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GEOTECHNICAL ENGINEERING REPORT

Sand Creek Culvert Replacement

Prepared for

Chelan County Natural Resources Department
Attn: Bryan Maloney
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Prepared by

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Project: NWG0072

November 11, 2025

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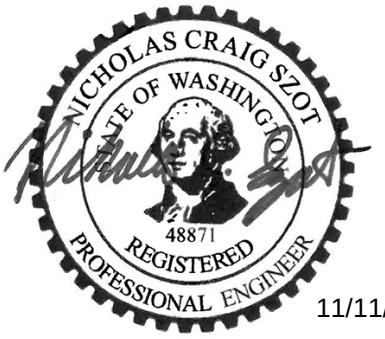

11/11/2025

Nick Szot, PE
Principal Geotechnical Engineer

Kale Spina, EIT
Professional Geotechnical Engineer-in-Training

Project Number: NWG0072

November 11, 2025

Geosyntec consultants

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1. INTRODUCTION

This report presents the results of a geotechnical engineering study performed by Geosyntec Consultants, Inc. (Geosyntec) for the Sand Creek Culvert Replacement (Project). The Project is located where Sand Creek crosses under Sand Creek Road, approximately 0.15 miles west of the intersection with Mission Creek Road (Figure 1), in Cashmere, Washington (Site). The Project design is led by Waterfall Engineering (Waterfall) and Chelan County Natural Resources Department (County). The Project location is shown on Figure 1 (Site Location Map) and Figure 2 (Site and Exploration Map) with base map and topography provided to Geosyntec by Waterfall.

The following sections provide a detailed Project description, results of the completed field explorations, and geotechnical engineering conclusions and recommendations for foundation design parameters for the proposed open-bottom pipe arch culvert (new culvert). In our opinion, the new culvert can be supported on shallow concrete footings provided recommendations in Section 4.2 of this report are followed.

2. PROJECT DESCRIPTION

Sand Creek (creek) flows underneath the gravel-surfaced Sand Creek Road via an existing 24-foot-long corrugated metal pipe-arch culvert that is approximately 8-foot-span by 5.7-foot-rise (existing culvert). Based on conversations with Waterfall and the County, we understand that the existing culvert is planned to be replaced with an open-bottom pipe arch culvert with a span of about 18 feet supported by concrete strip footings. The intent of the new culvert is to improve hydraulics and fish passage.

Geosyntec's scope of work for the Project includes review of existing geologic data, completion of machine-drilled borings to observe and document soil conditions near the new culvert footing locations, and recommendations for vertical and lateral foundation design parameters.

Vertical and lateral foundation design analysis and recommendations are detailed in Section 4 of this report in general accordance with:

- American Association of State Highway and Transportation Officials Bridge Design Specifications (BDS; AASHTO, 2024).

- Federal Lands Highway Standard Specifications (FLH SS) for Construction of Roads and Bridges on Federal Highway Projects FP-14 (FLH, 2024).

3. SITE CONDITIONS

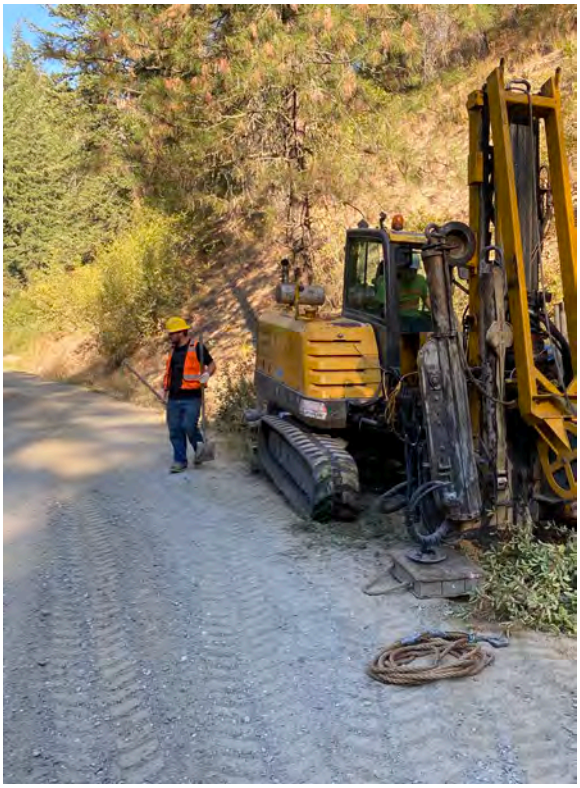
This section presents a description of Site conditions, including the Site surface setting and area topography, the geologic setting, and subsurface conditions. The general Site layout, select Site features, and locations of borings are shown on Figure 2.

3.1 Surface Conditions

Surface conditions generally consist of the gravel-surfaced road traversing over the existing culvert carrying the creek (Figure 2, Photograph 2). The road surface is approximately 6 feet above the creek level. The existing culvert is an 8-foot-diameter corrugated metal pipe (CMP) with cast in place concrete headwalls (Photograph 1).

The Site topography is shown on Figure 2. The stream and road are located at the bottom of a drainage valley with steeps slopes rising to the north and south of the site. The valley side slopes are inclined between 1H:1V and 2H:1V (horizontal to vertical) and are mostly vegetated with large coniferous trees and small low-lying shrubs. Some areas of the valley side walls were observed to consist of exposed surficial bedrock.

Photograph 1. Sand Creek passing north through the existing culvert. View to the north.



Photograph 2. Excavator mounted drill rig setting up to drill GB-01 on the shoulder of Sand Creek Road. View to the west.

3.2 Geology

Surficial geologic mapping of the area indicates the Site is underlain by Chumstick Formation (Tc) sandstone, shale, and conglomerate described as white, locally gray, medium- to- coarse grained micaceous feldsphathic sandstone interbedded with pebbly sandstone and bluish shale (Tabor, et. al., 1982). Although not mapped, topsoil from degradation of organic debris and materials, Quaternary alluvium (Qa) deposited by the creek, and fill from existing road and culvert are also expected to be present.

3.3 Subsurface Conditions

3.3.1 Machine-Drilled Borings

Geosyntec directed and observed two machined drilled exploratory soil borings (designated GB-01 and GB-02) on September 17, 2025, on the shoulders of Sand Creek Road (road) near the existing culvert inlet and outlet (Figure 2). GB-01 and GB-02 were advanced to depths of 12.3 feet and 21.5 feet, respectively, using an EC-95 drill rig and hollow-stem auger techniques by Boretec1, Inc under subcontract to Geosyntec. Standard Penetration Test (SPT) sampling was completed at 2.5- and 5-foot depth intervals. GB-01 was terminated due to auger refusal, however GB-02 was drilled to full planned depth.

A Geosyntec field representative was present throughout the boring explorations to observe the drilling action, collect soil samples, and prepare descriptive logs of the explorations. Soils were classified in general accordance with ASTM International D2488, *Standard Practice for Description and Identification of Soils* (Visual-Manual Procedure; ASTM, 2025). Upon completion, the borings were backfilled with bentonite chips and patched with excavated soil.

Exploration procedures, descriptions of the soils encountered in the borings, approximate depths where characteristics of the soils changed,[1] and soil sample collection depths and identifications are indicated on the subsurface exploration logs presented in Appendix A. Definitions of the terminology and symbols used on the logs are also shown on the Exploration Log Key included in Appendix A.

3.3.2 Laboratory Testing

Laboratory testing was performed by Hayre McElroy and Associates (HMAA) under subcontract to Geosyntec and included determination of grain-size distribution of soil samples in accordance with ASTM D6913. Laboratory test results are presented in Appendix B.

3.3.3 Stratigraphy

The geologic/soil units observed in the borings, presented in stratigraphic order from top to bottom include, fill, Alluvium (Qu), and Chumstick Formation (Tc). The units encountered generally agree with the mapped geology and the expectation of encountering fill and alluvium.

[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.

3.3.3.1 Fill

Roadway embankment fill was observed in both GB-01 and GB-02 extending from the road surface to approximately 7.5 feet below ground/road surface (bgs) in both borings. The fill consists of loose to medium dense, slightly moist to wet, gray and brown sand with silt and gravel (SP-SM) and silty sand with gravel (SM) with varying amounts of organic matter.

3.3.3.2 Alluvium (Qa)

Alluvium was observed underlying the fill in GB-01 and GB-02 to depths of 10 and 14 feet bgs, respectively. The alluvium consists of very loose to medium dense, wet, brown silty sand (SM) and sandy silt (ML) with varying amounts of gravel and organic matter.

3.3.3.3 Chumstick Formation (Tc)

Chumstick Formation Sandstone was encountered underlying the alluvium in both borings, extending to maximum depths explored (12.3 feet bgs and 21.5 feet bgs in GB-01 and GB-02, respectively). The depth bgs to the Chumstick Formation (Tc) is approximately 4 feet greater in GB-02 than in GB-01. We infer this change in depth to be due to the dipping and undulating orientation of the Chumstick Formation, as seen in the Chumstick outcropping visible in the canyon sidewalls. For design purposes, the depth to the Chumstick Formation can be interpolated linearly between the two exploration locations.

We interpret the Chumstick sandstone to be weathered to full depth explored in GB-01 and to 20 feet bgs in GB-02 where it becomes unweathered and very hard/dense. Where it is weathered, the Chumstick sandstone consists of very dense, wet, red brown silty sand (SM) and where it is unweathered, it consists of very weak (R1), slightly moist, gray sandstone with dipping beds.

3.3.4 Groundwater Conditions

Based on sample moisture, we infer groundwater level to be 7.5 feet below the roadway surface. This depth coincides with the inferred contact between the fill and the alluvium soil units, as well as the approximate depth of the creek below the road surface. Moisture content of the samples within the unweathered Chumstick Formation sandstone indicates that the groundwater table does not extend into this unit. Groundwater is expected to fluctuate seasonally with precipitation, snow melt, creek levels, and excavation soil type.

4. GEOTECHNICAL ENGINEERING CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary

Based on the results of our field explorations and engineering analyses, we conclude that the new culvert shallow foundations can be supported on a leveling pad comprised of compacted gravel fill overlying either the medium dense to dense alluvium soil or the weathered Chumstick Formation.

The following sections present geotechnical recommendations for new culvert foundation design, including bearing resistance, estimated settlement, lateral parameters, subgrade preparation, and structural fill materials.

4.2 Foundation Design and Construction Recommendations

4.2.1 Vertical Foundation Support

We recommend new culvert shallow foundations bear on a minimum 12-inch-thick fill leveling pad of structural fill placed and compacted atop a "bearing layer" of medium dense to very dense native sand and gravel (alluvium or weathered Chumstick Formation) provided they are generally firm and free of deleterious material, such as organics (logs, peat, large roots, etc.). The proposed bearing layer was observed at about Elevation 1,430 feet in GB-01 (approximately 10 feet bgs) and at about Elevation 1,429 in GB-02(approximately 12 feet bgs). The bearing layer might be shallower or deeper at different areas along the foundation. Thinning the fill leveling pad (less than 12 inches) can be considered on a case-by-case basis with direct observation by the engineer in localized areas should very hard bedrock be encountered. Groundwater and/or seepage for foundation excavation should be expected; shoring and dewatering planning and execution shall be provided by the contractor.

The fill leveling pad is intended to provide a relatively firm and uniform bearing surface for foundation elements and to reduce potential for total and differential settlement. The fill leveling pad material shall be crushed rock and generally meeting the requirements of surface course aggregate (SCA) per FLH SS for Construction of Roads and Bridges on Federal Highway Projects FP-24 7.03.05c, and/or Ballast per Washington State Department of Transportation (WSDOT) Standard Specifications 9-03.9 (FLH, 2024; WSDOT, 2026). The SCA can be used above wet conditions, and the Ballast below wet conditions to construct the fill pad. If Ballast is used, it shall be topped with at least 6 inches of SCA to effectively fill or 'choke' the top of the fill pad surface to a flat, smooth condition. The fill pad should be compacted to a firm condition in accordance with Section 4.5.3 below. Controlled density fill (CDF) can also be considered for the aforementioned leveling fill pad material but must be cured near-perfectly flat or include a few inches of sand/gravel atop it to ensure a flat, uniform contact surface to set pre-cast concrete foundation elements on.

A Geosyntec field representative should evaluate the foundation subgrade prior to placement of the fill pad and the foundations to verify conditions.

Subgrade materials that are not medium dense to very dense sand and gravel—such as existing fill, loose alluvium, or organic-rich soil—should be removed and replaced with compacted fill

leveling pad material. The fill leveling pad should extend beyond the edges of the footing by at least 1 foot in all directions and extend downward from bottom of footing to the bearing layer at an angle of 45 degrees or flatter.

Foundations should be founded at least 24 inches below adjacent grade for frost protection and not constructed over frozen subgrades.

4.2.2 Strength and Service Limit State

We analyzed the nominal bearing resistance for the Strength and Service Limit States for use in design of the new culvert foundations, assuming proper preparation of the foundation subgrade materials described above.

For concrete foundations 3 feet or wider, we recommend a nominal (unfactored) bearing resistance of 6,500 pounds per square foot (psf). This value accounts for the fill leveling pad underlying the foundations, at least 2 feet of cover/embedded below design scour level (determined by others), and saturated soils from creek levels. For load resistance and factor design (LRFD) Strength Limit State design, a Resistance Factor of 0.45 should be utilized, resulting in a Strength Limit State bearing resistance value of 3,000 psf.

We anticipate the leveling pad and underlying bearing layer subgrade will settle elastically from imposed foundation loads. For foundation design considering the LRFD Service Limit State and shallow foundations up to about 8 feet wide, we recommend utilizing a maximum Service Limit State bearing resistance of 3,000 psf corresponding to estimated total foundation settlements of 1 inch total. Differential settlement is estimated to be on the order of half the total settlement over the length of the foundation, and/or between abutments.

4.2.3 Lateral Foundation and Wall Parameters

Bridge wingwalls should be designed to adequately resist lateral earth pressures. Recommended design lateral earth pressures acting on these elements are presented in Table 1, below, and represent the active, at-rest, and passive conditions in unsubmerged and submerged conditions. These values assume that backfill directly around the foundations and behind the walls will meet recommendations presented in Section 4.5.

Table 1: Lateral Earth Pressure Parameters

Earth Pressure Condition	Earth Pressure Coefficient	Equivalent Fluid Weight[2],[3] (pcf)[1]	Surcharge Pressure (psf)[1]
Active (K_a)[4]	0.28	35 18 (submerged)	0.28*S[7]
At-Rest (K_0)	0.44	55 28 (submerged)	0.44*S[7]
Passive (K_p)[5]	3.54	440[6] 220 (submerged)	--

Notes:
1. Pounds per cubic foot (pcf) and pounds per square foot (psf).
2. Backfill with a unit weight of about 125 pcf is assumed.
3. Static earth pressures result in a triangular pressure distribution along the height of the abutment/wall. Assumes flat ground above/behind the abutment/wall.
4. To invoke the active conditions, the abutment/wall must rotate about the base with a lateral movement at the top of approximately 0.001H to 0.002H, where H is the exposed height of the abutment/wall, otherwise at-rest conditions should be used.
5. To invoke the passive conditions, the abutment/wall must move into the backfill with a lateral movement of approximately 0.020H. Assumes flat ground in front of the abutment/wall.
6. Nominal (ultimate) passive pressures are presented; a Strength Limit State Resistance Factor (ϕep) of 0.50 should be applied for design per AASHTO LRFD 10.5.5.2.
7. Resulting uniform (rectangular) surcharge acting along the height of the abutment/wall, where S is the surcharge pressure.

Sliding resistance is developed from the friction occurring between the bottom of the foundation and the leveling fill pad, and the passive resistance developed from the soil around the foundation. The frictional and passive resistance values presented assume the foundations bear on a fill leveling pad as described in Section 4.2.1.

For passive resistance against the sides of foundations, the nominal passive values provided in Table 1 may be utilized for design.

For frictional resistance along the bottoms of smooth, precast concrete foundations, we recommend a coefficient of friction (tan delta) of 0.45. For frictional resistance along the bottoms of mass, cast-in-place concrete foundations, we recommend a coefficient of friction (tan delta) of 0.55. Per AASHTO LRFD, we recommend a Strength Limit State Resistance Factor ($\phi_{Sliding}$) of 0.90 for cast-in-place, and 0.80 for precast concrete foundations.

4.3 Approach Embankments

Approach embankments should be constructed of structural fill materials compacted to the criteria described in Section 4.5.3. We recommend proof rolling the approach embankment with heavy equipment to identify soft spots prior to final grading. Soft spots should be replaced with properly compacted structural fill.

4.4 Earth Work

Based on the materials encountered in the explorations and our understanding of the Project, we anticipate Site earthwork can be completed with standard construction equipment, such as tracked excavators, with planning and contingency for rock excavation (rock teeth, pneumatic chipping attachments, etc.) in the Chumstick Formation should it be encountered at elevations above the foundation level. The equipment should be capable of performing excavation in saturated gravel-, cobble-, and boulder-laden soils that might also include logs and sandstone bedrock.

Appropriate erosion and sedimentation control measures should be in accordance with the local best management practices (BMPs) and should be installed prior to beginning earthwork activities.

4.4.1 Temporary Excavation Slopes and Shoring

Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. All temporary cuts exceeding 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 for worker safety (WSL, 2023). For planning purposes and using guidance provided by the WAC and our Site observations, we classify the Site soils as Type C with a maximum allowable temporary slope inclination of 1.5H:1V.

With time and the presence of seepage and/or precipitation, the stability of temporary unsupported cut slopes can be significantly reduced. Therefore, all temporary slopes should be protected from erosion by installing a surface water diversion ditch or berm at the top of the slope if precipitation is expected.

In addition, 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 temporary slopes. In such an event, lateral support for the temporary slopes should be provided by the contractor.

4.4.2 Construction Dewatering

Based on our explorations, and assuming construction occurs during periods of low creek flows, we estimate groundwater seepage will primarily occur into excavations that are below the creek level. Some zones of perched groundwater might exist above the creek level following heavy precipitation, snow melt, or after a flood event.

The Contractor shall be responsible for the control of ground- and surface water and should employ sloping, slope protection, ditching, sumps, dewatering, and other measures as necessary to complete necessary earthwork, demolition of the existing culvert, and construction of the new bridge. Dewatering and turbidity management plans, such as sumps and pumps, sheet pile or sandbag cutoff, stream bypass, and/or treatment tanks developed and implemented by the contractor, will likely be needed for excavation and preparation of foundation subgrades.

4.5 Structural Fill

4.5.1 Beneath Foundations

Structural fill placed beneath foundations should consist of materials described in Section 4.2.1.

4.5.2 Directly Behind Walls

Soils placed directly behind culvert wingwalls, and headwalls should consist of at least a 12-inch-thick (measured perpendicular to the wall) gravel drainage curtain to convey water down to the relatively permeable foundation subgrade below. The curtain drain material should meet the requirements of Select Borrow FLH SS 704.02 (FLH, 2024). A geotextile separator fabric should be placed between the curtain drain and the other embankment fill to mitigate transport of fine particles between the two materials.

4.5.3 Approach Embankments and Use of On-Site Soils

We provide the following recommendations for structural fill used to construct approach embankments:

- On-Site soils excavated for the Project should generally meet the requirements for Unclassified Borrow outlined in FLH SS 704.01 (FLH, 2024) appropriate for constructing approach embankments and backfill around the culvert. We recommend limiting the maximum particle size/diameter of on-Site materials to about 8 inches for bridge approach embankment fill. The top 6 inches of the approach embankment fill should consist of imported or on-Site crushed rock, such as SCA.
- On-Site soils are moisture sensitive and expected to be very moist or wet if excavated from below or near creek level and difficult to compact without time and effort to dry the material. If properly moisture conditioned, this material is acceptable to use, provided the maximum particle size is limited to less than 8 inches, as discussed above. We recommend Select Borrow FLH SS 704.02 (FLH, 2024) if imported materials are utilized during wet weather conditions.

4.5.4 Compaction Criteria

Structural fill should be compacted in general accordance with the methods described in Compacting FLH SS 209.10 (FLH, 2024), except Ballast material to construct the foundation fill pad (see Section 4.2.1) in submerged/wet conditions, which should be compacted by placement and compaction completed in lifts of less than 8 inches using aggressive tamping/spreading from a large excavator.

Compaction of on-Site soils during the dry summer months is preferred because they contain enough fines to be moisture sensitive in wet weather and must be properly moisture conditioned by wetting, drying, and/or mixing with drier materials.

5. ADDITIONAL GEOTECHNICAL ENGINEERIGN INPUT

Per our scope of work and as part of the design phase process, we recommend that Geosyntec continue to provide project plan review/input to verify critical geotechnical engineering foundation elements, subgrade preparation, and structural fill materials are properly included.

5.1 Construction Services

We are available to provide plan and specification review and 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 if variations in subsurface conditions become apparent.

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

- review applicable submittals for geotechnical materials
- observe and evaluate subgrade for foundations
- observe temporary excavations and structural fill placement
- attend meetings by telephone or on-Site, as needed
- other geotechnical engineering considerations that may arise during the course of 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 if subsurface conditions differ from those anticipated prior to the start of construction.

6. LIMITATIONS

Work for this project was performed for the Chelan County Natural Resources Department (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 Geosyntec Consultants (Geosyntec).

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 Geosyntec.

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, Geosyntec 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, Geosyntec 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 Geosyntec 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 Geosyntec. Geosyntec’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 (WA) at 509.888.7218.

7. REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 2024, LRFD Bridge Design Specifications, Customary U.S. Units.

ASTM International (ASTM), 2025, 2025 Annual Book of ASTM Standards, West Conshohocken, Pennsylvania.

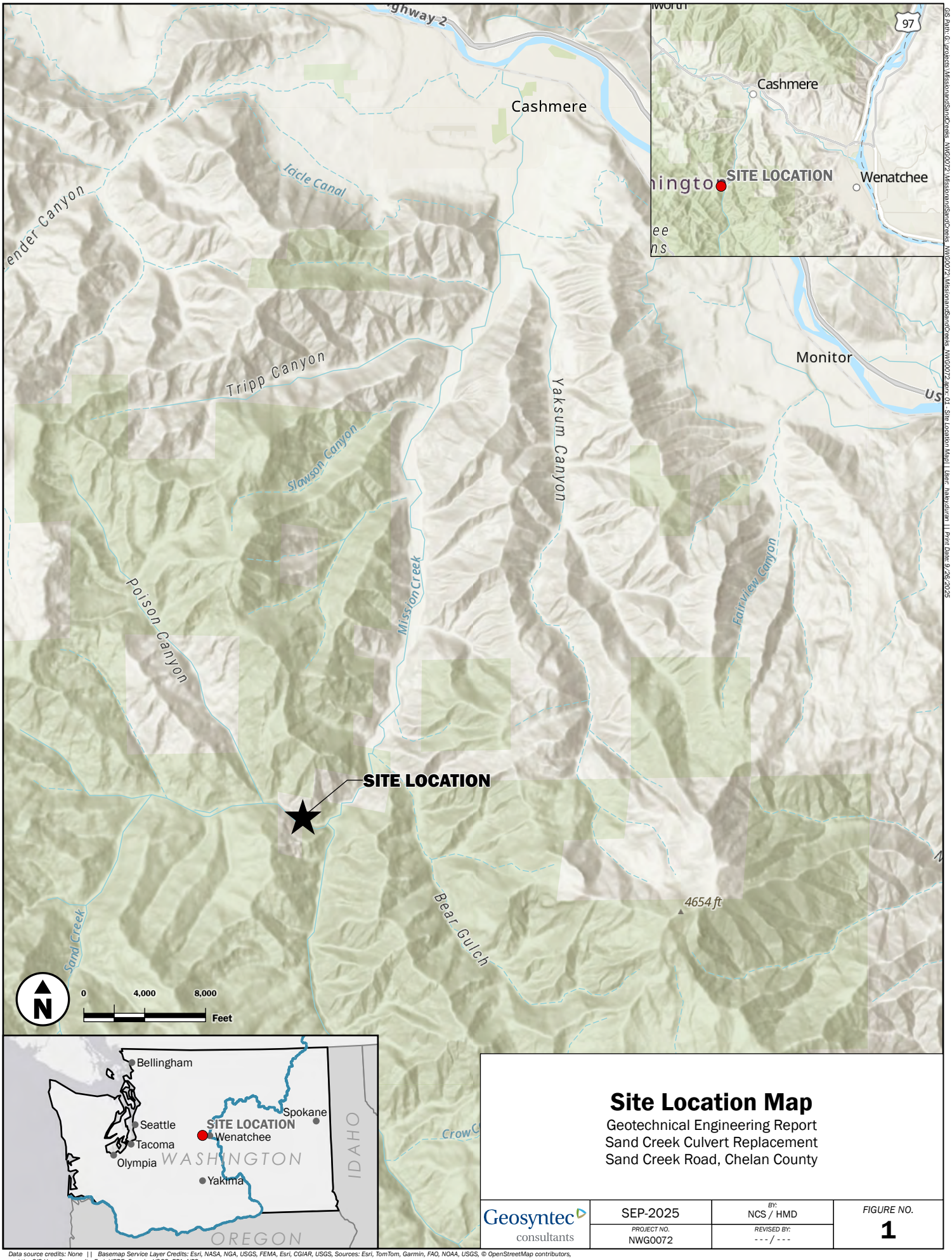
Federal Lands Highway (FLH), 2024, Federal Lands Highway Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-24.

Tabor, R.W., Waitt Jr., R.B., Frizzell, V. A., Swanson, D.A., Byerly, G.R., Bentley, R.D., (Tabor et. al.), 1982, Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington, dated 1982.

Washington State Department of Transportation (WSDOT), 2026, Standard Specifications for Road, Bridge and Municipal Construction, Document M 41-10.

Washington State Legislature (WSL), 2023, Washington Administrative Code (WAC) Title 296-155-66403, Appendix B-Sloping and benching, certified on February 20, 2023.

FIGURES



Site Location Map

Geotechnical Engineering Report
Sand Creek Culvert Replacement
Sand Creek Road, Chelan County

Geosyntec consultants	SEP-2025	BY: NCS / HMD	FIGURE NO. 1
	PROJECT NO. NWG0072	REVISED BY: ---/---	

GIS Path: G:\projects\Missoman\SandCreeks_NWG0072\Missoman\SandCreeks_NWG0072\Missoman\SandCreeks_NWG0072.aprx; 01_Site Location Map | User: haleycurran | Print Date: 9/26/2025

Sand Creek Fish Passage

Landowner: Chelan County Public Works
Sec Twnshp Range: Section 29, T25N, R18E
Lat and Long: 47° 25' 49.01"N, 120° 30' 41.27"W

REV	DATE	BY	APP'D	DESCRIPTION

BAR IS ONE INCH ON ORIGINAL DRAWING. SCALE VERIFICATION 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Site and Exploration Map

Geotechnical Engineering Report
Sand Creek Culvert Replacement
Sand Creek Road, Chelan County

Geosyntec consultants	SEP-2025	BY: NCS / HMD	FIGURE NO. 2
	PROJECT NO. NWG0072	REVISED BY: ---/---	

GIS Path: G:\projects\Missionand\SandCreek_NWG0072\Missionand\SandCreek_NWG0072.aprx\2. Site and Exploration Map || User: hdoty.duran || Print Date: 9/26/2025

Data source credits: None || Basemap Service Layer Credits: NA

APPENDIX A
Exploration Logs

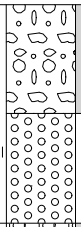
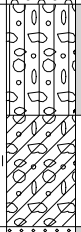
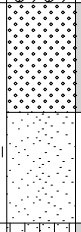
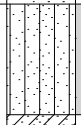
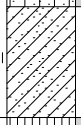
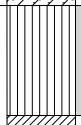
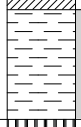
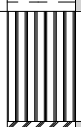
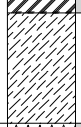
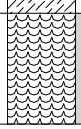
Soil Borings

Geosyntec directed and observed Boretec, Inc. drilling two soil borings, designated GB-01 and GB-02, using hollow-stem auger drilling techniques on September 17, 2025. Drilling was completed with an excavator mounted EC-95 drill rig, soil sampling at select intervals. The borings were advanced 12.3 and 21.5 feet below ground surface (bgs), respectively. The locations of the borings are shown on Figure 2. Once drilling was completed, the borings were backfilled with bentonite chips and capped with 6 to 12 inches of drill cuttings tamped with a shovel.

Disturbed samples were obtained at 2.5 and 5-foot intervals in accordance with the Standard Penetration Test (ASTM International [ASTM] Method D1586) methodology. This involves driving a 2-inch-outside-diameter split-barrel sampler 18 inches into the soil with a 140-pound hammer free falling from a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance ("N") or blow count. The resistance, or N-value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils.

Soil Identification

A Geosyntec field representative was present throughout the field exploration program to observe the test pits and drilling procedure, assist in sampling, and to prepare descriptive logs of the exploration. Soils were classified in general accordance with ASTM D2488, *Standard Practice for Description and Identification of Soils* (Visual-Manual Procedure). The summary exploration logs represent our interpretation of the contents of the field logs. The stratigraphic contacts shown on the individual summary logs represent the approximate boundaries between soil types; actual transitions may be more gradual. The subsurface conditions depicted are only for the specific date and locations reported; therefore, they are not necessarily representative of other locations and times.

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

Geosyntec consultants

Exploration Log Key

Sand Creek Culvert Replacement - NWG0072

Geotechnical Exploration Log

Aspect CONSULTING

Project Address & Site Specific Location	Coordinates (Lat,Lon WGS84)	Exploration Number
Sand Creek Rd, Cashmere, WA, See Figure 2.	47.4303, -120.5118 (est)	**GB-01**

Contractor	Equipment	Sampling Method	Ground Surface Elev. (NAVD88)	
Boretec1, Inc.	EC95	Rope & cathead; 140 lb hammer; 30" drop	1441' (est)	
Operator	**Exploration Method(s)**	**Work Start/Completion Dates**	**Top of Casing Elev. (NAVD88)**	**Depth to Water (Below GS)**
Tommy	6" OD X 2.25" ID Hollow Stem Auger	9/17/2025	NA	7.5' (ATD)

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	Material Type	Description	Depth (ft)
0	1440	Boring backfilled with bentonite chips and capped with excavated soil.	S-1	▲	5 4 3			**FILL** SAND WITH SILT AND GRAVEL (SP-SM); loose, slighlty moist, brown; fine to coarse sand; fine to coarse, subrounded to subangular gravel; subtrace organics.	0
5	1435	▽ 9/17/2025	S-2	6 ● ▲	3 10 12	PS		Becomes medium dense, moist, and brown gray.	5
			S-3	▲	5 2 9			**ALLUVIUM** SILTY SAND WITH GRAVEL (SM); medium dense, wet, gray brown; fine to coarse sand; fine to coarse, rounded gravel.	
10	1430	Drill chatter begins.	S-4	▲	50/6"			**WEATHERED CHUMSTICK SANDSTONE (Tc)** SANDSTONE; Silty sand (SM); very dense, wet, red-brown; fine to coarse sand; fine to coarse, subrounded gravel.	10
		Auger refusal: attempted to advance auger for approx. 20 minutes without progress.	S-5	▲	50/4"			Bottom of exploration at 12.33 ft. bgs.	
15	1425								15
20	1420								20

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Plastic Limit ⊢—⊣ Liquid Limit

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: KDS
Approved by: NCS

Exploration Log GB-01
Sheet 1 of 1

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\NWG0072 - SAND CRK.GPJ November 11, 2025

Aspect CONSULTING	Sand Creek Culvert Replacement - NWG0072		Geotechnical Exploration Log	
	Project Address & Site Specific Location Sand Creek Rd, Cashmere, WA, See Figure 2.		*Coordinates (Lat,Lon WGS84)* 47.4303, -120.5117 (est)	*Exploration Number* **GB-02**
Contractor Boretec1, Inc.	*Equipment* EC95	*Sampling Method* Rope & cathead; 140 lb hammer; 30" drop	*Ground Surface Elev. (NAVD88)* 1441' (est)	
Operator Tommy	*Exploration Method(s)* 6" OD X 2.25" ID Hollow Stem Auger	*Work Start/Completion Dates* 9/17/2025	*Top of Casing Elev. (NAVD88)* NA	*Depth to Water (Below GS)* 7.5' (ATD)

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	Material Type	Description	Depth (ft)
0	1440	Boring backfilled with bentonite chips and capped with excavated soil.	S-1		11 14 14			**FILL** SAND WITH SILT AND GRAVEL (SP-SM); medium dense, slightly moist, brown gray; fine to coarse sand; fine to coarse, subrounded to subangular gravel	
5	1435	▽ 9/17/2025	S-2		5 4 5			SILTY SAND WITH GRAVEL (SM); loose, wet, gray brown; fine to coarse sand; fine to coarse, subangular to angular.	5
			S-3		10 29 18			**ALLUVIUM** SANDY SILT (ML); dense, wet, brown; non-plastic silt; fine to coarse sand.	
10	1430		S-4	23.4 ●	2 1 1	PS		SILTY SAND (SM); very loose, wet, gray brown; fine to coarse sand.	10
			S-5		50/5"			SILTY SAND (SM); very dense, wet, gray; fine to coarse sand.	
15	1425		S-6	13.7 ●	35 26 16	PS		**WEATHERED CHUMSTICK SANDSTONE (Tc)** SANDSTONE; Silty sand (SM); dense, wet, red brown; fine to coarse sand; fine to coarse, subrounded gravel.	15
20	1420		S-7		27 21 42			**CHUMSTICK SANDSTONE (Tc)** SANDSTONE; very weak (R1), slightly weathered, gray; dipping beds with fine to coarse sand.	20
								Bottom of exploration at 21.5 ft. bgs.	

Legend

Sample Type
- ◯ No Soil Sample Recovery
- ◪ Split Barrel 2" X 1.375" (SPT)

Plastic Limit ⊢——⊣ Liquid Limit

Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: KDS
Approved by: NCS

Exploration Log GB-02
Sheet 1 of 1

NEW STANDARD EXPLORATION LOG TEMPLATE P:\GINTW\PROJECTS\NWG0072 - SAND CRK.GPJ November 11, 2025

APPENDIX B
Geotechnical Laboratory Testing Results

Geotechnical Laboratory Testing Results

We submitted selected samples from our explorations for laboratory testing to characterize the grain size and moisture content of the Site soils. The laboratory tests were conducted in accordance with ASTM International (ASTM) D422, *Standard Test Methods for Particle-Size Analysis of Soils*. The results of the laboratory testing are presented in this appendix.

hayremcelroy & associates, llc

9644 153rd Ave NE
Redmond, WA 98052
p 425.869.6750

Moisture Content

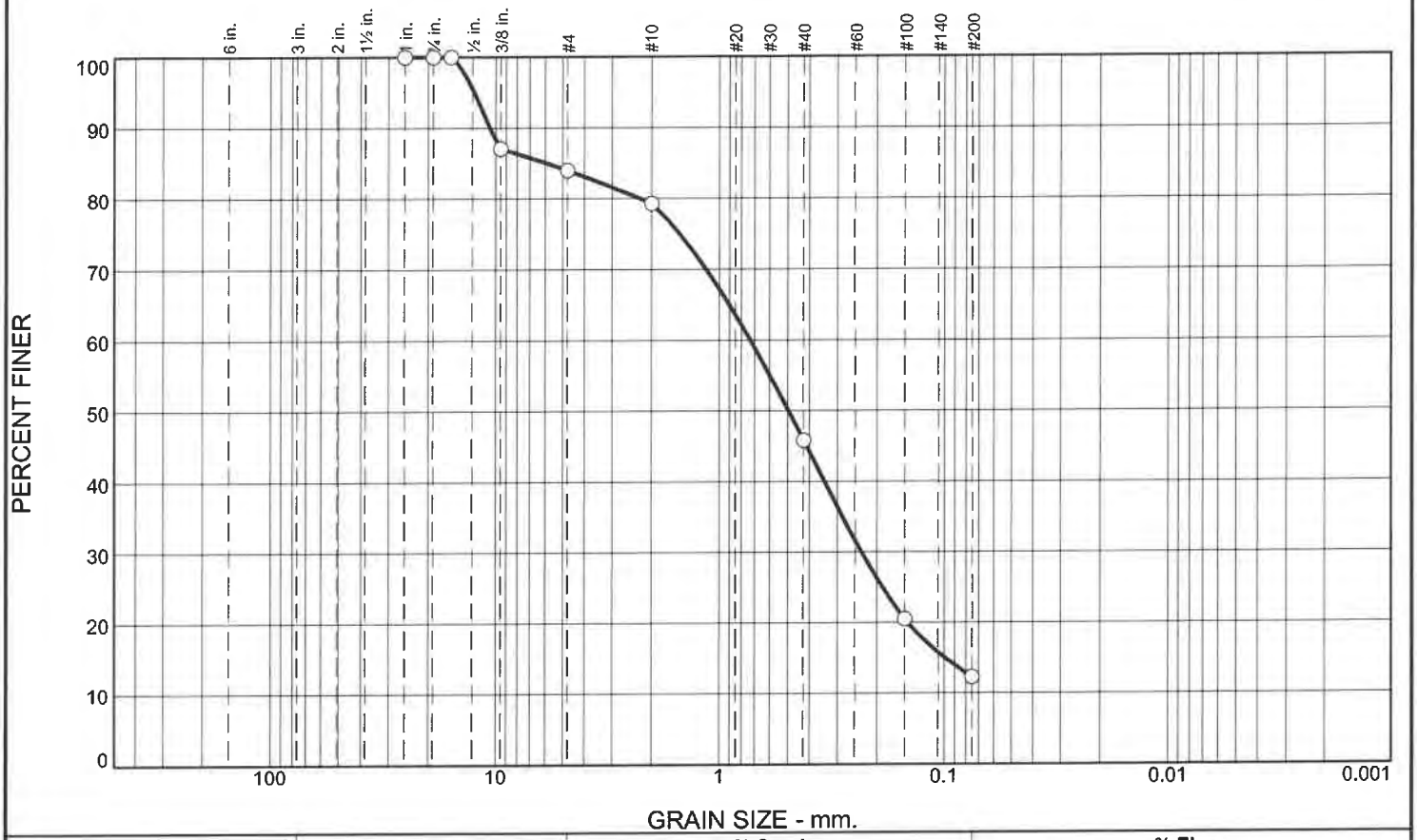
ASTM D-2216

HMA Project Number:	08-175	Received Date:	09/29/25
Project Name:	Mission Creek	Start Date:	10/02/25
Description:	Soil	Finish Date:	10/06/25
Lab Number:	8994	Technician:	HL

Lab #	Boring	Sample #	Depth (ft)	Tare ID	Weight of Moist Soil + Tare (g)	Weight of Dry Soil + Tare (g)	Tare Weight (g)	Weight of Water (g)	Moisture Content (%)
8994-A	**GB-01**	S-2	5'	LD-14	302.0	285.7	13.3	16.3	**6.0**
8994-B	**GB-02**	S-4	10'	WU-10	582.2	474.4	13.0	107.8	**23.4**
8994-C	**GB-02**	S-6	15'	MS-10	597.8	527.2	12.6	70.6	**13.7**

Oven No.	Oven In-Calibration	Calibration Due	Balance	In Calibration	Calibration Due
B23ERS-0026	8/18/2025	August 2026	545249	8/18/2025	Auguest 2026

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.0	4.7	33.5	33.5	12.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	100.0		
5/8"	100.0		
3/8"	87.1		
#4	84.0		
#10	79.3		
#40	45.8		
#100	20.5		
#200	12.3		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 10.6285 D_{85}= 5.8724 D_{60}= 0.7326
D_{50}= 0.4963 D_{30}= 0.2348 D_{15}= 0.0994
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

MC - 6.0%

Source of Sample: GB-01 **Depth:** 5 ft.
Sample Number: S-2

Date: 10/17/2025

Hayre McElroy & Associates, LLC

Redmond, WA

Client: Aspect / Geosyntec
Project: Mission Creek
Project #NWG0072
Project No: Lab #8994

Figure

Tested By: HL **Checked By:** JM

GRAIN SIZE DISTRIBUTION TEST DATA

10/17/2025

Client: Aspect / Geosyntec
Project: Mission Creek
Project #NWG0072
Project Number: Lab #8994
Location: GB-01
Depth: 5 ft. **Sample Number:** S-2
Material Description: Silty sand with gravel
Date: 10/17/2025
USCS Classification: SM
Testing Remarks: MC - 6.0%
Tested by: HL **Checked by:** JM

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 251.90
Tare Wt. = 13.30
Minus #200 from wash = 12.4%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
285.70	13.30	0.00	1"	0.00	100.0
			3/4"	0.00	100.0
			5/8"	0.00	100.0
			3/8"	35.20	87.1
			#4	43.60	84.0
			#10	56.40	79.3
			#40	147.60	45.8
			#100	216.60	20.5
			#200	239.00	12.3

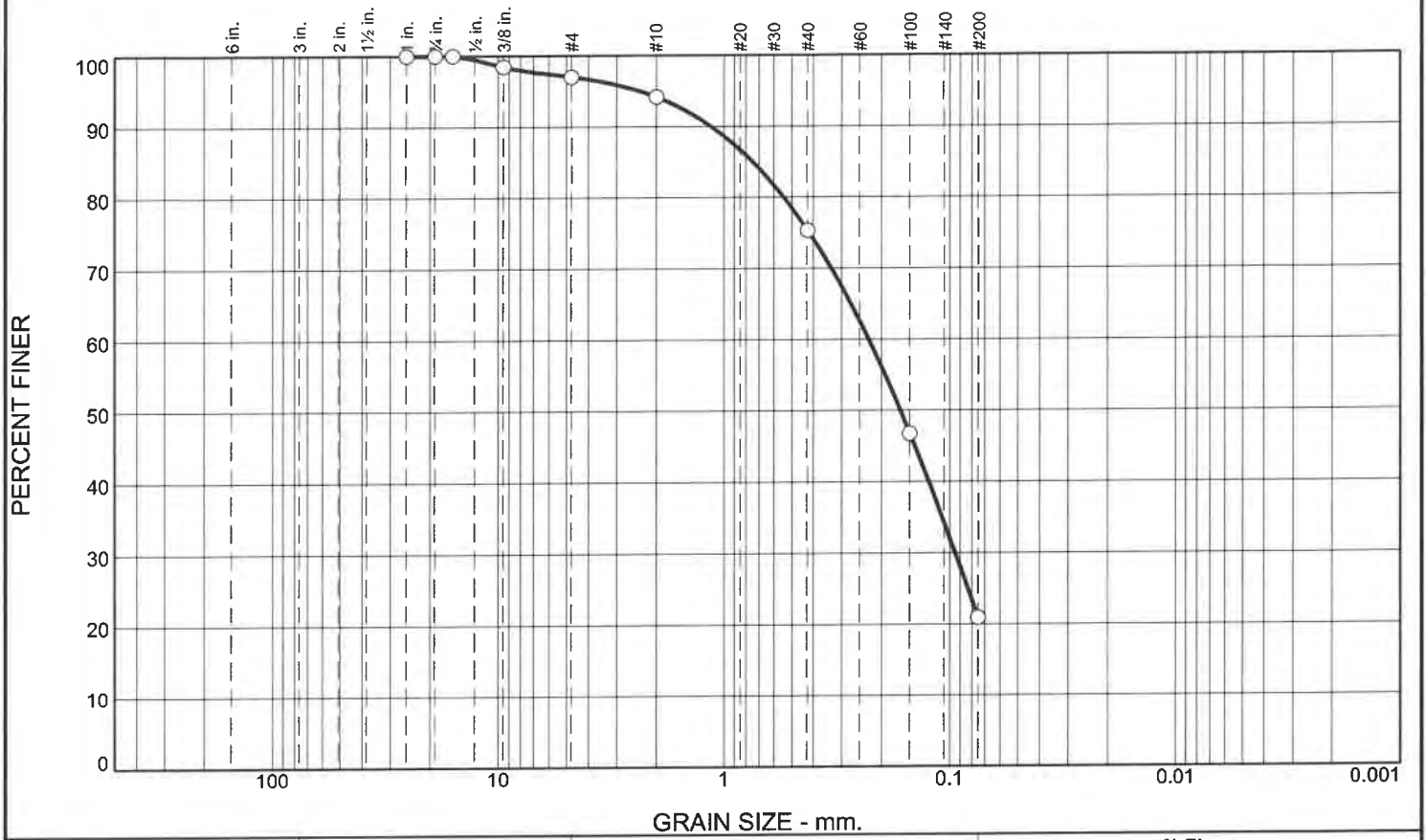
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	16.0	16.0	4.7	33.5	33.5	71.7			12.3

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0994	0.1457	0.2348	0.3436	0.4963	0.7326	2.2533	5.8724	10.6285	12.5105

Fineness Modulus
2.66

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	2.8	18.9	54.4	20.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	100.0		
5/8"	100.0		
3/8"	98.5		
#4	97.0		
#10	94.2		
#40	75.3		
#100	46.8		
#200	20.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1418 D_{85}= 0.7466 D_{60}= 0.2283
D_{50}= 0.1651 D_{30}= 0.0948 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

MC - 23.4%

Source of Sample: GB-02 **Depth:** 10 ft.
Sample Number: S-4

Date: 10/17/2025

Hayre McElroy & Associates, LLC

Redmond, WA

Client: Aspect / Geosyntec
Project: Mission Creek
Project #NWG0072
Project No: Lab #8994

Figure

Tested By: HL **Checked By:** JM

GRAIN SIZE DISTRIBUTION TEST DATA

10/17/2025

Client: Aspect / Geosyntec
Project: Mission Creek
Project #NWG0072
Project Number: Lab #8994
Location: GB-02
Depth: 10 ft.
Sample Number: S-4
Material Description: Silty sand
Date: 10/17/2025
USCS Classification: SM
Testing Remarks: MC - 23.4%
Tested by: HL
Checked by: JM

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 382.20
Tare Wt. = 13.00
Minus #200 from wash = 20.0%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
474.40	13.00	0.00	1"	0.00	100.0
			3/4"	0.00	100.0
			5/8"	0.00	100.0
			3/8"	7.00	98.5
			#4	13.70	97.0
			#10	26.80	94.2
			#40	113.80	75.3
			#100	245.60	46.8
			#200	364.80	20.9

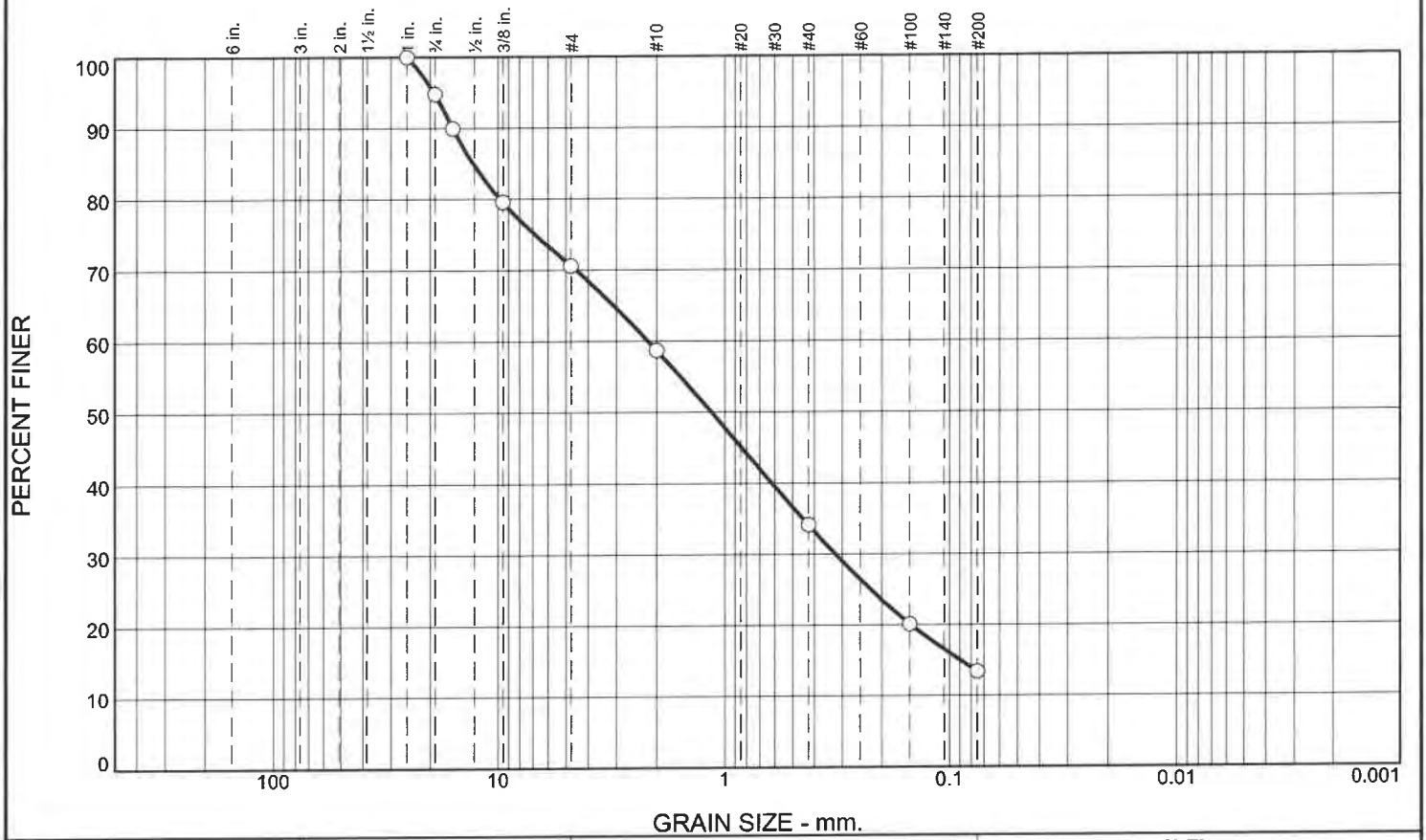
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	3.0	3.0	2.8	18.9	54.4	76.1			20.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
				0.0948	0.1239	0.1651	0.2283	0.5429	0.7466	1.1418	2.3575

Fineness Modulus
1.23

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.2	24.2	11.9	24.5	20.8	13.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	94.8		
5/8"	90.0		
3/8"	79.6		
#4	70.6		
#10	58.7		
#40	34.2		
#100	20.1		
#200	13.4		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 15.9030 D_{85}= 12.8688 D_{60}= 2.1804
D_{50}= 1.1471 D_{30}= 0.3218 D_{15}= 0.0896
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

MC - 13.7%

Source of Sample: GB-02 **Depth:** 15 ft.
Sample Number: S-6

Date: 10/17/2025

Hayre McElroy & Associates, LLC

Redmond, WA

Client: Aspect / Geosyntec
Project: Mission Creek
Project #NWG0072
Project No: Lab #8994

Figure

Tested By: HL **Checked By:** JM

GRAIN SIZE DISTRIBUTION TEST DATA

10/17/2025

Client: Aspect / Geosyntec
Project: Mission Creek
Project #NWG0072
Project Number: Lab #8994
Location: GB-02
Depth: 15 ft. **Sample Number:** S-6
Material Description: Silty sand with gravel
Date: 10/17/2025
USCS Classification: SM
Testing Remarks: MC - 13.7%
Tested by: HL **Checked by:** JM

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 460.10
Tare Wt. = 12.60
Minus #200 from wash = 13.0%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
527.20	12.60	0.00	1"	0.00	100.0
			3/4"	26.90	94.8
			5/8"	51.70	90.0
			3/8"	105.10	79.6
			#4	151.20	70.6
			#10	212.50	58.7
			#40	338.80	34.2
			#100	411.14	20.1
			#200	445.70	13.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	5.2	24.2	29.4	11.9	24.5	20.8	57.2			13.4

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0896	0.1486	0.3218	0.6167	1.1471	2.1804	9.7852	12.8688	15.9030	19.2353

Fineness Modulus
3.55

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 Geosyntec Consultants. Inc. (Geosyntec).

This Report and Project-Specific Factors

Geosyntec's services are designed to meet the specific needs of our clients. Geosyntec 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.

Geosyntec 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, Geosyntec 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 Geosyntec 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 Geosyntec Project Manager for this project.