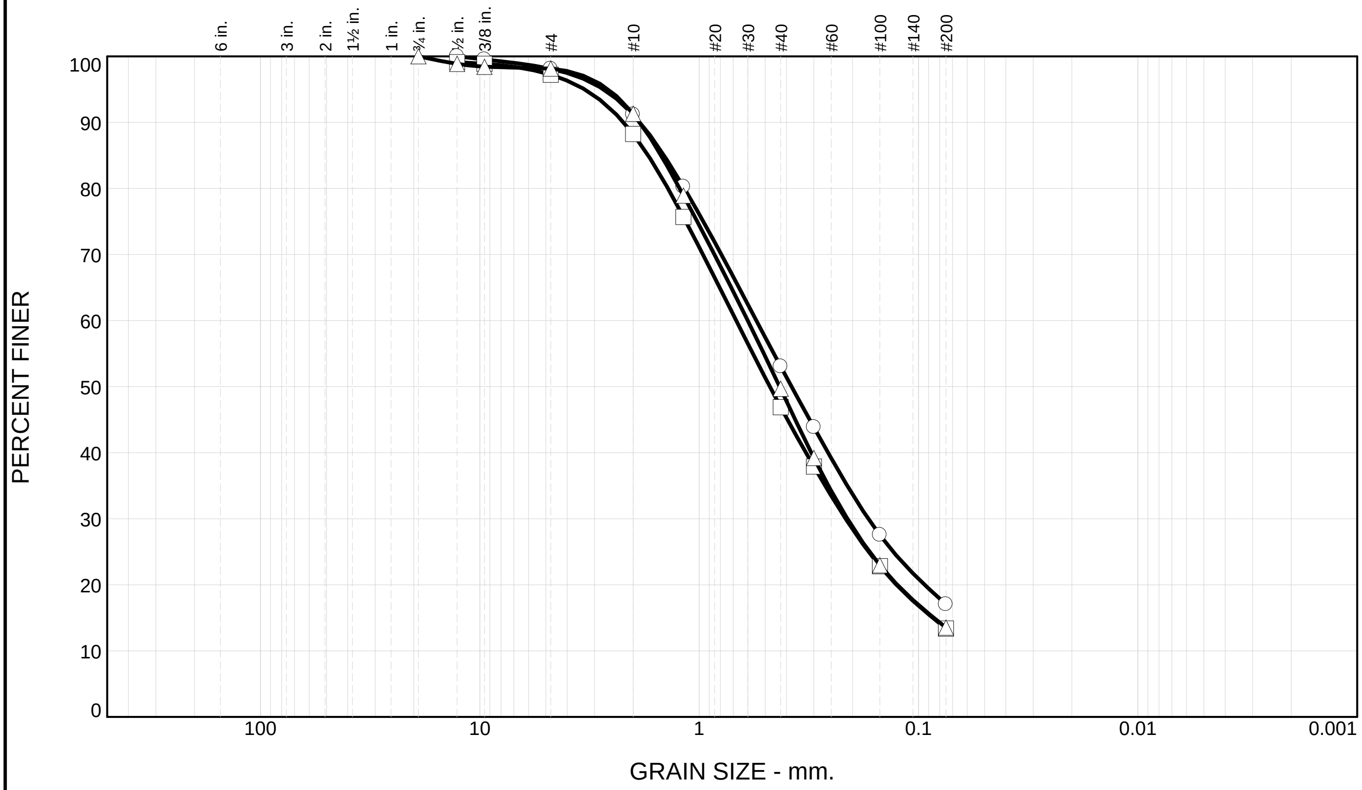
Client: A. Ablahani

Project: US 395 Lakeview - Washoe

Project No.: EA 73637

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.9	81.1	17.0		SM	A-2-4(0)	NP	22
□			83.8	13.4		SM	A-1-b	NP	20
△	0.0	1.9	84.6	13.5		SM	A-1-b	NP	22

SIEVE inches size	PERCENT FINER ○	□	△
3/4"			100.0
1/2"	100.0	99.1	98.9
3/8"	99.5	98.9	98.4
	GRAIN SIZE		
D_{60}	0.5486	0.6779	0.6007
D_{30}	0.1694	0.2149	0.2110
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.1	97.2	98.1
#10	91.2	88.3	91.3
#16	80.2	75.7	78.9
#40	53.1	46.9	49.7
#50	43.9	37.9	39.2
#100	27.5	22.8	23.0
#200	17.0	13.4	13.5

Material Description

○ silty sand

□ silty sand

△ silty sand

REMARKS:

○

□

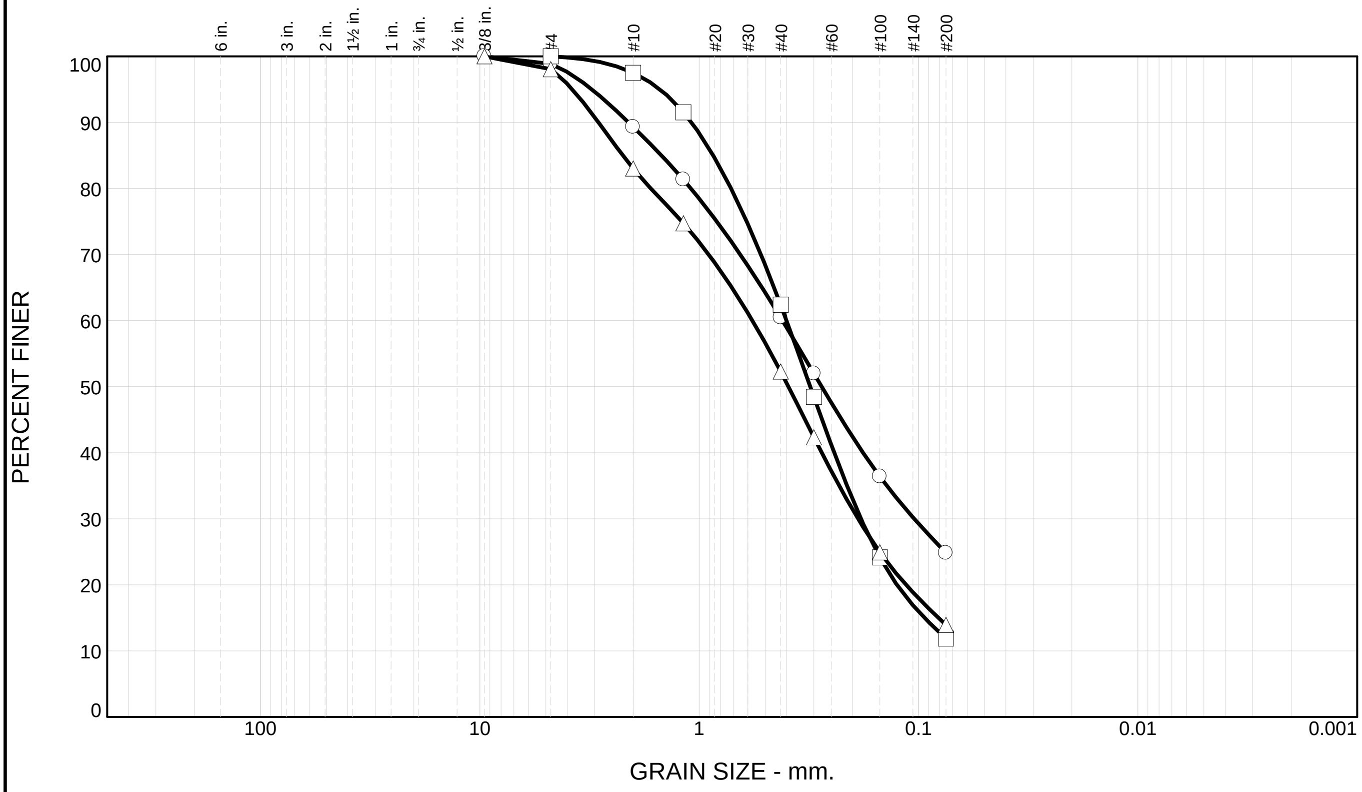
△

○ Source of Sample: LNN 3 Depth: 2.5 - 4.0' Sample Number: A
□ Source of Sample: LNN 3 Depth: 5.2 - 5.7' Sample Number: B1
△ Source of Sample: LNN 3 Depth: 5.7 - 6.2' Sample Number: B2

**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	1.1	74.1	24.8		SC-SM	A-2-4(0)	20	25
□	0.0	0.0	88.1	11.9		SP-SM	A-2-4(0)	NP	23
△	0.0	1.9	84.2	13.9		SM	A-2-4(0)	NP	21

SIEVE inches size	PERCENT FINER ○	□	△
3/8"	100.0		100.0
	GRAIN SIZE		
D_{60}	0.4169	0.3996	0.5718
D_{30}	0.1046	0.1831	0.1887
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	98.9	100.0	98.1
#10	89.3	97.5	83.0
#16	81.3	91.5	74.7
#40	60.5	62.4	52.3
#50	52.0	48.4	42.3
#100	36.4	24.1	24.9
#200	24.8	11.9	13.9

Material Description

○ silty, clayey sand

□ poorly graded sand with silt

△ silty sand

REMARKS:

○

□

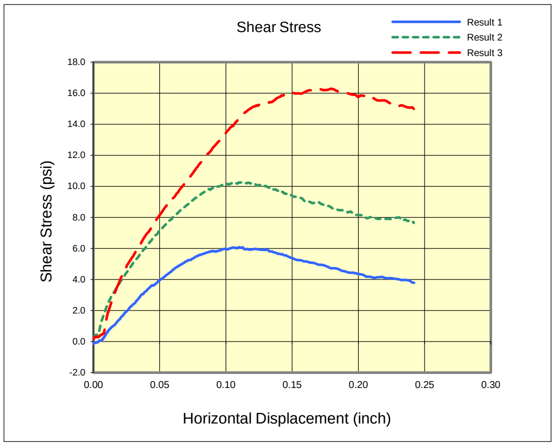
△

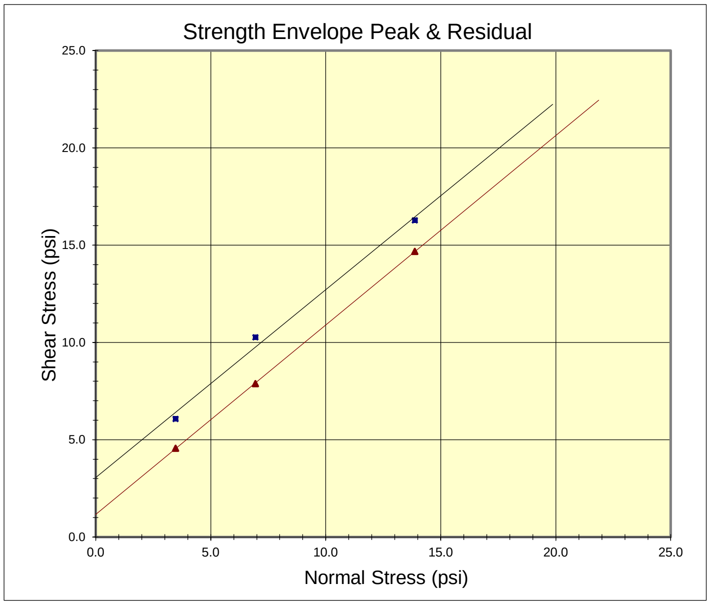
○ Source of Sample: LNN 3 Depth: 10.0 - 11.5' Sample Number: C
□ Source of Sample: LNN 3 Depth: 15.0 - 16.5' Sample Number: D
△ Source of Sample: LNN 3 Depth: 20.0 - 21.5' Sample Number: E

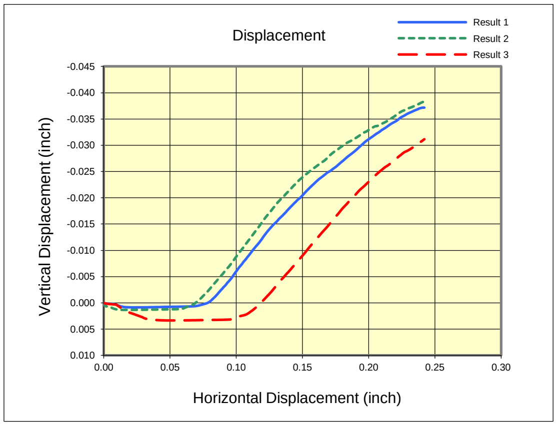
**NEVADA
DEPARTMENT OF
TRANSPORTATION**

Client: A. Ablahani
Project: US 395 Lakeview - Washoe
Project No.: EA 73637
Figure

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	44	degrees	44
Cohesion =	3.05	psi	1.15

Project: FL-5-12 Boring: LCA 1 Sample: B2

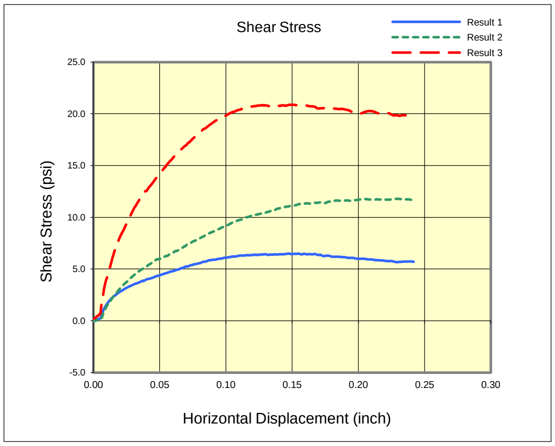
	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	7/11/2012	7/11/2012	7/11/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	4.50	4.50	4.50
Moisture (%)	5.4	5.1	4.2
Dry Unit Wt (pcf)	109.9	113.4	109.9
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0053	0.0055
Normal Stress (psi)	3.47	6.94	13.87
Peak Shear Stress(psi)	6.06	10.26	16.27
Residual Shear Stress(psi)	4.6	7.9	14.7
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	20.0	20.4	32.6

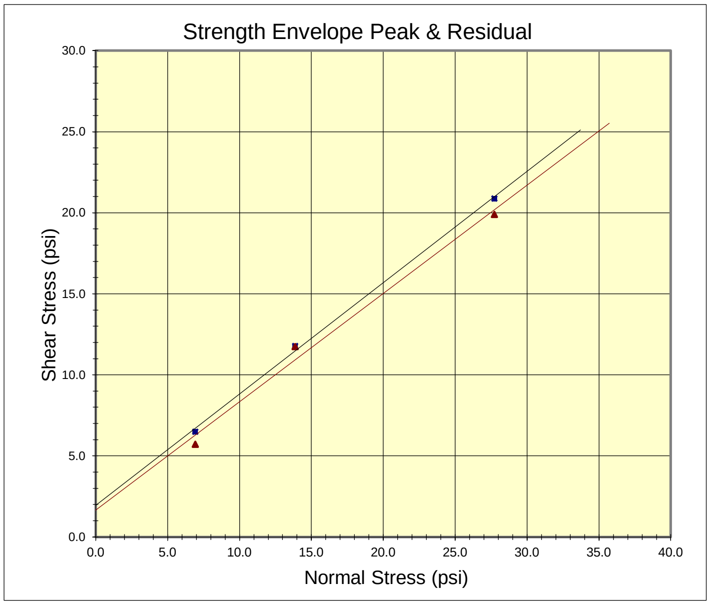
Specimen Comments

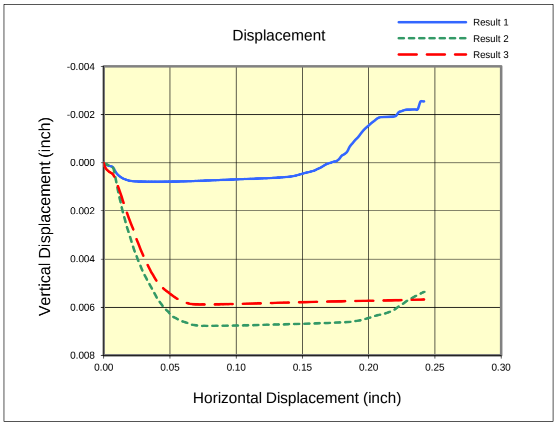
a 500 psf normal stress
b 1000 psf normal stress
c 2000 psf normal stress

Geotechnical Section
NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	34	degrees	34
Cohesion =	1.94	psi	1.64

Project: FL-5-12 Boring: LCA 1 Sample: F1

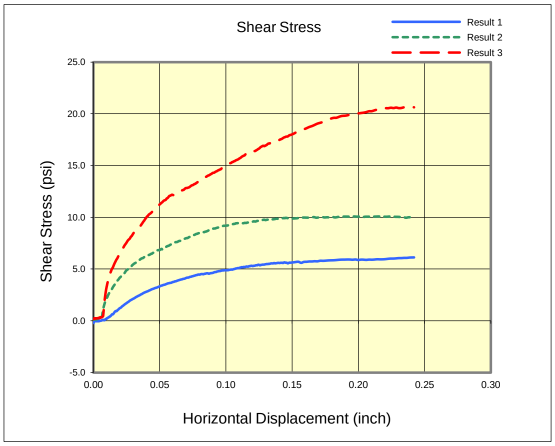
	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	7/12/2012	7/12/2012	7/12/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	12.50	12.00	12.00
Moisture (%)	7.3	7.5	8.4
Dry Unit Wt (pcf)	108.6	105.7	107.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0053	0.0055
Normal Stress (psi)	6.93	13.87	27.73
Peak Shear Stress(psi)	6.49	11.78	20.88
Residual Shear Stress(psi)	5.7	11.7	19.9
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	26.9	41.6	27.4

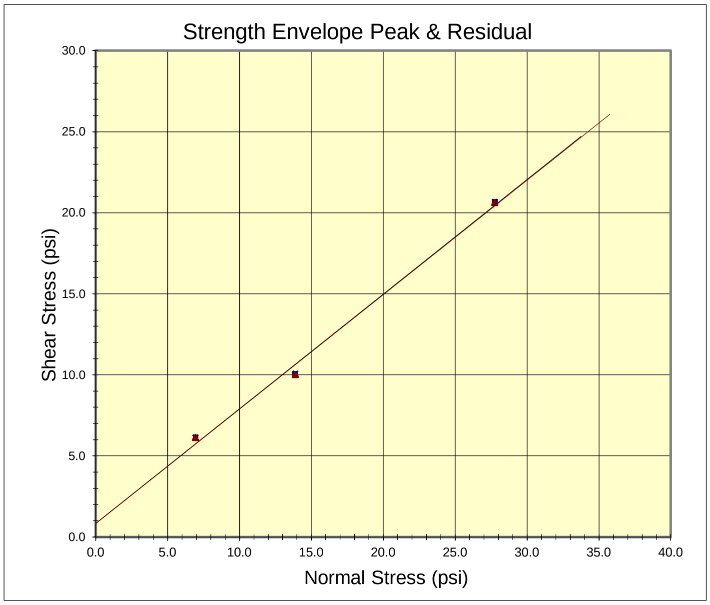
Specimen Comments

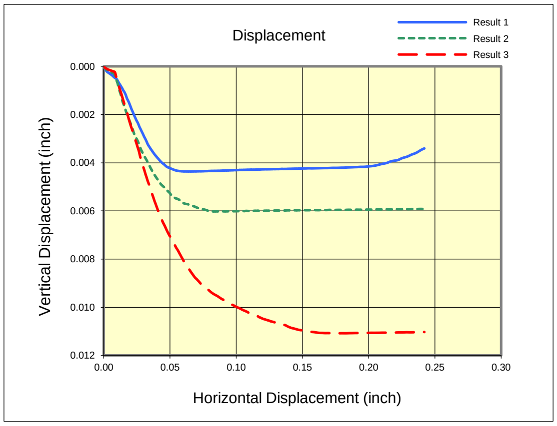
a 1000 psf normal stress
b 2000 psf normal stress
c 4000 psf normal stress

Geotechnical Section
NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	35	degrees	35
Cohesion =	0.84	psi	0.83

Project: FL-5-12 Boring: LCA 2 Sample: D2

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	7/16/2012	7/16/2012	7/16/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	9.50	9.50	9.50
Moisture (%)	14.8	12.7	11.9
Dry Unit Wt (pcf)	97.9	101.4	100.4
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0054	0.0055
Normal Stress (psi)	6.94	13.88	27.75
Peak Shear Stress(psi)	6.14	10.07	20.67
Residual Shear Stress(psi)	6.1	10.0	20.6
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	44.0	39.2	43.4

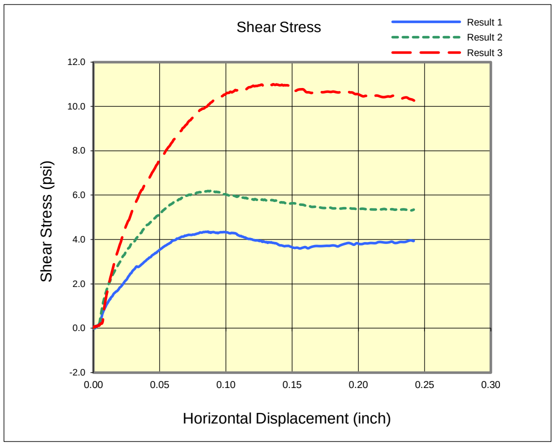
Specimen Comments

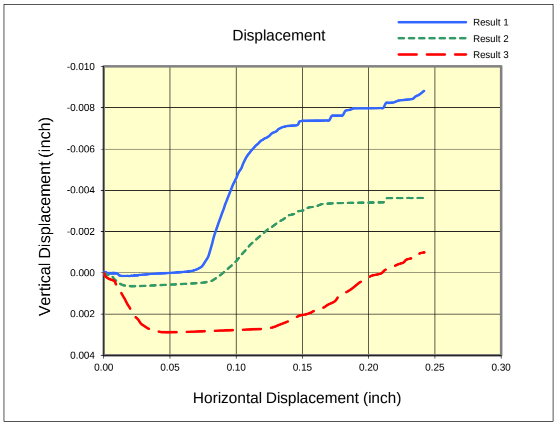
a	1000 psf normal stress
b	2000 psf normal stress
c	4000 psf normal stress

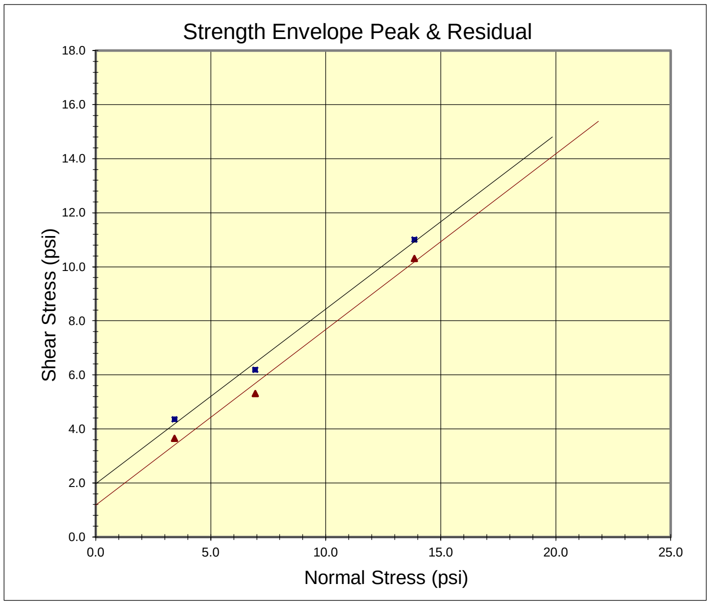
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	33	degrees	33
Cohesion =	1.96	psi	1.17

Project: FL-5-12 Boring: LCA 4 Sample: B1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	7/17/2012	7/17/2012	7/17/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	4.00	4.00	4.00
Moisture (%)	10.2	11.6	9.3
Dry Unit Wt (pcf)	105.2	104.0	104.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0054	0.0054
Normal Stress (psi)	3.43	6.94	13.85
Peak Shear Stress(psi)	4.35	6.19	11.01
Residual Shear Stress(psi)	3.7	5.3	10.3
Residual Point Picked @(in)	---	---	---
Time @ Peak Failure (min)	15.8	16.1	23.9

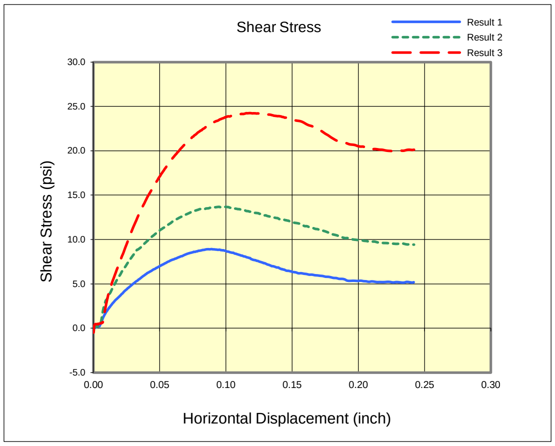
Specimen Comments

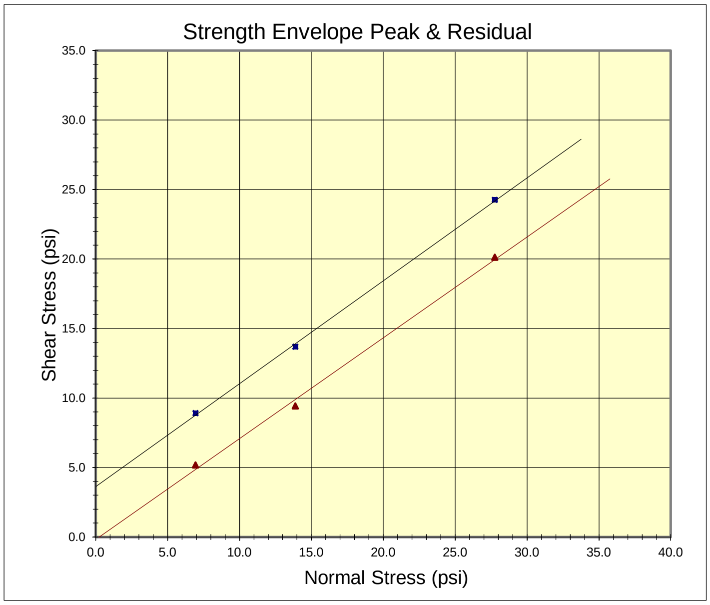
a 500 psf normal stress
b 1000 psf normal stress
c 2000 psf normal stress

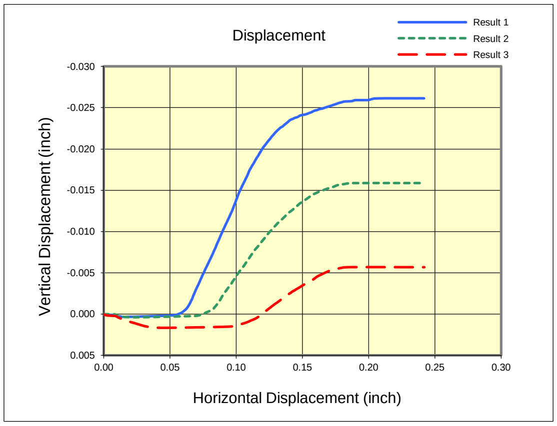
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	37	degrees	36
Cohesion =	3.63	psi	-0.17

Project: FL-5-12 Boring: LCA 4 Sample: D

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	7/18/2012	7/18/2012	7/18/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	9.50	9.50	9.50
Moisture (%)	17.8	18.8	21.4
Dry Unit Wt (pcf)	110.2	107.9	105.0
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0055
Normal Stress (psi)	6.94	13.88	27.76
Peak Shear Stress(psi)	8.91	13.69	24.26
Residual Shear Stress(psi)	5.2	9.4	20.1
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	16.3	17.9	21.5

Specimen Comments

a 1000 psf normal stress

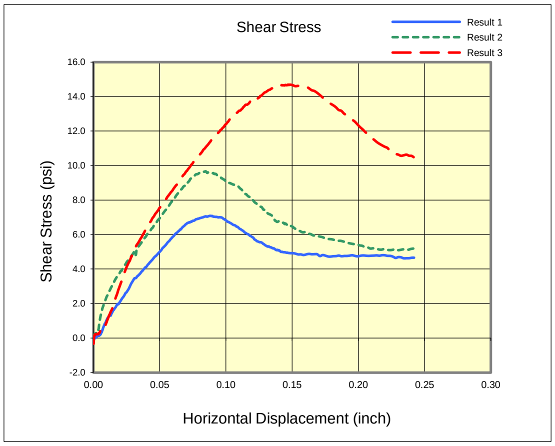
b 2000 psf normal stress

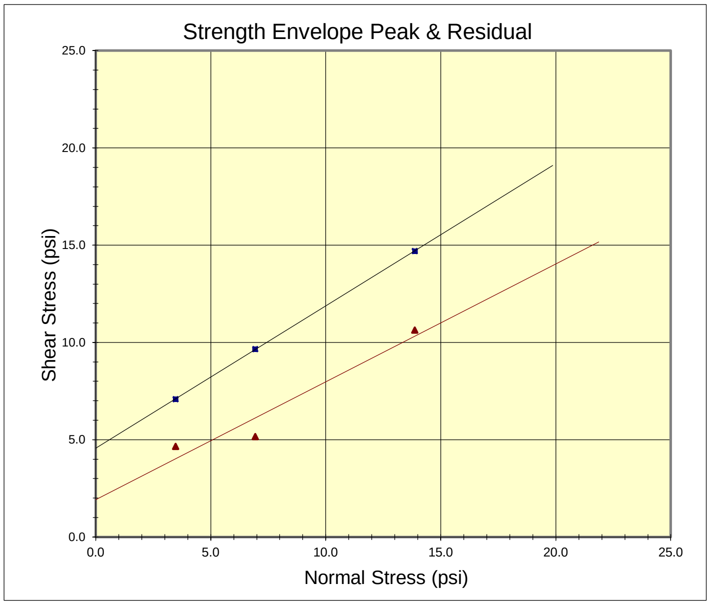
c 4000 psf normal stress

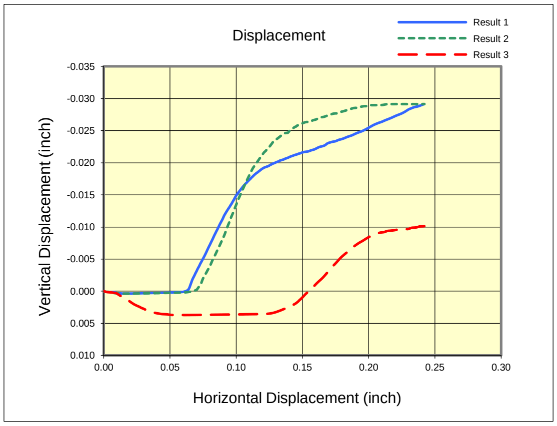
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	36	degrees	31
Cohesion =	4.56	psi	1.91

Project: FL-5-12 Boring: LCA 5 Sample: B1

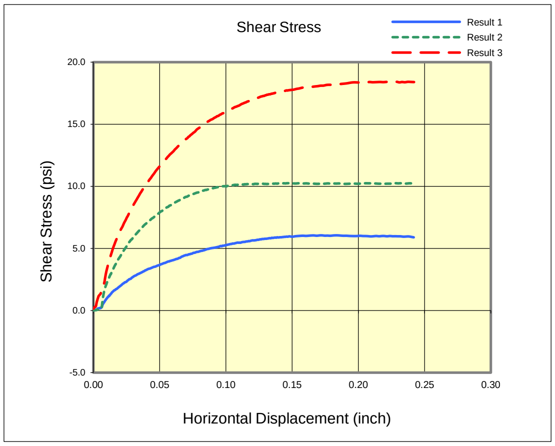
	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	7/19/2012	7/19/2012	7/19/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	5.00	5.00	5.00
Moisture (%)	9.3	8.7	8.8
Dry Unit Wt (pcf)	113.3	115.3	110.9
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0057
Normal Stress (psi)	3.47	6.93	13.87
Peak Shear Stress(psi)	7.08	9.66	14.70
Residual Shear Stress(psi)	4.7	5.2	10.6
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	16.1	15.4	26.7

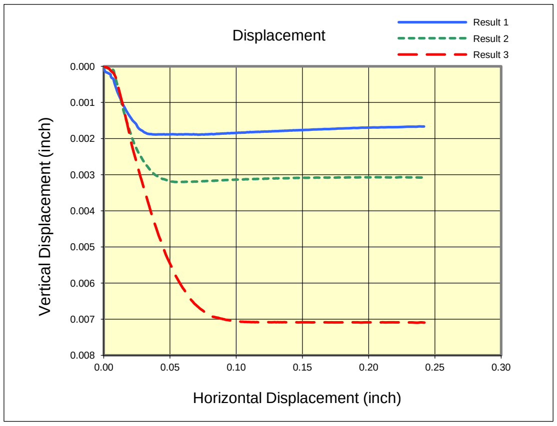
Specimen Comments

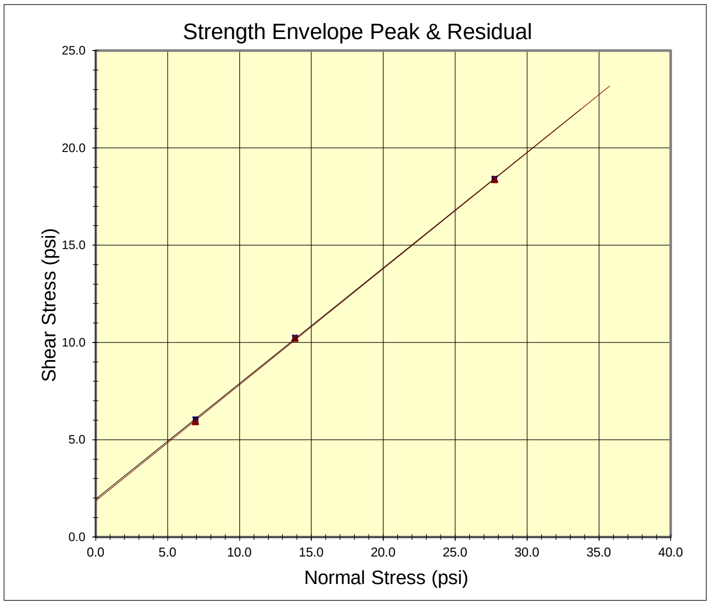
a	500 psf normal stress
b	1000 psf normal stress
c	2000 psf normal stress

Geotechnical Section

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	31	degrees	31
Cohesion =	1.96	psi	1.86

Project: FL-5-12 Boring: LSF 1 Sample: D1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/15/2012	11/15/2012	11/15/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.00	10.00	10.00
Moisture (%)	20.3	28.8	28.8
Dry Unit Wt (pcf)	95.7	89.6	91.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0054
Normal Stress (psi)	6.93	13.86	27.74
Peak Shear Stress(psi)	6.04	10.25	18.42
Residual Shear Stress(psi)	5.9	10.2	18.4
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	33.3	26.8	40.5

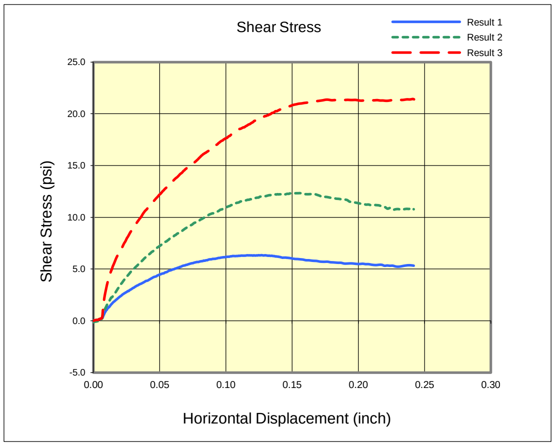
Specimen Comments

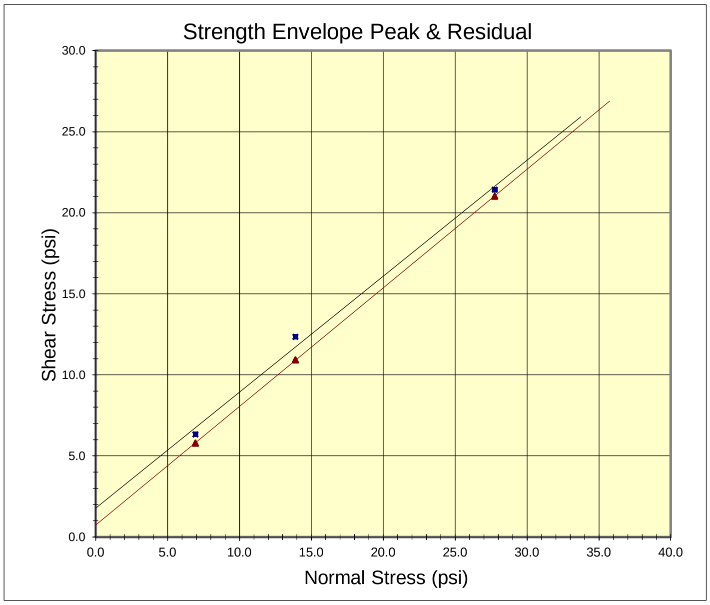
a	1000 psf normal stress
b	2000 psf normal stress
c	4000 psf normal stress

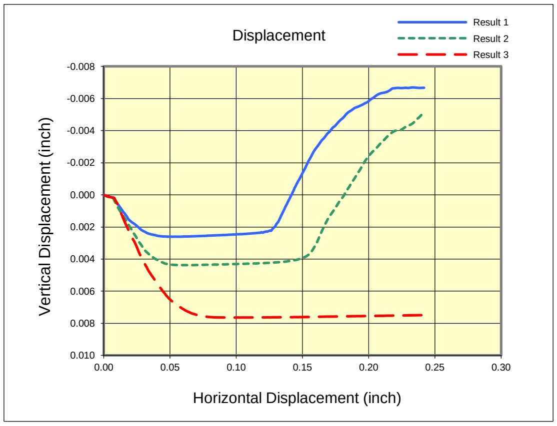
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	36	degrees	36
Cohesion =	1.78	psi	0.74

Project: FL-5-12 Boring: LSF 2 Sample: D1

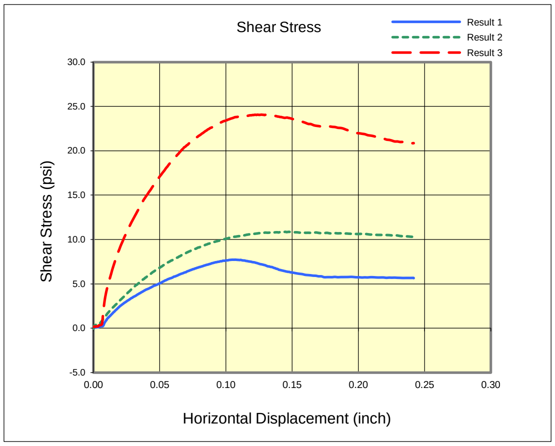
	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/26/2012	11/26/2012	11/26/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.00	10.00	10.00
Moisture (%)	11.4	10.1	11.4
Dry Unit Wt (pcf)	107.3	109.2	106.7
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0053	0.0054
Normal Stress (psi)	6.93	13.89	27.75
Peak Shear Stress(psi)	6.32	12.34	21.43
Residual Shear Stress(psi)	5.8	10.9	21.0
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	23.1	28.5	43.8

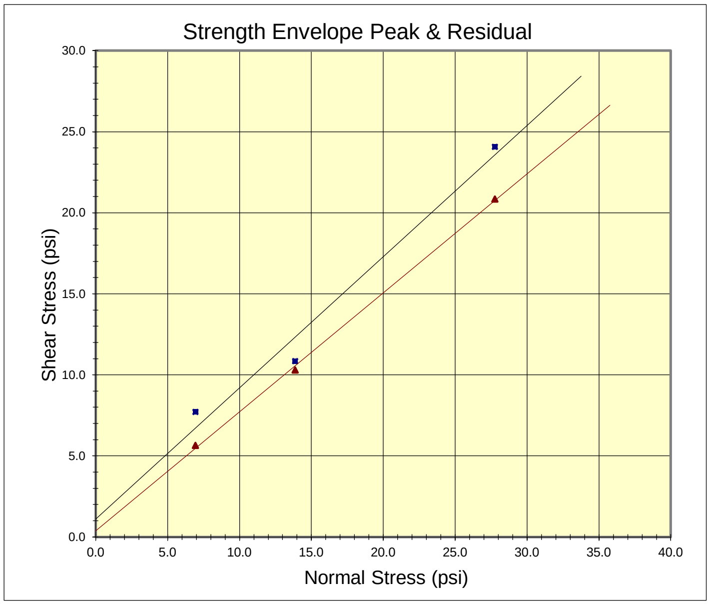
Specimen Comments

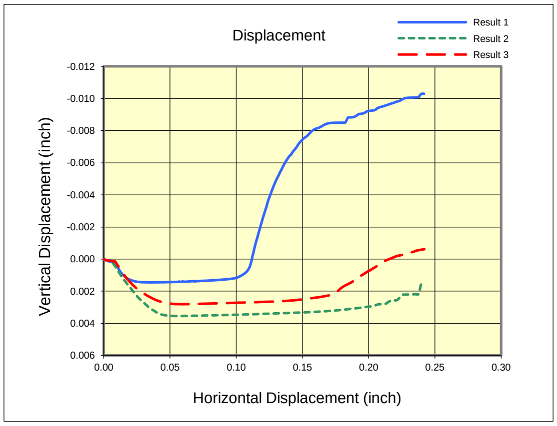
a	1000 psf normal stress
b	2000 psf normal stress
c	4000 psf normal stress

Geotechnical Section
NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	39	degrees	36
Cohesion =	1.11	psi	0.38

Project: FL-5-12 Boring: LSF 3 Sample: D1

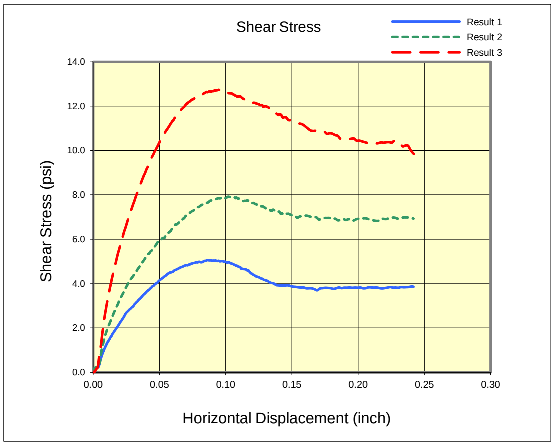
	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/27/2012	11/27/2012	11/27/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.00	10.00	10.00
Moisture (%)	11.9	11.9	16.4
Dry Unit Wt (pcf)	111.2	109.3	107.6
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0054
Normal Stress (psi)	6.93	13.87	27.76
Peak Shear Stress(psi)	7.71	10.85	24.07
Residual Shear Stress(psi)	5.6	10.3	20.8
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	19.5	26.9	23.1

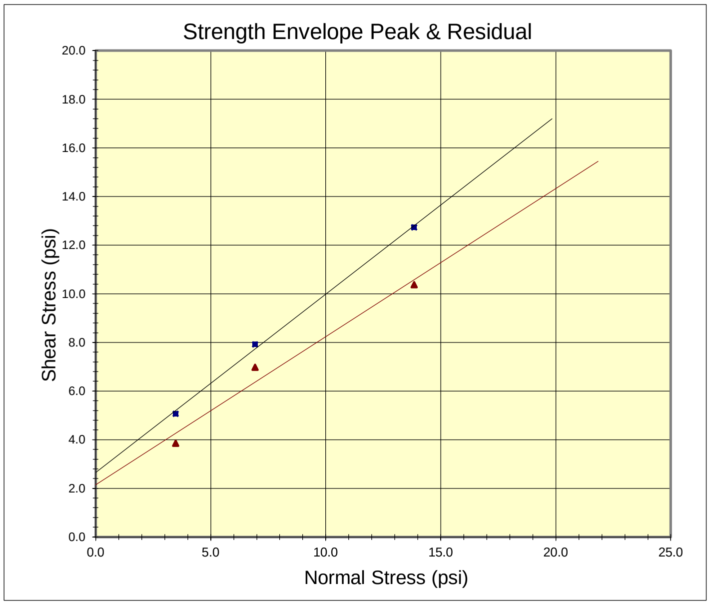
Specimen Comments

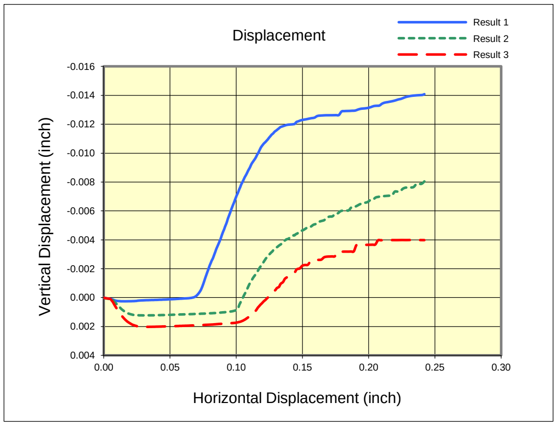
a 1000 psf normal stress
b 2000 psf normal stress
c 4000 psf normal stress

Geotechnical Section
NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	36	degrees	31
Cohesion =	2.64	psi	2.14

Project: FL-5-12 Boring: LSF 4 Sample: B1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/28/2012	11/28/2012	11/28/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	5.00	5.00	5.00
Moisture (%)	9.9	10.2	9.8
Dry Unit Wt (pcf)	111.4	110.5	110.5
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0055	0.0055
Normal Stress (psi)	3.48	6.93	13.84
Peak Shear Stress(psi)	5.06	7.92	12.73
Residual Shear Stress(psi)	3.9	7.0	10.4
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	15.8	18.6	17.2

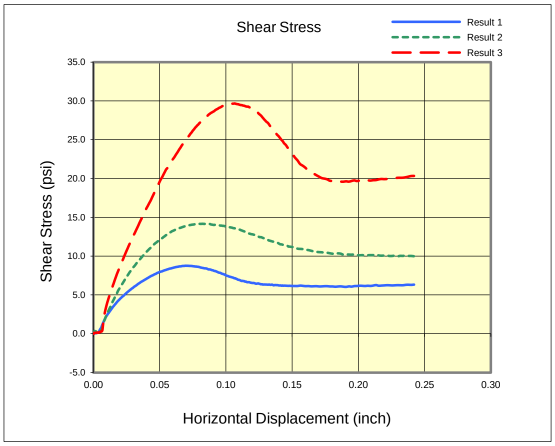
Specimen Comments

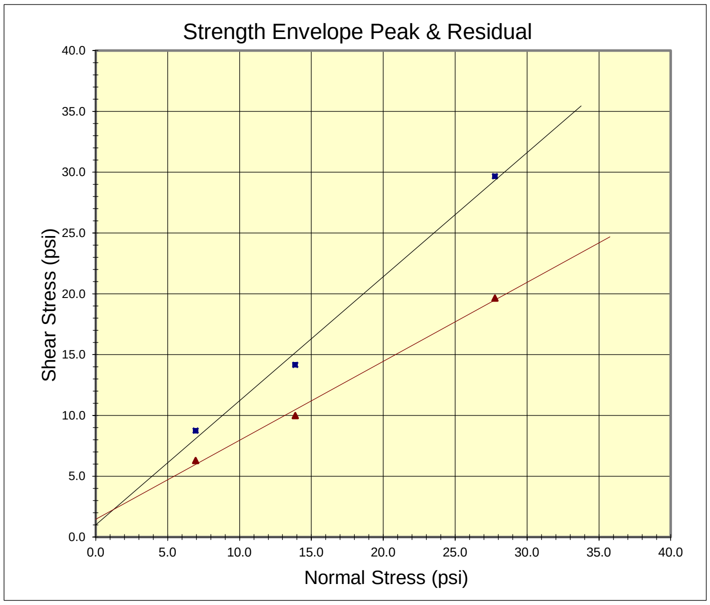
a	500 psf normal stress
b	1000 psf normal stress
c	2000 psf normal stress

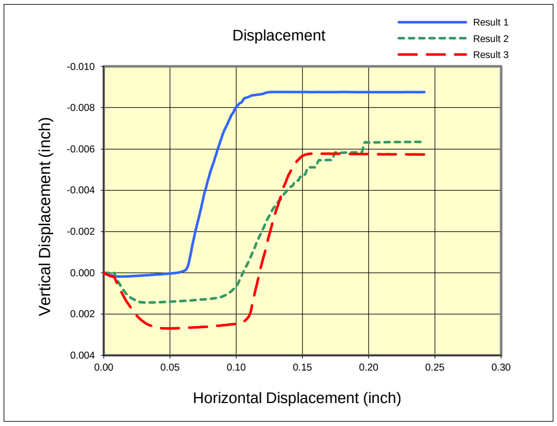
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	46	degrees	33
Cohesion =	0.98	psi	1.45

Project: FL-5-12 Boring: LSF 4 Sample: D1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/29/2012	11/29/2012	11/29/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.00	10.00	10.00
Moisture (%)	11.3	12.8	11.6
Dry Unit Wt (pcf)	111.6	111.9	116.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0056	0.0055
Normal Stress (psi)	6.95	13.88	27.77
Peak Shear Stress(psi)	8.75	14.15	29.67
Residual Shear Stress(psi)	6.3	10.0	19.6
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	12.6	14.9	19.4

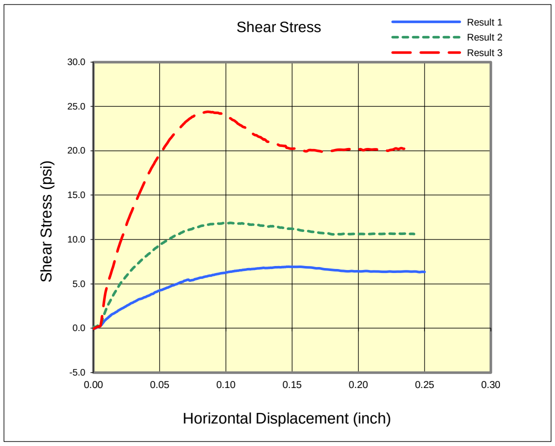
Specimen Comments

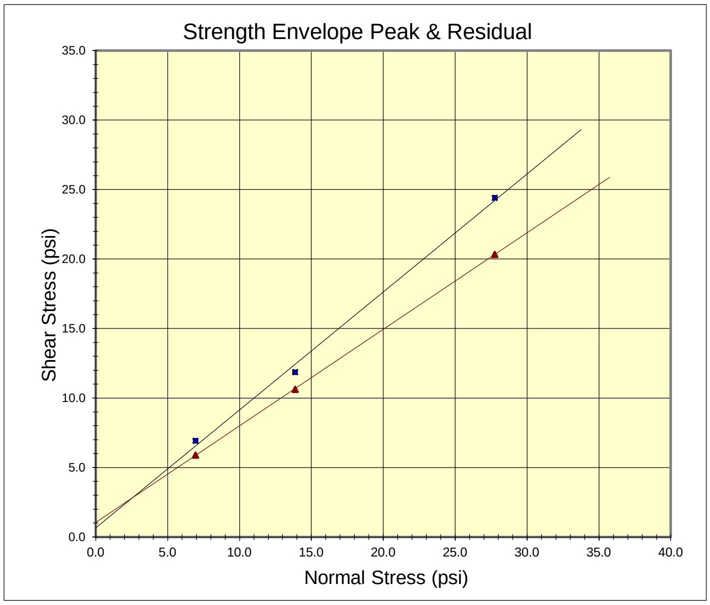
a 1000 psf normal stress
b 2000 psf normal stress
c 4000 psf normal stress

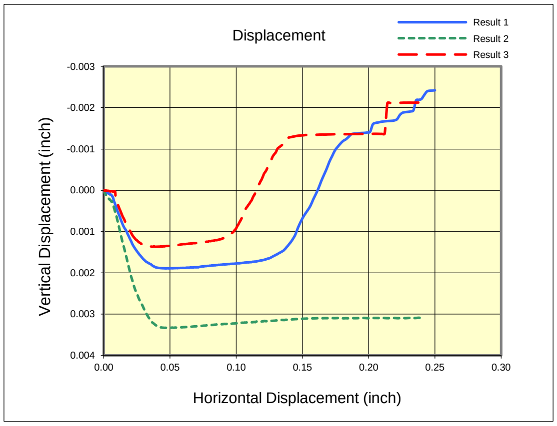
Geotechnical Section

DigiShear Report v4b __ LSF4-D1

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	40	degrees	35
Cohesion =	0.65	psi	1.03

Project: Fl-5-12 Boring: LNN 1 Sample: C1

	Result 1	Result 2	Result 3
Specimen:	a	b	C
Date Tested	11/5/2012	11/5/2012	11/5/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	8.00	8.00	8.00
Moisture (%)	7.9	8.0	8.0
Dry Unit Wt (pcf)	107.8	111.3	115.1
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0056	0.0057	0.0055
Normal Stress (psi)	6.94	13.87	27.75
Peak Shear Stress(psi)	6.92	11.86	24.40
Residual Shear Stress(psi)	5.9	10.6	20.3
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	26.8	18.7	15.8

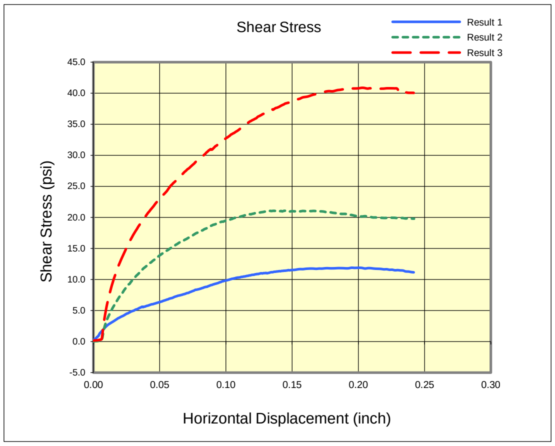
Specimen Comments

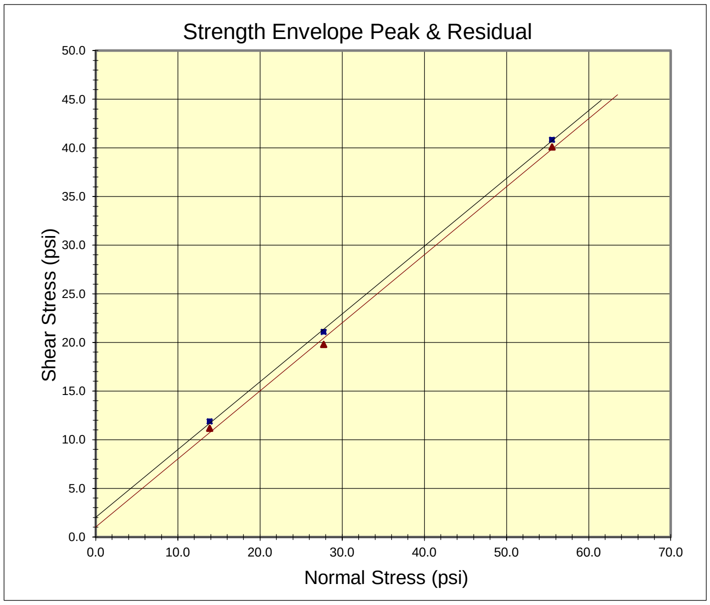
a	1000 psf normal stress
b	2000 psf normal stress
C	4000 psf normal stress

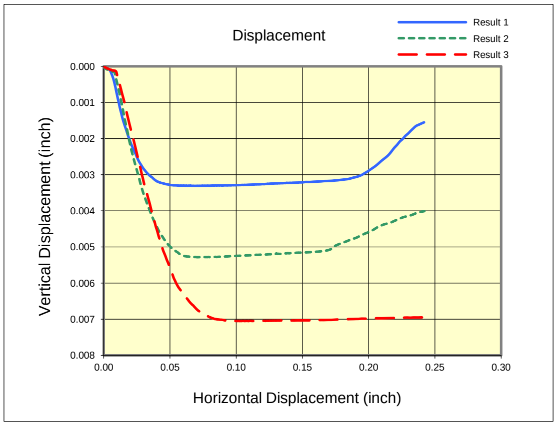
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	35	degrees	35
Cohesion =	2.02	psi	1.04

Project: FL-5-12 Boring: LNN 1 Sample: F1

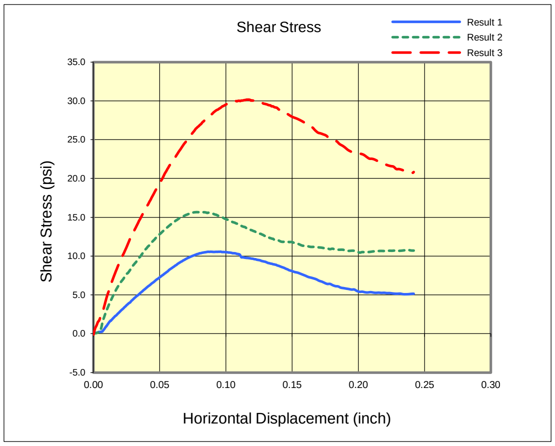
	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/6/2012	11/6/2012	11/6/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	15.00	15.00	15.00
Moisture (%)	12.7	12.0	12.0
Dry Unit Wt (pcf)	102.1	106.3	105.0
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0054	0.0055
Normal Stress (psi)	13.87	27.74	55.54
Peak Shear Stress(psi)	11.88	21.08	40.83
Residual Shear Stress(psi)	11.2	19.8	40.1
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	35.4	26.4	36.9

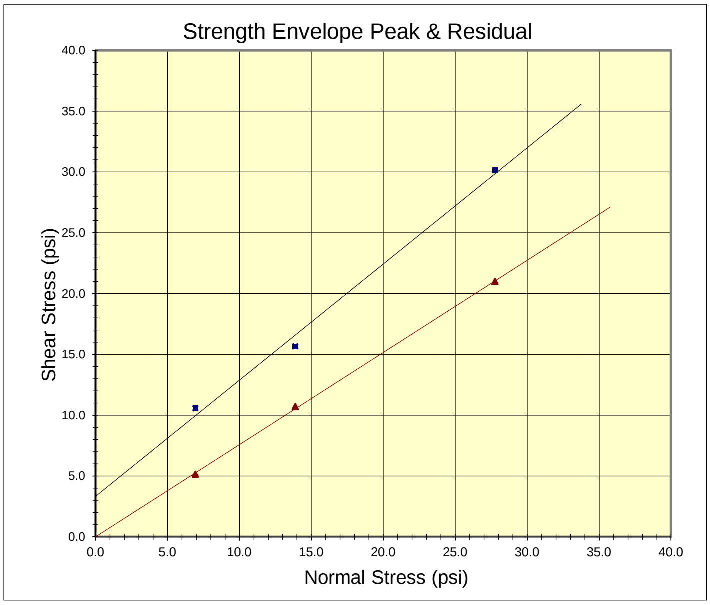
Specimen Comments

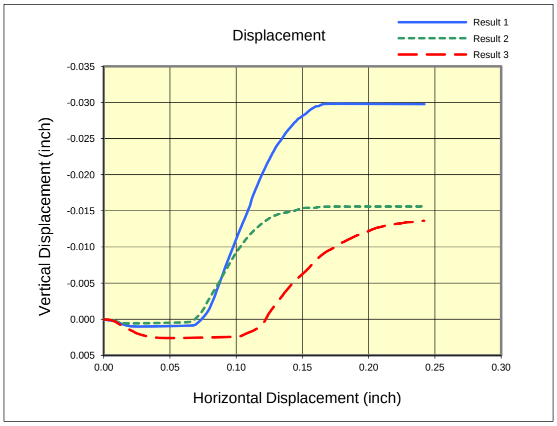
a	2000 psf normal stress
b	4000 psf normal stress
c	6000 psf normal stress

Geotechnical Section
NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	44	degrees	37
Cohesion =	3.33	psi	-0.01

Project: FL-5-12 Boring: LNN 2 Sample: B1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/7/2012	11/7/2012	11/7/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	5.00	5.00	5.00
Moisture (%)	9.8	10.1	8.2
Dry Unit Wt (pcf)	110.0	113.1	111.8
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0055	0.0055	0.0054
Normal Stress (psi)	6.93	13.88	27.76
Peak Shear Stress(psi)	10.57	15.66	30.16
Residual Shear Stress(psi)	5.1	10.7	21.0
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	17.4	14.9	21.3

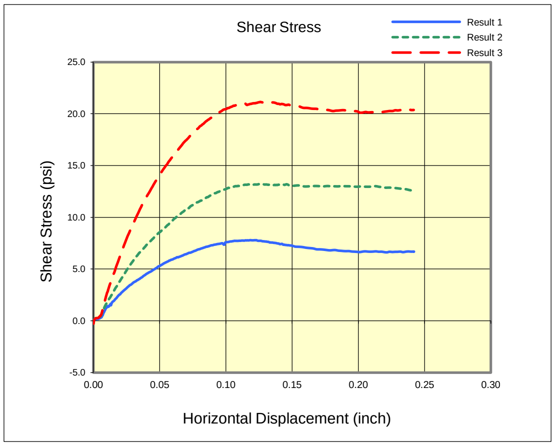
Specimen Comments

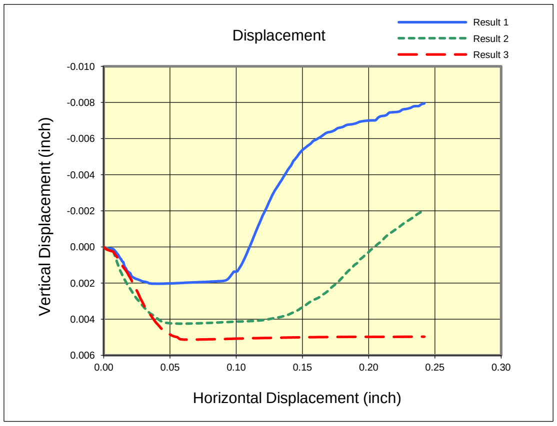
a	1000 psf normal stress
b	2000 psf normal stress
c	4000 psf normal stress

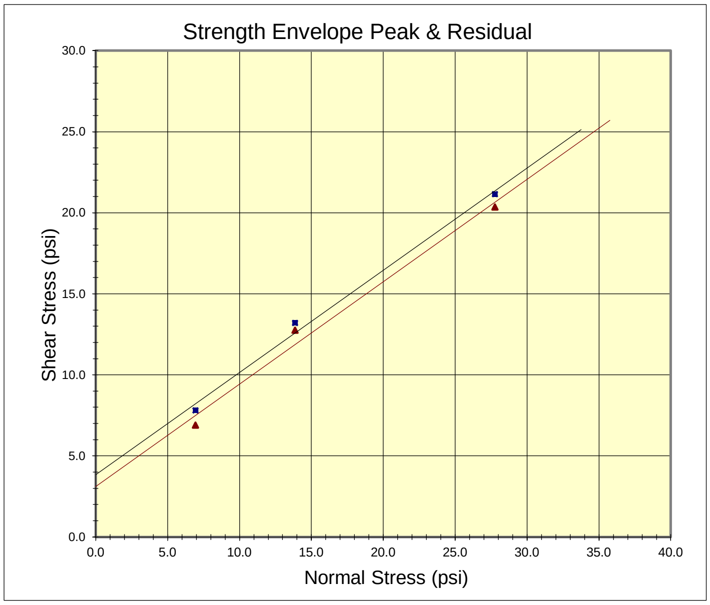
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual	
Friction Angle =	32	degrees	32	
Cohesion =	3.84	psi	3.11	

Project: FL-5-12 Boring: LNN 2 Sample: D1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/8/2012	11/8/2012	11/8/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	10.00	10.00	10.00
Moisture (%)	10.0	10.1	10.1
Dry Unit Wt (pcf)	108.3	106.8	107.7
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0057	0.0056	0.0055
Normal Stress (psi)	6.94	13.86	27.77
Peak Shear Stress(psi)	7.81	13.20	21.15
Residual Shear Stress(psi)	6.9	12.8	20.4
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	21.5	22.7	23.6

Specimen Comments

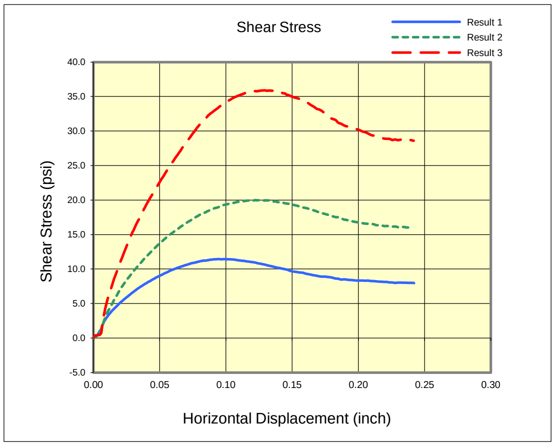
a 1000 psf normal stress

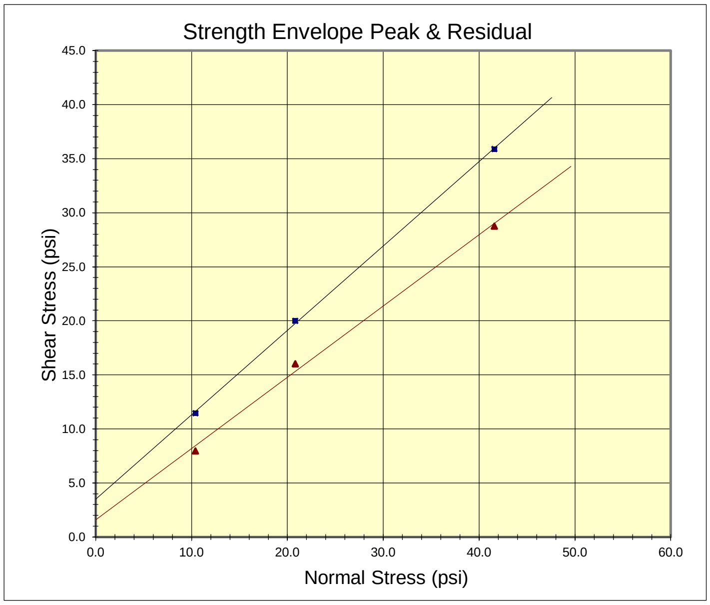
b 2000 psf normal stress

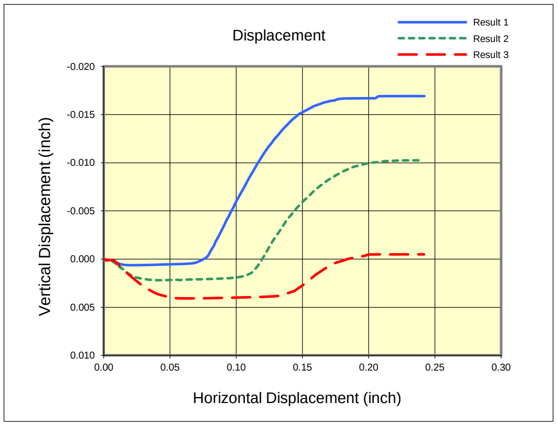
c 4000 psf normal stress

Geotechnical Section
NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	38	degrees	33
Cohesion =	3.48	psi	1.58

Project: FL-5-12 Boring: LNN 2 Sample: F

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/13/2012	11/13/2012	11/13/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	15.00	15.00	15.00
Moisture (%)	19.7	20.6	20.9
Dry Unit Wt (pcf)	103.4	102.5	104.4
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0053	0.0042	0.0054
Normal Stress (psi)	10.40	20.82	41.59
Peak Shear Stress(psi)	11.45	19.99	35.90
Residual Shear Stress(psi)	8.0	16.0	28.8
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	17.2	22.4	23.5

Specimen Comments

a 1500 psf normal stress

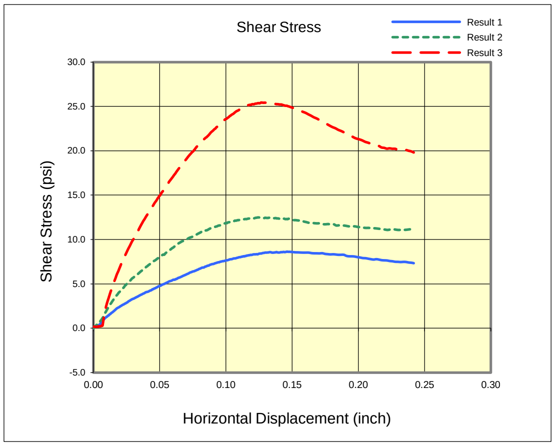
b 3000 psf normal stress

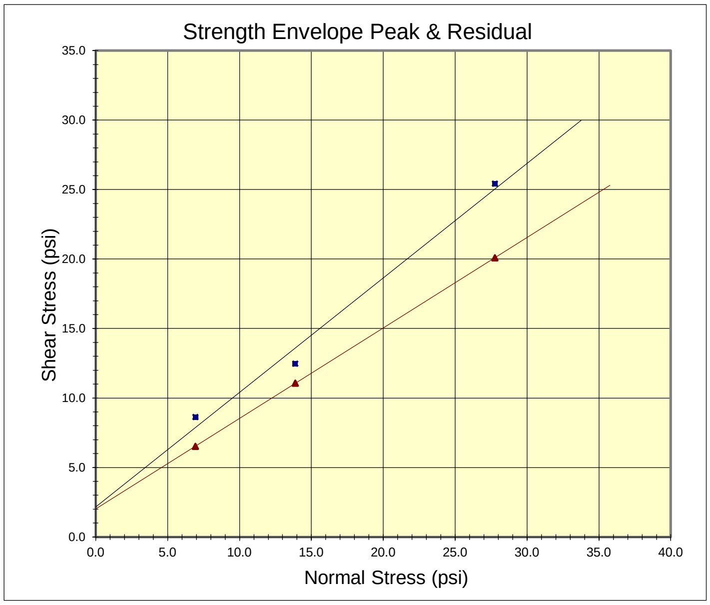
c 6000 psf normal stress

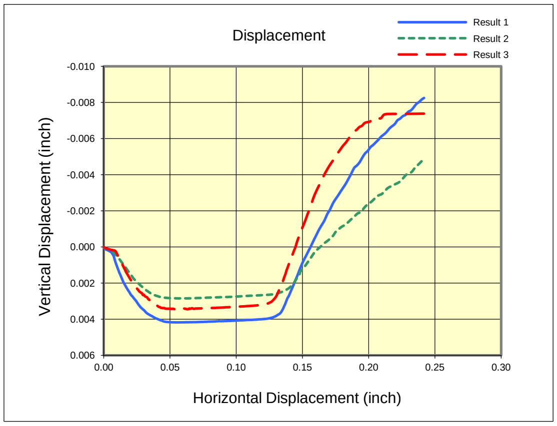
Geotechnical Section

NEVADA DOT

DIRECT SHEAR TEST REPORT







Strength Parameters

	Peak		Residual
Friction Angle =	40	degrees	33
Cohesion =	2.16	psi	2.01

Project: FL-5-12 Boring: LNN 3 Sample: B1

	Result 1	Result 2	Result 3
Specimen:	a	b	c
Date Tested	11/14/2012	11/14/2012	11/14/2012
Diameter (inch):	2.42	2.42	2.42
Height (inch):	1.00	1.00	1.00
Depth (ft):	5.00	5.00	5.00
Moisture (%)	7.7	8.4	11.2
Dry Unit Wt (pcf)	105.5	110.7	109.3
SHEAR			
Displacement Rate($^{in}/_{min}$)	0.0054	0.0055	0.0054
Normal Stress (psi)	6.93	13.88	27.76
Peak Shear Stress(psi)	8.63	12.47	25.43
Residual Shear Stress(psi)	6.5	11.1	20.1
Residual Point Picked @(in)	0.242	0.242	0.242
Time @ Peak Failure (min)	26.6	22.6	23.1

Specimen Comments

a	1000 psf normal stress
b	2000 psf normal stress
c	4000 psf normal stress

Geotechnical Section

NEVADA DOT

NEVADA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL SECTION

CHEMICAL ANALYSIS

E.A. No.: 73637

Project: US 395 Lakeview - Washoe

Date: 7/27/12

Sample ID	**Chlorides** **ppm** AASHTO T 291 A	**Sulfates** **ppm** AASHTO T 290 B	**pH** AASHTO T 289	**Resistivity** **ohm - cm** AASHTO T 288
LCA 1 D	285	0	5.7	1,301
LCA 2 B	480	0	7.1	945*
LCA 3 E	45	0	8.1	6,670
LCA 4 B2	240	0	7.4	1,600*
LCA 5 B2	190	0	6.8	1,850*
LSF 1 B1	125	0	7.4	2,000*
LSF 1 B2	130	0	7.4	2,150*
LSF 2 B2	110	0	7.0	2,400*
LSF 3 B2	190	0	7.0	1,900*
LNN 1 B	440	0	7.1	1,250*

* Deviated from AASHTO T 288 by using a small 4 pin soil box.