PanGEO
INCORPORATED
Geotechnical & Earthquake Engineering Consultants

June 21, 2021
PanGEO Project No. 21-269



Jeff Stubbs
Tamarack Springs Construction
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Subject: GEOTECHNICAL FEASIBILITY STUDY
East 3rd Street and Deer Meadow Drive, Cle Elum, Washington
Kittitas County Parcel No. 063034

Dear Mr. Stubbs,

Attached herein is our geotechnical feasibility study for your use. This report summarizes the results of our subsurface exploration program, anticipated subsurface conditions, and preliminary design recommendations. Based on the results of our test pit explorations, the site is generally underlain by fine alluvial silt to about 4 to 6 feet below grade in turn underlain by coarse alluvial gravel with sand. Groundwater was as shallow as 4½ feet below the ground surface in our test pits at the time of exploration.

Because the project design is in a preliminary stage, the focus of our study was to evaluate and document the subsurface conditions at the site and provide preliminary recommendations for planning purposes. Additional geotechnical engineering input may be needed during the design phase and permitting phase of the project.

We appreciate the opportunity to be of service. If you have any questions, please do not hesitate to call.

Sincerely,

Steven T. Swenson, L.G.
Project Geologist
(sswenson@pangeoinc.com)

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GEOTECHNICAL FEASIBILITY STUDY
EAST 3RD STREET AND DEER MEADOW DRIVE
KITTITAS COUNTY PARCEL NO. 063034
CLE ELUM, WASHINGTON

1.0 GENERAL

We understand you are in a due diligence period and, if you proceed with the purchase, the property will be developed with a multi-family residential development. Because the project planning is in a preliminary stage, the focus of our study was limited to evaluating and documenting the subsurface conditions at the site and providing preliminary recommendations for planning purposes. Our work was performed in general accordance with our proposal dated June 7, 2021, which was subsequently authorized on June 8, 2021. Our service scope included conducting a site reconnaissance, reviewing readily available geologic and geotechnical data in the vicinity of the site, observing excavation of seven (7) test pits, and preparing this report summarizing our findings and presenting our conceptual geotechnical design recommendations.

We anticipate that additional geotechnical engineering design input may be needed during the final design of the project in order to prepare a design level geotechnical report for your permit submittal package, if needed.

2.0 SITE AND PROJECT DESCRIPTION

The subject site consists of an undeveloped, irregularly shaped, approximately 10-acre parcel (Kittitas County Parcel No. 063034) located southwest of the intersection of East 3rd Street and Deer Meadow Drive in the eastern city limits of Cle Elum, Washington approximately as shown on the attached Figure 1, Vicinity Map. The subject site extends up to approximately 670 feet in a north-south direction and up to approximately 760 feet in an east-west direction. The subject site is bound to the north by East 3rd Street, to the south by single-family residences and commercial properties, to the east by single-family residences, and to the west by an approximately 25-foot wide unimproved right-of-way.

Topography at the site slopes very gently down to the south at an average gradient of less than 2 percent. Based on topographic information available on Google Earth, there is up to about 10 feet of vertical feet between the north and south property lines. The site is

vegetated with tall grass. A view of the current site conditions can be seen in Plate 1 below.



Plate 1 – Panoramic view from intersection of East 3rd Street and Deer Meadow Drive. Facing south/southwest form northeast portion of the site.

We understand the subject site is zoned for planned mixed-use and that the site may be developed with up to 40 single-family residence lots. We anticipate the new development will consist of mass grading to establish building pads, roadways, and stormwater facilities, and construction of a series of lightly-loaded wood frame residences. As currently envisioned, the residences would be constructed at-grade with excavations for foundation construction anticipated to be less than 4 feet deep We understand a conceptual development scheme has not yet been determined.

According to the City of Cle Elum Geologically Hazardous Areas Maps, steep slopes and landslide hazards are not mapped at the site. The City's maps indicate the liquefaction susceptibility of the site is mapped as 'moderate to high'.

3.0 SUBSURFACE EXPLORATIONS

3.1 TEST PITS

Seven test pits (TP-1 through TP-7) were excavated at the site on June 15, 2021 to explore subsurface conditions at the site. The approximate test pit locations are indicated on Figure 2. The approximate test pit GPS coordinates were obtained using the Theodolite 7.0 iPhone application and are provided on the test pit logs. The test pits were excavated 5 to 10 feet below grade using a Kubota KX040-4 rubber tracked mini-excavator owned and operated Tamarack Springs Construction.

A geologist from PanGEO was present during the field explorations to observe the test pit excavation, obtain representative soil samples, and to describe and document the soils encountered in the explorations. Summary test pit logs, which provide descriptions of the materials encountered, depths to soil contacts, and depths of seepage or caving, if present, observed in the test pit sidewalls are presented in Appendix A. The relative in-situ density of cohesionless soils, or the relative consistency of fine-grained soils, was estimated from the excavating action of the excavator, probing the sidewalls with a ½-inch diameter steel rod, and the stability of the test pit sidewalls. Where soil contacts were gradual or undulating, the average depth of the contact was recorded in the log.

3.2 EXISTING SUBSURFACE INFORMATION

In addition to our test pits completed for the current study, we also reviewed logs of previous test borings B-1 through B-4 at the Storey Service Station (Storey's) site located at 1310 East First Street (Galloway Environmental, 2000). The Storey's site is located about 400 feet southwest of the subject site. The previous test borings at Storey's were advanced 14 to 16 feet below the ground surface and each of the borings was developed with a groundwater monitoring well. A site plan showing the boring locations and the summary boring logs are included in Appendix B of this report for reference purposes. The results of the previous test borings are summarized in Section 4.2. Although these existing test borings are located offsite, they provide general subsurface information that is deeper than our test pits.

The previous test boring logs indicate that soil samples were obtained from the borings in general accordance with Standard Penetration Test (SPT) sampling methods (ASTM test method D-1586) in which the samples are obtained using a 2-inch outside diameter split-spoon sampler. The sampler is driven into the soil a distance of 18 inches using a 140-pound weight falling a distance of 30 inches. The number of blows required for each 6-inch increment of sampler penetration was recorded. The number of blows required to achieve the last 12 inches of sample penetration is defined as the SPT N-value. The N-value provides an empirical measure of the relative density of cohesionless soil, or the relative consistency of fine-grained soils.

4.0 SUBSURFACE CONDITIONS

4.1 Site Geology and USDA Soil Mapping

Subsurface conditions in the vicinity of the site were evaluated by reviewing the *Geologic Map of the Wenatchee 1:100,000 Quadrangle, Washington* (Tabor, et al., 1982). Based on our review, the primary geologic unit at the site is alluvium of the Yakima River (Geologic Map Unit *Qy*). According to the geologic map, the alluvium is described as boulder to pebble gravel.

Review of the soils map for the area of the site available on the USDA NRCS Web Soil Survey indicates the site is underlain by Patnish-Mippon-Myzel complex soils, 0 to 3 percent slopes (Map Unit 208). Patnish-Mippon-Myzel complex soils parent material is described as flood plain alluvium mixed with volcanic ash.

4.2 Soils

The soil conditions encountered in our test pits consisted of material that we interpret to be alluvium which is consistent with the mapped geology. A discussion of the subsurface conditions encountered at our test pit locations follows:

Fill – At test pit TP-1, an approximately 1-foot thick layer of medium dense silty fine sand interpreted as fill was encountered near the ground surface. Negligible fill material was encountered at the remaining test pit locations.

Fine Alluvium – Underlying the existing fill at test pit TP-1 and near the ground surface at the remaining test pit locations, medium stiff silt slightly clayey silt interpreted as fine alluvium was encountered. This soil unit typically contained fine roots, trace sand, and occasional subround gravel. This soil unit was encountered to depths ranging from 4 to 6 feet below grade at test pits TP-1 through TP-6, and to the maximum exploration depth of 9 feet below grade at TP-7.

Coarse Alluvium – Underlying the fine alluvium at test pits TP-1 through TP-6, medium dense to dense poorly graded gravel with a varying sand and silt content that we interpret as coarse alluvium was encountered. This soil unit contained cobbles and caving of this material ranged from slight to heavy. This soil unit was encountered to the maximum depth explored at all test pits except for TP-7.

Material interpreted as coarse alluvium was the primary geologic unit encountered at the previous test borings at Storey's. SPT N-values in this material indicate it is in a dense to very dense condition, although coarse gravel and cobbles likely resulted in inflated SPT N-values.

4.3 GROUNDWATER

Groundwater was encountered at test pits TP-1 through TP-3, TP-5, and TP-6 in coarse alluvial deposits at the time of excavation in June 2021. A summary of the depth to groundwater below the ground surface and the estimated groundwater table elevation is summarized in Table 1 on the following page.

Table 1 – Estimated Groundwater Table Elevation

Test Pit ID	Ground Surface Elevation*	Depth to Groundwater	Groundwater Table Elevation*
TP-1	1,884 feet	4½ feet	1879.5 feet
TP-2	1,886 feet	7 feet	1880 feet
TP-3	1,887 feet	8 feet	1879 feet
TP-4	1,891 feet	Not encountered to 10 feet	--
TP-5	1,887 feet	7½ feet	1879.5 feet
TP-6	1,885 feet	6½ feet	1878.5 feet
TP-7	1,889	Not encountered to 9 feet	--

*Elevations estimated based on topographic data available on Google Earth.

Groundwater table information in the Galloway Environmental report for the Storey's site indicates there was an approximately 1½-foot difference in the seasonal water table level from January 1998 to September 1999, with the seasonal groundwater table high in the spring.

It should be noted that groundwater elevations and seepage rates are likely to vary depending on the season, local subsurface conditions, the water level in the Yakima River, and other factors. Groundwater and Yakima River levels are normally highest in the spring.

5.0 PRELIMINARY DESIGN AND CONSTRUCTION CONSIDERATIONS

5.1 Seismic Design Considerations

Site Class - We anticipate that the proposed development will be designed in accordance with the 2018 edition of the International Building Code (IBC). Based on the subsurface

conditions encountered at our test pit locations, Site Class D (Stiff Soils) is considered appropriate for the project site.

Soil Liquefaction - Seismically induced liquefaction typically occurs in loose, saturated, sandy and silty materials. The effect of liquefaction can include reduced bearing capacity, settlement, and lateral ground movements.

Based on the coarse granular nature of the alluvium below the groundwater table at our test pits and the measured SPT N-values in this soil unit at the Storey's test borings, it is our opinion that the potential for soil liquefaction is low and design considerations associated with the soil liquefaction are not needed.

5.2 FOUNDATIONS

Medium stiff fine alluvial soils that may be compacted in-place to provide a suitable foundation subgrade were typically encountered within about 1-foot below the existing ground surface at our test pit locations. Therefore, the use of conventional footings is considered adequate to support new residences.

For preliminary planning purposes, an allowable bearing capacity of 2,000 psf may be used to design foundations bearing on fine alluvium deposits, provided the foundation subgrade is adequately compacted and prepared. Continuous and individual spread footings should have minimum widths of 18 and 24 inches, respectively. The onsite fine alluvial soils should not be reused as structural fill below footings.

For frost heave considerations, exterior footings should be placed at a minimum depth of 24 inches below final exterior grade. Interior spread foundations should be placed at a minimum depth of 12 inches below the top of slab.

If loose/soft soils that cannot be adequately compacted are encountered at the footing subgrade elevation, the loose/soft soil should be overexcavated to competent soil and replaced with granular structural fill such as Gravel Borrow (WSDOT 9-03.14(1)), crushed rock, or a PanGEO approved equivalent. If overexcavation is deemed necessary during construction, we do not anticipate the overexcavation depth would be deeper than 2 feet.

5.3 Stripping

The site is vegetated with grasses. Based on the subsurface conditions observed at the test pit locations, we anticipate a stripping depth in the range of 2 to 4 inches should generally be sufficient.

5.4 Material Reuse and Structural Fill

Although the onsite soils may be considered for use as structural fill, the soils expected to be encountered in site excavations at the site have a high fines content and will likely be difficult to compact to the requirements of structural fill. If imported structural fill is needed, it should consist of a well-graded granular material, such as Gravel Borrow (WSDOT 9-03.14(1)) or crushed rock.

Structural fill is defined as compacted fill placed for mass grading, under buildings, roadways, slabs, pavements, or other load-bearing areas. Structural fill should be moisture conditioned to within about 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 8 inches in thickness, and systematically compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557 (Modified Proctor). A sheepsfoot roller may be needed to achieve proper compaction of the fine alluvial silt.

5.5 Temporary Excavations

All temporary excavations should be performed in accordance with Part N of WAC (Washington Administrative Code) 296-155. The contractor is responsible for maintaining safe excavation slopes and/or shoring.

Temporary excavations are primarily anticipated to encounter medium stiff silt (fine alluvium) and medium dense to dense poorly graded gravel with sand (coarse alluvium). Temporary excavations greater than 4 feet deep should be properly sloped or shored. For planning purposes, the temporary excavations in fine alluvium may be sloped as steep as 1H:1V (Horizontal:Vertical) and temporary excavations in coarse alluvium situated above the groundwater table may be sloped as steep as 1½H:1V. Excavations situated below the groundwater table may be sloped as steep as 2H:1V, provided the groundwater

table is adequately lowered prior to excavating. Groundwater seepage may result in erosion on the cut face if dewatering is not adequate.

Temporary excavation slope inclinations should be re-evaluated in the field during construction based on observed soil conditions. During wet weather, the cut slopes may need to be flattened to reduce potential erosion.

5.6 Infiltration Considerations

Due to the high fines content of the near fine alluvial silt, it is our opinion that infiltration of surface water runoff in this soil unit is not considered practical.

As outlined in Site Suitability Criteria 5 (SSC—5) in Chapter 5.4 of the *Stormwater Management Manual for Eastern Washington* (SMMEW, WSDOE, 2019), a minimum 5-foot separation between the bottom of infiltration basins or infiltration trench systems and the seasonal high groundwater level is recommended.

The coarse alluvial soils encountered at our test pits are considered conducive to infiltration, however, it does not appear that there is sufficient vertical distance between the top of this soil unit and the groundwater table to meet Ecology's SSC-5 groundwater separation requirement, except for maybe in the vicinity of TP-4 in the northwest portion of the site.

5.7 Construction Dewatering

Excavations for deeper utilities such as sewer lines may encounter groundwater in the coarse alluvium. The rate of groundwater inflow would be relatively fast. Closely spaced sumps and pumps and/or dewatering wells would likely be needed to adequately control groundwater.

5.8 Pavement Considerations

We envision the proposed roadways within the site will be subject to heavy truck traffic during construction. After construction of the development is finished, roadway usage will generally be limited to passenger vehicles, and garbage and delivery trucks.

To provide stable roadways during construction and to reduce erosion and trackout from the site, we recommend paving the roadways with three (3) inches of asphalt treated base (ATB) on a properly prepared subgrade. After construction is complete, a wearing surface consisting of hot-mixed asphalt (HMA) or bituminous surface treatment (BST, aka chip-seal) may overlay the ATB. We recommend an HMA overlay be at least 2 inches thick. BST overlays should be about ¾ inches thick. Please be aware that the design life for an HMA overlay would be about 20 years and a BST overlay would likely need to be refreshed in about 8 to 10 years.

Before placement of the final paving lift, the ATB condition should be visually inspected to identify distressed areas in need of improvement.

5.9 Erosion Control

The site soils anticipated to be encountered in site excavations contain a relatively high percentage of fines and are moisture sensitive. Any subgrade soils that become softened either by construction disturbance or by rainfall should be removed and replaced with granular structural fill.

In our opinion, the potential for erosion at the site can be adequately mitigated by employing best management practices (BMPs). During construction, erosion control should include measures for reducing concentrated surface runoff and for reducing the potential of off-site sediment transport by protecting disturbed or exposed surfaces. As a minimum, erosion control on the downslope side of site excavations should be in-place prior to construction. The temporary erosion and sediment control (TESC) plan should include the following:

- Where practical, maintain vegetation buffers around cleared areas.
- The ground surface within the construction area should be graded to prevent ponding of water and to prevent runoff from reaching site slopes
- Adequately cover soil stockpiles with plastic sheeting.
- Hydroseed or place straw in areas where grading is completed.

- Divert water away from the top of slopes.
- Use silt fences and/or straw bales around the construction site perimeter.
- If possible, stage construction such that the amount of exposed soil and exposure time is minimized.

PanGEO should review the TESC plan to verify our recommendations are incorporated into the design. The erosion control measures should be inspected on a regular basis to verify they are functioning as intended.

6.0 UNCERTAINTY AND LIMITATIONS

We have prepared this report for use by Jeff Stubbs of Tamarack Springs Construction and other project team members. Conclusions contained in this report are based on a site reconnaissance, a subsurface exploration program, review of pertinent geologic publications, and our understanding of the project. The study was performed using a mutually agreed-upon scope of work.

The scope of our work does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractors' methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design. Additionally, the scope of our work specifically excludes the assessment of environmental characteristics, particularly those involving hazardous substances.

This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issuance. PanGEO should be notified if the project is delayed by more than 24 months from the date of this report so that we may review the applicability of our conclusions considering the time lapse.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of

information contained in this report for bidding purposes should be done at the contractor's option and risk. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

Within the limitation of scope, schedule and budget, PanGEO engages in the practice of geotechnical engineering and endeavors to perform its services in accordance with generally accepted professional principles and practices at the time the Report or its contents were prepared. No warranty, express or implied, is made.

We appreciate the opportunity to be of service to you on this project. Please feel free to contact our office with any questions you have regarding our study, this report, or any geotechnical engineering related project issues.

Sincerely,



Steven T. Swenson, L.G.
Project Geologist

Siew L. Tan, P.E.
Principal Geotechnical Engineer

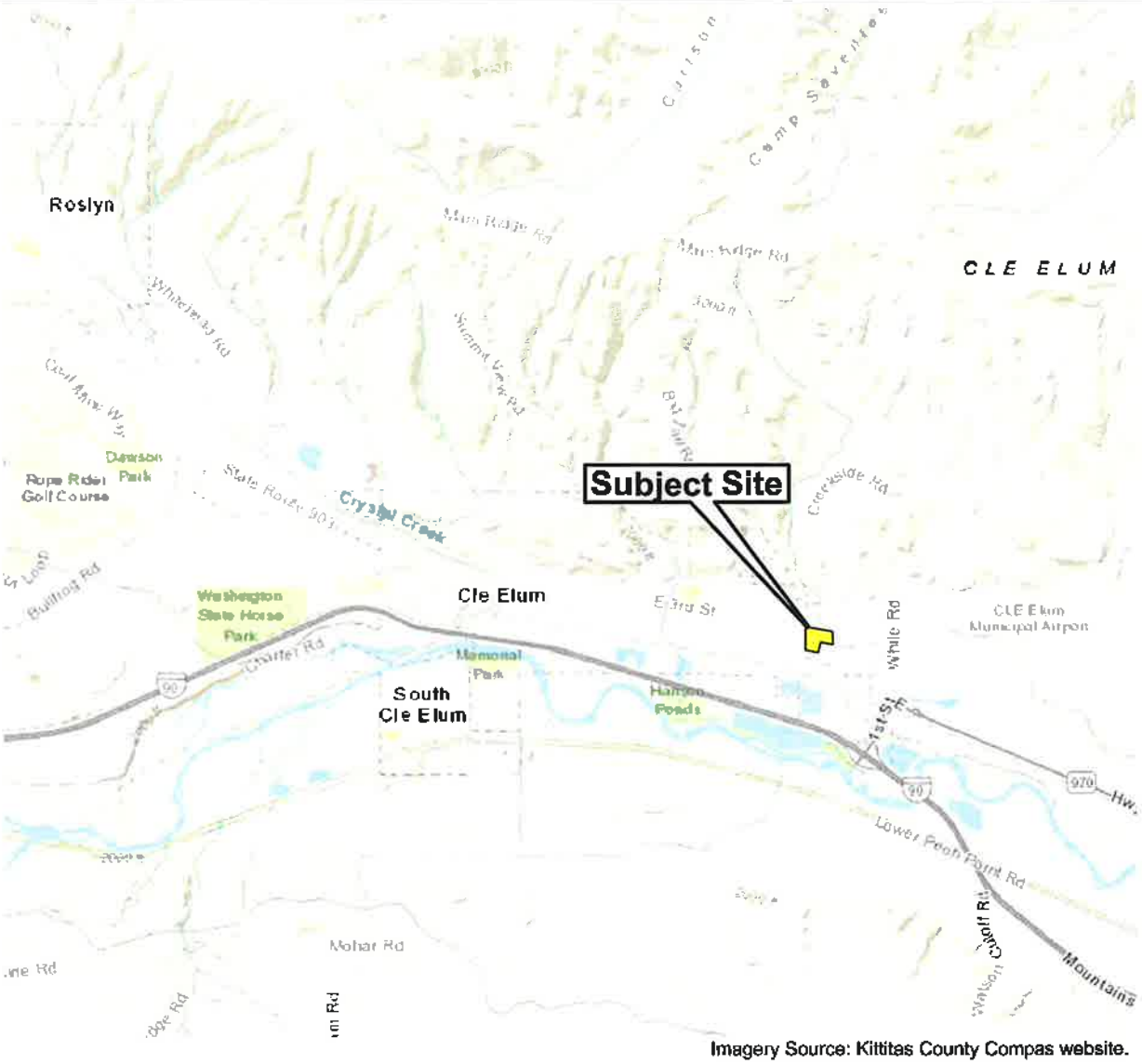
7.0 REFERENCES

International Building Code (IBC), 2018, International Code Council.

Tabor, R.W., Waitt, R.B., Frizzell Jr., V.A., Swanson, D.A, Byerly, G.R., Bentley, R.D., 1982, *Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington:* U. S. Geological Survey Geologic Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Washington State Department of Ecology, 2019, *Stormwater Management Manual for Eastern Washington* Publication.

Washington State Department of Transportation, 2021, *Standard Specifications for Road, Bridges, and Municipal Construction*.



Imagery Source: Kittitas County Compas website.



Not to Scale

PanGEO INCORPORATED	**East 3rd Street and Deer Meadow Drive Kittitas Co. Parcel No. 063034 Cle Elum, WA**	**VICINITY MAP**	
		Project No. **21-269**	Figure No. **1**

21-269 Fig1_Vicinity.grf 6/17/21 (08:20) STS



Legend:

Approx. Test Pit Location (PanGEO, June 2021)

(5') Depth to Groundwater at Time of Excavation

Note: Base map modified from imagery available on the Kittitas County Compas website.

PanGEO INCORPORATED	East 3rd Street and Deer Meadow Drive Kittitas Co. Parcel No. 063034 Cle Elum, WA	SITE AND EXPLORATION PLAN
		Project No. 21-269 / Figure No. 2

21-269 Fig 2 Site Plan.pgf 6/21/21 (10:00) STS

APPENDIX A

SUMMARY TEST PIT LOGS

RELATIVE DENSITY / CONSISTENCY

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Med. Dense	10 to 30	35 - 65	Med. Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)	GW	Well-graded GRAVEL
		GP	Poorly-graded GRAVEL
	GRAVEL (>12% fines)	GM	Silty GRAVEL
		GC	Clayey GRAVEL
Sand 50% or more of the coarse fraction passing the #4 sieve. Use dual symbols (eg. SP-SM) for 5% to 12% fines.	SAND (<5% fines)	SW	Well-graded SAND
		SP	Poorly-graded SAND
	SAND (>12% fines)	SM	Silty SAND
		SC	Clayey SAND
Silt and Clay 50%or more passing #200 sieve	Liquid Limit < 50	ML	SILT
		CL	Lean CLAY
		OL	Organic SILT or CLAY
	Liquid Limit > 50	MH	Elastic SILT
		CH	Fat CLAY
		OH	Organic SILT or CLAY
Highly Organic Soils		PT	PEAT

Notes: 1. Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.

2. The graphic symbols given above are not inclusive of all symbols that may appear on the borehole logs. Other symbols may be used where field observations indicated mixed soil constituents or dual constituent materials.

DESCRIPTIONS OF SOIL STRUCTURES

Layered: Units of material distinguished by color and/or composition from material units above and below

Laminated: Layers of soil typically 0.05 to 1mm thick, max. 1 cm

Lens: Layer of soil that pinches out laterally

Interlayered: Alternating layers of differing soil material

Pocket: Erratic, discontinuous deposit of limited extent

Homogeneous: Soil with uniform color and composition throughout

Fissured: Breaks along defined planes

Slickensided: Fracture planes that are polished or glossy

Blocky: Angular soil lumps that resist breakdown

Disrupted: Soil that is broken and mixed

Scattered: Less than one per foot

Numerous: More than one per foot

BCN: Angle between bedding plane and a plane normal to core axis

COMPONENT DEFINITIONS

COMPONENT	SIZE / SIEVE RANGE	COMPONENT	SIZE / SIEVE RANGE
Boulder:	> 12 inches	Sand	
Cobbles:	3 to 12 inches	Coarse Sand:	#4 to #10 sieve (4.5 to 2.0 mm)
Gravel		Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
Coarse Gravel:	3 to 3/4 inches	Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Fine Gravel:	3/4 inches to #4 sieve	Silt	0.074 to 0.002 mm
		Clay	<0.002 mm

TEST SYMBOLS

for In Situ and Laboratory Tests listed in "Other Tests" column.

ATT	Atterberg Limit Test
Comp	Compaction Tests
Con	Consolidation
DD	Dry Density
DS	Direct Shear
%F	Fines Content
GS	Grain Size
Perm	Permeability
PP	Pocket Penetrometer
R	R-value
SG	Specific Gravity
TV	Torvane
TXC	Triaxial Compression
UCC	Unconfined Compression

SYMBOLS

Sample/In Situ test types and intervals

- 2-inch OD Split Spoon, SPT (140-lb. hammer, 30" drop)
- 3.25-inch OD Split Spoon (300-lb hammer, 30" drop)
- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

MONITORING WELL

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

MOISTURE CONTENT

Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

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LOG KEY 09-118 LOG.GPJ PANGEO.GDT 11/12/13

Terms and Symbols for Boring and Test Pit Logs

Figure A-1

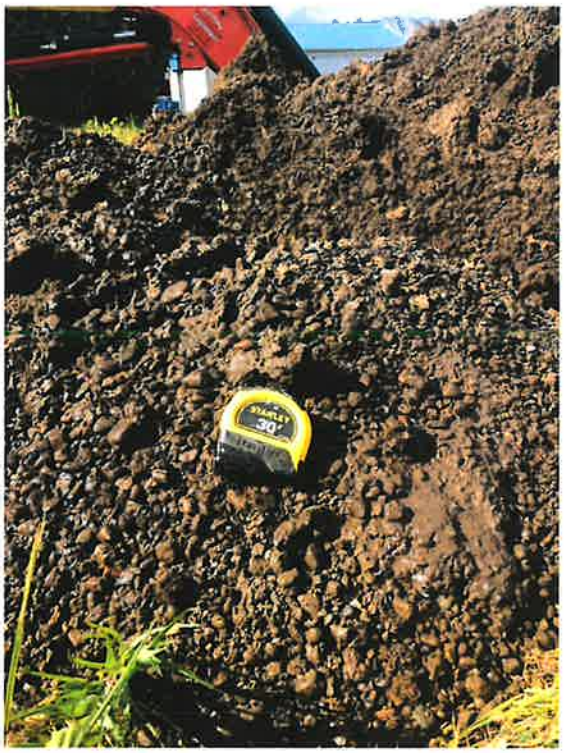
Test Pit No. TP-1

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,884 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.191636, -120.908276
Date: June 15, 2021

Depth (ft)	Soil Description
0 - 1	Medium dense, light brown, silty fine SAND, dry to moist. **[Fill]**
1 – 4¼	Medium stiff, brown to dark brown, slightly clayey SILT with sand, moist. **[Fine Alluvium]** • Contains fine roots • Increase in moisture with depth
4¼ - 5	Medium dense to dense, brown, poorly graded GRAVEL with sand, moist to wet. **[Coarse Alluvium]** • Groundwater encountered around 4½ feet below ground surface • Heavy caving below groundwater



Completed test pit.



Coarse alluvium test pit spoils.

Test Pit TP-1 terminated about 8 feet below grade.
Groundwater was encountered about 4½ feet below grade.

Test Pit No. TP-2

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,886 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.191694, -120.909312
Date: June 15, 2021

Depth (ft)	Soil Description
0 – 4	Medium stiff, brown to dark brown, slightly clayey SILT, moist. **[Fine Alluvium]** • Contains fine roots, trace sand • Increase in moisture with depth
4 – 7½	Medium dense to dense, brown, poorly graded GRAVEL with sand, moist. **[Coarse Alluvium]** • Contains cobbles, moderate caving • Groundwater encountered around 7 feet below ground surface • Heavy caving below groundwater



Completed test pit.



Test pit spoils.

Test Pit TP-2 terminated about 7½ feet below grade.
Groundwater was encountered about 7 feet below grade.

Test Pit No. TP-3

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,887 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.192286, -120.909420
Date: June 15, 2021

Depth (ft)	Soil Description
0 – 6	Medium stiff, brown to dark brown, slightly clayey SILT, moist. **[Fine Alluvium]** • Contains fine roots, trace sand • Increase in moisture with depth
6 – 8½	Medium dense to dense, brown, poorly graded GRAVEL with sand, moist. **[Coarse Alluvium]** • Contains cobbles, moderate caving • Groundwater encountered around 8 feet below ground surface • Heavy caving below groundwater



Test pit at 4 feet deep, fine alluvium.



Completed test pit.

Test Pit TP-3 terminated about 8½ feet below grade.
Groundwater was encountered about 8 feet below grade.

Test Pit No. TP-4

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,891 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.192955, -120.909308
Date: June 15, 2021

Depth (ft)	Soil Description
0 – 5	Medium stiff, brown to dark brown, slightly clayey SILT, moist. **[Fine Alluvium]** • Contains fine roots, trace sand, occasional gravel
5 – 7	Medium dense, brown, poorly graded GRAVEL with silt and sand, moist. **[Coarse Alluvium]** • Contains cobbles
7 – 10	Medium dense to dense, brown, poorly graded GRAVEL with sand, moist. **[Coarse Alluvium]** • Contains cobbles, slight caving • Becomes moist to wet around 9½ feet below ground surface, near groundwater table



Fine alluvium from about 5 feet deep.



Coarse alluvium from about 9 feet deep.

Test Pit TP-4 terminated about 10 feet below grade.
Groundwater was not encountered at the time of excavation.

Test Pit No. TP-5

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,887 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.192094, -120.907968
Date: June 15, 2021

Depth (ft)	Soil Description
0 – 5	Medium stiff, brown to dark brown, slightly clayey SILT, moist. **[Fine Alluvium]** • Contains fine roots, trace sand • Increase in moisture with depth
5 – 8	Medium dense to dense, brown, poorly graded GRAVEL with sand, moist. **[Coarse Alluvium]** • Contains cobbles • Groundwater encountered around 7½ feet below ground surface



Completed test pit.

Test Pit TP-5 terminated about 8 feet below grade.
Groundwater was encountered about 7½ feet below grade.

Test Pit No. TP-6

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,885 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.191926, -120.906817
Date: June 15, 2021

Depth (ft)	Soil Description
0 – 5	Medium stiff, brown to dark brown, slightly clayey SILT, moist. **[Fine Alluvium]** • Contains fine roots, trace sand, occasional gravel
5 – 7	Medium dense to dense, brown, poorly graded GRAVEL with sand, moist. **[Coarse Alluvium]** • Contains cobbles • Groundwater encountered around 6½ feet below ground surface



Completed test pit.

Test Pit TP-6 terminated about 7 feet below grade.
Groundwater was encountered about 6½ feet below grade.

Test Pit No. TP-7

Location: See Figure 2
Approximate Ground Surface Elevation: ~1,889 feet (estimated from Google Earth)
Approximate Coordinates (WGS84): 47.192955, -120.909308
Date: June 15, 2021

Depth (ft)	Soil Description
0 – 9	Medium stiff, brown to dark brown, slightly clayey SILT, moist. **[Fine Alluvium]** • Contains fine roots, trace sand • Increase in moisture around 6 feet below grade • Becomes mottled around 7 feet below grade, moist to wet fine sand seams



Mottled fine alluvium from about 7 feet deep.

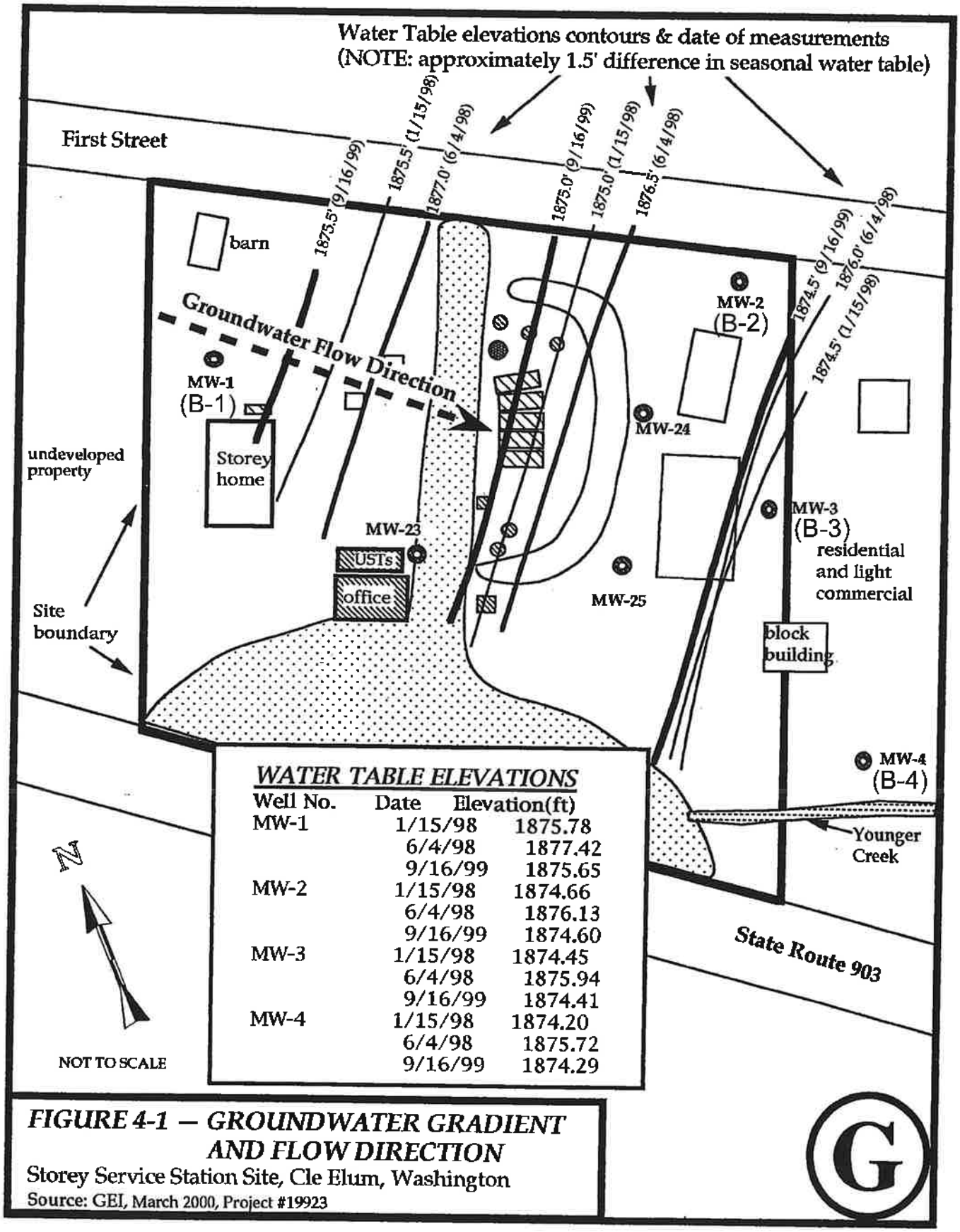


Completed test pit.

Test Pit TP-7 terminated about 9 feet below grade.
Groundwater was not encountered at the time of excavation.

APPENDIX B

PREVIOUS TEST BORING LOGS



WATER TABLE ELEVATIONS

Well No.	Date	Elevation(ft)
MW-1	1/15/98	1875.78
	6/4/98	1877.42
	9/16/99	1875.65
MW-2	1/15/98	1874.66
	6/4/98	1876.13
	9/16/99	1874.60
MW-3	1/15/98	1874.45
	6/4/98	1875.94
	9/16/99	1874.41
MW-4	1/15/98	1874.20
	6/4/98	1875.72
	9/16/99	1874.29

FIGURE 4-1 — GROUNDWATER GRADIENT AND FLOW DIRECTION

Storey Service Station Site, Cle Elum, Washington

Source: GEI, March 2000, Project #19923

PROJECT NO. GEI #19823

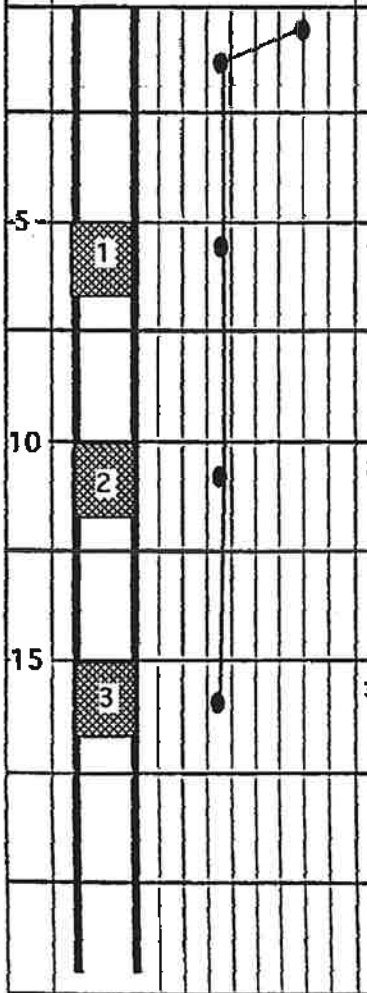
BORING LOG

SHEET 1 OF 4

PROJECT NAME: Storey
LOCATION: Cle Elum, WA
CLIENT NAME: Storey
SITE MANAGER: Gary Galloway
LOGGED BY: Gary Galloway

BORING NUMBER: B-1
BORING LOCATION: West Side
DRILLING CONTRACTOR: Holt Drilling
DRILLING METHOD: HSA
BIT SZ/HAMMER/WT/DROP: 6"/140#/30"
SAMPLE RETRIEVAL SYS: Split Spoon

DATE/TIME STARTED: 12/16/97
DATE/TIME COMPLETED: 10:35 Hrs
TOTAL DEPTH: 16'
SURFACE ELEVATION:
WATER DEPTH: 9'
CLOSURE METHOD: GW Well



DESCRIPTION

Lawn-covered surface

0'-2' Soil: brown, silty fine-grained sand, damp to moist, med dense, (SM)

2'-5' Qal: gray/brn, cobbly course-grained sand, dense, moist (SW)

5'-16' Same lithology

Sample Log

@5' Soil sample, no odor/no staining, moist, poor recovery (40%)

@10' Soil sample, no odor/no staining, wet, poor recovery (60%)

@15' Soil sample, no odor/no staining, wet, poor recovery (20%)

Legend - see back

FIELD BORING LOG

Signature Mary Galloway Date 12/16/97

PROJECT NO. GEI #19823

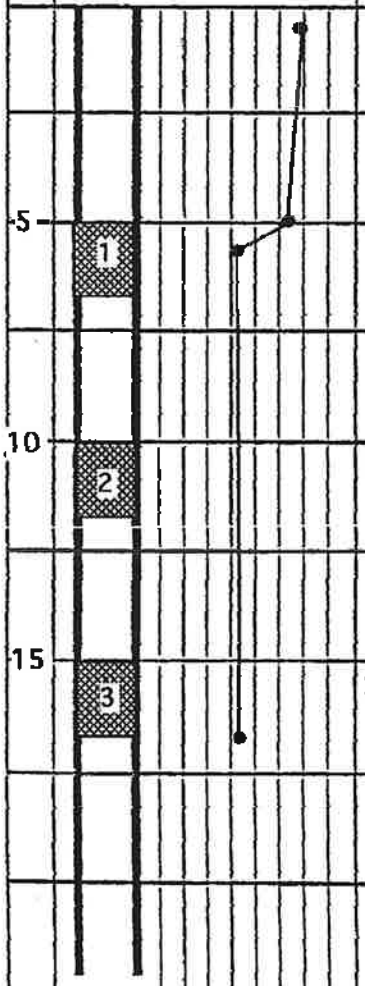
BORING LOG

SHEET 2 OF 4

PROJECT NAME: Storey
LOCATION: Cle Elum, WA
CLIENT NAME: Storey
SITE MANAGER: Gary Galloway
LOGGED BY: Gary Galloway

BORING NUMBER: B-2
BORING LOCATION: NE Side
DRILLING CONTRACTOR: Holt Drilling
DRILLING METHOD: HSA
BIT SZ/HAMMER/WT/DROP: 6"/140#/30"
SAMPLE RETRIEVAL SYS: Split Spoon

DATE/TIME STARTED: 12/16/97
DATE/TIME COMPLETED: 12:45 Hrs
TOTAL DEPTH: 16'
SURFACE ELEVATION:
WATER DEPTH: 9'
CLOSURE METHOD: GW Well



Sample #	Blows / 6"	OVA (ppm)	CGI (% LEL)	Odor	Color	Moisture	Porosity (%)	USCS Symbols
								SM
1	36 43 50	0.0						SW
2	32 22 20	12.1						
3	50/ 5"	23	1					

DESCRIPTION

0'-6" Soil: brown, organic-rich, silty sand, damp, med dense, (SM)

6"-5' Qal: lt. brn, silty fine-grained sand, med. dense, dry to damp (SM)

5'-16' Qal: brn., cobbly course-grained sand, med. dense to dense, wet (water @ 9')

Sample Log

@5' Soil sample, no odor/no staining, moist, poor recovery (70%)

@10' Soil sample, no odor/no staining, wet, poor recovery (30%)

@15' Soil sample, no odor/no staining, wet, poor recovery (40%)

Legend - see back

FIELD BORING LOG

Signature _____ Date 12/16/97

PROJECT NO. GEI #19823

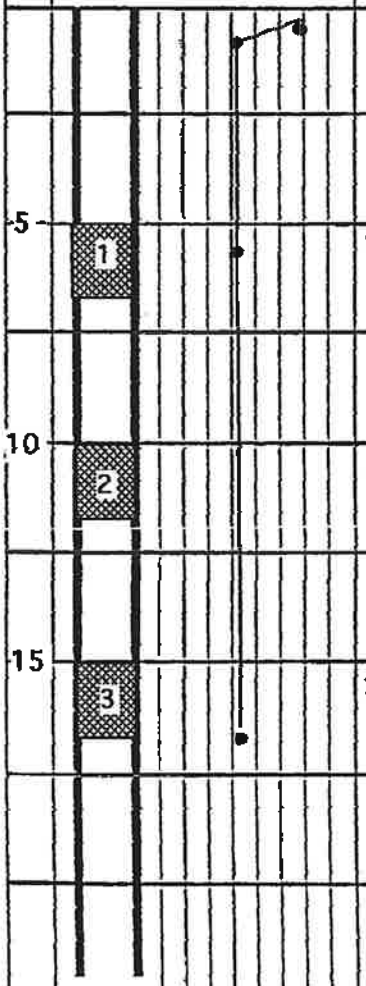
BORING LOG

SHEET 3 OF 4

PROJECT NAME: Storey
LOCATION: Cle Elum, WA
CLIENT NAME: Storey
SITE MANAGER: Gary Galloway
LOGGED BY: Gary Galloway

BORING NUMBER: B-3
BORING LOCATION: Center East Side
DRILLING CONTRACTOR: Holt Drilling
DRILLING METHOD: HSA
BIT SZ/HAMMER/WT/DROP: 6"/140#/30"
SAMPLE RETRIEVAL SYS: Split Spoon

DATE/TIME STARTED: 12/16/97
DATE/TIME COMPLETED: 15:05 Hrs
TOTAL DEPTH: 16'
SURFACE ELEVATION:
WATER DEPTH: 9'
CLOSURE METHOD: GW Well



Sample #	Blows / 6"	OVA (ppm)	CGI (% LEL)	Odor	Color	Moisture	Porosity (%)	USCS Symbols
								SM
1	39 26 38	6.1						SW
2	50 /3"	23.4						
3	36 50/ 4"	22	3					

DESCRIPTION

0'-6" Soil: brown, organic-rich, silty sand, med dense, damp (SM)

6"-16' Qal: gray/brn., cobbly course-grained sand, dense, moist (SW)

Sample Log

@5' Soil sample, no odor/no staining, moist, poor recovery (70%)

@10' Soil sample, no odor/no staining, wet, poor recovery (30%)

@15' Soil sample, no odor/no staining, wet, poor recovery (40%)

Legend - see back

FIELD BORING LOG

Signature _____ Date 12/16/97

B-04

PROJECT NO. GEI #19823

BORING LOG

SHEET 4 OF 4

PROJECT NAME: Storey
LOCATION: Cle Elum, WA
CLIENT NAME: Storey
SITE MANAGER: Gary Galloway
LOGGED BY: Gary Galloway

BORING NUMBER: B-4
BORING LOCATION: South East Side
DRILLING CONTRACTOR: Holt Drilling
DRILLING METHOD: HSA
BIT SZ/HAMMER/WT/DROP: 6"/140#/30"
SAMPLE RETRIEVAL SYS: Split Spoon

DATE/TIME STARTED: 12/17/97
DATE/TIME COMPLETED: 08:00 Hrs
TOTAL DEPTH: 14'
SURFACE ELEVATION:
WATER DEPTH: 9.5'
CLOSURE METHOD: GW Well

DEPTH (Feet)	GRAPHIC LOG	Sample #	Blows / 6"	OVA (ppm)	OGI (% LEL)	Odor	Color	Moisture	Porosity (%)	USCS Symbols
	Boulders, Cobbles, Pebbles, Gravel, Crs. Sand, Med. Sand, Fine Sand, Silt, Clay									
										SM
-5	1	1	44 50 /3 "	20.2						SW
10	2	2	50 /5"	21.4						
15	3	3	50/ 5"	20.8						

DESCRIPTION

0'-8" Soil: brown, silty sand, loose to med dense, damp (SM)

8"-16"Soil, lt. brn., silty sand, loose to med. dense, wet (SM)

16"-14' Qal: lt. brn./brn., cobbly medium-grained sand, dense, moist (SW)

HSA ring broke @ 14' Stop

Sample Log

@5' Soil sample, no odor/no staining, moist, poor recovery (5%)

@10' Soil sample, no odor/no staining, wet, poor recovery (60%)

@15' Soil sample, no odor/no staining, wet, poor recovery (40%)

Legend - see back

FIELD BORING LOG

Signature _____ Date 12/17/97

B-04