GEOTECHNICAL INVESTIGATION REPORT

NORTH BROADWAY STREET AND SHERMAN STREET REHABILITATION

JN: 10514.000

FALLON, NEVADA

OCTOBER 2021

PREPARED FOR:
CITY OF FALLON
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1.0 INTRODUCTION

This report presents the results of Lumos & Associates, Inc.'s Geotechnical Analysis for the proposed roadway rehabilitation improvements on Sherman Street and North Broadway Street in Fallon, Nevada. A vicinity map is included as Plate 1 and a site map is included as Plate 2.

It is our understanding that the proposed project will consist of approximately four-thousand (4,000) lane feet of roadway replacement along Sherman Street and North Broadway Street. We have assumed that final grades at the site will be approximately the same as the existing grades.

The purpose of our investigation was to characterize the site geology and soil conditions, describe the native soils and determine their engineering properties as they relate to the proposed construction. The proposed construction consists of roadway reconstruction, storm infiltrators, and utility trenching/backfill. The investigation was also intended to identify possible adverse geologic, soil, and/or water table conditions. However, this study did not include an environmental assessment or an evaluation for soil and/or groundwater contamination at the site.

2.0 GEOLOGIC SETTING

Fallon is located at the western portion of the Basin and Range geomorphic province. The Basin and Range is characterized by large normal fault-bounded valleys (grabens) that are separated by large mountain ranges (horsts). The Sierra Nevada geomorphic province located approximately 50 miles to the west is characterized by large granite masses that have been uplifted and tilted a few degrees towards the west. Overlying the Sierran granites are older oceanic meta-sedimentary and meta-volcanic rocks.

The geologic evolution of the region involves a long and complex history. The present features are largely the products of late Mesozoic and Tertiary events (150 thousand to 2 million years ago). During this period of time the entire region was uplifted from below sea level to over 10,000 feet. Beginning about 34 million years ago, widespread rhyolitic volcanism began in the northern part of the state and progressed southward. At the end of this period of volcanism, about 17 million years ago, extension (east-west growth) began, which resulted in the large-scale block faulting that created the present day "Basin and Range" physiography. Volcanism continued during extension but was characterized by more basaltic lava flows. Estimates of the amount of extension range from thirty (30%) to fifty (50%) percent of the original width of the region. Vertical offsets between the valleys and adjacent mountains range from about six-thousand (6,000) to fifteen-thousand (15,000) feet. Valley bottoms typically range in elevation between four-thousand (4,000) and sixty-five-hundred (6,500) feet above sea level with the intervening mountains 7,000 and 12,000 feet or more.

During extension, large volumes of sediments were deposited in the subsiding valleys by both streams and, during the past 2 million years, by intermittent large glacial lakes. Valley fill depths typically range from a few hundred feet to over ten-thousand (10,000) feet. During the past eleven thousand years, (Holocene epoch) arid erosional processes have evolved. That, combined with active faulting, continue to shape the present landscape.

Specifically, the project site is located in the central portion of Lahontan Valley, a deep sedimentary basin. The ancestral Truckee River during the Pleistocene Period (last 2 million years) fed a large glacial lake referred to as Lake Lahontan. The Truckee River entered the ancient lake about 24 miles west of the site near Fernley, Nevada. Lake sediments typically

consist of silts, sands and gravels in near shore areas and sands, silts and clays in deeper off shore environments. As the lake receded, alluvial deposits of sands, silts and gravels combined with Aeolian (wind-blown) deposits of silts and sands accumulated, as well as evaporate deposits. The evaporate deposits found southeast of Fallon are actively being mined for salt. Sediment depths in the center of the Lahontan basin are on the order of several thousand feet deep. Bedrock, where present, in the Fallon area is almost entirely late Tertiary (last 10 million years) volcanic extrusive rocks.

According to the geological map of Churchill County, Nevada by Ronald Willden and Robert C. Speed, the site is underlain by younger alluvium and is mapped as Qya. This unit is described as Lake Lahontan deposits, playa deposits, and young fan gravels (Refer to Plate 3).

3.0 SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation the site consisted of two (2) paved roadways that run north and south. North Broadway Street's limits extend from Highway 50 northward to the Churchill County Juvenile Facility. Sherman Street's limits extend from The Banner Hospital access road northward to Augusta Lane.

The current field investigation included a site reconnaissance and subsurface exploration. During the site reconnaissance, surface conditions were noted and the location of the exploratory test pits were determined by using existing features at the site. Therefore, the approximate location of the exploratory test pits should be considered accurate only to the degree implied by the methods used.

Six (6) exploratory test pits were excavated with a Caterpillar Mini Excavator to a maximum depth of nine and a half (9.5) feet below-existing-grade (b.e.g.) in the shoulder of the street. The locations of the exploratory test pits within the site are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnician in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected at each material change within the exploratory test pits and subsequently transported to our Carson City geotechnical laboratories for testing and additional analysis.

The subsurface soils encountered consisted generally of silty sands, poorly graded sands with silt, poorly graded sands, sandy lean clays, sandy fat clays, and non-native poorly graded gravel (roadway base) (SM, SP-SM, SP, CL, CH, and GP). Poor subgrade soils (CL) were encountered in Test Pits 2, 5, and 6 at or near the surface. We anticipate overexcavation in these areas. Suitable subgrade soils (SM and SP-SM) were encountered in test pits 1, 3, and 4. The soils in these areas are anticipated to be suitable to provide direct structural support. Groundwater was encountered in test pits TP-1, TP-2, TP-5, and TP-6 at depths ranging form six and a half to nine (6.5-9) feet at the time of our investigation. Additionally, seasonal fluctuations in the groundwater table should be anticipated.

4.0 FIELD AND LABORATORY TEST DATA

Laboratory tests performed on representative samples included sieve analysis (including fines), Atterberg limits, r-value, moisture density curve, hydraulic conductivity, expansion index, pH, resistivity, and soluble sulfate. Much of this data is displayed on the "logs" of the test pits to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the test pits are included in Appendix A of this report as Plates A-1 through A-6. A key to the logs is included as Plate A-9.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-6. Laboratory testing was performed per ASTM standards, except when test procedures are briefly described and no ASTM standard is specifically referenced in the report. Atterberg limits were determined using the dry method of preparation.

4.1 Analytical Testing

Silver State Analytical Laboratories, Reno, Nevada, conducted this testing. The testing included pH, resistivity, soluble sulfates. Test results are included (on Silver State letterhead) in Plate B-5.

4.2 Hydraulic Conductivity Testing

Geo Logic Associates, Inc. Reno, Nevada, conducted this testing. The testing was performed on the site poorly graded sands and poorly graded sands with silt. Test results are included (on Geo Logic letterhead) in Plate B-6.

The soil samples obtained during this investigation will be held in our laboratory for 30 days from the date of this report. The samples may be retained longer at an additional cost to the client or obtained from this office upon request.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

The following recommendations are based upon the construction and our understanding and assumptions of the proposed improvements, as outlined in the introduction of this report, and based on our findings during the field exploration phase of this project. If changes in the construction project are proposed, they should be presented to Lumos & Associates, Inc. Geotechnical Department, so that the recommendations provided herein can be reviewed and modified as necessary. At a minimum, final construction drawings should be submitted to the Lumos Geotechnical Department for review prior to actual construction and verification that our geotechnical design recommendations have been implemented.

5.2 General Site Grading

Prior to placement of fill and/or the proposed improvements, the areas to receive fill and/or improvements shall be cleared and grubbed. Clearing and grubbing is not anticipated under the asphalt concrete, however, if improvements will be placed outside of the roadway then it is anticipated to be as much as six (6) inches or more where thicker pavement is present.

Root- or organic-laden soils encountered during excavations, should be stockpiled in a designated area on site for later use in landscaping, or removed off site as directed by the owner. Excavated soils free from any organics, debris or otherwise unsuitable material and with particles no larger than four (4) inches in maximum dimension may be stockpiled and moisture conditioned for later use as compacted fill provided it meets the criteria for structural fill soils.

Exposed excavation surfaces to support any of the proposed improvements should be observed and approved by a Lumos representative. Upon re-compaction and prior to placing any base, the re-compacted surface should be proof-rolled to identify any possible yielding surfaces. Proof-rolling should be conducted with a heavy rubber-tire loader with a fully loaded bucket, or a fully loaded water truck, and observed and approved by a Lumos representative.

Unstable conditions due to yielding and/or pumping soils may be encountered on site. Additionally, the exposed soils may yield or pump under heavy equipment loads or where vibratory equipment draws up water. If yielding or pumping conditions are encountered, the soils should be scarified in place, allowed to dry as necessary and re-compacted, where applicable. Alternatively, unsuitable or saturated soil should be removed, the exposed surface leveled and compacted/tamped as much as practical without causing further pumping, and covered (including the sides) with geotextile stabilizing fabric (Mirafi HP370 or other equivalent). The fabric should then be covered with at least twelve (12) inches of four (4) to eight (8) inch **angular rock fill** with enough fines to fill the inter-rock pore spaces. Placement should be by end dumping. No traffic or other action should be allowed over the fabric, which may cause it to deflect/deform prior to cobble placement. Test sections should be used to determine the minimum thickness and/or number of layers required for stabilization.

Stabilization should be evaluated by proof-rolling standards commensurate with the equipment used, and approved by a Lumos representative. The placement of the stabilizing rock-fill may require additional over-excavation to maintain appropriate grading elevations. A filter fabric (Mirafi 180N or equal) should also be placed over the cobble rock fill to prevent piping of fines from covering soils into the stabilizing rock matrix.

Properly compacted structural fill and trench backfill soils to be used on site should consist of non-expansive materials [LL less than thirty-five (35) and/or a PI less than twelve (12) and/or Expansion Index less than twenty (20)], should be free of contaminants, organics [less than two (2) percent], rubble, or natural rock larger than four (4) inches in largest dimension. All structural fill and trench backfill soils shall also be non-corrosive and have a water soluble sulfate content of less than one-tenth (0.1) percent and a minimum "R"-Value of thirty (30). Structural fill and trench backfill soils shall also meet the following gradation requirements (Table 1 next page):

TABLE 1

STRUCTURAL FILL/TRENCH BACKFILL GRADATION

Sieve Size	% Passing
4"	100
¾"	70-100
#40	15-65
#200	5-25

Structural fill and trench backfill soils that do not meet the above requirements may be approved at the discretion of the Geotechnical Engineer. It is anticipated that the poorly-graded sand with silt (SP-SM) and the silty sands (SM), encountered in all test pits will be suitable for reuse as structural fill and trench backfill. The clays (CL and CH) encountered in test pits 2, 4, 5, and 6 are not suitable for reuse as structural fill and trench backfill. Import structural fill and trench backfill soils should be tested and approved prior to being placed or delivered on-site (**seven day advanced notice**).

Prior to placement of structural fill, the site subgrade shall be scarified to a depth of twelve (12) inches, moisture conditioned to within two percent (2%) of optimum, and recompacted to a minimum of ninety percent (90%) as determined by the ASTM D1557 Standard. If clay subgrade soils are encountered, they shall be overexcavated to a depth of at least six (6) inches below subgrade elevation and replaced with structural fill/trench backfill.

Structural fill and trench backfill should be placed only on compacted sub-grade or on compacted fill in loose lifts not exceeding eight (8) inches, moisture conditioned to within two percent (2%) of optimum, and compacted to at least **ninety percent (90%)** relative compaction as determined by the ASTM D1557 Standard. Lift thickness may be increased, at the discretion of the Geotechnical Engineer, provided the contractor can demonstrate that adequate compaction is being achieved.

Fill material should not be placed, spread or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by heavy rain or snow,

grading or filling operations should not resume until a Lumos representative approves the moisture content and density conditions of the subgrade or previously placed fill. When fill is placed on existing slopes steeper than 5:1, the existing slope shall be horizontally benched. Landscape areas should be cleared of all objectionable material. In cut areas, no other work is necessary except grading to proper elevation. In landscape areas, fill should be placed in loose lifts not exceeding eight inches and compacted to at least ninety percent (90%) relative compaction to prevent erosion.

Water should not be allowed to pond on or adjacent to sewer improvements, and measures should be taken to reduce surface water infiltration into the subgrade soils. A representative of Lumos should be present during site grading operations to ensure any unforeseen or concealed conditions within the site are identified and properly mitigated, and to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction and is dependent upon compaction and stability of the subgrade soils. The soils engineer may reject any material that does not meet engineering characteristics, compaction, and stability requirements. Further, recommendations of this report are based upon the assumption that earthwork construction will conform to recommendations set forth in this section of the report.

5.3 Infiltration Recommendations

Two (2) hydraulic conductivity tests were performed, one on each street, to determine the size of the rapid infiltration units to be constructed on the site. These tests were performed in the poorly graded sand (SP) and poorly graded sand with silt (SP-SM). The infiltration data is included on plates B-6. We recommend the units to be placed within these sand layers and be backfilled with material meeting the structural fill/trench backfill requirements. These sand layers were encountered in Test Pit 1 at 2.5 feet, Test Pit 2 at 4.5 feet, Test Pit 3 at 5.5 feet, Test Pit 4 at 7 feet, Test Pit 5 at 6.5 feet, and Test Pit 6 at 4.5 feet.

6.0 PAVEMENT DESIGN

6.1 Design Criteria

The pavement structural section for the asphalt concrete utilizing an R-value of 6 (Laboratory Test Results) is provided in Table 2, "Recommended Asphalt Pavement Sections. Traffic loading, based on our knowledge of the area, was assumed to be classified as collector with heavy traffic on North Broadway Street and a collector with light traffic on Sherman Street. The design traffic indices of 6.5 for North Broadway Street and 6.0 for Sherman Street were selected.

6.2 Pulverization and Asphalt Concrete

Lumos recommends pulverizing the existing asphalt concrete and base and reusing this material as base and/or structural fill/trench backfill. The pulverized asphalt concrete and base material shall meet the requirements of Type 1 Recycled Aggregate Base in the standard specifications if to be reused as base material. Pulverized aggregate base material shall be moisture conditioned to within two percent (2%) of optimum and compacted to at least ninety-five percent (95%) of the laboratory maximum density, as determined by the ASTM D1557 standard. Prior to placement of asphalt, we recommend roadway pulverized base be proof rolled utilizing a loader with a full bucket, or a fully loaded 10 wheel water truck. Observed pumping and/or yielding subgrade soils located during the proof rolling, shall be stabilized to the satisfaction of the Geotechnical Engineer.

TABLE 2

RECOMMENDED ASPHALT PAVEMENT SECTION

Street	Traffic Index	Minimum Asphalt Pavement	Minimum Pulverized Aggregate Base	Minimum Properly Prepared Suitable Subgrade/Structural Fill
North Broadway	6.5	4"	8"	6"
Sherman	6.0	4"	6"	6"

See Appendix C for Calculations

In the reconstruction areas of the project, the asphalt concrete should consist of PG64-28NV, and Type 2 asphalt aggregate per the "Orange Book" standards. We recommend a 50-blow Marshall mix that targets four percent (4%) air voids. Asphalt concrete, in any case, should be compacted to between ninety-two percent (92%) and ninety-seven percent (97%) of the Rice theoretical maximum density. All mix designs for asphalt concrete should be submitted to the Geotechnical Engineer for review and approval a minimum of seven (7) days prior to paving.

7.0 CORROSION AND CHEMICAL ATTACK

On-site soils have a negligible water-soluble sulfate content of less than 0.10% (<0.01% actual) in both samples tested. No specific type of cement is required for concrete in direct contact with on-site soils, as required by the Standard Specifications. However, Type II cement (meeting ASTM C150) is recommended for concrete in direct contact with on-site soils.

All exterior concrete should have between four and one half to seven and one half percent (4.5-7.5 %) entrained air, a maximum water-cement ratio of 0.45, and comply with all other ACI recommendations for concrete placed in areas subject to freezing. A minimum compression strength of four-thousand (4,000) psi is recommended for all external concrete. All interior concrete should also be placed pursuant to ACI recommendations.

Test results indicate native soils have pH test results of 8.76 and 7.19 and have a resistivity test results of 5,100 and 5,600 ohm-cm under saturated conditions. This indicates the site soils are considered corrosive toward ferrous metals in contact with these soils. Corrosion mitigation measures, such as protective coatings, wrappings, and cathodic protection are therefore recommended. If protective coatings are used, the type and quantity will depend on the kind of steel and specific construction application. Steel and wire concrete reinforcement cover of at least three (3) inches where cast against soil, unformed, is recommended.

8.0 UTILITY EXCAVATIONS

On-site soils are anticipated to be excavatable with conventional construction equipment. Compliance with OSHA regulations should be enforced for Type C soils. Native non-plastic to low plastic sands (SP-SM, SP, SM) (P.I. ≤ 12) may be suitable for backfill of utility trenches, provided soils meet the requirements of structural fill/trench backfill as mentioned earlier in this report. Trench backfill/structural fill shall be moisture conditioned, placed and compacted as previously discussed in the grading and filling section. On-site soils encountered during our field exploration do not meet the minimum requirements for bedding sand (Class A Backfill) and should be imported, where required. Bedding sand shall be placed in eight (8) inch maximum loose lifts and compacted to a minimum of ninety percent (90%) of the ASTM D1557 Standard. Groundwater was encountered during our field investigation in several of our test pits. If groundwater is encountered, we recommend "burrito wrapped" Class C Drain Rock be utilized as bedding to an elevation of at least one (1) foot above groundwater. Class C material shall meet the requirements in the Standard Specifications. The Class C Drain Rock shall be placed in one (1) foot lifts and compacted with a vibra plate to the satisfaction of the geotechnical engineer.

9.0 MOISTURE PROTECTION, EROSION AND DRAINAGE

The finish surfaces around all structures should slope away from the foundations and toward appropriate drop inlets or other surface drainage devices. It is recommended that within ten feet of any structure a minimum slope of five percent (5%) be used for soil subgrade and a minimum of one percent (1%) be used for pavement. These grades should be maintained for the life of the structures.

10.0 CONSTRUCTION SPECIFICATIONS

All work shall be governed by the Standard Specifications and Standard Details for Public Works Construction (SSPWC), as distributed by City of Fallon, except as modified herein.

11.0 LIMITATIONS

This report has been prepared in accordance with the currently accepted engineering practices in Northern Nevada. The analysis and recommendations in this report are based upon exploration performed at the locations shown on the site plan, the proposed improvements as described in the Introduction section of this report and upon the property in its condition as of the date of this report. Lumos makes no guarantee as to the continuity of conditions as subsurface variations may occur between or beyond exploration points and over time. Any subsurface variations encountered during construction should be immediately reported to Lumos so that, if necessary, Lumos' recommendations may be modified.

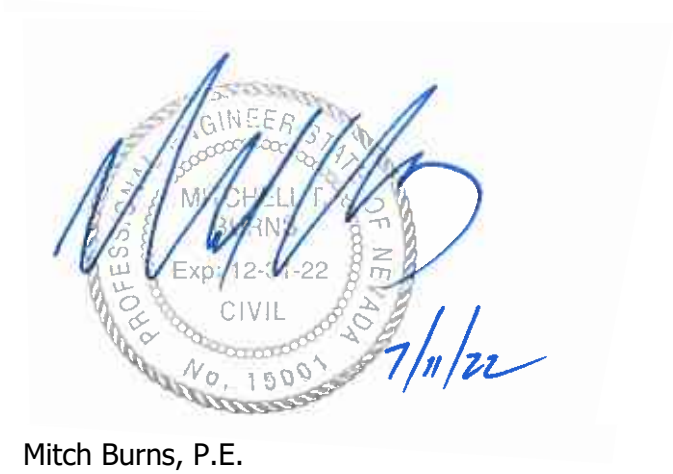
This report has been prepared for and provided directly to City of Fallon ("The Client"), and any and all use of this report is expressly limited to the exclusive use of the Client. The Client is responsible for determining who, if anyone, shall be provided this report, including any designers and subcontractors whose work is related to this project. Should the Client decide to provide this report to any other individual or entity, Lumos shall not be held liable for any use by those individuals or entities to whom this report is provided. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and employees from any claims resulting from unauthorized users.

If this report is utilized in the preparation of an Engineer's Estimate of Probable Construction Costs, then the preparer of the estimate acknowledges that the report recommendations are based on the subsurface conditions found at the specific locations investigated on site; that subsurface conditions may vary outside these locations; and that no guaranty or warranty, express or implied, is made that the conditions encountered are representative of the entire site. The preparer of the estimate agrees to indemnify, defend and hold harmless Lumos & Associates, its agents and employees from any and all claims, causes of action or liability arising from any claims resulting from the use of the report in the preparation of an Engineer's Cost Estimate.

This report is not intended for, nor should be utilized for, bidding purposes. If it is utilized for bidding purposes, Client acknowledges that the report recommendations are based on the subsurface conditions found at the specific locations investigated on site; that subsurface

conditions may vary outside these locations; and that no guaranty or warranty, express or implied, is made that the conditions encountered are representative of the entire site. The Client agrees to indemnify, defend and hold harmless Lumos & Associates, its agents and employees from any and all claims, causes or action or liability arising from any claims resulting from the use of the report for bidding purposes.

As explained above, subsurface variations may exist and as such, beyond the express findings located in this report, no warranties express, or implied, are made by this report. No affirmation of fact, including but not limited to statements regarding suitability for use of performance shall be deemed to be a warranty or guaranty for any purpose.



Mitch Burns, P.E.
Materials Engineering Manager

12.0 REFERENCES

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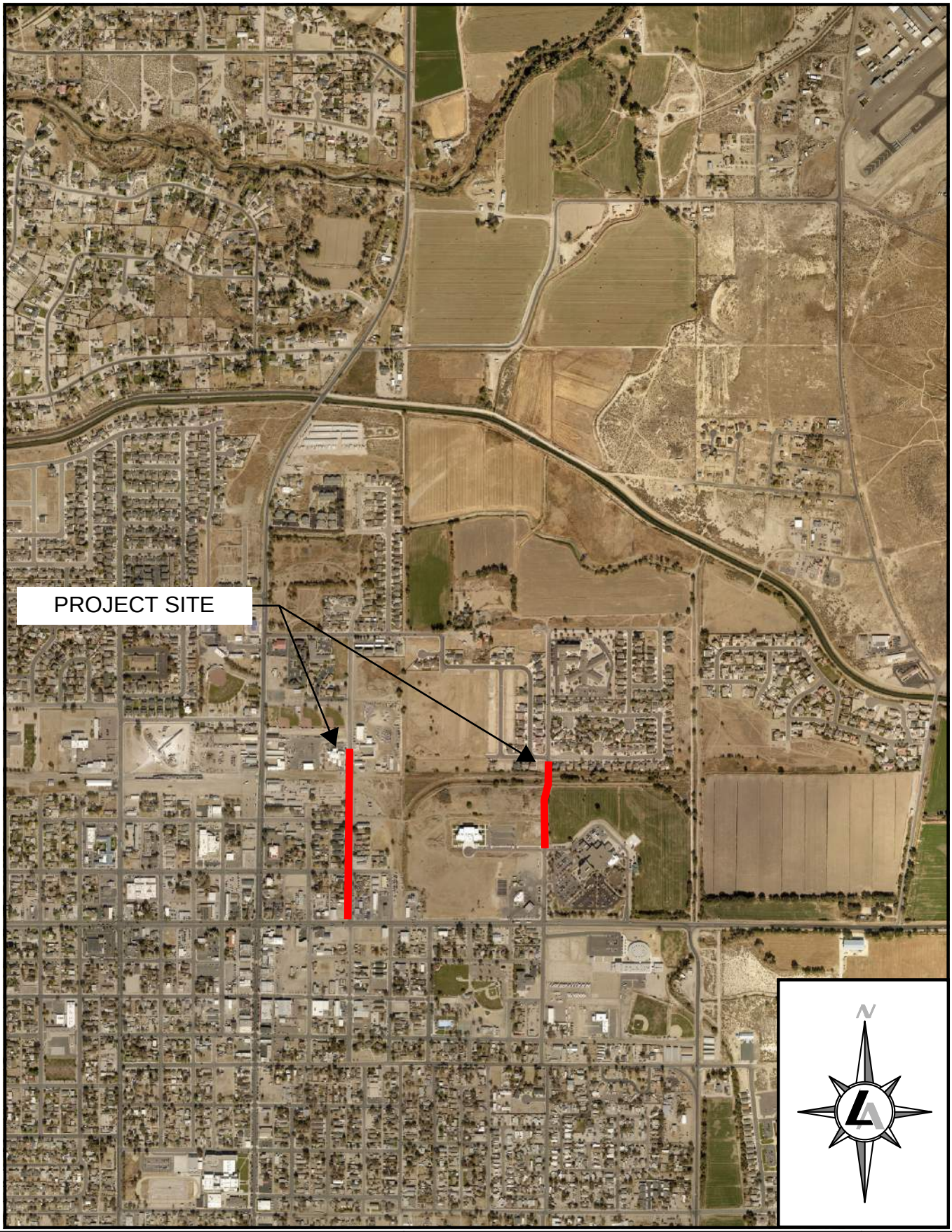

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mburns@lumosinc.com

N. Broadway and Sherman Rehabilitation

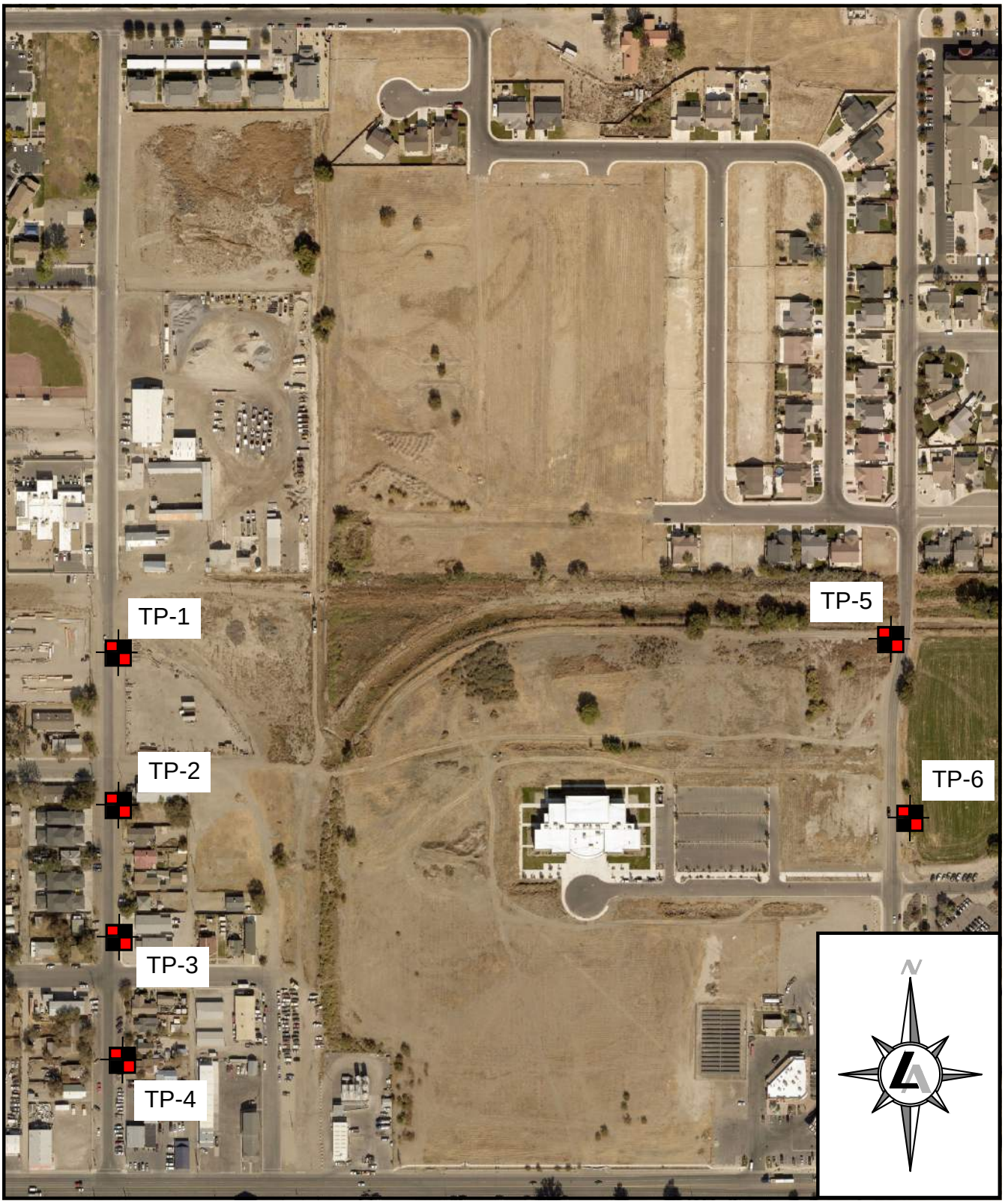
VICINITY MAP

Job Number: 10514.000

Date: October, 2021

PLATE

1



Approximate Test Pit Location

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N. Broadway and Sherman Rehabilitation

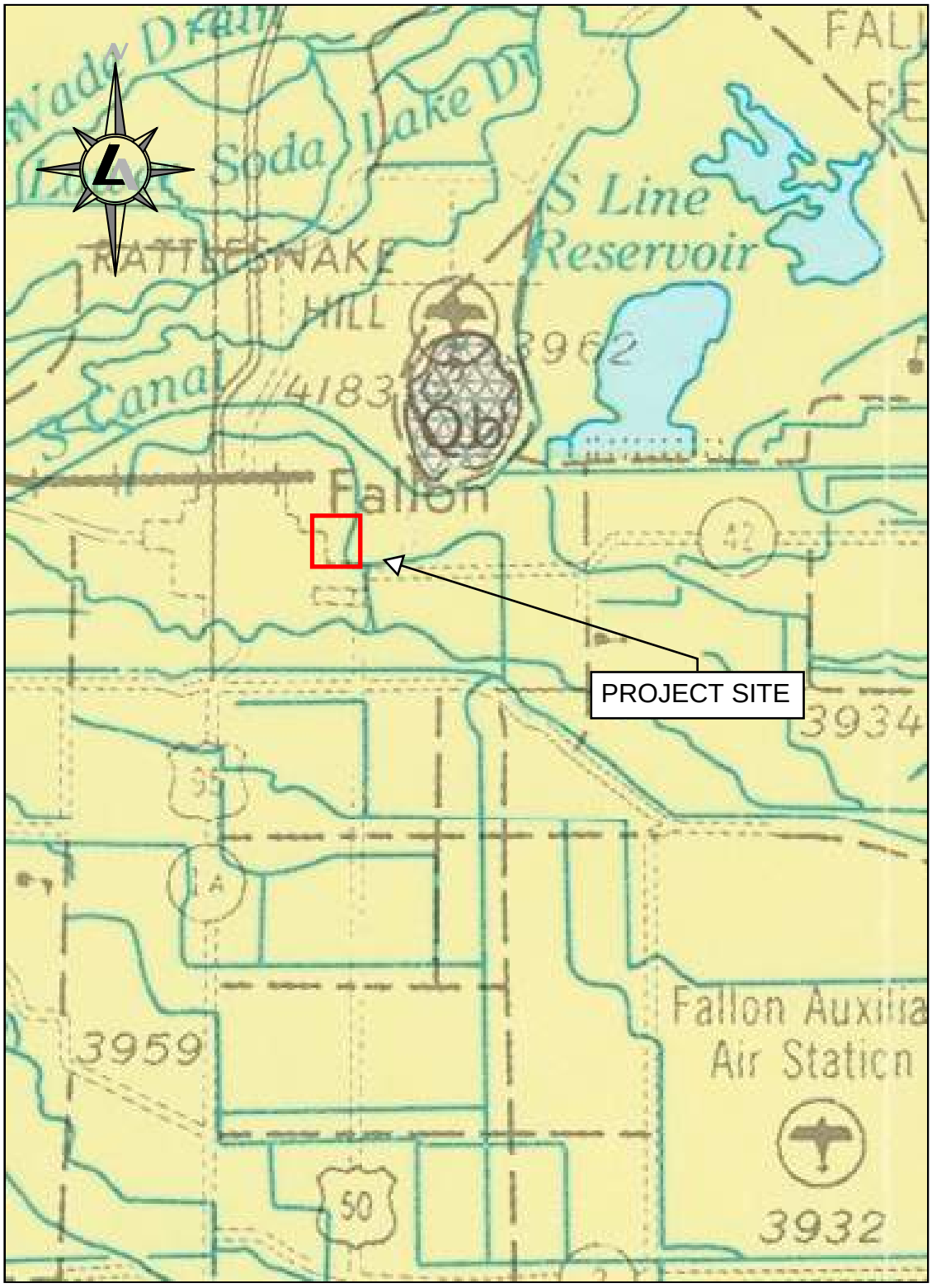
SITE MAP

Job Number: 10514.000

Date: October, 2021

PLATE

2



Qya — Lake Lahontan deposits, playa deposits, and young fan gravels

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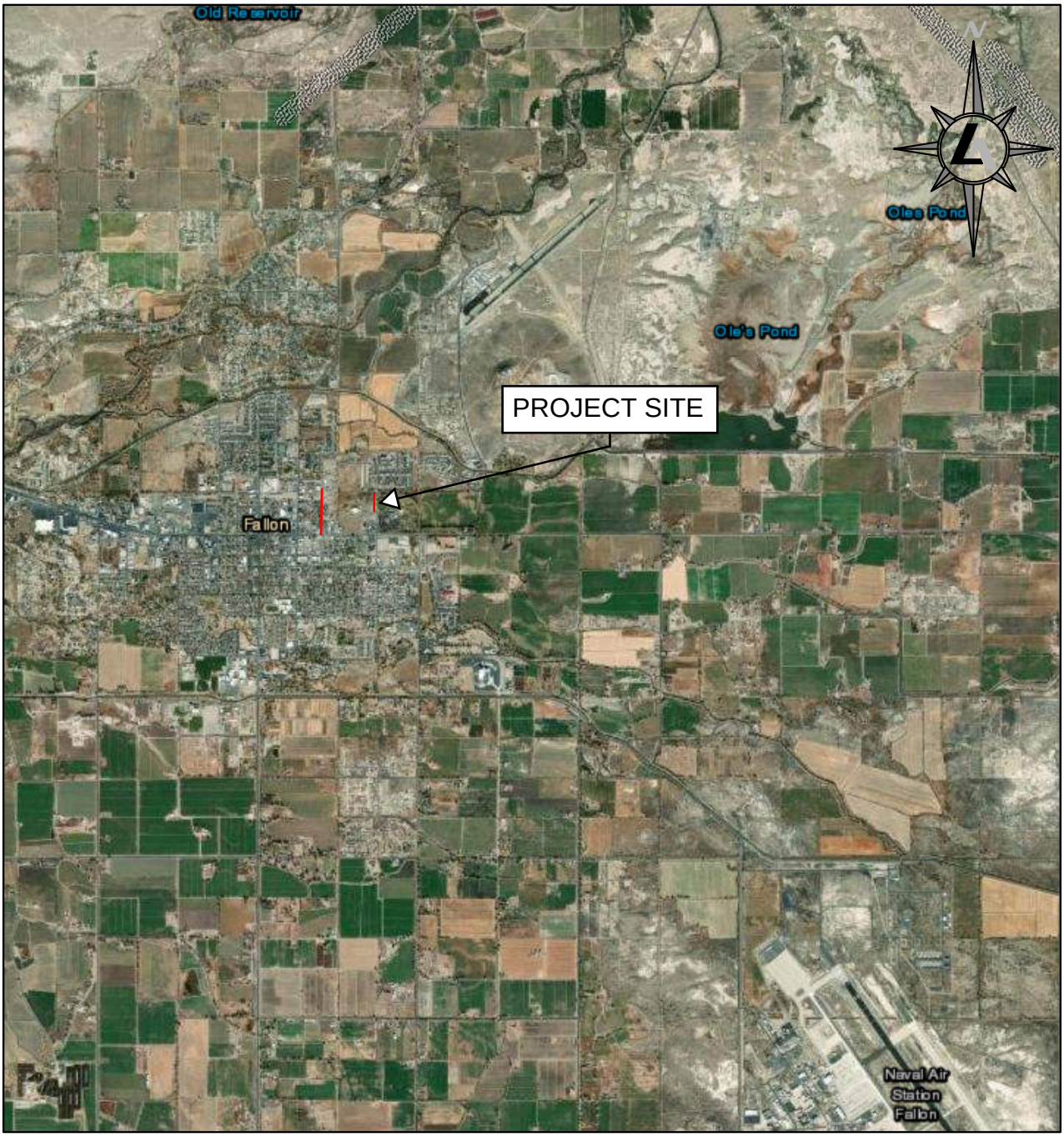
N. Broadway and Sherman Rehabilitation

GEOLOGY MAP

Job Number: 10514.000 Date: October, 2021

PLATE 3

Quaternary Faults of Nevada



September 29, 2021

1:72,224

0 0.5 1 2 mi

0 0.75 1.5 3 km

Esri, HERE, Garmin, Earthstar Geographics, NBMG

Quaternary Faults by Age - 100m Buffer

- less than 15,000
- less than 130,000
- less than 750,000
- less than 1,800,000
- Class B faults
- Unclassified
- less than 150

Quaternary Faults by Age

- less than 15,000 years
- less than 130,000 years
- less than 750,000 years
- less than 1.8 million years
- Class B faults

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N. Broadway and Sherman Rehabilitation

FAULT MAP

Job Number: 10514.000

Date: October, 2021

PLATE

4

APPENDIX A

Field Exploration Logs

LUMOS & ASSOCIATES

TEST PIT No. TP-1

Logged By: **M. Hartley**
Date Logged: **9/16/2021**
Equipment Type: **CAT Mini Excavator**

Total Depth: **8 feet**
Water Depth: **6.5 feet ±**
Ground Elev.:

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
1		B	**Silty SAND (SM)** Brown, Slightly Moist, Medium Dense				NP	NP	0.0	65.8	34.2			
2			2.5											
3		B	**Poorly Graded SAND (SP)** Light Brown, Slightly Moist to Wet, Loose to Medium Dense Estimated: 100% Coarse to Fine Sand											
4														
5			Caving in Sand											
6														
7			▼ Groundwater at 6.5 Feet											
8			8.0											

Test pit terminated at 8 feet.
Test pit backfilled without compaction verification.

LUMOS_TP_FULL_PAGE WITH R-V AND SHEAR_BROADWAY AND SHERMAN.GPJ US_LAB.GDT 11/3/21

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N. Broadway and Sherman Rehabilitation

LOG OF EXPORATORY TEST PIT

Job Number: 10514.000
Date: November 2021

PLATE
A-1

TEST PIT No. TP-2

Logged By: **M. Hartley**
Date Logged: **9/16/2021**
Equipment Type: **CAT Mini Excavator**

Total Depth: **8 feet**
Water Depth: **7.25 feet ±**
Ground Elev.:

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
			Base 8 Inches of Base Like Material 0.7											
1		B	**Sandy Lean CLAY (CL)** Dark Brown, Moist, Stiff				39	20	1.3	37.3	61.4	35		
2														
3														
4			4.5											
			Poorly Graded SAND (SP) Brown, Moist to Wet, Loose to Medium Dense Estimated: 100% Coarse to Fine Sand											
5		B												
6														
7			Groundwater at 7.25 feet Sands Cave Below Water Table											
8			8.0											

Test pit terminated at 8 feet.
Test pit backfilled without compaction verification.

LUMOS_TP_FULL_PAGE WITH R-V AND SHEAR_BROADWAY AND SHERMAN.GPJ_US_LAB.GDT 11/3/21

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N. Broadway and Sherman Rehabilitation

LOG OF EXPORATORY TEST PIT

Job Number: 10514.000
Date: November 2021

PLATE
A-2

TEST PIT No. TP-3

Logged By: **M. Hartley**
Date Logged: **9/16/2021**
Equipment Type: **CAT Mini Excavator**

Total Depth: **9.5 feet**
Water Depth: **No groundwater encountered**
Ground Elev.:

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
			Base 8 Inches of Base Like Material 0.7											
1		B	**Silty SAND (SM)** Tan, Slightly Moist, Dense				NP	NP	0.3	82.4	17.3		44	
2														
3														
4														
5			5.5											
6		B	**Poorly Graded SAND (SP)** Tan, slightly Moist, Loose to Medium Dense Estimated: 100% Coarse to Fine Sand No Ground Water Observed Mottling Observed at 6.25'											
7														
8														
9			9.5											

Test pit terminated at 9.5 feet.
Test pit backfilled without compaction verification.

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LOG OF EXPORATORY TEST PIT

Job Number: 10514.000
Date: November 2021

PLATE
A-3

TEST PIT No. TP-4

Logged By: **M. Hartley**
Date Logged: **9/16/2021**
Equipment Type: **CAT Mini Excavator**

Total Depth: **9 feet**
Water Depth: **No groundwater encountered**
Ground Elev.:

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
			Base 8 Inches of Base Like Material 0.7											
1		B	**Poorly Graded SAND with Silt (SP-SM)** Tan, Slightly Moist, Dense				NP	NP	1.4	91.8	6.8			
2														
3														
4														
5														
6			6.0											
		B	**Sandy Fat CLAY (CH)** Light Brown, Moist, Medium Stiff Estimated: 30% Medium to Fine Coarse 70% Fat Clay											
7														
8														
9			9.0											

Test pit terminated at 9 feet.
Test pit backfilled without compaction verification.

LUMOS_TP_FULL_PAGE WITH R-V AND SHEAR_BROADWAY AND SHERMAN.GPJ_US_LAB.GDT 11/3/21

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LOG OF EXPORATORY TEST PIT

Job Number: 10514.000

Date: November 2021

PLATE

A-4

TEST PIT No. TP-5

Logged By: **M. Hartley**
Date Logged: **9/16/2021**
Equipment Type: **CAT Mini Excavator**

Total Depth: **10 feet**
Water Depth: **9 feet ±**
Ground Elev.:

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
0			**Sandy Lean CLAY (CL)** Brown, Slightly Moist, Medium Stiff				34	17	3.0	43.1	53.9	20	6	
1		B												
2														
3														
4			4.5											
5		B	**Sandy Lean CLAY (CL)** Dark Brown, Moist, Medium Stiff Estimated: 40% Coarse to Fine Sand 60% Lean Clay											
6			6.5											
7		B	**Poorly Graded SAND (SP)** Tan, Moist to Wet, Loose to Medium Dense Estimated: 100% Coarse to Fine Sand Mottling at 6.75 Caving in Sand											
8														
9			▼ Groundwater at 9 Feet											
10			10.0											

Test pit terminated at 10 feet.
Test pit backfilled without compaction verification.

LUMOS_TP_FULL_PAGE WITH R-V AND SHEAR_BROADWAY AND SHERMAN.GPJ_US_LAB.GDT 11/3/21

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LOG OF EXPORATORY TEST PIT

Job Number: 10514.000
Date: November 2021

PLATE
A-5

TEST PIT No. TP-6

Logged By: **M. Hartley** | Total Depth: **9 feet**
Date Logged: **9/16/2021** | Water Depth: **8.25 feet ±**
Equipment Type: **CAT Mini Excavator** | Ground Elev.:

Percolation Test | Split Spoon | Ziplock Sample
California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
0			**Base**	0.3											
			3 Inches of Base Like Material												
			Lean CLAY with Sand (CL)												
1		B	Dark Brown, Slightly Moist, Stiff					48	28	0.0	27.5	72.5			
2															
3				3.5											
			Silty SAND (SM)												
4		B	Tan, Slightly Moist, Medium Dense												
			Estimated:												
			70% Medium to Fine Sand												
			30% Silt	4.5											
5			**Poorly Graded SAND (SP)**												
			Tan, Moist to Wet, Loose												
			Caving in Sand												
6		B	Mottling at 5.5 Feet					NP	NP	0.1	97.4	2.6			
7															
8			Groundwater at 8.25 Feet												
9				9.0											

Test pit terminated at 9 feet.
Test pit backfilled without compaction verification.

LUMOS_TP_FULL_PAGE WITH R-V AND SHEAR_BROADWAY AND SHERMAN.GPJ US_LAB.GDT 11/3/21

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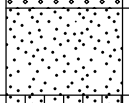
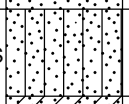
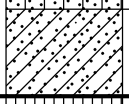
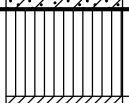
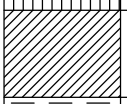
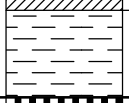
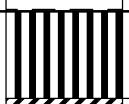
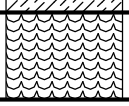
LOG OF EXPORATORY TEST PIT

Job Number: 10514.000 | Date: November 2021

PLATE A-6

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Other Tests

AN	ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)
C	CONSOLIDATION TEST
DS	DIRECT SHEAR TEST
MD	MOISTURE DENSITY CURVE

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N. Broadway and Sherman Rehabilitation

LEGEND

Job Number: 10514.000

Date: November 2021

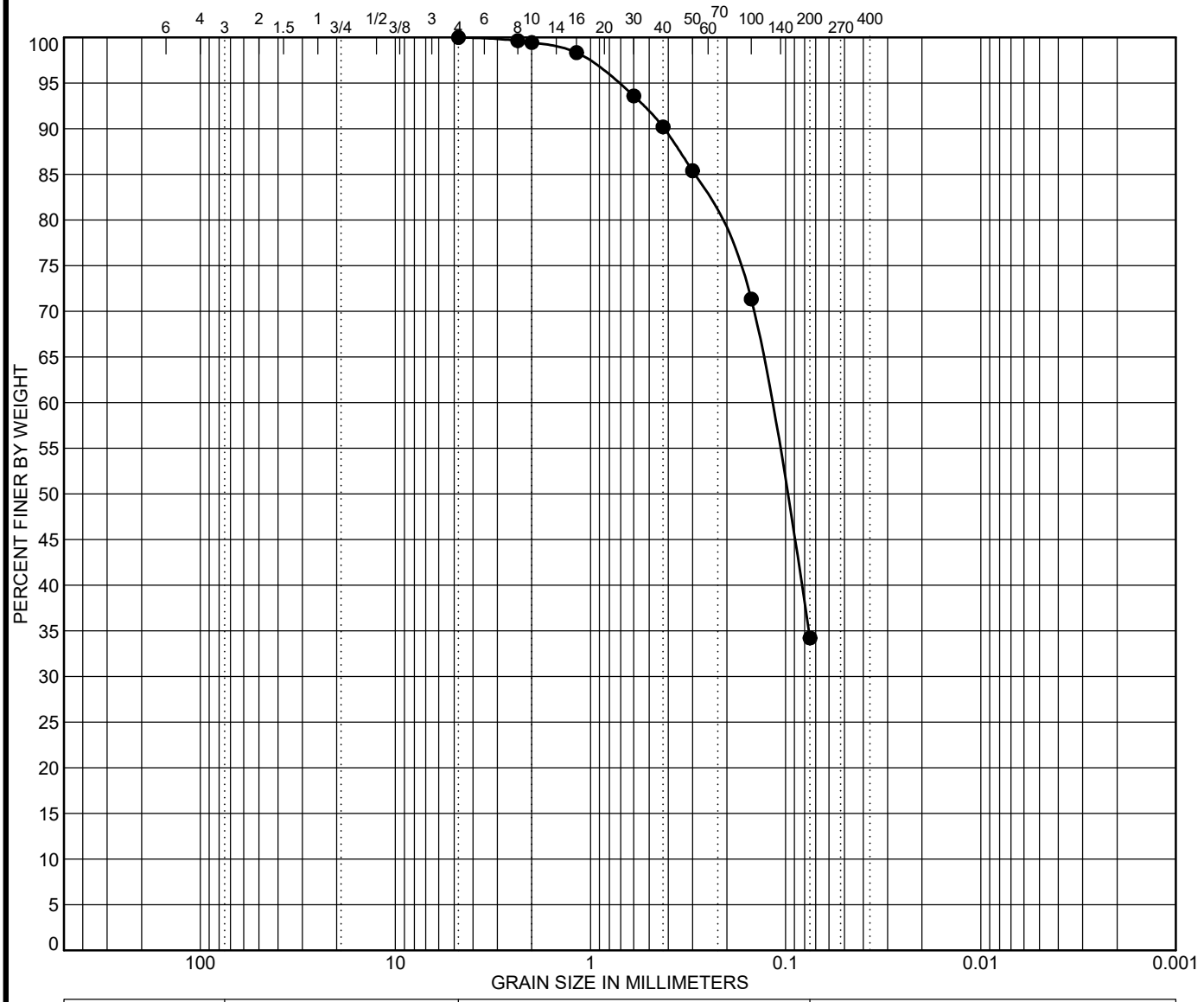
PLATE

A-7

APPENDIX B

Soils Laboratory Test Results

LUMOS & ASSOCIATES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 9/18/21					
TP-1	Classification	LL	PL	PI	Cc	Cu
Depth: 1	Silty SAND (SM)	NP	NP	NP		
Sample Location	TP-1 from 1' to 1.5'					
USCS	SM					
AASHTO						

Specimen Identification								
TP-1	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 1	4.75	0.121			0.0	65.8	34.2	

Natural Moisture	%		**Direct Shear**		**Absorption %**		
R-Value			**Insitu Density**		**Soundness**		
Expansion Index			**Specific Gravity**		**S.E.**		

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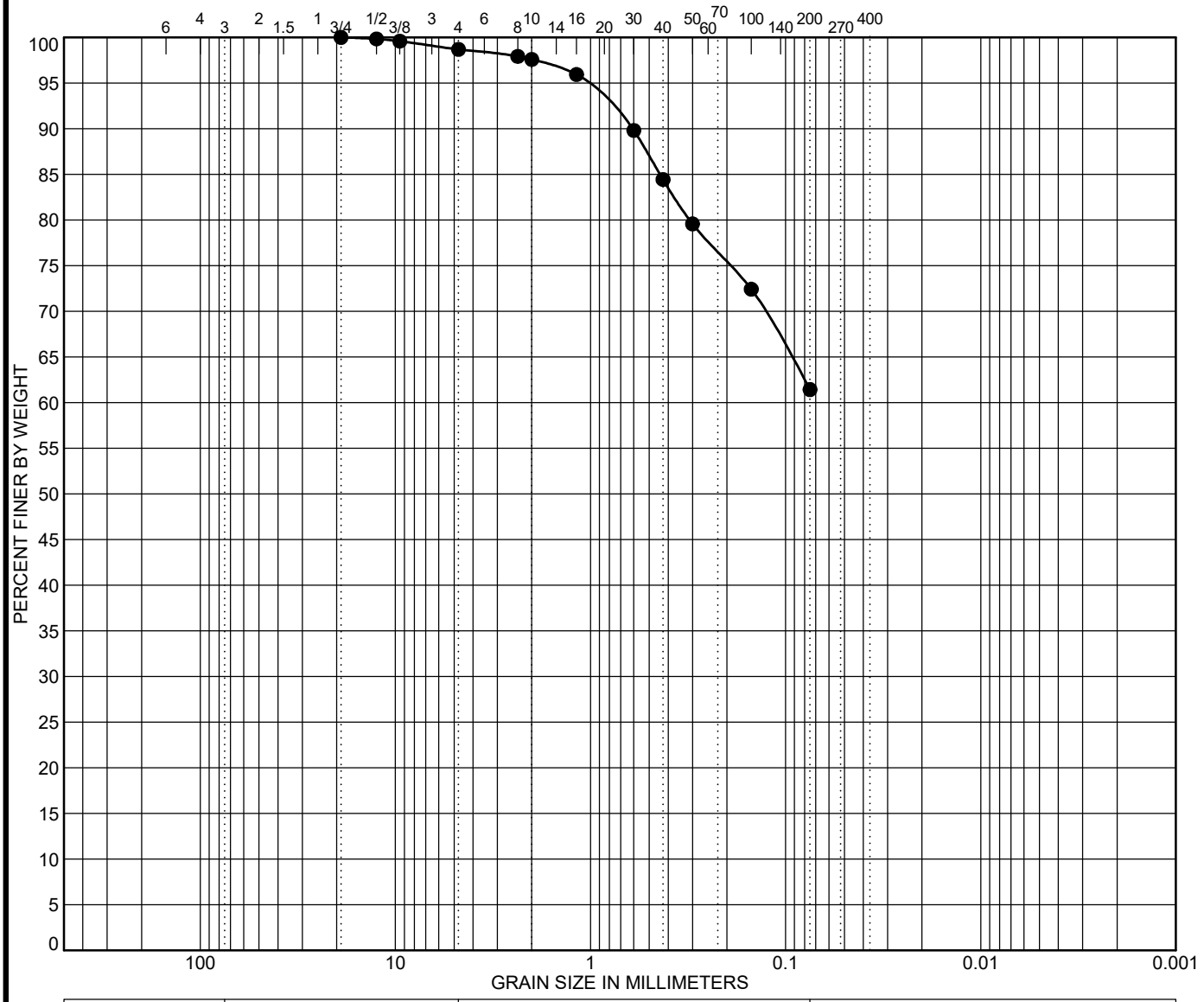
N. Broadway and Sherman Rehabilitation

GRAIN SIZE DISTRIBUTION

Job Number: 10514.000 Date: November 2021

PLATE

B-1.1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 9/18/21					
●	**TP-2**	Classification	LL	PL	PI	Cc	Cu
	Depth: 1	Lean CLAY with Sand (CL)	39	19	20		
	Sample Location	TP-2 from 1' tp 1.5'					
	USCS	CL					
	AASHTO						

	Specimen Identification								
●	**TP-2**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 1	19				1.3	37.3	61.4	

Natural Moisture	%		**Direct Shear**		**Absorption %**		
R-Value			**Insitu Density**		**Soundness**		
Expansion Index	35		**Specific Gravity**		**S.E.**		

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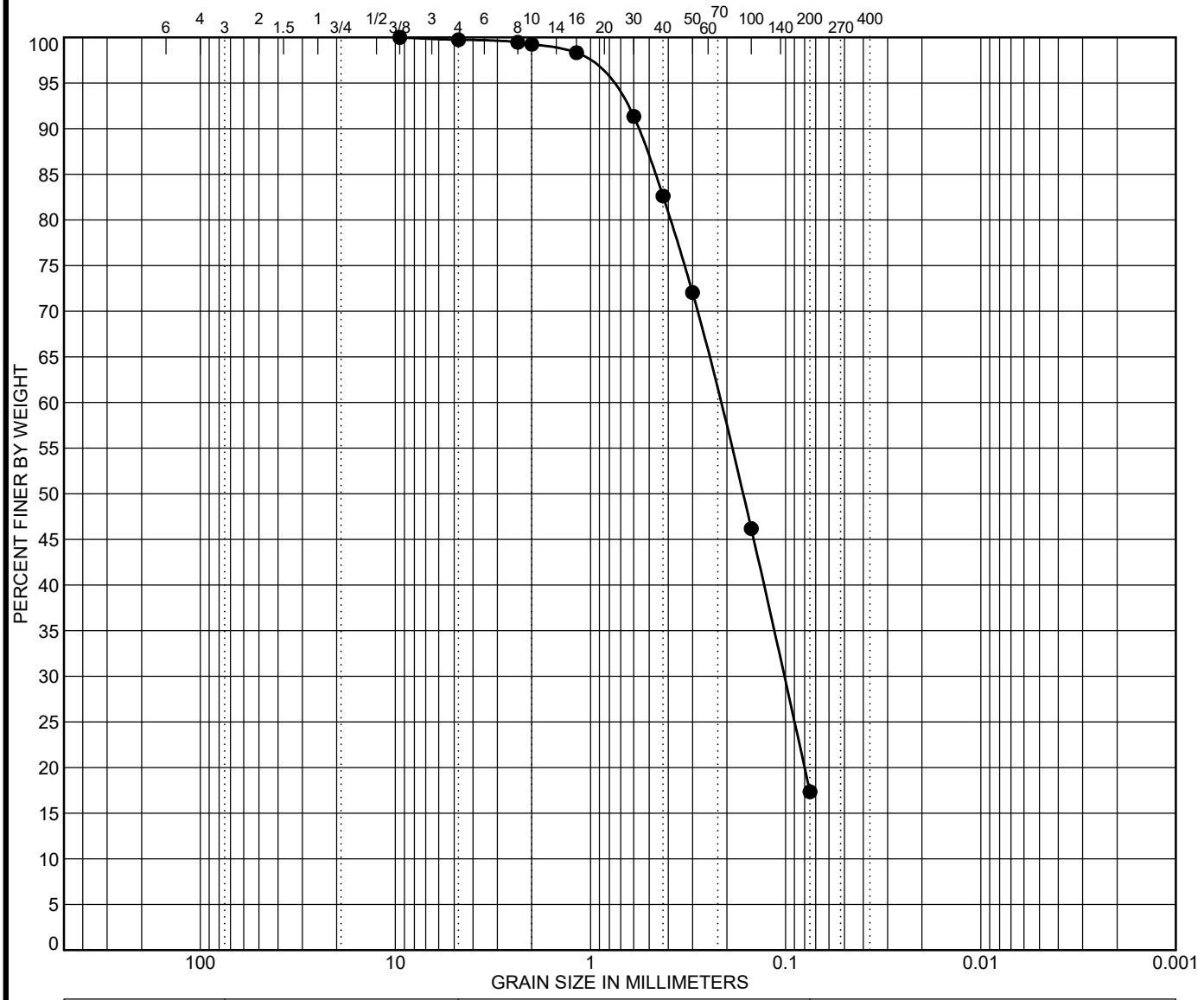
N. Broadway and Sherman Rehabilitation

GRAIN SIZE DISTRIBUTION

Job Number: 10514.000 Date: November 2021

PLATE

B-1.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 9/18/2021						
●	**TP-3**	Classification	LL	PL	PI	Cc	Cu	
	Depth: 1	Silty SAND (SM)	NP	NP	NP			
	Sample Location	TP-3 from 1' to 1.5'						
	USCS	SM						
	AASHTO							

	Specimen Identification								
●	**TP-3**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 1	9.5	0.217	0.102		0.3	82.4	17.3	

Natural Moisture	%		**Direct Shear**		**Absorption %**		
R-Value	44		**Insitu Density**		**Soundness**		
Expansion Index			**Specific Gravity**		**S.E.**		

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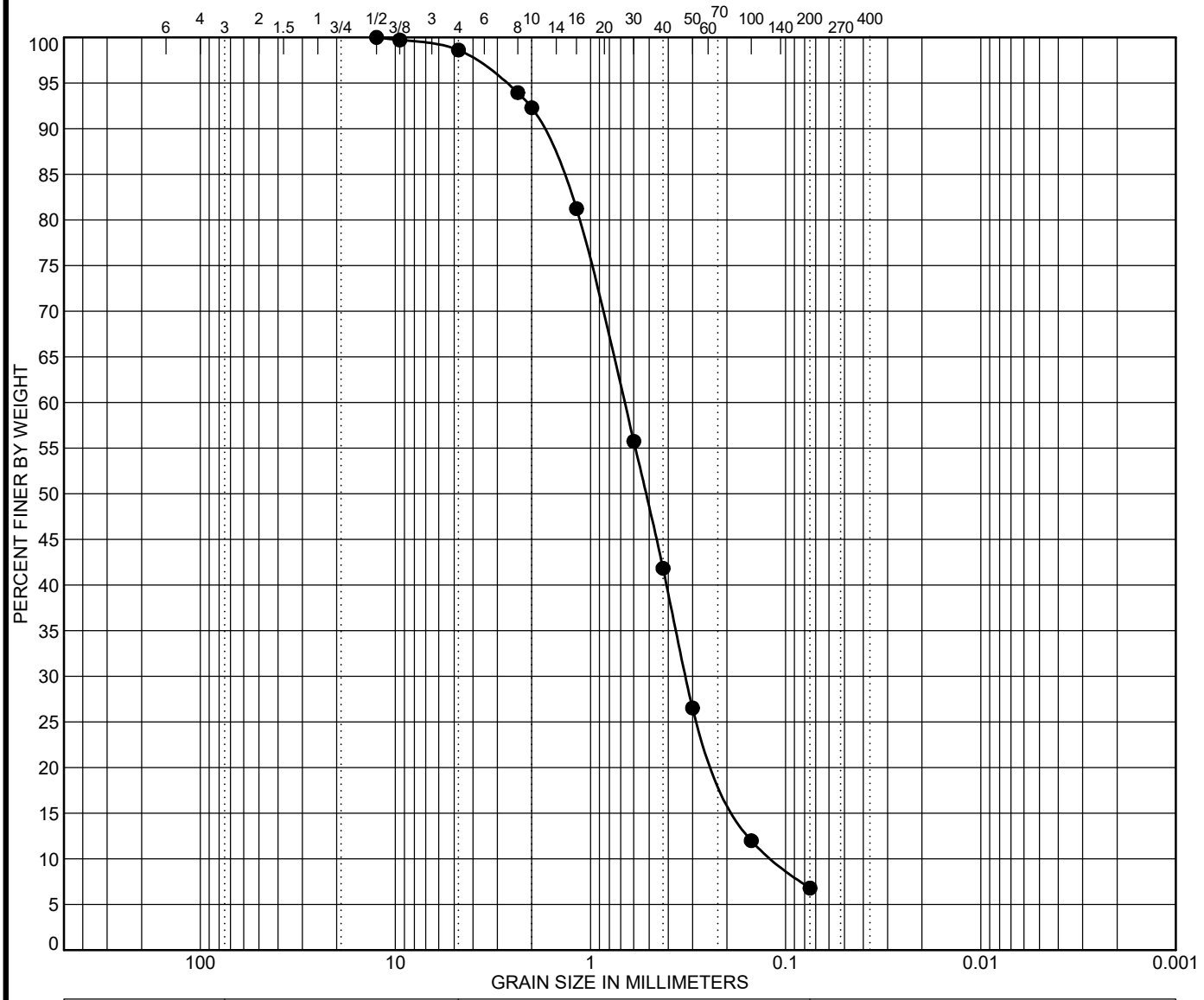
GRAIN SIZE DISTRIBUTION

Job Number: 10514.000 Date: November 2021

PLATE

B-1.3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 9/18/2021					
●	**TP-4**	Classification	LL	PL	PI	Cc	Cu
	Depth: 1	Poorly Graded SAND with Silt (SP-SM)	NP	NP	NP	1.4	5.8
	Sample Location	TP-4 from 1' to 1.5'					
	USCS	SP-SM					
	AASHTO						

	Specimen Identification								
●	**TP-4**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 1	12.5	0.672	0.325	0.115	1.4	91.8	6.8	

	Natural Moisture	%		**Direct Shear**		**Absorption %**	
	R-Value			**Insitu Density**		**Soundness**	
	Expansion Index			**Specific Gravity**		**S.E.**	

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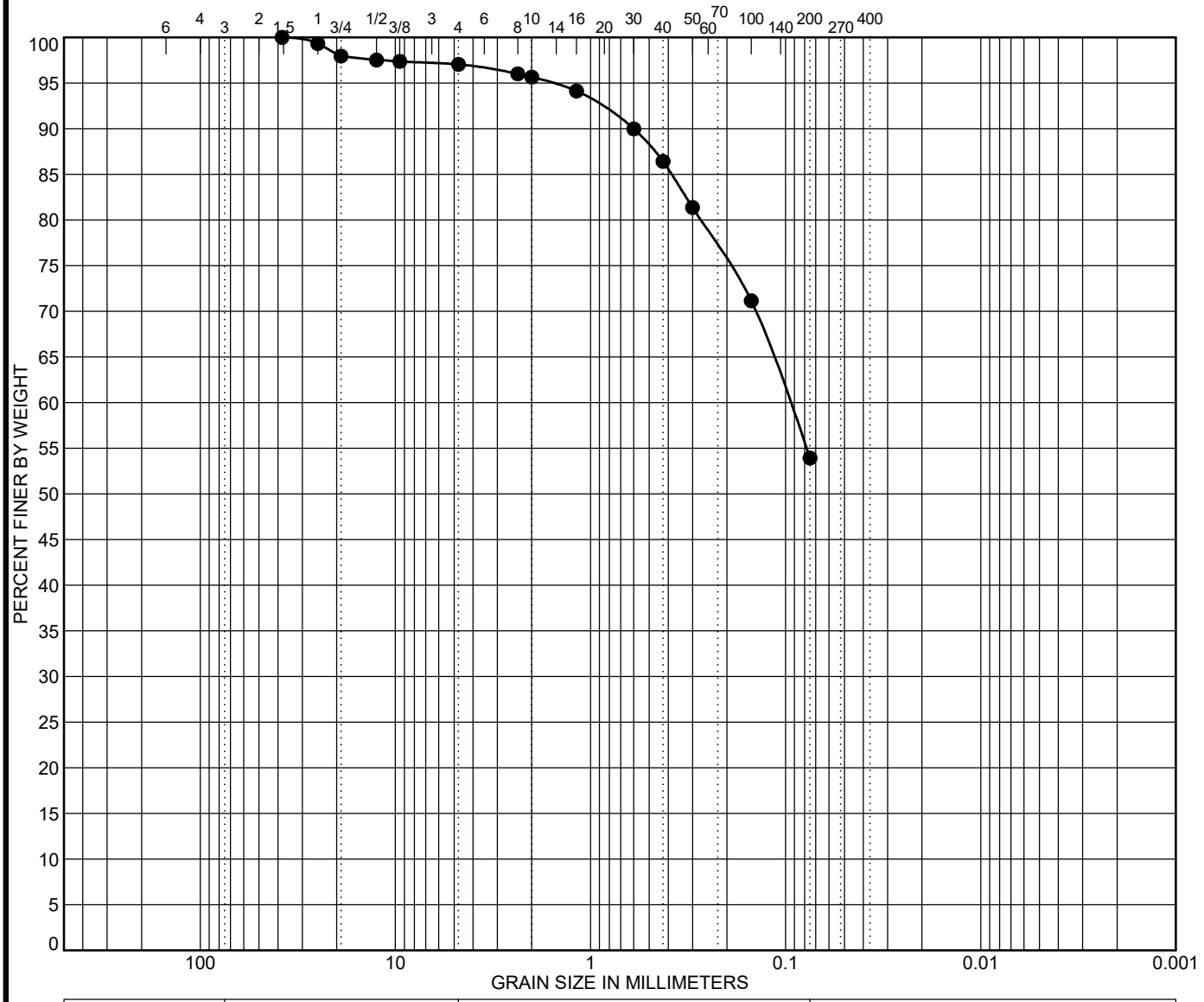
GRAIN SIZE DISTRIBUTION

Job Number: 10514.000 Date: November 2021

PLATE

B-1.4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 9/18/2021						
●	**TP-5**	Classification	LL	PL	PI	Cc	Cu
	Depth: 0.5	Sandy Lean CLAY (CL)	34	18	16		
	Sample Location	TP-5 from 0.5' to 1'					
	USCS	CL					
	AASHTO						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-5**								
	Depth: 0.5	38.1	0.096			3.0	43.1	53.9	

Natural Moisture	%		**Direct Shear**		**Absorption %**		
R-Value	6		**Insitu Density**		**Soundness**		
Expansion Index	20		**Specific Gravity**		**S.E.**		

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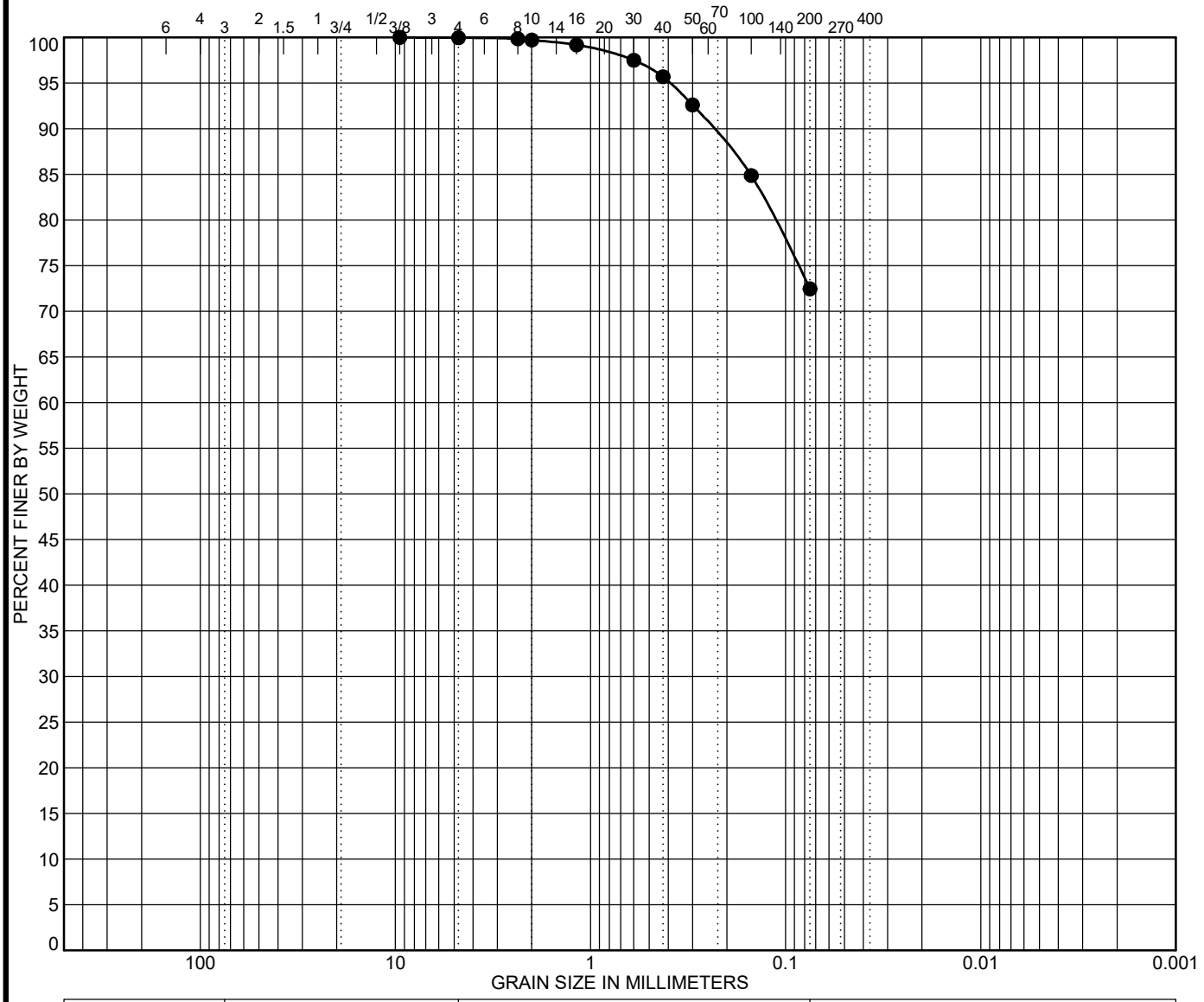
GRAIN SIZE DISTRIBUTION

Job Number: 10514.000 Date: November 2021

PLATE

B-1.5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 9/18/2021						
●	**TP-6**	Classification	LL	PL	PI	Cc	Cu
	Depth: 1	Sandy Lean CLAY (CL)	48	19	29		
	Sample Location	TP-6 from 1' to 1.5'					
	USCS	CL					
	AASHTO						

	Specimen Identification								
●	**TP-6**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 1	9.5				0.0	27.5	72.5	

Natural Moisture	%		**Direct Shear**		**Absorption %**		
R-Value			**Insitu Density**		**Soundness**		
Expansion Index			**Specific Gravity**		**S.E.**		

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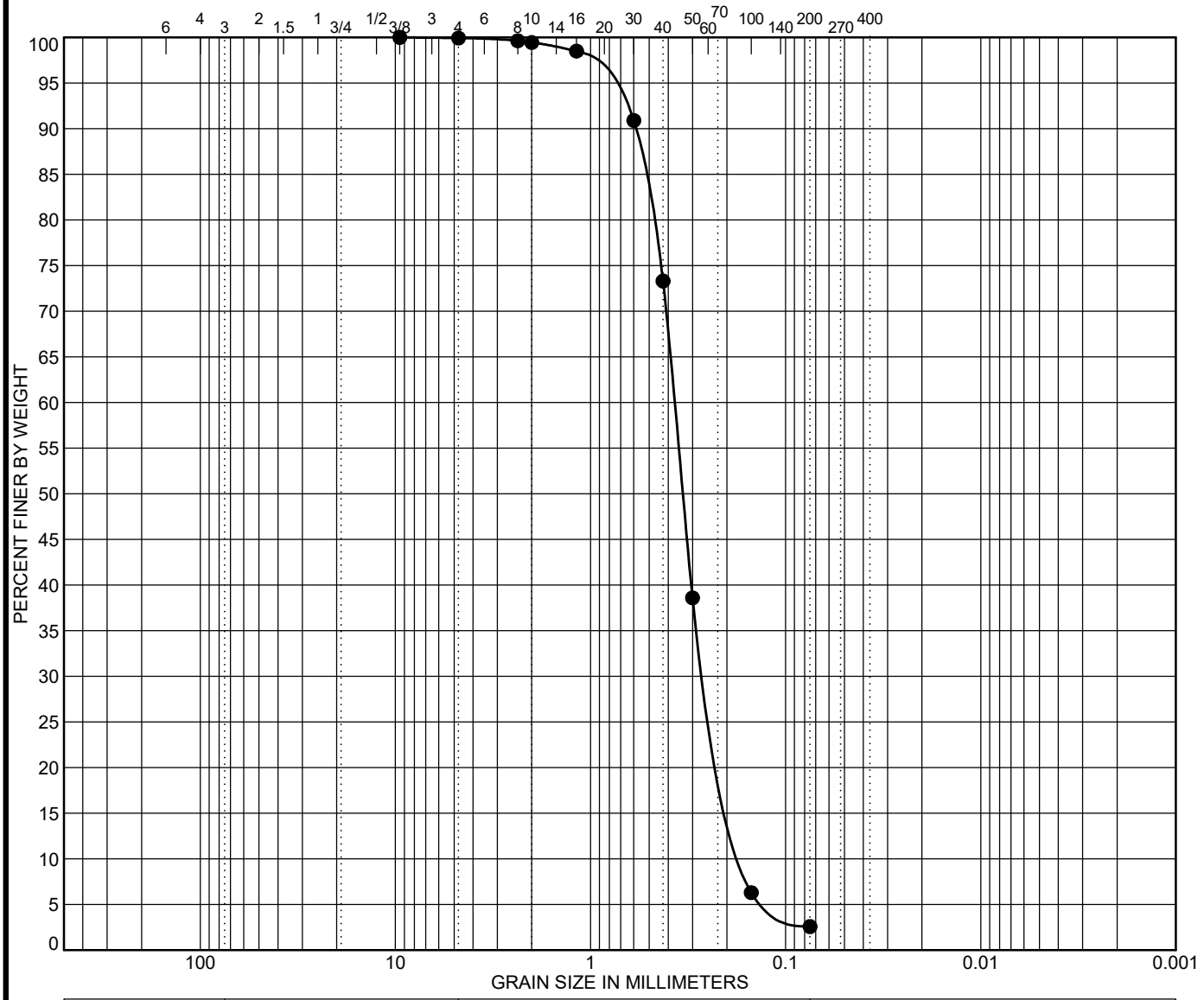
PLATE

B-1.6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 9/18/2021					
● **TP-6**	Classification	LL	PL	PI	Cc	Cu
Depth: 5.5	Poorly Graded SAND (SP)	NP	NP	NP	1.0	2.3
Sample Location	TP-6 from 5.5' to 6'					
USCS	SP					
AASHTO						

Specimen Identification								
● **TP-6**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 5.5	9.5	0.372	0.249	0.162	0.1	97.4	2.6	

Natural Moisture	%	**Direct Shear**		**Absorption %**	
R-Value		**Insitu Density**		**Soundness**	
Expansion Index		**Specific Gravity**		**S.E.**	

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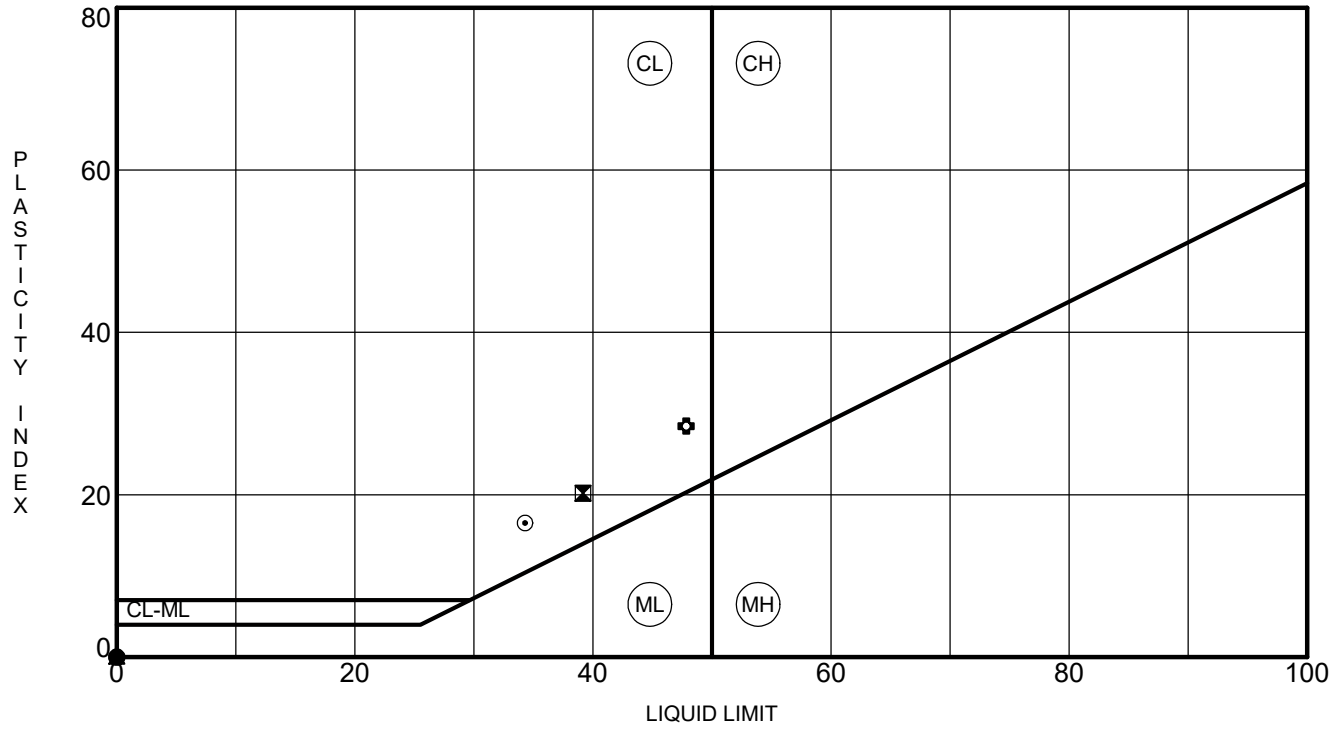
GRAIN SIZE DISTRIBUTION

Job Number: 10514.000 Date: November 2021

PLATE

B-1.7



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**TP-1**	**1.0**	**NP**	**NP**	**NP**	**34**	Silty SAND (SM)
⊠	**TP-2**	**1.0**	**39**	**19**	**20**	**61**	Lean CLAY with Sand (CL)
▲	**TP-3**	**1.0**	**NP**	**NP**	**NP**	**17**	Silty SAND (SM)
★	**TP-4**	**1.0**	**NP**	**NP**	**NP**	**7**	Poorly Graded SAND with Silt (SP-SM)
⊙	**TP-5**	**0.5**	**34**	**18**	**16**	**54**	Sandy Lean CLAY (CL)
✿	**TP-6**	**1.0**	**48**	**19**	**29**	**72**	Sandy Lean CLAY (CL)
○	**TP-6**	**5.5**	**NP**	**NP**	**NP**	**3**	Poorly Graded SAND (SP)

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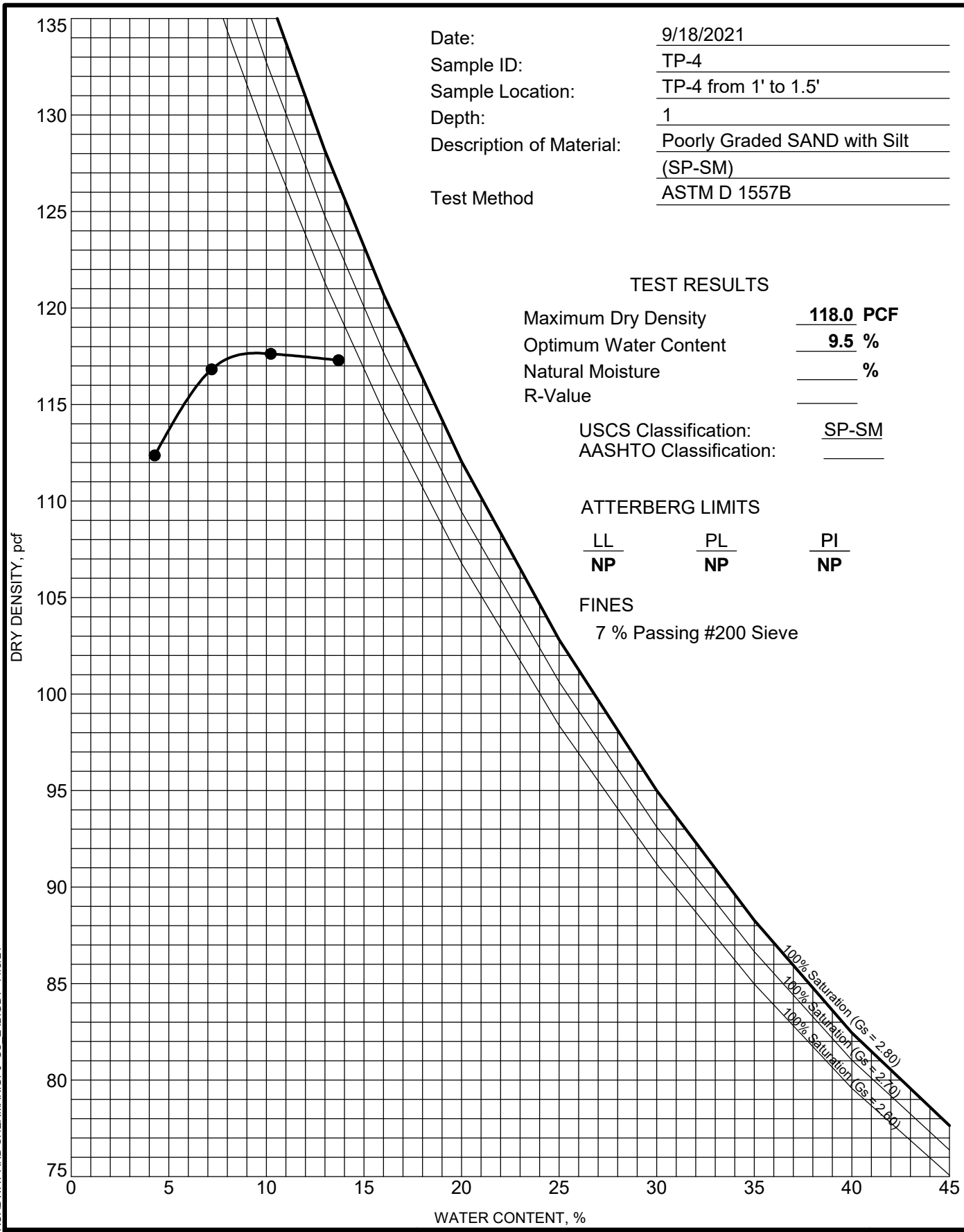
N. Broadway and Sherman Rehabilitation

ATTERBERG LIMITS' RESULTS

Job Number: 10514.000 Date: November 2021

PLATE

B-2



Date: 9/18/2021
Sample ID: TP-4
Sample Location: TP-4 from 1' to 1.5'
Depth: 1
Description of Material: Poorly Graded SAND with Silt (SP-SM)
Test Method ASTM D 1557B

TEST RESULTS

Maximum Dry Density	**118.0**	**PCF**
Optimum Water Content	**9.5**	**%**
Natural Moisture		**%**
R-Value		

USCS Classification: SP-SM
AASHTO Classification:

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

FINES
7 % Passing #200 Sieve

LUMOS COMPACTION BROADWAY AND SHERMAN.GPJ US_LAB.GDT 11/3/21

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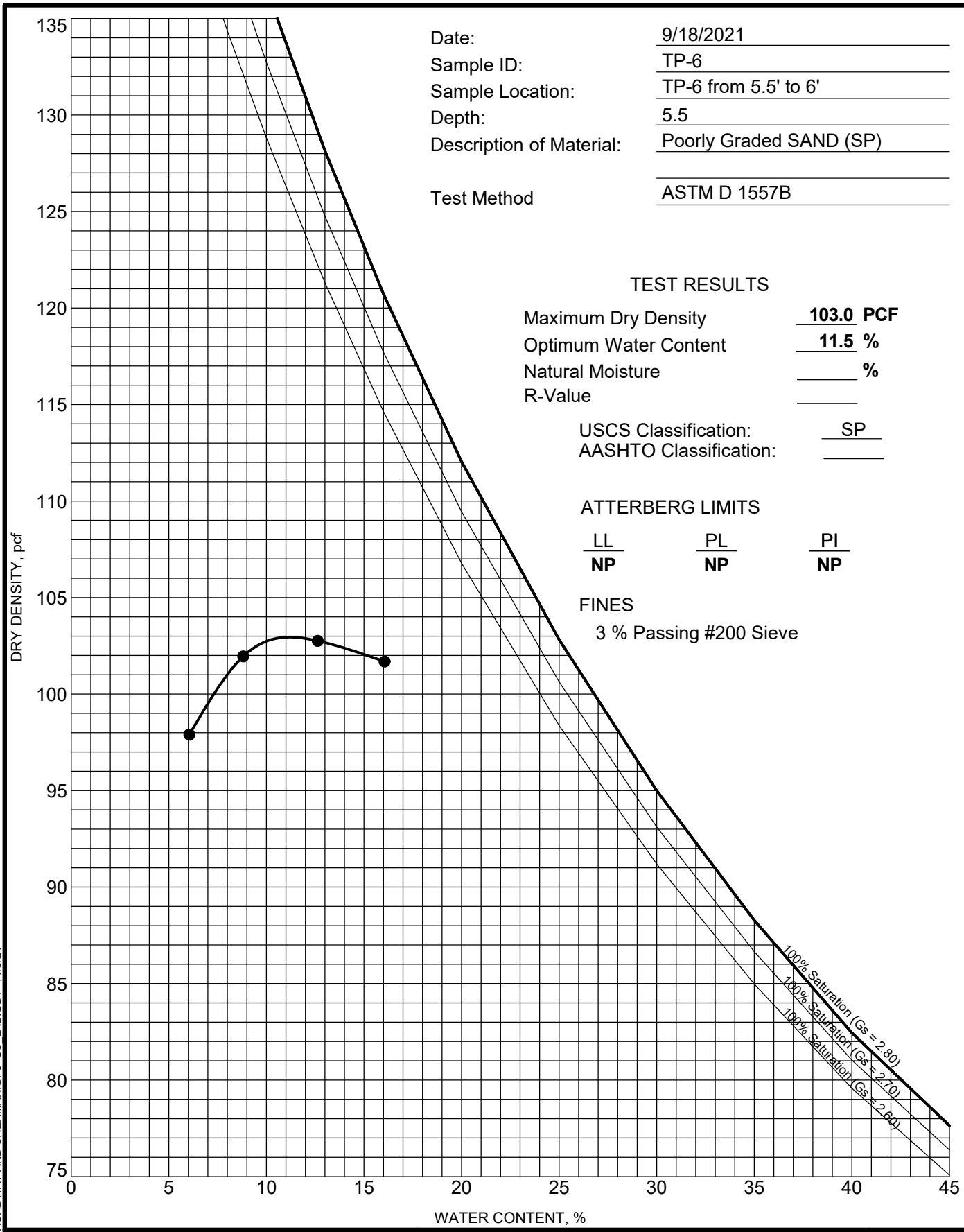
N. Broadway and Sherman Rehabilitation

MOISTURE-DENSITY CURVE

Job Number: 10514.000 Date: November 2021

PLATE
B-3.1



Date: 9/18/2021
Sample ID: TP-6
Sample Location: TP-6 from 5.5' to 6'
Depth: 5.5
Description of Material: Poorly Graded SAND (SP)

Test Method: ASTM D 1557B

TEST RESULTS

Maximum Dry Density	**103.0**	**PCF**
Optimum Water Content	**11.5**	**%**
Natural Moisture		**%**
R-Value		

USCS Classification: SP
AASHTO Classification:

ATTERBERG LIMITS

LL	PL	PI
NP	**NP**	**NP**

FINES
3 % Passing #200 Sieve

LUMOS COMPACTION BROADWAY AND SHERMAN.GPJ US_LAB.GDT 11/3/21

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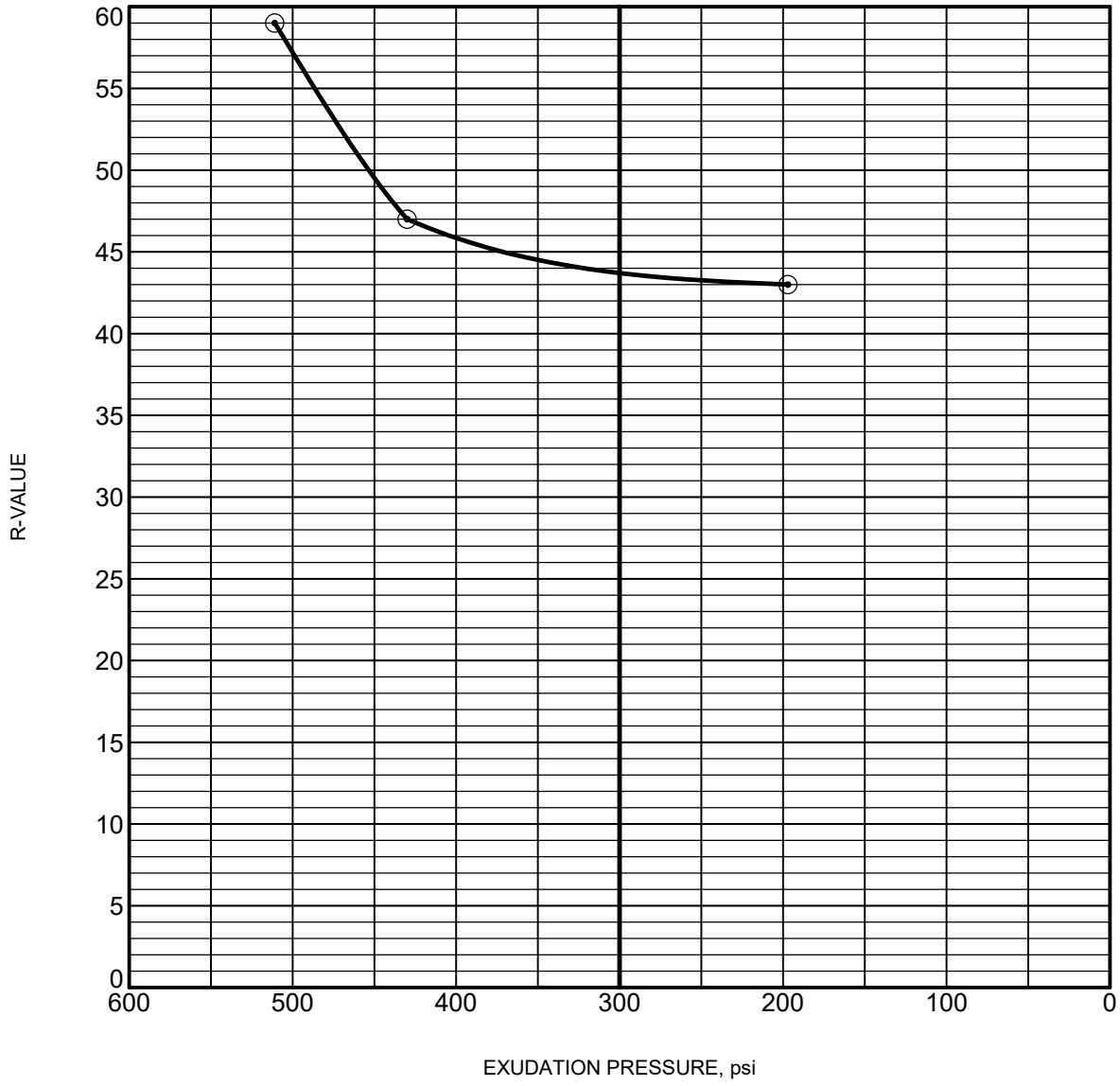
N. Broadway and Sherman Rehabilitation

MOISTURE-DENSITY CURVE

Job Number: 10514.000 Date: November 2021

PLATE

B-3.2



Test Data

Specimen No.	Water Content (%)	Dry Density (pcf)	Expansion (psf)	Exudation (psi)	Test R-Value*
1	**12.0**	**117.2**	**0.0**	**511.0**	**59.0**
2	**12.9**	**116.8**	**0.0**	**430.0**	**47.0**
3	**14.8**	**116.0**	**0.0**	**197.0**	**43.0**

* Reported values have been corrected for sample height, where required.

Test Result

Specimen Identification		Classification	R-Value
TP-3	**1.0**	**Silty SAND (SM)**	**44**

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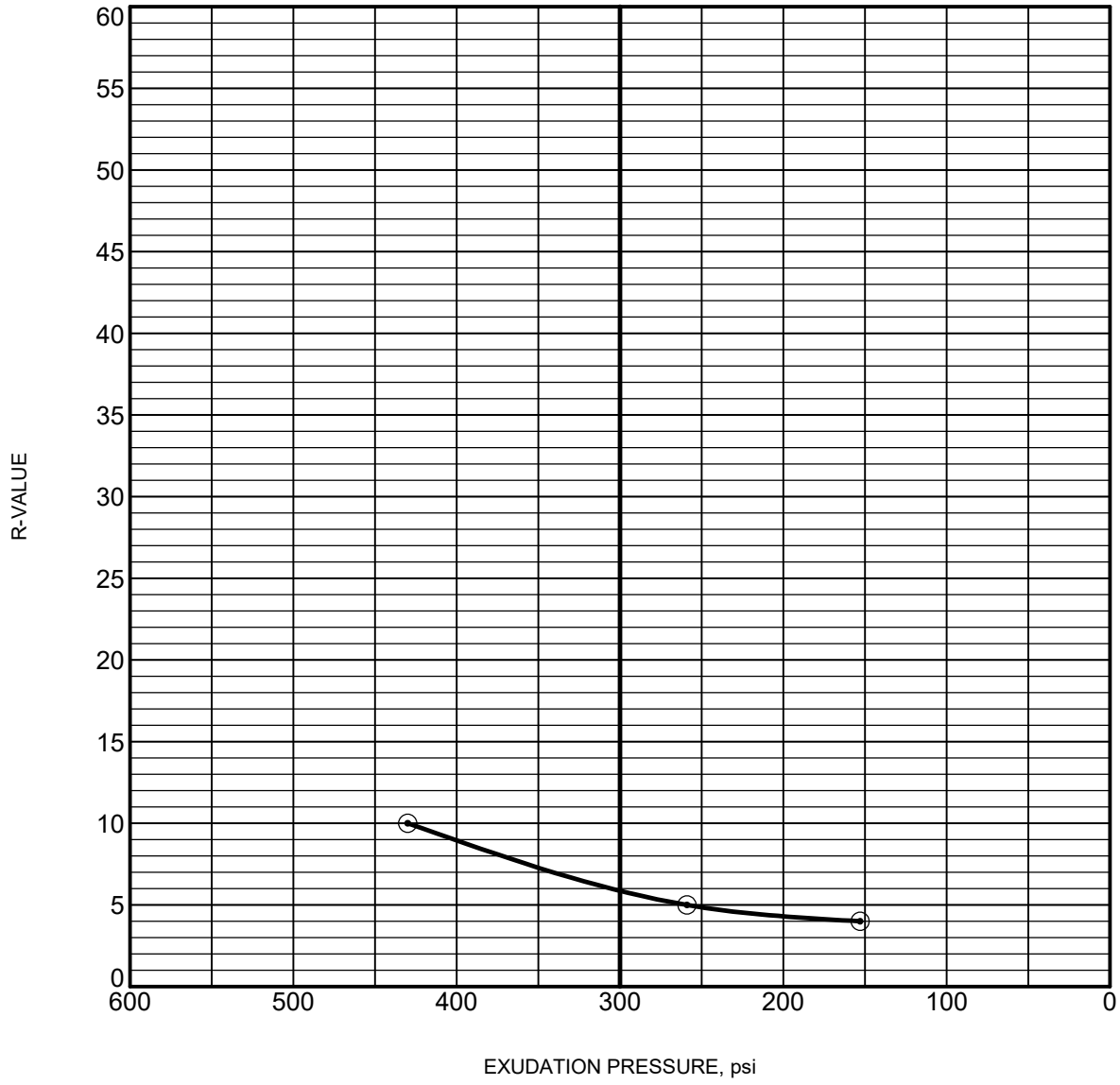
N. Broadway and Sherman Rehabilitation

RESISTANCE VALUE TEST

Job Number: 10514.000 Date: November 2021

PLATE

B-4.1



Test Data

Specimen No.	Water Content (%)	Dry Density (pcf)	Expansion (psf)	Exudation (psi)	Test R-Value*
1	**18.5**	**107.9**	**0.0**	**153.0**	**4.0**
2	**17.8**	**109.4**	**30.3**	**259.0**	**5.0**
3	**17.0**	**113.3**	**0.0**	**430.0**	**10.0**

* Reported values have been corrected for sample height, where required.

Test Result

Specimen Identification		Classification	R-Value
TP-5	**0.5**	**Sandy Lean CLAY (CL)**	**6**

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RESISTANCE VALUE TEST

Job Number: 10514.000 Date: November 2021

PLATE

B-4.2

Silver State Labs-Reno
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Analytical Report

Workorder#: **21090892**
Date Reported: **9/24/2021**

Client: Lumos and Associates - Reno
Project Name: TP-3 (Broadway) 6' - 6.5'
PO #: 10514.000/MTB

Sampled By: Mike H.

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
21090892-01	TP-3 (Broadway) 6' - 6.5'	09/16/2021 0:00	9/17/2021

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Chloride	EPA 9056	12	mg/Kg	5	MA	09/23/2021 14:54	
pH	SW-846 9045D	8.76	pH Units		AC	09/23/2021 15:59	
pH Temperature	SW-846 9045D	22.0	°C		AC	09/23/2021 15:59	
Resistivity	AASHTO T288	5600	Ohms-cm		AC	09/24/2021 10:04	
Sodium	ASTM D2791	< 0.01	%	0.01	AC	09/24/2021 10:11	
Sodium Sulfate as Na2SO4	Calculation	< 0.01	%	0.01	AC	09/24/2021 10:11	
Sulfate	SM4500 SO4E	< 0.01	%	0.01	AC	09/24/2021 10:11	

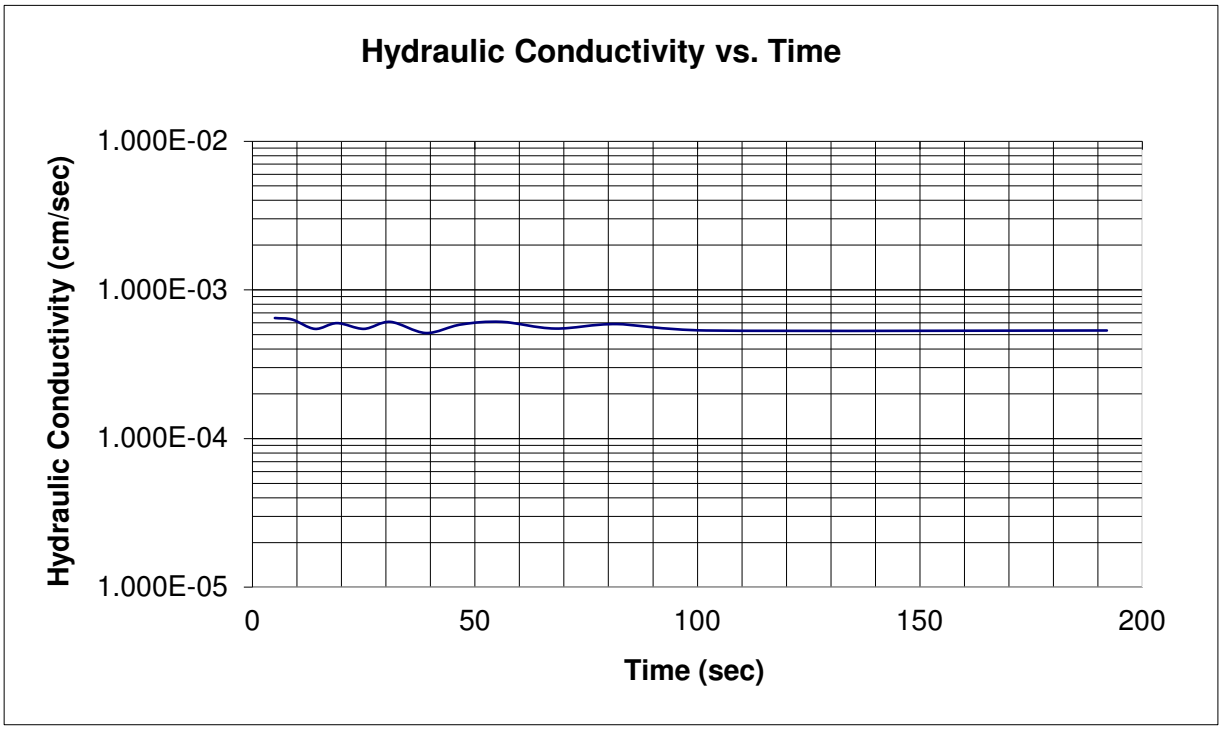
Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
21090892-02	TP-5 (Sherman) 7' - 7.5'	09/16/2021 0:00	9/17/2021

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Chloride	EPA 9056	17	mg/Kg	5	MA	09/23/2021 15:51	
pH	SW-846 9045D	7.19	pH Units		AC	09/23/2021 15:59	
pH Temperature	SW-846 9045D	22.0	°C		AC	09/23/2021 15:59	
Resistivity	AASHTO T288	5100	Ohms-cm		AC	09/24/2021 10:04	
Sodium	ASTM D2791	< 0.01	%	0.01	AC	09/24/2021 10:11	
Sodium Sulfate as Na2SO4	Calculation	< 0.01	%	0.01	AC	09/24/2021 10:11	
Sulfate	SM4500 SO4E	< 0.01	%	0.01	AC	09/24/2021 10:11	

FLEX WALL HYDRAULIC CONDUCTIVITY TEST RESULTS - ASTM D 5084

Client:	Lumos and Associates
Project:	Lumos Laboratory Testing
Project No.:	AS21.1080
Sample No:	Broadway TP-4 1'-1.5'
Date:	10/4/2021



BOUNDARY CONDITIONS

Permeant	water
Back-pressure, psi	70
Area of Headwater Tube, cm^2	0.333
Area of Tailwater Tube, cm^2	0.333
Effective Consolidation Stress, psi	5

SPECIMEN DATA

Specific Gravity [1]: 2.65

1- Assumed

2 - Final saturation value is considered approximate

	Initial	Final
Length, cm	7.620	7.559
Diameter,cm	7.061	7.061
Moisture, %	9.50	18.57
Dry Density, pcf	105.97	106.76
Saturation [2]	45	N/A

RESULTS

Initial Hydraulic Gradient	1.96
Final Hydraulic Gradient	0.09

Notes: Final sample slumped upon removal of effective stress.
Final sample dimensions are approximate.

Hydraulic Conductivity, cm/sec **5.76E-04**

Lumos and Associates **Lumos Lab Testing** **AS21.1080**	**FLEX WALL HYDRAULIC CONDUCTIVITY** **ASTM D 5084**	Geo-Logic ASSOCIATES

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N. Broadway and Sherman Rehabilitation

HYDRAULIC CONDUCTIVITY TESTING

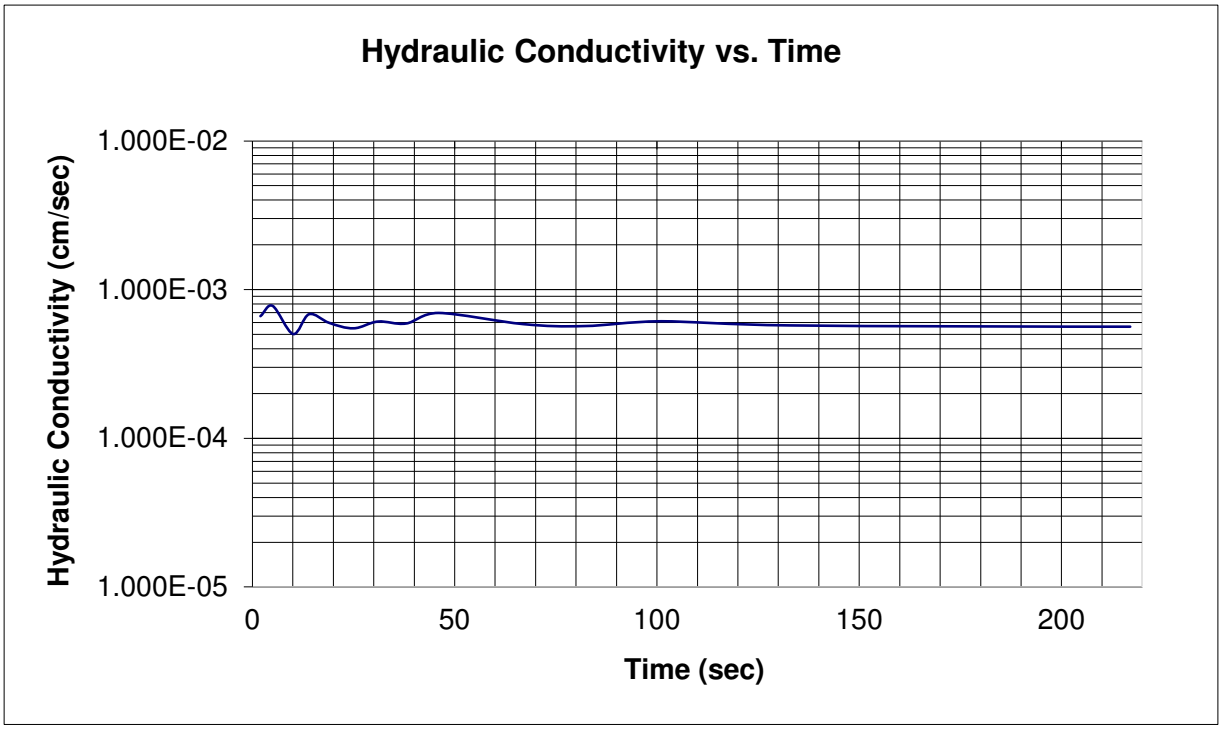
Job Number: 10514.000 Date: October, 2021

PLATE

B-6.1

FLEX WALL HYDRAULIC CONDUCTIVITY TEST RESULTS - ASTM D 5084

Client:	Lumos and Associates
Project:	Lumos Laboratory Testing
Project No.:	AS21.1080
Sample No:	Sherman TP-6 5.5'-6'
Date:	10/4/2021



BOUNDARY CONDITIONS

Permeant	water
Back-pressure, psi	70
Area of Headwater Tube, cm^2	0.333333
Area of Tailwater Tube, cm^2	0.333333
Effective Consolidation Stress, psi	5

SPECIMEN DATA

Specific Gravity [1]: 2.65

1- Assumed

2 - Final saturation value is considered approximate

	Initial	Final
Length, cm	7.620	7.559
Diameter,cm	7.061	7.061
Moisture, %	11.50	24.96
Dry Density, pcf	92.71	91.77
Saturation [2]	39	N/A

RESULTS

Initial Hydraulic Gradient	1.96
Final Hydraulic Gradient	0.04

Notes: Final sample slumped upon removal of effective stress.
Final sample dimensions are approximate.

Hydraulic Conductivity, cm/sec **6.02E-04**

Lumos and Associates **Lumos Lab Testing** **AS21.1080**	**FLEX WALL HYDRAULIC CONDUCTIVITY** **ASTM D 5084**	Geo-Logic ASSOCIATES

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HYDRAULIC CONDUCTIVITY TESTING

Job Number: 10514.000 Date: October, 2021

PLATE

B-6.2

APPENDIX C

Pavement Calculations

LUMOS & ASSOCIATES

Job # 10514.000
Project: North Broadway Street and Sherman Street Rehabilitation
Client: City of Fallon
Description: Pavement Calculations - North Broadway Street

R-Value for Subgrade Soils = 6 (Laboratory Results)
R-Value for Structural Fill = 30 (Standard Specification)
R-Value for Type 1 Recycled Aggregate Base = 70 (Standard Specification)
TI (Traffic Index) = 6.5 - Heavy Traffic on a Collector Street

$GE=0.0032*(TI)*(100-R)$

$G_{f\ (AC)}=2.14$, $G_{f(Base)}=1.1$, $G_{f(Structural\ Fill)}=1.0$
$t_{layer}=GE/G_f$

$GE_{AC}=0.0032*(6.5)*(100-70)=0.62'$
$t_{AC}=(0.62'/2.14)*(12"/1')=3.5"$ **USE 4" Asphalt Concrete**
$GE_{AC}=(4"*2.14)/(12")=0.71'$

$GE_{Base}=0.0032*(6.5)*(100-30)=1.46'$
$t_{Base}=((1.46'-0.71')/1.1)*(12"/1')=8.2"$ **USE 8" Recycled Aggregate Base**
$GE_{Base}=(8"*1.1)/(12")=0.73'$

$GE_{SF}=0.0032*(6.5)*(100-6)=1.96'$
$t_{SF}=((1.96'-0.71'-0.73')/1.0)*(12"/1')=6.2"$ **USE 6" Structural Fill**

Therefore, 4" of Asphalt Concrete (AC) underlain by a minimum of 8" of Aggregate Base, underlain by 6" of Structural Fill/Suitable Subgrade used as Sub Base.

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N. Broadway and Sherman Rehabilitation

PAVEMENT DESIGN

Job Number: 10514.000

Date: November, 2021

PLATE

C-1

Job # 10514.000
Project: North Broadway Street and Sherman Street Rehabilitation
Client: City of Fallon
Description: Pavement Calculations - Sherman Street

R-Value for Subgrade Soils = 6 (Laboratory Results)
R-Value for Structural Fill = 30 (Standard Specification)
R-Value for Type 1 Recycled Aggregate Base = 70 (Standard Specification)
TI (Traffic Index) = 6.0 - Normal Traffic on a Collector Street

$GE=0.0032*(TI)*(100-R)$

$G_{f\ (AC)}=2.32$, $G_{f(Base)}=1.1$, $G_{f(Structural\ Fill)}=1.0$
$t_{layer}=GE/G_f$

$GE_{AC}=0.0032*(6.0)*(100-70)=0.58'$
$t_{AC}=(0.58'/2.32)*(12"/1')=3.0"$ **USE 4" Asphalt Concrete**
$GE_{AC}=(4"*2.32)/(12")=0.77'$

$GE_{Base}=0.0032*(6.0)*(100-30)=1.34'$
$t_{Base}=((1.34'-0.77')/1.1)*(12"/1')=6.2"$ **USE 6" Recycled Aggregate Base**
$GE_{Base}=(6"*1.1)/(12")=0.55'$

$GE_{SF}=0.0032*(6.0)*(100-6)=1.80'$
$t_{SF}=((1.80'-0.77'-0.55')/1.0)*(12"/1')=5.8"$ **USE 6" Structural Fill**

Therefore, 4" of Asphalt Concrete (AC) underlain by a minimum of 6" of Aggregate Base, underlain by 6" of Structural Fill used as Sub Base/Suitable Subgrade used as Sub Base.

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N. Broadway and Sherman Rehabilitation

PAVEMENT DESIGN

Job Number: 10514.000

Date: November, 2021

PLATE

C-2