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Advanced Underground Utilities
PO Box 309
Sumner, Washington 98390

Attn: EJ Fernandez
(253) 988-2449
ej@auuinc.com

Geotechnical Engineering Report
Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
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INTRODUCTION

GeoResources is pleased to present this *Geotechnical Engineering Report* in support of the design and construction of the proposed commercial development at 212 and 302 Todd Road NE in Puyallup, Washington. The site location is shown on the attached Site Location Map, Figure 1.

Our understanding of the project is based on our correspondence with you; review of the *Preliminary Site Plan* prepared by JMJ Team dated April 20, 2026; our May 13, 2026 site visit and subsurface explorations; our understanding of the City of Puyallup development codes; and our experience in the area and on similar projects. The site consists of two adjacent tax parcels that are currently developed with two single-family residences, a detached garage, gravel driveways, and associated utilities. Based on the provided plan, you propose to develop the site with a commercial building, frontage improvements, and paved permeable surfacing for access and parking. The two residences are to remain. We anticipate that the proposed building will be a one- to two-story, wood-framed structure supported by conventional shallow foundations. An excerpt from the *Preliminary Site Plan* is provided as our Site & Exploration Plan, Figure 2.

PURPOSE & SCOPE

The purpose and scope of our services was to evaluate the surface and subsurface conditions across the site as a basis for providing geotechnical recommendations and design criteria for the proposed development. Specifically, the scope of services for this project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring surface and subsurface conditions by reconnoitering the site and monitoring the drilling of two borings in the area of the proposed structure;
3. Describing surface and subsurface conditions, including soil type, and depth to groundwater;
4. Providing recommendations for seismic design parameters, including 2021 IBC soil site class;

5. Preparing a liquefaction analysis for the existing site conditions based on SPT blow count data from the borings and providing conclusions and recommendations regarding options for mitigating potential liquefaction;
6. Providing geotechnical conclusions regarding foundations, including shallow foundation parameters, floor slab support and design criteria, bearing capacity, and subgrade modulus as appropriate;
7. Providing recommendations for subgrade walls, including lateral earth pressures and applicable seismic surcharges;
8. Providing geotechnical conclusions and recommendations regarding site grading activities including; site preparation, subgrade preparation, fill placement criteria, suitability of on-site soils for use as structural fill, temporary and permanent cut and fill slopes, and drainage and erosion control measures; and,
9. Preparing this written *Geotechnical Engineering Report* summarizing our site observations and conclusions, and our geotechnical recommendations and design criteria, along with the supporting data.

The above scope of work was outlined in our May 6, 2026 *Proposal for Geotechnical Services*. We received your written confirmation to proceed on May 7, 2026.

SITE CONDITIONS

Surface Conditions

The site consists of two contiguous tax parcels located at 212 and 302 Todd Rd NE in Puyallup, Washington, within an area of existing commercial and single- and multi-family residential development. According to the Pierce County Assessor website, the parcels when combined are generally rectangular in shape, measure about 195 to 210 feet wide (east/southeast to west/northwest) by about 365 to 445 feet long (north to south) and encompass approximately 1.98 acres. The site is bounded by mixed single-family and commercial development to the east, multi-family residential development and Wapato Creek to the south, commercial development to the west, and by Todd Road NE to the north.

Our site description is based on our review of the Pierce County Public GIS terrain basemap for the site area, and our site observations. The ground surface of the site is generally flat to gently sloping with total vertical relief on the order of 2 to 3 feet across the site. The existing site conditions and topography are shown on the Site Vicinity Map, Figure 3.

The site is mostly covered with gravel surfacing. Vegetation, where present, generally consists of scattered landscape plantings along Todd Road NE. Coniferous and deciduous trees are present off site to the south along Wapato Creek. No standing water, groundwater seeps, or springs were observed on the site at the time of our site visit. We did not observe evidence of soil erosion or slope instability.

Site Soils

The USDA Natural Resource Conservation Service (NRCS) Web Soil Survey for Pierce County maps the site soils as Puyallup fine sandy loam (31A). A detailed description of the mapped soils is included below, and a copy of the NRCS soil map for the site area is included as Figure 4.

- *Puyallup fine sandy loam (31A):* Mapped across the entire site, these soils are derived from alluvium and are included in hydrologic soils group B. The 31A soils form on slopes of 0 to 3 percent and are rated as a "slight" erosion hazard when exposed.

Site Geology

According to the draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Washington* (Troost et al.), the site is mapped as being immediately underlain by alluvium (Qal). These sediments were deposited within the last 10,000 years. No landslides, alluvial fans, or other deposits of mass wasting are mapped on or within the site vicinity. A detailed description of the mapped deposit is included below, and an excerpt of the above referenced geologic map is attached as Figure 5.

- *Alluvium (Qal):* Alluvium deposits generally consist of clay, silt, sand, and gravel deposited in streambeds and floodplains. Because alluvial soils are recent deposits, they are considered normally consolidated and typically exhibit low to moderate strength and moderate to high compressibility characteristics, depending on grain size distribution. Similarly, infiltration rates can vary widely within the alluvial soils based on grain size distribution.

Subsurface Explorations

On May 13, 2026, a GeoResources representative visited the site and monitored the drilling of a hollow stem auger and a mud rotary boring to depths of approximately 16.5 to 101.5 feet below the existing ground surface, respectively. The approximate relative locations and surface elevations of the explorations are summarized below in Table 1.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Boring Number	Functional Location	Surface Elevation[1] (feet)	Termination Depth (feet)	Termination Elevation (feet)
B-1	SE corner of proposed building	50	101.5	-51.5
B-2	North portion of proposed building	50	16.5	33.5

Notes:
[1]Surface elevations of on-site explorations estimated by interpolating between topographic contours on the Pierce County Public GIS terrain basemap (NAVD88).

The specific number, locations, and depths of our explorations were selected based on the configuration of the development and were adjusted in the field based on consideration for underground utilities, existing site conditions and usage, site access limitations and encountered stratigraphy. The subsurface explorations completed as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. The nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

Mud Rotary & Hollow Stem Auger Borings:

Boring B-1 was completed using mud rotary drilling methods, while boring B-2 was completed using hollow-stem auger drilling methods. During drilling, soil samples were obtained at 2½ and 5-foot depth intervals in accordance with Standard Penetration Test (SPT) procedures as per the test method outlined by ASTM D1586. The SPT method consists of driving a standard 2-inch-diameter split-spoon sampler 18 inches into the soil with a 140-pound hammer. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count". If a total of 50 blows is recorded within any 6-inch interval (refusal), the driving is stopped, and the blow counts are recorded as 50 blows for the actual distance the sampler was driven. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

Representative soil samples obtained from the explorations were placed in sealed plastic containers and taken to our laboratory for further examination and testing as deemed necessary. Each boring was then backfilled by the driller with bentonite chips and abandoned in accordance with WA State regulations.

Soil Classification:

A geologist from our office continuously monitored the explorations, maintained logs of the subsurface conditions encountered, obtained representative soil samples, and observed pertinent site features. The approximate locations of our explorations are indicated on the attached Site & Exploration Plan, Figure 2. The locations shown on Figure 2 were estimated by pacing or taping from locatable features on site and should only be considered as accurate as the method used. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our borings are included as Figures A-2 through A-3.

Subsurface Conditions

Our explorations encountered subsurface conditions that, in our opinion, generally agreed with the mapped stratigraphy. In general, we encountered undocumented fill and topsoil mantling alluvium and mudflow deposits. These soil layers and others are described in the following paragraphs and summarized below in Table 2.

- *Undocumented Fill:* At both exploration locations, we encountered approximately 1.0 foot of quarry spalls and gravel at the surface. We interpret these soils to be consistent with undocumented fill.
- *Alluvium:* Beneath the fill, both borings encountered native alluvial deposits consisting of interbedded sand, silty sand, sandy gravel, silt, and localized clayey silt with minor organics. These deposits are interpreted to reflect alternating higher- and lower-energy depositional environments and exhibit substantial vertical and lateral variability. Relative density and consistency ranged from very soft/loose to very dense. In boring B-1, loose surficial silty sand and very soft silt extended to depths of approximately 15 feet. Below this depth, the profile generally transitioned to medium dense sand and sandy gravel extending to approximately 59 feet. Beneath the mudflow deposits described below, very stiff silt was encountered from approximately 75 to 90 feet, underlain by medium dense to very dense sand and silty sand

extending to the termination depth of 101.5 feet. Organic soils were noted locally within portions of the fine-grained deposits. In contrast, boring B-2 encountered interbedded very loose silty sand and very soft silt and clay to the termination depth of 16.5 feet and did not encounter the denser granular soils observed at depth in boring B-1.

- *Mudflow:* Between depths of approximately 59 and 75 feet, boring B-1 encountered grey silty gravelly sand with minor organics in a very loose to loose condition. These deposits are interpreted to represent mudflow deposits and separate the overlying medium dense granular alluvium from the underlying very stiff fine-grained soils and dense to very dense granular alluvium.

TABLE 2:
APPROXIMATE THICKNESSES, DEPTHS, AND ELEVATIONS OF ENCOUNTERED SOIL LAYERS

Boring Number	Thickness of: Undocumented Fill (feet)	Thickness of: Upper Alluvium (feet)	Thickness of: Mudflow deposits (feet)	Depth to Lower, Medium Dense to Dense Alluvium (feet)	Elevation[1] of Lower, Medium Dense to Dense Alluvium (feet)
B-1	1.0	58.0	16.0	75.0	-25.0
B-2	1.0	>15.5	NE	NE	NE

Notes:
[1] Elevation based on interpolating between contours provided by the Pierce County terrain basemap (NAVD 88)

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the explorations to estimate index engineering properties of the soils encountered. Laboratory testing included visual soil classification per ASTM D2488 and ASTM D2487, moisture content determinations per ASTM D2216, and grain size analyses per ASTM D6913 standard procedures. The results of the laboratory tests are summarized below in Table 3 and graphical outputs are included in Appendix B.

TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Sample	Soil Type	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	Moisture (percent)
B-1, S-1, 5.0 ft	Alluvium (ML)	ND	ND	82.4	45.7
B-1, S-8, 35.0 ft	Alluvium (SM)	0.0	53.3	46.7	29.0
B-1, S-11, 50.0 ft	Alluvium (SW-SM)	6.8	85.7	7.5	22.3
B-1, S-13, 60.0 ft	Mudflow (SM)	21.7	52.6	25.7	17.7
B-1, S-17, 80.0 ft	Alluvium (ML)	0.4	23.9	75.7	28.6
B-2, S-4, 10.0 ft	Alluvium (ML)	0.0	4.5	95.5	39.5

Groundwater Conditions

Groundwater was observed in both borings 10 feet below the ground surface. Mottling was observed in both borings from about 3.0 to 15.0 feet below the ground surface. Based on our experience in the area and review of locatable water well logs in the site vicinity, it appears that the encountered groundwater is consistent with groundwater levels typical within the Puyallup River Valley.

We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off site construction activities, and site utilization. As such, water level observations made at the time of our field investigation may vary from those encountered during the construction phase. Analysis or modeling of anticipated groundwater levels during construction is beyond the scope of this report.

ENGINEERING CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our data review, site reconnaissance, subsurface explorations, and our experience in the area, it is our opinion that the proposed commercial building is feasible from a geotechnical standpoint, provided the recommendations herein are followed.

The very loose to very soft near-surface soils encountered at the site are expected to provide limited bearing support and present an elevated risk of post-construction settlement under building loads. Therefore, shallow foundations bearing directly on existing native soils are not recommended.

Because of the potential for liquefaction at the site, we recommend that ground improvements or deep foundations be utilized to mitigate against potential seismically induced settlements. These options could include stiffening the upper site soils with non-liquefiable structural fill, aggregate piers. Alternatively, deep foundations that fully bypass liquefiable soil layers could be relied upon for support. Information regarding these methods is provided below.

Seismic Design

The site is in the Puget Sound region of western Washington, which is seismically active. Seismicity in this region is attributed primarily to the interaction between the Pacific, Juan de Fuca and North American plates. The Juan de Fuca plate is subducting beneath the North American plate at the Cascadia Subduction Zone (CSZ). This produces both intercrustal (between plates) and intracrustal (within a plate) earthquakes. In the following sections we discuss the design criteria and potential hazards associated with the regional seismicity. The design values are the standard values and should only be applied as appropriate if specific seismic design is required. This is not a site-specific seismic analysis.

Seismic Site Class

Based on the subsurface conditions encountered at the site and our experience in the area, we interpret the structural site conditions to correspond to a seismic Site Class “E” in accordance with the 2021 IBC documents and American Society of Civil Engineers (ASCE) standard 7-16 Chapter 20 Table 20.3-1. The mapped spectral acceleration for the short period (S_s) was determined by the ASCE Hazard Tool. The Short-Period Site Coefficient, F_a was determined in accordance with Section 11.4.8. If the fundamental period of vibration of the proposed structure exceeds 0.5 seconds we should be notified and allowed to revisit our analysis and provide revised recommendations as needed.

Design Parameters

We used the *ASCE Hazard Tool* website to estimate seismic design parameters at the site. Table 4, below, summarizes the recommended design parameters when considering ASCE 7-16.

TABLE 4:
2021 IBC PARAMETERS FOR DESIGN OF SEISMIC STRUCTURES

Spectral Response Acceleration (SRA) and Site Coefficients	ASCE 7-16
Risk Category	II
Mapped SRA	S_s = 1.276g
Site Coefficients (Site Class E)[1]	F_a = 1.200
Maximum Considered Earthquake SRA	S_{MS} = 1.531
Design SRA	S_{DS} = 1.021
[1]ASCE 7-16 Section 11.4.8 allows for F_a to be taken as equal to that of Site Class C for structures on Site Class E sites with S_s greater than or equal to 1.0	

Peak Ground Acceleration

The mapped peak ground acceleration (PGA) for this site is 0.5g. To account for site class, the PGA is multiplied by a site amplification factor (F_{PGA}) of 1.2. The resulting site modified peak ground acceleration (PGA_M) is 0.6g. In general, estimating seismic earth pressures (k_h) by the Mononobe-Okabe method are taken as 33 to 50 percent of the PGA_M, or 0.2g to 0.3g.

Seismic Hazard Areas – per PMC 21.06.210 (117)

The PMC defines seismic hazard areas as areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, or soil liquefaction.

Liquefaction is a phenomenon where there is a temporary reduction or complete loss of soil strength due to an increase in pore water pressure in soils. The increase in pore water pressure is induced by seismic vibrations. Liquefaction primarily affects geologically recent deposits of loose, uniformly graded, fine-grained sands and low plasticity silts that are below the groundwater table. The native soils encountered in our explorations confirmed the mapped glacially consolidated soils. Given the density and grain size of the alluvium and mudflow soils and depth to groundwater, it is our opinion that the risk of liquefaction at the site is high. This is consistent with our liquefaction analysis provided below as well as the *Liquefaction Susceptibility Map of Pierce County, Washington* (2004); that maps the site to have a "high" liquefaction potential. An excerpt of this map is included as Figure 6.

The Department of Natural Resources (DNR) Geologic Hazards Map (Geologic Information Portal) shows the site to be located south of the Tacoma fault zone. The nearest mapped fault trace is located about 3.3 miles northeast of the site. An excerpt of the WA DNR seismogenic dataset for the general area is included as Figure 7. No evidence of ground fault rupture was observed in the subsurface explorations or during our site reconnaissance. Therefore, in our opinion, the proposed structure should have no greater risk for ground fault rupture than other appropriately designed and constructed structures located in the area.

Liquefaction Analysis

As discussed previously, the subsurface profile consists of geologically recent alluvial deposits comprising interbedded loose to medium dense sands and silty sands and very soft to soft fine-grained soils below the groundwater table. These materials are considered susceptible to liquefaction and cyclic softening during strong ground shaking and may experience associated permanent settlement.

To evaluate this hazard, liquefaction analyses were performed using CivilTech Corp.'s LiquefyPro software. Analyses were completed for the 975-year and 2,475-year return period seismic events. To provide a conservative assessment, groundwater was assumed to be at the ground surface, approximately 10 feet above the groundwater level encountered during drilling.

Based on these assumptions, cumulative seismic settlements are estimated to range from approximately 8 to 18 inches. Differential settlements are commonly approximated to be on the order of one-half of the total settlement; therefore, differential settlements on the order of 4 to 9 inches may occur. These estimates are intended to provide an order-of-magnitude assessment of potential ground deformation and should not be interpreted as precise predictions. LiquefyPro outputs are included in Appendix C.

For conventional Risk Category I and II structures, the estimated differential settlements should be evaluated by the structural engineer in accordance with ASCE 7-16 Section 12.13.9.2 and Table 12.13-3 to determine whether the proposed structure can tolerate the anticipated permanent ground deformations. Structural detailing and foundation systems should be selected accordingly.
If the estimated permanent ground deformations exceed those that can be tolerated by the proposed structure, mitigation measures such as ground improvement or deep foundations should be incorporated into the design.

Liquefaction Mitigation

If the anticipated permanent ground deformations are determined to exceed those that can be tolerated by the proposed structure, liquefaction mitigation measures should be incorporated into the design. Typical mitigation approaches include transferring structural loads to non-liquefiable soils at depth using deep foundations, densifying liquefiable soils through ground improvement, dissipating excess pore water pressures, or other specialty techniques intended to reduce the magnitude of liquefaction-induced settlement.

Ground improvement is anticipated to be the most practical liquefaction mitigation approach for this site. Methods such as aggregate piers, aggregate columns, or similar systems can improve bearing conditions, reduce post-construction settlement, and reduce the magnitude of liquefaction-induced settlement by densifying the soil profile and reinforcing settlement-sensitive soils. Should ground improvement be desired, this report may be provided directly to a qualified specialty design-build contractor for development of project-specific recommendations and performance criteria. If considered for the project, we should be allowed to review the proposed ground improvement system and provide project-specific recommendations.

Deep foundations may also be utilized to mitigate the effects of liquefaction-induced settlement. To be effective, deep foundation elements should derive support from the dense soils encountered at depth and should be designed to bypass the liquefiable and settlement-sensitive soils present near the ground surface. Design of deep foundation systems in these conditions require consideration of downdrag forces, lateral spreading effects, seismic performance, and pile-to-structure interaction. If deep foundations are considered for the project, we should be contacted to provide project-specific recommendations and foundation design parameters.

Shallow Foundation Support

The very loose to very soft near-surface soils encountered at the site are expected to provide limited bearing support and present an elevated risk of post-construction settlement under building loads. Consequently, shallow foundations bearing directly on existing native soils are not recommended regardless of the selected seismic performance objective.

Where shallow foundations are utilized, foundation support should be provided through construction of a geogrid-reinforced gravel raft as described below. The gravel raft is intended to provide a competent bearing surface, improve load distribution, reduce static settlement, and reduce the potential for differential settlement during seismic loading. Isolated spread footings are not recommended. Continuous strip footings interconnected with grade beams, seismic ties, or other approved methods should be utilized to improve structural continuity and foundation performance.

Geogrid Gravel Raft

To provide suitable support for shallow foundations and floor slabs, a geogrid-reinforced gravel raft should be constructed beneath the proposed structure. The gravel raft is intended to improve bearing conditions, reduce static settlement, improve constructability in the shallow groundwater conditions present at the site, and provide a more uniform support medium for foundation and slab elements. The gravel raft may also reduce the magnitude of differential settlement during a seismic event; however, it should not be relied upon to eliminate liquefaction-induced settlement.

The area below the structure should be excavated at least 3.0 feet below design bearing elevation, structural geogrid be placed (such as Tensar InterAx® NX850, or an approved equivalent), and granular structural fill placed above the geogrid to reestablish the design bearing surface. In addition to being placed at the bottom of the over-excavation, we recommend that a layer of geogrid be placed every 12 inches within the structural fill. Geogrid placed at the bottom of the over-excavation should be overlapped a minimum of 3 feet to mitigate movement of the geogrid during fill placement and compaction. Overlap for additional layers should be a minimum of 1 foot. The fill should be compacted with a large mechanical compactor such as a vibratory roller or hoe-pack in accordance with the "**Structural Fill**" section of this report. The over-excavation should extend 10 feet out from the footing edges. A Reinforced Gravel Raft Detail is included as Figure 8.

Where the over-excavation extends below the water table, we recommend quarry spalls be placed on top of the geogrid and bucket-tamped until firmly set. Since groundwater levels extend near the ground surface, we recommend that structural fill used in the geogrid gravel raft consist of 1-1/4 clean crushed rock, *"Permeable Ballast"* (WSDOT Spec. 9-03.9(2)), *"Quarry Spalls"* (WSDOT 9-13.1(5)), or an approved equivalent. This work should be completed during the dry season, where groundwater levels are at their lowest. Dewatering may be necessary to complete excavations and install geogrid.

Shallow Foundation Design

Foundation bearing surfaces prepared as described above can be designed for an allowable bearing pressure of up to 2,000 pounds per square foot (psf). Bearing pressures can be increased by up to one-third for seismic and wind loads. Minimum footing widths should be 24 inches for continuous spread footings unless otherwise designed by the structural engineer. Exterior footings should be at least 18 inches below the lowest adjacent grade for frost protection. All loose or soft soil and soil containing organics should be removed from beneath footing and areas to receive structural fill.

Lateral Resistance of Shallow Foundations

For portions of the structure founded on shallow continuous footings, lateral loads may be resisted by a combination of base friction and passive pressure against the footings and buried portions of the wall. In our opinion, passive earth pressures developed from properly compacted structural fill should be based on an allowable equivalent fluid density of 250 pounds per cubic foot (pcf). This passive resistance value assumes that the footings extend at least 18 inches below the lowest adjacent grade and that the ground surface is horizontal for a minimum distance of 1.5 times the embedment depth. The above passive earth pressure includes a factor of safety (FS) of 1.5 to limit lateral deflections. We recommend a coefficient of friction of 0.30 be used between cast-in-place concrete and structural fill for calculating the resistance to sliding at the base of the footings. The friction factor also includes a FS of 1.5.

Settlement

We were not provided with design loads prior to preparation of this report. Based on loading conditions typical of similar structures, post-construction settlements of foundations supported on the recommended geogrid-reinforced gravel raft are anticipated to be on the order of 1 to 2 inches.

The actual magnitude of settlement will depend on the applied loads, footing dimensions, and final grading conditions. The majority of static settlement is expected to occur during construction and the first several years following construction due to compression of the underlying fine-grained soils.

The settlement estimates presented above do not include liquefaction-induced settlement associated with a design-level seismic event. Based on analyses performed using the Tensar+ Geotechnical Design Software, post-liquefaction settlement of the geogrid-reinforced gravel raft system is estimated to be on the order of 2 inches. This value reflects the anticipated performance of the reinforced gravel raft and should not be interpreted as the total settlement of the underlying soil profile.

As discussed in the Liquefaction Analysis section, the native soils underlying the gravel raft may experience significantly greater settlement during a design-level seismic event. The geogrid-reinforced gravel raft is intended to bridge localized deformations and reduce differential settlement within the building footprint; however, it should not be relied upon to eliminate liquefaction-induced settlement. Actual performance will depend on the magnitude and distribution of seismic ground deformations beneath the structure.

Construction Considerations

We recommend that exposed footing subgrades be evaluated by a representative from GeoResources, LLC to confirm soil conditions and provide recommendations where unanticipated conditions are found. Native soils that are disturbed during footing excavation should be removed prior to the placement of the concrete forms and reinforcement.

Subgrade soil improvements, such as the geogrid gravel raft as described above, can help to reduce the overall and differential settlement within a building footprint during a liquefaction event;

however, the soils below the improvements still have the potential to liquefy, and therefore the risk of settlement is not completely eliminated.

Floor Slab Support

Where shallow foundations are utilized, floor slabs may be supported directly on the geogrid-reinforced gravel raft described above. The gravel raft should extend beneath the entire building footprint to provide a uniform support medium for both foundation and slab elements.

Floor slabs should be underlain by a minimum 6-inch-thick capillary break consisting of clean granular material such as coarse sand, pea gravel, ⅝-inch clean crushed rock, or gravel containing less than 3 percent fines. The capillary break material should be placed in a single lift and compacted to an unyielding condition. If pea gravel is utilized, a 2-inch-thick layer of clean crushed rock may be placed above the pea gravel to improve constructability.

A synthetic vapor retarder should be placed directly above the capillary break material to limit moisture migration through the slab. A modulus of subgrade reaction of 200 pci may be used for slab design where the slab is supported on the recommended geogrid-reinforced gravel raft. We estimate floor slab settlement will be approximately ½ inch or less over a span of 50 feet. Prior to placement of capillary break materials, the exposed subgrade should be compacted to a firm and unyielding condition and evaluated by a representative of our firm.

Temporary Excavations

All job site safety issues and precautions are the responsibility of the contractor providing services/work. The following cut/fill slope guidelines are provided for planning purposes only. Temporary cut slopes will likely be necessary during grading operations or utility installation. All excavations at the site associated with confined spaces, such as utility trenches and retaining walls, must be completed in accordance with local, state, or federal requirements including Washington Administrative Code (WAC) and Washington Industrial Safety and Health Administration (WISHA). Excavation, trenching, and shoring is covered under WAC 296-155 Part N.

Based on WAC 296-155-66401, it is our opinion that the undocumented fill, alluvium, and mudflow soils would be classified as Type C soils. According to WAC 296-155-66403, for temporary excavations of less than 20 feet in depth, the side slopes in Type C soils should be sloped at a maximum inclination of 1½H:1V (Horizontal:Vertical) or flatter from the toe to top of the slope. All exposed slope faces should be covered with a durable reinforced plastic membrane during construction to prevent slope raveling and rutting during periods of precipitation. These guidelines assume that all surface loads are kept at a minimum distance of at least one half the depth of the cut away from the top of the slope and that significant seepage is not present on the slope face. Flatter cut slopes will be necessary where significant raveling or seepage occurs, or if construction materials will be stockpiled along the slope crest.

Where it is not feasible to slope the site soils back at these inclinations, a retaining structure should be considered. Retaining structures greater than 4-feet in height (bottom of footing to top of structure) or that have slopes of greater than 15 percent above them, should be engineered per Washington Administrative Code (WAC 51-16-080 item 5). This information is provided solely for the benefit of the owner and other design consultants and should not be construed to imply that GeoResources assumes responsibility for job site safety. It is understood that job site safety is the sole responsibility of the project contractor.

Site Drainage

All ground surfaces, pavements and sidewalks at the site should be sloped to direct surface water away from the structures, property lines, and slopes. Surface water runoff should be controlled by a system of curbs, berms, drainage swales, and or catch basins, and conveyed to an appropriate discharge point.

We recommend that footing drains are installed for the development in accordance with IBC 1805.4.2, and subgrade walls (if utilized) have a wall drain. The roof drain should not be connected to the footing drain.

EARTHWORK RECOMMENDATIONS

Site Preparation

All structural areas on the site to be graded should be stripped of vegetation, organic surface soils, uncontrolled fill and other deleterious materials including existing structures, foundations, or abandoned utility lines. Organic topsoil is not suitable for use as structural fill but may be used for limited depths in non-structural areas. Based on our subsurface explorations, we anticipate that stripping depths will likely range from about 6 to 12 inches to remove these soils. Areas of thicker topsoil or organic debris may be encountered in localized depressions or in areas of heavy vegetation.

Where placement of fill material is required, the stripped/exposed subgrade areas should be compacted to a firm and unyielding surface prior to placement of new fill. Excavations for debris removal should be backfilled with structural fill compacted to the densities described in the "**Structural Fill**" section of this report.

We recommend that a member of our staff evaluate the exposed subgrade conditions after removal of vegetation and topsoil stripping is completed and prior to placement of structural fill. The exposed subgrade soil should be proof-rolled with heavy rubber-tired equipment during dry weather or probed with a ½-inch diameter steel T-probe during wet weather conditions.

Soft, loose, or otherwise unsuitable areas delineated during proof-rolling or probing should be recompacted, if practical, or over-excavated and replaced with structural fill. The depth and extent of overexcavation should be evaluated by our field representative at the time of construction. The areas of old fill material should be evaluated during grading operations to determine if they need mitigation, recompaction, or removal.

Structural Fill

All material placed as fill for the proposed development should be placed as structural fill. Material placed as structural fill should be free of debris, organic matter, trash, cobbles greater than 4-inches in diameter, or any other deleterious or objectionable material. The moisture content of the fill material should be adjusted as necessary for proper compaction.

Materials

The suitability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines (material passing US No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more difficult to achieve. During wet weather, we recommend use of well-graded sand and gravel with less than 5 percent (by weight) passing the US No. 200 sieve based on that fraction passing the ¾-inch sieve, such as "*Gravel Backfill for Walls"* (WSDOT 9-03.12(2)). If prolonged dry weather prevails during the wall construction, higher fines content (up to 10 to 12 percent) may be acceptable.

Placement and Compaction

The appropriate lift thickness will depend on the structural fill characteristics, and compaction equipment used, but it is typically limited to 4 to 6 inches for hand operated equipment; thicker lifts may be appropriate for larger equipment. For larger equipment such as a hoe-pac or drum roller, we recommend a maximum loose-lift thickness of 12 inches. Structural fill should be compacted to at least 95 percent of the MDD as determined by the Modified Proctor (ASTM D1557). Additionally, the moisture content should be maintained within 3 percent of the optimum moisture content in accordance with ASTM D1557.

Suitability of On-Site Materials as Fill

Because of the fines content in the alluvium and mudflow deposits encountered in our explorations, we do not recommend that these soils are used for structural fill. These shallow, silty soils may be used as fill in non-structural areas. If the soil material is over optimum moisture at the time of excavation, it will be necessary to aerate or dry the soil prior to placement as structural fill. We generally observed the site soils to be excessively moist at the time of our subsurface explorations.

We recommend that completed graded areas be restricted from traffic or protected prior to wet weather conditions. The graded areas may be protected by paving, placing asphalt-treated base, a layer of free-draining material such as pit run sand and gravel or clean crushed rock material containing less than 5 percent fines, or some combination of the above.

Erosion Control

Weathering and erosion are natural processes. To manage and reduce the potential for these natural processes, temporary and permanent erosion control measures should be installed and maintained during construction or as soon as practical thereafter to limit the additional influx of water to exposed areas and protect the existing municipal storm drain system and downstream receiving waters.

Erosion hazards can be mitigated by applying Best Management Practices (BMP's) outlined in Ecology's *Stormwater Management Manual for Western Washington*. Any disturbance to the soil should be mitigated as discussed above as soon as possible. Temporary erosion control BMPs may include, but are not limited to:

- Grading should be limited to providing surface grades that promote surface flows away from the top of excavation to appropriate discharge location.
- Fill material should consist of clean, well-graded, sand and gravel, of which not more than 5 percent fines by dry weight passes the No. 200 mesh sieve, based on wet-sieving the fraction passing the ¾-inch mesh sieve. The gravel content should range between 20 and 50 percent retained on a No. 4 mesh sieve. The fines should be non-plastic.
- Silt fencing and appropriate soil stockpiling techniques to prevent silty stormwater from leaving the site.

Erosion protection measures should be in place prior to the start of any grading activity on the site. Where vegetation is removed because of clearing and grading activities, a dense vegetative groundcover, grass lawn, or native vegetation should be reestablished as soon as feasible. All permanent erosion control methods should be maintained after construction activities have been completed. Any erosion and sediment control plan should be prepared in accordance with the City of Puyallup Municipal Code.

LIMITATIONS

GeoResources has prepared this report for use by Advanced Underground Utilities and other members of the design team for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,

GeoResources, LLC

Jordan L. Kovash, LG
Project Geologist

State of Washington
Engineering Geologist
3237
Licensed Geologist
Seth Taylor Mattos

6-24-26

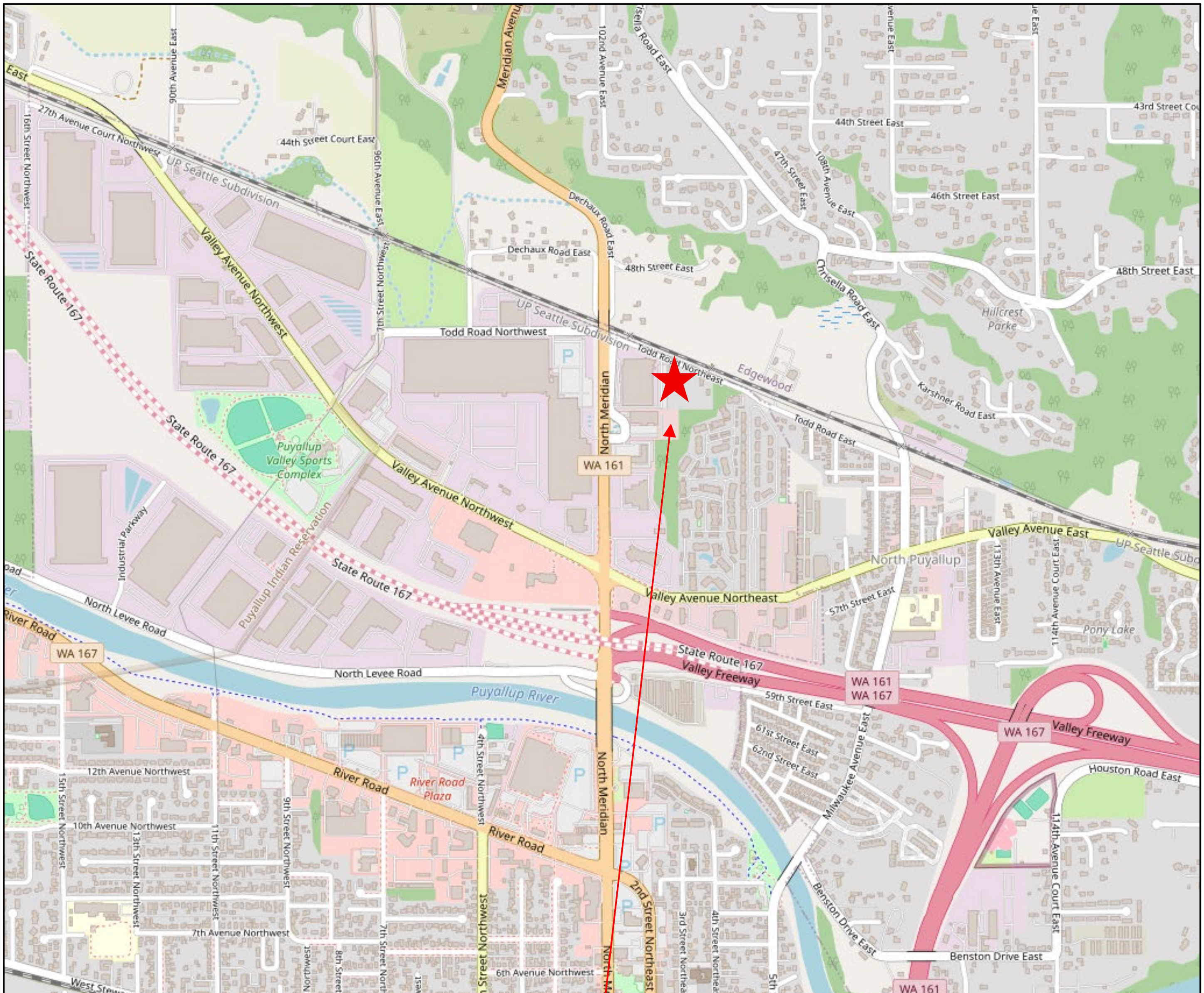
Andrew Edward B Schnitger
State of Washington
23020110
Registered
Professional Engineer

6.24.24

Seth Mattos, LEG
Principal

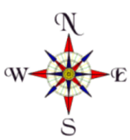
Andrew E. Schnitger, PE
Senior Geotechnical Engineer

JLK:STM:AES/jlk
Doc ID: AUU.ToddRdNE_212.RG
Attachments:
- Figure 1: Site Location Map
- Figure 2: Site & Exploration Plan
- Figure 3: Site Vicinity Map
- Figure 4: NRCS Soil Map
- Figure 5: Geologic Map
- Figure 6: Liquefaction Susceptibility Map
- Figure 7: WA DNR Fault Map
- Figure 8: Reinforced Gravel Raft Detail
- Appendix A: Subsurface Explorations
- Appendix B: Laboratory Test Results
- Appendix C: Liquefaction Analysis Results



Approximate Site Location

Map created from the Open Street Map website (https://matterhornwab.co.pierce.wa.us/)



Not to Scale

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Site Location Map

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 1

Excerpt from the *Preliminary Site Plan* prepared by JMJ Team dated April 20, 2026

Not to Scale

Exploration number and approximate location

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Site & Exploration Plan
Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.SEP	June 2026	Figure 2

Approximate Site Location

Map created from the Pierce County Public GIS (https://matterhornwab.co.pierce.wa.us/)

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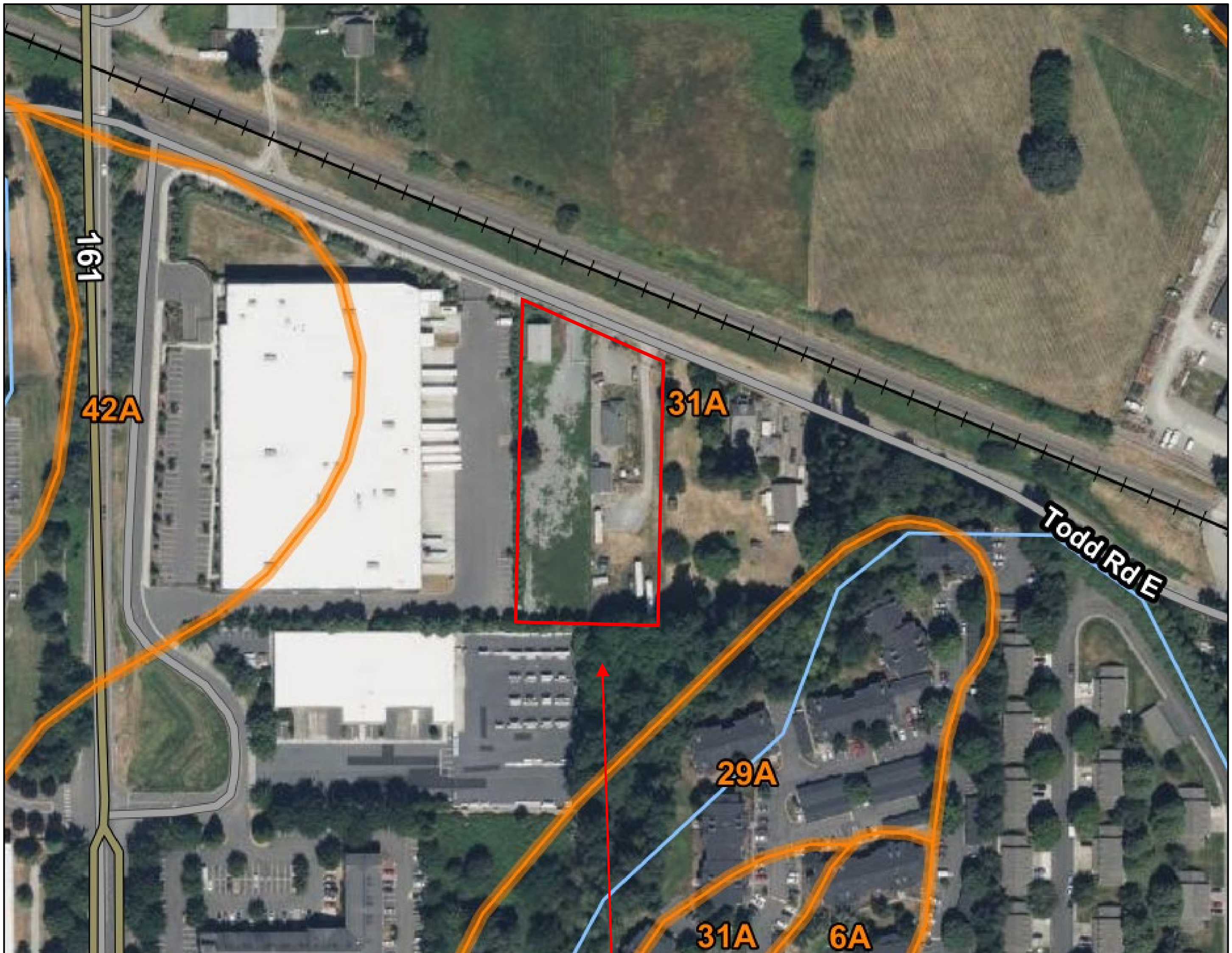
Site Vicinity Map

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 3



Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
31A	Puyallup fine sandy loam	Alluvium	0 to 3	Slight	B

N W E S

Not to Scale

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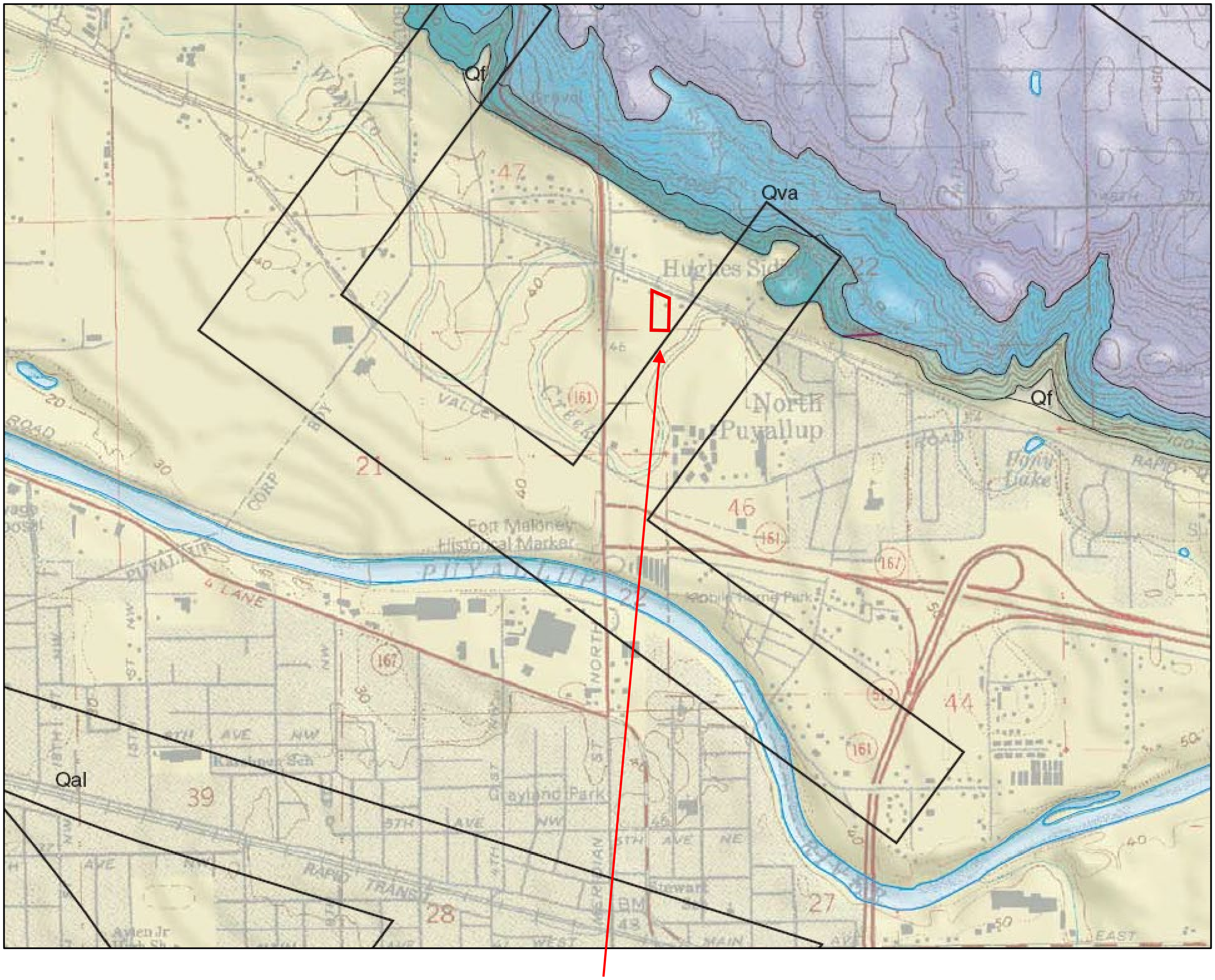
NRCS Soils Map

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 4



Approximate Site Location

An excerpt from the draft *Geologic Map of the Puyallup 7.5-Minute Quadrangle, Washington* (Troost et al.)

Symbol	Geologic Unit
Qal	Alluvium (Holocene)

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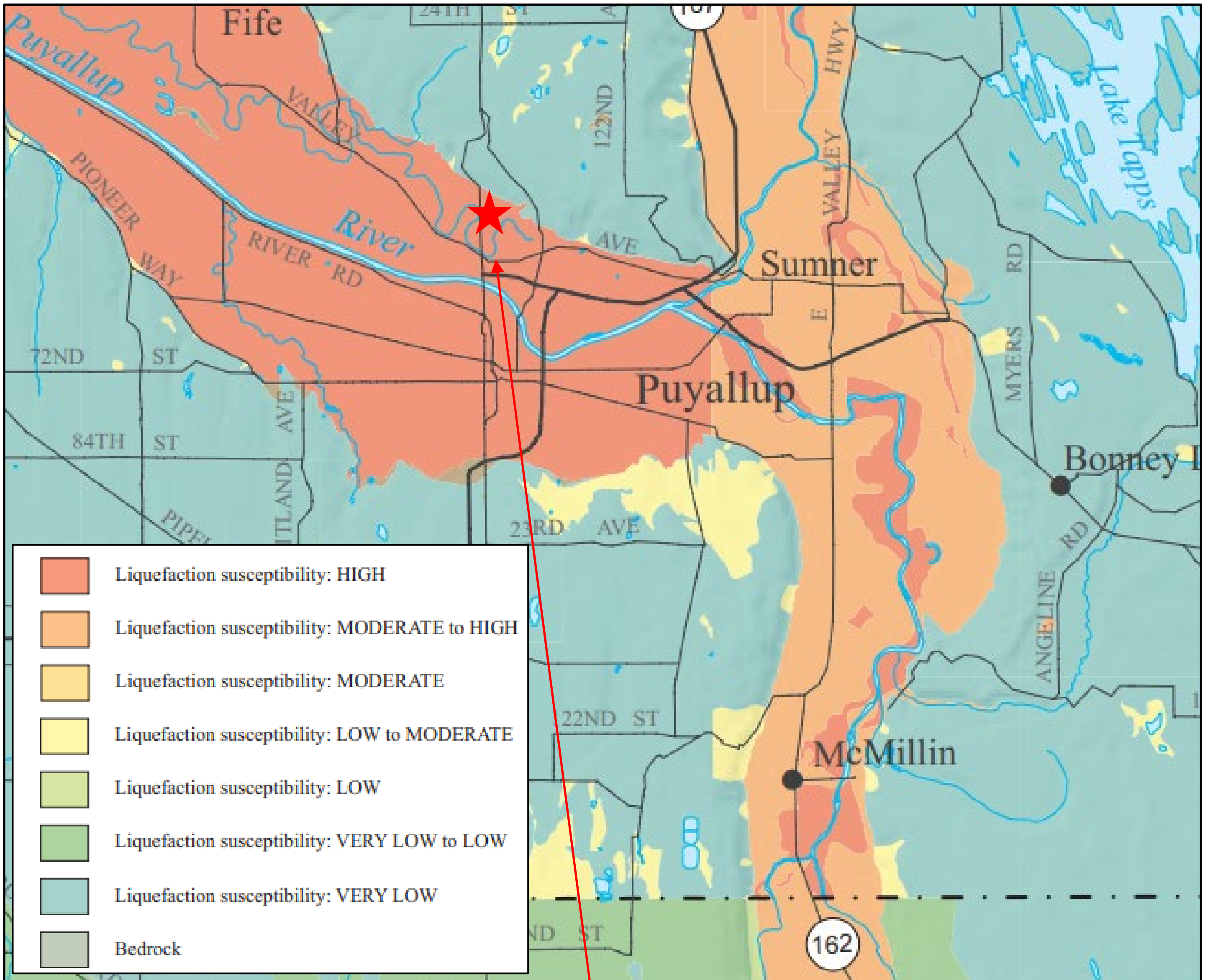
Geologic Map

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 5



Approximate Site Location

An excerpt from the *Liquefaction Susceptibility Map of Pierce County, Washington* (2004);

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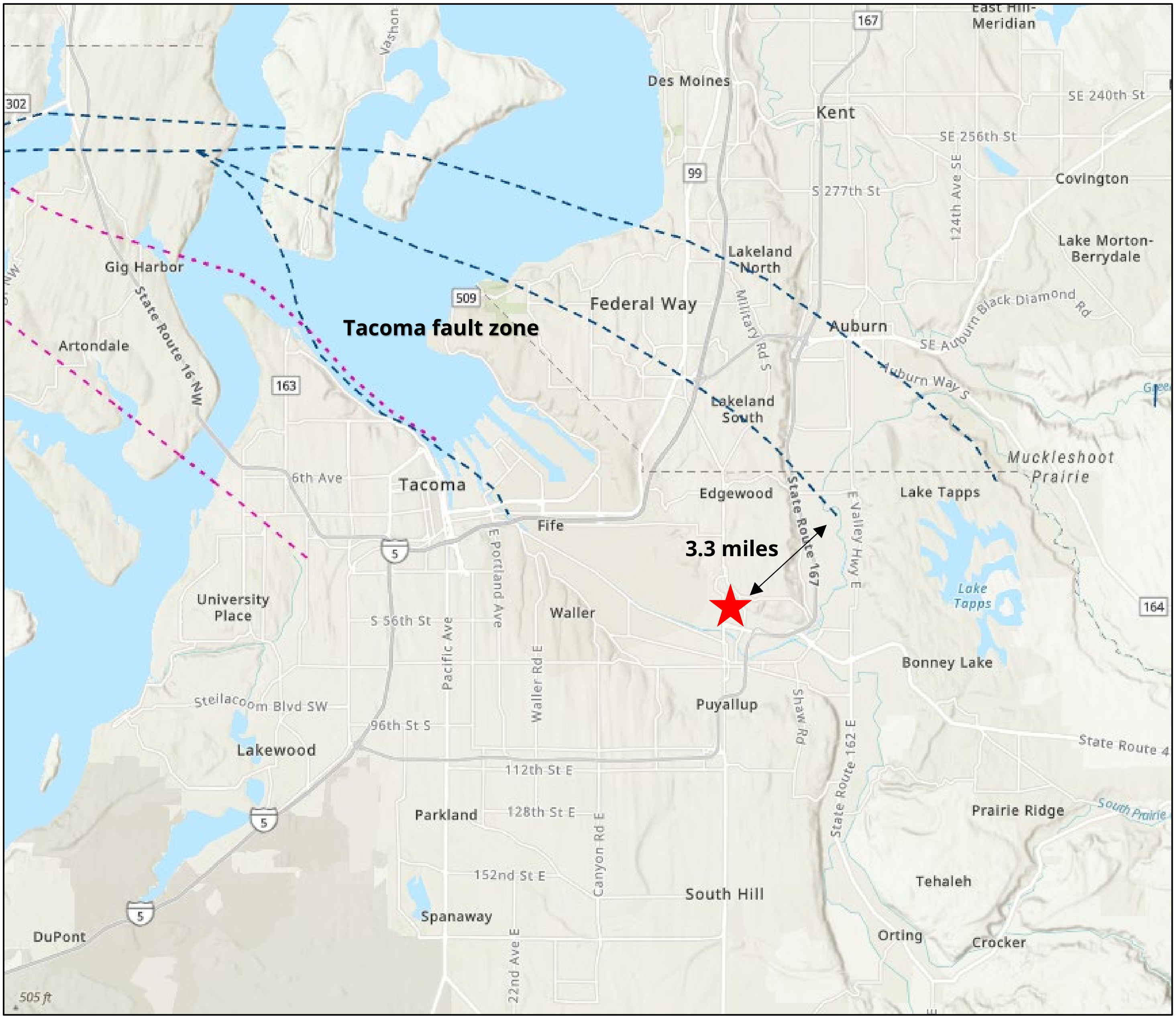
Liquefaction Susceptibility Map

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 6



Approximate Site Location

Map created on the Washington State Department of Natural Resources
Washington Geologic Information Portal Website
(https://geologyportal.dnr.wa.gov/#natural_hazards)

N W E S

Not to Scale

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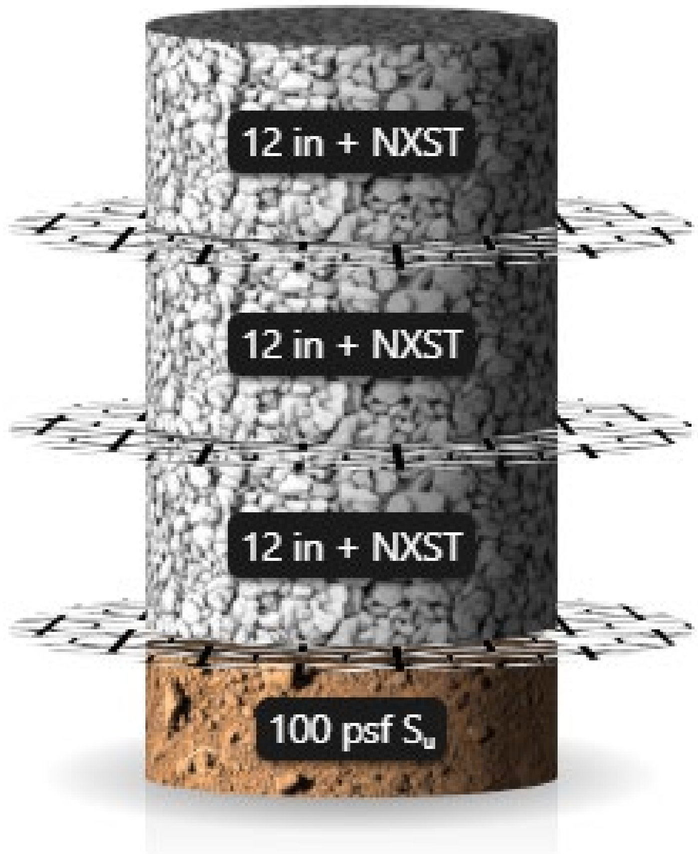
Fault Hazard Map

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 7



Excerpt from the Tensar+ “Liquefaction Effect Mitigation” software

Note: NXST is a generic callout for geogrid. Tensar InterAx® NX850, or an approved equivalent is recommended.

Not to Scale

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Reinforced Gravel Raft Detail

Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure 8

Appendix A
Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.

2. Soil classification using laboratory tests is based on ASTM D2487-90.

3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System
Proposed Commercial Development
212 & 302 Todd Road NE
Puyallup, Washington
PN: 0420222008 & 0420222028

Doc ID: AUU.ToddRdNE_212.F	June 2026	Figure A-1

LOG OF BORING **B-1**

Proposed Commercial Development
212 Todd Road NE
Puyallup, Washington

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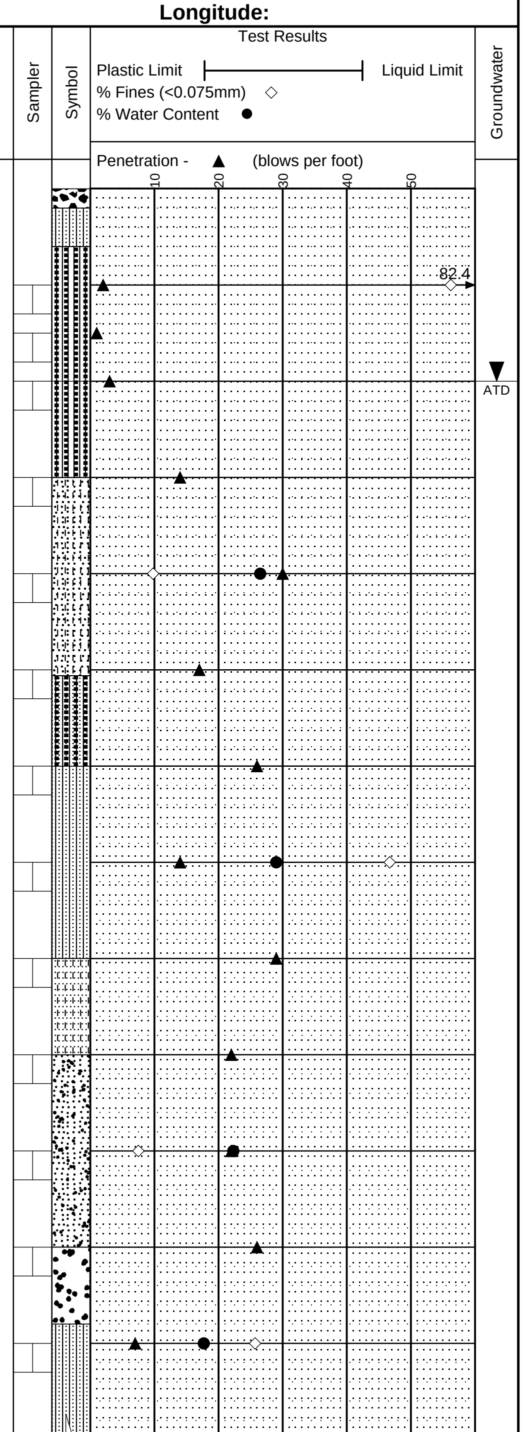
1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Holt Service Inc.	**Logged By:**	JLK
Drilling Method:	Mud Rotary	**Drilling Date:**	5/13/2026
Drilling Rig:	CME Truck Mounted Rig	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	50
Hammer Type:	automatic hammer	**Termination Depth:**	101.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

Notes: South portion of proposed building

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts
0	50		Spalls and gravel (Fill)	
			Black to dark brown silty SAND (very loose to loose, moist) (SM) (Alluvium)	
			Mottled grey-brown SILT with organics (very soft to soft, moist to wet) (ML) (Alluvium)	0 0 2 / 0 0 1
10	40		some charcoal	1 1 2
			Dark grey SAND with silt (medium dense, wet) (SP) (Alluvium)	4 8 6
20	30			8 14 16
			Grey silty SAND with wood organics (medium dense, moist to wet) (SM) (Alluvium)	5 10 7
30	20			9 13 13
				9 7 7
40	10		Dark grey SAND with silt (medium dense, wet) (SW-SM) (Alluvium)	13 13 16
			some gravel	9 11 11
50	0			8 10 12
		Slower drilling at 55ft	Dark grey sandy GRAVEL (medium dense, wet) (GP) (Alluvium)	10 11 15
60	-10	Slower drilling to 59ft Made additional mud	Grey silty gravelly SAND (very loose to loose, wet) (SM) (Mudflow)	2 4 3



Gravel | Silty sand | Description not given for: "ZJ" | Poorly graded sand with silt | Description not given for: "0J" | Well graded sand with silt

GEORESOURCES
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LOG OF BORING B-1

Proposed Commercial Development
212 Todd Road NE
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company: Holt Service Inc.
Drilling Method: Mud Rotary
Drilling Rig: CME Truck Mounted Rig
Sampler Type: split spoon
Hammer Type: automatic hammer
Hammer Weight: 140 lbs

Logged By: JLK
Drilling Date: 5/13/2026
Datum: NAVD88
Elevation: 50
Termination Depth: 101.5
Latitude:
Longitude:

Notes: South portion of proposed building

Test Results: Plastic Limit ├──┤ Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●; Penetration - ▲ (blows per foot) 10 20 30 40 50

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Test Results
				1 2 2	
70	-20		Grey SILT/CLAY grading to silty SAND, some organics (medium stiff/loose, wet) (ML/SM) (Mudflow)	2 2 4	
		Drill clamp broke, 1 hr delay prior to sampling at 75ft	Grey sandy SILT (very stiff to hard, wet) (ML) (Alluvium)	18 25 30	
80	-30			10 12 17	75.7
			some organics	5 6 10	
90	-40		Grey-brown SAND (medium dense, wet) (SP) (Alluvium)	5 11 19	
		Some chatter	Dark grey SAND (very dense, wet) (SP) (Alluvium)	20 32 24	
100	-50		Grey silty SAND (dense, moist to wet) (SM) (Alluvium)	14 18 23	
			(Termination Depth - 5/13/2026)		
110	-60				
120	-70				

Gravel | Silty sand | Description not given for: "ZJ" | Poorly graded sand with silt | Description not given for: "0J" | Well graded sand with silt

LOG OF BORING B-2

Proposed Commercial Development
212 Todd Road NE
Puyallup, Washington

GEORESOURCES
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1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company: Holt Service Inc.
Drilling Method: HSA
Drilling Rig: CME Truck Mounted Rig
Sampler Type: split spoon
Hammer Type: automatic hammer
Hammer Weight: 140 lbs

Logged By: JLK
Drilling Date: 5/13/2026
Datum: NAVD88
Elevation: 50
Termination Depth: 16.5
Latitude:
Longitude:

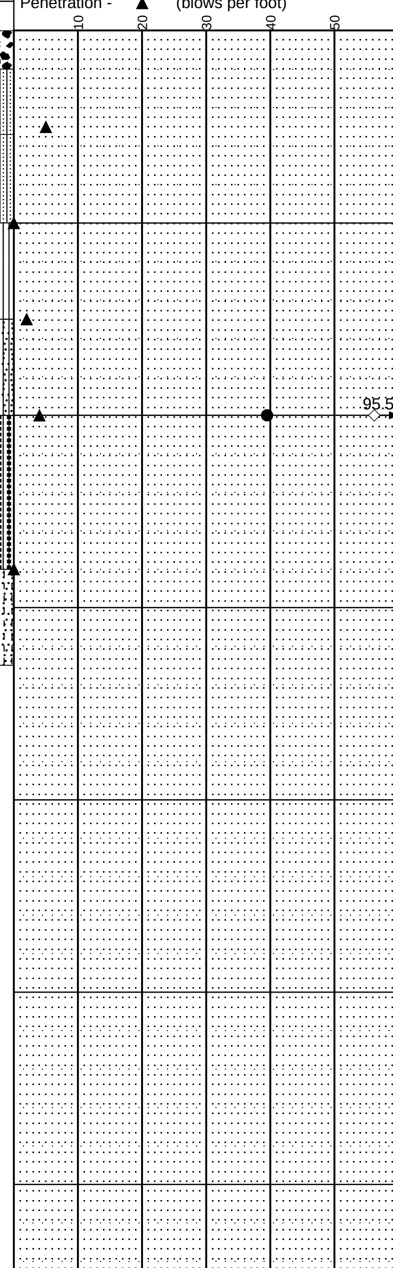
Notes: North portion of proposed building

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts
0	50		Spalls and gravel (Fill)	
			Black to dark brown silty SAND (very loose to loose, moist) (SM) (Alluvium)	
			Dark grey silty SAND (very loose to loost, moist to wet) (SM) (Alluvium)	6 3 2
5	45		Mottled grey SILT/CLAY (very soft, moist) (ML) (Alluvium)	0 0 0
			Mottled grey silty SAND (very loose, wet) (SM) grading to mottled SILT/CLAY (very soft, moist) (ML) (Alluvium)	0 0 2
10	40	Rod wet	Mottled SILT, some organics (soft, moist to wet) (ML) (Alluvium)	0 2 2
			Dark grey SAND with silt (very loose, wet) (SP-SM) (Alluvium)	0 0 0
15	35	Heave		
			(Termination Depth - 5/13/2026)	
20	30			
25	25			
30	20			

Test Results

Plastic Limit ⊢——⊣ Liquid Limit
% Fines (<0.075mm) ◇
% Water Content ●

Penetration - ▲ (blows per foot)

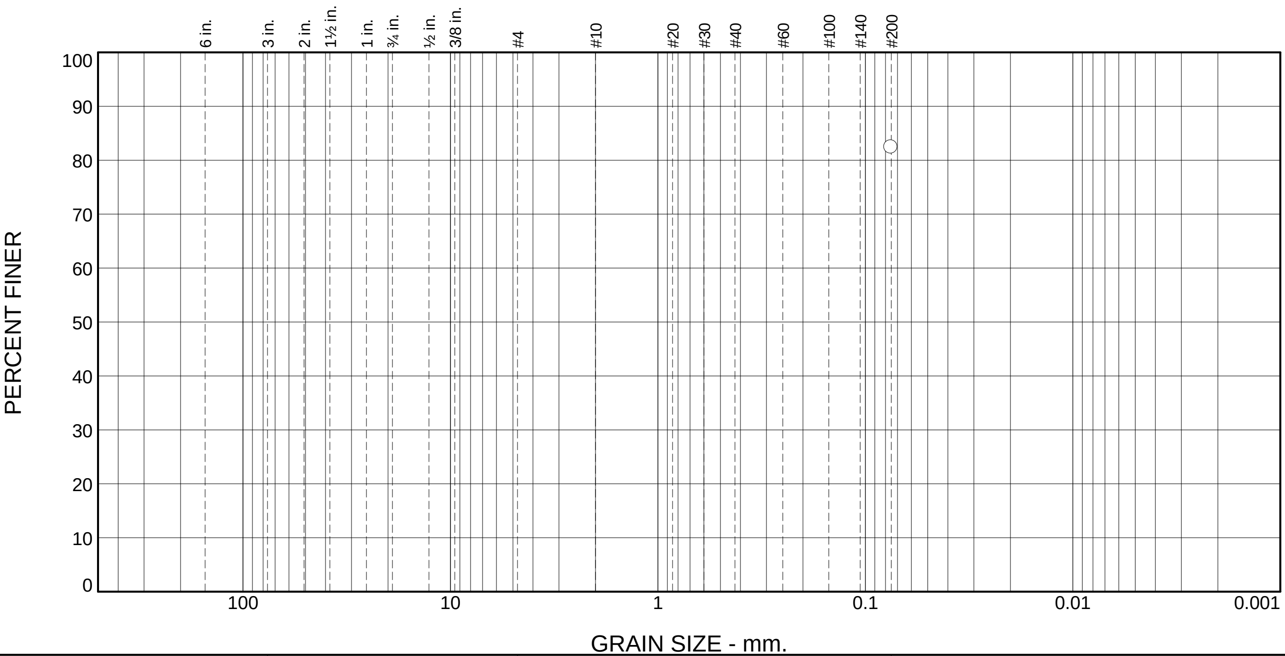


Groundwater: ▼ ATD

Gravel | Silty sand | Silt | Poorly graded silty fine sand | Description not given for: "ZJ" | Poorly graded sand with silt

Appendix B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						82.4	

Test Results (ASTM D 6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	82.4		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 45.7%

Date Received: 5/13/26 **Date Tested:** 5/18/26

Tested By: MAW

Checked By: JLK

Title: PM

Source of Sample: B-1 **Depth:** 5 **Date Sampled:** 5/13/26
Sample Number: 1

GeoResources, LLC

Fife, WA

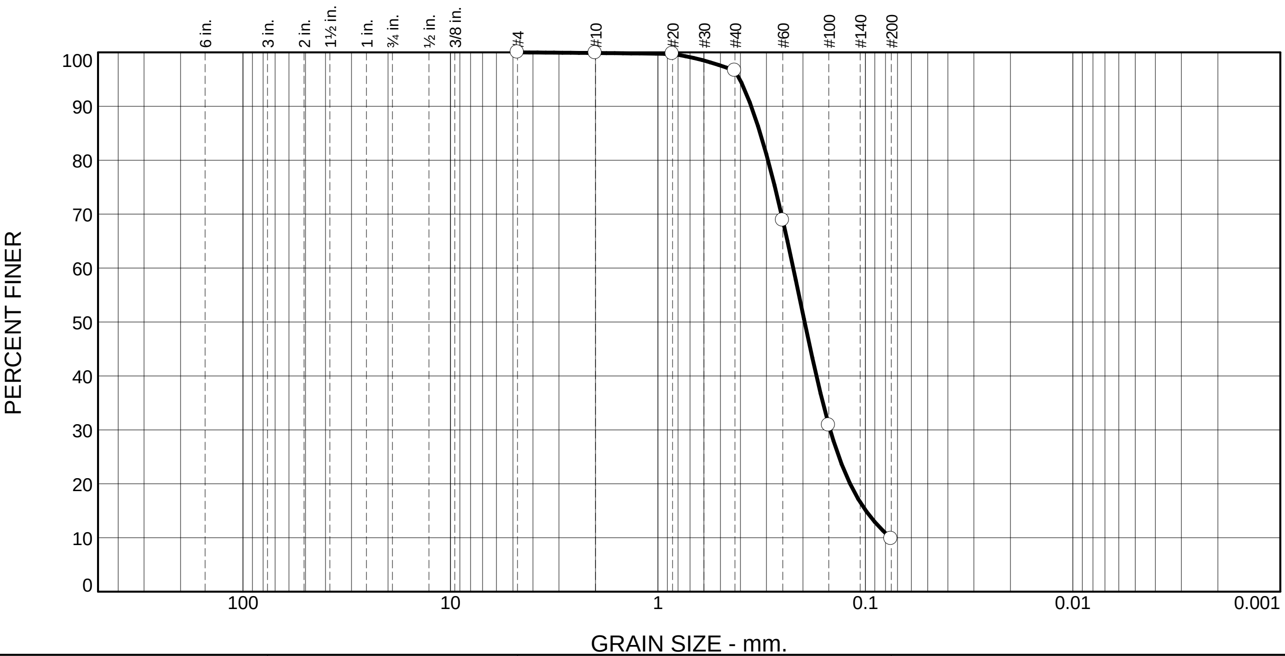
Client: Advanced Underground Utilities
Project: Proposed Commercial Development

Project No: AdvancedUndergroundUtilities.ToddRdNE.012 **Figure** B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________________ **Checked By:** ____________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	3.3	86.8	9.8	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.7		
#40	96.6		
#60	68.9		
#100	30.9		
#200	9.8		

* (no specification provided)

Material Description

Poorly graded SAND with silt (SP-SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.3550 D_{85}= 0.3212 D_{60}= 0.2227
D_{50}= 0.1963 D_{30}= 0.1478 D_{15}= 0.0994
D_{10}= 0.0759 C_u= 2.93 C_c= 1.29

Remarks

Natural Moisture: 26.7%

Date Received: 5/13/26 **Date Tested:** 5/18/26

Tested By: MAW

Checked By: JLK

Title: PM

Source of Sample: B-1 **Depth:** 20 **Date Sampled:** 5/13/26
Sample Number: 5

GeoResources, LLC

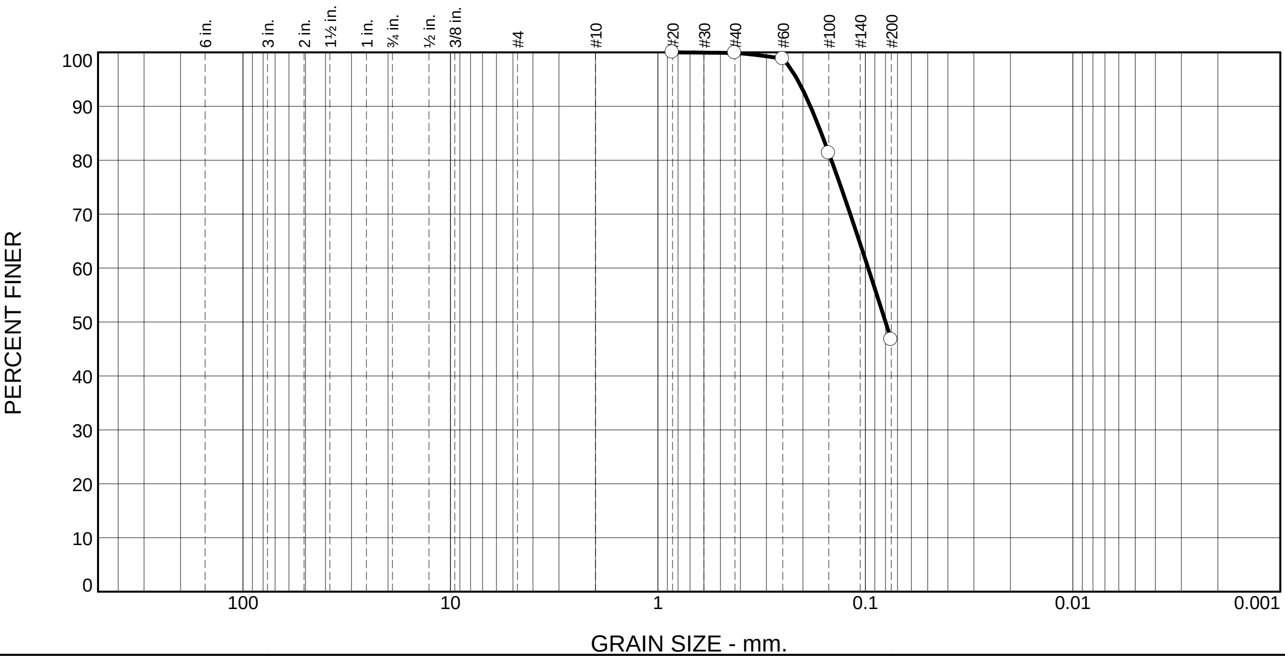
Fife, WA

Client: Advanced Underground Utilities
Project: Proposed Commercial Development
Project No: AdvancedUndergroundUtilities.ToddRdNE.012 **Figure** B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________________ **Checked By:** ____________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	53.2	46.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#20	100.0		
#40	99.9		
#60	98.8		
#100	81.3		
#200	46.7		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1841 D_{85}= 0.1630 D_{60}= 0.0969
D_{50}= 0.0799 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 29%

Date Received: 5/13/26 **Date Tested:** 5/18/26
Tested By: MAW
Checked By: JLK
Title: PM

Source of Sample: B-1 **Depth:** 35 **Date Sampled:** 5/13/26
Sample Number: 8

GeoResources, LLC

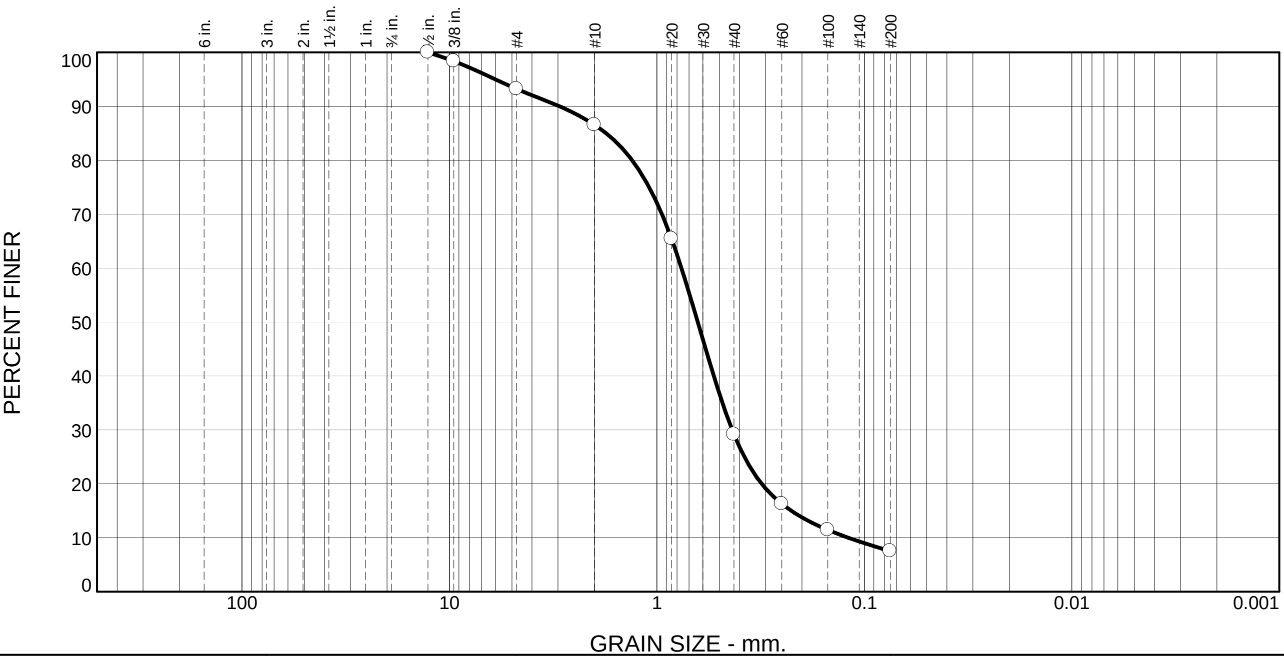
Fife, WA

Client: Advanced Underground Utilities
Project: Proposed Commercial Development
Project No: AdvancedUndergroundUtilities.ToddRdNE.012 **Figure** B-3

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________________ **Checked By:** ____________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.8	6.6	57.5	21.6	7.5	

Test Results (ASTM D 6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5	100.0		
0.375	98.4		
#4	93.2		
#10	86.6		
#20	65.4		
#40	29.1		
#60	16.3		
#100	11.4		
#200	7.5		

* (no specification provided)

Material Description

Well-graded SAND with silt (SW-SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 2.9527 D_{85}= 1.7575 D_{60}= 0.7616
D_{50}= 0.6355 D_{30}= 0.4338 D_{15}= 0.2250
D_{10}= 0.1195 C_u= 6.37 C_c= 2.07

Remarks

Natural Moisture: 22.3%

Date Received: 5/13/26 **Date Tested:** 5/18/26

Tested By: MAW

Checked By: JLK

Title: PM

Source of Sample: B-1 **Depth:** 50 **Date Sampled:** 5/13/26

Sample Number: 11

GeoResources, LLC

Fife, WA

Client: Advanced Underground Utilities

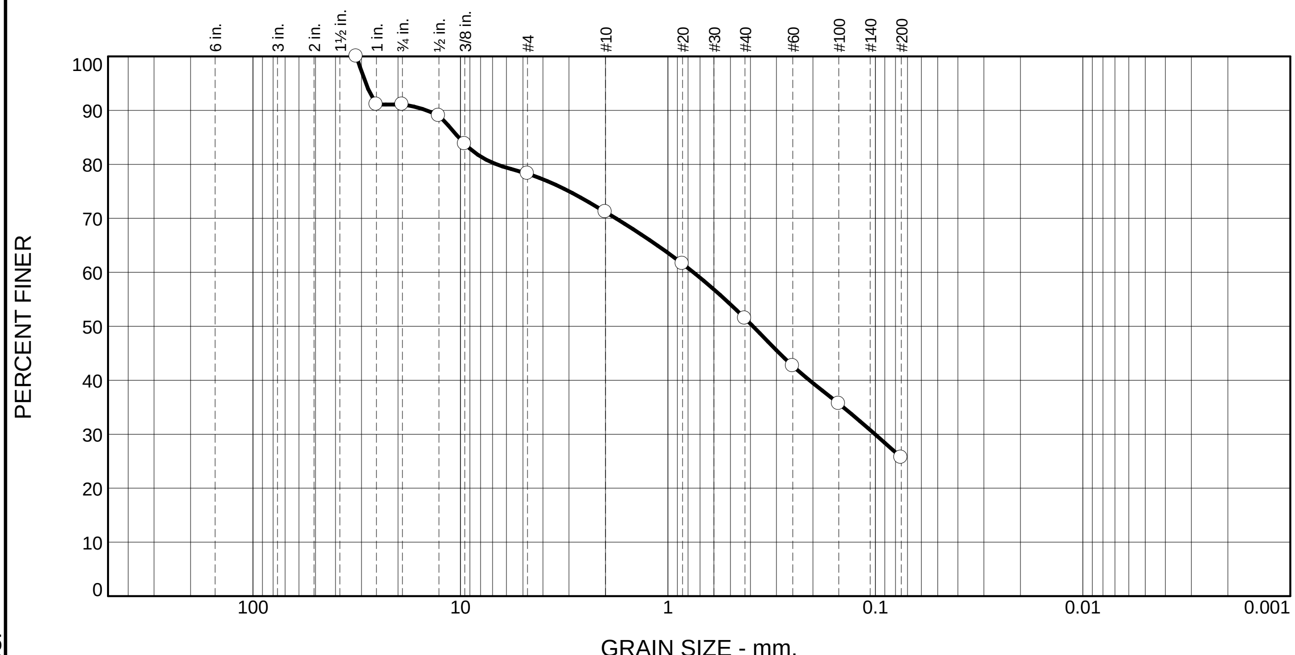
Project: Proposed Commercial Development

Project No: AdvancedUndergroundUtilities.ToddRdNE.012 **Figure** B-4

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________ **Checked By:** ____________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.9	12.8	7.1	19.7	25.8	25.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.25	100.0		
1.0	91.1		
0.75	91.1		
0.5	89.0		
0.375	83.8		
#4	78.3		
#10	71.2		
#20	61.6		
#40	51.5		
#60	42.6		
#100	35.7		
#200	25.7		

* (no specification provided)

Material Description

Silty SAND with gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 14.5780 D_{85}= 10.2095 D_{60}= 0.7534
D_{50}= 0.3895 D_{30}= 0.1004 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 17.7%

Date Received: 5/13/26 **Date Tested:** 5/18/26

Tested By: MAW

Checked By: JLK

Title: PM

Source of Sample: B-1 **Depth:** 60 **Date Sampled:** 5/13/26
Sample Number: 13

GeoResources, LLC

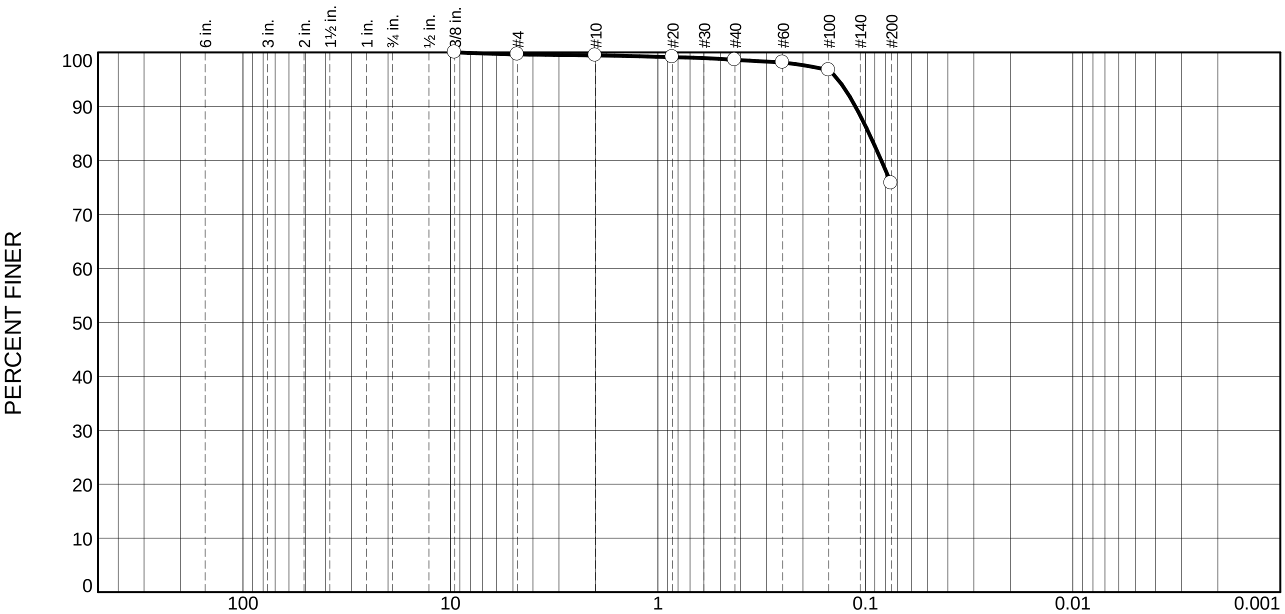
Fife, WA

Client: Advanced Underground Utilities
Project: Proposed Commercial Development
Project No: AdvancedUndergroundUtilities.ToddRdE.012 **Figure** B-5

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________________ **Checked By:** ____________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.2	0.8	22.9	75.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375	100.0		
#4	99.6		
#10	99.4		
#20	99.1		
#40	98.6		
#60	98.1		
#100	96.7		
#200	75.7		

* (no specification provided)

Material Description

SILT with sand (ML)(medium dense, wet)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1117 D_{85}= 0.0960 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 28.6%

Date Received: 5/13/26 **Date Tested:** 5/18/26
Tested By: MAW
Checked By: JLK
Title: PM

Source of Sample: B-1 **Depth:** 80 **Date Sampled:** 5/13/26
Sample Number: 17

GeoResources, LLC

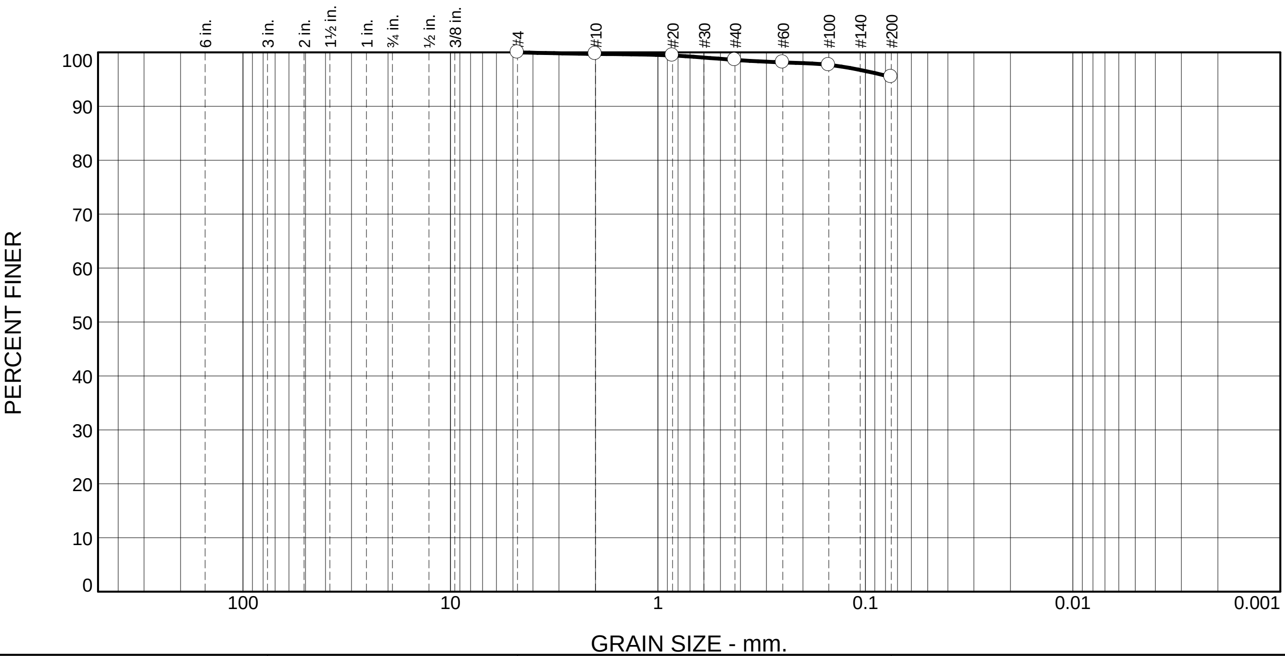
Fife, WA

Client: Advanced Underground Utilities
Project: Proposed Commercial Development
Project No: AdvancedUndergroundUtilities.ToddRdE.012 **Figure** B-6

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________ **Checked By:** ____________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	1.1	3.1	95.5	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.7		
#20	99.4		
#40	98.6		
#60	98.1		
#100	97.7		
#200	95.5		

* (no specification provided)

Material Description

SILT, some organics (soft, moist to wet) (ML)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 39.5%

Date Received: 5/13/26 **Date Tested:** 5/18/26

Tested By: MAW

Checked By: JLK

Title: PM

Source of Sample: B-2 **Depth:** 10 **Date Sampled:** 5/13/26

Sample Number: 4

GeoResources, LLC

Fife, WA

Client: Advanced Underground Utilities

Project: Proposed Commercial Development

Project No: AdvancedUndergroundUtilities.ToddRdE.012 **Figure** B-7

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: ____________________ **Checked By:** ____________________

Appendix C

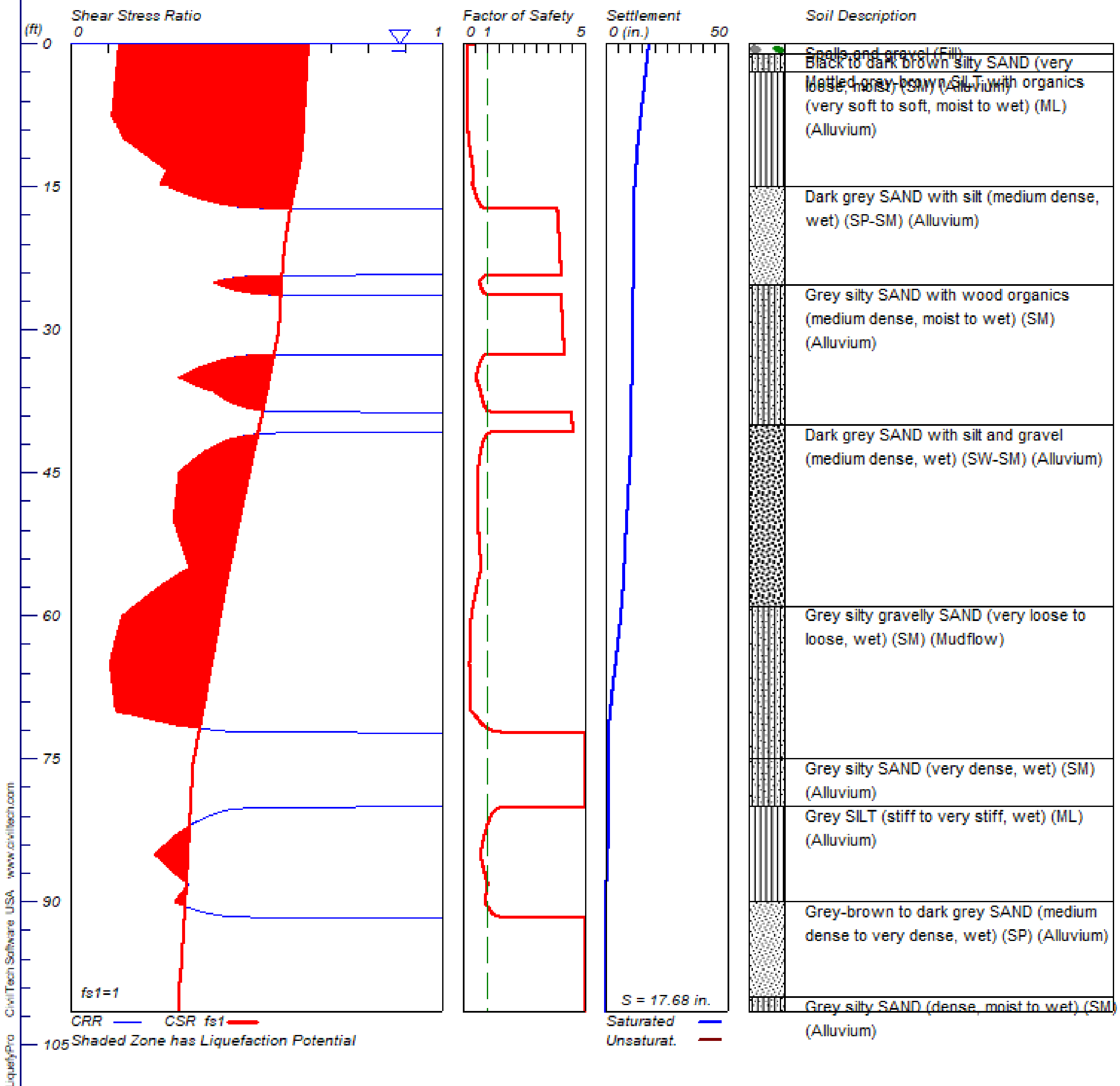
Liquefaction Analysis

LIQUEFACTION ANALYSIS

AUU.ToddRdNE_212

Hole No.=B-1 Water Depth=0 ft Surface Elev.=50

Magnitude=7.1
Acceleration=0.4g



CivilTech Corporation

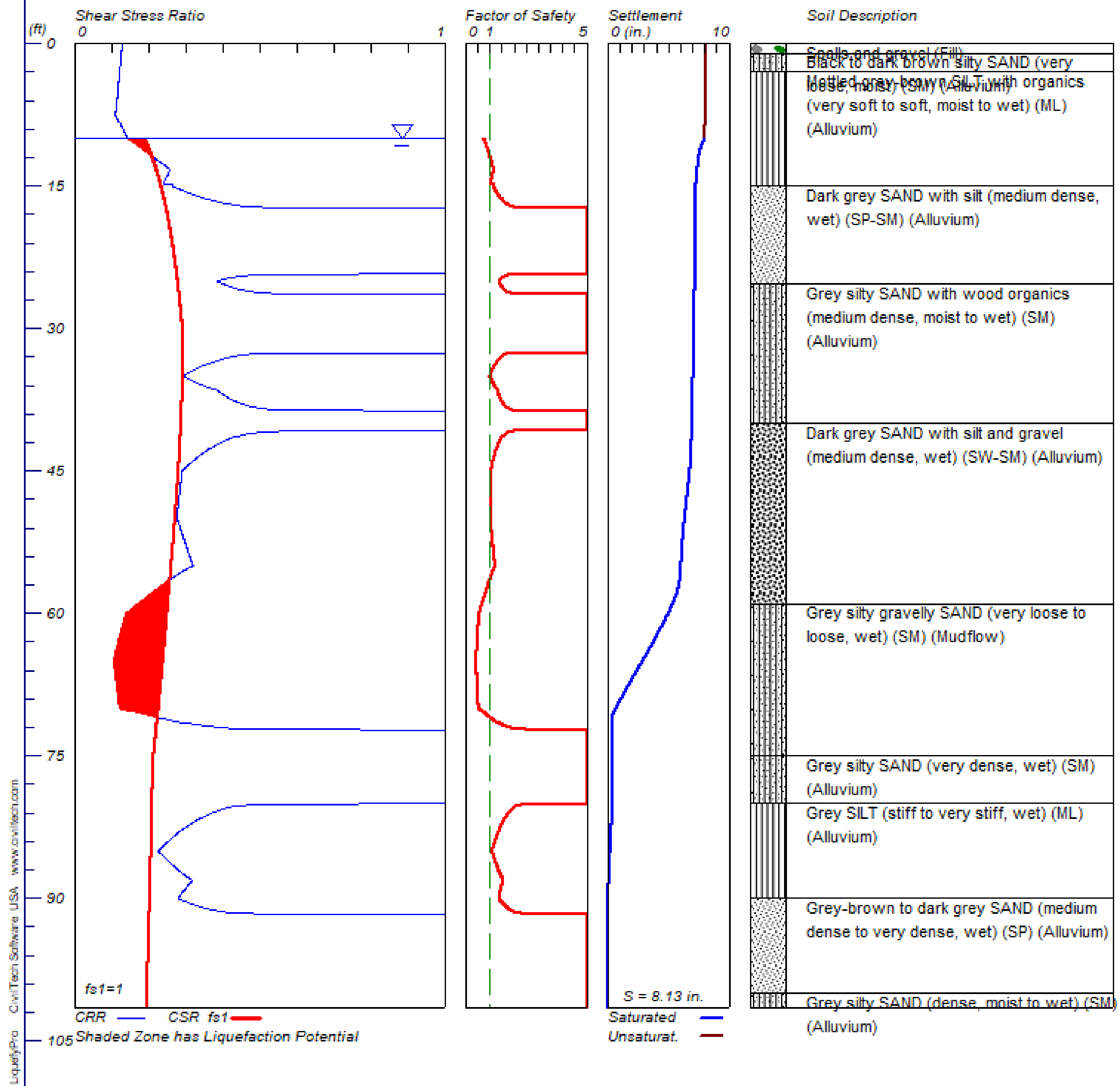
Plate A-1

LIQUEFACTION ANALYSIS

AUU.ToddRdNE_212

Hole No.=B-1 Water Depth=10 ft Surface Elev.=50

Magnitude=7.1
Acceleration=0.3g

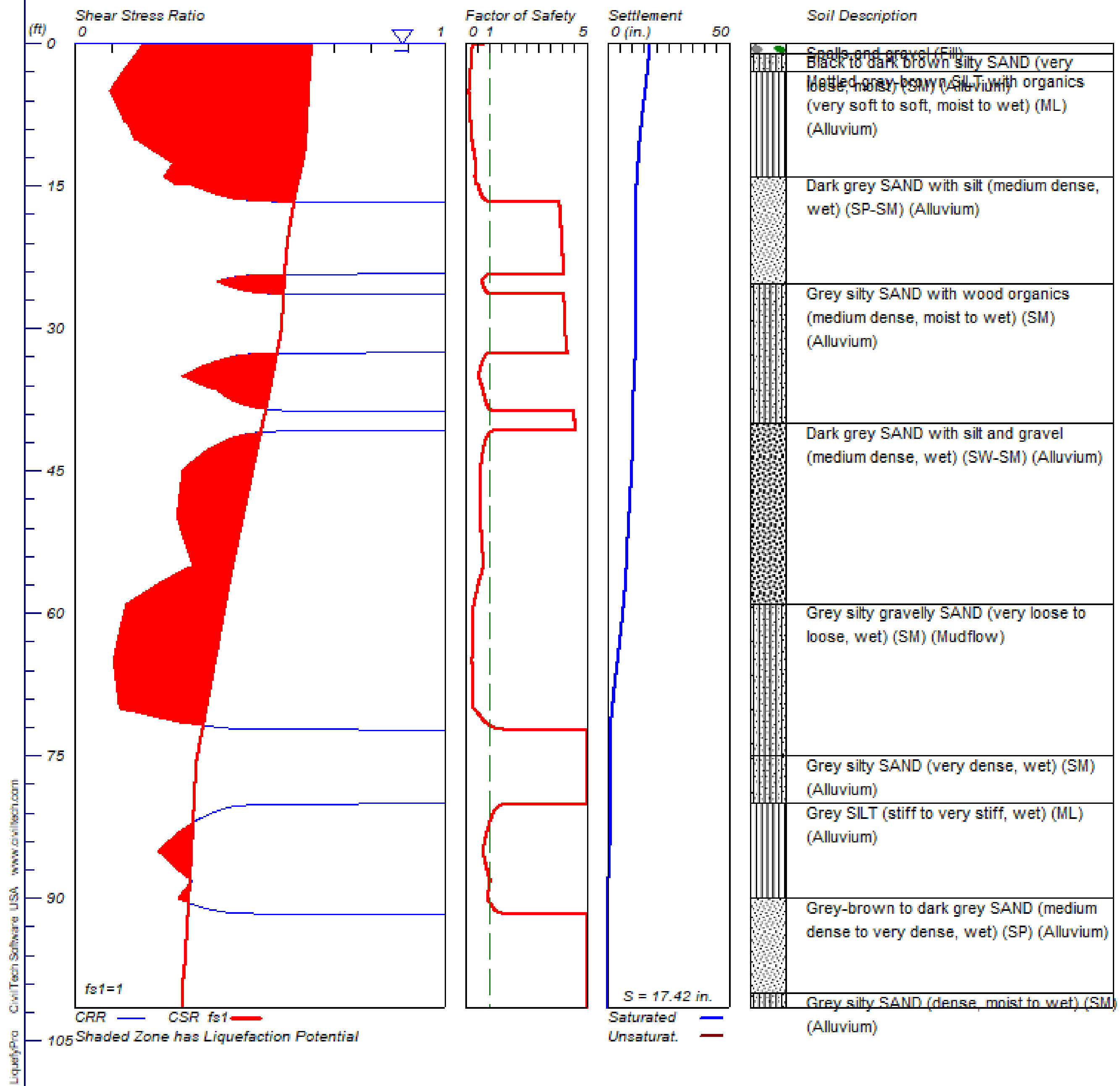


LIQUEFACTION ANALYSIS

AUU.ToddRdNE_212

Hole No.=B-2 Water Depth=0 ft Surface Elev.=50

Magnitude=7.1
Acceleration=0.4g



LIQUEFACTION ANALYSIS

AUU.ToddRdNE_212

Hole No.=B-2   Water Depth=10 ft   Surface Elev.=50

Magnitude=7.1
Acceleration=0.3g