GEOTECHNICAL ENGINEERING REPORT

City of Ellensburg
Craig Hill Pump Station Improvements
Ellensburg, Washington

Prepared for: HLA Engineering and Land Surveying, Inc.

Project No. 220488 • June 5, 2023

earth + water

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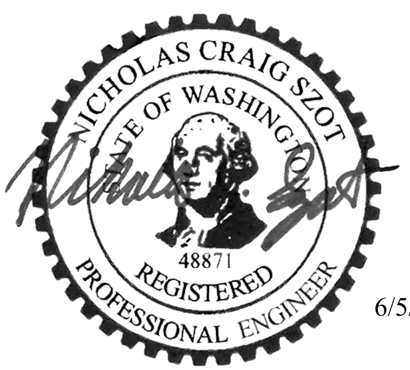

6/5/2023

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1 Introduction and Project Understanding

Aspect Consulting, LLC (Aspect), completed a geotechnical engineering study and this report to support design and construction of the City of Ellensburg Craig Hill Pump Station Improvements (Project). The Project Site is located to the northwest of the intersection of Craig Avenue and North Alder Street in Ellensburg, Washington (Site; Figure 1 and 2).

We understand the Project includes a new 1,500-gallon-per-minute pump station contained within a 1,000 square-foot (approximate) grade-supported building with utilities, concrete block retaining wall around the part of the building to facilitate grade transition, and an asphalt pavement access road and parking area.

The following report sections provide detailed descriptions of relevant Site conditions and features, the results of our subsurface investigation program, and geotechnical engineering design and construction recommendations for the Project improvements referenced above.

2 Site Conditions

Summaries of relevant Site history and surface and subsurface conditions are provided in the sections below. The summaries were developed by completing a review of relevant maps, historical aerial photographs, topographic survey, and observations made during a Site reconnaissance and test pit explorations.

2.1 Surface Conditions and Topography

The Site vicinity is currently developed with a 100-foot-diameter water storage reservoir, six small telecommunication buildings, fencing, gravel walkways, short retaining walls, and utilities. The Site is vegetated with multiple mature deciduous and coniferous trees, brush, and lawn.

The Site is located at a topographic highpoint locally known as Craig Hill. The Site topography is shown on Figure 2. The Site is bounded to the east by residential parcels, to the south by Craig Avenue, and to the north and west by the Kittitas County Fairgrounds.

2.2 Subsurface Conditions

2.2.1 Geology

The surficial geology of most of the Site is mapped as Ellensburg Formation (Mc(e)) reported to consist of gravel, sand, silt, and clay. West of the Site, the mapped geology consists oldest alluvium (QRcg) or Thorp gravel (Ttm) reported to consist of coarse sand and gravel (Bentley and Campbell, 1983; Sadowski et al., 2020). Fill is not mapped at the Site, but is likely present from the existing development on the Site.

2.2.2 Test Pits

On January 30, 2023, we completed a subsurface exploration program that consisted of three test pits designated ATP-01 through ATP-03 at the locations shown on Figure 2.

The test pits were excavated and logged to depths ranging from 8 to 12 feet below ground surface (bgs) and terminated at the discretion of the Aspect field representative, based on exploration objectives or limits of excavator reach. Soil samples were collected at the discretion of the Aspect field representative for further evaluation and geotechnical laboratory testing.

Exploration procedures and additional details are presented in Appendix A. Descriptions of the soils encountered in the explorations, as well as the depths where characteristics of the soils changed[1] are indicated on the subsurface exploration logs presented in Appendix A. Definitions of the terminology and symbols used on the logs are shown on the Exploration Logs Key in Appendix A.

[1] The stratigraphic contacts shown on the summary log represents the approximate boundaries between soil types; actual transitions may be more gradual. The subsurface conditions depicted are only for the specific date and location reported, and therefore, are not necessarily representative of other locations and times.

2.2.3 Geotechnical Laboratory Testing

Laboratory tests were conducted on selected soil samples to characterize engineering properties. Laboratory testing was performed by Hayre McElroy & Associates (HMA) under subcontract to Aspect and included determination of grain-size distribution (ASTM International [ASTM] ASTM D6913).

Laboratory test results (as reported by HMA) are presented in Appendix B and reflected on the exploration logs in Appendix A.

2.2.4 Generalized Stratigraphy

Our interpretations of the Site stratigraphy are based on the review of geologic maps, Site reconnaissance, and test pit observations.

In general, the Site stratigraphy generally agrees with the published geologic mapping of Ellensburg Formation mapped in the area, and our expectation of encountering fill.

We interpret the main soil/material units at the Site consist of:

Topsoil

We observed topsoil in ATP-01 and ATP-02 to a depth of approximately 0.5 feet bgs and consists of silty sand (SM)2; loose, moist, brown to dark brown; few organics, roots, sticks, and woody debris.

Fill

We observed gravel road surfacing fill in ATP-03 only to a depth of approximately 0.3 feet bgs that consists of gravel with sand (GP); medium dense, slightly moist, gray.

Fill was observed below the topsoil or road surfacing fill layer in all test pits to depths of 2 to 3 feet bgs. The fill generally consists of silty sand with varying gravel content (SM), or silty gravel with sand and cobbles (GM); loose to dense, moist, brown to dark brown; trace organics, roots, and sticks.

Ellensburg Formation

We observed Ellensburg Formation beneath the fill in all test pits starting at 2 to 3 feet bgs. The Ellensburg Formation extended to the total depths explored of 8 to 12 feet bgs and generally consisted of a 2 to 3-foot-thick layer of silty sand (SM); loose to medium dense, slightly moist to moist, brown; underlain with a layer of sand with silt (SP-SM); medium dense; slightly moist, light brown to light gray; weak cementation.

2.2.5 Groundwater

Static groundwater level was not observed in the test pits. Based on logs of nearby water wells and Site elevation relative to those of the nearby water wells, we expect the static groundwater level is at least 100 feet bgs (Ecology, 2023).

Groundwater conditions at the Site will vary with fluctuations in precipitation, Site usage (such as irrigation), and off-Site land use, as well as throughout the year, increasing in the wet winter and early spring months.

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[2] Soil Classification per the United Soil Classification System (USCS). Refer to ASTM International (ASTM) ASTM D2488.

3 Seismic Hazards

3.1 Surface Fault Rupture

The nearest fault is mapped about 1.4 miles north of the Site (Lidke and Haller, 2016). In our opinion, the relative risk of fault rupture at the surface of the Site is none to very low and is not a design consideration warranting additional exploration or analysis.

3.2 Ground Response

Seismic design parameters for use by the structural engineer to calculate seismic loads on the structure are provided in Table 1, below. These parameters are in accordance with the 2018 International Building Code (IBC; ICC, 2017), which references the American Society of Civil Engineers (ASCE) Standard ASCE/SEI 7-16, *Minimum Design Loads for Buildings and Other Structures* (ASCE, 2016) for seismic design.

Based on the results of our subsurface exploration program/review and geologic understanding of the area, we recommend the Site be characterized by a Seismic Site Class D. The IBC seismic design parameters are shown below in Table 1.

Table 1. Seismic Design Parameters

Parameter	Recommended Value
Site Class	D – “Stiff Soil”
Peak Ground Acceleration, PGA_M (g)	0.303
Short Period Spectral Acceleration, S_s (g)	0.499
1-Second Period Spectral Acceleration, S_1 (g)	0.204
Site Coefficient (F_a)	1.401
Site Coefficient (F_v)	2.192
Design Short Period Spectral Acceleration, S_{DS} (g)	0.466
Design 1-Second Period Spectral Acceleration, S_{D1} (g)	0.298

Note: Parameters based on the latitude and longitude of the Site: 46. 999031°N, 120.529823°W

3.3 Liquefaction

Liquefaction occurs when loose, saturated, and relatively cohesionless soil deposits located below the static groundwater level temporarily lose strength as a result of earthquake shaking. The primary factors controlling the onset of liquefaction include intensity and duration of strong ground motion, characteristics of subsurface soil, *in situ* stress conditions, and the depth to groundwater. The Washington State Department of Natural Resources (DNR) liquefaction susceptibility rating for the Site is mapped as “very low to low” (DNR, 2023). Based on the depth to static groundwater, composition of the Ellensburg Formation, and relatively low seismicity, we conclude the risk of liquefaction at the Site is none to very low and not a relevant design consideration warranting additional exploration or analysis.

4 Geotechnical Considerations and Recommendations

Based on our evaluations, we conclude the Project is feasible from a geotechnical perspective, provided the recommendations in this report are properly incorporated into design and construction. In summary, the major geotechnical recommendations and considerations for Project design and construction include:

- The proposed new pump station structure can be supported on conventional shallow foundations (strip footings) and slab-on-grade bearing on a crushed surfacing base course [CSBC] leveling pad or capillary break layer, respectively, placed directly onto firm, native Ellensburg Formation, or structural fill compacted directly over Ellensburg Formation.
- Concrete block retaining walls up to about 5 feet tall (retained height) around the building can be used to facilitate grade transition.
- Earthwork for the building and utility excavations can generally be completed with conventional earthwork equipment, such as backhoes, excavators, and dozers. Some of the on-Site soil can be repurposed as structural fill.

Detailed geotechnical design and construction recommendations are presented in the following sections.

4.1 Foundation and Slab Design

4.1.1 Shallow Foundations

The proposed pump station building can be supported on shallow foundations bearing on a fill leveling pad of least 6 inches of compacted CSBC, consisting of Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9(3) for Crushed Surfacing Base Course (WSDOT, 2023) overlying relatively undisturbed Ellensburg Formation, or compacted structural fill.

Prior to placement of the CSBC or any structural fill, the existing topsoil and fill should be removed to expose Ellensburg Formation material. Any soft, muddy, pumping, or organic-rich subgrade soil (such as the topsoil) should be removed and replaced with structural fill.

The CSBC leveling pad, and any structural fill placed below the footings should be placed and compacted to at least 95 percent of the maximum dry density (MDD) of the material (refer to Section 4.4) and extend at least 6 inches beyond the proposed edges of the foundations.

Footings bearing on the sequence of materials described above can be designed using a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). Maximum allowable bearing pressure may be increased by up to one-third for short-term transient loading conditions, such as wind and seismic loading.

We estimate foundations designed using this allowable bearing pressure and the subgrade preparation methods described above will experience total compression settlements of less than 1 inch. Differential settlement between adjacent foundation elements, and/or over a distance of about 50 feet along continuous strip footings, may be estimated to be up to half of the total settlement (up to 0.5 inches).

Footings should bear a minimum of 24 inches below adjacent exterior grade for frost protection and bearing capacity considerations. Continuous strip footings should have a minimum width of 2 feet.

We recommend all foundation subgrade preparation be evaluated by Aspect prior to placement of the CSBC leveling pad and/or structural fill. We recommend the CSBC leveling pad be evaluated by Aspect just before placement of foundation reinforcement bars. CSBC, structural fill, and concrete foundations should not be constructed atop frozen subgrades.

Foundation subgrade excavations that are left open during wet weather run a high risk of becoming wet, muddy, and otherwise not compactable to a firm condition. We recommend staging foundation subgrade excavation and covering with CSBC to limit the time the foundation subgrade is exposed to weather. Once the properly prepared native subgrade is covered with CSBC, it will be much less susceptible to wet weather disturbance.

4.1.2 Lateral Resistance

Lateral forces can be resisted by passive resistance against the side of the foundations and frictional resistance along the base of the foundations.

The ultimate passive equivalent fluid density can be taken as 450 pounds per cubic foot (pcf) for foundations that are constructed using neat-cut excavations and bearing against Site soils or compacted structural fill. We recommend including a factor of safety equal to 1.5 to calculate allowable passive resistance (i.e., 300 pcf allowable). The upper 1 foot of passive resistance should be neglected for design unless it is protected by pavement or slab-on-grade.

Foundations poured on CSBC and subgrade soils described above can be designed with an ultimate coefficient of friction equal to 0.60. A factor of safety equal to 1.5 should be applied to this ultimate value (allowable coefficient of friction of 0.4).

4.1.3 Slab-On-Grade Support

Slab-on-grade subgrade preparation should be completed in the same fashion as the shallow foundations described above in Section 4.1.1, with some modifications. For interior building slabs-on-grade, we recommend the uppermost 6 inches of the subgrade consist of compacted capillary break material (instead of CSBC) to provide uniform support and moisture control. The capillary break material should consist of free-draining, clean, fine gravel and coarse sand with a maximum particle size of 1 inch and less than 3 percent material passing the U.S. No. 200 sieve by weight (fines) generally meeting requirements of Standard Specification 9-03.12(3) Gravel Backfill for Drains (WSDOT, 2023), except up to 30 percent passing No. 4 sieve (sand) is allowed. Angular material manufactured by crushing is preferred over rounded material, such as bank run sand and gravel, to provide a subgrade surface that is not easily disturbed by workers laying steel rebar and concrete formwork. The capillary break material should be compacted to relatively firm and unyielding condition and evaluated by Aspect prior to placement of steel rebar and formwork.

For building areas where vapor intrusion mitigation would be detrimental to the interior finished space (such as air-conditioned office areas that may be covered with flooring), consideration should be given to placement of a vapor barrier over the capillary break. Detailed design and performance issues with respect to vapor intrusion and moisture control, as it relates to the interior environment of the structure, are beyond the expertise of Aspect. A building envelope specialist or contractor should be consulted to address these issues, as needed.

Exterior building slabs, such as those for parking or equipment laydown/storage, can be constructed over 6 inches of CSBC (same as shallow foundations).

For slabs-on-grade designed as a beam on elastic subgrade, we recommend using an initial vertical modulus (K_{v1}) of 150 pounds per cubic inch (pci), if bearing on the sequence of subgrade materials described in Section 4.1.1. The K_{v1} value is appropriate for a 1-foot by 1-foot slab and needs to be adjusted based on the actual width (B) of the slab to a design vertical modulus (K_s), using the following equation:

$$K_s = K_{v1}(B+1)^2/(4B^2),$$

where B = slab width (in feet).

4.2 Utilities

Utility trench subgrade may consist of on-Site materials provided the subgrade is relatively firm. Subgrade that is observed to be soft, pumping, or contain abundant organics should be subexcavated to firm subgrade soil or a maximum depth of about 1 foot. Subexcavated areas should be backfilled with a stabilizing layer of quarry spalls capped with at least a choker-course layer of CSBC.

Bedding materials should only be placed over the firm subgrade that is free of standing water and loose, disturbed, or muddy soil. Material placed directly below (bedding), around, and above (cover) the utility should consist of Gravel Backfill for Pipe Zone Bedding as described in Section 9.03.12(3) of the WSDOT Standard Specifications (WSDOT, 2023), and can include pea gravel. The pipe bedding materials should be placed and compacted (or aggressively vibrated if pea gravel) to a relatively firm condition in accordance with the pipe manufacturer's specifications. Bedding and cover should be at least 6 inches thick.

4.3 Access Road Pavement Section

We understand the proposed improvements include a paved access road and parking area. We recommend that any access road used by pickup trucks or smaller vehicles consist of at least 2.5 inches of hot mix asphalt (HMA) overlying 6 inches of CSBC. Access roads used by relatively heavier delivery/cargo trucks should consist of at least 3.0 inches of HMA overlying 8 inches of CSBC.

Pavement subgrade should be free of deleterious material, including abundant organics or garbage. Asphalt pavement subgrade should be compacted to a relatively firm and unyielding condition and evaluated by proof rolling with a loaded dump truck or front-end loader prior to placement of the pavement section. Any soft or yielding areas identified during proof-rolling should be removed and replaced with compacted structural fill material described in Section 4.4.

4.4 Gravity Block Retaining Walls

We recommend using the soil parameters presented in Table 2 and geotechnical recommendations presented below for gravity concrete block wall design and construction for gravity block walls (up to 5 feet retained height) supporting native soils and placed/compacted structural fill.

Table 2. Soil Parameters for Design of Gravity Block Walls

Soil Unit	Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)
Retained Soil	125	34	0
Foundation Soil	125	34	0

Notes:
pcf = pounds per cubic foot; psf = pounds per square foot; and deg = degrees.

- Minimum embedment of 12 inches at wall face.
- A 6-inch-thick leveling pad of CSBC directly overlying properly prepared subgrade consisting of native soils and /or structural fill (see Section 4.1.1 above).
- Retained soil consists of 1) compacted structural fill meeting the requirements for Common Borrow Standard Specification 9-03.14(3) used to backfill the construction temporary excavation behind the wall, or 2) native (cut) soils.
- Active and passive earth pressure conditions (triangular distribution), and sliding coefficient, based on flexible/yielding wall conditions and soil parameters shown in Table 2.
- Passive earth pressure resistance ignored within 1 foot of final grade in front of the wall, unless covered by pavement or concrete slab.
- A 4-inch diameter, perforated drain pipe surrounded by 4 inches of Gravel Backfill for Drains Standard Specifications 9-03.12(4) and Geotextile for Underground Drainage, Moderate Survivability Class A Standard Specification 9-33.1 (on all sides) at the wall base. The drain pipe should be discharged to a suitable location to prevent the development of saturated soil conditions and buildup of hydrostatic pressures.
- A washed rock drain curtain at back of wall at least 12-inches-thick extending up from the drain pipe upward to within about 1 foot of the ground surface. The washed rock material should meet the requirements of Gravel Backfill for Walls Standard Specification 9-03.12(2).
- Minimum base block widths of 2.5 feet.
- Seismic lateral earth pressure equal to 5.5H (psf, rectangular distribution), where H is the exposed height of the wall in feet, calculated based on a horizontal seismic coefficient (k_h) of 0.15g equal to one-half of the Site-adjusted peak

ground acceleration (Table 1). Need only apply to wall sections taller than 4 feet (retained height).

We expect fill materials used to construct block wall, and underlying subgrade soils, will behave elastically when loaded and are not prone to settle long-term. We estimate that the block wall settlement will occur rapidly and incrementally as fill is placed and compacted and the wall is built up. We estimate differential settlement along the length and width of the block wall will be relatively minor and gradual, and not detrimental to landscaping above the wall or wall performance.

4.5 Earthwork Considerations

4.5.1 General Earthwork Considerations

Based on the explorations performed on-Site, it is our opinion that conventional equipment can be used for Site excavation and grading.

We expect that the native Ellensburg formation on the Site could be reused as structural fill beneath slab-on-grade and around footings, if screened to remove particles larger than about 4 inches. Observed existing fill are not recommended for reuse as structural fill.

In general, soil containing more than about 5 percent fines cannot be consistently compacted to a dense and firm condition when the water content is greater than about 3 to 5 percent above or below optimum moisture content. The results of laboratory analyses (grain size) indicate that the existing fill and Ellensburg Formation soils, which may be considered as structural fill, have a fines content that is great enough to make it moisture-sensitive when wet, but if properly moisture conditioned, should be acceptable to use. This material may be difficult to compact if left exposed to wet weather. Drying excessively wet soil will be easier to accomplish in the dry summer months.

Based on our experience, allowing Site soils to become excessively moist or wet and subsequently soft and muddy is a common and avoidable earthwork problem that results in delays and unplanned overexcavation and replacement quantities. Staging of excavation, fill placement and compaction, and covering materials stockpiles is strongly advised to minimize exposure to wet weather.

Additional structural fill recommendations and considerations are provided below.

4.5.2 Structural Fill

Soils placed beneath or around foundations, slabs-on-grade, or below paved areas should be considered structural fill. In these fill areas, we recommend the following:

- All structural fill material to be reviewed by Aspect prior to use.
- All structural fill CSBC beneath foundations and capillary break material placed beneath slabs should meet the recommendations presented in Section 4.1.
- Structural fill beneath foundations should consist of CSBC.
- Structural fill beneath slabs-on-grade and capillary break, around foundations, or below pavement sections may consist of CSBC or on-Site materials generally meeting the requirements of WSDOT Standard Specification 9-03.14 (3) for Common Borrow (WSDOT, 2023). The on-Site Ellensburg Formation soils

generally meet the criteria for Common Borrow, if screened to remove particles larger than about 4 inches (Aspect modification to the WSDOT specification).

- Structural fill should be compacted to a relatively firm and unyielding condition to a minimum density of 95 percent of the MDD using the Modified Proctor method (ASTM D1557).
- Structural fill should be placed with a loose thickness no greater than 8 to 10 inches when using relatively large compaction equipment, such as a vibrating plate attached to an excavator (hoe pack) or drum roller. If small, hand-operated compaction equipment is used to compact structural fill, fill lifts should not exceed 6 inches in loose thickness.

4.5.3 Temporary Excavations and Dewatering

Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. All temporary cuts in excess of 4 feet in height that are not protected by trench boxes or otherwise shored should be sloped in accordance with Part N of Washington Administrative Code (WAC) 296-155 (WAC, 2019).

In general, soils across the Site classify as Occupational Safety and Health Administration (OSHA) Soil Classification Type C. Temporary excavation side slopes are anticipated to stand as steep as 1.5H:1V (Horizontal:Vertical). The cut-slope inclinations estimated above are for planning purposes only and should be evaluated in the field by a geotechnical engineer.

The contractor should monitor the stability of the temporary cut slopes and adjust the construction schedule and slope inclination accordingly. Vibrations created by traffic and construction equipment may cause caving and raveling of the trench walls. In such an event, lateral support for the trench walls should be provided by the contractor to prevent loss of ground support.

To avoid damage to nearby building foundations or retaining walls, we recommend temporary excavation be offset a lateral distance of at least 3 feet from the closest edge of the neighboring structures and foundations, and sloped flatter than 1.5H:1V. The location of nearby structures and foundations should be carefully surveyed during design to better understand grading constraints as they relate to these recommendations.

Perched groundwater is expected to be encountered in some locations during foundation and utility excavation. It shall be the contractor's responsibility to adequately dewater the excavation to work and construct foundations, slab, and utilities in relatively dry conditions.

4.5.4 Temporary Erosion Control

To prevent Site erosion during construction, appropriate temporary erosion and sedimentation control (TESC) measures should be used in accordance with the recommendations above and the local best management practices (BMPs). Specific TESC measures may include appropriately placed silt fencing, straw wattles, rock check dams, and plastic covering of exposed slope cuts and soil stockpiles. Outside of the proposed construction areas, the existing vegetation should be retained.

Permanent erosion control within the areas of construction should be achieved through pavement surfacing or vegetation reestablishment.

5 Recommendations for Continuing Geotechnical Services

Throughout this report, we have provided recommendations where we consider it would be appropriate for Aspect to provide additional geotechnical input to the design and construction process. Additional recommendations are summarized in this section.

5.1 Additional Design and Consultation Services

Before construction begins, we recommend that Aspect:

- Continue to meet with the design team, as needed, to address geotechnical questions that may arise throughout the remainder of the design process.
- Review the geotechnical elements of the Project plans to see that the geotechnical engineering recommendations are properly interpreted.
- Provide environmental engineering consultation and/or study, as needed/requested.

5.2 Additional Construction Services

We are available to provide geotechnical engineering and monitoring services during construction. The integrity of the geotechnical elements depends on proper Site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent.

During the construction phase of the Project, we recommend that Aspect be retained to perform the following tasks:

- Review applicable submittals
- Observe and evaluate subgrade and structural fill placement for all footings and slabs-on-grade
- Attend meetings, as needed
- Address other geotechnical engineering considerations that may arise during construction

The purpose of our observations is to verify compliance with design concepts and recommendations, and to allow design changes or evaluation of appropriate construction methods in the event that subsurface conditions differ from those anticipated prior to the start of construction.

6 References

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7 Limitations

Work for this project was performed for HLA Engineering and Land Surveying, Inc. (Client), and this report was prepared consistent with recognized standards of professionals in the same locality and involving similar conditions, at the time the work was performed. No other warranty, expressed or implied, is made by Aspect Consulting, LLC (Aspect).

Recommendations presented herein are based on our interpretation of site conditions, geotechnical engineering calculations, and judgment in accordance with our mutually agreed-upon scope of work. Our recommendations are unique and specific to the project, site, and Client. Application of this report for any purpose other than the project should be done only after consultation with Aspect.

Variations may exist between the soil and groundwater conditions reported and those actually underlying the site. The nature and extent of such soil variations may change over time and may not be evident before construction begins. If any soil conditions are encountered at the site that are different from those described in this report, Aspect should be notified immediately to review the applicability of our recommendations.

Risks are inherent with any site involving slopes and no recommendations, geologic analysis, or engineering design can assure slope stability. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the Client.

It is the Client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, and agents, are made aware of this report in its entirety. At the time of this report, design plans and construction methods have not been finalized, and the recommendations presented herein are based on preliminary project information. If project developments result in changes from the preliminary project information, Aspect should be contacted to determine if our recommendations contained in this report should be revised and/or expanded upon.

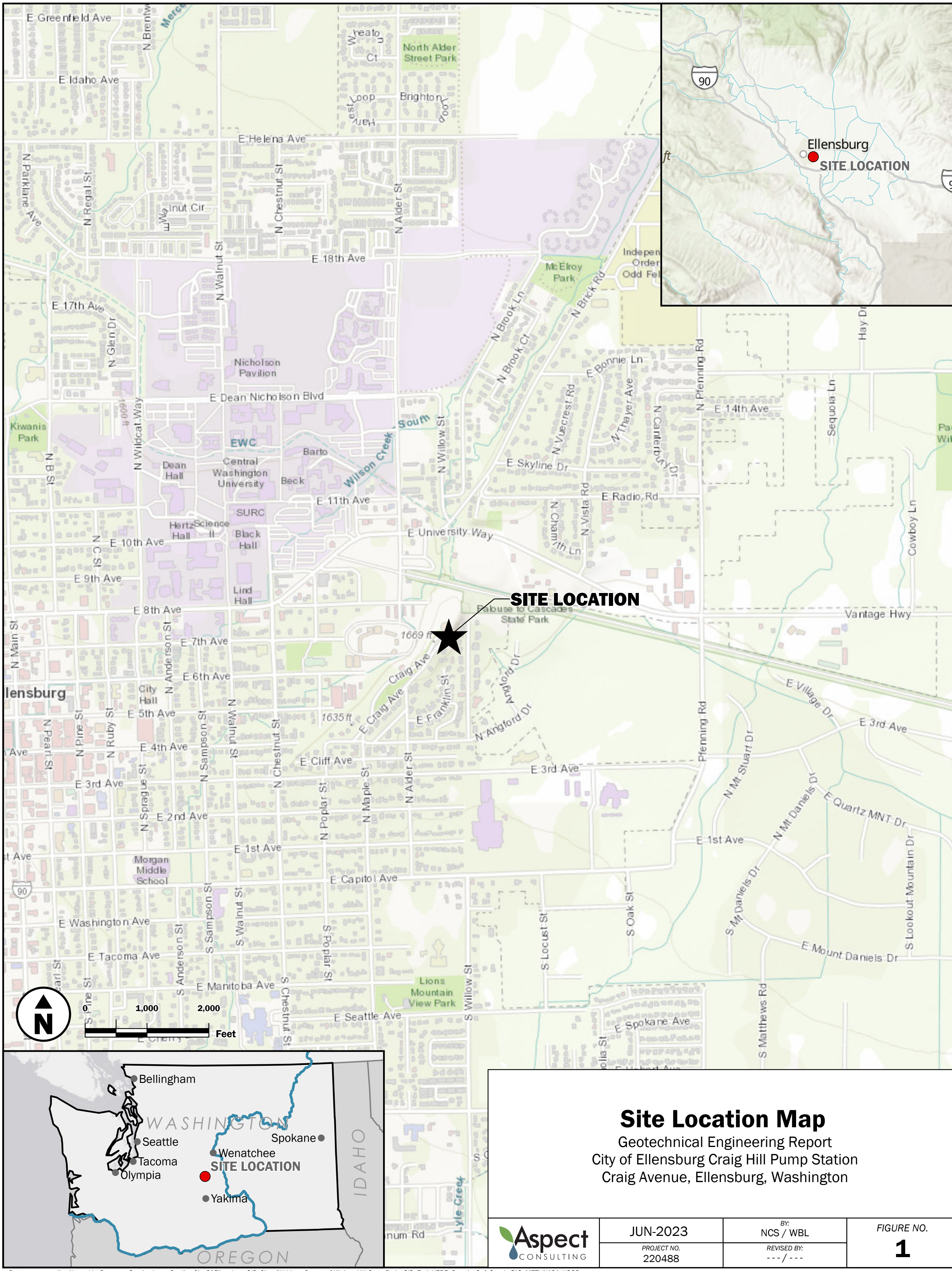
The scope of work does not include services related to construction safety precautions. Site safety is typically the responsibility of the contractor, and our recommendations are not intended to direct the contractor’s site safety methods, techniques, sequences, or procedures. The scope of our work also does not include the assessment of environmental characteristics, particularly those involving potentially hazardous substances in soil or groundwater.

All reports prepared by Aspect for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect. Aspect’s original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Please refer to Appendix C titled “Report Limitations and Guidelines for Use” for additional information governing the use of this report.

We appreciate the opportunity to perform these services. If you have any questions, please call Nick Szot, PE, Associate Geotechnical Engineering at 509.888.7218

FIGURES



Site Location Map

Geotechnical Engineering Report
City of Ellensburg Craig Hill Pump Station
Craig Avenue, Ellensburg, Washington

Aspect CONSULTING	JUN-2023	BY: NCS / WBL	FIGURE NO.
	PROJECT NO. 220488	REVISED BY: --- / ---	1

Data source credits: None || Basemap Service Layer Credits: City Of Ellensburg GIS, City of Yakima, County of Kittitas, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, Esri, HERE, Garmin, USGS, EPA, City Of Ellensburg GIS, City of Yakima, County of Kittitas, Bureau of Land Management, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA, Esri, USGS

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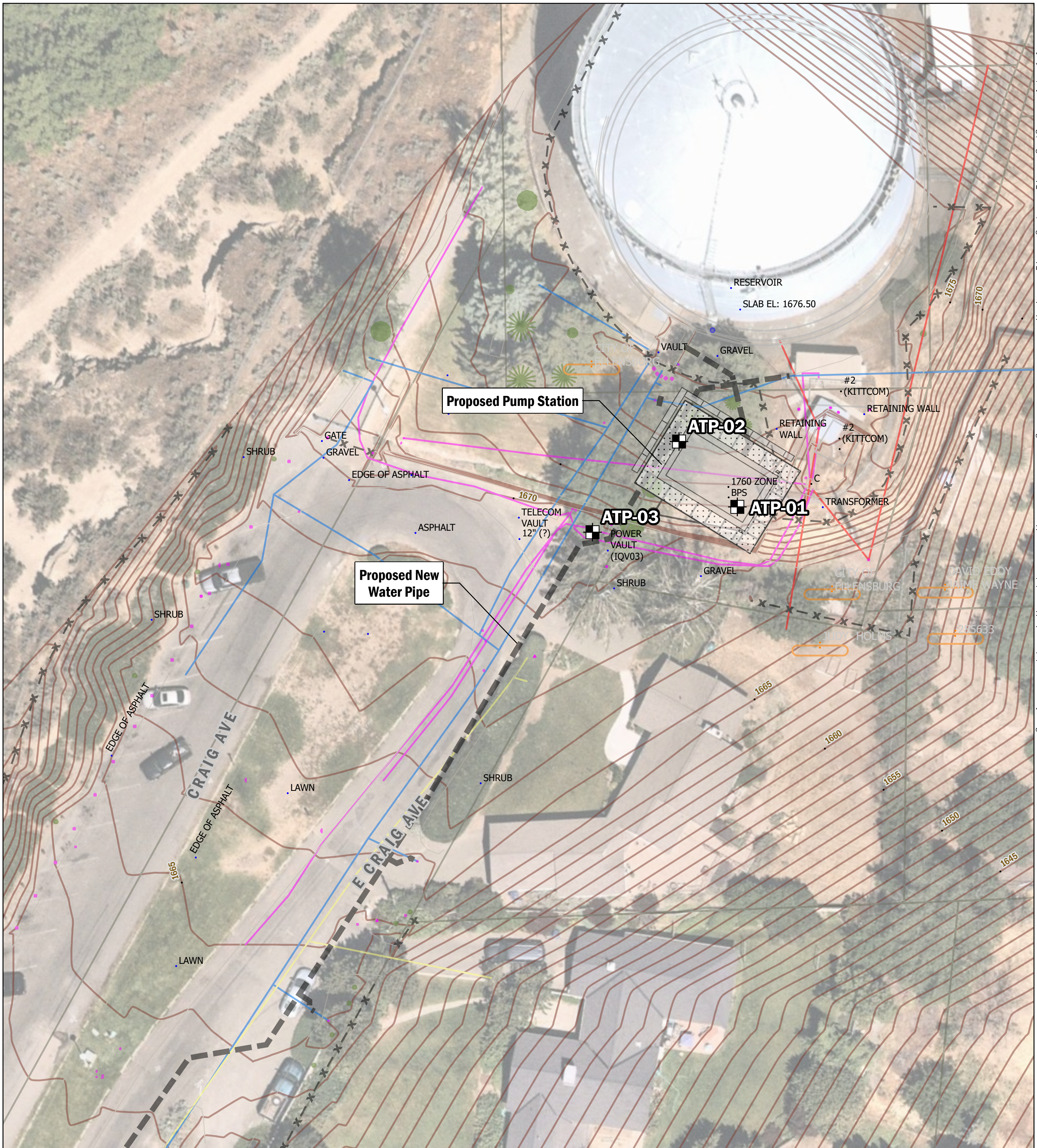

Test Pit

N

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Feet

Site Exploration Map

Geotechnical Engineering Report
City of Ellensburg Craig Hill Booster Pump Station
Craig Avenue, Ellensburg, Washington

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JUN-2023	BY: NCS / WBL	FIGURE NO.
PROJECT NO. 220488	REVISED BY: - - - / - - -	2

Data source credits: None || Basemap Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

ArcGIS Pro: G:\projects\CityOfEllensburg\CraigsHillPump_220488\CraigsHillPump_220488.aprx || NAD 1983 2011 StatePlane Washington South FIPS 4602 Ft US || Date Saved: 3/8/2023 || Exported 3/8/2023 16:18 by wlongmire

APPENDIX A

Subsurface Exploration Logs

Major Division	Subdivision	Fines	Symbol	Group Name
Coarse-Grained Soils - More than 50%1 Retained on No. 200 Sieve	Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines	GW	Well-graded GRAVEL Well-graded GRAVEL WITH SAND
			GP	Poorly-graded GRAVEL Poorly-graded GRAVEL WITH SAND
		≥15% Fines	GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
			GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines	SW	Well-graded SAND Well-graded SAND WITH GRAVEL
			SP	Poorly-graded SAND Poorly-graded SAND WITH GRAVEL
		≥15% Fines	SM	SILTY SAND SILTY SAND WITH GRAVEL
			SC	CLAYEY SAND CLAYEY SAND WITH GRAVEL
Fine-Grained Soils - 50%1 or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50%		ML	SILT SANDY or GRAVELLY SILT SILT WITH SAND SILT WITH GRAVEL
			CL	LEAN CLAY SANDY or GRAVELLY LEAN CLAY LEAN CLAY WITH SAND LEAN CLAY WITH GRAVEL
			OL	ORGANIC SILT SANDY or GRAVELLY ORGANIC SILT ORGANIC SILT WITH SAND ORGANIC SILT WITH GRAVEL
	Silts and Clays Liquid Limit 50% or More		MH	ELASTIC SILT SANDY or GRAVELLY ELASTIC SILT ELASTIC SILT WITH SAND ELASTIC SILT WITH GRAVEL
			CH	FAT CLAY SANDY or GRAVELLY FAT CLAY FAT CLAY WITH SAND FAT CLAY WITH GRAVEL
			OH	ORGANIC CLAY SANDY or GRAVELLY ORGANIC CLAY ORGANIC CLAY WITH SAND ORGANIC CLAY WITH GRAVEL
Highly Organic Soils			PT	PEAT and other mostly organic soils

"WITH SILT" or "WITH CLAY" means 5 to 15% silt and clay, denoted by a "-" in the group name; e.g., SP-SM • "SILTY" or "CLAYEY" means >15% silt and clay • "WITH SAND" or "WITH GRAVEL" means 15 to 30% sand and gravel. • "SANDY" or "GRAVELLY" means >30% sand and gravel. • "Well-graded" means approximately equal amounts of fine to coarse grain sizes • "Poorly graded" means unequal amounts of grain sizes • Group names separated by "/" means soil contains layers of the two soil types; e.g., SM/ML.

Soils were described and identified in the field in general accordance with the methods described in ASTM D2488. Where indicated in the log, soils were classified using ASTM D2487 or other laboratory tests as appropriate. Refer to the report accompanying these exploration logs for details.

1. Estimated or measured percentage by dry weight
2. (SPT) Standard Penetration Test (ASTM D1586)
3. Determined by SPT, DCPT (ASTM STP399) or other field methods. See report text for details.

GEOTECHNICAL LAB TESTS

MC	=	Natural Moisture Content
PS	=	Particle Size Distribution
FC	=	Fines Content (% < 0.075 mm)
GH	=	Hydrometer Test
AL	=	Atterberg Limits
C	=	Consolidation Test
Str	=	Strength Test
OC	=	Organic Content (% Loss by Ignition)
Comp	=	Proctor Test
K	=	Hydraulic Conductivity Test
SG	=	Specific Gravity Test

CHEMICAL LAB TESTS

Organic Chemicals

BTEX	=	Benzene, Toluene, Ethylbenzene, Xylenes
TPH-Dx	=	Diesel and Oil-Range Petroleum Hydrocarbons
TPH-G	=	Gasoline-Range Petroleum Hydrocarbons
VOCs	=	Volatile Organic Compounds
SVOCs	=	Semi-Volatile Organic Compounds
PAHs	=	Polycyclic Aromatic Hydrocarbon Compounds
PCBs	=	Polychlorinated Biphenyls

Metals

RCRA8	=	As, Ba, Cd, Cr, Pb, Hg, Se, Ag, (d = dissolved, t = total)
MTCA5	=	As, Cd, Cr, Hg, Pb (d = dissolved, t = total)
PP-13	=	Ag, As, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn (d=dissolved, t=total)

FIELD TESTS

PID	=	Photoionization Detector
Sheen	=	Oil Sheen Test
SPT[2]	=	Standard Penetration Test
NSPT	=	Non-Standard Penetration Test
DCPT	=	Dynamic Cone Penetration Test

COMPONENT DEFINITIONS

Descriptive Term		*Size Range and Sieve Number*
Boulders	=	Larger than 12 inches
Cobbles	=	3 inches to 12 inches
Coarse Gravel	=	3 inches to 3/4 inches
Fine Gravel	=	3/4 inches to No. 4 (4.75 mm)
Coarse Sand	=	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	=	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	=	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	=	Smaller than No. 200 (0.075 mm)

ESTIMATED[1] PERCENTAGE

% by Weight		*Modifier*	*% by Weight*		*Modifier*
<1	=	Subtrace	15 to 25	=	Little
1 to <5	=	Trace	30 to 45	=	Some
5 to 10	=	Few	>50	=	Mostly

MOISTURE CONTENT

Dry	=	Absence of moisture, dusty, dry to the touch
Slightly Moist	=	Perceptible moisture
Moist	=	Damp but no visible water
Very Moist	=	Water visible but not free draining
Wet	=	Visible free water, usually from below water table

RELATIVE DENSITY

Non-Cohesive or Coarse-Grained Soils

Density[3]		*SPT[2] Blows/Foot*	*Penetration with 1/2" Diameter Rod*
Very Loose	=	0 to 4	≥ 2'
Loose	=	5 to 10	1' to 2'
Medium Dense	=	11 to 30	3" to 1'
Dense	=	31 to 50	1" to 3"
Very Dense	=	> 50	< 1"

CONSISTENCY

Cohesive or Fine-Grained Soils

Consistency[3]		*SPT[2] Blows/Foot*	*Manual Test*
Very Soft	=	0 to 1	Penetrated >1" easily by thumb. Extrudes between thumb & fingers.
Soft	=	2 to 4	Penetrated 1/4" to 1" easily by thumb. Easily molded.
Medium Stiff	=	5 to 8	Penetrated >1/4" with effort by thumb. Molded with strong pressure.
Stiff	=	9 to 15	Indented ~1/4" with effort by thumb.
Very Stiff	=	16 to 30	Indented easily by thumbnail.
Hard	=	> 30	Indented with difficulty by thumbnail.

GEOLOGIC CONTACTS

Observed and Distinct — Observed and Gradual — Inferred

Aspect CONSULTING

Exploration Log Key

Aspect CONSULTING	Craig Hill Pump Station - 220488			Geotechnical Exploration Log	
	Project Address & Site Specific Location			*Coordinates (Lat,Lon WGS84)*	*Exploration Number*
	Craig Avenue and N. Alder Street Ellensburg, WA., See Figure 2.			46.9990, -120.5297 (est)	**ATP-01**
Contractor	*Equipment*	*Sampling Method*		*Ground Surface Elev. (NAVD88)*	
City of Ellensburg	Deere 310 SL Backhoe	Grab		1673' (est)	
Operator	*Exploration Method(s)*	*Work Start/Completion Dates*		*Top of Casing Elev. (NAVD88)*	*Depth to Water (Below GS)*
Donnie	Test Pit	1/30/2023		NA	No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Notes and Completion Details	Sample Type/ID	Blows/foot ▲ Water Content (%)● (0 10 20 30 40 50)	Blows/6"	Tests	Description	Depth (ft)
0	1673						**TOPSOIL** SILTY SAND (SM); loose, moist, brown to dark brown; fine to medium sand; few organics, roots, rootlets, sticks, and woody debris.	
1	1672		Grab S1	● (~20)		DCPT =6,8,8 PS FC=38.8%	**FILL** SILTY SAND (SM); loose, moist, brown to dark brown; non-plastic; fine to medium sand; trace fine to coarse, subrounded gravel; trace organics, roots, rootlets, sticks, and woody debris.	1
2	1671							2
3	1670		Grab S2			DCPT =11,12,13	**ELLENSBURG FORMATION (Mc(e))** SILTY SAND (SM); medium dense, moist, brown; non-plastic; fine to medium sand; trace fine, subrounded gravel; trace pumice fragments; trace organics, rootlets; weak cementation.	3
4	1669	Exploration backfilled with spoils and compacted with backhoe bucket.	Grab S3			DCPT =12,30/1.5"		4
5	1668							5
6	1667						SAND WITH SILT (SP-SM); medium dense, slightly moist, light brown; fine to medium sand; weak cementation.	6
7	1666		Grab S4			DCPT =12,15,15		7
8	1665							8
9	1664							9
10	1663							10
11	1662	Sidewalls remain vertical with no caving.				DCPT =10,12,15	Bottom of exploration at 11.5 ft. bgs.	11
12	1661							12
13	1660							13

Legend

Sample Type: Grab sample

Plastic Limit ├──┤ Liquid Limit

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: JBM
Approved by: NCS

Exploration Log ATP-01

Sheet 1 of 1

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\220488 - CRAIG HILL PUMP STATION.GPJ March 8, 2023

Review Stage:DRAFT Rev.2

Craig Hill Pump Station - 220488

Geotechnical Exploration Log

Aspect CONSULTING

Project Address & Site Specific Location	Coordinates (Lat,Lon WGS84)	Exploration Number
Craig Avenue and N. Alder Street Ellensburg, WA., See Figure 2.	46.9990, -120.5297 (est)	ATP-02

Contractor	Equipment	Sampling Method	Ground Surface Elev. (NAVD88)
City of Ellensburg	Deere 310 SL Backhoe	Grab	1673' (est)

Operator	Exploration Method(s)	Work Start/Completion Dates	Top of Casing Elev. (NAVD88)	Depth to Water (Below GS)
Donnie	Test Pit	1/30/2023	NA	No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Notes and Completion Details	Sample Type/ID	Blows/foot ▲ Water Content (%)● 0 10 20 30 40 50	Blows/6"	Tests	Description	Depth (ft)
0	1673						**TOPSOIL** SILTY SAND (SM); loose, moist, brown to dark brown; fine to medium sand; few organics, roots, rootlets, sticks, and woody debris.	
1	1672						**FILL** SILTY GRAVEL WITH SAND AND COBBLES (GM); loose, moist, brown to dark brown; non-plastic; fine to coarse sand; fine to coarse, subrounded to rounded gravel; subrounded to rounded cobbles; few organics, roots, rootlets, sticks, and woody debris; trace metallic debris.	1
2	1671							2
3	1670		Grab S1	●		DCPT =6,11,19 PS FC=34.7%	**ELLENSBURG FORMATION (Mc(e))** SILTY SAND (SM); medium dense, slightly moist, light brown to brown; non-plastic; fine to medium sand; trace pumice fragments; trace organics, rootlets; weak cementation.	3
4	1669	Exploration backfilled with spoils and compacted with backhoe bucket.						4
5	1668							5
6	1667							6
6.5			Grab S2			DCPT =11,14,14	SAND WITH SILT (SP-SM); medium dense, slightly moist, light brown; fine to medium sand; weak cementation.	
7	1666							7
8	1665							8
9	1664							9
10	1663		Grab S3			DCPT =7,19,21	Becomes dense and light brown to light gray.	10
11	1662	Sidewalls remain vertical with no caving.						11
12	1661						Bottom of exploration at 12 ft. bgs.	12
13	1660							13

Legend

Sample Type: Grab sample

Plastic Limit ├──┤ Liquid Limit

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: JBM
Approved by: NCS

Exploration Log ATP-02

Craig Hill Pump Station - 220488

Geotechnical Exploration Log

Contractor	Equipment	Sampling Method	Ground Surface Elev. (NAVD88)	Exploration Number
City of Ellensburg	Deere 310 SL Backhoe	Grab	1670' (est)	ATP-03

Project Address & Site Specific Location	Craig Avenue and N. Alder Street Ellensburg, WA., See Figure 2.
Coordinates (Lat,Lon WGS84)	46.9989, -120.5298 (est)

Operator	Exploration Method(s)	Work Start/Completion Dates	Top of Casing Elev. (NAVD88)	Depth to Water (Below GS)
Donnie	Test Pit	1/30/2023	NA	No Water Encountered

Depth (feet)	Elev. (feet)	Exploration Notes and Completion Details	Sample Type/ID	Tests	Description
0	1670				**FILL** GRAVEL WITH SAND (GP); medium dense, slightly moist, gray; medium to coarse sand; fine to coarse angular to subrounded gravel.
1	1669		S1 (Grab)	DCPT =11,17,17	SILTY SAND WITH GRAVEL (SM); dense, moist, brown; non-plastic; fine to coarse sand; fine to coarse, subrounded to angular gravel; trace subrounded cobbles; trace organics, roots, rootlets.
2	1668		S2 (Grab)	DCPT =7,7,7	**ELLENSBURG FORMATION (Mc(e))** SILTY SAND (SM); loose, moist, brown; non-plastic; fine to medium sand; trace fine, subrounded gravel; trace pumice fragments; trace organics, rootlets; weak cementation.
3	1667				
4	1666	Exploration backfilled with spoils and compacted with backhoe bucket.		DCPT =6,11,12	SAND WITH SILT (SP-SM); medium dense, slightly moist, light brown to light gray.; fine to medium sand; weak cementation.
5	1665				
5.5				DCPT =6,10,12	
6	1664				
7	1663	Sidewalls remain vertical with no caving.			
7.5			S3 (Grab)	DCPT =7,21,25	Becomes dense.
8	1662				Bottom of exploration at 8 ft. bgs.
9	1661				
10	1660				
11	1659				
12	1658				
13	1657				

Blows/foot ▲ Water Content (%) ● 0 10 20 30 40 50 — Blows/6" — Material Type

Legend

Sample Type: Grab sample

Plastic Limit ⊢—⊣ Liquid Limit

Water Level: No Water Encountered

See Exploration Log Key for explanation of symbols

Logged by: JBM
Approved by: NCS

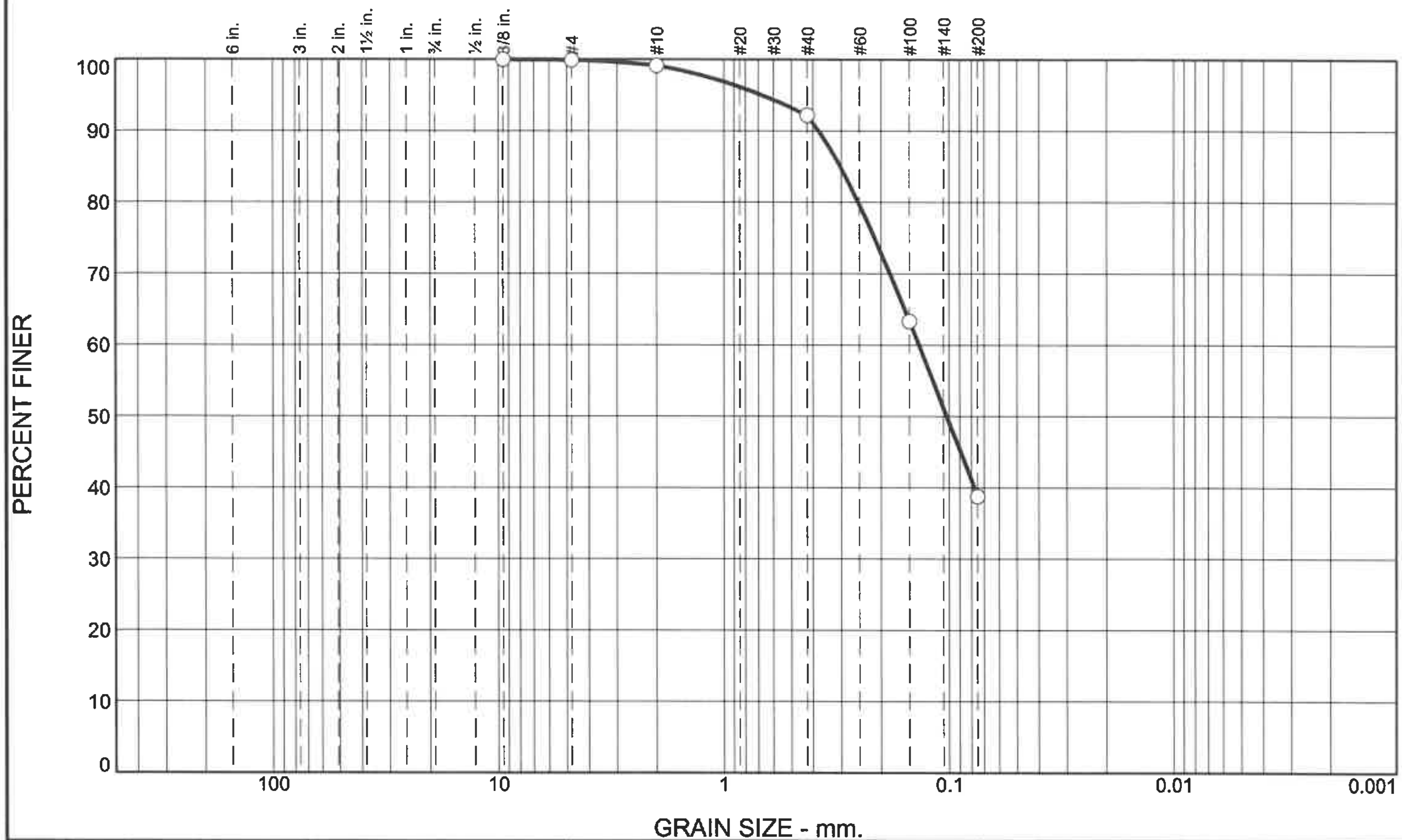
Exploration Log ATP-03

Sheet 1 of 1

APPENDIX B

Geotechnical Laboratory Testing Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.7	7.0	53.4	38.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.9		
#10	99.2		
#40	92.2		
#100	63.3		
#200	38.8		

* (no specification provided)

Soil Description

Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3777 D_{85}= 0.3039 D_{60}= 0.1363
D_{50}= 0.1026 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: ATP-01 / S-1 **Depth:** 1
Sample Number: 8617 **Date:** 2/9/23

Hayre McElroy & Associates, LLC

Redmond, WA

Client: Aspect Consulting
Project: Craig Hill Pump Station
Project No: 08-175 / 220488 **Figure**

Tested By: AD **Checked By:** JAM

GRAIN SIZE DISTRIBUTION TEST DATA

2/9/2023

Client: Aspect Consulting
Project: Craig Hill Pump Station
Project Number: 08-175 / 220488
Location: ATP-01 / S-1
Depth: 1
Sample Number: 8617
Material Description: Silty SAND
Date: 2/9/23
USCS Classification: SM
Tested by: AD
Checked by: JAM

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 538.10
Tare Wt. = 231.10
Minus #200 from wash = 37.3%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
720.40	231.10	0.00	3/8"	0.00	100.0
			#4	0.30	99.9
			#10	4.10	99.2
			#40	38.00	92.2
			#100	179.50	63.3
			#200	299.60	38.8

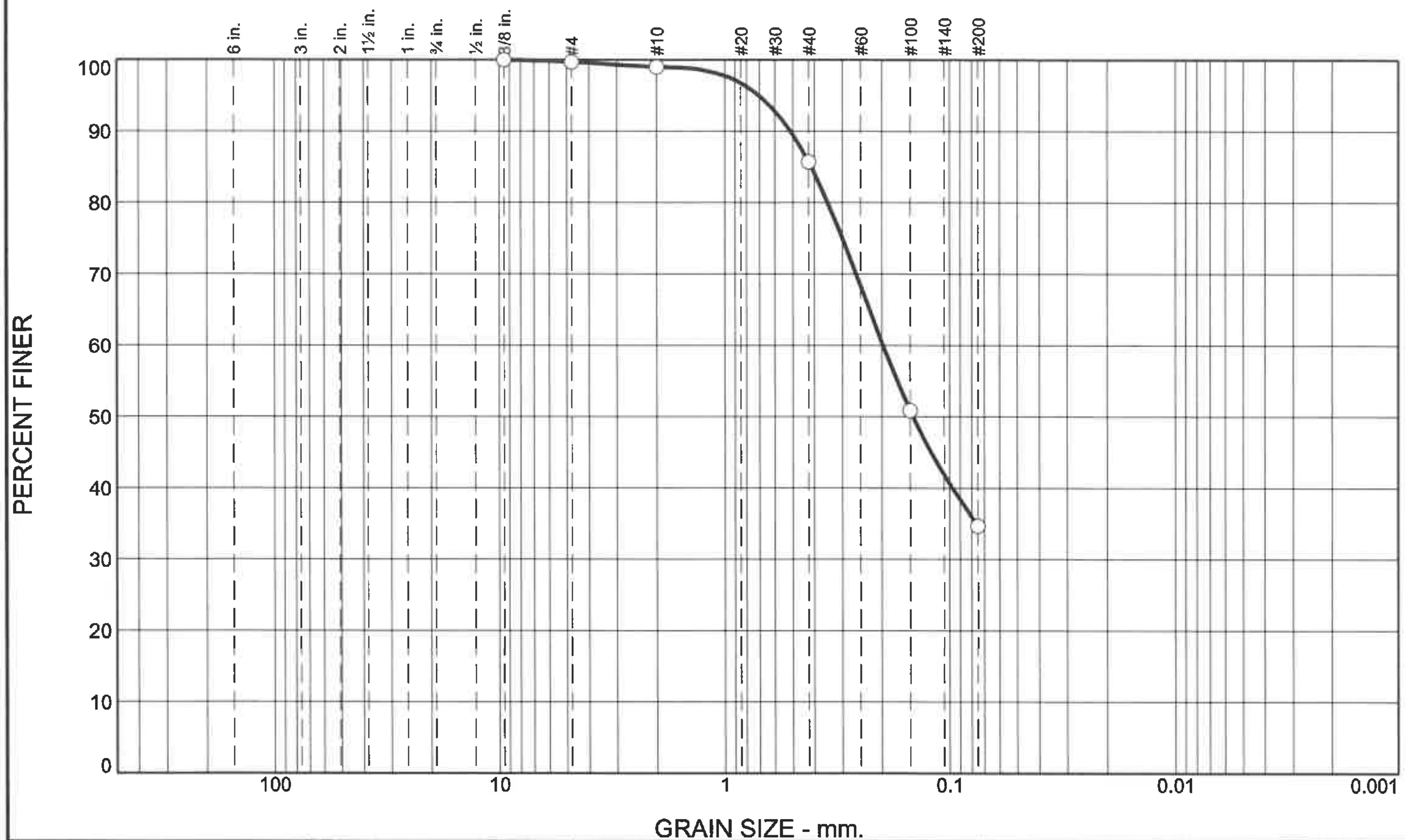
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.1	0.1	0.7	7.0	53.4	61.1			38.8

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
					0.0776	0.1026	0.1363	0.2527	0.3039	0.3777	0.6691

Fineness Modulus
0.61

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.7	13.3	51.0	34.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.7		
#10	99.0		
#40	85.7		
#100	50.9		
#200	34.7		

* (no specification provided)

Soil Description

Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5114 D_{85}= 0.4136 D_{60}= 0.1980
D_{50}= 0.1457 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: ATP-02 / S-1 **Depth:** 3
Sample Number: 8617 **Date:** 2/9/23

Hayre McElroy & Associates, LLC

Redmond, WA

Client: Aspect Consulting
Project: Craig Hill Pump Station
Project No: 08-175 / 220488 **Figure**

Tested By: AD **Checked By:** JAM

GRAIN SIZE DISTRIBUTION TEST DATA

2/9/2023

Client: Aspect Consulting
Project: Craig Hill Pump Station
Project Number: 08-175 / 220488
Location: ATP-02 / S-1
Depth: 3
Sample Number: 8617
Material Description: Silty SAND
Date: 2/9/23
USCS Classification: SM
Tested by: AD
Checked by: JAM

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 665.90
Tare Wt. = 234.80
Minus #200 from wash = 32.7%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
875.80	234.80	0.00	3/8"	0.00	100.0
			#4	1.80	99.7
			#10	6.20	99.0
			#40	91.50	85.7
			#100	315.00	50.9
			#200	418.60	34.7

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.3	0.3	0.7	13.3	51.0	65.0			34.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
					0.0971	0.1457	0.1980	0.3494	0.4136	0.5114	0.7038

Fineness Modulus
0.84

hayremcelroy & associates, llc
9644 153rd Ave NE
Redmond, WA 98052
425.869.6750

Moisture Content

ASTM D-2216

Project Number: 08-175 / 220488
Received Date: 2/3/2023

Project Name: Craig Hill Pump Station
Lab Number: 8617
Start Date: 2/6/2023
Finish Date: 2/9/2023
Technician: AD

HMA Lab #	Boring	Sample	Depth (ft)	Weight of Moist Soil + Tare (g)	Weight of Dry Soil + Tare (g)	Tare Weight (g)	**Moisture Content (%)**
8617	ATP-01	S-1	1	821.5	720.4	231.1	**20.7**
8617	ATP-02	S-1	3	965.7	875.8	234.8	**14.0**

APPENDIX C

Report Limitations and Guidelines for Use

REPORT LIMITATIONS AND GUIDELINES FOR USE

Geoscience is Not Exact

The geoscience practices (geotechnical engineering, geology, and environmental science) are far less exact than other engineering and natural science disciplines. It is important to recognize this limitation in evaluating the content of the report. If you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or property, you should contact Aspect Consulting, LLC (Aspect).

This Report and Project-Specific Factors

Aspect's services are designed to meet the specific needs of our clients. Aspect has performed the services in general accordance with our agreement (the Agreement) with the Client (defined under the Limitations section of this project's work product). This report has been prepared for the exclusive use of the Client. This report should not be applied for any purpose or project except the purpose described in the Agreement.

Aspect considered many unique, project-specific factors when establishing the Scope of Work for this project and report. You should not rely on this report if it was:

- Not prepared for you;
- Not prepared for the specific purpose identified in the Agreement;
- Not prepared for the specific subject property assessed; or
- Completed before important changes occurred concerning the subject property, project, or governmental regulatory actions.

If changes are made to the project or subject property after the date of this report, Aspect should be retained to assess the impact of the changes with respect to the conclusions contained in the report.

Reliance Conditions for Third Parties

This report was prepared for the exclusive use of the Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against liability claims by third parties with whom there would otherwise be no contractual limitations. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with our Agreement with the Client and recognized geoscience practices in the same locality and involving similar conditions at the time this report was prepared.

Property Conditions Change Over Time

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope instability, or groundwater fluctuations. If any of the described events may have occurred following the issuance of the report, you should contact Aspect so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical, Geologic, and Environmental Reports Are Not Interchangeable

The equipment, techniques, and personnel used to perform a geotechnical or geologic study differ significantly from those used to perform an environmental study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually address any environmental findings, conclusions, or recommendations (e.g., about the likelihood of encountering underground storage tanks or regulated contaminants). Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding the subject property.

We appreciate the opportunity to perform these services. If you have any questions, please contact the Aspect Project Manager for this project.