Supplemental Hydrogeologic and Geotechnical Assessment Report

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

for
City of Spokane Valley

December 4, 2025

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1.0 Introduction

This report summarizes the results of our supplemental hydrogeologic and geotechnical assessment associated with the Ridgemont Estates Stormwater Improvement project, which is located in the vicinity of the Ridgemont Estates neighborhood in the City of Spokane Valley, Washington (the City). The results discussed herein are supplemental to project findings presented in our January 7, 2025 technical memorandum (GeoEngineers, Inc. [GeoEngineers], 2025) which covers a broader topographic area related to the Ridgemont Estates project than the focused study area described herein. The supplemental project area assessed in this report includes portions of the valley lowland west of the Ridgemont Estates neighborhood, generally bounded by South Cheryl Court to the west, East 23rd Avenue to the north, South Sonora Drive to the east and South Seabiscuit Drive to the south (the supplemental project area is herein referred to as the "Project Area"), approximately as shown in the Vicinity Map, Figure 1.

The goal of this supplemental hydrogeologic and geotechnical assessment is to evaluate subsurface conditions, infiltration rates and existing drywell performance within the Project Area and provide updated pavement design criteria based on a more comprehensive traffic dataset provided by the City. Project results will be used to identify and inform stormwater improvement alternatives for consideration by the City. Our supplemental assessment included field exploration, infiltration testing and analysis. The approximate locations of GeoEngineers' supplemental explorations and other key site features are presented in the Site Plan, Figure 2.

2.0 Scope of Services

Our services were conducted consistent with the Agreement for Professional Services between GeoEngineers and the City dated and signed August 7, 2025. Our specific scope for the services described in this report consisted of the following:

1. Coordinating with the City to identify exploration and infiltration test locations.
2. Conducting subsurface explorations and infiltration testing at selected locations within the Project Area.
    a. Explored subsurface soil, rock and groundwater conditions by drilling nine borings.
    b. Performed full-scale drywell infiltration testing of three selected drywells in general compliance with the 2024 Stormwater Management Manual for Eastern Washington (SMMEW).
3. Analyzing infiltration test data for normalized and design outflow rates.
4. Providing conclusions regarding observed drywell performance.
5. Providing recommendations on the suitability of encountered soils for support of drywells in the Project Area.
6. Providing site preparation and earthwork recommendations based upon observed soil conditions, laboratory testing and hydrogeologic conditions.
7. Providing updated pavement thickness design for select pavements based upon traffic data provided by the City.

3.0 Project Area Setting

Spokane Valley is situated within the northeast portion of the Columbia Plateau physiographic province. The existing topography of the area developed during the Pleistocene Epoch (about 2.6 million years [Ma] to 11,700 years ago) and the Holocene Epoch (about 11,700 years ago to present). In the Pleistocene, a sequence of catastrophic flood events, generated by the failure of ice dams in western Montana and northern Idaho, deposited hundreds of feet of highly permeable sediments within the Spokane River valley. Along valley flanks, the floods stripped away overlying sediments, leaving erosional features in the underlying basalt surface (Whiteman et al., 1994) and exposing underlying Miocene age (16 to 11.6 Ma) sedimentary rocks such as the Latah Formation and Precambrian age (542 Ma and older) basement rock such as the Hauser Lake Gneiss. More recent stream erosion and alluvium deposition have slightly modified this landscape. GeoEngineers (2025) provides a detailed description of geologic and hydrogeologic units underlying the Project Area. Surficial geologic conditions underlying the Project Area are outlined in the Surficial Geology Map, Figure 3.

Within and surrounding the Project Area, land use consists primarily of single-family residential properties serviced by municipal water supply and municipal sewer. The Ridgemont Estates stormwater system, in its current state, captures and transmits stormwater through a network of catch basins, pipes and ditches from the Ridgemont Estates neighborhood to designed infiltration infrastructure near the Project Area.

4.0 Exploratory Borings and Laboratory Testing

Subsurface conditions within the Project Area were explored using hollow-stem-auger (HSA) drilling methods. Nine HSA borings (B-1 through B-8, and B-1A) were completed within the Project Area using GeoEngineers in-house drill rig during the period from September 25 to 28, 2025. Approximate exploration locations are shown in Figure 2. Descriptions of GeoEngineers' field exploration procedures and boring logs are provided in Appendix A.

GeoEngineers analyzed 11 discrete soil samples for grain-size distribution by ASTM International (ASTM) Method C136 and four discrete soil samples for moisture content by ASTM Method D2216. Results of our grain-size distribution analyses are presented in Appendix B.

5.0 Site Conditions

5.1 SURFACE CONDITIONS

The Project Area straddles the south margin of the Spokane River valley between Saltese Flats and Dishman Hills. The Project Area is primarily located at the fringe of the Spokane Valley lowlands that varies from about 2,040 feet to 2,100 feet in elevation (Elevations in this report refer to the North American Vertical Datum of 1988 [NAVD 88], unless otherwise specified). An enhanced natural stormwater drainage feature is located along the south margin of the Project Area. The Project Area extends into the Spokane River Valley to the north and west with the Ridgemont Estates Plateau to the east.

The Project Area has been developed for single-family residential properties with public right-of-way occupied by asphalt pavement surfacing. As discussed by GeoEngineers (2025), existing pavements within

the Project Area are generally in poor to fair condition. Asphalt pavement conditions observed during this assessment appeared consistent with GeoEngineers (2025). Pavement conditions along East 24th Avenue between Sullivan Road and South Sonora Drive are generally fair. The roadway is beginning to exhibit signs of distress, including longitudinal cracking and minor fatigue cracking in wheel paths. Pavement along South Timberlane Drive between East 24th Avenue and South Needham Drive is in poor condition, with significant areas of transverse, longitudinal and fatigue (alligator) cracking and occasional patches. Pavement along South Timberlane Drive north of East 24th Avenue to East 23rd Avenue is in good condition, with minor transverse and fatigue cracking. Pavement along South Sonora Drive between East 24th Avenue and East Cameron Court, and along East Cameron Court, is in poor condition with extensive fatigue cracking.

5.2 SUBSURFACE CONDITIONS

5.2.1 Literature Review

5.2.1.1 SOIL SURVEY REPORTS

The Natural Resource Conservation Service (NRCS) Web Soil Survey maps the Project Area according to the following:

- Most of the Project Area west of the portion of South Timberlane Drive located south of East 24th Avenue is mapped as: “Urban Land - Opportunity, disturbed complex, 0 to 3 percent slopes.” These soils typically consist of extremely gravelly loam with decreasing silt and clay content below depths of about 3 to 5 feet.
- The Project Area underlying East Cameron Court and South Timberlane Drive south of East 24th Avenue is mapped as: “Lenz-Rock outcrop complex, 3 to 15 percent slopes.” These soils typically consist of gravelly sandy loam with decreasing silt and clay content and increasing cobble content below depths of about 1 to 2 feet. Bedrock is generally encountered between 3 and 4 feet.
- A small portion at the east Project Area boundary underlying South Sonora Drive and East 24th Avenue east of South 24th Court as: “Bricken, moist-Speigle complex, mass wasted, 8 to 25 percent slopes.” These soils typically consist of silt loam with gravel and increasing clay content below depths of about 3 to 4 feet.

The NRCS classifies each of these soils as having low risk of subsidence, moderate potential for frost action, low potential for corrosion of uncoated steel, and low to moderate potential for corrosion of concrete.

5.2.1.2 GEOLOGIC MAPPING

The Washington State Department of Natural Resources Preliminary Geologic Map of the Greenacres 7.5-Minute Quadrangle, Spokane County, Washington (Derkey et al., 2004) maps the Project Area according to the following:

- Most of the Project Area toward the valley floor and along the drainage way extending south along South Timberlane Drive and Saltese Road as glacial flood deposits, predominantly gravel (Qfg). These deposits consist of poorly to well-graded thick-bedded to massive mixtures of boulders, cobbles, gravel and sand; locally containing beds and lenses of sand and silt.
- A minor portion of the Project Area underlying East Cameron Court as Hauser Lake Gneiss basement rock (pChl). These deposits consist of interlayered schist and gneiss with localized migmatitic structure.

The surficial geology within and around the Project Area is presented in the Surficial Geology Map, Figure 3.

5.2.2 Soil Conditions

Shallow subsurface soil and rock conditions within the Project Area are composed of a complex sequence of coarse- and fine-grained glacial deposits and basement rock, as shown in Cross Section A-A', Figure 4 (cross section transect is shown in Figure 2). Observed subsurface conditions generally consisted of the following:

- Roadways generally consisted of asphalt pavement surfacing ranging in thickness from 2 to 5½ inches and crushed surfacing base course ranging in thickness from 3 to 11 inches.
- Where present, fill consisted of two general soil types including medium dense gravel with variable silt content and loose sand. Fill was observed underlying roadway base in borings B-1, B-1A, and B-2 to depths of about 2½ to 5 feet.
- Fine-grained glaciolacustrine deposits consisting of medium stiff to stiff silt were present in explorations B-1 and B-1A. These fine-grained deposits appeared to be prevalent in the Project Area approximately east of South Timberlane Drive. This unit appeared to underlay fill and or roadway base in explorations B-1 and B-1A and extended to depths of 12 and 8 feet, respectively.
- Coarse-grained glaciofluvial deposits generally consisting of sand and gravel with variable silt content was encountered to depths that ranged from about 3 to 39 feet bgs (maximum depth explored). This unit was the predominant soil type in the Project Area north and west of South Timberlane Drive. This unit was not identified in borings B-1 and can be further delineated into the following two subunits:
  - Relatively low permeability sands and gravels with appreciable silt content up to 49 percent. This unit was observed in B-1A and B-4 through B-8 to depths ranging from 1 to 20 feet bgs.
  - Relatively high permeability rounded to subrounded gravels with variably low silt content. This unit is typical of the gravels that make up the Spokane Valley/Rathdrum Prairie (SVRP) Aquifer and was observed in borings B-2 and B-3 to depths of up to 39 feet bgs (maximum depth explored).
- Basement rock consisting of variably decomposed gneiss, associated with the Hauser Lake Gneiss formation, was observed in explorations B-5, B-7 and B-8 at depths of 12½, 3 and 3½ feet, respectively.

5.2.3 Groundwater Conditions

At the time of drilling, saturated soil conditions were observed in borings B-1 and B-1A at depths of approximately 5 to 6 feet. Underlying soil moisture conditions suggest that the observed soil saturation appeared to be perched groundwater above underlying fine-grained sediments.

Based on review of well reports available on the Washington State Department of Ecology (Ecology) on-line well database, depth to groundwater in the valley floor north and west of the site vicinity is generally greater than 100 feet. Groundwater in the valley floor area is associated with the SVRP Aquifer, a highly productive aquifer composed of sand, gravel, cobbles and boulders deposits during previously-described Pleistocene flood events.

5.3 DRYWELL TESTING

Three full-scale drywell tests (IT-1 through IT-3) were completed on October 21 and 22, 2025 at the approximate locations presented in Figure 2. IT-1 was conducted in an existing drywell located in the west

bound lane of East 24th Avenue approximately 550 feet east of Sullivan Road. IT-2 was conducted in an existing drywell southeast of the intersection of South Timberlane Drive and East 23rd Avenue. IT-3 was conducted in an existing drywell south of the intersection of South Timberlane Drive and East 27th Avenue.

The tests were conducted in general accordance with Chapter 6 of the SMMEW (Ecology, 2024), Results were analyzed for normalized and design outflow rate in general accordance with Appendix 4B of the *Spokane Regional Stormwater Manual* (Spokane County et al., 2008). A detailed description of testing procedures is presented in Appendix A. Hydraulic testing data and results are summarized below and attached in Appendix C.

5.3.1 IT-1 - East 24th Avenue Drywell

The selected drywell included a cylindrical concrete double-drum construction with a 4-foot-diameter active barrel section extending from about 4 feet bgs to the apparent bottom measured at 11.8 feet bgs. Silt, sand, gravel and concrete debris were observed at the base of the drywell. The drywell is constructed with a concrete reduction and extension from the top of the active barrel to the manhole cover. A lateral inlet pipe was observed near the top of the active barrel from a north adjacent catch basin. The bottom of the inlet was measured at 4.2 feet bgs.

Water for the test was sourced from a Vera Water and Power hydrant located on the north side of East 24th Avenue approximately 200 feet west of the selected drywell. Approximately 21,600 gallons of water were discharged into the drywell during testing. Head within the drywell was maintained at a height of approximately 2 feet (measured from the bottom of the drywell) during the approximate 1-hour constant head period. To maintain the constant head, the hydrant was discharged at maximum capacity. Discharge rates during the constant head period ranged from approximately 260 gallons per minute (gpm) to 300 gpm. For a double-depth drywell with a design drywell head of 10 feet, the normalized outflow rate for the constant rate period was approximately 3.1 cubic feet per second (cfs). In the nearest project boring (B-2), soil at a depth of 8.5 to 10 feet bgs contained 7 percent fines (silt- and clay-sized particles passing the U.S. No. 200 sieve), which corresponds to a minimum safety factor of 1.8 (Spokane County et al., 2008). Application of a safety factor of 1.8 to the normalized outflow rate yields a design outflow rate of approximately 1.7 cfs.

The duration of the falling head period was 29 minutes, which was the time required for the drywell to go dry. The falling-head infiltration rate generally diminished over time as head decreased, potentially reflecting the impact of accumulated sediment and debris at the bottom of the drywell. Full-scale drywell testing data for IT-1 are presented in Table C-1 and Figure C-1 of Appendix C.

5.3.2 IT-2 - East 23rd Avenue Drywell

The selected drywell included a cylindrical concrete double-drum construction with a 4-foot-diameter active barrel section extending from about 4 feet bgs to the partial concrete bottom measured at 13.2 feet bgs. Sediment and debris were not observed at the base of the drywell. The drywell is constructed with a concrete reduction and extension from the top of the active barrel to the manhole cover. Lateral piping was not observed.

Water for the test was sourced from a Vera Water and Power hydrant located at the south corner of East 23rd Avenue and South Timberlane Drive approximately 20 feet northwest of the selected drywell. Approximately 32,100 gallons of water were discharged into the drywell during testing. Head within the

drywell was maintained at a height of about 1 foot during the approximate 1-hour constant head period. To maintain the constant head, the hydrant was discharged at maximum capacity. Discharge rates during the constant head period ranged from approximately 420 gpm to 480 gpm. For a double-depth drywell with a design drywell head of 10 feet, the normalized outflow rate for the constant rate period was approximately 10.3 cfs. In the nearest project boring (B-3), soil at a depth of 8.5 to 10 feet bgs contained 7 percent fines, which corresponds to a minimum safety factor of 1.8 (Spokane County et al., 2008). Application of a safety factor of 1.8 to the normalized outflow rate yields a design outflow rate of approximately 5.7 cfs.

The duration of the falling head period was 2 minutes, which was the time required for the drywell to go dry. The falling-head infiltration rate generally remained steady over time as head decreased. Full-scale drywell testing data for IT-2 are presented in Table C-2 and Figure C-2 of Appendix C.

5.3.3 IT-3 - South Timberlane Drive Drywell

The selected drywell included a pentagonal concrete triple-drum construction with a 4-foot-diameter active barrel section extending from about 1.4 feet bgs to the apparent bottom measured at 10.4 feet bgs. Silt, sand, gravel and detritus were observed at the base of the drywell. The drywell is constructed with a concrete reduction and extension from the top of the active barrel to the manhole cover. A lateral inlet pipe was observed near the top of the active barrel from a northwest adjacent catch basin. The bottom of the inlet was measured at 3.2 feet bgs.

Water for the test was sourced from a Vera Water and Power hydrant located at the northwest corner of South Timberlane Drive and East 27th Avenue, approximately 60 feet northwest of the drywell. A total of approximately 1,105 gallons were discharged into the drywell during testing. Head within the drywell was maintained just below the bottom of the lateral outfall pipe at a height of about 6.4 feet during the approximate 1-hour constant head period. The discharge rate during the constant head period was approximately 3 gpm. For a double-depth drywell with a design drywell head of 10 feet, the normalized outflow rate for the constant rate period was approximately 0.01 cfs. In the nearest project boring (B-5), soil at a depth of 3.5 to 5 feet bgs contained 19 percent fines and soil at a depth of 8.5 to 10 feet bgs contained 8 percent fines. Given this range in fines content, GeoEngineers applied a safety factor of 2.5 to the normalized outflow rate, which yields a design outflow rate of approximately 0.004 cfs. However, it should be noted that gneissic bedrock in boring B-5 was encountered at a depth of approximately 12.5 feet bgs in adjacent boring B-5. Because gneissic bedrock likely forms a limiting layer to stormwater infiltration, this observation suggest that this drywell might not satisfy the limiting layer separation requirements specified by Spokane County et al., (2008). The falling head period was monitored for 30 minutes, during that time the head level within the drywell decreased approximately 4.8 inches. The falling-head infiltration rate generally remained constant over the falling head period. Full-scale drywell testing data for IT-3 are presented in Table C-3 and Figure C-3 of Appendix C.

5.3.4 Summary of Results

Full-scale drywell infiltration testing results are summarized in Table 1.

TABLE 1. FULL-SCALE DRYWELL TESTING SUMMARY

TEST NUMBER	LOCATION	NORMALIZED OUTFLOW RATE (CFS)[1]	CORRECTION FACTOR[2]	DESIGN OUTFLOW RATE[3] (CFS)
		CONSTANT HEAD PERIOD		
IT-1	E 24th Ave	3.1	1.8	1.7
IT-2	E 23rd Ave	10.3	1.8	5.7[4]
IT-3	S Timberlane Dr	0.01	2.5	0.004

Notes:

[1]The normalized outflow rate provided for the constant head period represents the 1-hour constant rate period.

[2]The correction factor was adapted from Table 4B-1 of the 2008 Spokane Regional Stormwater Manual.

[3]The preliminary design outflow rate was estimated by applying the correction factor to the normalized outflow rate.

[4]Because of the limited drywell head achieved during testing, GeoEngineers recommends design outflow rate at IT-2 not exceed 2 cfs (see Section 6.0: Conclusions and Recommendations).

cfs = cubic feet per second.

Preliminary design outflow rates range from 5.7 cfs at the East 23rd Avenue (IT-2) drywell to 0.004 cfs at the South Timberlane Drive (IT-3) drywell.

5.4 GRAIN-SIZE CORRELATIONS

Given the slow outflow rates measured in IT-3, we also estimated drywell outflow rates using correlations to soil grain size for borings B-4 through B-6 which, similar to IT-3, are located on South Timberlane Drive. The Spokane 200 Method was used as outlined in the Spokane Regional Stormwater Manual (Spokane County et al., 2008) dated April 2008. Approximate design drywell outflow rates using the Spokane 200 Method are presented in Table 2 below.

TABLE 2. SPOKANE 200 METHOD SUMMARY FOR BORINGS ON SOUTH TIMBERLANE DRIVE

BORING	DESIGN DRYWELL OUTLFOW RATE (CFS)	
	TYPE A	TYPE B
B-4	0.013	0.022
B-5	0.018	NA
B-6	0.009	0.014

Notes:

[1]The safety factor was adapted from Table 4B-1 of the 2008 Spokane Regional Stormwater Manual based on the results of grain-size analyses of representative samples from nearby borings.

[2]The design outflow rate was estimated by applying the correction factor to the normalized outflow rate and multiplying by six for a single-depth (Type I or Type A) drywell and by 10 for a double-depth (Type II or Type B) drywell.

NA = Not Applicable

cfs = cubic feet per second.

A Type B drywell is not applicable at B-5 as it does not meet the minimum vertical separation requirement between the bottom of a drywell and a limiting layer (in this case bedrock). The borings were drilled during a period of low seasonal groundwater level (August) and drywell performance could be negatively impacted by seasonal high groundwater levels, which could be expected during winter and/or spring.

6.0 Conclusions and Recommendations

6.1 STORMWATER INFILTRATION CONSIDERATIONS

The design outflow rates associated with the drywell tests described herein vary over a wide range. At IT-1 and IT-2, design outflow rates are approximately 1.7 and 5.7 cfs, respectively. At IT-3, the design outflow rate is approximately 0.004 cfs. Relatively poor drywell performance at IT-3 is corroborated by Spokane 200 Method grain size correlations using adjacent borings. This supports the conclusion that, while some of the poor performance in IT-3 could be the result of drywell siltation, poor drywell performance can primarily be attributed to hydrogeologic conditions at the IT-3 drywell location.

Implementing the drywell test analysis procedure described by Spokane County et al. (2008) yielded a design outflow rate of 5.7 cfs at IT-2. However, because of the limited water height (approximately 1 foot) achieved in IT-2 during testing, it is our opinion that extrapolation of those results to a 10-foot drywell design head is tenuous. Therefore, we recommend that the City limit the design outflow rate at IT-2 to 2 cfs or less.

From a stormwater infiltration perspective, project results indicate that the project area can be broadly divided into two regions, approximately separated by the red line shown in Figure 2. Northwest of the line, subsurface conditions are generally characterized by relatively coarse-grained glaciofluvial sediments and a relatively thick unsaturated zone. These conditions generally are conducive to subsurface infiltration using drywells, as indicated by drywell testing results at IT-1 and IT-2. Southeast of the line shown in Figure 2, subsurface conditions are generally characterized by a combination of shallow bedrock, shallow fine-grained sediment, and/or shallow groundwater. These conditions generally are not conducive to subsurface infiltration using drywells, as indicated by drywell testing results at IT-3.

It is important to understand, however, that the red dividing line shown in Figure 2 is approximate and appropriate for regional planning purposes only. Subsurface conditions and potential drywell performance should be confirmed through exploration and testing prior to design and/or construction of specific stormwater infiltration facilities.

The red dividing line shown in Figure 2 suggests that a large portion of the Project Area (to the southeast of the line) might not be conducive to drywell-based stormwater infiltration. In this portion of the Project Area, the City could consider conveying stormwater to the northwest for infiltration within the area underlain by a thick sequence of relatively coarse-grained glaciofluvial deposits. This could be accomplished, for example, by siting multiple, relatively closely spaced drywells in an appropriate location northwest of the dividing line. If the City pursues this approach, we recommend that the suitability of the potential infiltration location be evaluated through the following:

- Performance of a full-scale drywell test at the closest existing drywell location (if not IT-1 or IT-2).
- Drilling of a boring to a depth of 60 feet bgs to confirm the presence of a suitable sequence of unsaturated glaciofluvial sediment beneath the site.

- Performance of a groundwater infiltration and mounding analysis to evaluate appropriate drywell spacing and the capacity of the site to infiltrate the planned stormwater volume with acceptable groundwater mounding conditions.

6.2 UPDATED PAVEMENT THICKNESS DESIGN

6.2.1 General

We conducted additional pavement thickness design calculations based on site-specific traffic data collected by the City. We used procedures outlined in the American Association of State Highway and Transportation Officials (AASHTO) 1993 Pavement Design Guidelines (AASHTO, 1993) to complete pavement thickness design. Input parameters referenced in our previous technical memorandum were used in our additional analyses.

6.2.2 Traffic

The City collected traffic count data at the following locations:

- South Vera Crest Drive between East 22nd Avenue and South Conklin Road.
- East 22nd Avenue between South Carmine Street and South Conklin Road.

The traffic counts were conducted over a period of 3 days from September 9 to 11, 2025 (Tuesday through Thursday). The traffic counts provided total traffic for both lanes divided into vehicle classifications. Based on the time of year and days of the week, the traffic counts captured school bus traffic. For simplicity, we assumed the traffic count data remained consistent throughout the year.

As discussed in our previous technical memorandum, we used truck factors provided in both the Spokane Valley Street Standards and from the Washington State Department of Transportation (WSDOT) to estimate equivalent single axle loads (ESALs). To estimate ESALs for a 20-year design life, we assumed a directional distribution factor of 50 percent (equal traffic in both lanes) and a growth rate of 1.5 percent. Table 2 presents the results of the ESAL estimates. We also estimated ESALs for 24th Avenue assuming traffic on 24th Avenue equals the sum of the ESALs from South Vera Crest Drive and East 22nd Avenue.

TABLE 2. SUMMARY OF 20-YEAR DESIGN LIFE ESAL ESTIMATES BASED ON SITE-SPECIFIC TRAFFIC DATA

LOCATION	ESALS	
	SPOKANE VALLEY	WSDOT
South Vera Crest between E. 22nd and S. Conklin	157,000	63,000
East 22nd Avenue between S. Carmine and S. Conklin	711,000	244,000
24th Avenue	870,000	311,000

Notes:
ESALS = equivalent single axle loads

The ESAL estimates derived using the Spokane Valley truck factors are about 2.5 to 2.9 times larger than the ESAL estimates derived using the WSDOT truck factors. This appears to largely be the result of significantly larger truck factors used by Spokane Valley for buses (2.87 ESALs per bus) compared to WSDOT (0.57 ESALs per bus).

6.2.3 Results

Table 3 presents the results of our pavement thickness design based on street location and ESAL estimates.

TABLE 3. PAVEMENT THICKNESS DESIGN RESULTS

LOCATION	ESALS	HMA (INCHES)	CRUSHED ROCK BASE COURSE (INCHES)
South Vera Crest between East 22nd and South Conklin	63,000	3	7
	157,000	3.5	7.5
East 22nd Ave between South Carmine and South Conklin	244,000	4	7.5
	711,000	4.5	9.5
24th Avenue	311,000	4	8
	870,000	4.5	10.5

6.2.4 Earthwork Recommendations

Subgrade at the locations of most of our previous and recent explorations consisted of sand and gravel with variable fines content. Thus, at this time we do not anticipate that geotextile separation fabric will be required between subgrade soil and base course. However, it is possible that silt and clay could be encountered at subgrade elevation in some areas. Therefore, contingencies should be included for placement of geotextile fabric in areas where fine-grained (silt and clay) soil is encountered at working subgrade, or where soft spot repair is required.

Subgrade should be prepared in accordance with section 8.3.3 of the City of Spokane Valley Street Standards. If subgrade consists of very stiff to hard silt or clay, alternative measures such as probing or proof-rolling could be considered. The most appropriate means of evaluating subgrade preparation should be determined by the project geotechnical engineer at the time earthwork is performed. If soft spots are encountered, subgrade soil should be excavated to firm bearing or a depth of 2 feet, whichever is greater, and replaced with suitable granular structural fill. Alternatively, the depth of overexcavation could be reduced in conjunction with the use of a high strength geotextile fabric such as Mirafi 380i.

Portions of the site soil encountered in our explorations are moisture sensitive (particularly silt [ML], clay [CL], silty sand [SM] and silty gravel [GM] soils identified on the exploration logs). These soils will be difficult to adequately work and compact if moisture contents are not within about 2 to 4 percentage points of optimum at the time of earthwork. When the moisture content of the soil is more than a few percent above the optimum moisture content, the soil could become muddy and unstable. Operation of equipment on such unstable soil without causing disturbance will be difficult, and it will be difficult or impossible to meet the required compaction criteria. Disturbance of near-surface soil should be expected if earthwork is performed during periods of wet weather. We recommend scheduling site preparation and earthwork activities during extended periods of dry weather when the soil should: (1) be less susceptible to disturbance; (2) provide better support for construction equipment; and (3) be more likely to meet the required compaction criteria.

If earthwork activities cause excessive subgrade disturbance after stripping, removal of the disturbed soil and moisture-conditioning such as scarifying or windrowing and waiting for the soil to dry, mixing with drier or less moisture sensitive soil, or replacement with structural fill might be necessary. Disturbance to a greater depth should be expected if site preparation work is conducted during periods of wet weather when the moisture content of the site soil could exceed optimum.

6.2.5 Use of On-site Soil

The suitability of on-site soil for reuse as structural fill below pavement areas depends on soil gradation and moisture content at the time of compaction. As the amount of fines increases, soil becomes increasingly sensitive to slight changes in moisture content and adequate compaction becomes more difficult to achieve. In our opinion:

- Silt and clay soil is highly moisture sensitive and typically is poorly suited for reuse as structural fill. We suggest to the extent practicable, that silt and clay soil not be used as structural fill below roadway sections.
- The silty sand and silty gravel soils encountered in our explorations should be suitable for reuse as structural backfill below roadway sections. However, they generally contain a relatively high amount of fines and are moisture sensitive. These soils could become unstable under construction traffic and difficult to manage or compact during or after periods of precipitation. As such, these soils should only be considered suitable for use as structural fill during prolonged periods of warm, dry weather. In addition, this material might need to be screened to remove particles greater than 6 inches in maximum dimension.

The sand and gravel soils with relatively low fines content (soils with group classifications of “SP,” “SP-SM,”, “SW-SM,” “GP,” “GP-GM,” “GW-GM” on the exploration logs) generally contain a low to moderate amount of fines and should be suitable for use as an all-weather structural fill, provided these soils are properly moisture-conditioned for compaction. These soils might need to be screened to remove cobbles and boulders before being reused as structural fill.

7.0 Limitations

We prepared this report for the City of Spokane Valley to assist in the characterization of the hydrogeologic and pavement conditions within the Project Area. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the fields of hydrogeology and geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix D, “Report Limitations and Guidelines for Use” for additional information pertaining to use of this report.

8.0 References

American Association of State Highway and Transportation Officials (AASHTO), "Guide for Design of Pavement Structures," 1993.

City of Spokane Valley, Street Standards. Adopted December 2009, Revised February 2018.

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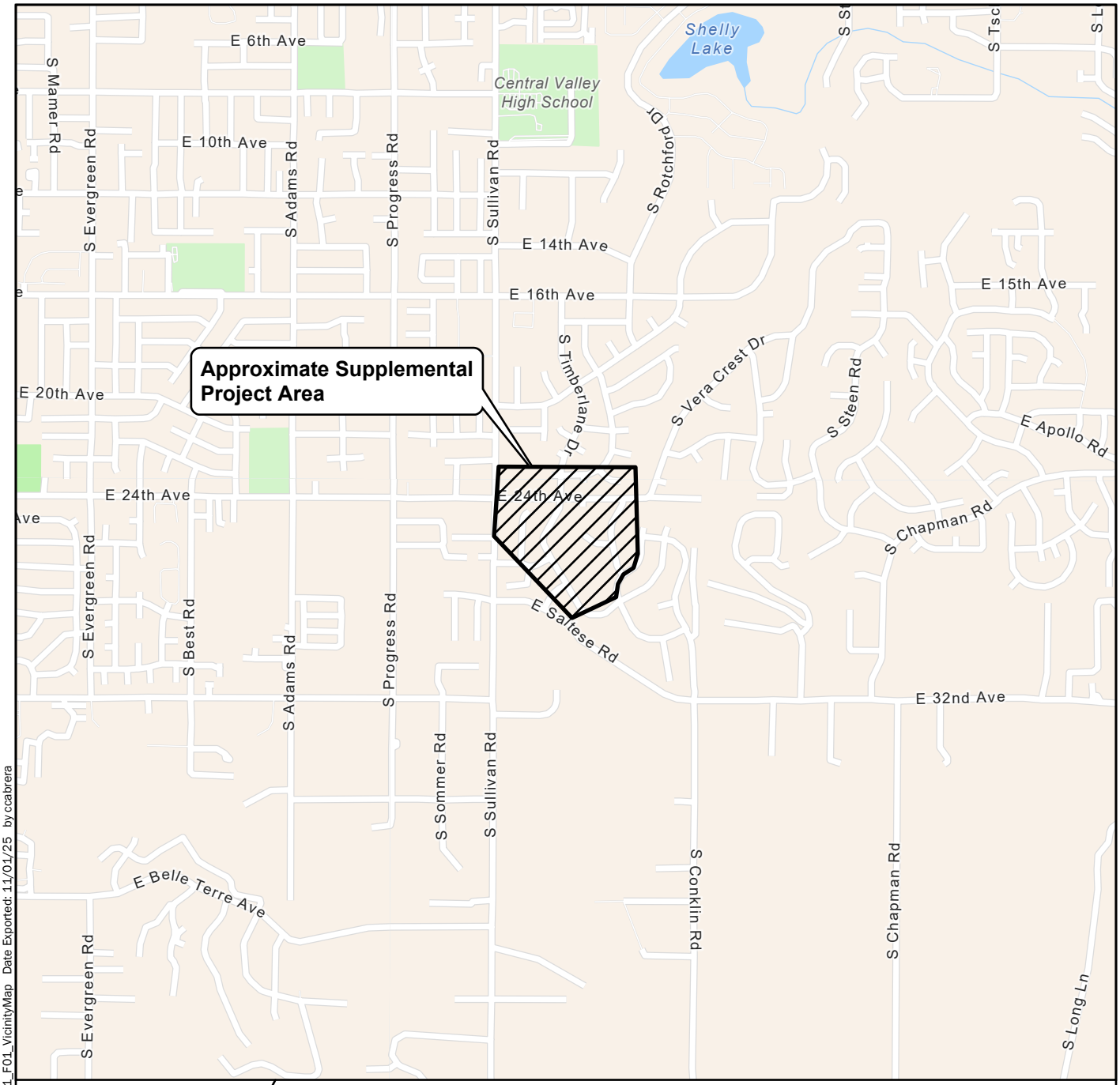
Figures



Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 11N

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Vicinity Map

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

GeoEngineers

Figure 1

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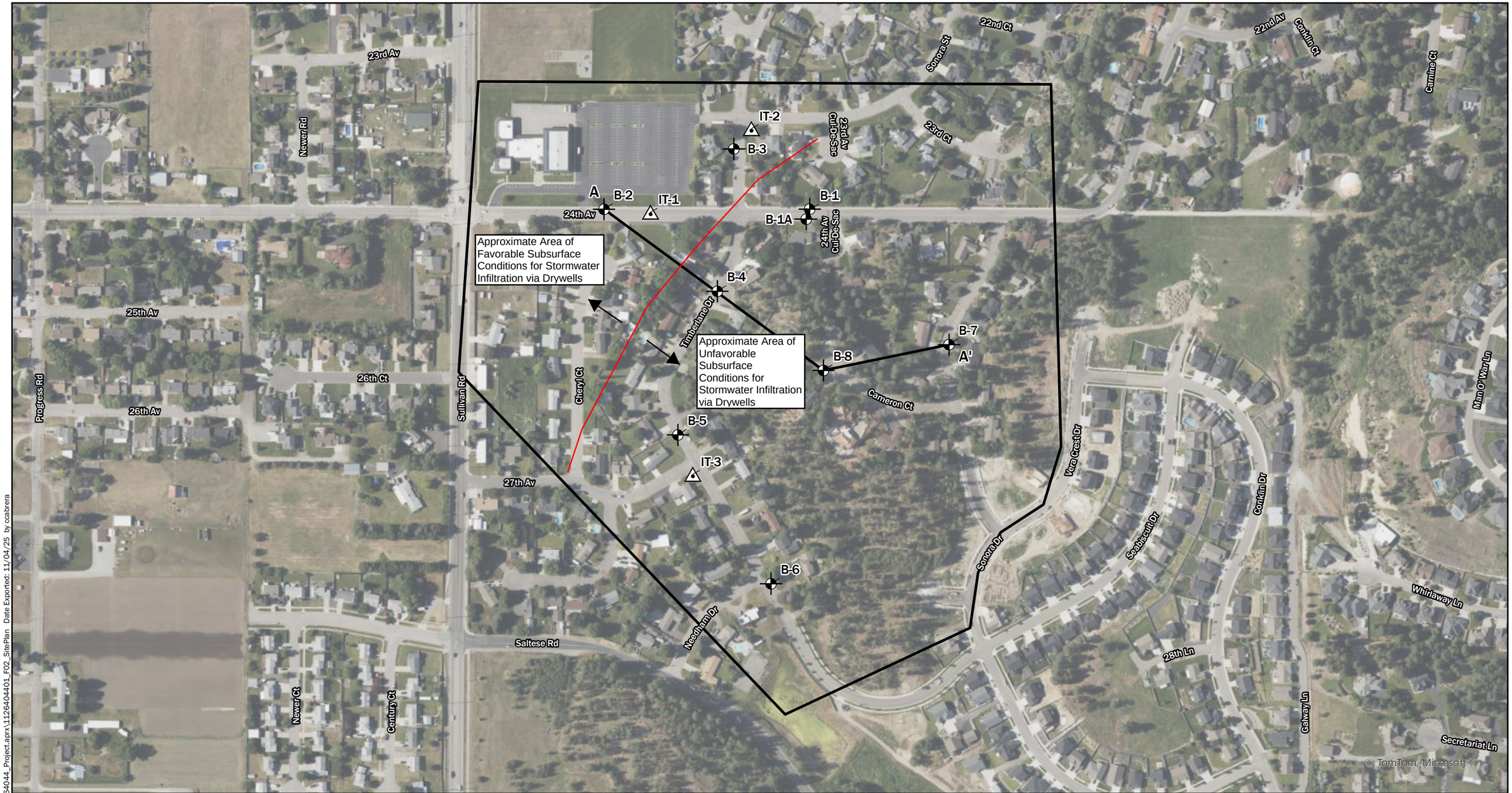

P:\11\11264044\GIS\11264044_Project\112640401_F02_SitePlan Date Exported: 11/04/25 by ccabrera

Source(s):
- Spokane County GIS
- Azure Imagery

Coordinate System: NAD 1983 UTM Zone 11N 1

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Legend

- Boring Number and Approximate Location
- Infiltration Test Number and Approximate Location
- Cross Section
- Approximate Supplemental Project Area

N

0 300

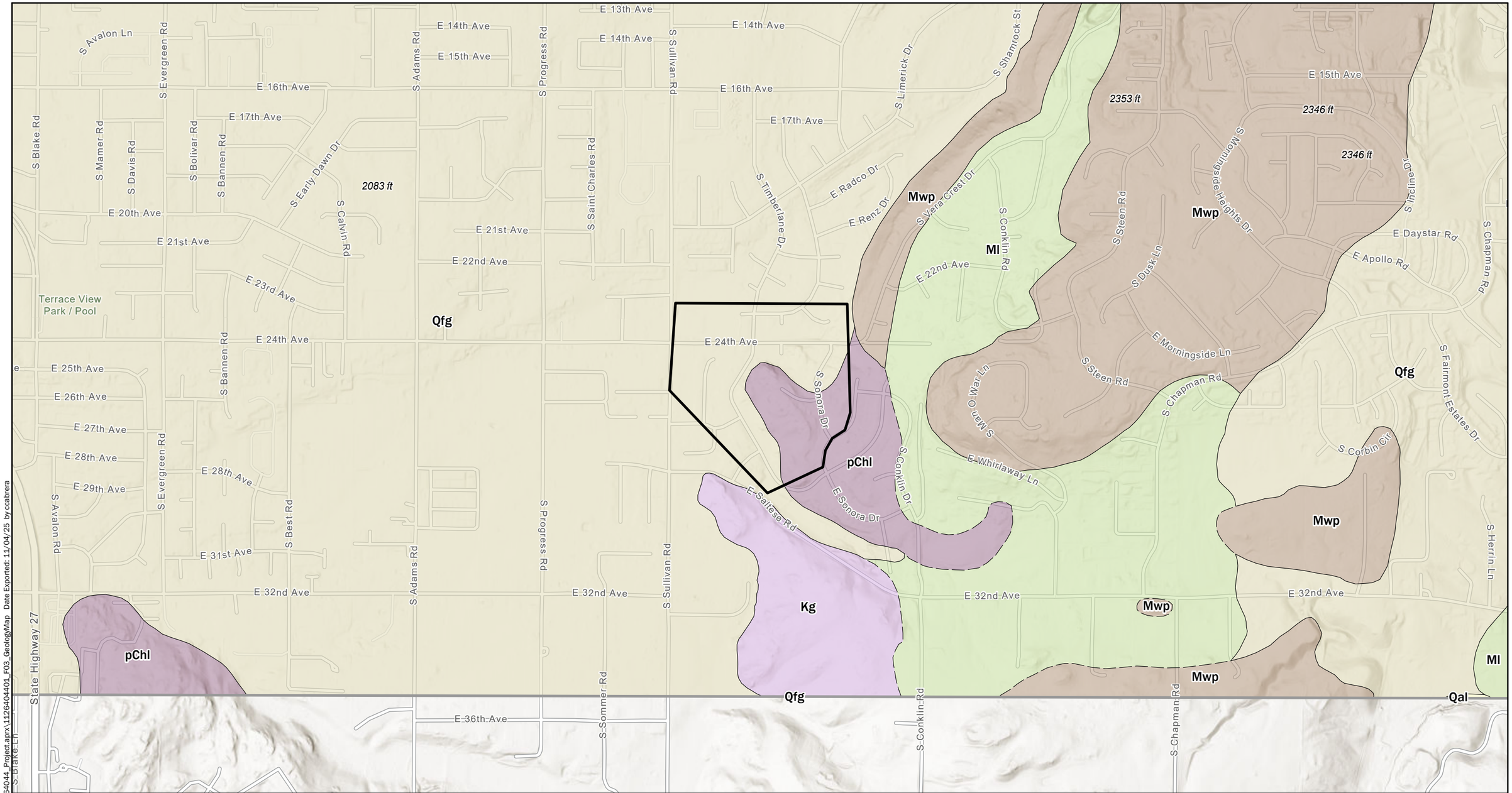
Feet

Site Plan

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

GeoEngineers

Figure 2



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Source(s):
- Washington DNR 1:24K Geology, https://www.dnr.wa.gov/.
- ESRI Terrain Base Map

Coordinate System: NAD 1983 UTM Zone 11N

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Legend

Approximate Supplemental Project Area

Geologic Units 24k

Quaternary Rocks and Deposits
- Qaf Quaternary alluvium
- Qfg Pleistocene glaciofluvial deposits

Neogene Rocks
- Ml Miocene Latah Formation
- Mwp Miocene Columbia River Basalt Group, undivided

Mesozoic Rocks
- Kg Mesozoic intrusive rocks

Precambrian Rocks
- pChl Precambrian heterogeneous metamorphic rocks

N

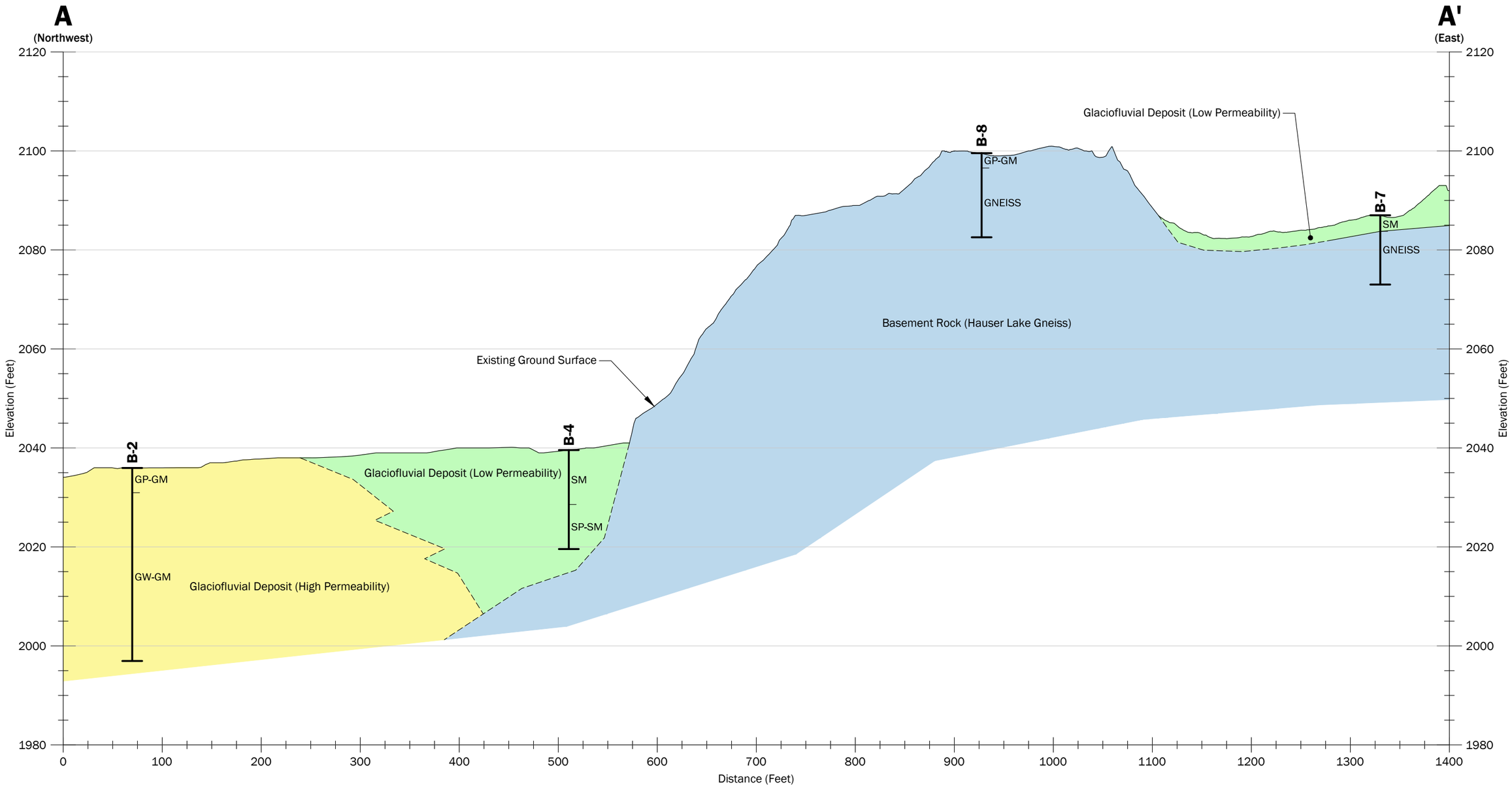
0 1,000
Feet

Surficial Geology Map

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

GeoEngineers

Figure 3

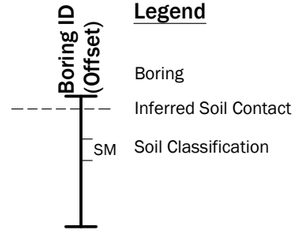


Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: NAVD88

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.



Legend

Boring

Inferred Soil Contact

Soil Classification

Glaciofluvial Deposit (High Permeability)

Glaciofluvial Deposit (Low Permeability)

Basement Rock (Hauser Lake Gneiss)

0 100
Horizontal Feet

0 20
Vertical Feet
Vertical Exaggeration = 5X

Cross Section A-A'

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

GeoEngineers

Figure 4

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Appendices

Appendix A
Field Explorations

Appendix A
Field Explorations

SUBSURFACE EXPLORATION

Subsurface soil and groundwater conditions at the Project Area were explored from September 25 to 28, 2025. Subsurface explorations included drilling nine borings (B-1, B-1A, and B-2 through B-8) at the approximate locations shown in the Site Plan, Figure 2.

Borings were drilled using a truck-mounted hollow-stem-auger drill rig owned and operated by GeoEngineers, Inc. (GeoEngineers) Samples of soil encountered in the borings were obtained at approximate 2½- to 5-foot-depth intervals using either a 2-inch outside-diameter standard split-spoon sampler or a 3.25-inch outside-diameter Dames and Moore style split barrel sampler. The larger diameter sampler was used to improve sample recovery in the gravely site soil. The samplers were driven into the soil using a 140-pound automatic hammer falling 30 inches on each blow. The number of blows required to drive the samplers each of three 6-inch increments of penetration were recorded in the field. The sum of the blow counts for the last two 6-inch increments of penetration is reported on the boring logs as the ASTM International (ASTM) D 1586-08A Standard Penetration Test (SPT) N-value for the standard sampler. The approximate SPT N-values for the Dames and Moore style sampler are provided on the boring logs and the respective sample depths.

The explorations were observed by an experienced representative from our firm who documented the exploration progress, classified the soil and rock encountered, obtained representative samples, and observed groundwater conditions, if encountered.

Soil encountered in the explorations was classified in general accordance with the ASTM D 2488 (visual-manual procedure) and the classification chart listed in Key to Exploration Logs, Figure A-1. The following is a list of figures included in Appendix A. Logs of the borings are presented in Logs of Borings, Figures A-2 through A-10.

The exploration logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials or their characteristics change, although these changes might actually be gradual.

Exploration locations were selected in coordination with the City of Spokane Valley. The exploration locations were established in the field and preliminarily recorded using an iPhone with GIS software. Exploration locations and elevations should be considered accurate to the degree implied by the method used.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- Modified California Sampler (6-inch sleeve) or Dames & Moore
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

- Measured groundwater level in exploration, well, or piezometer
- Measured free product in well or piezometer

Graphic Log Contact

- Distinct contact between soil strata
- Approximate contact between soil strata

Material Description Contact

- Contact between geologic units
- Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
UU	Unconsolidated undrained triaxial compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled Start 8/25/2025 End 8/25/2025	Total Depth (ft) 12	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2038 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Truck-mounted CME 75	
Easting (X) 2537810 Northing (Y) 252914		System Datum WA State Plane North NAD83 (feet)		See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 5½ inches of asphalt concrete			
							CR	Approximately 11 inches of crushed rock			
		18	35		1		GM	Silty Gravel with Sand (GM), medium dense, gray-brown, moist; subrounded to rounded gravel; contains pieces of geotextile fabric [Fill]			Approximate SPT N-value = 14
2035							SP	Poorly Graded Sand (SP), loose, gray, moist; fine to coarse sand. [Fill]			Abandoned water line encountered at approximately 3 to 4 feet
		10	8		2		ML	Silty with Sand (ML), medium stiff, brown, moist.			
	5										Perched groundwater observed at approximately 5¼ feet
		9	25		3 %F			Becomes stiff and wet	54	77	Approximate SPT N-value = 10
2030											
		6	6		4			Becomes medium stiff			
	10										
								Boring completed at approximately 12 feet due to auger deflection			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-1

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-2
Sheet 1 of 1

Drilled Start 8/28/2025 End 8/28/2025	Total Depth (ft) 19	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2038 Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment Truck-mounted CME 75			
Easting (X) 2537801 Northing (Y) 252882	System Datum WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration			

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 5 inches of asphalt concrete			
							CR	Approximately 6 inches of crushed rock			
2035		12	12		1A 1B		GP-GM	Poorly Graded Gravel with Silt and Sand (GP-GM), medium dense, gray, moist; subrounded to rounded gravel. [Fill]			
							ML	Silt with Sand (ML), sitff, brown, moist.			
		14	14		2						Approximate SPT N-value = 6
	5							Becomes medium stiff			
		15	8		3			Becomes wet			
2030							SM	Silty Sand (SM), very loose, brown, moist; mostly fine to medium sand.	17	42	
		16	8		4 SA						Approximate SPT N-value = 3
	10										
2025								Becomes medium dense with gravel			
		12	16		5 %F				17	41	
	15										
2020							GM	Silty Gravel with Sand and Cobbles (GM), very dense, brown, moist; rounded to subrounded gravel.			
		3	113/4"		6						Approximate SPT N-value = 50+

Boring completed at approximately 19 feet due to auger refusal.

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-1A

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-3
Sheet 1 of 1

Drilled Start 8/25/2025 End 8/25/2025	Total Depth (ft) 39	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2035 Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment Truck-mounted CME 75			
Easting (X) 2537163 Northing (Y) 252882	System Datum WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration			
Notes:					

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 4½ inches of asphalt concrete			
							CR	Approximately 11 inches of crushed rock			
		9	22		1		GP-GM	Poorly Graded Gravel with Silt, Sand and Cobbles (GP-GM), medium dense, brown, moist; few cobbles, subrounded to rounded gravel. [Fill]			
2030		14	41		2 SA				5	11	Abandoned water line encountered at approximately 3 to 4 feet Approximate SPT N-value = 17
	5						GW-GM	Well-Graded Gravel with Silt, Sand and Cobbles (GW-GM), dense to very dense, gray-brown, moist; few cobbles, subrounded to rounded gravel.			
		13	60		3						
2025		18	100		4 SA				2	7	Approximate SPT N-value = 42
	10										
		11	54		5						
2020	15										
		4	113/4"		6						Approximate SPT N-value = 50+
2015	20										
		15	29		7			Becomes medium dense			
2010	25										

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

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Log of Boring B-2

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-4
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample / Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	25									
		12	79	8			Becomes dense			Approximate SPT N-value = 32
2005	30									
		3	76	9			Becomes very dense			
2000	35									
		0	113/5"	10						Approximate SPT N-value = 50+

Boring completed at approximately 39 feet.

Log of Boring B-2 (continued)

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Drilled Start 8/26/2025 End 8/26/2025	Total Depth (ft) 35	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2035 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Truck-mounted CME 75	
Easting (X) 2537562 Northing (Y) 253092		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 3 inches of asphalt concrete			
							CR	Approximately 6 inches of crushed rock			
		12	24		1		GM	Silty Gravel with Sand (GM), medium dense, brown, moist; subrounded to rounded gravel.			
2030	5	11	23		2 SA		GP-GM	Poorly Graded Gravel with Silt, Sand, and Cobbles (GP-GM), loose, gray-brown, moist; few cobbles, subrounded to rounded gravel.	4	9	Approximate SPT N-value = 9
		7	73/10.5"		3						Sampler refusal on cobble, blow count not representative
2025	10	16	88		4 SA		GW-GM	Well-Graded Gravel with Silt, Sand and Cobbles (GW-GM), dense, gray-brown, moist; few cobbles, subrounded to rounded gravel.	2	7	Approximate SPT N-value = 36
2020	15	12	29		5			Becomes medium dense Becomes very dense with cobbles			
2015	20	15	195		6						Approximate SPT N-value = 50+
2010	25	13	44		7			Becomes dense			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

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Log of Boring B-3

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-5
Sheet 1 of 2

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	25										
2005		13	149		8			Becomes very dense			Approximate SPT N-value = 50+
	30										
		0	50/1"		9						Sampler refusal on cobble, blow count not representative
2000	35										

Boring completed at approximately 35 feet due to auger refusal.

Log of Boring B-3 (continued)

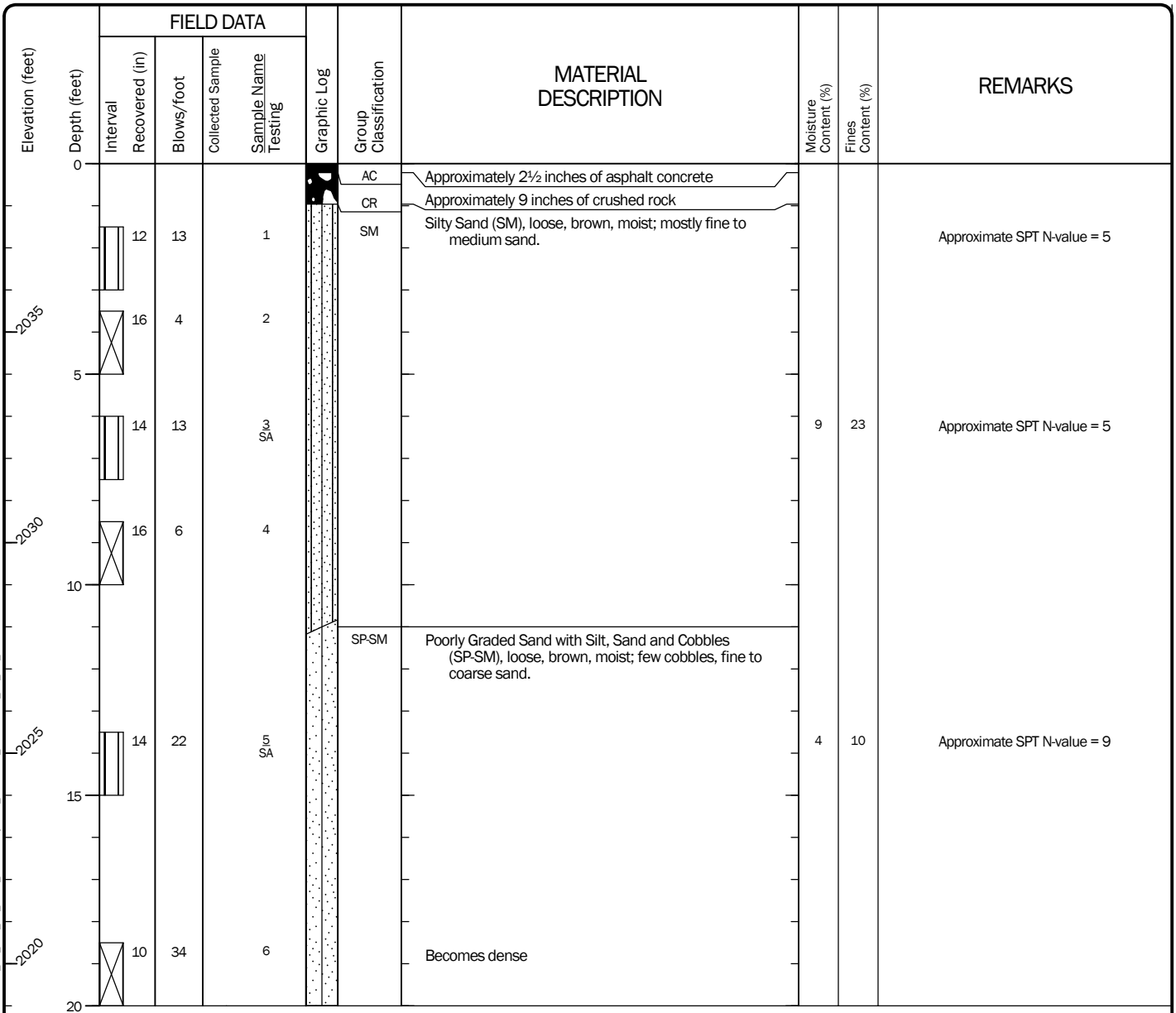
GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Drilled	Start 8/26/2025	End 8/26/2025	Total Depth (ft)	20	Logged By	AMN	Driller	GeoEngineers, Inc.	Drilling Method	Hollow-stem Auger
					Checked By	BKH				

Surface Elevation (ft) Vertical Datum	2039 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Truck-mounted CME 75
Easting (X) Northing (Y)	2537533 252641	System Datum	WA State Plane North NAD83 (feet)	Groundwater not observed at time of exploration	

Notes:



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Date:11/7/25 Path:P:\11\11264044\GINT\112640401.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring B-4

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-6
Sheet 1 of 1

Drilled Start 8/26/2025 End 8/26/2025	Total Depth (ft) 19	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2043 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Truck-mounted CME 75	
Easting (X) 2537431 Northing (Y) 252183		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 2½ inches of asphalt concrete			
							CR	Approximately 6 inches of crushed rock			
		10	9		1		GM	Silty Gravel with Sand (GM), loose, brown, moist.			
2040		14	16		2 SA				7	19	Approximate SPT N-value = 6
	5										
		10	8		3						
2035		13	10		4 SA		SP-SM	Well-Graded Sand with Silt and Gravel (SP-SM), loose, brown, moist; mostly medium to coarse sand.	5	8	Approximate SPT N-value = 4
	10										
2030							GNEISS	Gneiss, gray to brown, fine to coarse grained, predominantly decomposed, very soft to soft, very poor RQD			Grinding
		2	50/4"		5			Reworks to brown-gray sand with gravel and trace silt (grus) (very dense, dry to moist)			
	15										
2025		1	50/1"		6						

Boring completed at approximately 19 feet due to auger refusal

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-5

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-7
Sheet 1 of 1

Drilled Start 8/27/2025 End 8/27/2025	Total Depth (ft) 20	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2052 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Truck-mounted CME 75	
Easting (X) 2537747 Northing (Y) 251729		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 3 inches of asphalt concrete			
							CR	Approximately 5 inches of crushed rock			
2050		12	13		1		SM	Silty Sand with Gravel (SM), loose, brown, moist; mostly fine to medium sand.			Approximate SPT N-value = 5
		8	4		2						
	5										
2045		9	4		3 %F			Becomes moist to wet and without gravel	13	30	Approximate SPT N-value = 2
		13	11		4			Becomes medium dense and moist			
	10										
2040								Becomes loose			
		15	20		5 SA				9	13	Approximate SPT N-value = 8
	15										
2035											
		13	9		6						
	20							Boring completed at approximately 20 feet			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-6

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-8
Sheet 1 of 1

Drilled Start 8/27/2025 End 8/27/2025	Total Depth (ft) 14	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2085 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Truck-mounted CME 75	
Easting (X) 2538270 Northing (Y) 252510		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 3 inches of asphalt concrete			
							CR	Approximately 5 inches of crushed rock			
		10	26		1 %F		SM	Silty Sand (SM), medium dense, brown to black, moist; fine to coarse sand, mottled texture.	15	49	
2080		17	44		2		GNEISS	Gneiss, gray to tan, fine to coarse grained, predominantly decomposed, very soft to soft, very poor RQD			Approximate SPT N-value = 18
	5							Reworks to brown to gray silty sand with occasional gravel (grus) (very dense, dry to moist)			
		15	62/11"		3						
		3	50/3"		4						
2075	10										
		3	50/5"		5						

Boring completed at approximately 14 feet due to auger refusal.

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-7

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

Figure A-9
Sheet 1 of 1

Drilled Start 8/25/2025 End 8/25/2025	Total Depth (ft) 17	Logged By AMN Checked By BKH	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2099 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Truck-mounted CME 75	
Easting (X) 2537879 Northing (Y) 252409		System Datum WA State Plane North NAD83 (feet)		Groundwater not observed at time of exploration	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	15	72		1 SA		AC	Approximately 2 inches of asphalt concrete			
							CR	Approximately 3 inches of crushed rock			
							GP-GM	Well-Graded Gravel Silt, Sand and Cobbles (GP-GM), medium dense, brown, moist; decomposed gneiss.	2	10	Approximate SPT N-value = 30
2095		15	60		2		GNEISS	Gneiss, gray to tan, fine to coarse grained, predominantly decomposed, very soft to soft, very poor RQD			
	5										
		3	113/4"		3			Reworks to brown-gray fine to coarse sand with gravel and trace silt (grus) (very dense, dry to moist)			Approximate SPT N-value = 50+
2090		5	50/5"		4						
	10										
2085		8	50/2"		5						
	15							Boring completed at approximately 17 feet due to auger refusal			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Boring B-8

GeoEngineers

Project: Ridgemont Estates Stormwater Improvement
Project Location: Spokane Valley, Washington
Project Number: 11264-044-01

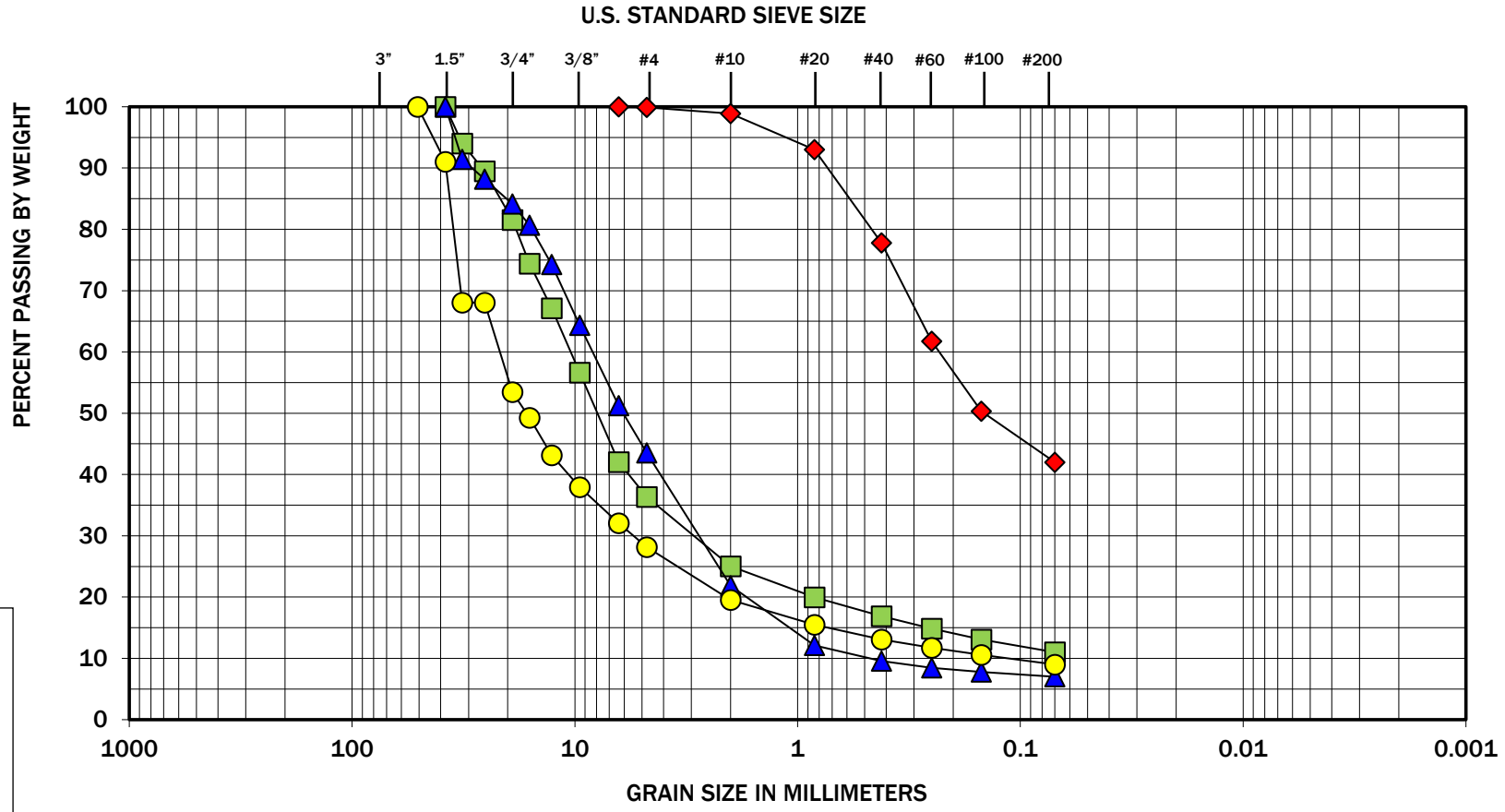
Figure A-10
Sheet 1 of 1

Appendix B
Laboratory Data

Appendix B
Laboratory Data

Soil samples obtained from the explorations were returned to Geoengineers, Inc.'s (GeoEngineers') laboratory in Spokane, Washington. Representative soil samples were selected for laboratory tests to evaluate the pertinent physical and geotechnical engineering characteristics of the site soil. The following samples and tests were conducted:

- Four moisture content determinations of representative soil samples in accordance with ASTM International (ATSM) D2216. Results are presented on the exploration logs at the respective sample depths.
- Eleven sieve analyses of representative soil samples in accordance with ASTM C136. Results are presented in Figures B-1 through B-3. Percent passing the U.S. No. 200 sieve also are presented on the exploration logs at the respective sample depths.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-1A	8.5 - 10	17	Silty Sand
■	B-2	3.5 - 5	5	Poorly graded grave with silt and sand
▲	B-2	8.5 - 10	2	Well graded gravel with silt and sand
●	B-3	3.5 - 5	4	Poorly graded gravel with silt and sand

The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure B-1

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

Sieve Analysis Results

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-3	8.5 - 10	2	Well graded gravel with silt and sand
■	B-4	6 - 7.5	9	Silty sand
▲	B-4	13.5 - 15	4	Poorly graded sand with silt and gravel
●	B-5	3.5 - 5	7	Silty gravel with sand

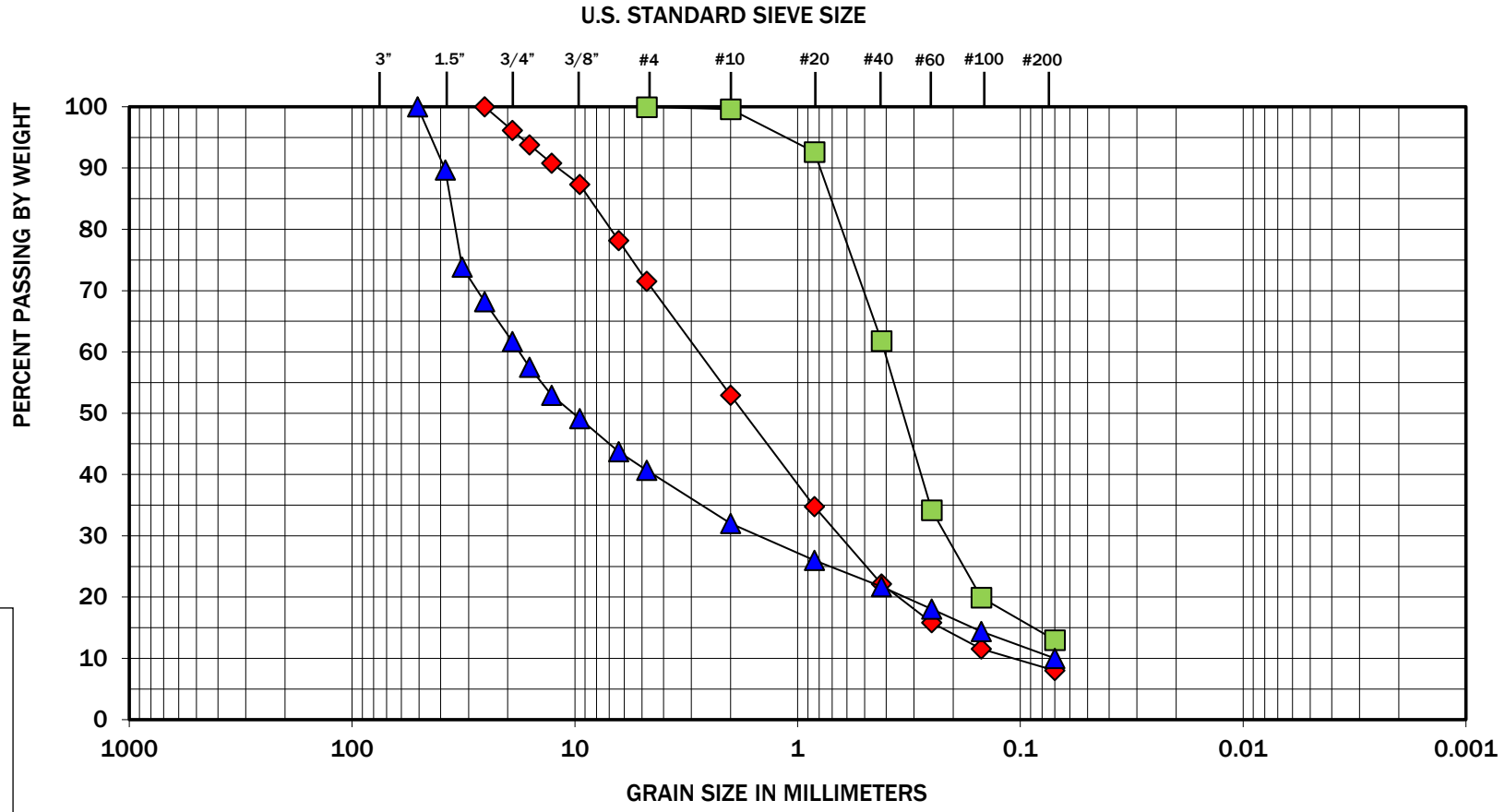
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure B-2

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-5	8.5 - 10	5	Well graded sand with silt and gravel
■	B-6	13.5 - 15	9	Silty sand
▲	B-8	1 – 2.5	2	Well graded gravel with silt and sand

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure B-3

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

Sieve Analysis Results

Appendix C
Drywell Testing

Appendix C
Drywell Testing

GeoEngineers, Inc. (GeoEngineers) conducted three full-scale drywell infiltration tests (IT-1 through IT-3) on October 21 and 22, 2025. The tests were conducted in general accordance with Chapter 6 of the Stormwater Management Manual for Eastern Washington (Ecology, 2024), Results were analyzed for design outflow rate in general accordance with Appendix 4B of the *Spokane Regional Stormwater Manual* (Spokane County et al., 2008). The approximate test locations are provided in Figure 2. Full-scale drywell test data are provided in Appendix C.

GeoEngineers used the following testing procedure:

- Inspected and measured the dimensions of each drywell selected for drywell testing.
- Installed temporary 2-inch-diameter polyvinyl chloride (PVC) piezometers within the drywells.
- Added clean water to the drywells at a rate that maintained a water level consistent with either the top of the active barrel section, immediately below the lowest lateral connecting pipe, or as high as allowable by maximum flow. Water was discharged into the drywells for a minimum 1-hour constant-head period followed by falling head periods.
- At regular intervals, measured the cumulative volume and instantaneous flow rate in gallons per minute (gpm) necessary to maintain constant head within the drywells.
- Terminated water discharge and recorded the rate of water level decrease in the drywells for at least 30 minutes or until dry.

Table C-1

Drywell Test Analysis - East 24th Avenue (IT-1)

Ridgemont Estates Stormwater Improvement Project
Spokane Valley, Washington

Time of Day	Elapsed Time[2] *minutes*	Meter Reading *gallons*	Flow Rate *gpm*	Flow Rate *cfs*	Total Flow Volume *gallons*	Total Flow Volume *cubic feet*	Depth to Water[3] *feet*	Head[4,5] *feet*	Notes
9:47:00	0	660,700	0	0	0	0	15.08	0	Static conditions - flow begins
9:52:00	5	661,600	180	0.40	900	120	13.34	1.74	
9:53:00	6	661,800	200	0.45	1,100	147	13.20	1.88	
9:54:00	7	662,100	300	0.67	1,400	187	13.10	1.98	
9:56:00	9	662,700	300	0.67	2,000	267	13.05	2.03	
10:00:00	13	663,800	275	0.61	3,100	414	13.05	2.03	
10:02:00	15	664,400	300	0.67	3,700	495	13.05	2.03	Begin constant-head test
10:05:00	18	665,300	300	0.67	4,600	615	13.05	2.03	
10:10:00	23	666,700	280	0.62	6,000	802	13.05	2.03	
10:15:00	28	668,200	300	0.67	7,500	1,003	13.05	2.03	
10:20:00	33	669,600	280	0.62	8,900	1,190	13.05	2.03	
10:25:00	38	670,900	260	0.58	10,200	1,364	13.05	2.03	
10:30:00	43	672,300	280	0.62	11,600	1,551	13.05	2.03	
10:35:00	48	673,800	300	0.67	13,100	1,751	13.05	2.03	
10:40:00	53	675,200	280	0.62	14,500	1,939	13.05	2.03	
10:45:00	58	676,600	280	0.62	15,900	2,126	13.05	2.03	
10:50:00	63	678,000	280	0.62	17,300	2,313	13.05	2.03	
10:55:00	68	679,500	300	0.67	18,800	2,513	13.05	2.03	
11:00:00	73	680,900	280	0.62	20,200	2,701	13.05	2.03	
11:05:00	78	682,300	280	0.62	21,600	2,888	13.05	2.03	Falling Head Test
11:06:00	79						13.70	1.38	
11:07:00	80						14.05	1.03	
11:08:00	81						14.29	0.79	
11:09:00	82						14.41	0.67	
11:10:00	83						14.49	0.59	
11:12:00	85						14.57	0.51	
11:14:00	87						14.57	0.51	
11:16:00	89						14.61	0.47	
11:18:00	91						14.65	0.43	
11:20:00	93						14.69	0.39	
11:22:00	95						14.73	0.35	
11:24:00	97						14.78	0.30	
11:26:00	99						14.88	0.20	
11:28:00	101						14.88	0.20	
11:30:00	103						14.95	0.13	
11:32:00	105						15.05	0.03	
11:34:00	107						15.08	0.00	
11:36:00	109						15.08	0.00	
Design Outfall Rate[6]									
Stabilized flow rate (Q) in cubic feet per second (cfs)								0.634	
Head within drywell (H) in feet								2.03	
Maximum design drywell head (H_D) in feet								10	
Normalized outflow rate (q_A) in cfs								3.124	
Factor of Safety (FS)								1.8	%Fines = unknown
Design outflow rate (q_D) in cfs								1.736	

Notes:

[1] Infiltration test performed in general accordance with the 2024 Stormwater Management Manual for Eastern Washington.

[2] Elapsed time referenced to beginning of test on October 21, 2025.

[3] Depth to water measured from the top of the sounding tube (+3.08' above ground surface)

[4] Head refers to induced head level within the drywell.

[5] Constant-head maintained at the maximum flow rate that could be achieved during the test.

[6] Design outflow rate based upon the Spokane Regional Stormwater Manual, Appendix 4B.

Drywell Condition: double-depth concrete; diameter = 4.0 ft; total depth = 11.8 ft; active barrel = 7.6 ft (base to bottom of outfall pipe 4.2 ft bgs); sediment/debris accumulation.

Table C-2

Drywell Test Analysis - East 23rd Avenue (IT-2)

Ridgemont Estates Stormwater Improvement Project

Spokane Valley, Washington

Time of Day	Elapsed Time[2] *minutes*	Meter Reading *gallons*	Flow Rate *gpm*	Flow Rate *cfs*	Total Flow Volume *gallons*	Total Flow Volume *cubic feet*	Depth to Water[3] *feet*	Head[4,5] *feet*	Notes
13:08:00	0	682,400	0	0	0	0	15.13	0	Static conditions - flow begins
13:10:00	2	683,200	400	0.89	800	107	14.30	0.83	
13:12:00	4	684,200	500	1.11	1,800	241	14.18	0.95	
13:14:00	6	685,100	450	1.00	2,700	361	14.18	0.95	
13:16:00	8	686,000	450	1.00	3,600	481	14.18	0.95	Begin constant-head test
13:18:00	10	686,900	450	1.00	4,500	602	14.18	0.95	
13:20:00	12	687,800	450	1.00	5,400	722	14.18	0.95	
13:25:00	17	690,000	440	0.98	7,600	1,016	14.19	0.94	
13:30:00	22	692,200	440	0.98	9,800	1,310	14.18	0.95	
13:35:00	27	694,500	460	1.02	12,100	1,618	14.18	0.95	
13:40:00	32	696,700	440	0.98	14,300	1,912	14.17	0.96	
13:45:00	37	698,900	440	0.98	16,500	2,206	14.16	0.97	
13:50:00	42	701,100	440	0.98	18,700	2,500	14.16	0.97	
13:55:00	47	703,500	480	1.07	21,100	2,821	14.17	0.96	
14:00:00	52	705,700	440	0.98	23,300	3,115	14.15	0.98	
14:05:00	57	707,900	440	0.98	25,500	3,409	14.15	0.98	
14:10:00	62	710,000	420	0.94	27,600	3,690	14.15	0.98	
14:15:00	67	712,300	460	1.02	29,900	3,997	14.16	0.97	
14:20:00	72	714,500	440	0.98	32,100	4,291	14.16	0.97	Falling Head Test
14:21:00	73						15.07	0.06	
14:22:00	74						15.13	0.00	
14:30:00	82						15.13	0.00	
Design Outfall Rate[6]									
Stabilized flow rate (Q) in cubic feet per second (cfs)								0.994	
Head within drywell (H) in feet								0.96	
Maximum design drywell head (H_D) in feet								10	
Normalized outflow rate (q_A) in cfs								10.330	
Factor of Safety (FS)								1.8	%Fines = unknown
Design outflow rate (q_D) in cfs								5.739	

Notes:

[1] Infiltration test performed in general accordance with the 2024 Stormwater Management Manual for Eastern Washington.

[2] Elapsed time referenced to beginning of test on October 21, 2025.

[3] Depth to water measured from the top of the sounding tube (+2.2' above ground surface)

[4] Head refers to induced head level within the drywell.

[5] Constant-head maintained at the maximum flow rate that could be achieved during the test.

[6] Design outflow rate based upon the Spokane Regional Stormwater Manual, Appendix 4B.

Drywell Condition: double-depth concrete; diameter = 4.0 ft; total depth = 13.2 ft; active barrel = 10 ft (base to bottom of shoulder); no sediment/debri accumulation.

Table C-3

Drywell Test Analysis - South Timberlane Drive (IT-3)

Ridgemont Estates Stormwater Improvement Project

Spokane Valley, Washington

Time of Day	Elapsed Time[2] *minutes*	Meter Reading *gallons*	Flow Rate *gpm*	Flow Rate *cfs*	Total Flow Volume *gallons*	Total Flow Volume *cubic feet*	Depth to Water[3] *feet*	Head[4,5] *feet*	Notes
10:16:00	0	49,410	0	0	0	0	15.09	0	Static conditions - flow begins
10:32:00	16	49,860	28	0.06	450	60	10.72	4.37	
10:34:00	18	49,880	10	0.02	470	63	10.58	4.51	
10:35:00	19	49,885	5	0.01	475	64	10.54	4.55	
10:40:00	24	49,910	5	0.01	500	67	10.42	4.67	
10:58:00	42	50,260	19	0.04	850	114	8.74	6.35	
11:01:00	45	50,270	3	0.01	860	115	8.74	6.35	
11:04:00	48	50,290	7	0.01	880	118	8.73	6.36	
11:06:00	50	50,300	5	0.01	890	119	8.73	6.36	
11:10:00	54	50,313	3	0.01	903	121	8.72	6.37	
11:14:00	58	50,323	3	0.01	913	122	8.73	6.36	
11:18:00	62	50,337	3	0.01	927	124	8.73	6.36	
11:22:00	66	50,348	3	0.01	938	125	8.73	6.36	Begin constant-head test
11:26:00	70	50,360	3	0.01	950	127	8.73	6.36	
11:30:00	74	50,372	3	0.01	962	129	8.73	6.36	
11:34:00	78	50,384	3	0.01	974	130	8.73	6.36	
11:38:00	82	50,396	3	0.01	986	132	8.73	6.36	
11:42:00	86	50,407	3	0.01	997	133	8.72	6.37	
11:46:00	90	50,418	3	0.01	1,008	135	8.73	6.36	
11:50:00	94	50,429	3	0.01	1,019	136	8.73	6.36	
11:55:00	99	50,443	3	0.01	1,033	138	8.73	6.36	
11:58:00	102	50,451	3	0.01	1,041	139	8.73	6.36	
12:02:00	106	50462	3	0.01	1,052	141	8.73	6.36	
12:06:00	110	50472	3	0.01	1,062	142	8.73	6.36	
12:10:00	114	50483	3	0.01	1,073	143	8.73	6.36	
12:14:00	118	50494	3	0.01	1,084	145	8.73	6.36	
12:18:00	122	50505	3	0.01	1,095	146	8.73	6.36	
12:22:00	126	50515	3	0.01	1,105	148	8.73	6.36	Falling Head Test
12:24:00	128						8.75	6.34	
12:26:00	130						8.77	6.32	
12:28:00	132						8.80	6.29	
12:30:00	134						8.83	6.26	
12:35:00	139						8.90	6.19	
12:40:00	144						8.95	6.14	
12:45:00	149						9.01	6.08	
12:50:00	154						9.07	6.02	
12:55:00	159						9.13	5.96	
Design Outfall Rate[6]									
Stabilized flow rate (Q) in cubic feet per second (cfs)								0.006	
Head within drywell (H) in feet								6.36	
Maximum design drywell head (H_D) in feet								10	
Normalized outflow rate (q_A) in cfs								0.010	
Factor of Safety (FS)								2.5	%Fines = unknown
Design outflow rate (q_D) in cfs								0.004	

Notes:

[1] Infiltration test performed in general accordance with the 2024 Stormwater Management Manual for Eastern Washington.

[2] Elapsed time referenced to beginning of test on October 22, 2025.

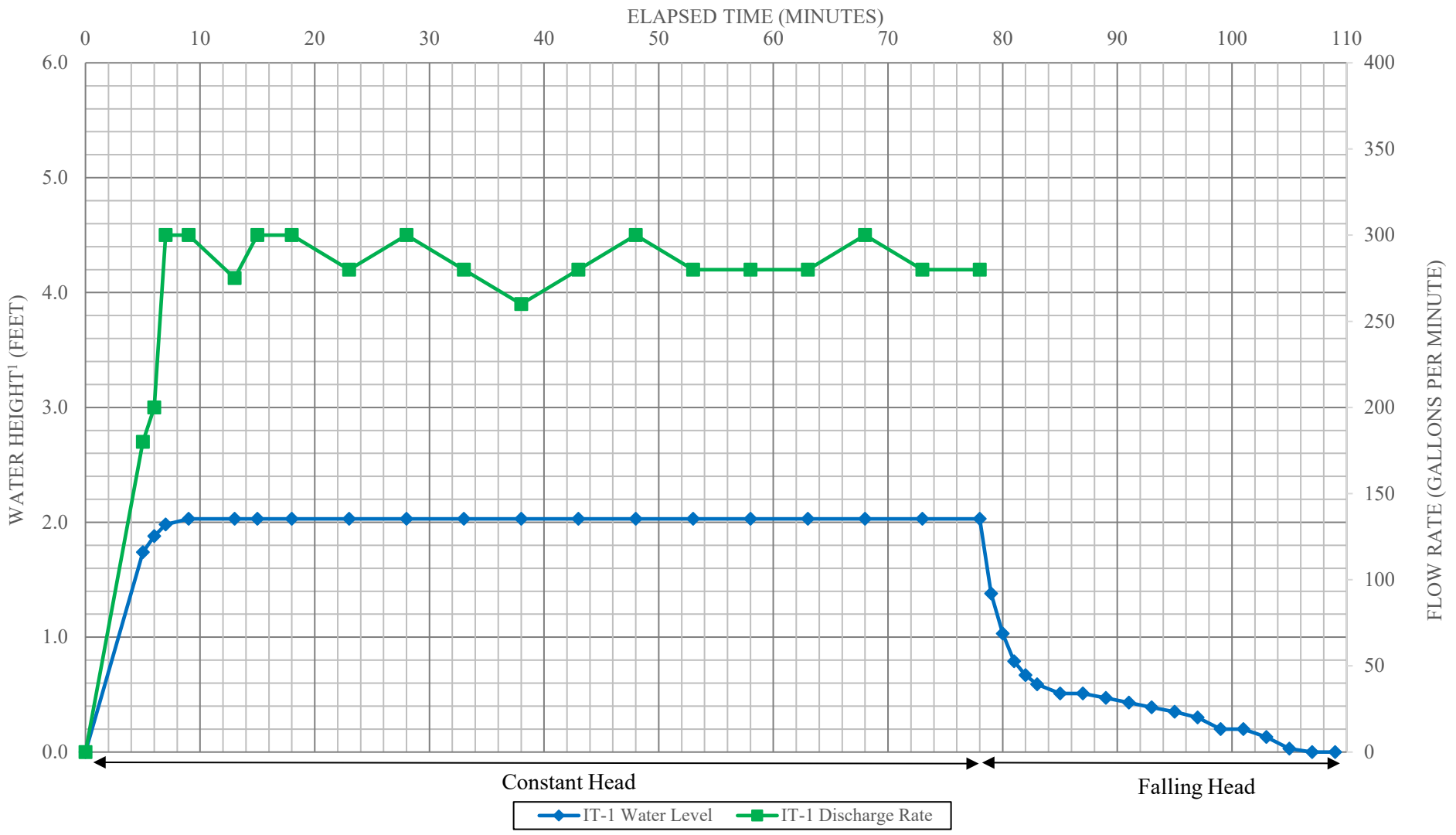
[3] Depth to water measured from the top of the sounding tube (+4.68' above ground surface)

[4] Head refers to induced head level within the drywell.

[5] Constant-head maintained at the maximum flow rate that could be achieved during the test.

[6] Design outflow rate based upon the Spokane Regional Stormwater Manual, Appendix 4B.

Drywell Condition: hexagonal double-depth concrete; width at widest = 4.0 ft; total depth = 10.4 ft; active barrel = 7.2 ft (base to bottom of outfall pipe at 3.2 ft bgs).



Note:

1. Water height refers to water level above the apparent base of the drywell.

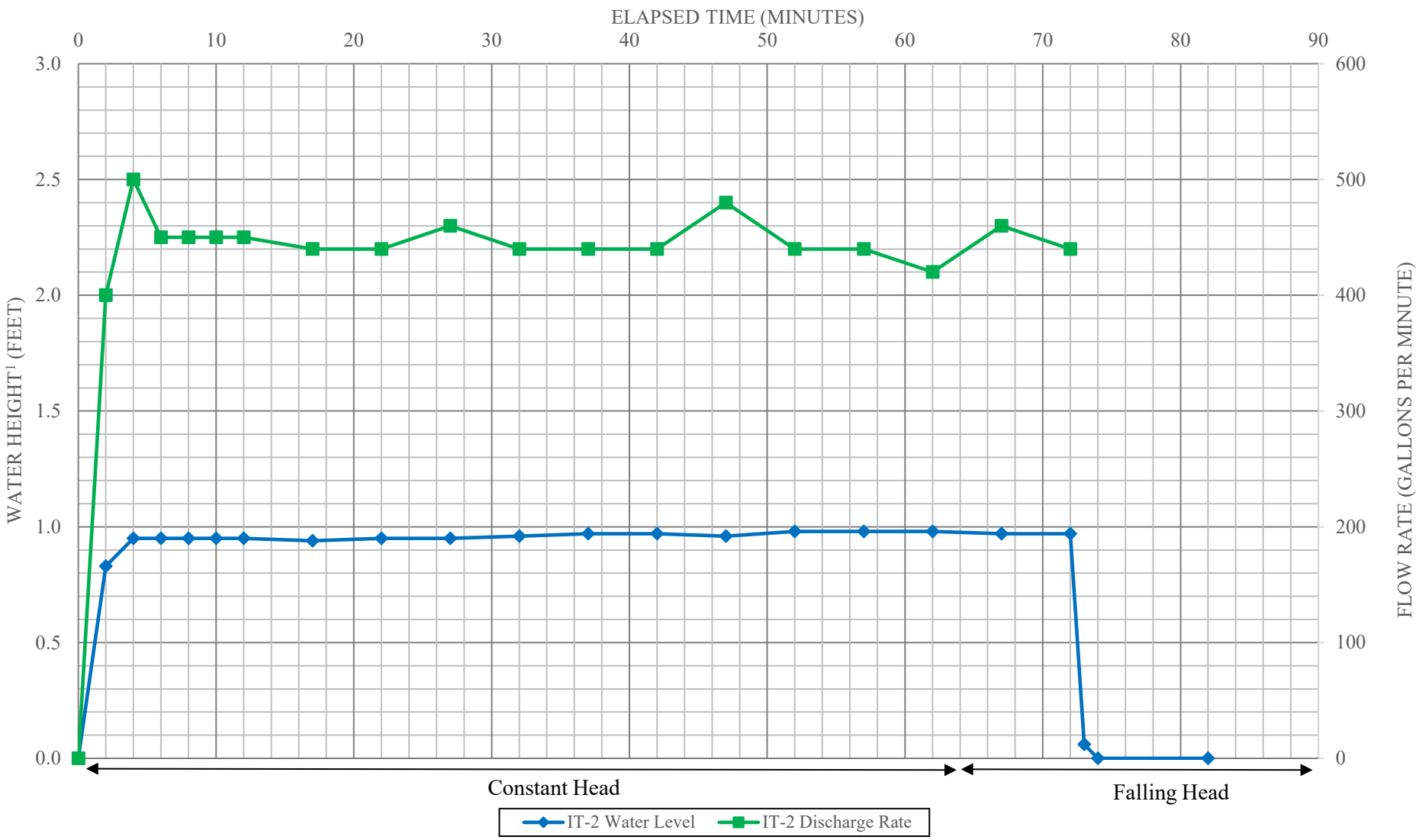
IT-1 Water Height and Discharge Rate

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure C-1

11264-044-01



Note:

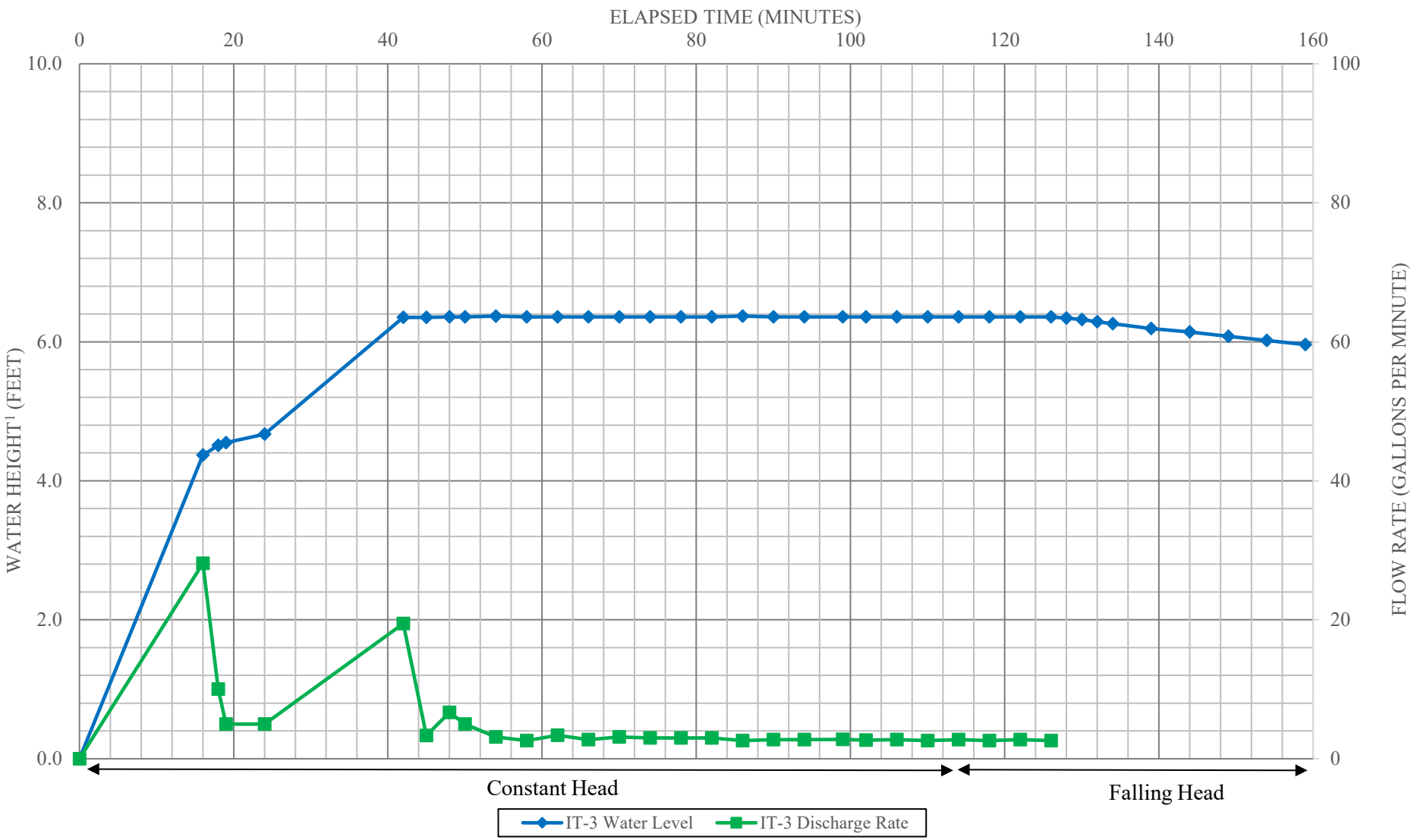
1. Water height refers to water level above the apparent base of the drywell.

IT-2 Water Height and Discharge Rate

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure C-2



Note:

1. Water height refers to water level above the apparent base of the drywell.

IT-3 Water Height and Discharge Rate

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure C-3

Appendix D
Report Limitations and Guidelines for Use

Appendix D
Report Limitations and Guidelines for Use[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

READ THESE PROVISIONS CLOSELY

It is important to recognize that the geoscience practices (geotechnical engineering, hydrogeology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers, Inc. (GeoEngineers) includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

HYDROGEOLOGIC AND/OR GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the City of Spokane Valley and for the Project specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A HYDROGEOLOGIC AND/OR GEOTECHNICAL REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for the Ridgemont Estates Stormwater Improvements project in Spokane Valley, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific site explored, or
- Completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;

[1] Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.

- Elevation, configuration, location, orientation or weight of the proposed structure;
- Composition of the design team; or
- Project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

ENVIRONMENTAL CONCERNS ARE NOT COVERED

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

INFORMATION PROVIDED BY OTHERS

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

SUBSURFACE CONDITIONS CAN CHANGE

This hydrogeologic and geotechnical 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 man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

HYDROGEOLOGIC AND/OR GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on geologic maps, our site observations and well logs completed by others. GeoEngineers reviewed these data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

REPORT RECOMMENDATIONS ARE NOT FINAL

We have developed our opinions on widely spaced wells observed and logged by others. These investigations sample just a small percentage of the site area and region. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers'

recommendations can be finalized only by observing actual subsurface conditions revealed during well drilling and construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

A HYDROGEOLOGIC AND/OR GEOTECHNICAL REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

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Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.