Geotechnical Engineering Report
Latah Glen
Parcel Nos: 25364.0001 & 25361.0004
Spokane, Washington

Prepared For:
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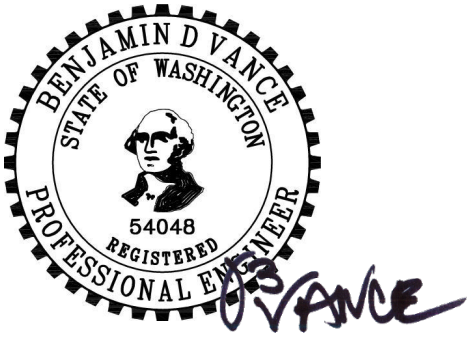

Report Date: September 30, 2020
Job Number: 20211

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Appendices

1.0 EXECUTIVE SUMMARY

The following geotechnical engineering report has been prepared for the Latah Glen development located at the above referenced site in Spokane, Washington. From a geotechnical perspective, the following concepts were identified as favorable for the proposed construction:

- The site is suitable for the proposed construction provided the following report recommendations are implemented.
- Most of the native soils encountered at the site will provide adequate bearing capacity for foundations, support for pavements, and drainage.

The following items have been identified at the project site and proposed construction that should be carefully considered during design and construction:

- Test pits TP-4, TP-7 to TP-10, TP-13, TP-14 and TP-24 encountered refusal due to bedrock at depths ranging from about 2.5-feet to 13-feet below the ground surface. The bedrock is anticipated to be variable across the site. A hydraulic ram or blasting may be required to excavate for utilities, house foundations or other infrastructure improvements.
- Undocumented fill was encountered in test pits TP-3 to TP-8, TP-10 to TP-16, TP-18, TP-20, TP-22 to TP-23 and TP-26 to TP-28 at depths ranging from about ½-feet to 6-feet to below ground surface. Undocumented fill should be removed and replaced with compacted *Structural Fill* below all settlement prone structures.
- Further slope stability evaluation should be performed if house foundations are closer than 30 feet from the crest of a slope steeper than 1.5H:1.0V. The exploration was based on a preliminary plan.
- Limited sub-excavations into native soils will be necessary below foundations if alluvial silts are encountered at foundation subgrade elevations. Recommendations for the sub-excavations are provided below in Section 5.1.1.
- Slope design and construction should incorporate the recommendations provided in the attached *Benching and Slope Fill Requirements* diagram in Appendix E.
- The silty sands and sandy silts at the site are moderately to highly frost-susceptible. Recommendations to help mitigate the potential for frost heave are provided below in Section 5.4.

Liberty Geotech should be involved in the design development and earthwork construction to help ensure that the report recommendations are incorporated into the design and construction Liberty Geotech is available to discuss these items further in-person or via conference call.

2.0 PROPOSED CONSTRUCTION

The project will consist of a residential development at the above referenced site. The development will consist of asphalt paved roadways, underground utilities, and stormwater

management facilities associated with 157 residential homes. Stormwater will be managed using infiltration swales with drywells.

Furthermore, the recommendations included in this report are based on the following plans:

- *Site Plan* prepared by Storhaug, dated July 15, 2020.
- *Design Review Exhibits* (sheets 1 through 4) prepared by Storhaug, dated July 15, 2020.
- *Storm Drain Plan* prepared by Storhaug, dated August 7, 2020.
- *Concept Profile* prepared by Storhaug, dated August 7, 2020.

3.0 GEOTECHNICAL EXPLORATION

3.1 Geology, Topography, and Current Site Use

The *Geologic Map of the Spokane Southwest 7.5-minute Quadrangle* (Hamilton, 2004) was reviewed to determine the geologic deposit at the site. The geologic map indicated that the geologic unit was an Alluvium, Glacial Flood Deposit, and Grande Ronde Basalt. In addition, the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS, 2019) was reviewed. The soil survey indicates that the soil units are Marble Loamy Sand, Clayton-Hagen, Lakespring Ashy Loam. The soil survey describes the soil as sandy glaciofluvial deposits and loess mixed with minor amounts of volcanic ash over glaciolacustrine deposits.

The majority of the site is an abandoned auto salvage yard. There are 2 structures located at the northeast portion of the property. The eastern half of the property is heavily littered with abandoned vehicles and trash. The central western portion of the property is relatively steeply sloped and contains what appears to be old mining roads. Outside of the previous auto yard and possible mining area is sparsely vegetated with trees and prairie grasses. Based on elevations obtained from Google Earth™, the site slopes from the southwest to the northeast with approximately 160-feet of relief.

3.2 Subsurface Exploration

The soils encountered in the test pits were highly variable across the site. In general, the test pits encountered either topsoil or undocumented fill to depths ranging from about ½-foot to 7 ½-feet. Below the topsoil or undocumented fill, the test pits encountered alluvium, glacial outwash, wind deposits, lacustrine deposits, and/or bedrock to their termination or refusal depths. The alluvium consisted of silt and clayey and silty to poorly graded sand, the glacial outwash consisted of silty to poorly graded sand, the wind deposits consisted of silt, and the lacustrine deposits consisted of silt.

3.3 Estimated Groundwater and Bedrock Elevations

Groundwater was not observed during the exploration. Well logs in the vicinity of the site (Department of Ecology, State of Washington) indicate that the static groundwater is at depth of about 50-feet below the ground surface. However, groundwater can become perched on the shallow bedrock surface. Seasonal and annual fluctuations of groundwater levels should be anticipated.

Furthermore, bedrock was encountered in test pits TP-4, TP-7 to TP-10, TP-13, TP-14, TP-24 and TP-25 at depths ranging from about 2.5-feet to 13-feet below the ground surface.

4.0 LABORATORY TESTING RESULTS

Soil samples were obtained in the exploration locations at varying depths to characterize the soil encountered at the site. The results of the laboratory testing results are presented in Appendix C: *Laboratory Testing Results*. The laboratory testing was performed referencing the following American Society for Testing and Material Standard Methods (ASTM):

- ASTM D1140 *Amount of Material in Soils Finer than the No. 200 Sieve*,
- ASTM D2216 *Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,*
- ASTM D6913 *Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*.

4.1 Summary of Laboratory Testing Results

The following table summarizes the laboratory tests that were performed on the soil samples obtained from the site. Additional details are provided in Appendix B and D.

Table 4.1.A - Summary of Laboratory Testing

Soil Unit	Lab Tests Performed	Summary of Results
Native Alluvium	• Percent Passing No. 200 Sieve • Gradation Sieve • Natural Moisture Content	Soil classified as silty sand and sandy silt. • % Passing No. 200: 16% - 59% • Moisture Content: 4% - 29%
Glacial Outwash	• Percent Passing No. 200 Sieve • Gradation Sieve • Natural Moisture Content	Soil classified as poorly-graded sand. • % Passing No. 200: 1% - 7% • Moisture Content: 3% - 4%

Native Lacustrine	• Percent Passing No. 200 Sieve • Natural Moisture Content	Soil classified as sandy silt • % Passing No. 200: 63% Moisture Content: 29%

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 Earthwork

The following recommendations should be considered by the general contractors and earthwork subcontractors prior to providing a cost estimate for the earthwork on the project.

5.1.1 Subgrade Preparation

Clear and grub all vegetation, strip all topsoil and remove all undocumented fill to prepare the subgrades under foundations, slabs, and pavements. If alluvial silts are encountered at foundation subgrade elevation, the soil should be sub-excavated to at least 1 foot below bottom of footing elevation and replaced with compacted structural fill. The sub-excavations should be oversized to provide lateral stability for the structural backfill. The bottoms of the excavations should be oversized at least 1 foot beyond the outside edges of the proposed footings for each foot of excavation below the bottoms of the footings (1H:1V oversizing).

Liberty Geotech should be contacted once the foundation subgrade areas have been exposed to review the subgrade conditions.

In pavement areas, after removing any topsoil and existing fill, the upper 8 inches of the resulting subgrade should be scarified, moistened or dried to within -1 to +3 percent optimum moisture, and compacted to a minimum of 95 percent of the modified Proctor dry density determined in accordance with ASTM D 1557. Furthermore, prior to placing the aggregate base, all areas should be proof-rolled with a loaded dump truck or loaded water truck to determine if the subgrade materials are loose, soft or weak, and in need of further stabilization, compaction, or sub-excavation and re-compaction or replacement. The proof-roll should be witnessed by a geotechnical engineer from Liberty Geotech.

5.1.2 Site Grading

The pavement subgrade surface should be shaped to provide positive drainage to minimize the potential for water to pond in the subgrade. Because the site soils are moderately to highly frost susceptible, it will be important to avoid creating low areas in the subgrade where water can

pond and freeze, which could heave the pavement. Snow storage areas should be carefully considered to minimize the amount of water infiltrating in the subgrade areas.

Slope construction will require proper benching techniques as shown on the attached *Benching and Slope Fill Requirements* diagram in Appendix E. These recommendations should be applied to *Structural Fill* placed on slopes steeper than 10 percent. Furthermore, keyway and bench drains should be considered to remove potential groundwater from the keyway and benches.

Permanent slopes should be graded no steeper than 1.5:1 (horizontal:vertical). Establishing vegetation on permanent slopes as soon as possible is recommended. Slopes excavated into bedrock are often stable at steeper angles. We recommend the geotechnical engineer be retained to observe excavations into bedrock to provide final sloping recommendations.

5.1.3 Earthwork Soil Products, Compaction, and Testing Frequency

Different soil products should be used for different applications. The following table presents recommendations for anticipated earthwork construction:

Table 5.1.2.A - Soil product selection.

Soil Product	Project Use	Soil Description
Structural Fill	● Fill areas under foundation. ● Fill to achieve subgrade under pavement, slab or driveway. ● Backfill of shallow foundations. ● Fill outside 3 feet of the back face of retaining walls. ● Soil restraining a retaining wall from sliding. ● Embankment fill.	Soil classified as: ● GP-GM or GW-GM ● GM ● SP-SM or SW-SM ● SM Soil should be free of organics, deleterious material, and all material larger than 6-inches in diameter.
Retaining Wall Fill	● Fill within 3 feet of the back face of retaining walls. ● Fill within 1.5 feet of the back face of basement walls.	Free-draining soil classified as: ● GP or GW ● SP or SW Soil should be free of organics, deleterious material, and all material larger than 3-inches in diameter.
Concrete Slab	● Fill immediately below	Soil should meet the percent passing the

Cushion	slab-on-grade, sidewalks and exterior hardscapes.	following sieve size: ● 1”: 80-100% ● No. 4: 25-65% ● No. 200: 7% maximum Soil should be free of organics, clay fines, deleterious material, and all material larger than 2-inches in diameter.
Crushed Surfacing	● Fill immediately below slab-on-grade, asphaltic-pavement, concrete pavement, sidewalks and exterior hardscapes.	Crushed rock should meet the percent passing the following sieve size: ● 1-¼”: 99-100% ● 1”: 80-100% ● ⅝”: 50-80% ● No. 4: 25-45% ● No. 40: 3-18% ● No. 200: 7.5% maximum ● Sand equivalent: 40 minimum Also, the material should be free of wood, roots, bark, and deleterious material. For roadway base the following requirements should also be met: ● Fracture face: 75%, minimum ● Los Angeles Wear, 500 rev: 35%, maximum. ● Degradation factor: 15 minimum.
Landscaping Fill	● Non-structural fill areas. ● Vegetated areas.	Soil meeting the following requirements: ● Silt or Clay: 35% to 70% ● Sand: 20% to 60% ● Organic material: 2% to 20% ● Deleterious materials (gravel, rock, slag, cinder, roots, sod): 5% max ● pH between 5 and 7

The following table provides compaction recommendations specific to ASTM D1557 *Laboratory Compaction Characteristics of Soil Using Modified Effort.* All fill products should be compacted in lifts of soil not exceeding 12 inches measured prior to compaction.

Table 5.1.3.B - Compaction recommendation.

Project Use	**Recommended Compaction**
● Fill areas under foundation. ● Fill to achieve subgrade under slab or driveway.	95 percent of the maximum dry density of Modified Proctor.

• Fill immediately below slab-on-grade. • Fill immediately below the asphaltic-concrete pavement, concrete pavement, sidewalks, and exterior hardscapes.	
• Exterior wall backfill. • Utility trench backfills.	92 percent of the maximum dry density of Modified Proctor.
• Non-structural fill areas. • Vegetated areas.	80 to 85 percent of the maximum dry density of Modified Proctor.

If more than 30 percent of native or imported *Structural Fill* material is retained on the ¾" sieve, ASTM D1557 *Laboratory Compaction Characteristics of Soil Using Modified Effort* is not recommended to be used. In this case, a soil specific method specification can be developed. A nuclear density gauge can be used during earthwork operations to establish a moisture and compaction method that provides an acceptable maximum dry density. Method specification earthwork operations are recommended to have full-time soil testing to ensure adequate compaction.

The soil products are recommended to have passing compaction testing results at the following frequency to ensure the soil is uniformly meeting compaction requirements. Failing test results should be retested after additional compactive effort and, if necessary, water is added. At least 90% of the compaction testing results must achieve the required maximum dry density.

Table 5.1.3.C - Testing Frequency.

Project Use	**Testing Frequency**
• Below interior building concrete slabs for fill less than a vertical foot.	2,500 square feet and a minimum of 2 tests.
• Along the building footings for every vertical foot of fill.	50 lineal feet and a minimum of 2 tests.
• Structural fill placements larger than one foot in height	100 cubic yards
• Fill under asphalt parking areas and exterior concrete flatwork	5,000 square feet and a minimum of 2 tests.
• Utility trenches for every two vertical feet of trench backfill.	100 lineal feet and a minimum of 2 tests.

The jurisdictional requirements should be conformed to if there is a conflict with the requirements of Table 5.1.2.C. Excavations deeper than four feet must have adequate trenching protection or sloped back in accordance with state and federal requirements in order to be compaction tested.

5.1.4 Excavation Construction Considerations

The soils at the site are removable with a toothed-bucket on an excavator. However, a hydraulic breaker may be required for excavations into weathered bedrock. Blasting may be considered to remove isolated rock outcroppings if it is more economical than removal with a hydraulic breaker. A blasting plan should be prepared if blasting is required.

If groundwater is encountered in excavations we recommend dewatering. When final plans are available, we should be contacted to discuss dewatering options.

No excavation support or sloped excavations have been reviewed in preparation of this report. The contractor should perform excavations in accordance with state and federal regulations. If requested, Liberty Geotech is available to provide further analysis of excavation support or shoring design. Liberty Geotech is not responsible for the safety of trenches, excavations or shoring support.

5.1.5 Weather-Related Earthwork Considerations

Wet weather, freezing conditions, or snow can impede or prevent earthwork operations. The following recommendations should be considered by the contractors and owners during construction:

1. It is not recommended that soil products are placed during freezing conditions. No concrete or soil products should be placed on frozen soil.
2. The steeply-sloped topography may cause hazardous working conditions during winter or wet weather conditions.
3. The on-site soils, bedrock and any imported soil products may become saturated during earthwork operations and will reduce operation production.
4. Stockpiles of soil products should be protected during wet weather. Soil products that have been compacted should be protected and not travelled on during wet weather to prevent disturbing the subgrade.

This report does not provide recommendations for erosion, runoff, trackout from trucks removing site stripping, or environmental considerations associated with earthwork operations.

5.2 Shallow Foundation Design

The following design parameters are provided based on the project understanding described in Section 2.0. Liberty Geotech should be notified to revise or confirm the following

recommendations if the building location, locations of the site improvements, or structural loads change.

- If alluvial silts are encountered at foundation subgrade elevation, the soil should be sub-excavated to at least 1 foot below bottom of footing elevation and replaced with compacted structural fill.
- Allowable bearing capacity for foundations: 1,500 psf.
- Footing embedment for heated foundations*:* 2 feet.
- Footing embedment for unheated foundations: 3 feet.
- Estimated total settlement for foundations on *Structural Fill:* Less than 1 inch.
- A sliding coefficient of friction between the shallow foundations and native soil of 0.35 may be used.

Differential settlement can occur when two different foundations exert different bearing pressures on the soil. The magnitude of the differential settlement depends on the foundation pressure difference. Or, differential settlement can occur due to differences in the soil resistance to the foundation pressure. Footing foundations are not recommended to bear on both *Structural Fill* and bedrock to prevent differential settlement. Differential settlement is anticipated to be less than ½ inch.

5.3 Concrete Slab Design and Construction Considerations

The following recommendations should be considered to be the minimum design requirements. The structural engineer's design supersedes these recommendations. A structural engineer should design concrete slabs supporting more than 200 pounds per square foot.

- The concrete slab should be a minimum of four inches thick.
- The slab reinforcement should not be less than No. 3 rebar, 18 inches in the center in both directions, and constructed in the middle of the slab.
- The modulus of subgrade support is recommended to be 150 pounds per square inch per inch (pci).
- The slab should be supported with inches of compacted *Concrete Slab Cushion* soil in accordance with Section 5.1.

Vapor transmission through the concrete slabs may damage moisture sensitive floor coverings. The design and ownership team should carefully consider design publication *Guide to Concrete Floor and Slab Construction* (ACI, 2015) before ommiting a vapor retarded under the slab. The design and ownership team may consider omitting a vapor retarder under the slab based on lack of clay in the native soil, depth to groundwater, usage of *Concrete Slab Cushion*, and no proposed moisture sensitive floor coverings. If a moisture retarder is used, it should meet the requirements of ASTM E1643: *Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*.

Concrete slabs can crack because of numerous reasons. The following considerations should be mitigated during construction to reduce the risk of the concrete slabs cracking.

- The concrete mix design can be altered based on the ambient temperature, aggregate moisture content, anticipated time in the mix truck, and finishing methods. A poorly designed mix that does not incorporate these factors can cause concrete slabs to crack.
- The contractor's means and methods can cause concrete slabs to crack including improper placement of rebar support, improper crack control joints, improper curing methods or poor finishing techniques, and placing concrete during cold or hot weather.

5.4 Exterior Slabs

The silty sands and silts at the site are considered to be moderately to highly frost-susceptible. If these soils become saturated and freeze, heave may occur. One way to reduce the potential for heave is to remove any frost-susceptible soil down to bottom-of-footing grade or to a maximum depth of 3 feet, whichever is less, and replace with non-frost-susceptible sand or gravel. Sand or sandy gravel having less than 5 percent of the particles by weight passing a 200 sieve is considered to be non-frost-susceptible.

5.5 Seismicity and Liquefaction

The proposed site is designated a **Site Class D**. The following table presents seismicity coefficients referencing the IBC 2015 code.

Table 5.4.A Seismic Design Parameters

0.2 Second MCE Spectral Response Acceleration	S_s	0.330
0.2 Second MCE Spectral Response Acceleration	S_1	0.115
1.0 Second MCE Spectral Response Acceleration	S_{DS}	0.338
1.0 Second MCE Spectral Response Acceleration	S_{D1}	0.179
Design Peak Ground Acceleration	PGA_M	0.216

Latitude: 47.619941

Longitude: -117.43970

There is a low potential for liquefaction based on the *Liquefaction Susceptibility Map of Spokane County, Washington*.

5.6 Lateral Earth Pressure Design

The following table provides equivalent fluid pressures recommended to be used by the structural engineer to design retaining or basement walls.

Table 5.5.A Seismic Design Parameters

Equivalent Fluid Pressure Designation	Unit Weight (PCF)
Active Equivalent Fluid Pressure	40
At-rest Equivalent Fluid Pressure	60
Passive Equivalent Fluid Pressure	250

Concrete basement walls that are fully restrained should be designed for at-rest equivalent fluid pressure. Flexible walls or concrete walls that are allowed to crack may be designed for the active equivalent fluid pressure. Soil that is preventing a retaining wall or foundation wall from sliding may be analyzed with the passive equivalent fluid pressure.

5.7 Drainage and Stormwater Infiltration Recommendations

The following recommendations should be used by the civil engineer to design bio-infiltration swales, drywell structures, or infiltration galleries:

- The depth to a restrictive layer is highly variable across the site.
- Based on the test pits, drywells would be suitable for the proposed swales located near TP-18, TP-20, TP-21, and TP-22. Low-profile drywells could be considered for the swale located near TP-14. Furthermore, drainage areas could be repositioned such that they are located in areas of the site containing free-draining soils at depth (sands classified as SP).
- Swales and drywells should be located 10-feet from the edge of buildings and concrete hardscapes to minimize the effects of infiltration.
- Hardscaping and landscaping should be sloped at least five percent away from buildings or settlement prone site improvements.

Subsurface infiltration using bio-infiltration swales or infiltration galleries may be designed with a hydraulic conductivity of 15 inches per hour should be used for infiltration design. The following recommendations are provided in the *Stormwater Management Manual for Eastern Washington* (Stormwater, 2019).

- All biofiltration swales should be sized to empty within 72 hours of an infiltration event.

- The soil has a medium to high treatment capacity based on Table 5.6.1 of the *Stormwater Management Manual for Eastern* (Stormwater, 2004).

Single and double-depth drywells may utilize a design outflow rate of 0.14 and 0.23 cubic feet per second, respectively. Higher drywell outflow recommendations may be provided once the final drywell locations are determined. Drywells should only be placed in the free-draining sands encountered at the site. The drywells must conform to the jurisdiction specification in which they are constructed. Low profile drywells could be considered for swales in areas with shallow limiting layers.

Foundation drains should not be omitted based on the drainage characteristics of the native soils. In addition, all basement walls are recommended to have a waterproofing membrane to help prevent water infiltration. A plate in Appendix F: *Basement Wall Drainage Detail* provides recommendations for helping mitigate water seepage through the basement wall.

5.8 Pavement Section Design Recommendations

The following pavement design recommendations are provided for 3.0 inches of asphaltic-concrete pavement over 6.0 inches of *Crushed Surfacing*. Subgrade areas that are predominately silt should be over-excavated by 6.0 inches and replaced with *Structural Fill* or *Crushed Surfacing.* Alternative to over-excavation, a geotextile separation (Mirifi H2Ri or an approved equivalent) may be installed over prepared silt subgrade. The Structural Number for this pavement section is 1.91 and the number of passes with an equivalent single-axle load (ESAL) is 50,000. The following design parameters were used in the analysis:

- Subgrade support modulus, M_r: 8,000 psi (assuming the subgrade has been scarified and re-compacted to a minimum of 95 percent of the modified Proctor).
- Reliability percent: 80%.
- Standard deviation: 0.45.
- Asphaltic-concrete layer coefficient, a1: 0.42.
- Aggregate base layer coefficient, a2: 0.12.
- Drainage coefficient of aggregate base, m: 0.90.

Paving operations can be observed and tested by Liberty Geotech or by the asphalt paving company. Asphalt should be compacted to 92 percent of the Rice density. Liberty Geotech can provide additional traffic analysis or life-cycle cost analysis upon request.

6.0 DESIGN REVIEW AND CONSTRUCTION OBSERVATIONS

6.1 Geotechnical Consultant versus Geotechnical Inspector

The owner chooses to retain Liberty Geotech as either the Geotechnical Consultant or Geotechnical Inspector. Liberty Geotech provides recommendations and suggestions to the project team as the Geotechnical Consultant. In a Consultant role, Liberty Geotech has no

liability for settlement associated with *Structural Fill* placement and compaction, moisture or seepage through retaining walls or concrete slabs, site drainage, or cracks in the interior or exterior concrete flatwork. Liberty Geotech's liability is limited to the authorized proposal dated August 19, 2020. As a geotechnical inspector, Liberty Geotech provides inspections and soil testing during construction.

Liberty Geotech has been retained as a Geotechnical Consultant for the Latah Glen. At the owner's request Liberty Geotech can provide a proposal to perform additional geotechnical inspections for the project. This report cannot be relied upon for geotechnical recommendations if Liberty Geotech is not retained to observe and confirm the soil conditions as recommended in this report.

6.2 Revisions and Transfer of Geotechnical Recommendations

Liberty Geotech should be notified to update recommendations if the proposed development changes or subsurface soil or groundwater conditions vary from those described in this report. This report cannot be relied upon by property owners adjacent to this property without confirmation of their specific site soil conditions. Also, the report recommendations cannot be transferred to other business entities or subsequent property owners without written authorization. No warranty or certification of construction is provided with this report. It is recommended that Liberty Geotech is retained to provide design review of the proposed construction and be the Geotechnical Consultant during construction in order to continue to be the Geotechnical Engineer of Record.

7.0 REFERENCES

ACI Committee 302. "Guide for Concrete Floor and Slab Construction." ACI 302.1R-15. American Concrete Institute, P.O. Box 19150 Redford Station, Detroit, Michigan 48219.

Derkey, Robert E., Hamilton, Michael M., Stradling, Dale F., 2004. Geologic Map of the Spokane SW 7.5-minute Quadrangle, Spokane County, Washington. Washington Division of Geology and Earth Resources.

OSHPD. "Seismic Design Maps."Accessed September 27, 2020. https://seismicmaps.org/

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United States Department of Agriculture, Natural Resources Conservation Service. "Web Soil Survey." Accessed September 27, 2020. http://websoilsurvey.nrcs.usda.gov/

Washington State Department of Ecology. "Stormwater Management Manual for Eastern Washington." February 2019. Publication Number 18-10-044.

Washington State Department of Ecology. “Washington State Well Report Viewer.” Accessed September 27, 2020. fortress.wa.gov/ecy/wellconstruction/map/WCLSWebMap/

APPENDIX A

Exploration Site Plan

VICINITY MAP
(GOOGLE MAPPING SERVICE™)

APPROXIMATE SCALE - FEET

0 75 150

LEGEND

TP-1 TEST PIT LOCATION

IMAGE SOURCE: GOOGLE EARTH, PARTIAL OVERLAY OF LATAH GLEN, SITE PLAN, STORHAUG, DATED JULY 15, 2020

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EXPLORATION SITE PLAN

LATAH GLEN

PARCEL NOS: 25364.0001 AND 25361.0004

SPOKANE, WASHINGTON

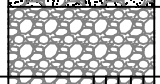
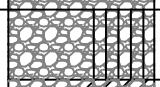
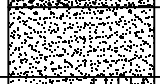
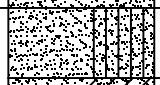
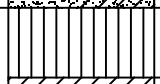
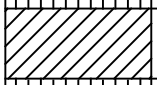
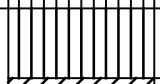
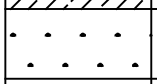
LIBERTY GEOTECH

JOB NO. 20211	SEPTEMBER 30, 2020	PLATE 1

APPENDIX B

Subsurface Exploration Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS GROUP SYMBOL	SOIL DECRIPTION
COURSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	WELL-GRADED GRAVEL
				GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES		GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
				GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
	SAND	CLEAN SAND		SW	WELL-GRADED SAND
				SP	POORLY-GRADED SAND
		SAND WITH FINES		SM	SILTY SAND
				SC	CLAYEY SAND
	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	INELASTIC SILT
				CL	LEAN CLAY
				OL	ORGANIC SILT
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	ELASTIC SILT
				CH	FAT CLAY
				OH	ORGANIC CLAY
				PT	PEAT

ABBREVATIONS
BGS - BELOW EXISTING GROUND SURFACE
N.E. - NOT ENCOUNTERED

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Poorly-Graded Sand with Silt (SP-SM) Loose, Brown, Dry	1934	0								
ALLUVIUM - Sandy Silt (ML) Firm, Brown, Dry	1930	5								cobbles and boulders up to 16"
ALLUVIUM - Silty Sand (SM) Medium Dense, Brown, Moist	1925	10								

Test pit terminated at 10-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 1		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: ne	Logged By: MK		Sheet: 1 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Light Brown, Dry	1920	0								
ALLUVIUM - Sandy Silt (ML) Firm, Light Brown, Dry	1915	5		1-Gallon Bag		57		8		
ALLUVIUM - Silty Sand (SM) Dense, Brown, Moist	1910	10		1-Gallon Bag		33		8		

Test pit terminated at 13-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 2		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: ne	Logged By: MK		Sheet: 2 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand (SM) Loose, Light Brown, Dry		0								
ALLUVIUM - Silty Sand (SM) Dense, Brown, Dry	1910	5		1-Gallon Bag						
	1905	10								
	1900	15								

Test pit terminated at 15-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 3		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 3 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Sandy Silt (ML) Soft, Light Brown, Dry	1910	0								
ALLUVIUM - Silty Sand (SM) Medium Dense, Light Brown, Dry	1905	5		1-Gallon Bag		16		13		
LACUSTRINE - Sandy Silt (ML) Firm, Light Brown, Moist	1900	10		1-Gallon Bag	4.5+	63		29		
BEDROCK - Poorly-Graded Gravel (GP) Hard, Brown, Moist										

Test pit terminated at 13-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 4		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 4 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Poorly-Graded Sand with Silt (SP-SM) Loose, Light Brown, Dry	1902	0								
EOLIAN - Sandy Silt (ML) Hard, Brown, Dry	1900	5		1-Gallon Bag						
ALLUVIUM - Silty Sand with Gravel (SM) Dense, Dark Brown, Moist	1895			1-Gallon Bag						
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Dense, Dark Brown, Moist		10								

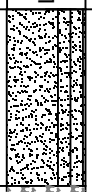
Test pit terminated at 11-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 5		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 5 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand (SM) Loose, Light Brown, Dry	1865	0								
ALLUVIUM - Silty Sand (SM) Loose, Brown, Dry		5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Dense, Dark Brown, Moist	1860	10		1-Gallon Bag		1		4.8		angular cobbles

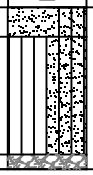
Test pit terminated at 12-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 6		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 6 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Light Brown, Dry	1892	0								
BEDROCK - Poorly-Graded Gravel (GP) Dense, Light Brown, Dry										

Test pit terminated at 4-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 7		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 7 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand (SM) Loose, Light Brown, Dry	1864	0								
LACUSTRINE - Sandy Silt (ML) Soft, Light Brown, Dry										
BEDROCK - Poorly-Graded Gravel (GP) Very Dense, Brown, Dry										

Test pit terminated at 2.75-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 8		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 8 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
ALLUVIUM - Silty Sand (SM) Loose, Light Brown, Dry	1855	0		1-Gallon Bag						
LACUSTRINE - Sandy Silt (ML) Very Hard, Brown, Dry	1850	5		1-Gallon Bag 1-Gallon Bag	4.5+					
LACUSTRINE - Sandy Silt (ML) Very Hard, Dark Brown, Moist					4.5+					
BEDROCK - Poorly-Graded Gravel (GP) Very Dense, Brown, Moist				1-Gallon Bag	4.5+					

Test pit terminated at 9-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 9		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 9 of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand (SM) Loose, Light Brown, Dry	1880	0								
BEDROCK - Poorly-Graded Gravel (GP) Very Hard, Brown, Dry										

Test pit terminated at 2.5-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 10		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 10of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Sandy Silt with Gravel (ML) Very Soft, Light Brown, Dry	1850	0								
ALLUVIUM - Silty Sand (SM) Loose, Tan, Dry	1845	5		1-Gallon Bag						
ALLUVIUM - Sandy Silt (ML) Firm, Tan, Dry				1-Gallon Bag		59		32		
ALLUVIUM - Silty Sand (SM) Dense, Light Brown, Dry	1840	10		1-Gallon Bag		33		18		

Test pit terminated at 13-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 11		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 11of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Sandy Silt with Gravel (ML) Very Soft, Light Brown, Dry		0								
ALLUVIUM - Silty Sand (SM) Medium Dense, Tan, Dry	1845									
ALLUVIUM - Silty Sand (SM) Medium Dense, Brown, Moist		5								
	1840									
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Dense Gray, Moist		10		1-Gallon Bag		4		6		
	1835									

Test pit terminated at 14-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 12		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 12of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silt (ML) Soft, Light Brown, Dry	1830	0								
ALLUVIUM - Silty Sand (SM) Medium Dense, Tan, Dry		5								
BEDROCK - Poorly-Graded Gravel (GP) Very Dense, Dark Brown, Moist										

Test pit terminated at 8-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 13		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 13of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Light Brown, Dry	1860	0								angular basalt cobbles
UNDOCUMENTED FILL - Silty Sand (SM) Medium Dense, Tan, Dry										andgular cobbels from builidng the road.
ALLUVIUM - Poorly-Graded Sand (SP) Dense, Dark Brown, Moist	1855	5								angular cobbles
BEDROCK - Poorly-Graded Gravel (GP) Very Dense, Dark Brown, Moist		10								

Test pit terminated at 10-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 14		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 14of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Light Brown, Dry	1855	0								angular basalt cobbles, old car parts
ALLUVIUM - Silty Sand (SM) Medium Dense, Tan, Dry		5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Loose, Dark Brown, Dense	1850									angular cobbles

Test pit terminated at 9-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 15		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 15of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Sandy Silt (ML) Soft, Light Brown, Dry	1850	0								
UNDOCUMENTED FILL - Silty Gravel with Sand (GM) Loose, Tan, Dry		5								cobble and boulders up to 30"
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Medium Dense, Gray, Moist	1845	10								
	1840									

Test pit terminated at 11-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 16		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 16of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
ALLUVIUM - Sandy Silt (ML) Very Soft, Light Brown, Dry		0		1-Gallon Bag		32		4		
ALLUVIUM - Silty Sand (SM) Medium Dense, Tan, Dry	1830	5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Loose, Gray, Medium Dense	1825	10								angular cobbles

Test pit terminated at 13-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 17		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 17of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Poorly-Graded Sand with Silt and Gravel (SP-SM) Loose, Light Gray, Dry	1825	0								
UNDOCUMENTED FILL - Poorly-Graded Sand with Silt and Gravel (SP-SM) Loose, Light Gray, Dry		5								cobbles and boulders up to 36"/ concrete blocks
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Dense, Light Gray, Moist	1820	10								
	1815									

Test pit terminated at 12-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 18		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 18of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Sandy Silt (ML) Soft, Light Brown, Dry		0								
ALLUVIUM - Silty Sand (SM) Medium Dense, Tan, Dry	1850	5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Silt (SP-SM) Medium Dense, Dark Brown, Dry	1845	10		1-Gallon Bag		7		3		
	1840									

Test pit terminated at 12-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 19		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 19of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Sandy Silt (ML) Soft, Light Brown, Dry	1845	0								Garbage and road building material
ALLUVIUM - Silty Sand (SM) Medium Dense, Tan, Dry		5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Dense, Gray, Moist	1840	10								
	1835									

Test pit terminated at 12-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 20		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 20of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Sandy Silt (ML) Soft, Light Brown, Dry	1845	0								
ALLUVIUM - Silty Sand (SM) Dense, Tan, Dry	1840	5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Dense, Gray, Moist	1835	10								

Test pit terminated at 12-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 21		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 21of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Sandy Silt (ML) Very Soft, Light Brown, Dry	1835	0								
ALLUVIUM - Silty Sand (SM) Loose, Tan, Dry	1830	5								
		10								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Dense, Gray, Moist	1825									cobbles

Test pit terminated at 14-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 22		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 22of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Light Gray, Dry	1825	0								
UNDOCUMENTED FILL - Poorly-Graded Sand with Silt and Gravel (SP-SM) Loose, Light Gray, Dry		5		1-Gallon Bag						cobbles and boulders up to 20" and garbage
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Loose, Light Gray, Dry	1820	10		1-Gallon Bag		1		4		
	1815									

Test pit terminated at 12-feet bgs due to proposed depth.

Client: Sycamore Group, LLC	Test Pit Number: 23		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 23of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand with Gravel (SM) Loose, Light Gray, Dry		0								
UNDOCUMENTED FILL - Silt (ML) Loose, Light Gray, Dry	1810	5		5-Gallon Bulk						boulders up to 20", Very ashy, Small pieces of charcoal
ALLUVIUM - Silty Sand with Gravel (SM) Loose, Brown, Dry	1805			1-Gallon Bag		18		4		boulders up to 20"
BEDROCK - Poorly-Graded Gravel (GP) Very Dense, Brown, Dry										Basalt bedrock

Test pit terminated at 9-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 24		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT 316F	Date Excavated: 9/9/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 24of 24

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Sandy Silt (ML) Loose, Dark Brown, Dry ALLUVIUM - Sandy Silt (ML) Soft, Light Brown, Dry										With roots With roots and cobbles

Test pit terminated at 3.5-feet bgs due to bedrock.

Client: Sycamore Group, LLC	Test Pit Number: 25		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT308D	Date Excavated: 9/28/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 1 of 4

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Dark Brown, Dry	1815									With cobbles, boulders, and debris
UNDOCUMENTED FILL - Poorly-Graded Sand with Gravel (SP) Loose, Dark Gray, Dry	1810	5								With cobbles and boulders
ALLUVIUM - Clayey Sand (SC) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Loose, Dark Brown, Dry	1805	10								

Test pit terminated at 13.5-feet bgs due to sidewall caving.

Client: Sycamore Group, LLC	Test Pit Number: 26		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT308D	Date Excavated: 9/28/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 2 of 4

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Dark Brown, Dry		0								With cobbles and debris
GLACIAL FLOOD DEPOSITS - Silty Sand with Gravel (SM) Loose, Light Brown, Dry	1810	5								
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Loose, Dark Brown, Dry	1805	10		1-Gallon Bag		2		4		

Test pit terminated at 12-feet bgs due to sidewall caving.

Client: Sycamore Group, LLC	Test Pit Number: 27		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT308D	Date Excavated: 9/28/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 3 of 4

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	POCKET PEN. (TSF)	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand with Gravel (SM) Loose, Dark Brown, Dry	1810									With cobbles and debris
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Loose, Dark Brown, Dry	1805	5								With cobbles and boulders
		10								

Test pit terminated at 10-feet bgs due to sidewall caving.

Client: Sycamore Group, LLC	Test Pit Number: 28		
Project: Latah Glen	Project Number: 20211		
Equipment: CAT308D	Date Excavated: 9/28/2020		
Depth to Groundwater: NE	Logged By: MK		Sheet: 4 of 4

APPENDIX C

Laboratory Testing Results

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

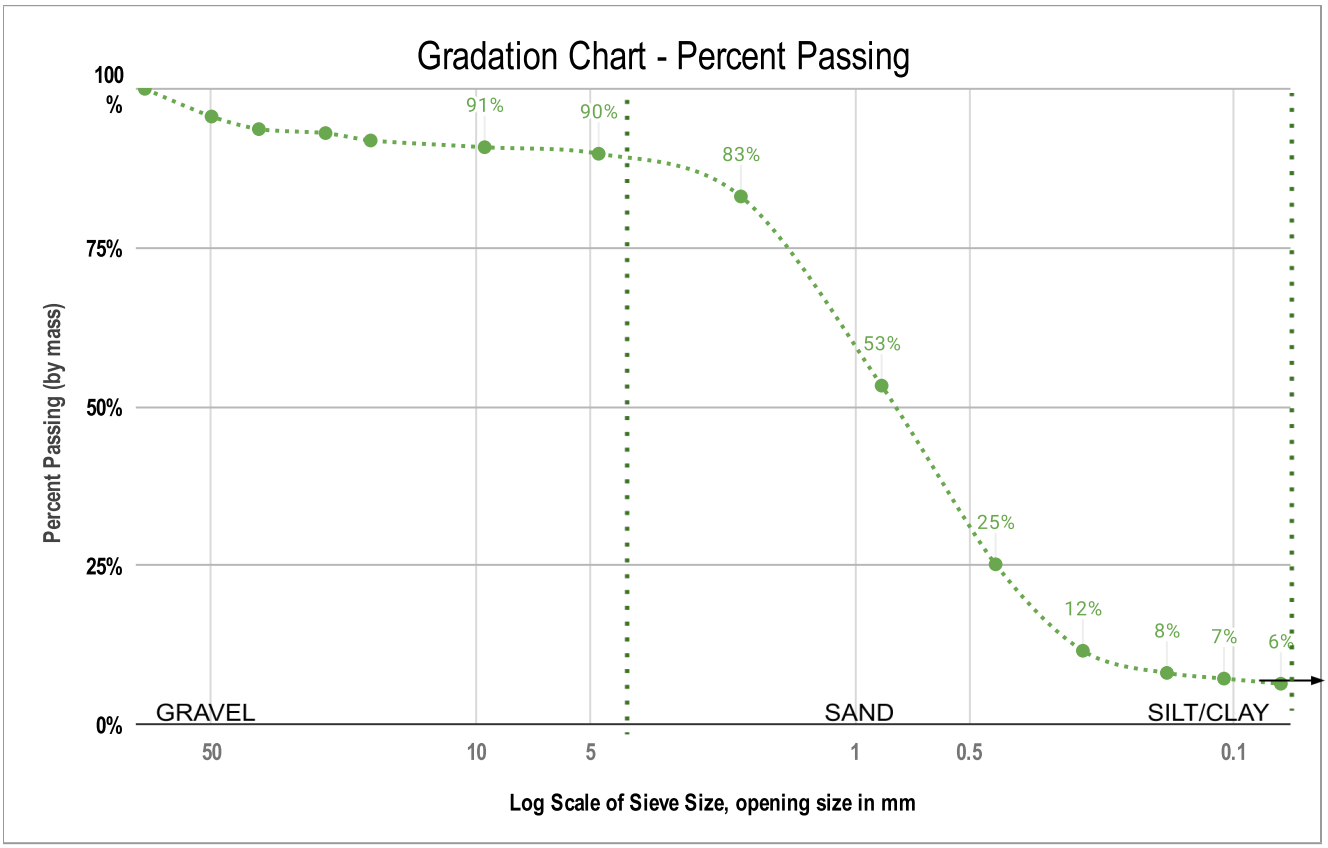
Project: Latah Glen **Test No.:** 20211.2 **Testing Date:** 9/21/2020

Job No: 20211 **Sample Location:** TP-23@3.5' **Laboratory Technician:** James Swearingen

Method Used: Method A Max Particle Size: 3/8"

Total Sample Mass: 25,336 grams Minimum Sample Size: 165 grams

Drying Method: Oven Dry



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Poorly-Graded Sand with Silt

Percent Moisture: 2.7%

%Gravel: 10% **%Sand:** 83% **%Fines:** 6%

Coefficient of Uniformity, Cu: 5.0

Coefficient of Curvature, Cc: 1.3

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

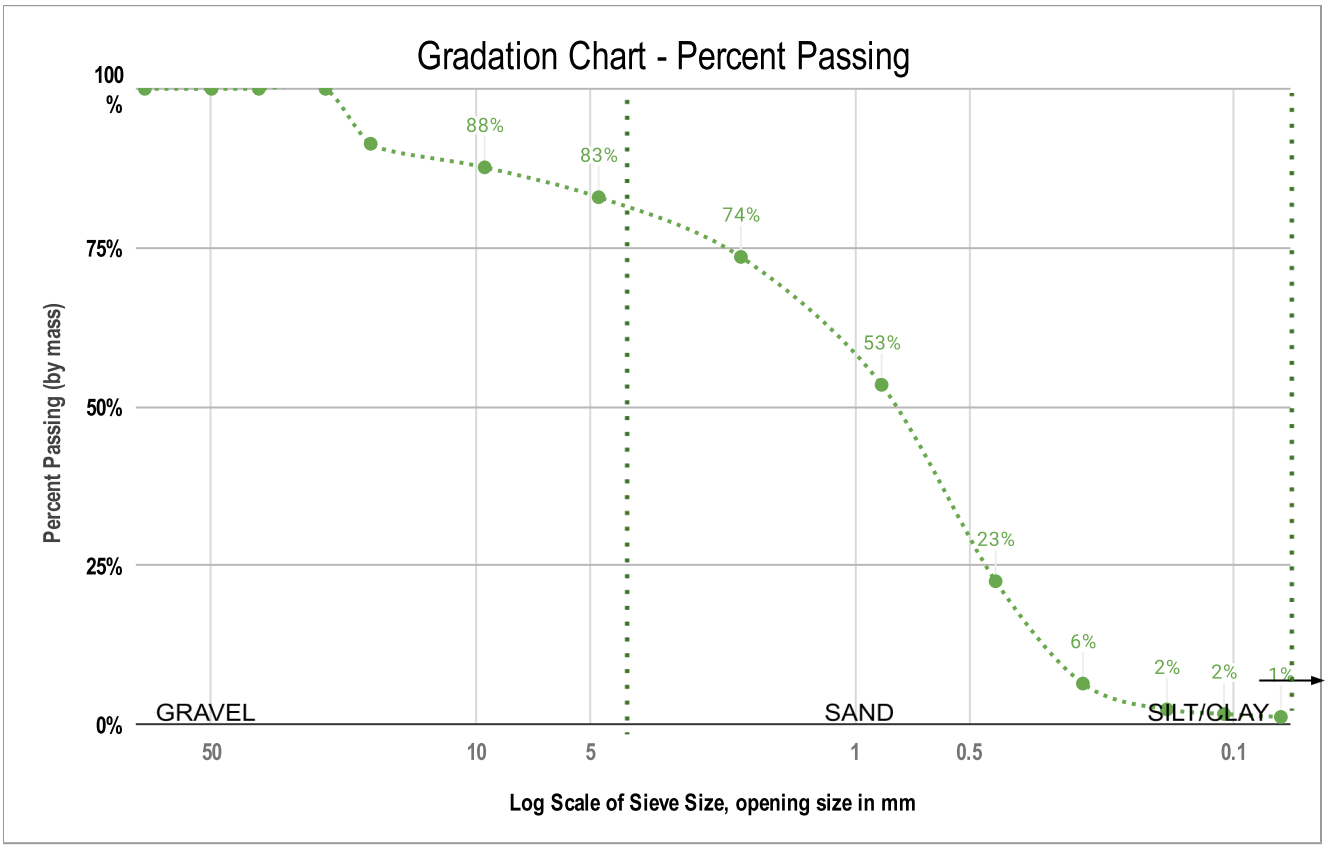
Project: Latah Glenn **Test No.:** 20211.4 **Testing Date:** 9/11/2020

Job No: 20211 **Sample Location:** TP-6@12' **Laboratory Technician:** James Swearingen

Method Used: Method A Max Particle Size: 3/4"

Total Sample Mass: 1,521 grams Minimum Sample Size: 1,300 grams

Drying Method: Oven Dry



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Well-Graded Sand with Gravel

Percent Moisture: 4.8%

%Gravel: 17% **%Sand:** 82% **%Fines:** 1%

Coefficient of Uniformity, Cu: 5.0

Coefficient of Curvature, Cc: 0.5

APPENDIX D

Photo Log

Appendix E: Photo Log

PHOTO 1: TP-1

PHOTO 2: TP-2

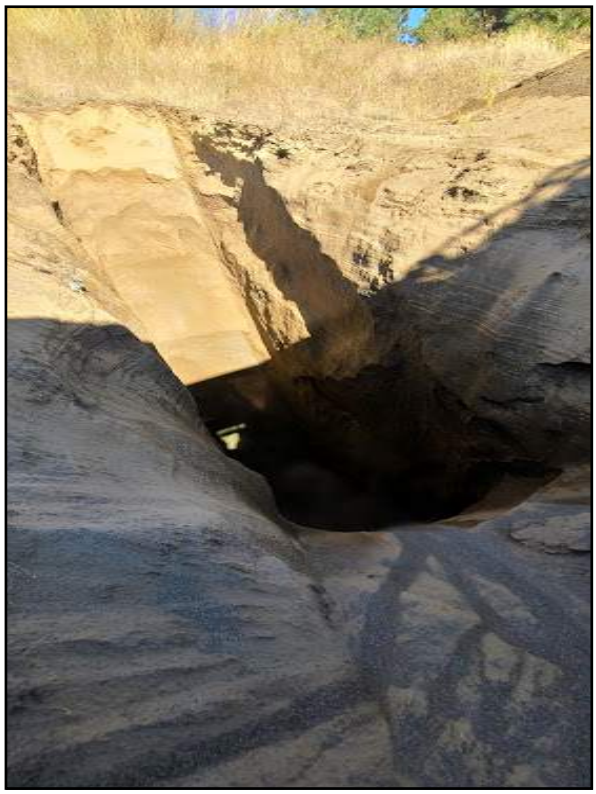


PHOTO 3: TP-3

PHOTO 4: TP-4

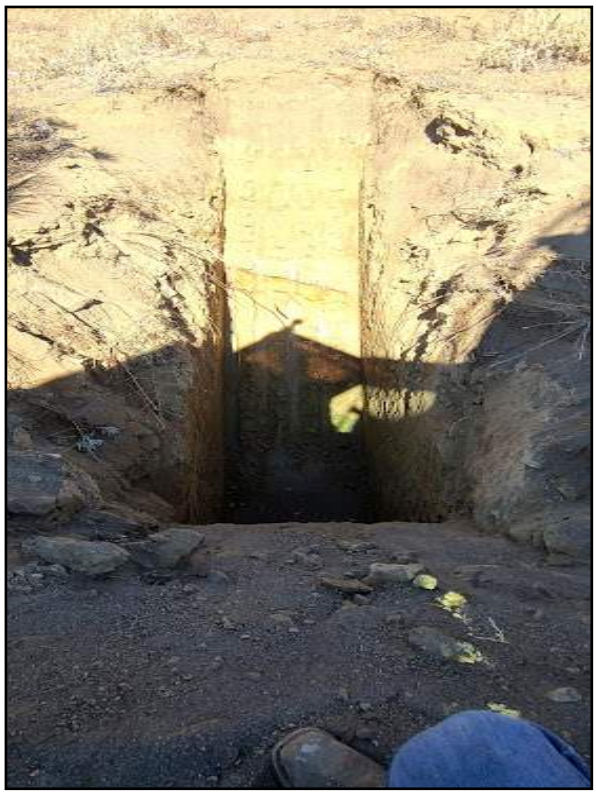


PHOTO 5: TP-5

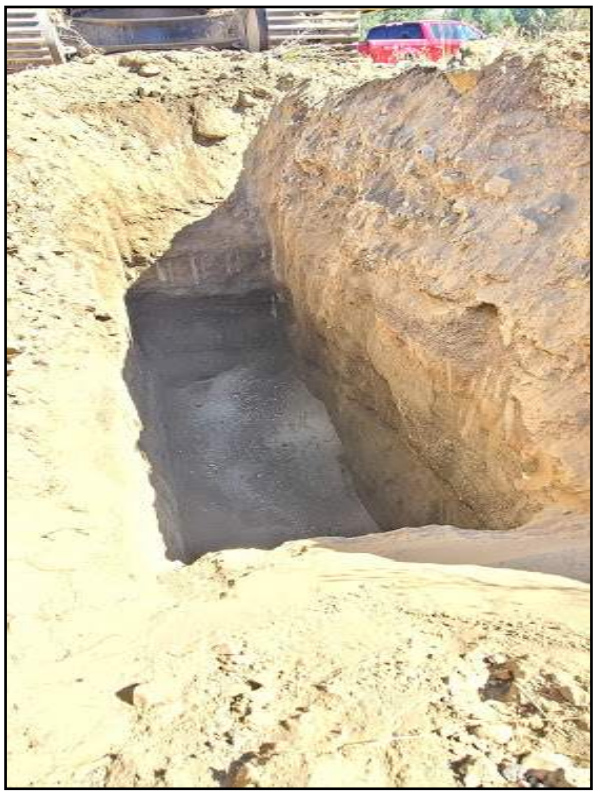


PHOTO 6: TP-6

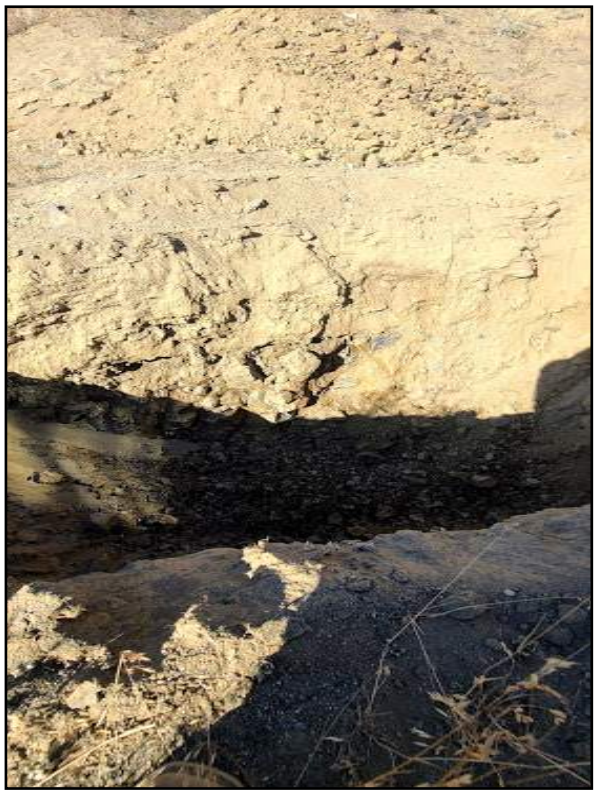


PHOTO 7: TP-7

PHOTO 8: TP-8

Appendix E: Photo Log

PHOTO 9: TP-9

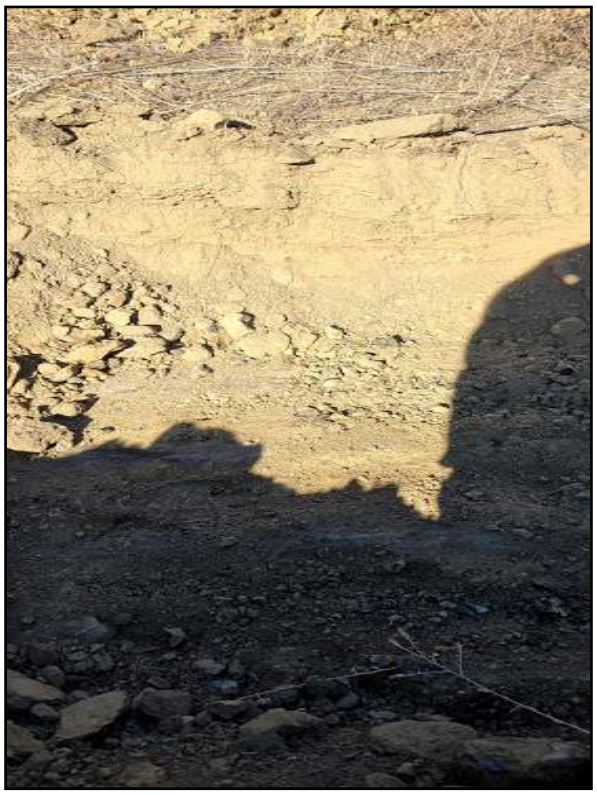


PHOTO 10: TP-10

PHOTO 11: TP-11

PHOTO 12: TP-12

PHOTO 13: TP-13

PHOTO 14: TP-14

PHOTO 15: TP-15

PHOTO 16: TP-16

PHOTO 17: TP-17

PHOTO 18: TP-18

PHOTO 19: TP-19

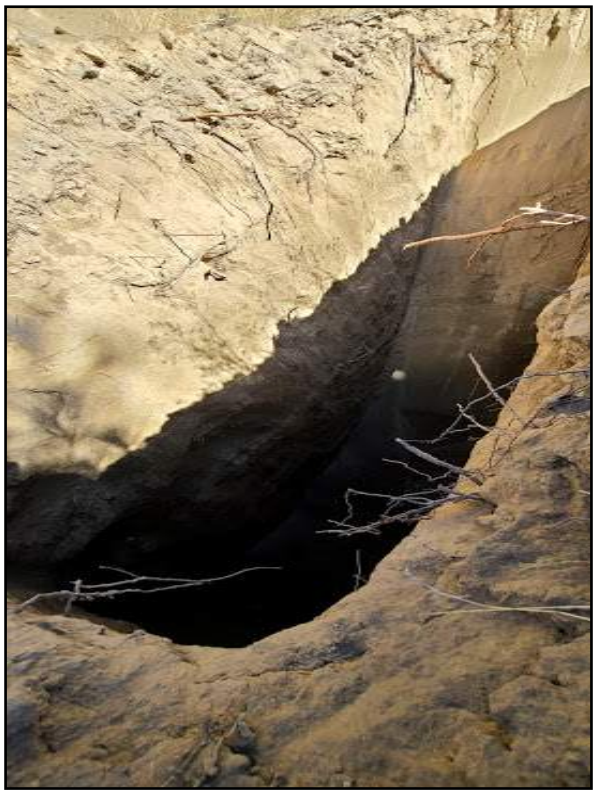


PHOTO 20: TP-20

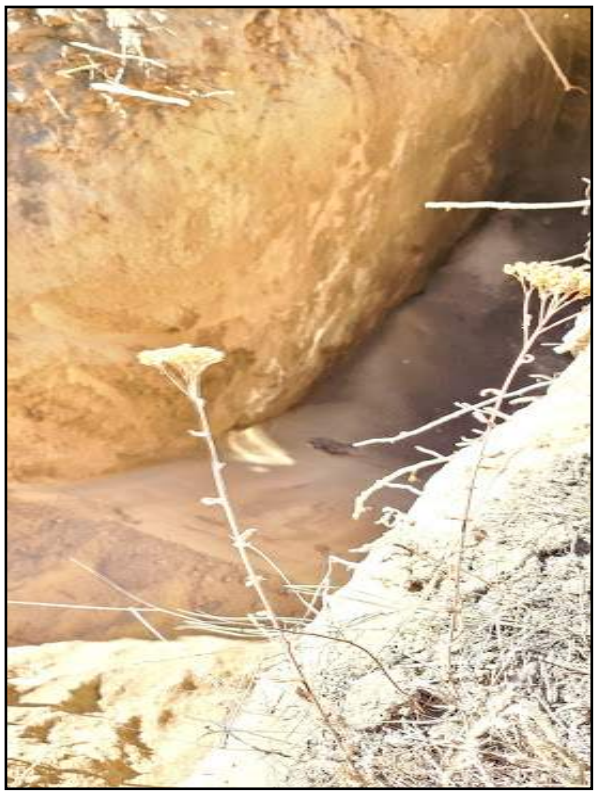


PHOTO 21: TP-21

PHOTO 22: TP-22

PHOTO 23: TP-23

PHOTO 24: TP-24

PHOTO 25: TP-25

PHOTO 26: TP-26

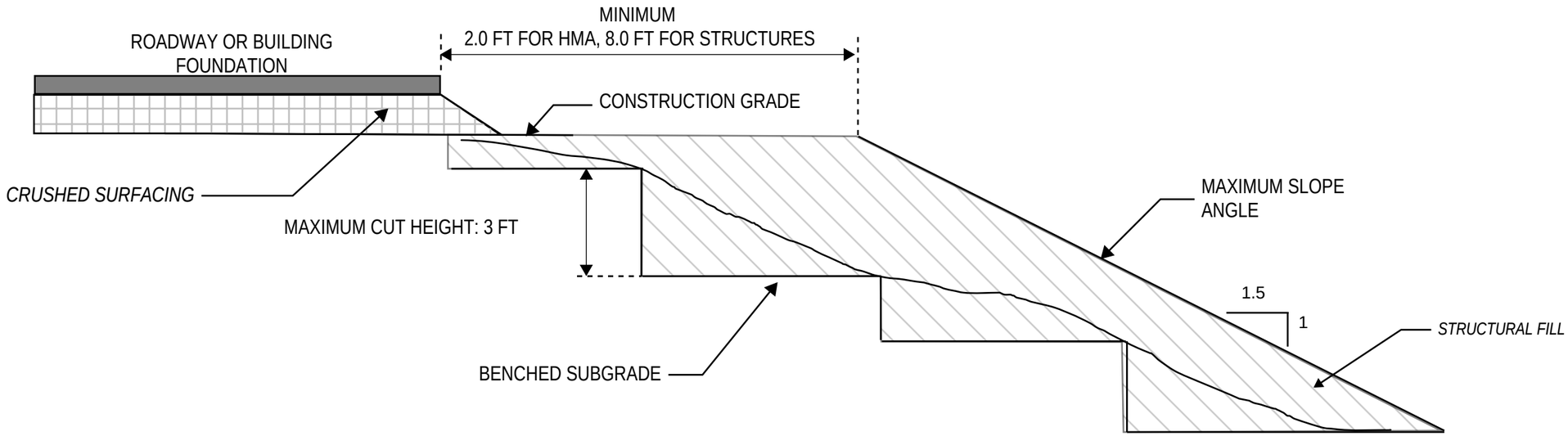
PHOTO 27: TP-27

PHOTO 28: TP-28

APPENDIX E

BENCHING AND SLOPE FILL REQUIREMENTS

BENCHING AND CONSTRUCTION REQUIREMENTS FOR SLOPE CONSTRUCTION



GENERAL NOTES

1. THE SLOPE BENCHING SHOULD BE CONSTRUCTED ON SUBGRADE SURFACE THAT HAVE BEEN PREPARED IN ACCORDANCE WITH THE *SITE STRIPPING* OF THE GEOTECHNICAL REPORT. THE SUBGRADE SHOULD BE APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF THE FIRST LIFT.
2. ALL SLOPING SURFACES SHOULD BE BENCHED WITH A MAXIMUM VERTICAL CUT OF 3 FEET.
3. ALL LOOSE LIFT HEIGHTS SHOULD BE LIMITED TO 12 INCHES PRIOR TO COMPACTION
4. REFER TO THE GEOTECH REPORT FOR ADDITIONAL DESIGN RECOMMENDATIONS AND CONSTRUCTION RECOMMENDATIONS.

BENCHING AND SLOPE FILL REQUIREMENTS
LATAH GLEN
PARCEL NOS: 25364.0001 AND 25361.0004
SPOKANE, WASHINGTON

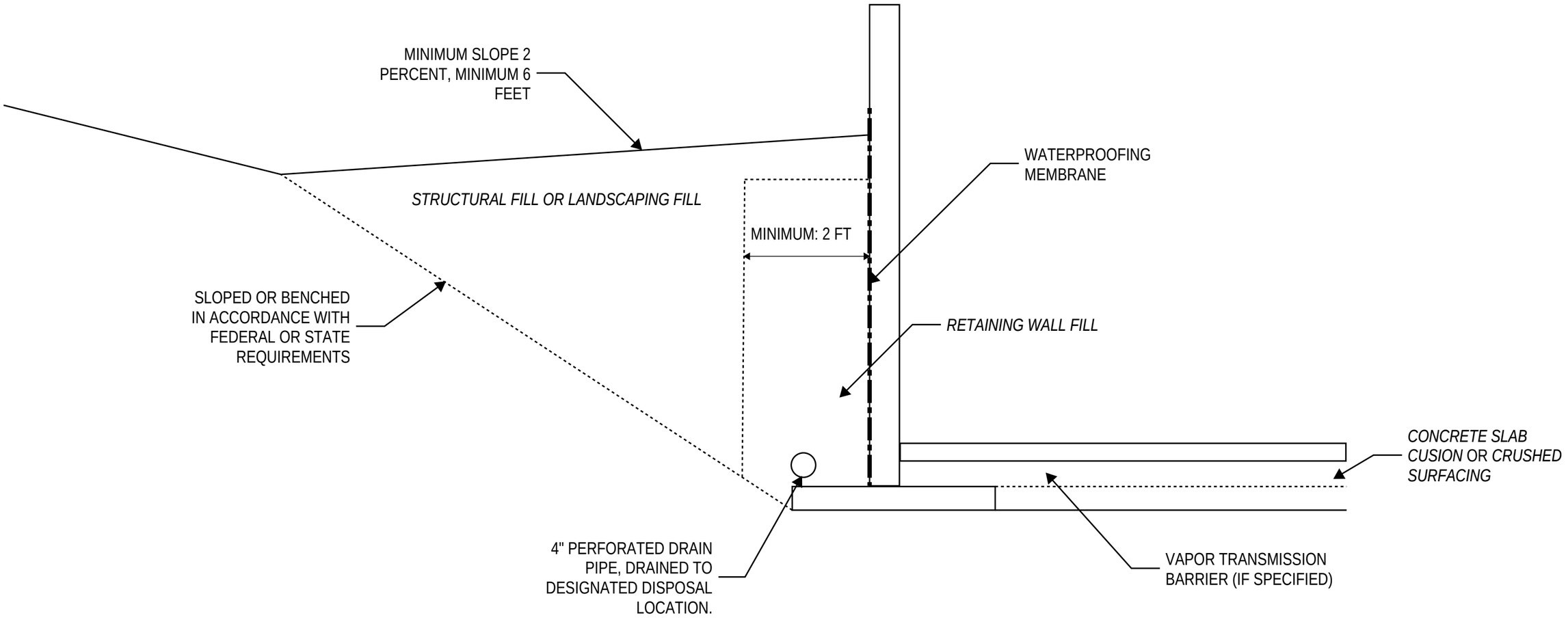
LIBERTY GEOTECH

JOB NO. 20211	SEPTEMBER 30, 2020	PLATE 2

APPENDIX F

BASEMENT WALL DRAINAGE DETAIL

BASEMENT WALL DRAINAGE DETAIL



GENERAL NOTES

1. ALL FILL SHOULD BE PLACED AND COMPACTED IN ACCORDANCE WITH THE GEOTECH REPORT.
2. DRAIN PIPE SHOULD BE PLACED BELOW INTERIOR SLAB ELEVATION.
3. ALL LOOSE LIFT HEIGHTS SHOULD BE LIMITED TO 12 INCHES PRIOR TO COMPACTION
4. REFER TO THE GEOTECH REPORT FOR ADDITIONAL DESIGN RECOMMENDATIONS AND CONSTRUCTION RECOMMENDATIONS.

BASEMENT WALL DRAINAGE DETAIL

LATAH GLEN

PARCEL NOS: 25364.0001 AND 25361.0004

SPOKANE, WASHINGTON

LIBERTY GEOTECH

JOB NO. 20211	SEPTEMBER 30, 2020	PLATE 3