EarthTech
Geotechnical and Construction Testing Services
681 Edison Way, Reno, NV 89502

February 20, 2023
Project No. 132.06.23-G

Axion Engineering, LLC
683 Edison Way
Reno, NV 89502

Attn: Gary Guzelis, P.E.

Re: Geotechnical Engineering Services, Springland Drive Sanitary Sewer Improvements, Sparks, Nevada

Dear Mr. Guzelis:

Earth Tech is pleased to present results of geotechnical engineering services our firm provided for the project. Based on results of our work, experience in the area, and understanding of project development, we conclude that the site is suitable for its intended use provided recommendations included in our report are adhered to during design and construction. The primary geotechnical concerns identified are the fine-grain, clean (little or no binder) and loose density state of the underlying soils and presence of shallow ground water.

We appreciate being selected to provide these services and trust results fulfill your needs. If you or your consultants have questions, please contact us at (775) 771-2388 or at chris@earthtechnv.com.

Respectfully,

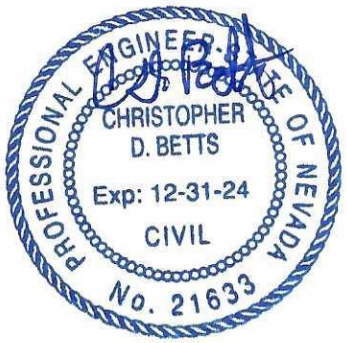
EARTH TECH, LLC

Chris D. Betts

Chris D. Betts, P.E.
President

Joshua V. Reyes

Joshua V. Reyes, E.I.
Staff Engineer



2-20-2023

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Introduction

Earth Tech is pleased to present results of geotechnical engineering services our firm provided for the project. Development includes replacement of 3,068 feet of 8-inch PVC sanitary sewer pipe with new 12-inch PVC sanitary sewer pipe. The existing sewer pipe varies in depth from six to eight feet below existing asphalt and is on Montezuma Way from Shadow Lane to and including Lida Way, Tenabo Way, and Springland Drive to Barring Boulevard.

Based on a preliminary grading information, we understand earthwork necessary for removal and replacement will result in trench excavations from about seven to nine feet below grade. Earthwork will be performed in accordance with the 2012 *Standard Specifications for Public Works Construction, Revision 8* by the Regional Transportation Commission and City of Sparks *Standard Detail for Public Works Construction*. We assume new asphaltic concrete will match existing.

The purpose of our work will be to assess the subsurface soil conditions along the proposed sewer improvements, and to provide opinions and recommendations concerning:

1. Potential geological hazards
2. Trench excavation
3. Pipe bedding and backfill, and
4. Support of pavement sections

This report is geotechnical in nature and not intended to identify other constraints such as environmental hazards, wetlands determinations, or the potential presence of buried utilities.

Recommendations included in this report are specific to development of the project and are not intended for off-site development. Proposed development outside the limits of our investigation, or conceptual changes to the project such as grade changes could require additional subsurface exploration, laboratory testing, and engineering analysis.

Field Exploration and Laboratory Tests

To attain an overview of the underlying soil conditions along the proposed sewer improvements, six test borings were drilled with a Central Mine Equipment (CME) 55 drill-rig using 7.125-inch outside diameter hollow-stem augers (HSA). The borings were advanced to depths of 9½ to 10½ feet below ground surface. Traffic control was provided by Silver State Barricade. The test borings were positioned in the field using pace and compass methods, and our understanding of project development. The test boring locations are depicted on Plate 1 with respect to a satellite image via the Washoe County Regional Mapping System. The boring locations are approximate. No greater accuracy is implied.

Our engineer logged visual descriptions of the earth materials. Representative soil samples were collected from the test borings in an 18-inch split-spoon sampler using a 140-pound safety hammer with a 30-inch drop from a cathead release mechanism. The number of blows per foot required to advance the sampler were recorded using methods of the Standard Penetration Test (SPT).

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The test borings were loosely backfilled with auger cuttings and capped with high-strength, non-shrink grout. Logs of the test borings are presented on Plates 2 through 4. The materials encountered were classified in accordance with the Unified Soil Classification System, which is explained on Plate 5.

The samples were returned to our office to confirm field classifications, and to select representative samples for laboratory testing. Results of in-situ dry unit-weights and moisture contents, particle size analyses and Liquid and Plastic Limits and are presented on the boring logs and Plates 6 through 13. Resistivity, pH and sulfate content (SO_4) analyses were performed by an independent laboratory to evaluate the corrosion potential. The results are presented on logs of test borings 3 and 6 (Plates 3 and 4).

Site, Soil, and Geologic Conditions

The project is a developed roadway and is bordered by concrete curb-and-gutter and residential development. The roadway surfaces are level, match elevations of adjacent development, and are surfaced with asphaltic concrete.

Based on the United States Geological Survey 7.5-Minute topographic map of the Vista Quadrangle, the project is in the northern portions of Sections 34 and 35, Township 20 North, Range 20 East, and elevation is between 4,420 to 4,460 feet relative to mean sea level.

According to mapping by the Web Soil Survey and U. S. Department of Agriculture, Soil Conservation Service (*Soil Survey of Washoe County, Nevada, South Part,* Sheet No. 23, dated 1980), the underlying materials consist of the following:

> Jubilee sandy loam, drained (#445): This very deep soil is on alluvial fans and flood plains. The drainage has been altered. The soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,400 feet. Typically, the surface layer is dark gray sandy loam about 22 inches thick. The underlying material to a depth of 60 inches is dark grayish brown, stratified, mottled loamy coarse sand and fine sandy loam. Permeability is moderately rapid. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high-water table is at a depth of 48 to 72 inches in winter and early spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along stream-banks. Limitations for shallow excavations are severe due to caving cutbanks. Limitations for dwellings with or without basements and for small commercial buildings are severe due to flooding. Limitations for local roads and streets are severe due to depth to low strength. Limitations for septic tank absorption fields are moderate due to depth to flooding and wetness. Shrink-swell potential is low. Frequency of flooding is rare. Depth to high water table is 4.0 to 6.0 feet. Depth to bedrock is greater than 60 inches. Potential frost action is moderate. Risk of corrosion to uncoated steel is moderate, and to concrete it is low. Limitations associated with the use of this soil for urban development include flooding, shallow water table and susceptibility to frost heaving.

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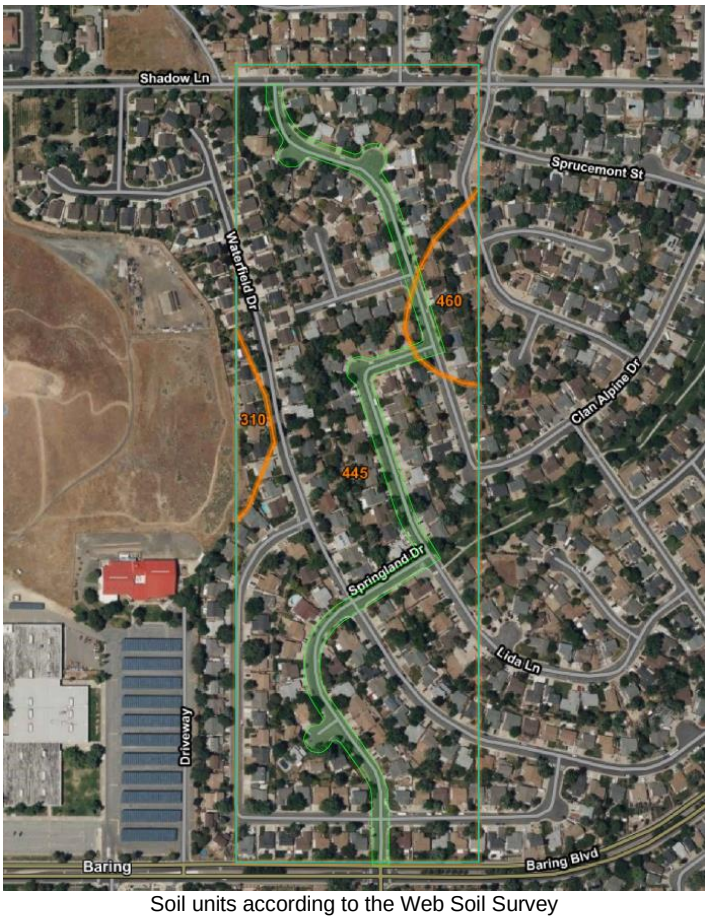
Surprise loamy sand, 2 to 4 percent slopes (# 460). This very deep, well-drained soil is on alluvial fans. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 4,700 to 5,600 feet. Typically, the surface layer is grayish brown loamy sand about 14 inches thick. The subsoil is light yellowish brown gravelly sandy loam about 23 inches thick. The substratum to a depth of 66 inches or more is brown, stratified sandy loam to gravelly loamy sand. Permeability is moderately rapid. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The soil is subject to flash flooding during storms of unusually high intensity. Limitations for shallow excavations are slight. Limitations for dwellings with or without basements and commercial buildings are severe due to flooding. Limitations for local roads and streets are severe due to flooding and frost action. Limitations for septic tank absorption fields are severe due to flooding. Shrink-swell potential is low. Frequency of flooding is rare. Depth to high water table is greater than 6.0 feet. Depth to bedrock is greater than 60 inches. Potential frost action is moderate. Risk of corrosion to uncoated steel is moderate, and to concrete it is low. The main limitations associated with the use of this unit for urban development, as defined by the soil survey, are potential for flooding to occur and the susceptibility to frost heaving.



Soil units according to the Web Soil Survey

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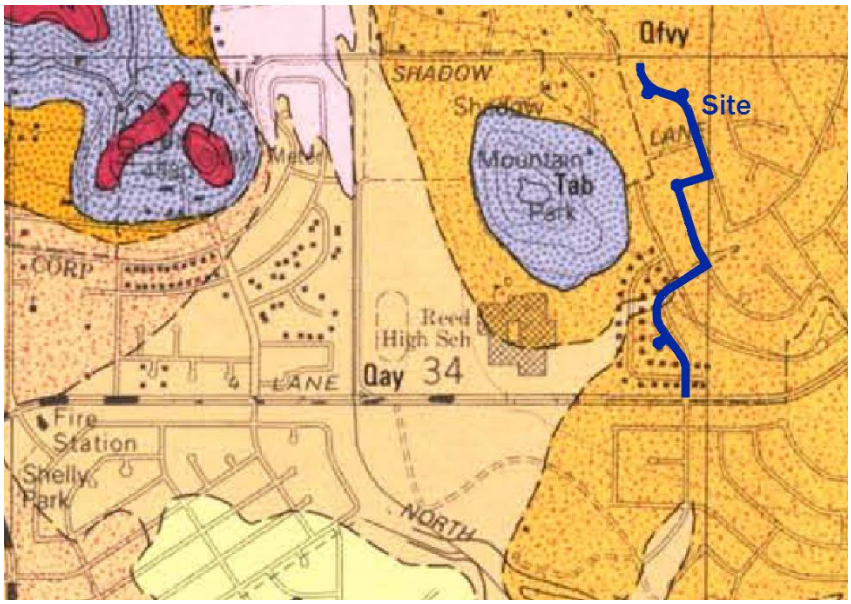
According to mapping by John W. Bell and Harold F. Bonham, Jr. (*Vista Quadrangle Geologic Map,* Nevada Bureau of Mines and Geology, dated 1987), the materials underlying the site consist of Quaternary-age alluvial fan deposits of the Virginia and Pah Rah Ranges (Qfvy). These deposits are derived from andesitic, basaltic, and, locally, metamorphic rocks of the Virginia and Pah Rah Ranges. Generally, they are poorly sorted, subangular to subrounded clasts. In the Truckee Meadows and Spanish Springs Valley, deposits are gray to brown silty sand and pebbly medium sand. In the Truckee Canyon, deposits are gray sandy cobble to boulder gravel. The soils have A-C to cambic B profiles.



Geologic units according to the Vista Quadrangle geologic map

Our subsurface exploration confirms, in general, the soil and geologic mapping with the native soil consisting of gray brown to brown loose to very dense moist to wet silty, clayey sand (SC-SM), brown medium dense, moist poorly-graded sand with clay (SP-SC), gray brown medium dense moist poorly-graded sand with silt (SP-SM), brown medium stiff moist sandy clay (CL) and brown medium dense moist silty sand (SM) to the depths explored. The underlying soils are in variable density state and exhibit very low to low potential for expansion. Tests conducted through an independent laboratory indicate that the native soils exhibit a negligible corrosion potential for Portland cement concrete (Table 4.2.1 of ACI 318-11). The samples were assessed using percent by mass water-soluble sulfate (SO_4). Based on A*ccelerated Corrosion Tests for Buried Metal Structures* (Lieberman, 1996), resistivity and pH testing of the underlying soils indicates they exhibit a moderate corrosion potential to uncoated steel or metal. Results of our laboratory testing

At the time of our subsurface exploration (February 8th and 9th, 2023), free water was encountered in one of our test borings at a non-stabilized depth of 7.0 feet. Stabilized levels are generally higher than non-stabilized, and seasonally, levels will fluctuate. The *Vista Quadrangle Groundwater Map* by Douglas K. Maurer and Robert L. Moffatt (Nevada Bureau of Mines and Geology, 1992) indicates depth to groundwater at the site is between 20 to 40 feet below ground surface. The soil survey indicates that a seasonal high-water table is at a depth of 48 to 72 inches in winter and early spring.

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According to the referenced geologic map, no faults cross the project. According to the USGS website, *Quaternary Faults in Google Earth*, no faults cross the property. The website indicates that the nearest Holocene- to latest-Pleistocene-age fault is approximately one mile northwest of the property. Faults of this age have moved or shifted in the last 15,000 years.

According to the Nevada Seismological Laboratory website (http://www.seismo.unr.edu), the nearest principal Quaternary-age faults are those associated with the Eastern Reno Basin fault zone. The Nevada Seismological Laboratory indicates an earthquake of magnitude 6.9 is possible along this fault zone (*Reno/Carson Fault Information*, updated January 31, 2003).

Although a detailed analysis of liquefaction potential, which would require additional drilling to depths of at least 50 feet, plus detailed laboratory testing and engineering analysis, was not part of the scope of our work, we believe that mitigation measures regarding liquefaction would be cost prohibitive considering the type of construction proposed. Generally, these types of mitigation measures are reserved for public safety facilities such as fire and police stations and hospitals or other buildings with high occupancy such as schools.

Flood hazard studies were completed by the Federal Emergency Management Agency (FEMA) and published on Community Panel Numbers 32031C3054G and 32031C3062G effective March 16, 2009. According to FEMA, the project is in Zone X (unshaded) which is an area of minimal flood hazard.

Discussions and Opinions

The majority of the underlying materials contain excessive amounts of fine-grain particles such as silt, clay and fine sand. Fine-grain soils will inhibit achieving uniform moisture content and impede compaction efforts. Consideration should be given to time constraints associated with scarification, moisture conditioning, drying and compacting fine-grained soils. During periods of inclement weather, water may also become perched above the fine-grain soil resulting in saturated conditions for prolonged periods and creating limitations for equipment mobility. Consideration should be given to the necessity for maintaining moisture content to prevent wind erosion and for controlling dust during earthwork operations.

In addition to their fine-grain nature, the underlying materials do not meet Class A Backfill specifications required by the governing agency.

Portions of the underlying material are relatively clean sands and contain little or no binder such as silt. Consideration should be given to difficulty associated with moisture conditioning and attaining specified compaction associated with clean soils. Portions of the underlying material are also in a loose density state. Consideration should also be given to the potential for instability of excavation sidewalls and the subsequent lateral increase in trench widths due to widening or overbreak associated with clean and/or loose soil. Stabilization measures such shoring will be necessary to maintain stability and safety.

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Shallow ground water was encountered at test boring 6 at a non-stabilized depth of seven feet below grade. Typically, stabilized levels are higher than non-stabilized levels and, seasonally, this level will fluctuate. Consideration should be given to excavations which approach ground water elevations or areas of high moisture content, such as the zone within 36 inches above ground water. As dewatering will be necessary, consideration should be given to ordinances which place constraints on the discharge of ground water and/or permits which may be required.

The underlying materials exhibit a moderate corrosion potential for uncoated steel or metal. Based on our test results, we believe adequate mitigation can be attained by using properly prepared and placed Type II Portland cement concrete, by maintaining a minimum three-inch concrete cover where reinforcing steel or other metal is in proximity to native soils and, at the direction of the manufacturer, by using special coating on reinforcing steel and metal.

There are no apparent geologic hazards that would place unusual constraints on the project.

Recommendations

1. The Earthwork Contractor must comply with the *Safety and Health Regulations for Construction* as directed by the Occupational Safety and Health Act (OSHA Standards, Volume 11, Part 1926, Subpart P) while excavating and backfilling. The Earthwork Contractor is also responsible for providing a competent person, as defined by the OSHA standards, to ensure excavation safety.

2. Materials used in the pipe zone must conform to Section 200.03.02, Table 200.03.02-I (Class A Backfill) or Section 200.03.04, Tables 200.03.04-I and -II (Class C Backfill), as outlined in the 2012 *Standard Specifications for Public Works Construction, Revision 8* by the Regional Transportation Commission and City of Sparks *Standard Detail for Public Works Construction Trench Excavation/Backfill* drawing S-117 (see enclosure).

   Filter fabric, such as Mirafi 180N or equal, shall be placed between Class B Backfill and trench backfill and extend at least 12 inches upward along trench sidewalls per the City of Sparks *Standard Detail for Public Works Construction Trench Excavation/Backfill* drawing S-117 (see enclosure).

3. Materials used as trench backfill must conform to Section 200.03.06, Table 200.03.06-I and -II (Class E Backfill) or Section 200.01.03, Tables 200.01.03-I and -II (Type 2, Class B Crushed Aggregate Base), as outlined in the 2012 *Standard Specifications for Public Works Construction, Revision 8* by the Regional Transportation Commission and City of Sparks *Standard Detail for Public Works Construction* City of Sparks *Standard Detail for Public Works Construction Trench Excavation/Backfill* drawing S-117 (see enclosure). The upper 36 inches of trench backfill must consist of Type 2, Class B aggregate base.

   Our investigation indicates the subsurface materials will not meet the requirements for Class E Backfill.

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All backfill shall be conditioned to near optimum moisture content, placed in a maximum 12-inch loose lift and compacted to at least 90 percent relative compaction[1]. Class C Backfill shall be compacted firm with a vibratory plate compactor. Type 2, Class B aggregate base used in the upper 36 inches of trench backfill shall be compacted to at least 95 percent relative compaction. All lifts of backfill shall be tested for compaction every 250 lineal feet. The Earthwork Contractor shall obtain approval from the Geotechnical Engineer (or his representative in the field) of each lift prior to placement of subsequent fill.

The earthwork contractor shall ensure that proposed fills are approved by the geotechnical engineer or his representative in the field at least ten working days prior to use.

4. For corrosion potential mitigation, we recommend using properly prepared and placed Type II portland cement concrete; maintaining at least three inches of concrete cover where reinforcing steel or other metal is near soil and following Manufacturer's directions for coating reinforcing steel and metal.

5. Thickness of new flexible pavement shall match existing; however, in no case shall new flexible pavement be less than four inches in thickness.

6. Recommendations presented in this report are based on our understanding of project development. Should conditions change from our understanding, we must be notified to determine if our recommendations are appropriate for design and construction. Recommendations included in this report are also based on the assumption that sufficient field inspection and construction review will be provided during all phases of construction.

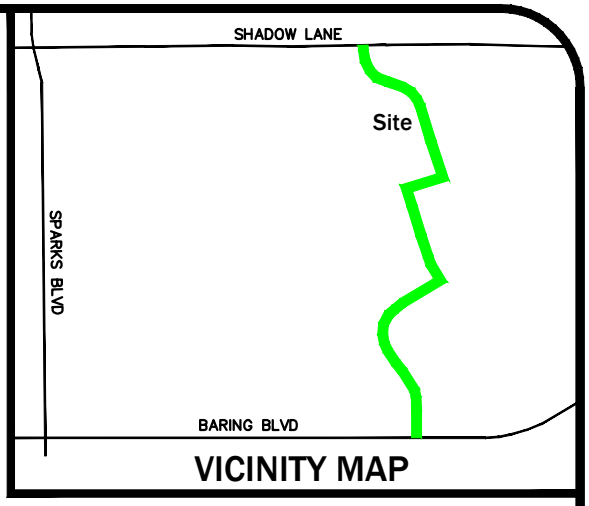
7. Earth Tech has prepared this report based on certain assumptions concerning subsurface conditions at the property. Earth Tech should provide on-site observations and testing during excavation, fill placement and paving. These observations would allow us to document that the soil conditions are as anticipated, and that the contractor's work is in conformance with the intent of our recommendations and the approved plans and specifications. Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control and by subsequent acts occurring on the site after field reconnaissance. This report may be subject to review and revision at any time. Opinions about the condition of the property do not constitute a warranty of any kind.

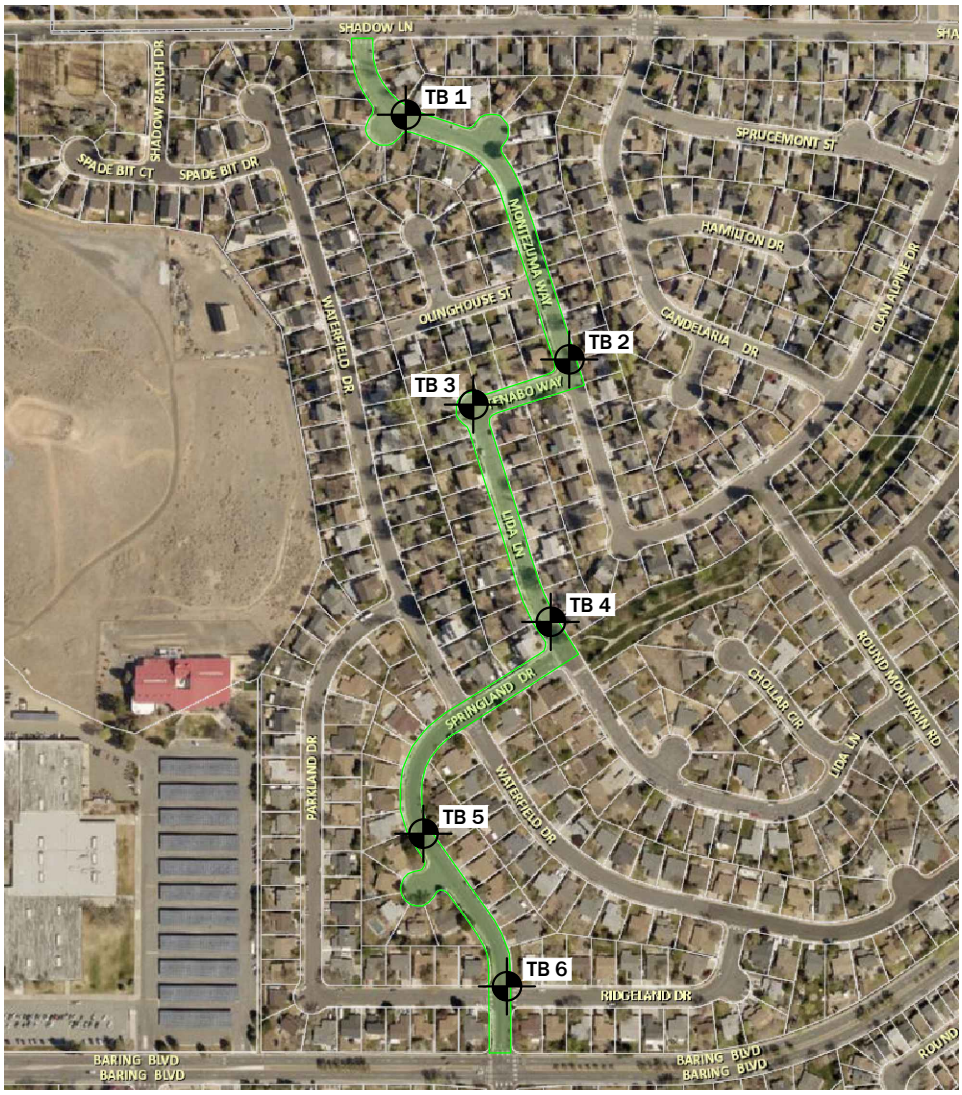
Attachments: Plates 1 through 13

Enclosure: City of Sparks *Standard Detail for Public Works Construction Trench Excavation/Backfill* drawing S-117

Submitted: Wet-stamped .pdf via e-mail

[1] Relative compaction refers to the in-place dry unit-weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the laboratory procedure ASTM Test Designation: D 1557.





Notes: N.T.S

Site plan via
Washoe County Regional Mapping System

Approximate test boring location

Job No. 132.06.23-G	SITE AND EXPLORATION PLAN	reviewed: CDB
EarthTech Geotechnical and Construction Testing Services 681 Edison Way, Reno, NV 89502	Springland Drive Sanitary Sewer Improvements Sparks, Nevada	Plate 1

Test Boring: TB 1

Equipment: CME 55 w/ 7.125" OD HSA

Elevation: N/A Date: 2/8/2023

Laboratory Tests Plate Numbers and Related Information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				1	Four inches of asphalt Six inches of aggregate base Gray-brown silty, clayey sand (SC-SM), dense, moist
* Particle Size Distribution Report (See Plate 6) Liquid and Plastic Limits Test Report (See Plate 11)	44			*2 3	
				4	Color change to brown and change to medium dense below 4.0 feet
	13			5 6 7 8	
** Particle Size Distribution Report (See Plate 7)				**9	Brown poorly-graded sand with clay (SP-SC), medium dense, moist
	13			10	No Free Water Encountered

Note:
HSA = Hollow-Stem Auger

Test Boring: TB 2

Equipment: CME 55 w/ 7.125" OD HSA

Elevation: N/A Date: 2/8/2023

Laboratory Tests Plate Numbers and Related Information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				1	Four inches of asphalt Six inches of aggregate base Brown silty, clayey sand (SC-SM), loose, moist
	9			2 3 4	Becoming medium dense below 4.0 feet
* Particle Size Distribution Report (See Plate 8)				5 *6	
	16			7 8	
				9	Brown sandy clay (CL), medium stiff, moist
	20			10	No Free Water Encountered

Note:
HSA = Hollow-Stem Auger

Job No. 132.06.23-G	TEST BORING LOG	reviewed: CDB
EarthTech Geotechnical and Construction Testing Services 681 Edison Way, Reno, NV 89502	Springland Drive Sanitary Sewer Improvements Sparks, Nevada	Plate 2

Test Boring: TB 3

Equipment: CME 55 w/ 7.125" OD HSA

Elevation: N/A Date: 2/8/2023

Laboratory Tests Plate Numbers and Related Information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				1	Four inches of asphalt Eight inches of aggregate base Brown silty, clayey sand (SC-SM), medium dense, moist
* pH = 7.30 SO_4 = 13.5 ppm Resistivity = 1667 ohm-cm	17			2 * 3 4	
				5	Color change to brown and becoming loose below 5.0 feet
** Particle Size Distribution Report (See Plate 9) Liquid and Plastic Limits Test Report (See Plate 12)	2			** 6 7	
				8	Becoming medium dense 8.0 feet
	12			9	No Free Water Encountered

Note:
HSA = Hollow-Stem Auger

Test Boring: TB 4

Equipment: CME 55 w/ 7.125" OD HSA

Elevation: N/A Date: 2/9/2023

Laboratory Tests Plate Numbers and Related Information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				1	Four inches of asphalt Six inches of aggregate base Brown silty, clayey sand (SC-SM), medium dense, moist
	11	11.8	107.1	2 3 4 5 6	
	13			7	Gray-brown poorly-graded sand with silt (SP-SM), medium dense, moist
				8 9	Brown silty, clayey sand (SC-SM), very dense, moist
	85			10	No Free Water Encountered

Note:
HSA = Hollow-Stem Auger

Job No. 132.06.23-G	TEST BORING LOG	reviewed: CDB
EarthTech Geotechnical and Construction Testing Services 681 Edison Way, Reno, NV 89502	Springland Drive Sanitary Sewer Improvements Sparks, Nevada	Plate 3

Test Boring: TB 5

Equipment: CME 55 w/ 7.125" OD HSA

Elevation: N/A Date: 2/9/2023

Laboratory Tests Plate Numbers and Related Information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
	10	9.7	113.8	1–3	Four inches of asphalt Six inches of aggregate base Brown silty, clayey sand (SC-SM), medium dense, moist
	9/6" 22/6"			7	Becoming dense below 7.0 feet
	79			10	Becoming very dense below 9.5 feet
					No Free Water Encountered

Note:
HSA = Hollow-Stem Auger

Test Boring: TB 6

Equipment: CME 55 w/ 7.125" OD HSA

Elevation: N/A Date: 2/9/2023

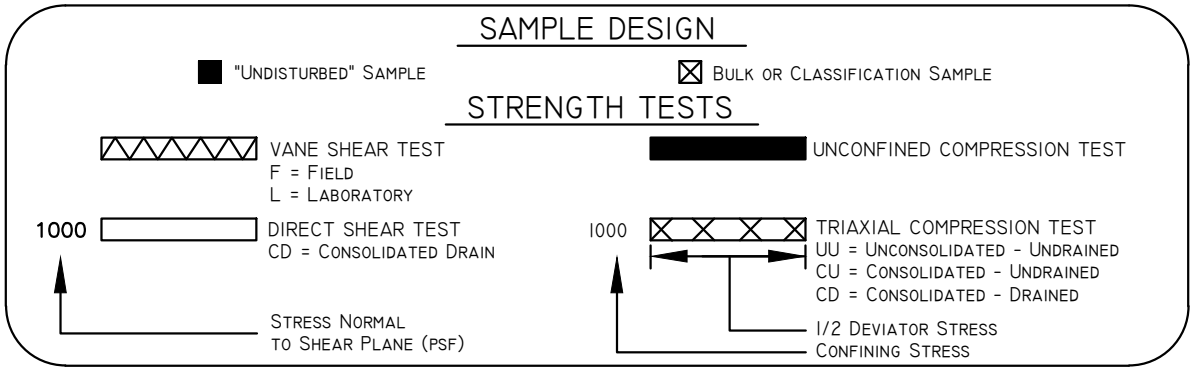
Laboratory Tests Plate Numbers and Related Information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
	15	13.1	120.6	1–3	Four inches of asphalt Six inches of aggregate base Brown silty, clayey sand (SC-SM), medium dense, moist
				4–5	Brown silty sand (SM), medium dense, moist
* Particle Size Distribution Report (See Plate 10) Liquid and Plastic Limits Test Report (See Plate 13)				*6	Brown silty, clayey sand (SC-SM), medium dense, moist Becoming wet below 6.0 feet
	18			▽ 7	Non-stabilized groundwater at 7.0 feet
** pH = 8.16 SO_4 = 20.2 ppm Resistivity = 2778 ohm-cm	33			** 10	Becoming dense below 10.0 feet

Note:
HSA = Hollow-Stem Auger

Job No. 132.06.23-G	TEST BORING LOG	reviewed: CDB
EarthTech Geotechnical and Construction Testing Services 681 Edison Way, Reno, NV 89502	Springland Drive Sanitary Sewer Improvements Sparks, Nevada	Plate 4

MAJOR DIVISIONS			HATCH		TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN #200 SIEVE)	GRAVELS (MORE THAN HALF COURSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, POORLY GRADED GRAVEL-SAND SILT MIXTURES
			GC		CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS (MORE THAN HALF COURSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE)	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS, GRAVELLY SANDS
			SP		POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC		CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN HALF IS SMALLER THAN #200 SIEVE)	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
			OL		INORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)		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, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

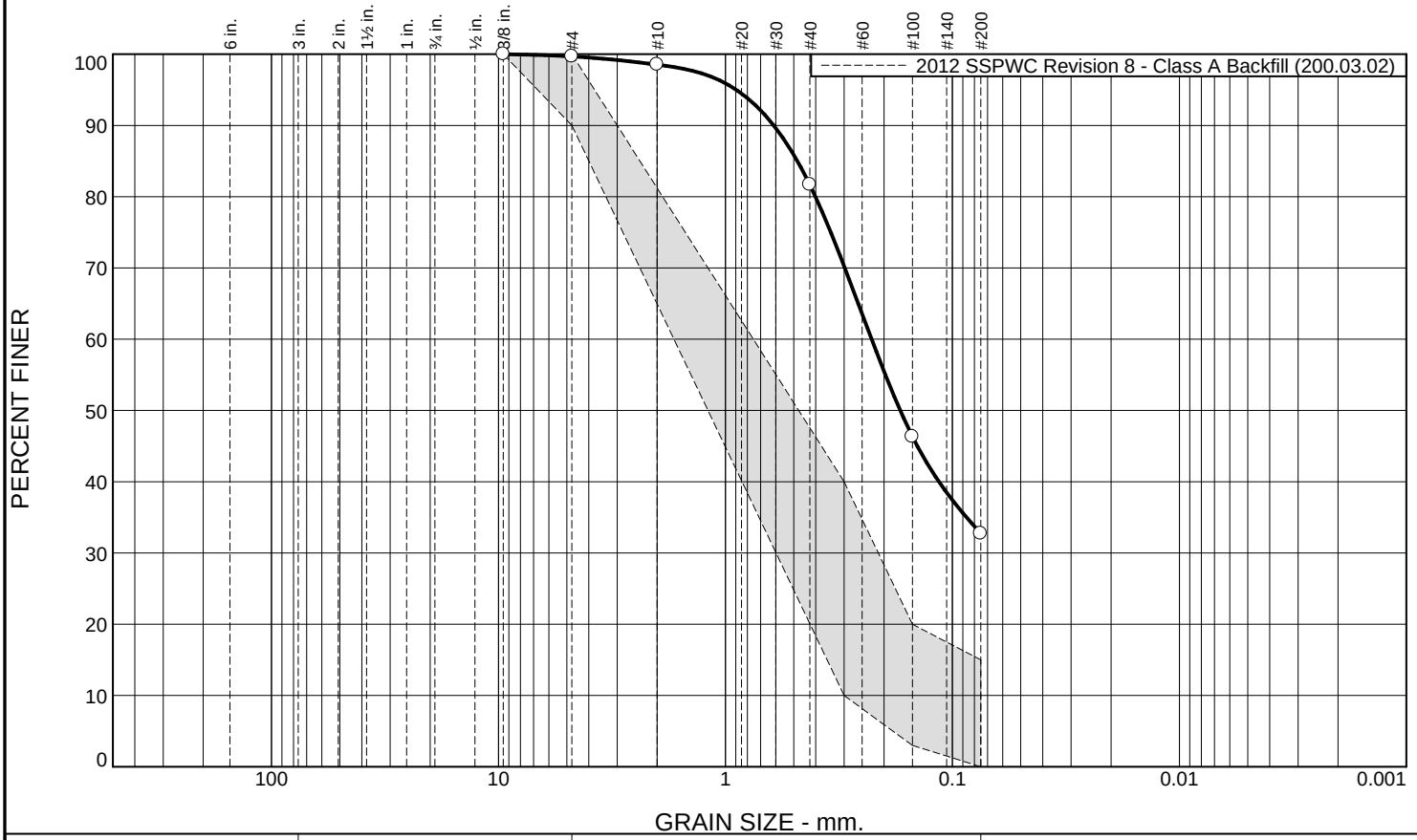
UNIFIED SOIL CLASSIFICATION SYSTEM



KEY TO TEST DATA

Job No. 132.06.23-G	SOIL CLASSIFICATION CHART/KEY	reviewed: CDB
EarthTech Geotechnical and Construction Testing Services 681 Edison Way, Reno, NV 89502	Springland Drive Sanitary Sewer Improvements Sparks, Nevada	Plate 5

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	1.2	16.8	49.0	32.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0	100.0	
#4	99.7	90.0 - 100.0	
#10	98.5		
#40	81.7		
#100	46.3	3.0 - 20.0	X
#200	32.7	0.0 - 15.0	X

* 2012 SSPWC Revision 8 - Class A Backfill (200.03.02)

Soil Description

Gray-brown silty, clayey sand (SC-SM)

Atterberg Limits

PL= 17 LL= 23 PI= 6

Coefficients

D_{90}= 0.6126 D_{85}= 0.4819 D_{60}= 0.2269
D_{50}= 0.1697 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

ASTM Test Designation: C136

Source of Sample: Test Boring 1 **Depth:** 2'-3'

Date: 2/10/2023

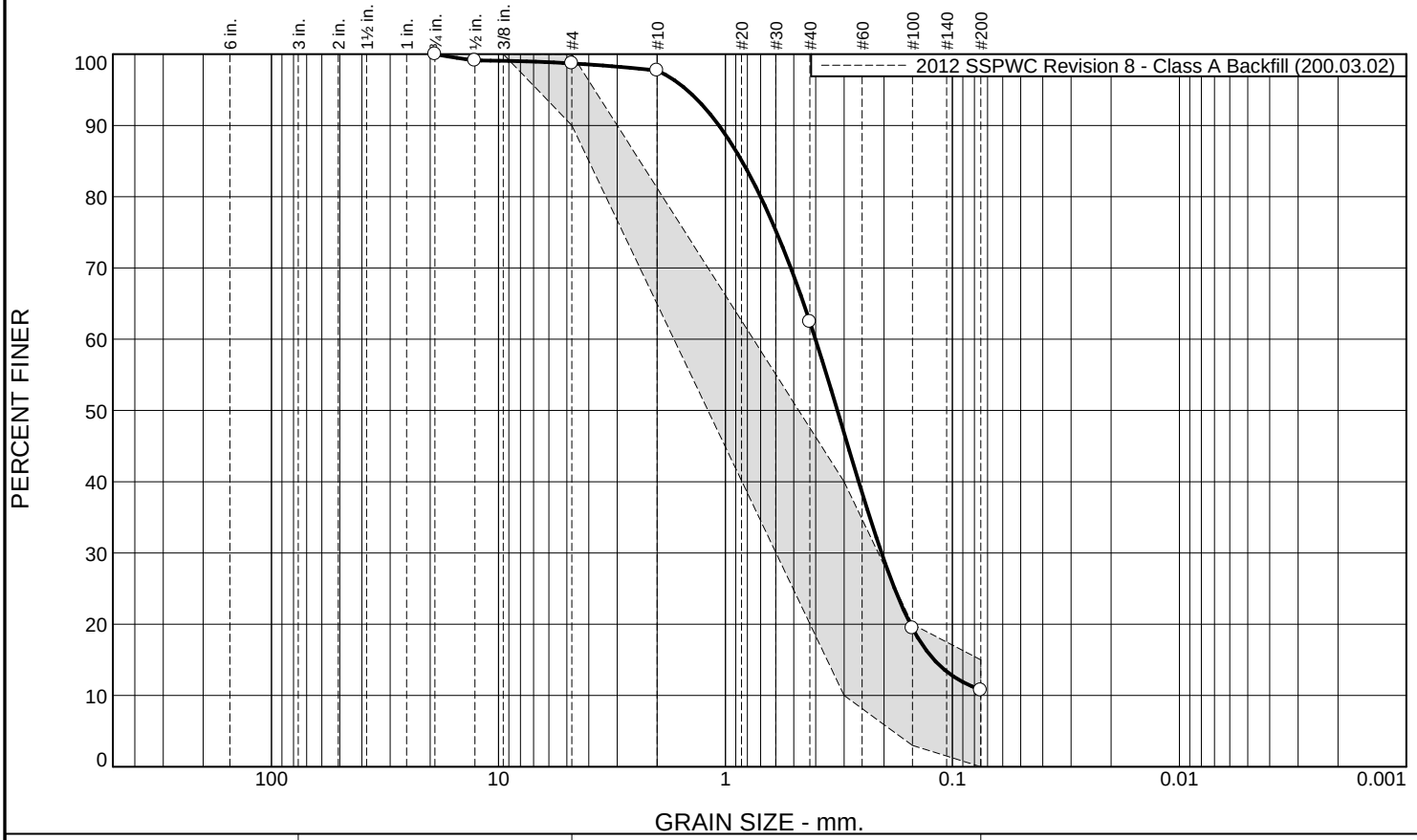
Earth Tech
681 Edison Way
Reno, NV, 89502

Client: Axion Engineering
Project: Springland Drive SS Improvements

Project No: 132.06.23-G **Plate 6**

Tested By: SL **Checked By:** CDB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.3	1.0	35.2	51.7	10.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	99.1		
#4	98.7	90.0 - 100.0	
#10	97.7		
#40	62.5		
#100	19.4	3.0 - 20.0	
#200	10.8	0.0 - 15.0	

* 2012 SSPWC Revision 8 - Class A Backfill (200.03.02)

Soil Description

Brown poorly-graded sand with clay (SP-SC)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.0680 D_{85}= 0.8462 D_{60}= 0.4011
D_{50}= 0.3213 D_{30}= 0.2052 D_{15}= 0.1204
D_{10}= C_u= C_c=

Classification

USCS= SP-SC AASHTO=

Remarks

ASTM Test Designation: C136

Source of Sample: Test Boring 1 **Depth:** 9.5'-10.5'

Date: 2/10/2023

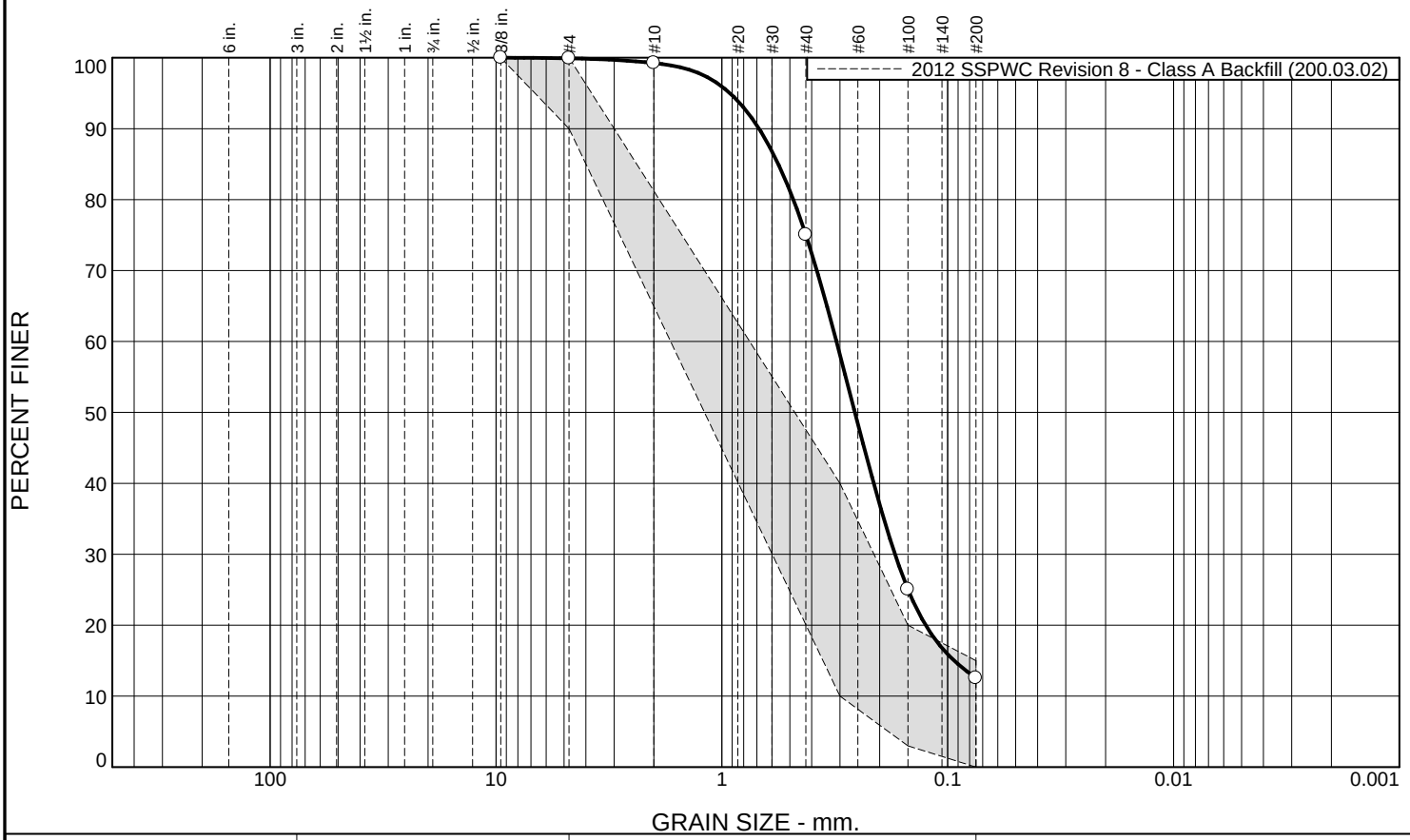
Earth Tech
681 Edison Way
Reno, NV, 89502

Client: Axion Engineering
Project: Springland Drive SS Improvements

Project No: 132.06.23-G **Plate 7**

Tested By: SL **Checked By:** CDB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.7	24.1	62.6	12.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0	100.0	
#4	99.9	90.0 - 100.0	
#10	99.2		
#40	75.1		
#100	25.0	3.0 - 20.0	X
#200	12.5	0.0 - 15.0	

* 2012 SSPWC Revision 8 - Class A Backfill (200.03.02)

Soil Description

Brown silty, clayey sand (SC-SM)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.6846 D_{85}= 0.5623 D_{60}= 0.3110
D_{50}= 0.2577 D_{30}= 0.1711 D_{15}= 0.0936
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

ASTM Test Designation: C136

Source of Sample: Test Boring 2 **Depth:** 6'-7.5'

Date: 2/10/2023

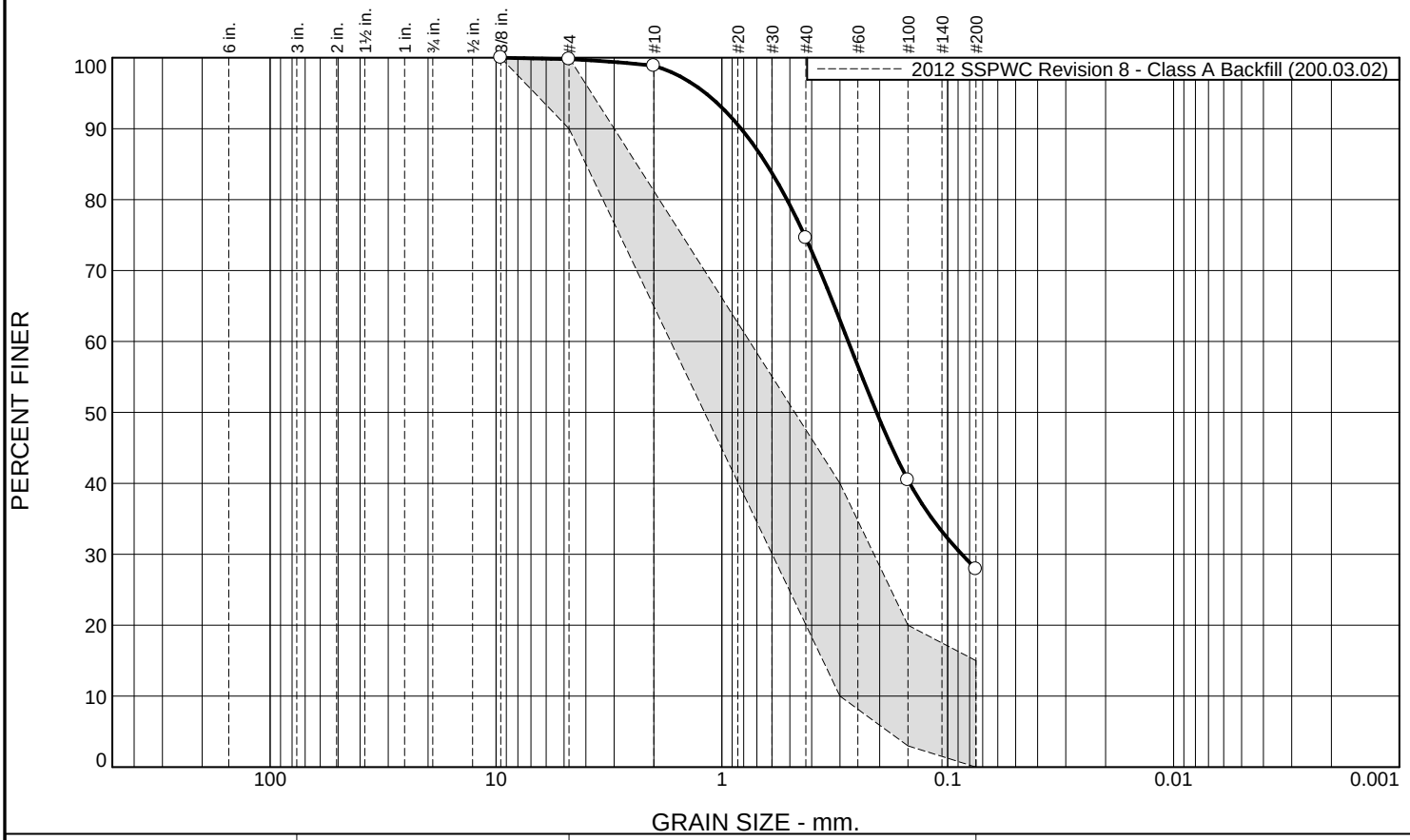
Earth Tech
681 Edison Way
Reno, NV, 89502

Client: Axion Engineering
Project: Springland Drive SS Improvements

Project No: 132.06.23-G **Plate 8**

Tested By: SL **Checked By:** CDB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.9	24.3	46.7	27.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0	100.0	
#4	99.8	90.0 - 100.0	
#10	98.9		
#40	74.6		
#100	40.5	3.0 - 20.0	X
#200	27.9	0.0 - 15.0	X

* 2012 SSPWC Revision 8 - Class A Backfill (200.03.02)

Soil Description

Brown silty, clayey sand (SC-SM)

Atterberg Limits

PL= 17 LL= 21 PI= 4

Coefficients

D_{90}= 0.8215 D_{85}= 0.6342 D_{60}= 0.2756
D_{50}= 0.2065 D_{30}= 0.0866 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

ASTM Test Designation: C136

Source of Sample: Test Boring 3 **Depth:** 6'-7.5'

Date: 2/10/2023

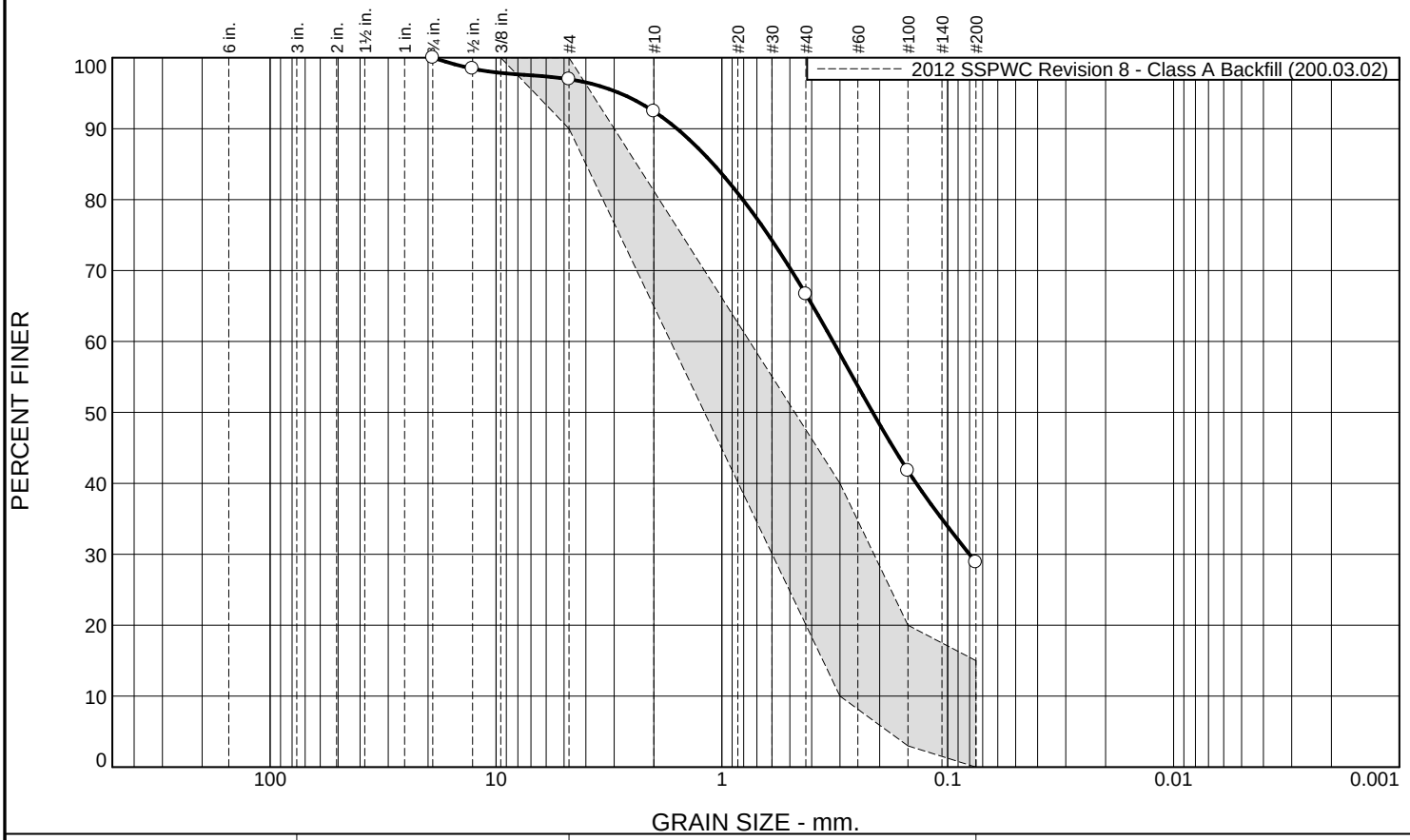
Earth Tech
681 Edison Way
Reno, NV, 89502

Client: Axion Engineering
Project: Springland Drive SS Improvements

Project No: 132.06.23-G **Plate 9**

Tested By: SL **Checked By:** CDB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	4.6	25.7	37.8	28.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.5		
#4	97.0	90.0 - 100.0	
#10	92.4		
#40	66.7		
#100	41.8	3.0 - 20.0	X
#200	28.9	0.0 - 15.0	X

* 2012 SSPWC Revision 8 - Class A Backfill (200.03.02)

Soil Description

Brown silty, clayey sand (SC-SM)

Atterberg Limits

PL= 17 LL= 22 PI= 5

Coefficients

D_{90}= 1.5805 D_{85}= 1.0902 D_{60}= 0.3220
D_{50}= 0.2148 D_{30}= 0.0801 D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

ASTM Test Designation: C136

Source of Sample: Test Boring 6 **Depth:** 6'-7.5'

Date: 2/10/2023

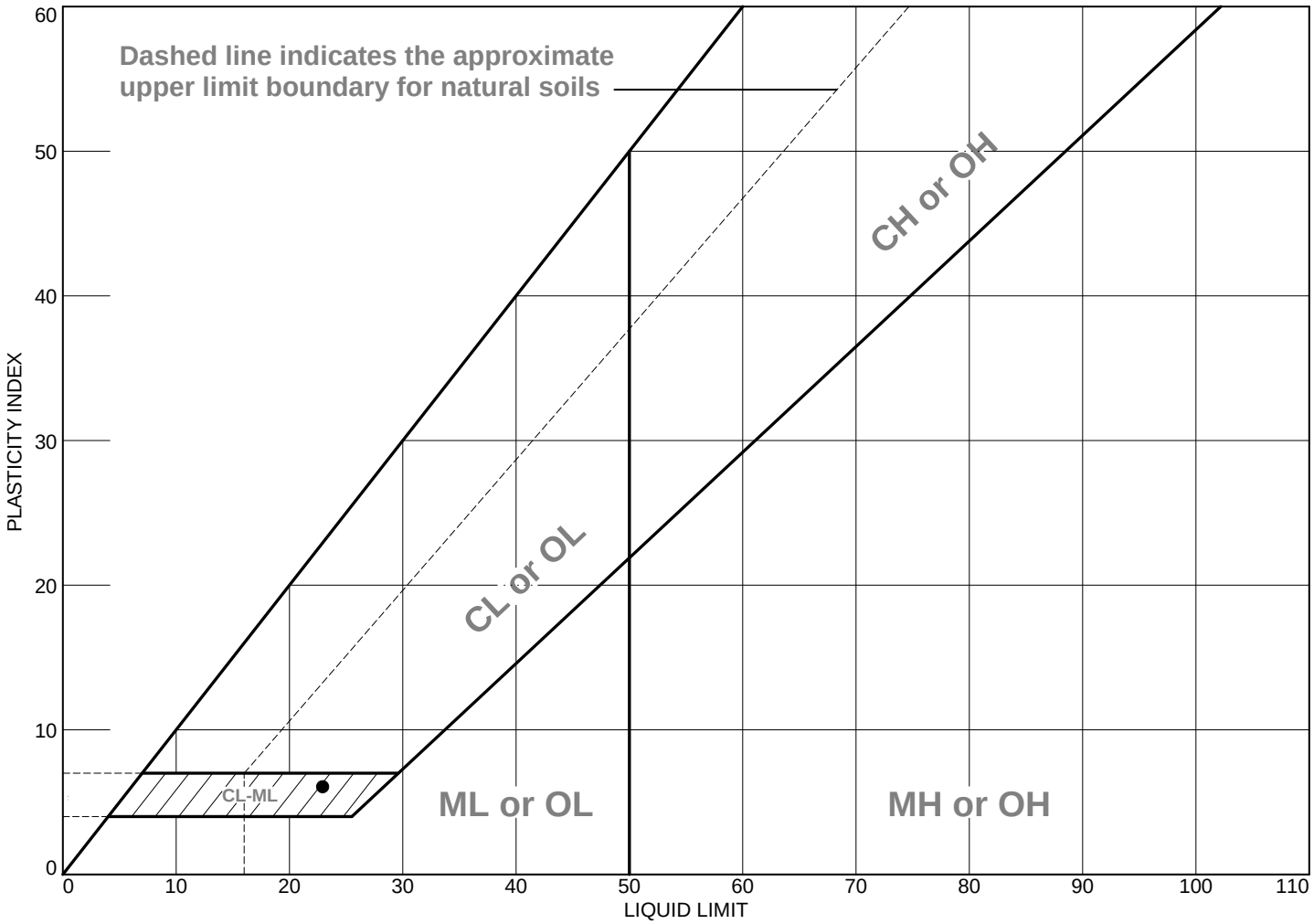
Earth Tech
681 Edison Way
Reno, NV, 89502

Client: Axion Engineering
Project: Springland Drive SS Improvements

Project No: 132.06.23-G **Plate 10**

Tested By: SL **Checked By:** CDB

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray-brown silty, clayey sand (SC-SM)	23	17	6	81.7	32.7	SC-SM

Project No. 132.06.23-G **Client:** Axion Engineering

Project: Springland Drive SS Improvements

●**Source of Sample:** Test Boring 1 **Depth:** 2'-3'

Earth Tech
681 Edison Way
Reno, NV, 89502

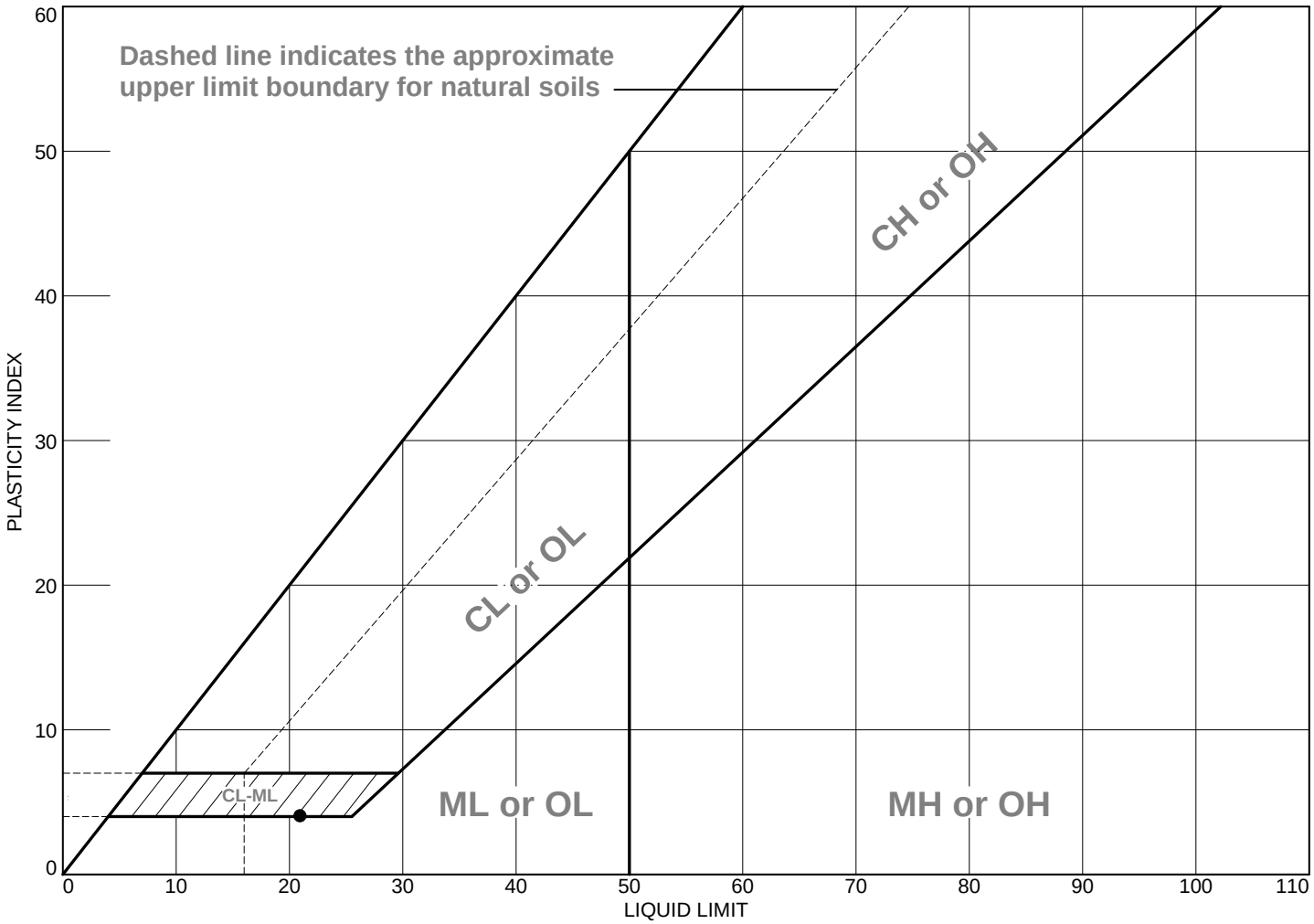
Remarks:

●ASTM D4318
Specimen was dry prepped. A manual device and flat grooving tool was used for the liquid limit. The plastic limit was hand-rolled.
Date: 2/10/2023

Plate 11

Tested By: SL **Checked By:** CDB

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown silty, clayey sand (SC-SM)	21	17	4	74.6	27.9	SC-SM

Project No. 132.06.23-G **Client:** Axion Engineering

Project: Springland Drive SS Improvements

●**Source of Sample:** Test Boring 3 **Depth:** 6'-7.5'

Earth Tech
681 Edison Way
Reno, NV, 89502

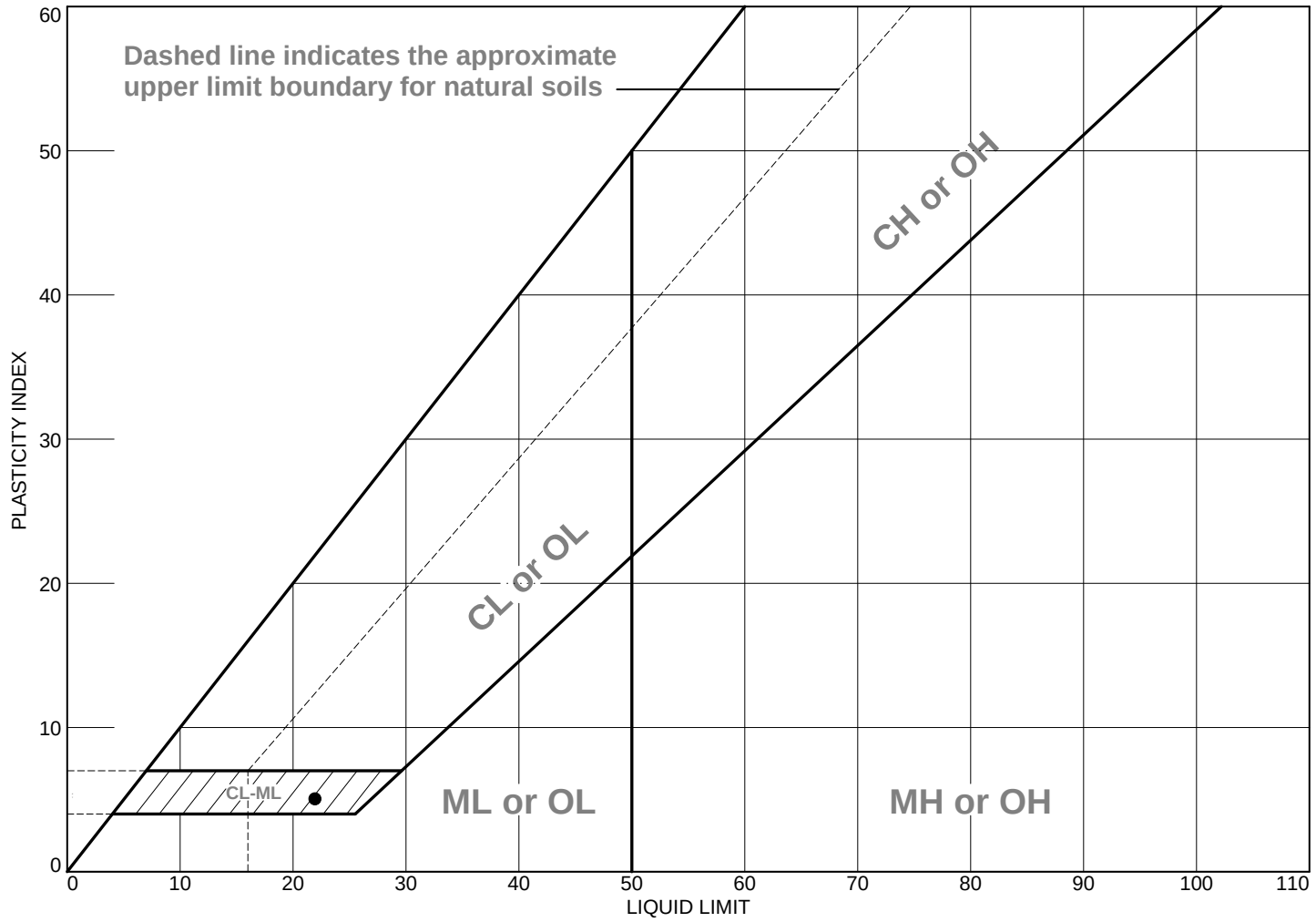
Remarks:

●ASTM D4318
Specimen was dry prepped. A manual device and flat grooving tool was used for the liquid limit. The plastic limit was hand-rolled.
Date: 2/10/2023

Plate 12

Tested By: SL **Checked By:** CDB

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown silty, clayey sand (SC-SM)	22	17	5	66.7	28.9	SC-SM

Project No. 132.06.23-G **Client:** Axion Engineering

Project: Springland Drive SS Improvements

●**Source of Sample:** Test Boring 6 **Depth:** 6'-7.5'

Earth Tech
681 Edison Way
Reno, NV, 89502

Remarks:

●ASTM D4318
Specimen was dry prepped. A manual device and flat grooving tool was used for the liquid limit. The plastic limit was hand-rolled.
Date: 2/10/2023

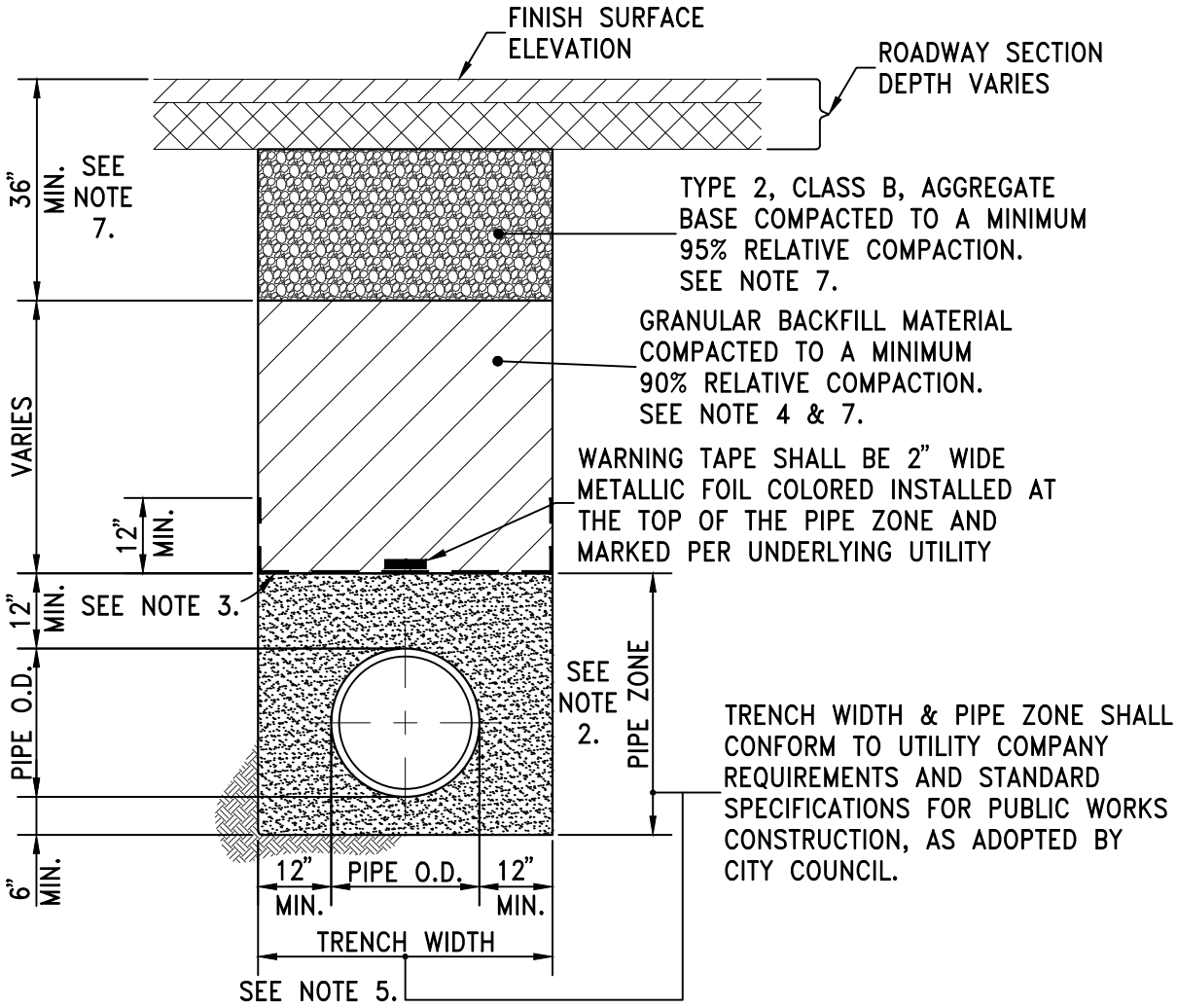
Plate 13

Tested By: SL **Checked By:** CDB

Earth Tech, LLC
681 Edison Way
Reno, Nevada 89502

ENCLOSURE

(City of Sparks *Standard Detail for Public Works Construction Trench Excavation/Backfill drawing S-117*)



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (SSPWC), AS ADOPTED BY CITY COUNCIL.

2. BEDDING MATERIAL SHALL CONFORM TO OWNING–UTILITY COMPANY REQUIREMENTS AS APPROVED BY THE CITY OF SPARKS. FOR CITY–OWNED UTILITIES, BEDDING MATERIAL SHALL BE CLASS A OR C, COMPACTED TO MINIMUM 90% RELATIVE COMPACTION. MATERIALS SHALL CONFORM TO SSPWC SECTION 200, AS ADOPTED BY CITY COUNCIL.

3. CLASS C BEDDING REQUIRES INSTALLATION OF GEOTEXTILE FABRIC BETWEEN PIPE ZONE AND BACKFILL MATERIAL. GEOTEXTILE FABRIC SHALL BE MIRAFI 180N OR APPROVED EQUAL.

4. BACKFILL MATERIAL SHALL BE TYPE 2, CLASS B OR CLASS E AND COMPACTED TO MINIMUM 90% RELATIVE COMPACTION. MATERIALS SHALL CONFORM TO SSPWC SECTION 200, AS ADOPTED BY CITY COUNCIL.

5. ALL EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A. REQUIREMENTS.

6. EXISTING PIPE TO BE ABANDONED SHALL BE GROUT FILLED OR COMPLETELY REMOVED.

7. MINIMUM BACKFILL DEPTH REQUIREMENT IS FOR TRENCHING IN EXISTING PAVED STREETS. TRENCHING FOR NEW DEVELOPMENT WHERE STREETS HAVE NOT YET BEEN CONSTRUCTED, BACKFILL MATERIAL SHALL BE TYPE 2, CLASS B OR CLASS E AND COMPACTED TO MINIMUM 90% RELATIVE COMPACTION. MATERIALS SHALL CONFORM TO SSPWC SECTION 200, AS ADOPTED BY CITY COUNCIL.

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
City of Sparks — TRENCH EXCAVATION/BACKFILL	S-117
	APPROVED BY: JE | DATE: 1/2020