Technical Memorandum
Geotechnical and Hydrogeologic

Ridgemont Estates Stormwater Improvements
Spokane Valley, Washington

for
Osborn Consulting

January 7, 2025

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GeoEngineers

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File No. 11264-044-00
January 7, 2025

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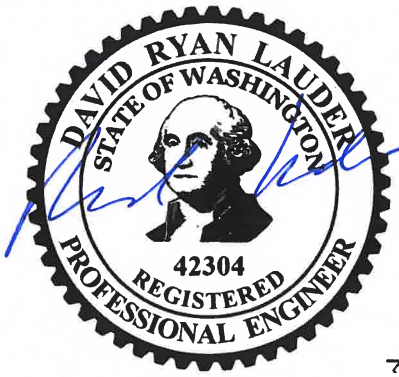

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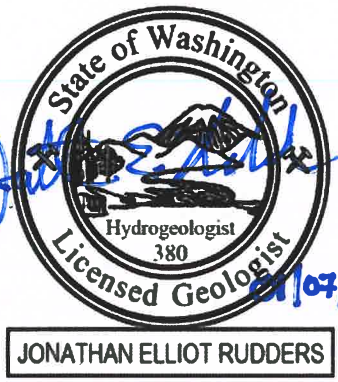

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1.0 Introduction

This report summarizes the results of our geotechnical and hydrogeologic investigation associated with the Ridgemont Estates Stormwater Improvement project area, which is located in the vicinity of the Ridgemont Estates neighborhood in Spokane Valley, Washington, approximately as shown in the Vicinity Map, Figure 1. The project area includes portions of the Ridgemont Estates Plateau (REP) including the Ridgemont Estates neighborhood and adjacent subdivisions, generally bounded by Vera Crest Drive to the west, Steen Road to the north, Incline Drive to the east and Man O' War Lane to the south. Additional areas of study included portions of the surrounding valley lowlands including the Main Infiltration Pond (Main Pond) and the Radco Infiltration Pond (Radco Pond) as shown in the Project Area Site Plan, Figure 2 (all areas are collectively incorporated for the purpose of this project and are herein referred to as the "Project Area"). The initial goal of the project, which is being led by Osborn Consulting (Osborn), is to evaluate surface runoff, shallow subsurface flow and the condition of existing stormwater infrastructure within the Project Area in response to suspected stormwater-related pavement damages, flooding and icy conditions reported within the Project Area. Project results will be used to identify and inform stormwater improvement alternatives for consideration by the City of Spokane Valley (the City).

GeoEngineers, Inc. (GeoEngineers) conducted the geotechnical and hydrogeologic investigation under contract with Osborn Consulting (Osborn). Our services were conducted under the Subconsultant Professional Services Agreement with Osborn dated October 9, 2023 and primary Contract No. 23-158 with the City dated September 20, 2023.

Our geotechnical and hydrogeologic investigation consisted of two components, a hydrogeologic data review and a geotechnical assessment. The hydrogeologic data review primarily served as a desktop study of existing hydrogeologic information throughout the Project Area. The geotechnical assessment included field exploration, monitoring well installation, water level monitoring and infiltration testing in a targeted portion of the Project Area around South Vera Crest Drive and South Conklin Road (Geotechnical Field Work Study Area) with known stormwater impacts. GeoEngineers explorations, hydrogeologic and geotechnical investigation areas and other key site features are presented in Figure 2.

The Ridgemont Estates stormwater system, in its current state, captures and transmits stormwater through a network of catch basins, pipes and ditches on the REP to designed infiltration infrastructure at the base of the REP near the northwest and western edges of the Project Area. Infiltration infrastructure includes the Main and Radco Ponds, and a series of catch basins and drywells.

2.0 Scope of Services

Our services were conducted consistent with Exhibit B of our Professional Services Agreement between GeoEngineers and Osborn dated and signed October 9, 2023. Our specific scope of services consisted of the following:

1. Conducted a hydrogeologic data review of the project area.
    a. Compiled and reviewed existing geotechnical and hydrogeologic information for the project area.
    b. Reviewed drainage complaint information and home-owner improvements provided by the City.
    c. Tabulated existing stormwater infiltration and groundwater data.

d. Generated maps of the project area summarizing geotechnical and hydrogeologic data.

e. Generated cross sections showing the anticipated hydrogeologic conditions.

f. Identified potential stormwater problem areas within the project based on compiled data and conducted field reconnaissance to observe identified problem areas.

2. Assisted with development, subsurface exploration and testing locations for geotechnical assessment.

3. Conducted geotechnical assessment activities at key locations within the project area.

   a. Evaluated pavement and subgrade conditions and hydrogeologic conditions at select locations by conducting subsurface drilling, sampling and laboratory testing operations.

   b. Installed and developed monitoring wells at select locations to evaluate perched groundwater conditions and monitor groundwater response to storms and seasonal fluctuations in precipitation.

      i. Installed pressure transducers within the monitoring wells to monitor groundwater conditions within the project area.

      ii. Downloaded and analyzed groundwater data from the transducers on a periodic interval.

   c. Evaluated subsurface soil conditions at the Main Pond by conducting test pit explorations, soil sampling and laboratory testing.

   d. Performed pilot infiltration testing of existing conditions at the Main Pond in general accordance with the 2019 Stormwater Management Manual for Eastern Washington.

   e. Analyzed infiltration test data for infiltration rate and hydraulic conductivity.

   f. Performed full-scale drywell infiltration testing of two selected drywells in general compliance with the 2019 Stormwater Management Manual for Eastern Washington and the 2008 Spokane Regional Stormwater Manual.

      i. Analyzed infiltration test data for normalized and design outflow rates.

   g. Provide hydrogeologic recommendations on the feasibility of stormwater infiltration at the Main Pond.

   h. Provide pavement recommendations based upon observed soil and pavement conditions, laboratory testing and hydrogeologic conditions.

   i. Provide this technical report summarizing project results and recommendations.

3.0 Site Background

3.1 PHYSIOGRAPHY

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 has slightly modified this landscape.

The Project Area is located within or at the margin of Spokane Valley between the Saltese Flats and Dishman Hills. The Project Area is primarily located on an elevated plateau that varies from about 2,300 feet to 2,380 feet in elevation. Relatively steep margins descend to approximately 2,140 feet in elevation at the base of the REP (Elevations in this report refer to the North American Vertical Datum of 1988 [NAVD 88], unless otherwise specified). With the exception of ephemeral streams in shallow drainage features, the REP is largely devoid of surface water. Occasional springs and stormwater drainage features are located along the crest and bases of the REP. The REP is bordered by the Spokane River Valley to the north and west and Saltese Flats to the east.

3.2 CLIMATE SUMMARY

The climate of the Spokane Valley area is semi-arid, with warm, dry summers and cool, wet winters. At Spokane Airport Climate Station No. 457938 (situated about 16 miles southwest of the Project Area), annual precipitation is approximately 16 inches. Annual snowfall is approximately 41 inches per year. Much of the precipitation occurs during fall and winter months and runoff/groundwater recharge conditions are high during spring.

3.3 LAND USE

Land use surrounding the Project Area consists primarily of single-family residential properties serviced by municipal water supply and municipal sewer.

4.0 Compilation of Existing Subsurface Information

4.1 DATA SOURCES

GeoEngineers reviewed and compiled subsurface information provided by the City, including:

- Geotechnical reports for previous projects conducted within the vicinity of the Project Area.
- A summary of the complaints received by the City related to high groundwater within the Project Area.
- Specific as-built plans for infiltration structures within the Project Area, such as drywells, catch basins and infiltration trenches.

GeoEngineers reviewed water well reports (well logs) on file with the Washington State Department of Ecology (Ecology) for the following geographic areas:

- Section 30 of Township 25 North, Range 45 East.
- Section 24 of Township 25 North, Range 44 East.
- Section 25 of Township 25 North, Range 44 East.

Exploration logs from previous geotechnical reports are provided in Appendix A. Explorations logs have been assigned a designation based on the project name and exploration number, these designations are provided in the upper right corner of each log.

Compiled well logs are provided in Appendix B. Each well log has been assigned a designation based on its Public Land Survey System (PLSS) location, these designations are provided in the upper right-hand corner of the each well log.

4.2 SUBSURFACE DATABASE

GeoEngineers developed databases of existing subsurface data. Compiled data are summarized in the following tables:

- Compilation of Subsurface Data from Existing Explorations, Table A-1.
- Compilation of Subsurface Data from Water Well Reports, Table B-1.

This data, as well as results of GeoEngineers' Project Area explorations and testing, were used to develop the geologic and hydrogeologic setting information described below.

5.0 Summary of Geologic and Hydrogeologic Setting

5.1 GEOLOGIC SETTING

Surficial geology within and near the Spokane Valley is presented in the Surficial Geologic Map, Figure 3. Basement rocks underlying the Project Area generally consist of metamorphic rocks of Precambrian age (greater than about 541 Ma). Precambrian rocks were intruded by granitic plutonic rocks during the Mesozoic Era (about 252 to 66 Ma) and the Paleogene Period (about 66 to 23 Ma). Basement rocks outcrop along the northwest and southwest margins of the REP and underlie the entire study area at depth.

Basement rocks are stratigraphically overlain by Miocene age basalt flows associated with the Columbia River Basalt Group (CRBG) (Pardee et al., 1926; Whiteman et al., 1994; Kahle et al., 2011; Smith et al., 1989; Leek, 2006, Reidel and Tolan, 2013). The CRBG was deposited during an extended period of Miocene (about 23 to 5.3 MA) volcanism that extruded a series of fluid lava flows. The lava flowed from north-northwest trending fissures as much as 90 miles long, which were located primarily in northeastern Oregon and eastern Washington (Hooper, 1982; Tolan et al., 1989). The resulting basalt deposits are hundreds to thousands of feet thick in some areas of eastern Washington and extend throughout the Columbia Plateau. As the basalt flowed into the area surrounding Spokane (which is situated near the eastern terminus of the CRBG), it filled preexisting depressions, lapping onto elevated areas of older, uplifted metamorphic and igneous rocks.

The CRBG is divided into five formations that include, from oldest to youngest, the Steens Basalt, Imnaha Basalt, Grande Ronde Basalt (including the Picture Gorge Basalt), Wanapum Basalt and Saddle Mountains Basalt (Swanson et al., 1979; Beeson et al., 1985; Reidel and Fecht. 1987; Tolan et al., 1989). The Wanapum Basalts are mapped within the Spokane Valley area and, more specifically, the Project Area.

Interbedded within the CRBG deposits within the Project Area are sedimentary rocks associated with the Latah Formation. The Latah Formation was formed in the middle Miocene (16 to 11.6 Ma) time period where eastern Washington and parts of northwest Idaho were intermittently inundated resulting in the formation of fluvial and lacustrine deposits. The Latah formation consists of variably indurated finely laminated siltstone, claystone and minor sandstone rocks and is commonly found to be interbedded with Miocene age basalt flows associated with the CRBG (Pardee et al., 1926; Whiteman et al., 1994; Kahle et al., 2011; Smith et al., 1989; Leek, 2006; Reidel and Tolan, 2013). The Latah Formation outcrops within slopes at the margin of the REP and is overlain by CRBG within the eastern portions of the Project Area.

Throughout the REP, CRBG and Latah Formation deposits are primarily overlain by Pleistocene glaciofluvial (flood) deposits, which consist of unsorted mixtures of silt, sand, gravel, cobbles and boulders. Sediments across the REP tend to be undulating with variable thickness although glaciofluvial deposits generally are thin to absent within the REP portion of the Project Area. Flood deposits form the Spokane Valley/Rathdrum Prairie (SVRP) Aquifer located north and west adjacent to the base of Project Area and are hundreds of feet thick (Kahle and Bartolino, 2007). Flood deposits frequently are interbedded with glaciolacustrine sediments consisting primarily of clay, silt or silty fine sand. Minor Quaternary (less than about 2.6 MA) mass wasting deposits occur along the flanks of the REP and consist primarily of fine-grained sediments and other debris shed from the REP.

5.2 HYDROGEOLOGIC SETTING

5.2.1 General

Groundwater underlying the Project Area occurs within four primary hydrogeologic units. These units include the: (1) Basement rock unit; (2) CRBG unit; (3) Latah unit and (4) Sedimentary unit (including the SVRP Aquifer).

5.2.2 Basement Rock Unit

Groundwater occurs in basement rock in fractured and/or weathered zones. Porosity, hydraulic conductivity and transmissivity are generally low. Basement rock surrounding and underlying the Project Area include plutonic igneous rock of granitic origin and metamorphic rock that typically exhibit very poor infiltration rates. As such, basement rock are not typically targeted for infiltration.

5.2.3 CRBG Unit

The CRBG consists of a series of individual basalt flows. Groundwater is most readily transmitted through the broken vesicular and scoriaceous interflow zones that characterize the top of each basalt flow. The interflow zones are separated by the less porous and less transmissive entablature and colonnade, which comprise 90 to 95 percent of the total flow volume (Whiteman et al., 1994).

In general, groundwater within the CRBG unit flows from upland areas to surface drainage features such as the Columbia River and its tributaries (Kahle et al. 2011). Groundwater flow is controlled by topography, geologic structures, basement topography, recharge and discharge conditions, unit continuity and permeability variations. Basalt permeability is controlled by primary rock texture and secondary jointing and fracturing. In many locations, the permeability of the CRBG interflow zones has been reduced by secondary mineralization of zeolites and/or clay infilling joints and fractures.

The CRBG is overlain, in places, by Latah Formation deposits. In other locations, the CRBG directly crops out on the surface. Recharge to the CRBG occurs through direct precipitation, vertical infiltration from overlying unconfined aquifers and lateral recharge from upgradient areas to the north and east. Discharge from the CRBG occurs through leakage to adjacent aquifers (such as the SVRP Aquifer), along gaining reaches of streams and to water supply wells.

Recharge to shallow water-bearing zones within the CRBG is generated from precipitation, infiltration of irrigation water and by leakage from overlying aquifers (if any). The semi-arid nature of the Project Area limits the amount of available natural recharge from precipitation. Groundwater discharge from shallow water-bearing zones within the CRBG occurs as springs, base flow to surface water systems, geologically slow leakage to aquifers with lower potentiometric heads and water supply wells.

5.2.4 Latah Unit

The Latah Formation consists of a series of fine-grained lacustrine sedimentary deposits that are commonly found interbedded with CRBG basalt flows. Due to the fine-grained nature, the Latah Formation deposit does not readily transmit groundwater. Porosity, hydraulic conductivity and transmissivity are generally low.

5.2.5 Sedimentary Unit

The sedimentary unit consists of the various sediments that overlay the CRBG, Latah Formation and basement rocks within the Project Area. Sediments primarily include Pleistocene glaciofluvial and glaciolacustrine deposits.

North and west of the REP, approaching the Spokane Valley and Spokane River, glaciofluvial sedimentary deposits consist of thick sequences of sand, gravel, cobbles and boulders to depths of up to 600 feet with interbedded lenses and pockets of fine-grained glaciolacustrine deposits. These sedimentary sequences form the SVRP Aquifer, as shown in Figure 3. The sedimentary deposits that make up the SVRP are highly transmissive and unconfined making it a target location for stormwater infiltration. The SVRP Aquifer is recharged by snowmelt within adjacent and nearby upland areas, direct infiltration of precipitation, outdoor water use, septic discharge and stormwater infiltration. The SVRP Aquifer primarily discharges to the Spokane River, the Little Spokane River, vertically to underlying bedrock aquifers and to water supply wells.

The sedimentary unit within the REP is thin (generally less than 20 feet) relative to the SVRP Aquifer. Sediments on the REP overlay either the CRBG, Latah Formation or basement rock.

Recharge to the sedimentary unit on the REP is primarily from infiltration of precipitation, infiltration of surface water along losing stream reaches, seepage of irrigation water from lawns and septic systems. In urban areas, like Ridgemont Estates, additional recharge results from infiltration of stormwater runoff from impervious surfaces associated with roads, parking lots and buildings. Discharge from the sedimentary unit generally occurs as base flow to surface water such as springs, streams and ponds located in low-lying areas adjacent to the REP. Subsurface discharge to the underlying basalt aquifer system also may occur locally.

Because of the generally poor infiltration characteristics of basalt and the Latah Formation observed on the REP, the sedimentary deposits that make up the SVRP at the base of the REP are of primary significance as a target for stormwater infiltration within the Project Area and surrounding area. Infiltration capacity of the sedimentary unit is controlled by physical heterogeneities associated with the sediment deposits and moisture content. Vadose zone heterogeneities and moisture variations result in complex flow paths that include downward percolation, lateral movement and perched water in the vadose zone. Perched groundwater occurs where discrete areas or lenses of fine-grained materials or bedrock exist and act to inhibit downward percolation. In coarse strata vertical moisture movement in the vadose zone can be measured at several feet per day, depending on moisture content. Vertical movement of moisture through fine vadose zone strata will be several orders of magnitude lower.

6.0 Project Explorations

6.1 GENERAL

Subsurface conditions within the Geotechnical Fieldwork Study Area were explored using drilling, coring and test pit excavation methods. Explorations within the Geotechnical Fieldwork Study Area were advanced within the REP and Main Pond. Five hollow-stem-auger borings with monitoring wells (GE-B-1 through GE-B-5) and nine pavement cores (GE-C-1 through GE-C-9) were completed within the REP. Four test pits (GE-TP-1 through GE-TP-4) were completed within the Main Pond. Approximate exploration locations within the REP are shown in Figure 2. In addition, exploration locations within the Main Pond are shown in detail in the Infiltration Test Site Plan, Figure 4. Descriptions of GeoEngineers' field exploration equipment and procedures, exploration and monitoring well logs and results of laboratory testing are provided in Appendix C.

6.2 BOREHOLES, WELLS, PAVEMENT CORES AND TEST PITS

Subsurface conditions were explored at the REP through the following explorations:

- Hollow-stem-auger boring GE-B-1, drilled to 10 feet bgs on October 17, 2023.
- Hollow-stem-auger borings GE-B-2 through GE-B-5, drilled to 26½ feet bgs between October 17 through 19, 2023.
- Pavement cores GE-C-1 through GE-C-9, advanced to a depth of 1 foot bgs on October 20, 2023.

Borings GE-B-2 through GE-B-5 were completed with 2-inch-diameter polyvinyl chloride (PVC) monitoring wells. Boring GE-B-1 was abandoned after drilling in accordance with Chapter 173-160 of the Washington Administrative Code (WAC).

Subsurface conditions were explored at the Main Pond through the following explorations:

- Test pit GE-TP-1, excavated within the Main Pond to a depth of 2 feet bgs for pilot infiltration testing on March 18, 2024.
- Test pits GE-TP-2 through TP-4, excavated within the Main Pond to depths in the range of 11½ to 12 feet bgs on March 18, 2024.

GeoEngineers analyzed a total of sixteen discrete samples for analysis of grain-size distribution per ASTM Method C 136 and moisture content by ASTM Method D2216. Results of our grain-size distribution analyses are presented in Appendix C, Figures C-11 through C-16.

6.3 SURFACE CONDITIONS

6.3.1 *Existing Pavement Condition*

The existing pavements within the project area are generally in poor condition and exhibit significant fatigue (alligator) cracking (particularly pavement in older portions of the development that are approaching 50 years old) as well as transverse and longitudinal cracks. In some areas, fatigue cracking has progressed to a point of complete disintegration of the asphalt surfacing. There also is evidence of previous patching, particularly for underground utility work. We did not observe areas indicative of subgrade failures (subgrade failures often consist of fatigue cracking coupled with significant rutting, potholes or other evidence of loss of subgrade support).

The following is a summary of existing pavement information based on review of available plans and previous geotechnical engineering reports provided by the City.

- Budinger Associates (Budinger) submitted a report in 2008 that included recommendations for reconstruction of 24th Avenue east of Sullivan Road, extending along a portion of South Vera Crest Drive. The City also produced plans for the reconstructed pavement. Based on review of Google Earth Imagery, it appears the project was completed sometime between 2008 and 2011. The design pavement sections for Vera Crest consisted of:
  - An approximate 150-foot-long segment starting at the top of the hill near the intersection of South Vera Crest and East 24th Avenue: 5 inches of hot mix asphalt (HMA) surfacing overlying 6 inches cement treated base (constructed using full depth reclamation processes) overlying 10 inches of permeable ballast.
  - An approximate 450-foot-long segment continuing along South Vera Crest Drive to the end of the project at the north side of the intersection of South Vera Crest Drive and East 22nd Avenue: 5 inches of HMA surfacing overlying 6 inches of crushed surfacing, overlying 10 inches of permeable ballast.
  - Separation geotextile was included in the design to be placed on top of prepared subgrade. The project also included recommendations for pavement underdrains to be installed along the edges of the roadway (both sides on tangent sections and just on the low side on superelevated sections).
- 1975 plans for Renz Subdivision No. 1 indicated the design pavement section was 2 inches of asphalt concrete pavement over 4 inches of crushed surfacing. The project included South Vera Crest Drive from the top of the hill to approximately 285 feet north of East 20th Court, all of East 20th Court, East 22nd Avenue between Vera Crest and South Conklin Road, South Carnine Court and South Conklin Court.

6.4 SUBSURFACE SOIL CONDITIONS

6.4.1 *Ridgemont Estates Plateau*

Subsurface soil conditions within the REP are composed of a complex sequence of glaciofluvial sediments overlying fine-grained sedimentary deposits, generally interpreted at variable depths as the Latah Formation, CRBG and basement rock, as shown in Figure 5, Cross Section A-A' and Figure 6, Cross Section B-B' (cross section transects are shown in Figure 2). Observed subsurface conditions generally consisted of the following:

- Roadways generally were underlain by asphalt pavement surfacing ranging in thickness from 1½ to 5 inches and crushed surfacing base course ranging in thickness from 1½ to 4 inches.
- Where present, glaciofluvial deposits generally consisted of sand and gravel with variable silt content to depths of about 4½ to 15 feet bgs. This unit was not identified in borings B-3 and B-4.
- Silt and clay deposits of variable densities were present to depths of up to about 26½ feet bgs. Deeper stiff to hard silt and clay deposits were interpreted as Latah Formation deposits. The upper contact of this unit was variable and observed at about 15 feet bgs in B-2, at the bottom of base course in B-3 and B-4 and at about 4½ feet bgs in B-5. This unit was not observed in B-1.
- Weathered basalt bedrock, associated with the CRBG, was observed at about 10 feet bgs in exploration B-1.

At the time of drilling, saturated soil conditions were not observed, suggesting depth to the groundwater table exceeded the termination depth of each boring at the time of exploration.

6.4.2 Main Infiltration Pond

Shallow subsurface conditions beneath the Main Pond are composed of a complex sequence of glaciofluvial and glaciolacustrine sediments, as shown in Cross Section C-C', Figure 7 (cross section transects are provided in Figures 2 and 4). Observed subsurface conditions generally consist of the following:

- Surficial silt with organic matter from ground surface to a depth of about 1 foot bgs.
- Interpreted glaciolacustrine deposits consisting of silt with variable sand content from about 1 foot bgs to variable depths up to greater than 12 feet bgs. The lower contact of this unit appears to deepen to the northeast of the Main Pond.
- Interpreted glaciofluvial deposits consisting of sand with gravel and variable silt content from variable depths of 1½ feet bgs to greater than 12 feet bgs. The upper contact of this unit was observed at 1½ feet bgs in TP-1, 3½ feet bgs in TP-2 and 10 feet bgs in TP-3. This unit was not observed in TP-4, though it may be present at depth (Figure 7).

At the time the test pits were completed, saturated soil conditions were not observed, suggesting depth to the groundwater table exceeded 12 feet bgs.

6.4.3 Existing Pavement and Subgrade Soil

The thickness of existing asphalt concrete (AC) surfacing and underlying base course was measured at each of the project boring and core locations. Additionally, dynamic cone penetration (DCP) tests were conducted at each core location (DCP-1 through DCP-9 correspond to core locations GE-C-1 through GE-C-9, respectively). DCP tests consist of advancing a small diameter graduated steel probe into the subgrade soil to a depth of approximately 3 feet using a manually operated slide hammer. The incremental number of blows and depth of probe advancement is recorded, and the results can be used to estimate California Bearing Ratio and/or the resilient modulus of the in-situ subgrade soil. Table 1 presents a summary of the existing pavement thicknesses measured at the core locations and estimated resilient modulus values. Logs of the DCP probes are presented in Appendix D.

TABLE 1. EXISTING PAVEMENT SUMMARY

EXPLORATION	ASSOCIATED DCP TEST	STREET	APPROXIMATE AC SURFACING (IN)	APPROXIMATE BASE COURSE (IN)	SUBGRADE	ESTIMATED SUBGRADE RESILIENT MODULUS (PSI)
GE-C-1	DCP-1	E 22nd Ave	4.75	3	Sand with silt	6,500
GE-C-2	DCP-2	S. Conklin St	2	15	-	7,600
GE-C-3	DCP-3	S. Carnine St	1.25	3	Sand with silt and gravel	7,500
GE-C-4	DCP-4	S. Conklin Rd	1.75	8	Sand with silt	5,600
GE-C-5	DCP-5	S. Conklin Rd.	2.25	6.75	Gravel with sand	6,900
GE-C-6	DCP-6	S. Ridgemont Dr	2.75	5	Gravel with sand	5,000
GE-C-7	DCP-7	S. Ridgemont Dr	2.25	12	-	4,100
GE-C-8	DCP-8	S. Conklin Rd	1.75	4	Gravel with sand	4,200
GE-C-9	DCP-9	E. 20th Ct	2	2	Sand with silt and gravel	9,100
GE-B-1	--	Vera Crest Dr	1.5	1.5	Silt	-
GE-B-2	--	Vera Crest Dr	1.5	2	Sand	-
GE-B-3	--	Vera Crest Dr	5	4	Clay	-
GE-B-4	--	S. Ridgemont	4	4	Clay	-
GE-B-5	--	S. Carnine Ct	3	4	Silty Sand	-

7.0 Grain-Size-Based Hydraulic Conductivity Estimates

A total of nine samples were submitted to GeoEngineers' laboratory for gradation analyses completed in accordance with ASTM Method C 136. GeoEngineers' laboratory test results are presented in Appendix C. The percentages of fines within the samples ranged from 4 percent to 97 percent, as summarized in Table 2.

TABLE 2. FINES PERCENTAGES AND SATURATED HYDRAULIC CONDUCTIVITY

EXPLORATION	APPROXIMATE DEPTH (FEET BGS)	SEDIMENT TYPE	LOCATION	FINES PERCENTAGE [1]	APPROXIMATE SATURATED HYDRAULIC CONDUCTIVITY [2] (INCHES PER HOUR)
GE-B-2	5-6.5	SM	S Vera Crest Dr	18	NA
GE-B-2	10-11.5	SP-SM	S Vera Crest Dr	10	16
GE-B-3	5-6.5	ML	S Vera Crest Dr	67	NA
GE-B-4	5-6.5	ML	S Conklin Rd	61	NA
GE-B-5	2.5-4	SM	E 22nd Ave	21	NA
GE-TP--2	2-3	ML	Main Pond	90	NA
GE-TP-2	7-8	GP	Main Pond	4	1300
GE-TP-3	1.5-2	ML	Main Pond	97	NA
GE-TP-3	10-11	GM	Main Pond	18	NA
GE-TP-4	3.5-4	ML	Main Pond	82	NA

Notes: [1]Fines percentage is the percentage of sample (by weight) that consists of silt- and clay-sized sediment particles passing the U.S. No. 200 sieve.
[2]Saturated hydraulic conductivity was calculated using Equations 6.17 of the Stormwater Management Manual for Eastern Washington (Ecology, 2019).
NA = not applicable.

Grain-size-based hydraulic conductivity analyses generally rely, in part, on the samples d_{10} value (the sieve size that would allow 10 percent of the sample to pass). For samples with d_{10} values that were defined by their respective gradation curve, GeoEngineers estimated saturated hydraulic conductivity based on Equation 6.17 of the *Stormwater Management Manual for Eastern Washington* (Ecology, 2019). Resulting hydraulic conductivity estimates are summarized in Table 1. Estimates range from 16 inches per hour (iph) to 1300 iph.

8.0 Project Area Subsurface Geologic Framework

Based on information compiled from previous reports and collected during this field investigation, we created a series of figures and geologic cross-sections that graphically summarize our interpreted subsurface geologic framework for the Project Area. Aspects of the compiled data within the project subsurface dataset (Appendices A and B) are provided in the following figures:

- Hydrogeologic Cross-Section A-A', Figure 5: This section originates near the southwest corner of the Project Area and trends east and northeast to the northeast corner of the Geotechnical Fieldwork Study Area. Glaciofluvial deposits associated with the SVRP Aquifer occur in the southwest portion of the section and pinch out near VC-B-4. Shallow REP deposits consist of CRBG and interpreted Latah Formation, except near GE-B-2, where an apparent trough of glaciofluvial deposits was observed.

- Hydrogeologic Cross-Section B-B', Figure 6: This section originates near the western edge of the study area and trends east to the eastern edge of the Geotechnical Fieldwork Study Area. Glaciofluvial deposits associated with the SVRP Aquifer occur within the west portion of the section. Shallow REP deposits underlying this section also primarily consist of CRBG and interpreted Latah Formation, with a thin sequence of glaciofluvial sediments situated near GE-B-5.
- Hydrogeologic Cross-Section C-C', Figure 7: This section originates near the southwest corner of the Main Pond and trends northeast to the northeast corner of the Main Pond. Subsurface conditions of the Main Pond are of particular interest for potential infiltration of stormwater generated from the REP, specifically from the South Vera Crest Drive and South Conklin Road area. Thick sequences of fine-grained deposits, interpreted as glaciolacustrine deposits, dominate the shallow subsurface of the Main Pond and appear to increase in thickness to the northeast. Glaciofluvial deposits of sand and gravel were encountered at a depth of about 5½ feet bgs at GE-TP-2. Sand and gravel were absent from GE-TP-4, though could occur at depth as shown in Figure 7.
- Thickness of Permeable Sediments, Figure 8: This figure presents approximate thickness of permeable glaciofluvial sediments overlying CRBG, interpreted Latah Formation and/or basement rock. Data used to support this figure primarily was obtained from previous geotechnical explorations (Table A-1) and project explorations (Appendix C). Permeable sediments on the REP are generally thin (less than 20 feet in thickness) and, where present, occur in isolated lenses and pockets, such as the one observed at exploration GE-B-2. Glaciofluvial deposits appear to thicken near the base of the REP, as shown at the southwest corner of the Project Area in borings SC-B-1 and SC-B-2, and north corner of the Project Area in test pits RE-TP-8 through RE-TP-10. This trend appears consistent with typical SVRP deposits found in Spokane Valley.
- Depth to Crystalline Bedrock, Figure 9: This figure presents observed depths to crystalline bedrock (CRBG and/or basement rock) underlying the Project Area. Data used to support this figure is from existing boring and test pit observations (Table A-1) and project explorations (Appendix C). Observed depth to bedrock was variable throughout the Project Area with depths ranging from about 3 feet to greater than 30 feet bgs. Bedrock appeared to become increasingly shallow to the south near the base of the REP, as shown in test pits RH-TP-101 through RH-TP-106.
- Depth to Limiting Stratigraphic Layer, Figure 10: This figure presents our interpretation of depth to the uppermost fine-grained sediments that limit stormwater infiltration. The limiting stratigraphic layer could consist of basalt, basement rock, Latah Formation, weathered/reworked Latah Formation and/or fill material consisting primarily of fine-grained sediment. Data used to support this figure is from existing boring and test pit observations (Table A-1) and project explorations (Appendix C). The limiting stratigraphic layer generally was encountered at shallow depths throughout the Project Area, ranging from approximately 0.3 to 7 feet bgs, with the exception of exploration GE-B-2, where the limiting stratigraphic layer was encountered at approximately 15 feet bgs.

Collectively, this subsurface geologic framework indicates that challenging stormwater infiltration conditions occur throughout the REP. Limiting stratigraphic units occur at relatively shallow depths throughout most of the REP. An isolated zone of surficial glaciofluvial sediments was observed within the approximate center of the Project Area, as shown in Figure 3. However, this glaciofluvial zone appears to be bounded by limiting stratigraphic units in all directions and, therefore, is likely of limited storage and limited functionality in transporting infiltrated stormwater off the REP to downgradient areas.

9.0 Monitoring Instrumentation and Groundwater Elevations

9.1 MONITORING POINT ELEVATION DATA

Monitoring well elevations were provided to GeoEngineers by Osborn and are summarized in Table 3.

TABLE 3. MONITORING POINT ELEVATION DATA

LOCATION	STRUCTURE TYPE	TOC ELEVATION [1] (FEET)	GROUND SURFACE ELEVATION [1] (FEET)
GE-B-2	Monitoring Well	2,141.43	2,141.68
GE-B-3	Monitoring Well	2,182.41	2,182.71
GE-B-4	Monitoring Well	2,214.76	2,215.06
GE-B-5	Monitoring Well	2,213.68	2,213.93

Notes: [1]Elevations are referenced to the NAVD88 datum.
TOC = top of north rim of PVC well casing

9.2 INSTRUMENTATION

On November 13, 2023, GeoEngineers installed Solinst Model M10 Levelogger 5 pressure transducers/dataloggers in monitoring wells GE-B-2 through GE-B-5. We also installed a Solinst Model Barologger 5 barometer/datalogger within the monument at GE-B-2. The dataloggers were programmed to record water (or air) pressure and temperature on a 2-hour interval for the purpose of characterizing seasonal trends in groundwater elevation and response to precipitation events within shallow groundwater at the monitoring locations.

9.3 GROUNDWATER ELEVATION DATA

9.3.1 Previous Groundwater Measurements

GeoEngineers reviewed 60 exploration logs and 13 water well logs at and adjacent to the Project Area (Tables A-1 and B-1), which were completed during the period from May 1974 through July 2017. Two borings completed in January 2008 (VC-B-3 and VC-B-4) and one test pit completed in April 2017 (RE-TP-5), reported shallow groundwater at depths ranging from 2 to 7 feet (Figure 11). Existing water wells, primarily completed in basalt bedrock, reported depths to groundwater of 50 to 140 feet bgs.

9.3.2 Project Manual Measurements

GeoEngineers collected manual groundwater levels in GE-B-2 through GE-B-5 on November 13, 2023, December 22, 2023, February 28, 2024 and June 14, 2024 (collectively designated the groundwater monitoring events). Results of these groundwater monitoring events are summarized in Table 4. GE-B-5 was dry during the November 2023 event indicating that groundwater elevation at this location was less than 2,204.5 feet (NAVD88).

During the Project Area monitoring events, depth to groundwater was relatively shallow. Depth to groundwater at the four monitoring locations, excluding the dry measurement in GE-B-5 during November 2023, ranged from 3.70 bgs in GE-B-4 to 8.75 feet bgs in GE-B-3. Groundwater elevations ranged from 2,134.63 feet (NAVD88) in GE-B-2 to 2,211.10 feet (NAVD88) in GE-B-4. A summary of groundwater measurements is presented in Table 4.

TABLE 4. MANUAL DEPTH TO GROUNDWATER MEASUREMENTS

MONITORING WELL	DATE	TIME	DEPTH TO GROUNDWATER [1] (FEET BTOC)	GROUNDWATER ELEVATION [1,2] (FEET BGS)	RANGE IN GROUNDWATER ELEVATION (FEET)
GE-B-2	11/13/2023	13:18	7.05	2,134.63	2.35
	12/22/2023	12:41	6.17	2,135.51	
	02/28/2024	11:15	4.70	2,136.98	
	06/14/2024	13:01	6.60	2,135.08	
GE-B-3	11/13/2023	13:46	8.75	2,173.96	2.14
	12/22/2023	12:31	6.61	2,176.10	
	02/28/2024	11:30	7.20	2,175.51	
	06/14/2024	13:21	8.45	2,174.26	
GE-B-4	11/13/2023	14:03	3.96	2,211.10	0.33
	12/22/2023	12:13	3.93	2,211.13	
	02/28/2024	11:45	3.70	2,211.36	
	06/14/2024	13:38	3.63	2,211.43	
GE-B-5	11/13/2023	14:24	Dry	<2,204.48	>2.35
	12/22/2023	12:53	8.45	2,205.48	
	02/28/2024	12:15	7.10	2,206.83	
	06/14/2024	13:52	9.19	2,204.74	

Notes: [1]Elevations are referenced to the NAVD88 datum.
[2]Groundwater elevations were calculated by subtracting the depth to groundwater from the surveyed top of casing elevations.
bTOC = below top of casing; bgs = below ground surface

9.3.3 Electronic Measurements

GeoEngineers downloaded the pressure transducer/dataloggers and barometer deployed in project monitoring wells during each groundwater monitoring event. The project monitoring period, therefore, extends from November 13, 2023 to June 14, 2024.

We corrected the data for barometric pressure fluctuation and reduced the data for depth to groundwater and groundwater elevation. Results are provided and compared to daily precipitation at the Spokane Airport Climate Station (No. 457938) in Depth to Groundwater and Precipitation, Figure 12. Climate station reports are included in Appendix E, Climate Data. Our observations include the following:

- Groundwater monitoring data from monitoring well GE-B-2 generally are indicative of conditions within the limited zone of glaciofluvial sediments outlined in Figure 3. Groundwater monitoring data from monitoring wells GE-B-3 through GE-B-5 generally are indicative of conditions within interpreted Latah Formation sediments.
- Groundwater levels generally rose in project monitoring wells and structures during the winter and spring months from about early December 2023 through early March 2024. The magnitude of the observed increase ranged from approximately 1.5 to 2.75 feet.

- After the early portion of March 2024, groundwater levels generally decreased in the project monitoring wells and structures. The observed magnitude of decrease was on the order of 1.0 to 2.75 feet.
- Groundwater levels within glaciofluvial sediments (monitoring well B-2) tended to increase and decrease gradually over a period of weeks to months. Groundwater levels within interpreted Latah Formation sediments (monitoring wells B-3 through B-5) increased and decreased more rapidly, generally over a period of days.
- Depths to groundwater within monitoring well GE-B-5, generally appeared to follow the seasonal pattern observed in other monitoring wells screened within the interpreted Latah Formation, although the well was intermittently dry. Dry conditions in GE-B-5 were recorded from November to the middle of December 2023, the early portion of January 2024, and early April 2024 through the end of the project monitoring period.
- Project monitoring wells responded variably to major precipitation events.
  - Monitoring locations completed with interpreted Latah Formation sediments (GE-B-3 through GE-B-5) showed a rapid response in groundwater elevation to significant precipitation events.
  - The monitoring location completed within glaciofluvial sediments (GE-B-2) did not respond rapidly to precipitation events. Rather, it appeared to respond gradually to longer-term, seasonal variation in precipitation and associated groundwater recharge.
- A diurnal (daily) fluctuation in groundwater level was observed in most of the monitoring locations. The magnitude of the observed fluctuation was generally less than 0.04 feet. The observed fluctuation also generally decreased with increasing depth to groundwater. This observed diurnal fluctuation could be caused by daily uptake of water by vegetation, daily irrigation practices and/or the transfer of water between the shallow aquifer and capillary fringe related to daily temperature and barometric fluctuation (Turk, 1975).

10.0 Hydraulic Testing

10.1 PILOT INFILTRATION TESTING

10.1.1 Test Procedure

The infiltration characteristics of the unsaturated zone at the Main Pond were estimated by completing a large-scale pilot infiltration test (designated IT-1) in test pit TP-1 (Figure 4). The intent of the pilot test was to characterize the capacity of existing shallow soil within the Main Pond to infiltrate stormwater. Therefore, pilot testing was conducted in TP-1 at a depth of 2 feet bgs.

GeoEngineers conducted the pilot infiltration test in general accordance with Appendix 6B of the *Stormwater Management Manual for Eastern Washington* (Ecology, 2019). Pilot infiltration test data are provided and shown in Table F-1 and Figure F-1 of Appendix F.

GeoEngineers used the following testing procedure:

- Excavated a 10.2-foot by 11.0-foot test pit to a depth of 2 feet bgs.
- Installed a temporary 2-inch-diameter PVC piezometer.

- Added clean water to the pit at a rate that maintained a water level between 1 and 2 feet above the bottom of the pit. Water was injected into the pit for an approximate 4-hour soaking period followed by an approximate 1-hour constant head period.
- At regular intervals, the cumulative volume and instantaneous flow rate were measured in gallons per minute (gpm) to maintain the water level at the same point in the piezometer.
- Terminated water discharge and recorded the rate of water level decrease in the test pits for an approximate 2-hour period (falling head test).

10.1.2 Test Results

At the Main Pond, water was sourced from an adjacent City fire hydrant. A total of 1,150 gallons was injected during testing. Head within test pit TP-1 was maintained at a height of approximately 1.17 feet above the bottom of the test pit during the constant head period (Figure F-1). To maintain the constant head, an injection rate that ranged from approximately 0.93 gpm to 1.03 gpm was required. Between measurement intervals, this correlates to infiltration rates through the bottom of the test pit that range from 0.80 iph to 0.89 iph. The stabilized infiltration rate for the 1-hour constant rate period was approximately 0.85 iph. The falling head period was recorded for 2 hours, in which the water level in TP-1 dropped 0.18 feet. During the falling-head period, the stabilized infiltration rate was approximately 1.03 iph.

Pilot infiltration testing results are summarized in Table 5.

TABLE 5. PILOT INFILTRATION RESULTS SUMMARY

EXPLORATION	LOCATION	INFILTRATION RATE (IPH)		CORRECTION FACTOR [3]	PRELIMINARY DESIGN INFILTRATION RATE [4] (IPH)
		CONSTANT HEAD PERIOD [1]	FALLING HEAD PERIOD [2]		
TP-1	Main Pond	0.85	1.03	0.34	0.29

Notes: [1]The infiltration rate provided for the constant head period represents a stabilized infiltration rate for final hour of the constant rate period.
[2]The infiltration rate provided for the falling head period represents an average infiltration rate for the falling head period.
[3]The correction factor was adapted from Table 6.4 of the 2019 Stormwater Management Manual for Eastern Washington and assumes the following parameters CFv: 0.50, CFt: 0.75, CFm: 0.9, and CFb: 1.0.
[4]The preliminary design infiltration rate was estimated by applying the correction factor to the stabilized infiltration rate during the constant head period.
iph = inches per hour.

After applying the specified correction factor from the 2019 Stormwater Management Manual for Eastern Washington (Ecology, 2019), preliminary design infiltration rate at the Main Pond was 0.29 iph.

10.2 FULL-SCALE DRYWELL TESTING

10.2.1 Procedure

The performance of existing drywells within the Radco Pond (infiltration test IT-2) and along the north side of East 24th Avenue (infiltration test IT-3) were estimated by completing full-scale drywell infiltration tests in one existing drywell at each location. Approximate test locations are shown in Figure 4. GeoEngineers conducted the full-scale drywell infiltration tests in general accordance with Appendix 6B of the *Stormwater Management Manual for Eastern Washington* (Ecology, 2019) and Appendix 4B of the *Spokane Regional Stormwater Manual* (Spokane County et al., 2008). Full-scale drywell test data for tests IT-2 and IT-3 are provided and shown in Tables F-2 and F-3, and Figures F-2 and F-3 of Appendix F, respectively.

GeoEngineers used the following testing procedure:

- Inspected and measured the dimensions of each drywell selected for drywell testing.
- Installed temporary 2-inch-diameter PVC piezometers within the drywells.
- Added clean water to the drywells at a rate that maintained a water level consistent with the top of the active barrel section or immediately below the lowest lateral connecting pipe, if present. Water was injected 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 gpm necessary to maintain constant head within the drywells.
- Terminated water discharge and recorded the rate of water level decrease in the drywells for approximately 50 minutes or until the drywells were dry.

10.2.2 Radco Infiltration Pond

At the Radco Pond, the drywell closest to the southwest stormwater inlet was selected for testing. Water for the test was sourced from a City hydrant located on the north side of East Radco Drive adjacent to the Radco Pond access road. A total of 32,134 gallons were injected during testing. Head within the drywell was maintained at a maximum height of 3.44 feet to 3.61 feet during the constant head period (Figure C-2). To maintain the constant head, the hydrant was discharged at maximum capacity. Injection rates ranged from approximately 239 gpm to 294 gpm. The normalized outflow rate for the 1-hour constant rate period was 2.0 cubic feet per second (cfs).

The duration of the falling head period was 6 minutes, which was the time required for the drywell to go dry. The falling-head infiltration rate generally diminished over time as head decreased and, potentially, the wetting front extended to zones of relatively low permeability.

10.2.3 East 24th Avenue

In the sidewalk along the north side of East 24th Avenue, east adjacent to the intersection of East 24th Avenue and South Timberlane Drive, a cluster of three existing drywells is present. The series of three, double-depth concrete drywells, herein designated the west, central and east drywell, are interconnected by approximate 8-inch-diameter lateral piping at a depth of about 5½ feet (drywell rim to bottom of pipe). Initial investigation of the series of drywells indicated moderate to severe siltation in the west and central drywells and minor siltation in the east drywell. As a result, the east drywell was selected for testing, as it appeared to be the least impacted by siltation and debris accumulation.

Water for the test was sourced from a City hydrant located at the northwest corner of the above intersection. A total of 785 gallons were injected during testing. Head within the drywell was maintained at a height of 4.07 feet to 4.09 feet during the constant head period (Figure C-3). Head within the drywell during the constant rate period was limited by the height of lateral connection piping. To maintain the constant head, the hydrant was discharged at injection rates of approximately 78 gpm to 105 gpm. The normalized outflow rate for the 1-hour constant rate period was 0.014 cfs.

The duration of the falling head period was 50 minutes, in which the water level within the drywell decreased by a total of 1.1 feet. The falling-head infiltration rate generally remained constant during the falling head period.

The measured exfiltration rate is generally low for drywells hydraulically connected to glaciofluvial sand and gravel deposits. It is unknown if the low exfiltration rates are a result of lower permeability soil surrounding the drywells, shallow bedrock beneath the drywell base, the condition of the drywells or a combination of the above. Due to the following factors, exfiltration rates generated from the East 24th Avenue full-scale drywell test could be biased low due to the following drywell testing conditions:

- Drywell testing was conducted in a single drywell within the East 24th Avenue drywell cluster

Exfiltration rate was likely limited by siltation and accumulated debris. Minor siltation observed within the east (tested) drywell could have impacted outflow capacity of the drywell. The drywell test was limited to the active barrel section of the east drywell below the lateral interconnecting outlet piping, in accordance with procedures outlined in the Spokane Regional Stormwater Manual. Thus, only a portion of the active barrel section was tested. To provide a representative exfiltration rate of the East 24th Avenue drywell cluster, we recommend conducting a full-scale drywell test on the entire series of drywells including the full active barrel sections of each drywell simultaneously, as practical. Prior to drywell infiltration testing, we recommend all sediment and accumulated debris be removed and drywell slots be thoroughly cleaned to restore exfiltration capacity, to the extent practicable.

10.2.4 Summary of Results

Full-scale drywell infiltration testing results are summarized in Table 6.

TABLE 6. FULL-SCALE DRYWELL INFILTRATION RESULTS SUMMARY

TEST NUMBER	LOCATION	NORMALIZED OUTFLOW RATE (CFS) [1]	CORRECTION FACTOR [2]	DESIGN OUTFLOW RATE [3] (CFS)
		CONSTANT HEAD PERIOD		
IT-2	Radco Pond	2.0	2.5	0.81
IT-3	E 24th Ave	0.014	2.5	0.0055

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 during the constant head period.
cfs = cubic feet per second.

After applying the specified correction factor from the 2008 Spokane Regional Stormwater Manual (Spokane County et al., 2008), preliminary design outflow rates range from 0.81 cfs at the Radco Pond and 0.0055 cfs at East 24th Avenue.

11.0 Drainage Complaints

The City provided GeoEngineers with figures describing and showing the approximate locations of: (1) historic citizen complaints received from residents within the Project Area related to shallow groundwater and stormwater runoff; and (2) historic City observations related to seasonal springs, ponded drywells and infiltration pond overflow. The term ponded drywell refers to overflowed drywells with subsequent surface ponding. Associated approximate locations are provided in Historic Drainage Complaints, Figure 13 and are summarized by the following:

- A total of 27 citizen complaints were documented within the Project Area.
- Emergence of flow from seasonal springs generated during discrete large-scale precipitation events or sustained periods of precipitation were reported at seven locations. Five seasonal springs were reported near the southwest corner of the Project Area along South Vera Crest Drive, East 24th Avenue and South Sonora Drive and two seasonal springs were reported near South Steen Road. Based on the observed soil conditions at each spring location, infiltration is likely limited by surface or near-surface fine-grained sediments, which could consist of Latah Formation, weathered/reworked Latah Formation and/or fill material consisting primarily of fine-grained sediment. Depths to fine-grained sediment of about 0.7 to 2.5 feet bgs were observed near the seasonal spring locations (Figure 10). Seasonal springs near South Sonora Drive appear to be impacted by shallow bedrock (Figure 9). Groundwater also was observed at a depth of about 2 feet bgs in a boring drilled by Budinger and Associates in 2008 within South Vera Crest Drive near the intersection with 24th Avenue (Figure 11).
- Ponded drywells observed during large scale rain events or sustained periods of precipitation were reported at fourteen locations. Seven ponded drywells were reported at the northwestern edge of the REP along South Vera Crest and East 22nd Avenue and seven were observed at the southwest corner of the Project Area near South Sonora Drive, South Timberlane Drive and East Cameron Court (Figure 13). Based on subsurface soil conditions in adjacent explorations near the northern seven ponded drywell locations, infiltration appears to be limited by thickness of permeable sediments (Figure 9). Thickness of permeable sediments near the northern ponded drywell locations ranged from 0 to 3.8 feet , except for the ponded drywell documented adjacent to boring GE-B-2 (Figure 8). At boring location GE-B-2, thickness of permeable sediments were about 14.7 feet. We interpret drywell ponding at this location to be associated with stormwater inflow exceeding infiltration capacity of the infiltration structure.
- Stormwater pond overflow was reported at the infiltration pond located at the southwest corner of the Project Area between East Saltese Road and South Timberlane Road. Subsurface exploration data at this location is limited but based upon the geologic subsurface in the immediate vicinity, the pond is likely impacted by shallow bedrock (Figures 3 and 13). Based upon available aerial imagery, wetland vegetation appears to be present throughout the upgradient portion of the valley bottom. Wetland vegetation typically indicates prolonged periods of moist to wet conditions and fine-grained soil deposits. Wetland conditions and fine-grained soil conditions could also impact infiltration capacity.

12.0 Discussion

12.1 PROJECT AREA DRAINAGE CONDITIONS

The Project Area is underlain by a complex stratigraphic sequence of silty surficial deposits, glaciofluvial sediments, glaciolacustrine sediments, fine-grained sedimentary deposits associated with the Latah Formation, basalt flows associated with the CRBG and basement rocks. As cross-sections A-A' through C-C' (Figures 5 through 7) and Figure 8 (Thickness of Permeable Sediments) indicate, permeable sediments generally occur in thin, discontinuous deposits within the Project Area and, therefore, appear to be insufficient to support infiltration of stormwater and residential irrigation water within the Project Area.

Based on project findings, our current conceptual model of the hydrogeologic conditions that have contributed to the drainage issues observed within the Project Area is as follows:

- Stormwater infiltration across the Project Area is limited by shallow glaciofluvial sediment, Latah Formation, CRBG and basement rocks.
- A limited amount of stormwater infiltrates within glaciofluvial sediments which appear to occur within discontinuous depressions, channels and pockets, similar to that observed within project boring GE-B-2. These glaciofluvial deposits, however, generally are bounded by low-permeability sediment and rock and are not effective conduits for transport of infiltrated stormwater off the REP.
- With the advent of residential development, irrigated lawns, impermeable surfaces (paved areas, streets and buildings) and permanent stormwater infrastructure became prevalent within the Project Area. The percentage of water lost to evapotranspiration significantly decreased and stormwater discharge became concentrated at points of discharge (drywells, infiltration trenches and roof downspouts). As a result, more water now infiltrates through existing stormwater infrastructure and the vadose zone within the Project Area relative to pre-development conditions. The mechanisms creating increased infiltration primarily occurs through lawn watering, the removal of evapotranspiration through the loss of native vegetation and construction of impermeable surfaces where stormwater runoff is concentrated at specific infiltration points.
- As the area of development increased, the rate and volume of water entering existing stormwater infrastructure and subsurface soils increased. Eventually, stormwater infiltration seasonally began to exceed the capacity of the sediment strata and stormwater infrastructure resulting in the flooding and drainage issues now occurring in the Project Area.

Ultimately, solution(s) to the drainage problems observed within the Project Area likely will center around routing stormwater off the REP towards down-gradient discharge areas underlain by relatively thick sequences of glaciofluvial sediments overlying the SVRP Aquifer.

12.2 PAVEMENT THICKNESS DESIGN

12.2.1 General

We used procedures outlined in the American Association of State Highway and Transportation Officials (AASHTO) Guide to Design of Pavement Structures (commonly referred to as AASHTO 93) to evaluate potential pavement thicknesses for project streets. AASHTO 93 is an empirical design procedure that requires various input parameters. Site-specific parameters include the subgrade soil resilient modulus and traffic loads. The remaining input parameters are based on the functional classification of the roadway and material properties of the proposed pavement section. We evaluated pavement thicknesses for conventional HMA surfacing supported by crushed surfacing base course.

12.2.2 Subgrade

As indicated previously, a number of pavement cores and borings have been conducted in the Project Area. Results of the borings and pavement cores indicate the existing asphalt concrete surfacing is variable, ranging from about 1 inch to about 5 inches. Base course thickness also is highly variable. The explorations also indicate subgrade soil varies from silt and clay to sand and gravel (likely varying from reworked Latah Formation deposits to imported fill).

Results of our field explorations indicate the resilient modulus of the existing subgrade soil is greater than 3,000 psi, thus per the 2018 City of Spokane Valley Street Standards, standard pavement sections may be used for residential streets, assuming traffic loads result in ESAL values less than about 50,000 for a 20-year design life. Based on our limited time on-site during fieldwork, we observed a considerable volume of traffic along South Vera Crest Drive and East 22nd Avenue. We suggest consideration be given for the City to collect traffic counts as a basis for completing site-specific pavement thickness design for these streets.

12.2.3 Traffic

The traffic parameter used in the AASHTO 93 is based on equivalent single axle loads (ESALs). An ESAL value of 1.0 is equivalent to the load (or damage) a single truck axle loaded to 18,000 pounds will impart to a roadway. ESALs can be estimated by completing traffic counts and estimating the number of different types of trucks that use a particular street or segment of roadway. Load factors (also called truck factors) can then be applied to the different types of trucks within the traffic count. The truck factors provided in the City of Spokane Valley Street Standards are provided in Table 7.

Table 7. Truck Factors from the City of Spokane Valley Street Standards

VEHICLE CLASSIFICATION	TRUCK FACTOR (ESALS PER VEHICLE)
School Bus	2.87
STA Bus	2.57
Refuse Truck	1.03
All other trucks (averaged)	0.42

Other truck factors are also available. For example, the following breakdown of Truck Factors for various vehicle classifications available on the Washington State Department of Transportation (WSDOT) website is presented in Table 8.

Table 8. Example Truck Factors from WSDOT

VEHICLE CLASSIFICATION	TRUCK FACTOR (ESALS PER VEHICLE)
Cars and pickups	0.0007
2-axle, 6-tire single-unit trucks	0.25
3+ axle single-unit trucks	0.58
2 axle truck and semi-trailer double-unit trucks	0.39
4 axle truck and semi-trailer double-unit trucks	0.51
5+ axle truck and semi-trailer double-unit trucks	1.13
Buses	0.57
Twin trailers (multi-unit trucks)	2.4

The City of Spokane Valley Transportation Network on-line map indicates streets within the project limits are not classified as collectors or arterials. Information on site-specific traffic was not available at the time we prepared this report. In the absence of site-specific traffic data, we reviewed the design traffic information that was used for design of the 8 rehabilitation of 24th Avenue and the southern portions of South Vera Crest Drive, completed by Budinger and Associates, Inc. (Budinger) in 2008. The design average daily traffic used by Budinger was 3,000 vehicles per day (vpd) with an assumed 3 percent trucks (200 trucks per day for each 5-day work week). Budinger assumed all of the traffic would be in the design lane and assumed a truck factor of 2.0 ESALs per truck. This resulted in an estimated ESAL value of 1,170,000 ESALs for a 20-year design life for 24th Avenue and Vera Crest Drive.

We conducted a brief parametric study to assess possible alternative ESAL values for project streets. Assuming a growth rate of zero, and assuming 90 percent of the 3 percent total trucks used by Budinger consist of 2-axle, 6-tire single units, 9 percent of the trucks consist of 3 axle single units, and 1 percent of the trucks consist of buses, using the truck factors in Table 8, we estimated a 20-year design life equivalent single axle load (ESAL) value of approximately 225,000. If we assume a 2 percent annual growth rate starting from the 2008 design traffic values, the estimated 20-year design life ESAL value assuming the same contribution of trucks is approximately 350,000. For a 4 percent annual growth rate, the estimated 20-year design life ESAL value is approximately 600,000. If we assume 250 ADT for a residential street, with 3.5 percent trucks (including a mixture of single unit trucks and school buses) we can develop a 20-year ESAL estimate of about 50,000.

Again, we recommend site-specific traffic data be collected in advance of final pavement design to confirm or revise design ESAL values.

12.3 OTHER INPUT PARAMETERS

We completed preliminary pavement thickness design using procedures outlined in the City of Spokane Valley Street Standards along with the following input parameters:

- ESAL values of 50,000, 225,000; 375,000; 630,000 and 1,170,000 (previous design for 24th Avenue and Vera Crest Drive).
- Based on the results of our explorations, and review of previous efforts by Budinger, the average resilient modulus of subgrade soil within the project area is approximately 6,000 psi.
- Reliability of 75 percent for residential streets and 90 percent for non-residential streets (matching previous pavement design by Budinger). The City of Spokane Valley Street Standards stipulate a reliability level of 75 percent for residential and local non-residential streets, and 90 percent for all other street classifications. Note that reliability is the probability that a pavement section will perform satisfactorily over the traffic and environmental conditions for the design period. Higher reliability levels are typically assigned to more critical roadways within a roadway system. Overall deviation of 0.45 for new or reconstruction in accordance with City of Spokane Valley Street Standards.
- Initial serviceability index of 4.2 in accordance with City of Spokane Valley Street Standards.
- Terminal serviceability index of 2.0 for residential streets and 2.25 for Collectors and Minor Arterials (matching previous pavement design by Budinger). The City of Spokane Valley Street Standards stipulates a terminal serviceability of 2.0 for residential and local non-residential streets, and a terminal serviceability of 2.25 for collectors and minor arterials. The terminal serviceability index is the serviceability level at which a pavement is considered to have exhausted its serviceable life. Higher terminal serviceability levels are typically assigned to collectors and arterials, while lower terminal serviceability indices are typically assigned to residential streets.
- Structural coefficient of 0.42 for HMA and 0.14 for crushed surfacing in accordance with City of Spokane Valley Street Standards.

12.3.1 Results

Tables 9 and 10 present the results of our analyses for Residential and Collector street classifications, respectively. We included pavement thickness results in Table 9 for various ESAL levels greater than 50,000 but did not include pavement thickness for the 1,170,000 ESAL value, as this value is significantly larger than what a typical residential street would be designed for, in our opinion. The 350,000 ESAL value and 630,000 ESAL values also are larger than typical for residential streets. We did not include the 50,000 ESAL value in Table 10, because this is much lower than a typical Collector street classification traffic load.

TABLE 9. PAVEMENT THICKNESS DESIGN SUMMARY BASED ON VARIOUS ESAL VALUES – RESIDENTIAL STREET CLASSIFICATION

ESAL VALUE	HMA THICKNESS (INCHES)	CRUSHED SURFACING BASE COURSE THICKNESS (INCHES)
50,000 (typical residential street ESALs)	3	6
225,000	3.5	8.5
350,000	4	8.5
600,000	4.5	9

TABLE 10. PAVEMENT THICKNESS DESIGN SUMMARY BASED ON VARIOUS ESAL VALUES –COLLECTOR STREET CLASSIFICATION

ESAL VALUE	HMA THICKNESS (INCHES)	CRUSHED SURFACING BASE COURSE THICKNESS (INCHES)
225,000	4	9.5
350,000	4.5	9.5
600,000	5	10
1,170,000 (previous 24th Ave and Vera Crest design value)	5.5	10.5

As shown in Tables 9 and 10, for a given ESAL value, the pavement thickness required for a Collector street is thicker than the pavement thickness for a residential street.

We recommend crushed rock base course meet criteria for "Crushed Surfacing Base Course" (CSBC) per section 9-03.9(3) of the WSDOT Standard Specifications. While historical practice has included use of crushed surfacing top course (CSTC), we recommend consideration be given to using just CSBC, as the larger aggregate size and smaller fines content of CSBC compared to CSTC should provide better long-term support and drainage for HMA pavements in our opinion.

WSDOT has noted that the typical distress experienced by HMA pavements in Washington since adopting Superpave mix design methodologies has been surface cracking, and that rutting generally has been less of an issue. In recent years, WSDOT has begun using more Class ⅜-inch HMA mixes (as opposed to traditional Class ½-inch mixes) as a means of reducing cracking susceptibility of HMA. Class ⅜-inch mixes typically have a higher binder content compared to Class ½-inch mixes and are thus believed to be more flexible and less brittle than Class ½-inch mixes. A review of the on-line WSDOT unit bid analysis web site indicates since 2020 approximately 279,000 tons of Class ⅜-inch HMA have been specified for WSDOT Eastern Region projects vs. approximately 77,000 tons of Class ½-inch HMA. We suggest consideration be given to using a Class ⅜-inch mix.

Subgrade at the locations of most of our explorations consisted of sand and gravel with variable fines content. Thus, at this time we don't anticipate that geotextile separation fabric will be required between subgrade soil and base course. However, it is likely 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.

12.4 PAVEMENT UNDERDRAINS

Results of our explorations and groundwater monitoring indicate that depth to groundwater below most of the Project Area is shallow enough to contribute to the observed drainage issues but deep enough to limit the effectiveness of pavement underdrains. The only areas where groundwater has been encountered at depths less than approximately 4 feet bgs is near where 24th Avenue transitions to South Vera Crest Drive. As indicated previously, this section of roadway was reconstructed sometime between 2008 and 2011. Plans indicated pavement underdrains were installed in this area to take advantage of concurrent trenching and installation of a water line, and to address areas of shallow groundwater and surface water seeps along portions of 24th Avenue and the start of Vera Crest Drive. Given the depth to groundwater observed elsewhere, we do not believe that extensive pavement underdrains will provide significant benefit to collect and remove shallow groundwater for most of the site. However, we do recommend consideration be given to installing undrains in the following location(s):

- Along South Conklin Road, where the existing open channel is conveyed into a pipe that crosses below the road. The intent of the proposed underdrain(s) at this location is to collect potential shallow groundwater that could be present near the inlet of the existing open channel.
- Along South Vera Crest Drive where the existing open channel is conveyed into a pipe that crosses below the road. The intent of the proposed underdrain(s) at this location is to collect shallow groundwater that could be present beneath South Vera Crest where the open channel transitions into to lateral piping.

  Subsurface data in the immediate vicinity of this location is limited. Based upon the approximate 15 foot-thick sequence of coarse-grained sediments observed in exploration GEI-B-2, underdrains would not likely show significant benefit, however, this exploration is approximately 250 feet from where the open channel transitions beneath South Vera Crest. For this reason, we recommend conducting a limited subsurface evaluation to determine whether installation of underdrains along South Vera Crest Drive are warranted, particularly near the exiting open channel.

Results of future exploratory work or observation of soft or wet areas during construction could indicate other areas where underdrains are warranted. Pavement underdrains also could be installed to assist in conveying surface water that infiltrates into the roadway base course section to suitable discharge points where fine-grained soil is exposed at working subgrade during construction.

13.0 Limitations

We prepared this report for Osborn Consulting 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 G, "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

14.0 References

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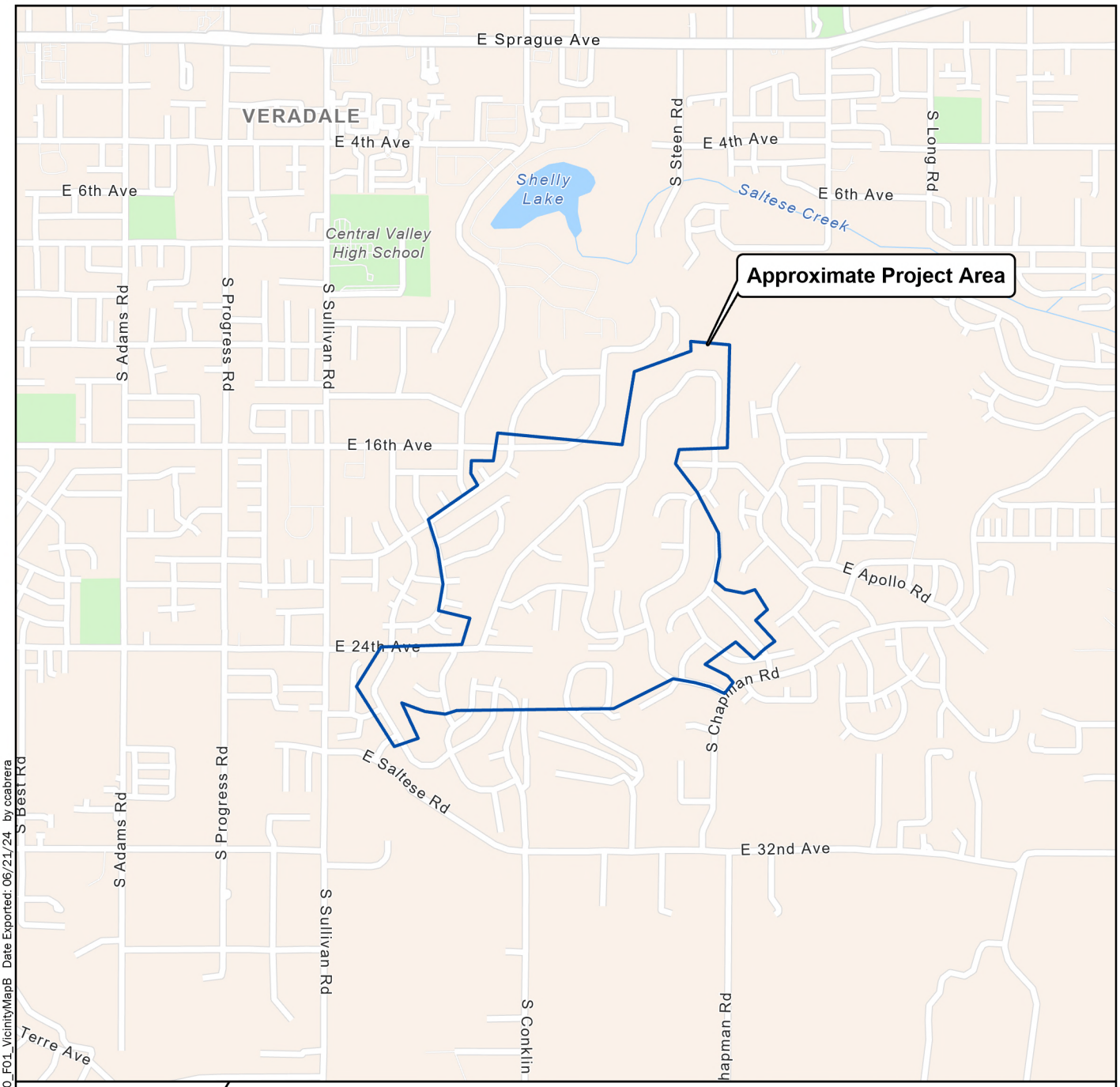
Figures



Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 11N

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Vicinity Map

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 1

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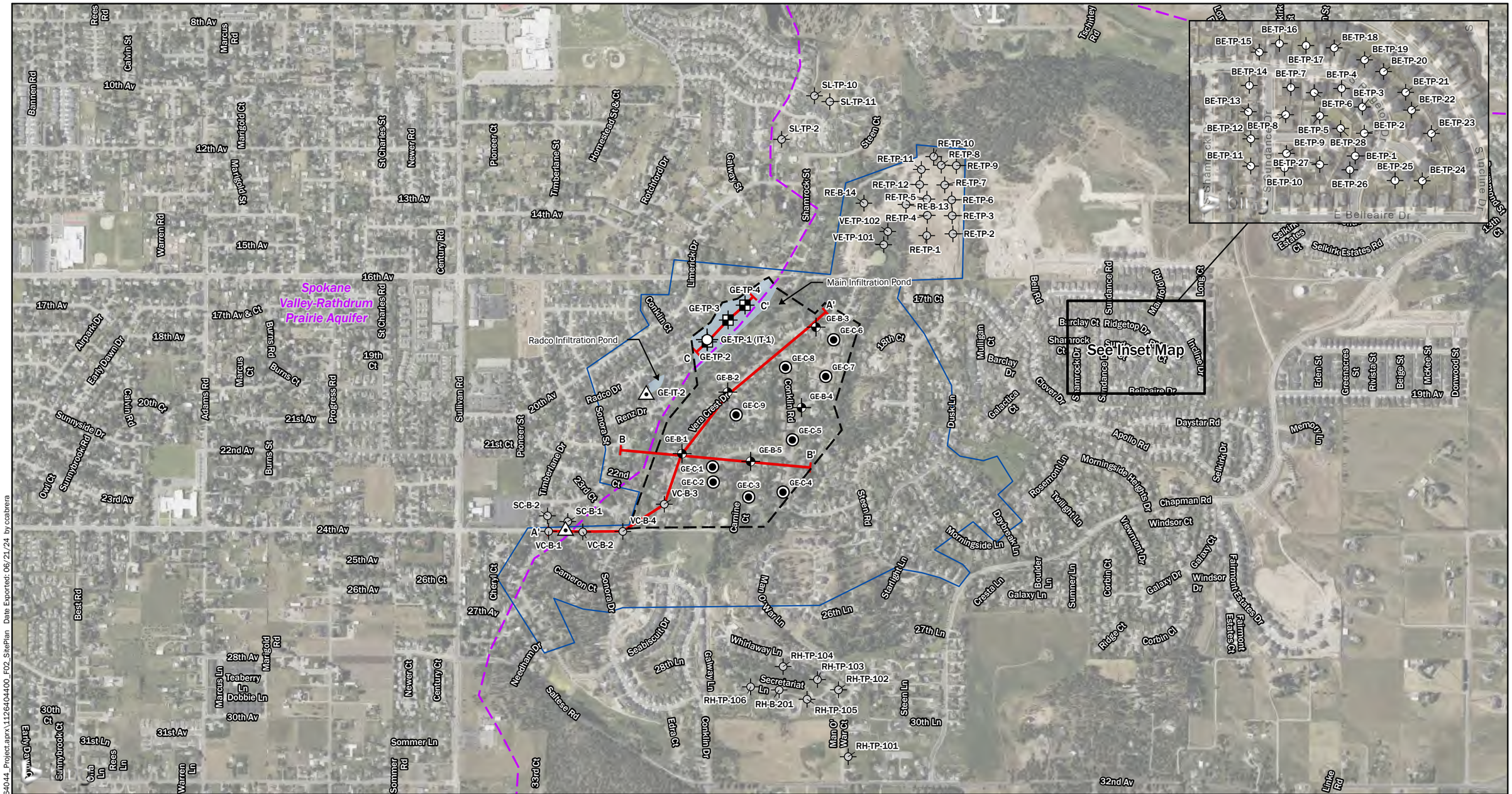
Spokane Valley-Rathdrum Prairie Aquifer
Main Infiltration Pond
Radco Infiltration Pond
See Inset Map
E Belleaire Dr
SL-TP-10
SL-TP-11
SL-TP-2
RE-TP-10
RE-TP-8
RE-TP-9
RE-TP-11
RE-TP-12
RE-TP-7
RE-B-14
RE-TP-5
RE-TP-6
RE-B-13
VE-TP-102
RE-TP-4
RE-TP-3
VE-TP-101
RE-TP-2
RE-TP-1
GE-TP-4
GE-TP-3
GE-TP-1 (IT-1)
GE-TP-2
GE-IT-2
GE-B-3
GE-C-6
GE-C-8
GE-C-7
GE-B-2
GE-B-4
GE-C-9
GE-C-5
GE-B-1
GE-B-5
GE-C-1
GE-C-2
GE-C-3
GE-C-4
VC-B-3
VC-B-4
SC-B-2
SC-B-1
VC-B-1
VC-B-2
RH-TP-104
RH-TP-103
RH-TP-102
RH-TP-106
RH-B-201
RH-TP-105
RH-TP-101
BE-TP-16
BE-TP-15
BE-TP-18
BE-TP-19
BE-TP-17
BE-TP-20
BE-TP-14
BE-TP-7
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25th Av
26th Av
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27th Av
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30th Av
30th Ct
31st Av
31st Ln
17th Ct
18th Ct
19th Av
26th Ln
27th Ln
28th Ln
30th Ln
32nd Av
33rd Ct
Rees Rd
Calvin St
Marcus Rd
Bannon Rd
Marigold Ct
Marigold St
St Charles St
Newer Rd
Pioneer Ct
Timberlane St
Homestead St & Ct
Rochford Dr
Galway St
Steen Ct
Shamrock St
Limerick Dr
Conklin Ct
Century Rd
Warren Rd
Airpark Dr
Early Dawn Dr
Burns Rd
Burns Ct
Marcus Ct
Adams Rd
Progress Rd
Sullivan Rd
Radco Dr
Renz Dr
Vera Crest Dr
Conklin Rd
Sonora St
Timberlane Dr
Cheryl Ct
Cameron Ct
Sonora Dr
Best Rd
Marigold Rd
Teaberry Ln
Dobbie Ln
Marcus Ln
Newer Ct
Century Ct
Needham Dr
Salsese Rd
Seabiscuit Dr
Whirlaway Ln
Galway Ln
Edra Ct
Conklin Dr
Man O' War Ln
Man O' War Ct
Steen Ln
Starlight Ln
Morningside Ln
Daybreak Ln
Rosemont Ln
Twilight Ln
Cresta Ln
Galaxy Ln
Boulder Ln
Sumner Ln
Corbin Ct
Ridge Ct
Corbin Cl
Viewmont Dr
Galaxy Dr
Galaxy Ct
Windsor Dr
Windsor Ct
Chapman Rd
Fairmont Estates Dr
Fairmont Estates Ct
Selkirk Estates Ct
Selkirk Estates Rd
Sundance Rd
Mallard Rd
Long Ct
Bell Rd
Barclay Ct
Ridgetop Dr
Shamrock Ct
Shamrock Dr
Sundance Ln
Belleaire Dr
Incline Ln
Mulligan Ct
Barclay Dr
Clover Dr
Galactica Ct
Dusk Ln
Daystar Rd
Apollo Rd
Morningside Heights Dr
Selkirk Dr
Eden St
Greenacres St
Rivista St
Belge St
McKee St
Donwood St
Memory Ln
Linke Rd
Sunnyside Dr
Sunnybrook Rd
Sunnybrook Ct
Owl Ct
Early Dawn Dr
Rees Ln
Orla Ln
Warren Ln
Sommer Ln
Sommer Rd
Tekshley Rd
Source(s):
• ESRI
Coordinate System: NAD 1983 UTM Zone 11N
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Legend
Boring Number and Approximate Location
Pavement Core Number and Approximate Location
Test Pit Number and Approximate Location
Infiltration Test Number and Approximate Location
TP/IT
Historic Exploration Approximate Location and GeoEngineers Designation
Cross Section
Geotechnical Field Work Study Area
Hydrogeologic Data Review Area
Spokane Valley-Rathdrum Prairie Aquifer
Pond
N
0
1,000
Feet
Project Area Site Plan
Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington
GeoEngineers
Figure 2
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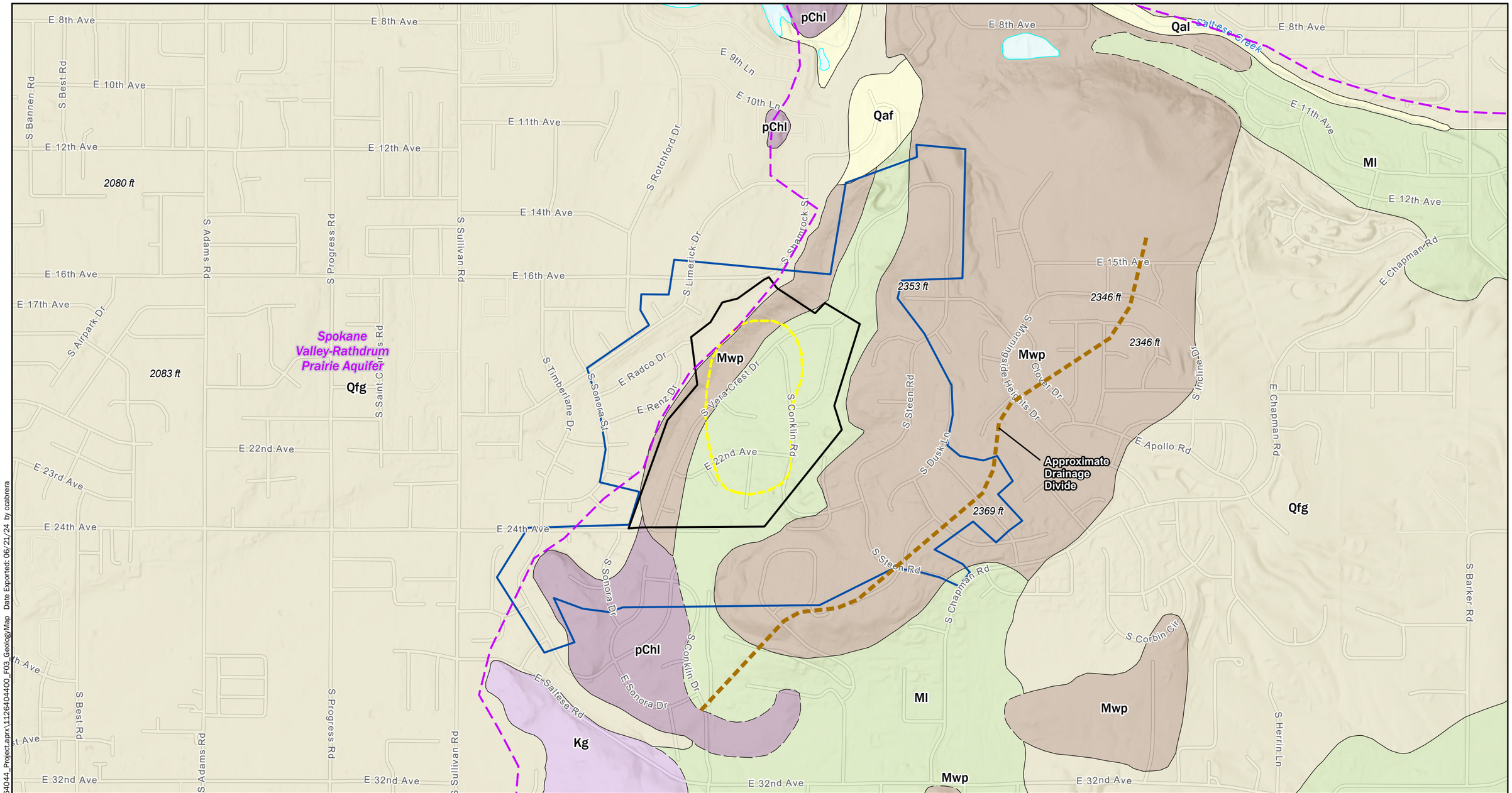

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Source(s):
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- ESRI Terrain Base Map

Coordinate System: NAD 1983 UTM Zone 11N

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Legend

- Geotechnical Field Work Study Area
- Hydrogeologic Data Review Area
- Spokane Valley-Rathdrum Prairie Aquifer
- Qfg Zone Identified by Project Exploration

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

Water
- Water

N

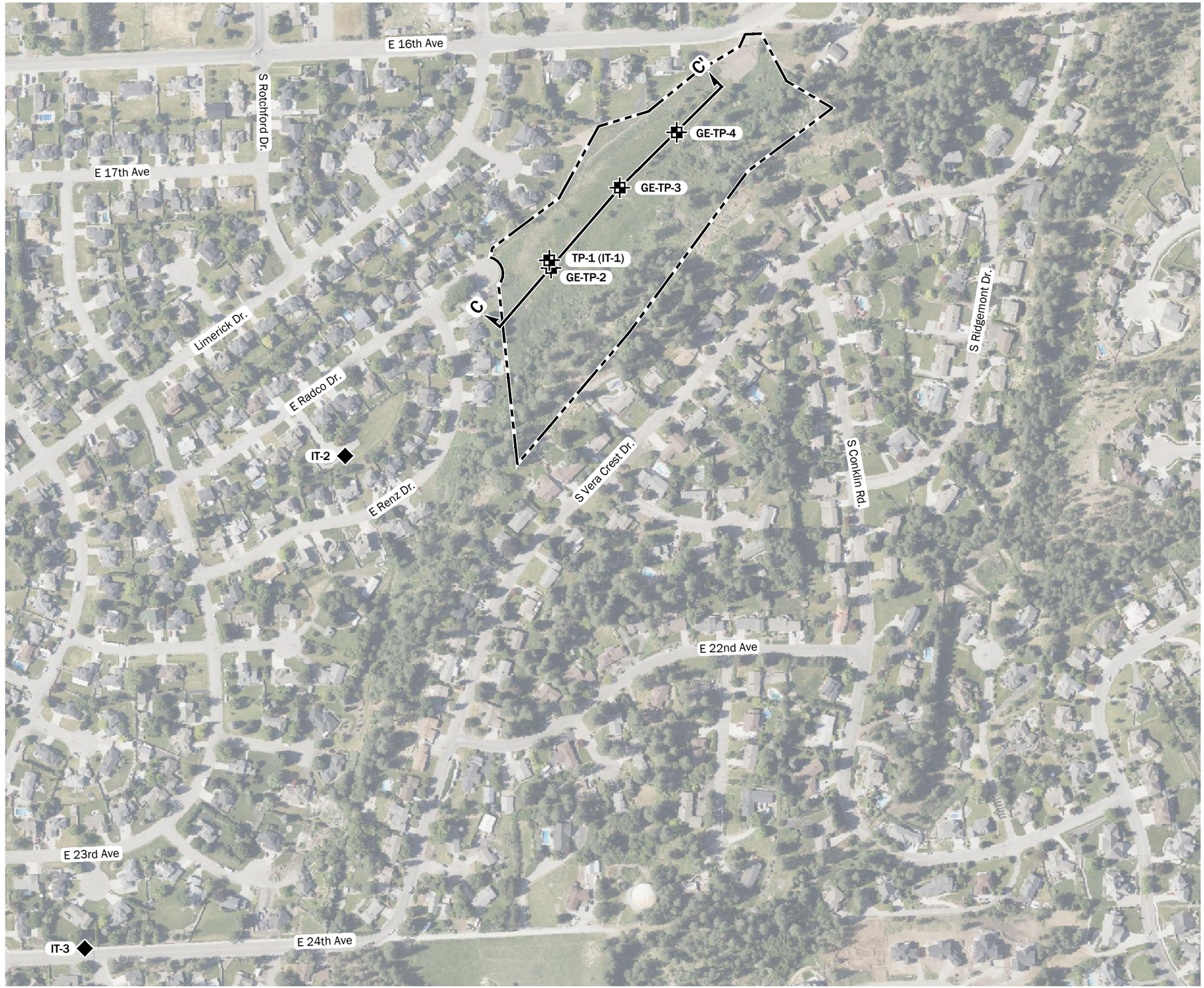
0 1,000
Feet

Surficial Geology Map

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 3



Legend

- Main Pond Boundary (Parcel No. 45255.9101)
- GE-TP-2 — Test Pit by GeoEngineers, 2024
- IT-2 — Drywell Infiltration Test by GeoEngineers, 2024
- A — A' Cross Section Location

Source(s):
- Aerial from Microsoft Bing

Coordinate System: WA State Plane, North Zone Zone, NAD83, US Foot

N

0 300

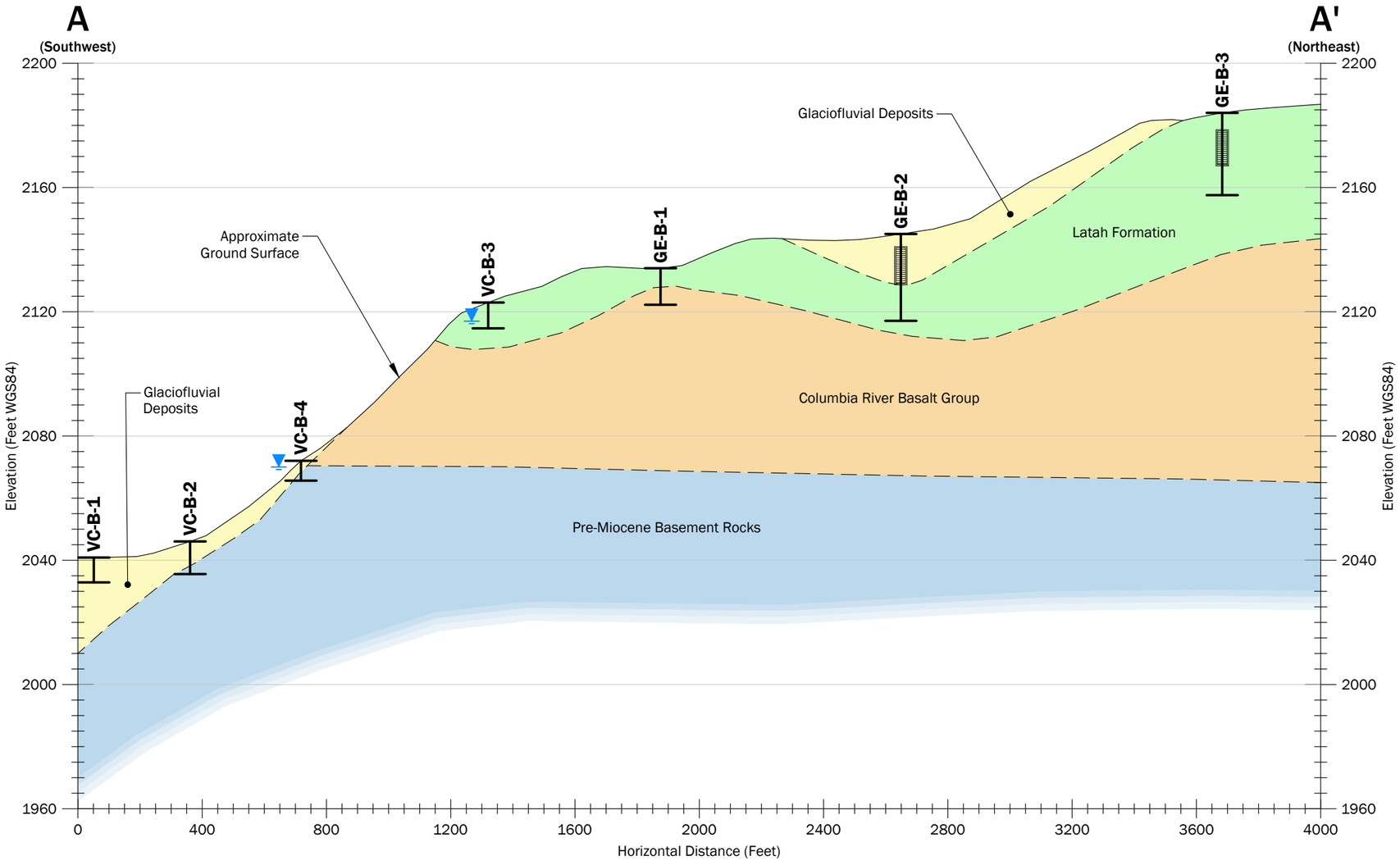
Feet

Infiltration Test Site Plan

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 4



Notes:

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.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.
3. Lithologic contacts were interpreted using boring logs and surficial geologic mapping

Datum: WGS84 = World Geodetic System 1984.

Legend

VC-B-1 — Exploration

Inferred Lithologic Contact

SM — Soil Classification

Screen Section (If Applicable)

Glaciofluvial Deposits

Latah Formation

Columbia River Basalt Group

Pre-Miocene Basement Rocks

400 0 400
Horizontal Scale in Feet

40 0 40
Vertical Scale in Feet
Vertical Exaggeration: 10X

Hydrogeologic Cross Section A-A'

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 5

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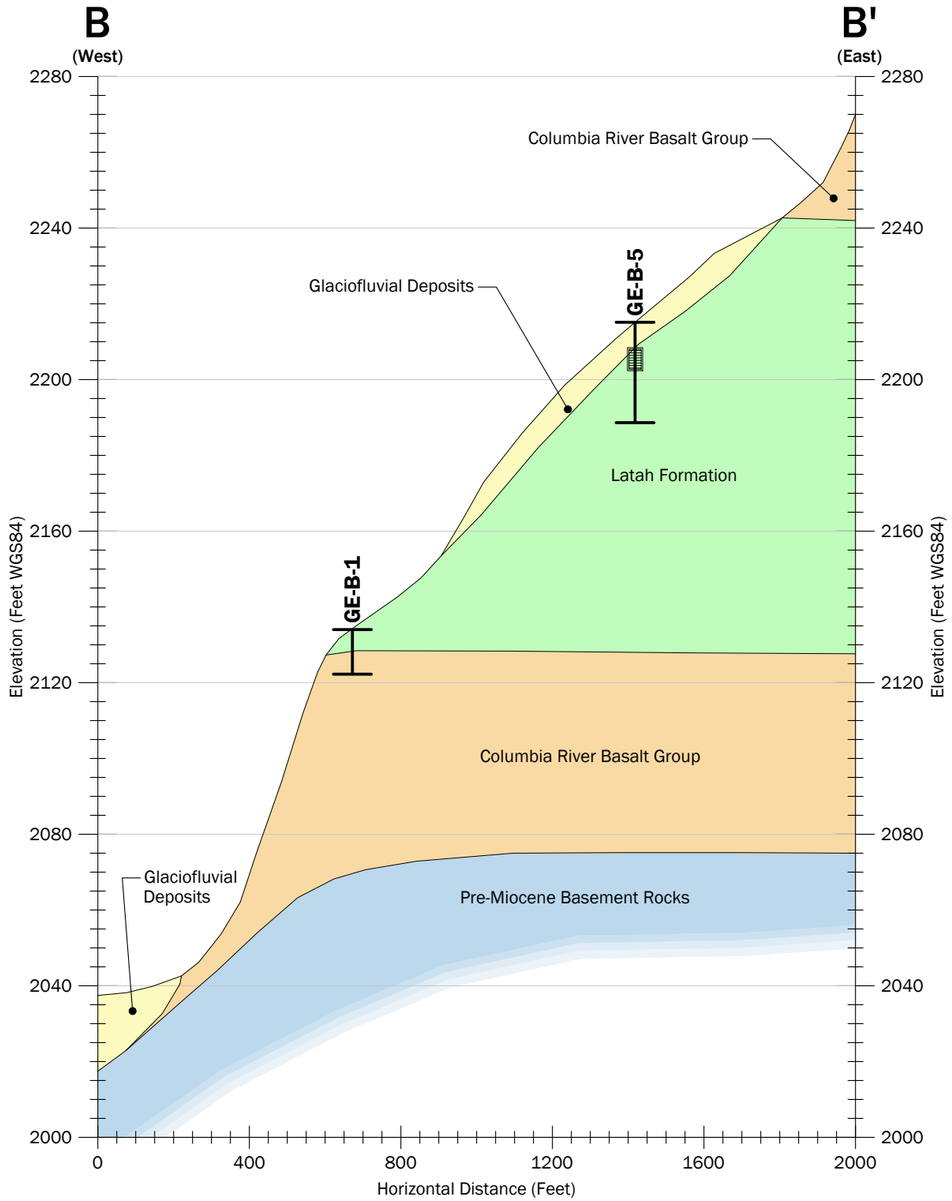

Notes:

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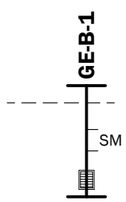
3. Lithologic contacts were interpreted using boring logs and surficial geologic mapping

Datum: WGS84 = World Geodetic System 1984.



Legend

- Exploration
- Inferred Lithologic Contact
- Soil Classification
- Screen Section (If Applicable)
- Glaciofluvial Deposits
- Latah Formation
- Columbia River Basalt Group
- Pre-Miocene Basement Rocks

400 0 400
Horizontal Scale in Feet

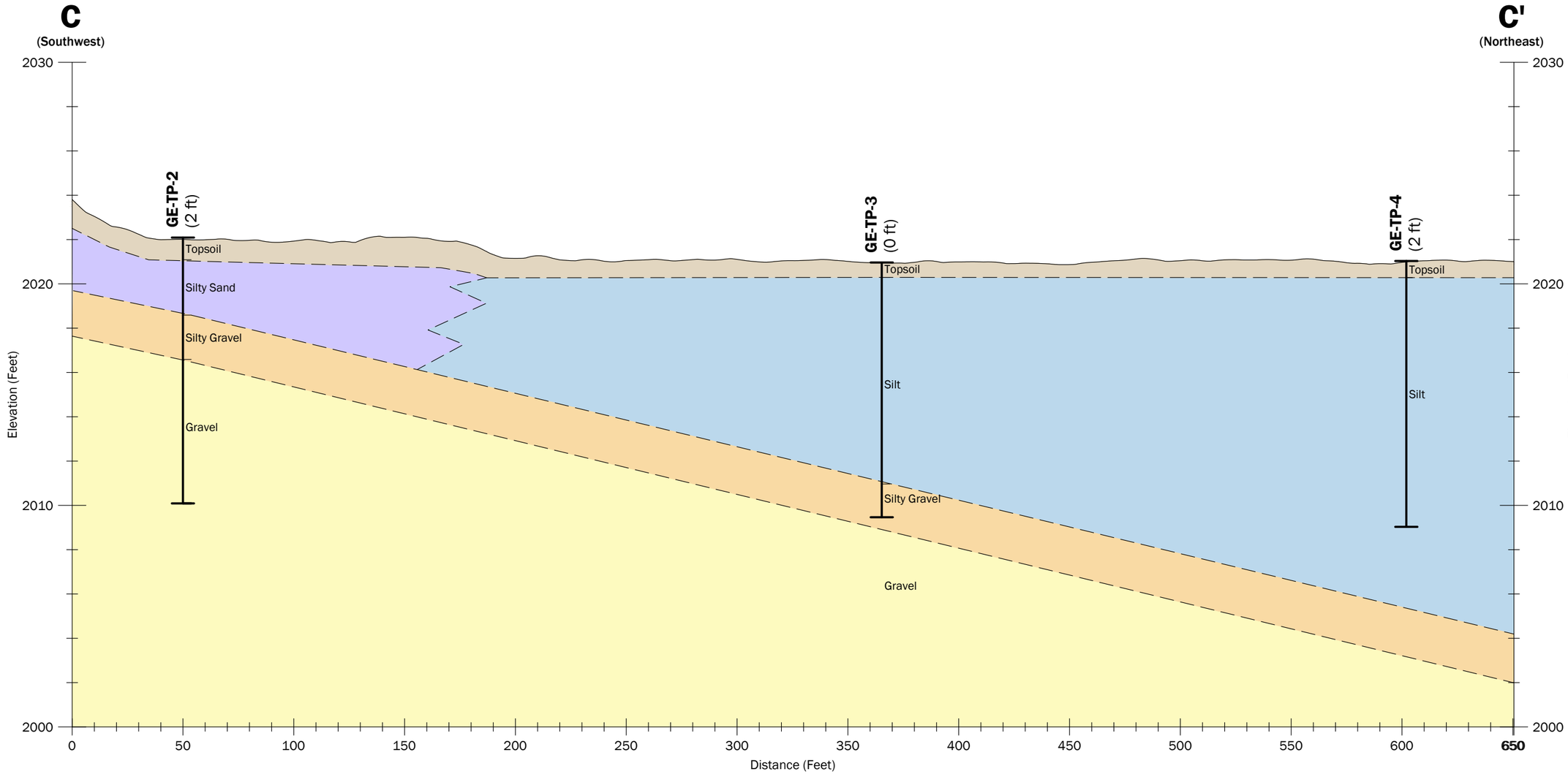
40 0 40
Vertical Scale in Feet
Vertical Exaggeration: 10X

Hydrogeologic Cross Section B-B'

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 6



Notes:

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3. Lithologic contacts were interpreted using boring logs and surficial geologic mapping

Datum: WGS84 = World Geodetic System 1984.

Test Pit ID
(Offset)

Legend

Test Pit

Inferred Soil Contact

- Topsoil
- Silt (Glaciolacustrine)
- Silty Sand (Glaciofluvial)
- Silty Gravel (Glaciofluvial)
- Gravel (Glaciofluvial)

50 0 50
Horizontal Scale in Feet

5 0 5
Vertical Scale in Feet
Vertical Exaggeration: 10X

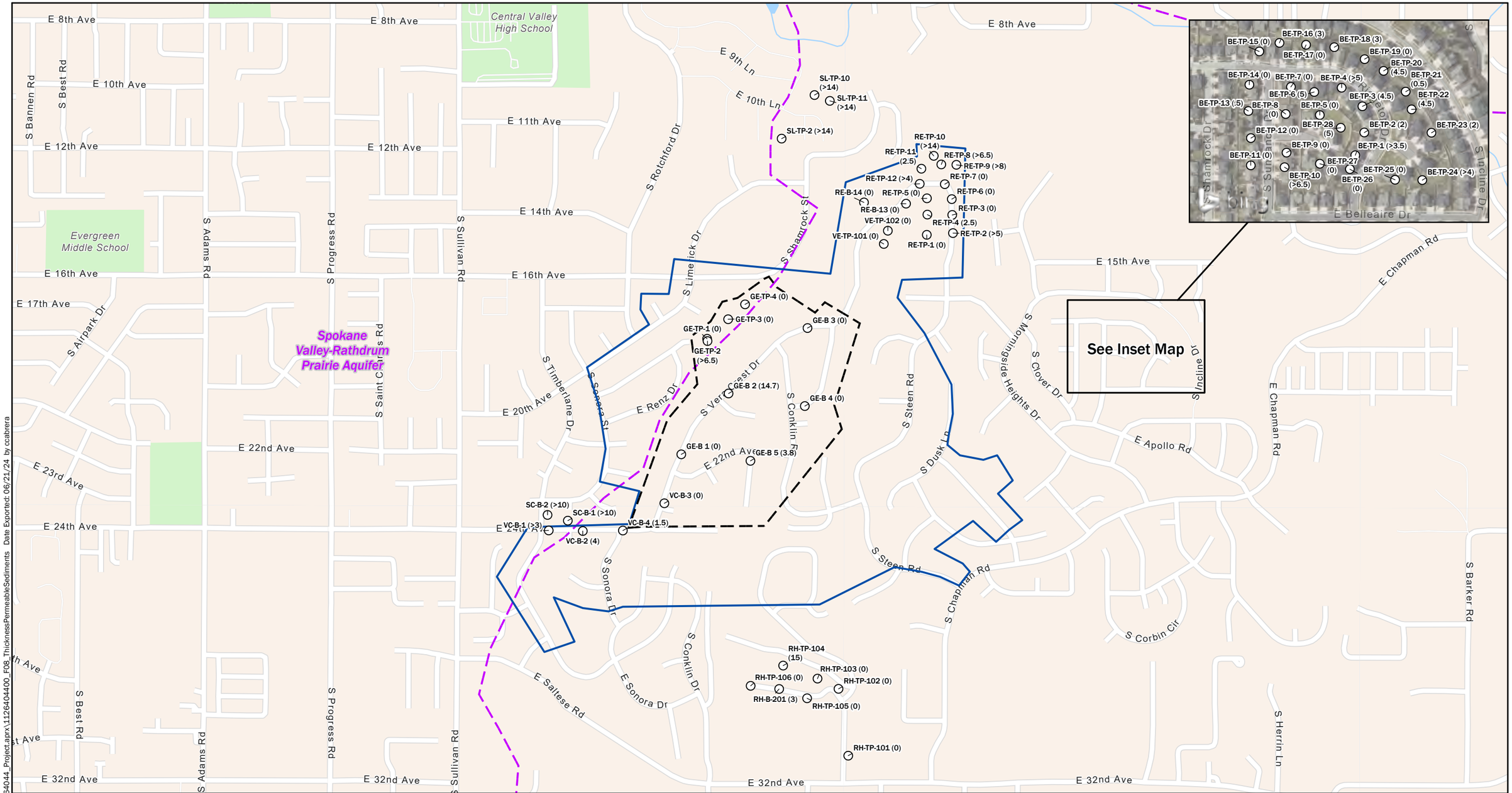
Hydrogeologic Cross Section C-C'

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 7

P:\11\11264044\CAD\00 Hydrogeologic Analysis\11264044OO_F14-F15 Site Plan and Cross-Section.dwg 7 Date Exported:6/25/2024 11:49 AM - by Mike C. Rau



Notes:

1. Permeable sediments are defined as either: (1) sand and/or gravel with less than 12 perfect fines (silt- and clay-sized particles passing the U.S. No 200 sieve); or (2) sediment described as silty but associated with infiltration testing in excess of 72 inches per hour

Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 11N

Legend

- BE-TP-1 (>6.5) — Exploration Designation and Reported Thickness of Permeable Sediments (feet)
- Spokane Valley-Rathdrum Prairie Aquifer
- Geotechnical Field Work Study Area
- Hydrogeologic Data Review Area

N

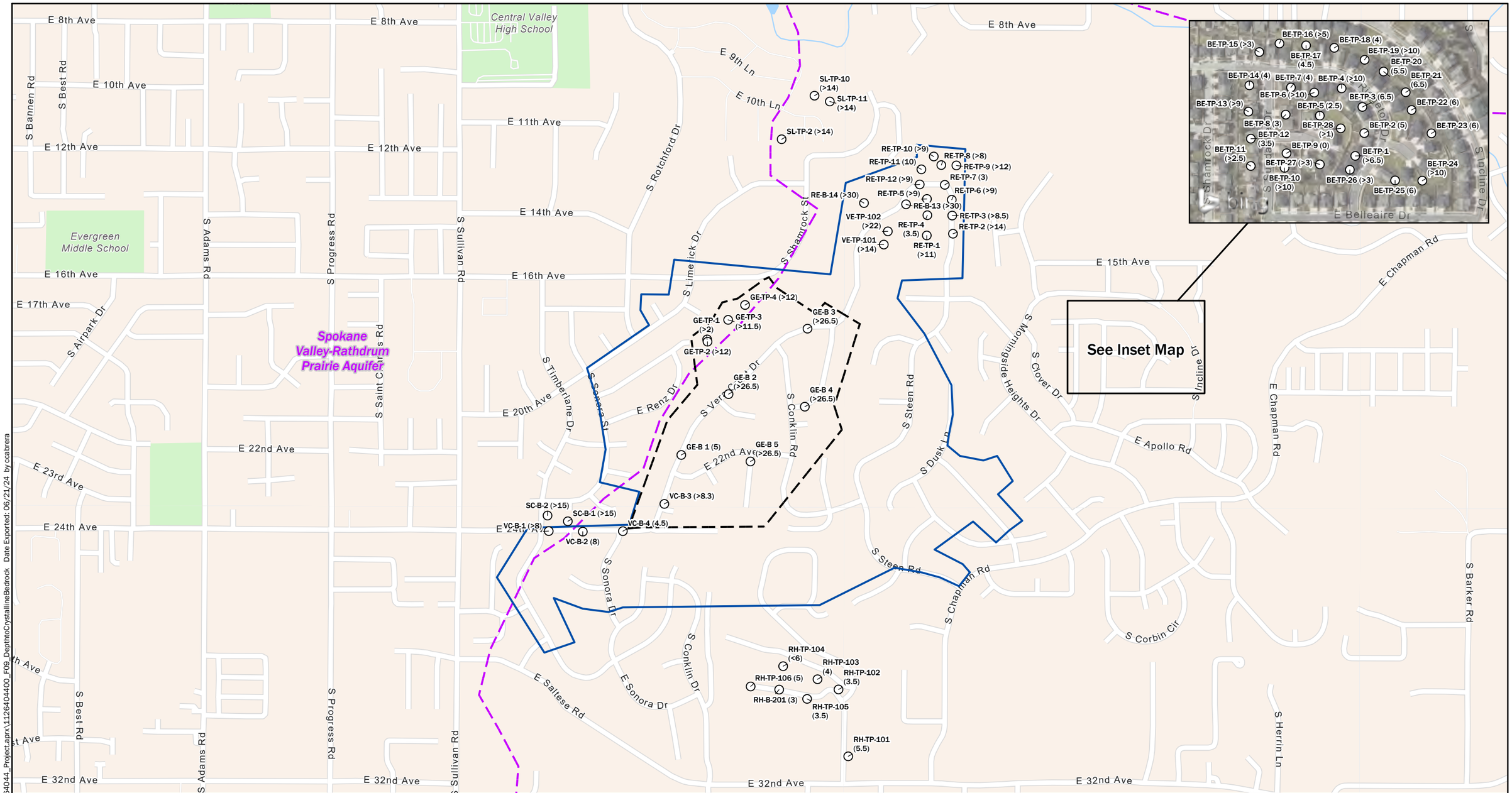
0 1,000 Feet

Thickness of Permeable Sediments

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 8



P:\11\11264044\GIS\11264044_Project\11264044_Project.aprx\11264044_F09_DepthtoCrystallineBedrock Date Exported: 06/21/24 by ccabrera

Legend

BE-TP-1 (>6.5) ○ Exploration Designation and Reported Depth to Crystalline Bedrock (feet)

Spokane Valley-Rathdrum Prairie Aquifer

Geotechnical Field Work Study Area

Hydrogeologic Data Review Area

Notes:
1. Crystalline bedrock refers to Miocene age Columbia River Basalt Flows or Pre-Miocene Basement Rock

Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 11N

N

0 1,000

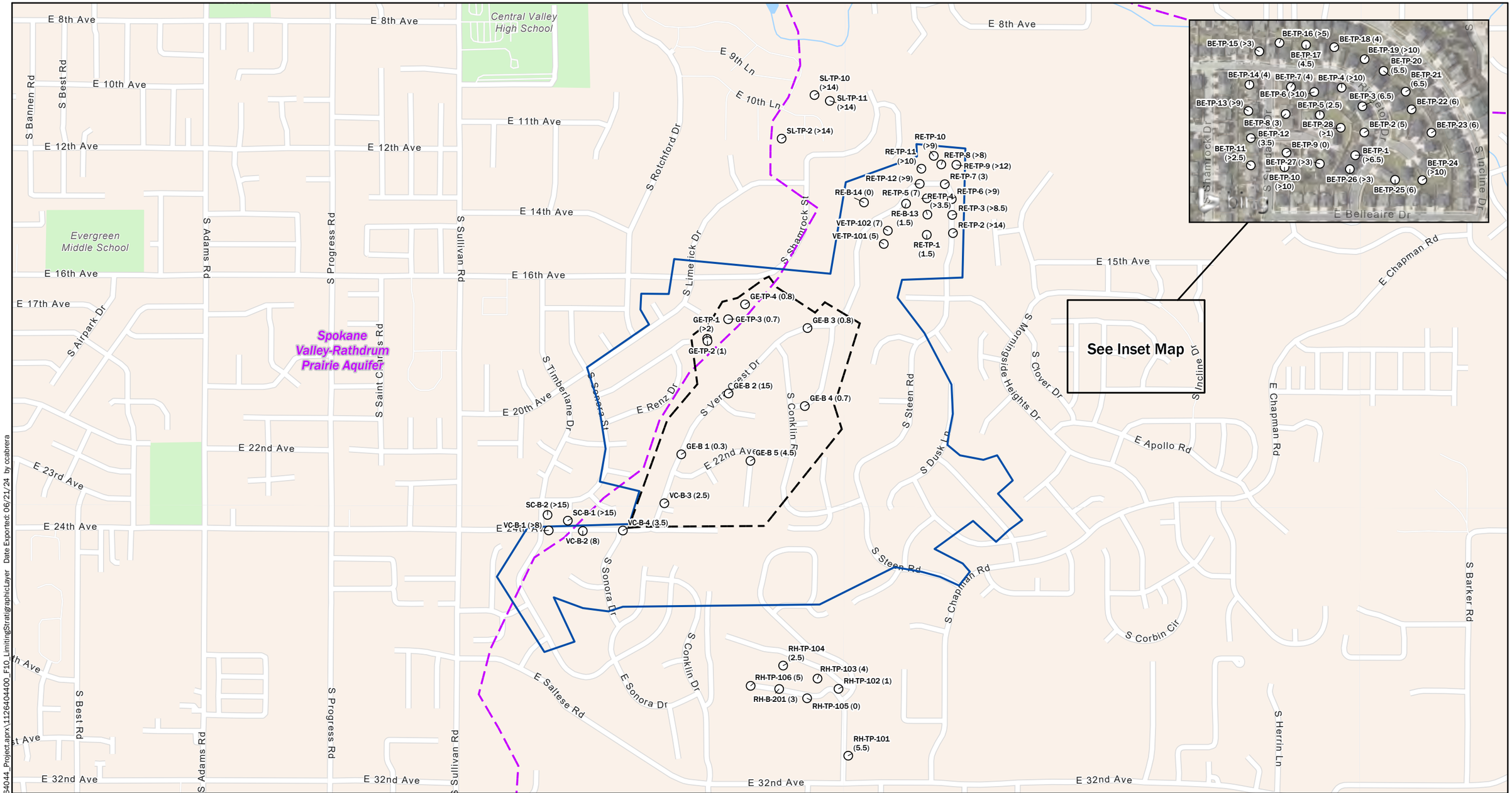
Feet

Depth to Crystalline Bedrock

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 9



Notes:
1. Explorations with no reported depth to limiting stratigraphic layer did not have a reported groundwater depth.
2. Limiting stratigraphic layer refers to uppermost lithologic layer composed of interpreted low permeability material that will limit the rate of stormwater infiltration. The limiting stratigraphic layer could be composed of basalt, basement rock, Latah Formation, reworked Latah Formation, and/or fill material composed primarily of fine-grained sediment.

Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 11N

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Legend

VE-TP-101 (5) — Exploration Designation and Reported Depth to Limiting Stratigraphic Layer (feet)

Spokane Valley-Rathdrum Prairie Aquifer

Geotechnical Field Work Study Area

Hydrogeologic Data Review Area

N

0 1,000

Feet

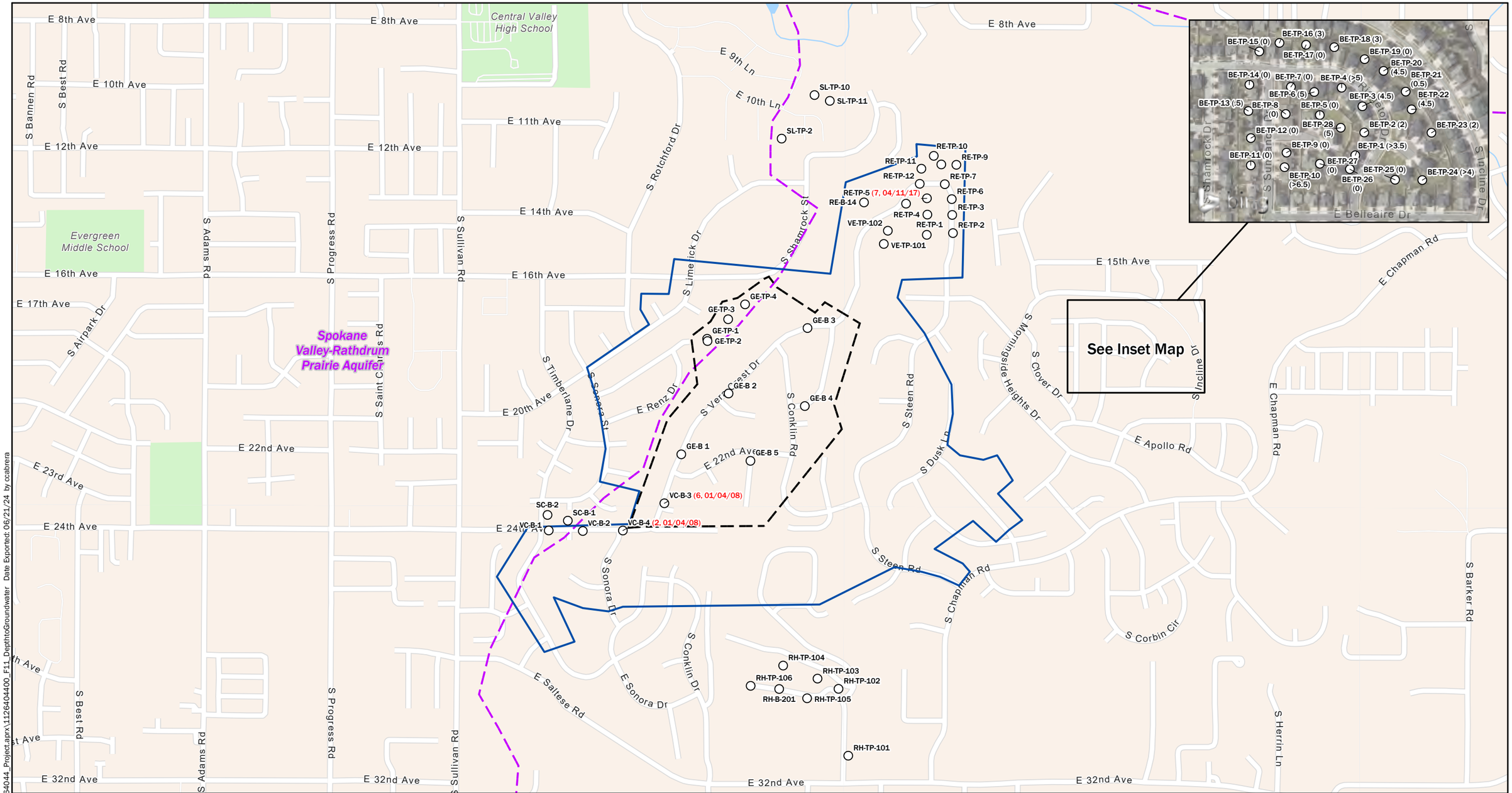
Depth to Limiting Stratigraphic Layer

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 10

P:\11\11264044\GIS\11264044_Project\11264044_Project.aprx\11264044_F10_LimitingStratigraphicLayer Date Exported: 06/21/24 by ccabrera



P:\11\11264044\GIS\11264044_Project\11264044_Project.aprx\11264044_F11_DepthtoGroundwater Date Exported: 06/21/24 by ccabrera

Legend

- VE-B-3 (6, 01/04/08) ○ Exploration Designation and Reported Depth to Groundwater and Date of Measurement
- Spokane Valley-Rathdrum Prairie Aquifer
- Geotechnical Field Work Study Area
- Hydrogeologic Data Review Area
- Spokane Valley-Rathdrum Prairie Aquifer

Notes:
1. Explorations with no reported depth to groundwater did not have a reported groundwater depth.

Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 11N

N

0 1,000

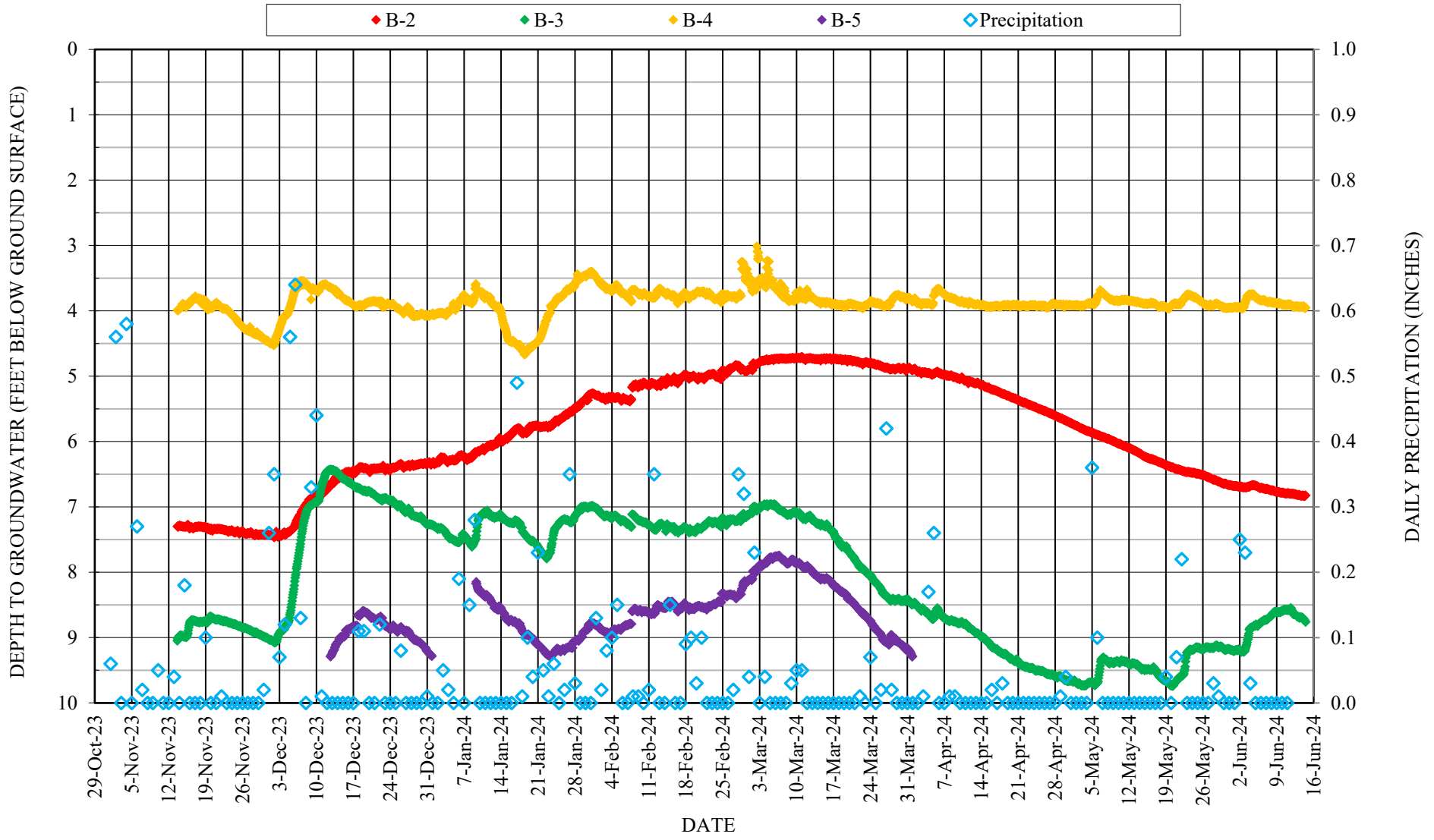
Feet

Depth to Groundwater

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 11



Note:

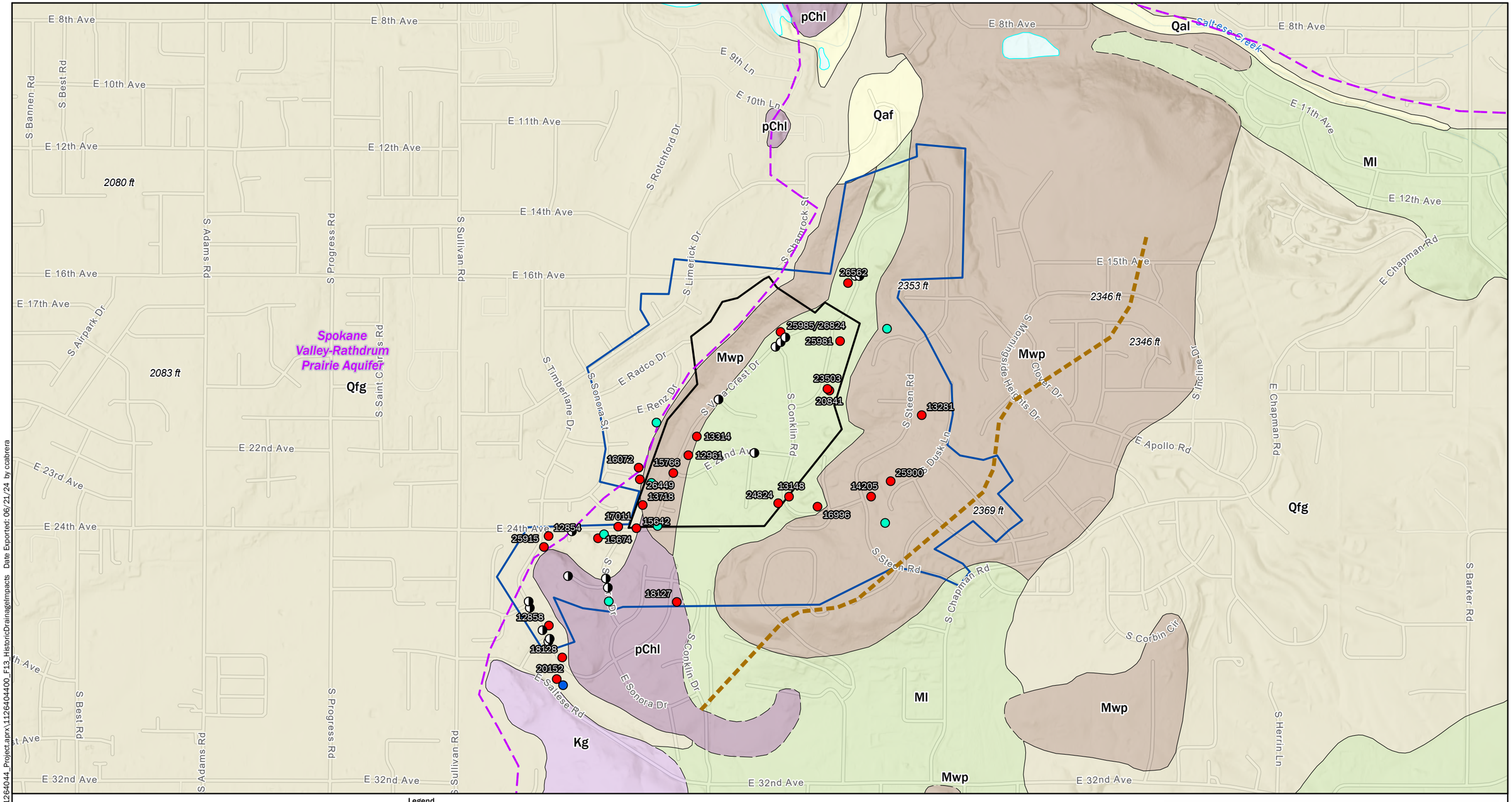
1. Precipitation totals for the Spokane Felts Field, WA US Climate Station (Station No. USW00094176) were obtained from the National Oceanic and Atmospheric Administration on June 17, 2024. Trace amounts are shown as zero.

Depth to Groundwater and Precipitation

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 12



P:\11\11264044\GIS\11264044_Project\11264044_Project.aprx\1126404400_F13_HistoricDrainageImpacts Date Exported: 06/21/24 by ccabrera

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

- Citizen Complaint
- Infiltration Pond Overflow
- Ponded Drywell
- Seasonal Spring
- Approximate Drainage Divide
- Spokane Valley-Rathdrum Prairie Aquifer
- Geotechnical Field Work Study Area
- Hydrogeologic Data Review 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

Paleozoic Rocks
- pChl Paleozoic heterogeneous metamorphic rocks

Water
- Water

N

0 1,000
Feet

Historic Drainage Impacts

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure 13

Appendices

Appendix A
Previous Geotechnical Explorations

BE-TP-1

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-1** LOCATION: **Lots 2 and 3 Block 2** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title)

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, medium grained, brown.		
3.0	SM	SILTY SAND WITH GRAVEL, fine grained, dark brown, organic odor. (Topsoil)		
6.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, coarse grained, grayish brown, with cobbles, moist. (Alluvium)		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-2

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-2** LOCATION: **Lots 4 and 5 Block 2** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, with cobbles, moist.		
3.0	GP-GM	POORLY GRADED GRAVEL WITH SILT, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
5.0	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
7.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-3

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-3 LOCATION: Lot 7 and 8 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title)

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown.		
2.0	GP-GM	POORLY GRADED GRAVEL WITH SILT, coarse grained, grayish brown, with cobbles and boulders to 4 feet in diameter, moist. (Alluvium)		
6.5	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
7.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-4

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-4	
Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	LOCATION: Lots 8 and 9 Block 2	
	DATE: 7/6/2017	SCALE: 1" = 1.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
5.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
8.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, coarse grained, grayish brown, with cobbles, moist. (Alluvium)		
10.0	GP	POORLY GRADED GRAVEL WITH SAND, gray, with cobbles and boulders, dry. (Alluvium)		
		End of test pit. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

BE-TP-5

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-5 LOCATION: Lots 16 and 17 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
2.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown.		
2.5	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
3.0	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
		End of test pit due to refusal.		
		Groundwater not encountered at time of excavation.		
		Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-6

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-6
Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	LOCATION: Lots 10 and 11 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.5	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
5.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
10.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, coarse grained, grayish brown, with cobbles and occasional boulders to 1 foot in diameter, moist. (Alluvium)		
		End of test pit. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

BE-TP-7

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-7** LOCATION: **Lots 12 and 13 Block 2** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title)

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.0				
	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
4.0				
	GP	POORLY GRADED GRAVEL WITH SAND, reddish brown to gray, dry. (Fractured Basalt)		
5.0				
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-8

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-8 LOCATION: Lots 14 and 15 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.5	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, organics odor.		
3.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
4.0	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-9

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-9 LOCATION: Lots 22 and 23 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.5		Fractured Basalt, coarse, black, moist.		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-10

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-10 LOCATION: Lot 21 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND WITH GRAVEL, fine grained, dark brown, organic odor. (Topsoil)		
2.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
3.5	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, coarse grained, grayish brown, with cobbles, moist. (Alluvium)		
8.5	GP	POORLY GRADED GRAVEL, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
10.0		End of test pit. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

BE-TP-11

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-11 LOCATION: Lots 1 and 2 Block 3 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title)

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
2.5		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-12

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-12 LOCATION: Lots 3 and 4 Block 3 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.5	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
3.5	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
4.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-13

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-13** LOCATION: **Lots 5 and 6 Block 3** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title)

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
4.0	GP	POORLY GRADED GRAVEL, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
9.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-14

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-14	
Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	LOCATION: Lots 7 and 8 Block 3	
	DATE: 7/6/2017	SCALE: 1" = 1.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
2.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
4.0	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
6.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

BE-TP-15

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-15
Revised Basement Recommendations **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	LOCATION: **Lots 18 and 19 Block 1** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine to coarse, brown, moist.		
2.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
3.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-16

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-16
Revised Basement Recommendations **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington**	LOCATION: **Lots 17 and 18 Block 1**
Project No. 217-037G	DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine to coarse, brown, moist.		
2.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
5.0	GP-GM	POORLY GRADED GRAVEL WITH SILT, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-17

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-17** LOCATION: **Lots 15 and 16 Block 1** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
4.5	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
5.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-18

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-18 LOCATION: Lots 13 and 14 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.0				
	GP-GM	POORLY GRADED GRAVEL WITH SILT, coarse grained, gray, with cobbled and boulders, dry. (Alluvium)		
4.0				
4.5	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-19

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-19 LOCATION: Lots 11 and 12 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
2.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
10.0		End of test pit. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-20

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-20** LOCATION: **Lots 9 and 10 Block 1** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	SM	SILTY SAND WITH GRAVEL, fine grained, dark brown, organic odor. (Topsoil)		
1.0	GP-GM	POORLY GRADED GRAVEL WITH SILT, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
5.5	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
6.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-21

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-21 LOCATION: Lots 7 and 8 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title)

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, with organics odor. (Topsoil)		
2.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
6.0	GP	POORLY GRADED GRAVEL, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
6.5	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
7.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-22

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-22 LOCATION: Lots 5 and 6 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
	SM	SILTY SAND, fine grained, dark brown, with organics, moist. (Topsoil)		
1.5				
	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, coarse grained, grayish brown, with cobbles, moist. (Alluvium)		
6.0				
	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
7.0				
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-23

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-23 LOCATION: Lots 3 and 4 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
2.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, organic odor.		
4.0	SM	SILTY SAND, medium grained, reddish brown, moist.		
6.0	GP	POORLY GRADED GRAVEL, coarse grained, gray, with cobbles and boulders, dry. (Alluvium)		
8.0	GP	POORLY GRADED GRAVEL WITH SAND, coarse grained, reddish brown to gray, dry. (Fractured Basalt)		
		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-24

LOG OF TEST PIT

PROJECT: Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	TEST PIT: TP-24 LOCATION: Lots 2 and 3 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
4.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, organic odor.		
6.0	SM	SILTY SAND WITH GARVEL, medium grained, reddish brown, moist. (Alluvium)		
10.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, coarse grained, grayish brown, with cobbles, moist. (Alluvium)		
		End of test pit. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

BE-TP-25

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-25
Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	LOCATION: Lots 1 and 2 Block 1 DATE: 7/6/2017 SCALE: 1" = 1.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
2.0	SM	SILTY SAND WITH GRAVEL, fine grained, dark brown, organic odor. (Topsoil)		
6.0	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
10.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL, reddish brown to gray, dry. (Fractured Basalt)		
		End of test pit. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

BE-TP-26

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-26	
Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	LOCATION: Lots 1 and 2 Block 2	
	DATE: 7/6/2017	SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, organic odor.		
1.5	SM	SILTY SAND WITH GRAVEL, medium grained, reddish brown, moist. (Alluvium)		
3.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-27

LOG OF TEST PIT

PROJECT:	TEST PIT: TP-27
Revised Basement Recommendations Belleaire Phase III Ridgetop Drive and Sundance Drive Spokane County, Washington Project No. 217-037G	LOCATION: Lots 19 and 20 Block 2 DATE: 7/6/2017 SCALE: 1" = 1.5'

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
	FILL	STRUCTURAL FILL: Silty Sand with Gravel, fine grained, dark brown, organics odor.		
3.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

(See Report and Standard Plates for elevation and descriptive terminology.)

BE-TP-28

LOG OF TEST PIT

PROJECT: **Revised Basement Recommendations** **Belleaire Phase III** **Ridgetop Drive and Sundance Drive** **Spokane County, Washington** **Project No. 217-037G**	TEST PIT: **TP-28** LOCATION: **Lots 17 and 18 Block 2** DATE: **7/6/2017** SCALE: **1" = 1.5'**

(See Report and Standard Plates for elevation and descriptive terminology.)

(new title) Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
	FILL	STRUCTURAL FILL: Shot Rock		
1.0		End of test pit due to refusal. Groundwater not encountered at time of excavation. Test pit immediately backfilled.		

SL-TP-2

TEST PIT 2

Date: 5-19-06
Excavator: C&B Excavating
Equipment: Hitachi 210 trackhoe
Location: south end of pond adjacent to Lane C
Surface: cleared and grubbed

Elevation: 2030 ft
Logged by: T. Black

DEPTH	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	moist, brown, medium dense	GRAVEL, some Sand, small amount Silt and Clay, occasional organics (roots)	
5	moist to very moist, gray, medium dense	GRAVEL, some coarse Sand, occasional Cobbles and Boulders, rounded, calcerous deposits	
10		(layer caves slightly and becomes cleaner with depth)	
15	no free groundwater observed	End of Excavation @ 14 ft	
20			

TPW P06169 SHELLEY LAKE.GPJ BUDINGER.GDT 7/10/06

Budinger & Associates
3820 E. Broadway Ave.
Spokane, WA 99202

TEST PIT LOGS **FIGURE 3-2**

Project: Shelley Lake 5th Addition
Location: City of the Spokane Valley
Number: P06169

SL-TP-10

TEST PIT 10

Date: 6-27-06
Excavator: C&B Excavating
Equipment: Fermec 760B backhoe
Location: west area of pond in tract B
Surface: grass and weeds

Elevation: 2022 ft
Logged by: T. Black

DEPTH	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	slightly moist to moist, brown, medium dense	GRAVEL, small amount Sand and Silt, occasional Cobble, coarse	
5	slightly moist, brown to gray, medium dense to dense	GRAVEL, small amount Cobbles, occasional Sand and Boulders, coarse, calcerous deposits on underside of gravels	
10		(layer becomes more coarse with depth)	
15	no free groundwater observed	End of Excavation @ 14 ft	
20			

TPW P06169 SHELLEY LAKE.GPJ BUDINGER.GDT 7/10/06

Budinger & Associates
3820 E. Broadway Ave.
Spokane, WA 99202

TEST PIT LOGS **FIGURE 3-10**

Project: Shelley Lake 5th Addition
Location: City of the Spokane Valley
Number: P06169

SL-TP-11

TEST PIT 11

Date: 6-27-06
Excavator: C&B Excavating
Equipment: Fermec 760B backhoe
Location: east area of pond in tract B
Surface: grass and weeds

Elevation: 2028 ft
Logged by: T. Black

DEPTH	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	slightly moist to moist, brown, medium dense	GRAVEL, small amount Sand and Silt, occasional Cobble, coarse	
5	slightly moist, brown to gray, medium dense to dense	GRAVEL, small amount Sand, occasional Cobbles, coarse, calcerous deposits on underside of gravels	
10		(layer becomes more coarse with depth)	
15	no free groundwater observed	End of Excavation @ 14 ft	
20			

TPW P06169 SHELLEY LAKE.GPJ BUDINGER.GDT 7/10/06

Budinger & Associates
3820 E. Broadway Ave.
Spokane, WA 99202

TEST PIT LOGS **FIGURE 3-11**

Project: Shelley Lake 5th Addition
Location: City of the Spokane Valley
Number: P06169

E-1562-01

TABLE 1
TEST PIT LOGS

TP-101	GSE	JANUARY 27, 1995
0.0 - 1.5 FT.	Loose, dark brown, sandy SILT; moist. Moisture Content = 19.2%	
1.5 - 3.0 FT.	Medium dense, brown, silty SAND; moist. Moisture Content = 13.7%	
3.0 - 5.5 FT.	Medium dense, light brown, gravelly, silty SAND; moist, cobbly. Moisture Content = 10.6%	
5.5 - 6.0 FT.	Dense, dark gray, highly fractured, Basalt BEDROCK.	
	Note: No ground water encountered.	

TP-102	GSE	JANUARY 27, 1995
0 - 1.0 FT.	Loose, dark brown, sandy SILT; wet. Moisture Content = 24.4%	
1.0 - 3.5 FT.	Loose, brown, sandy SILT; wet. Moisture Content = 17.4%	
3.5 - 6.0 FT.	Medium dense, light orange-brown, decomposed GRANITE; wet. Moisture Content = 18.2%	
	Note: No ground water encountered.	

TP-103	GSE	JANUARY 27, 1995
0.0 - 1.5 FT.	Loose, dark brown, sandy SILT; wet. Moisture Content = 21.2%	
1.5 - 3.0 FT.	Loose, brown, silty SAND; wet, becomes gravelly at 2.0 FT. Moisture Content = 14.7%	
3.0 - 4.0 FT.	Medium dense, tan and brown, clayey GRAVEL; wet. Moisture Content = 22.2%	
4.0 - 5.5 FT.	Medium dense, gray and brown, decomposed GRANITE; wet. Moisture Content = 16.1%	
5.5 - 6.0 FT.	Dense, gray and brown, Granite BEDROCK.	
	Note: No ground water encountered.	

TP-104	GSE	JANUARY 27, 1995
0.0 - 1.0 FT.	Loose, brown, silty SAND; wet.	
1.0 - 2.5 FT.	Medium dense, brown, silty, sandy GRAVEL; wet, with basalt cobbles. Moisture Content = 13.0%	

2.5 - 5.0 FT. Medium stiff to stiff, light orange-brown, CLAY; wet.
Moisture Content = 29.8%
5.0 - 6.0 FT. Hard, tan, CLAY; dry
Moisture Content = 21.9%

Note: No ground water encountered

TP-105 GSE JANUARY 27, 1995
0.0 - 3.5 FT. Loose, brown, sandy SILT; wet.
Moisture Content = 23.5%
3.5 - 4.0 FT. Hard, gray, Granite BEDROCK

Note: No ground water encountered

TP-106 GSE JANUARY 27, 1995
0.0 - 2.5 FT. Loose, brown, sandy SILT; wet.
Moisture Content = 19.0%
2.5 - 3.5 FT. Medium dense, orange-brown, silty SAND; wet.
Moisture Content = 11.6%
3.5 - 5.0 FT. Medium dense, light orange-brown, clayey GRAVEL; wet, with basalt cobbles.
Moisture Content = 23.5%
5.0 - 5.5 FT. Medium dense, light gray-brown, decomposed GRANITE; wet.
Moisture Content = 19.9%

Note: No ground water encountered.

RH-B-201

Drilling Method: Hollow-stem auger
Driller: F. Payton Logged By: B. Binsfield
Date: 2/7/95
Surface Elevation: _____ Datum: _____

DESCRIPTION	DEPTH, FT.
Loose, gray-brown, silty SAND; wet.	
	3.0
Very dense, tan and gray, decomposed GRANITE; moist.	
	11.5
Bottom of boring. Auger refusal on hard Granite BEDROCK. Completed 2/9/95	

SOIL LOG

SAMPLE NO. / SAMPLES: 1, 2, 3, 4

GROUND WATER: No ground water encountered during drilling

STANDARD PENETRATION TEST
▲ N-Value (Blows/Ft.)

DEPTH, FT. | N-Value (Blows/Ft.)
2 | 4 | 6 | 8 | 10 | 12
0 20 40 60
62

0 20 40 60
% WATER CONTENT
Plastic Limit ⊢●⊣ Liquid Limit
Natural Water Content

LEGEND
- 2" O.D. Split Spoon Sample
- 3" O.D. Shelby Tube Sample
- * Sample Not Recovered
- NX Core Run
- ▽ Ground Water Level

NOTES
1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. Refer to KEY for explanation of Soil Log symbols and definitions.
5. This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Field Rep. _____ Checked By _____ Drawn By TDB Drawing Date 2-15-95

Remington Hill Subdivision
Veradale, Washington

LOG OF BORING B-201

February 1995 E-1562-01

GCI GIFFORD CONSULTANTS, INC.
GEOTECHNICAL ENGINEERS
2020 E. Springfield Ave., Spokane, WA 99202

FIG. 3

TABLE 1
TEST PIT LOGS

TP101	GSE 2212	February 24, 1999
0-2.0'	Loose - medium dense, gray-brown, clayey, sandy SILT; wet, roots.	
2.0-5.0'	Loose-medium dense, brown, silty SAND; moist.	
5.0-11.0'	Stiff, light brown, sandy SILT; dry, locally oxidized orange, paleosol (?).	
11.0-14.0'	Very stiff, light brown, silty CLAY; dry.	

TP102	GSE 2212	February 24, 1999
0-2.5'	Loose, gray-brown, clayey, sandy SILT; moist to wet, roots.	
2.5-3.5'	Medium dense, light brown, clayey, silty GRAVEL; moist.	
3.5-5.0'	Medium dense, brown, silty SAND; dry.	
5.0-7.0'	Loose, orange-brown, silty, gravelly SAND; dry.	
7.0-13.0'	Stiff-very stiff, light brown, silty CLAY; dry.	
13-22.0'	Very stiff, dark gray, silty CLAY; dry.	

T25 R44 S25 SC-B-1 90 DJ 04

Spokane County Engineers

SUBSURFACE EXPLORATION LOG

BORING NO. 1
SHEET 1 OF 2

JOB NO. _____ JOB TITLE 23rd & Timberlane (80' N of 24th)
LOCATION _____ FEATURE _____ COORDINATES _____ DATE 3-13-90
DRILL _____ ANGLE _____ BEARING _____ REF. EL. _____ DATUM _____
DRILLING CONTRACTOR _____ DRILLER McCallum INSPECTOR _____
SAMPLE HAMMER: WT. _____ DROP _____ TYPE _____

DEPTH FEET	PERC-RATE	SAMPLE C-CORE B-BAG CK-CHUNK R-RING	TUBE SAMPLE NO.	PENETRATION RESISTANCE	(N) VALUE BLOW/FT.	MOISTURE CONTENT, %	Color	MATERIAL DESCRIPTION	GROUNDWATER
5	Greater than 72"/hr	"R" Value Sample #1				moist	Brown	silty loam w/clay, gravel and cobble	
15						moist	Brown	silty gravel w/decomposed granite & cobble	
								End of Boring - No Refusal	

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

T25 R44 S25 SC-B-2 90 DJ 04

Spokane County Engineers

SUBSURFACE EXPLORATION LOG

BORING NO. 2
SHEET 2 OF 2

JOB NO. _____ JOB TITLE 23rd & Timberlane (125' N of 24th)
LOCATION _____ FEATURE _____ COORDINATES _____ DATE 3-13-90
DRILL 75Z ANGLE _____ BEARING _____ REF. EL. _____ DATUM _____
DRILLING CONTRACTOR _____ DRILLER Mr Collam INSPECTOR _____
SAMPLE HAMMER: WT. _____ DROP _____ TYPE _____

DEPTH FEET	PERC-RATE	SAMPLE C-CORE B-BAG CK-CHUNK R-RING	TUBE SAMPLE NO.	PENETRATION RESISTANCE	(N) VALUE BLOW/FT.	MOISTURE CONTENT, %	Color	MATERIAL DESCRIPTION	GROUNDWATER
						moist	Brown	silty loam w/clay, gravel and cobble (same as "R" sample #1)	
	Greater than 72"/hr					moist	Brown	silty gravel w/decomposed granite + cobble	
								End of Boring - No Refusal	

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

TEST BORING 1

VC-B-1

Date of Boring: 1-4-08
Driller: Budinger & Assoc., Inc.
Type of Drill: Mobile B-57 with automatic SPT hammer
Location: On 24th, east of the intersection at 24th & S. Timberlane Dr.
Surface: asphalt concrete pavement

Elevation: 2040 ft
Logged by: T. Black
Size of hole: 6.5" O.D. (3-1/4" I.D.) hollow stem auger

DEPTH	SAMPLES RQD, BLOW COUNTS N (% RECOVERY)	MOISTURE, COLOR, CONDITION	DESCRIPTION
0	51 (88%)	black	ASPHALT CONCRETE PAVEMENT, logitudinal, horizontal and fatigue cracking
		moist, dark brown, very dense	FILL: Gravel, some Sand, occasional Silt, subangular
		moist, brown, moderately dense	FILL: Sand, small amount Silt, occasional Gravel, slightly micaceous, subangular to subrounded
	10 (100%)	moist, dark brown, loose	
	10 (100%)	moist, brown, loose	SAND, some Silt, slightly cemented
	9 (88%)		SILT, some Sand, medium to fine
5	12 (88%)	moist, dark brown, loose	SAND, small amount Silt and Gravel, subrounded, medium
	12 (42%)		
		(SPT sample 6 to 7½ feet - gravel in shoe)	
		no free groundwater observed	(CPT-1 indicated a dense layer beginning at approximately 7½ feet - Gravel layer?)
			End of Boring @ 8 ft
10			
15			
20			

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ◪
3" SPLIT SPOON PENETRATION, BLOWS/FT ■

10 20 30 40 50 60 70 80 90

SOIL LOG

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 5-1**

Project: 24th and Veracrest Drive
Location: City of Spokane Valley
Number: P07370

LWWWT P07370 BORING LOGS.GPJ BUDINGER.GDT 2/7/08

TEST BORING 2

VC-B-2

Date of Boring: 1-4-08
Driller: Budinger & Assoc., Inc.
Type of Drill: Mobile B-57 with automatic SPT hammer
Location: On 24th, east of the intersection at 24th & S. 24th Ct.
Surface: asphalt concrete pavement

Elevation: 2045 ft
Logged by: K. Rudie
Size of hole: 6.5" O.D. (3-1/4" I.D.) hollow stem auger

DEPTH	SAMPLES RQD, BLOW COUNTS N (% RECOVERY)	MOISTURE, COLOR, CONDITION	DESCRIPTION
0	R (100%)	black	ASPHALT CONCRETE PAVEMENT, logitudinal, horizontal and fatigue cracking
		moist, dark brown, very dense	FILL: Gravel, some Sand, small amount Silt, subangular
		slightly moist, light brown to brown, very dense	FILL: Sand, some Gravel, small amount Silt, fine to medium, angular to subrounded, slightly cemented
	39 (88%)		
	28 (88%)	slightly moist, brown, medium dense	FILL: Sand, occasional Silt, slightly micaceous
	28 (75%)	slightly moist, brown to gray, medium dense	SAND, small amount Gravel, occasional Silt, slightly cemented
5	23 (75%)	slightly moist, light brown, loose to medium dense	SAND, some Silt, occasional Gravel and organics (roots), fine
	9 (100%)		
	52 (83%)	slightly moist, brown with gray and reddish orange mottling, soft (rock)	Decomposed Granite/Quartzite? SAND, small amount Silt and Gravel, cemented, weathered, slightly micaceous
10		no free groundwater observed	End of Boring @ 10.5 ft
15			
20			

SOIL LOG

TEST RESULTS

ATTERBERG LIMITS
PL LL
WATER CONTENT
STANDARD PEN TEST, N-VALUE (OBSERVED)
3" SPLIT SPOON PENETRATION, BLOWS/FT

10 20 30 40 50 60 70 80 90 +100

LWWWT P07370 BORING LOGS.GPJ BUDINGER.GDT 2/7/08

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 5-2**

Project: 24th and Veracrest Drive
Location: City of Spokane Valley
Number: P07370

TEST BORING 3

VC-B-3

Date of Boring: 1-4-08
Driller: Budinger & Assoc., Inc.
Type of Drill: Mobile B-57 with automatic SPT hammer
Location: On Veracrest, northeast of the intersection at Veracrest & E. 23rd Ct.
Surface: asphalt concrete pavement

Elevation: 2125 ft
Logged by: K. Rudie
Size of hole: 6.5" O.D. (3-1/4" I.D.) hollow stem auger

DEPTH	SAMPLES RQD, BLOW COUNTS N (% RECOVERY)	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		black	ASPHALT CONCRETE PAVEMENT	
	47 (100%)	moist, brown to gray, dense	FILL: Sand, small amount Gravel, Cobbles, and Silt, occasional wood chips, cemented, angular to subangular	
	26 (100%)	moist, brown, moderately dense	FILL: Sand, trace Silt, medium to coarse	
	8 (100%)	moist, brown with red and gray mottling, stiff	CLAY, small amount Silt, occasional lenses of Sand with Gravel, blocky structure, possible Latah Formation	
	16 (100%)			
5	23 (100%)			
	17 (100%)			
			End of Boring @ 8.33 ft	
10				
15				
20				

TEST RESULTS

ATTERBERG LIMITS
PL LL
WATER CONTENT
STANDARD PEN TEST, N-VALUE (OBSERVED)
3" SPLIT SPOON PENETRATION, BLOWS/FT

10 20 30 40 50 60 70 80 90

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 5-3**

Project: 24th and Veracrest Drive
Location: City of Spokane Valley
Number: P07370

LWWWT P07370 BORING LOGS.GPJ BUDINGER.GDT 2/7/08

TEST BORING 4

VC-B-4

Date of Boring: 1-4-08
Driller: Budinger & Assoc., Inc.
Type of Drill: Mobile B-57 with automatic SPT hammer
Location: On 24th, east of the intersection at 24th & S. Sonora Dr.
Surface: asphalt concrete pavement

Elevation: 2075 ft
Logged by: K. Rudie
Size of hole: 6.5" O.D. (3-1/4" I.D.) hollow stem auger

DEPTH	SAMPLES RQD, BLOW COUNTS N (% RECOVERY)	MOISTURE, COLOR, CONDITION	DESCRIPTION
0	65 (83%)	black very moist, brown, dense	ASPHALT CONCRETE PAVEMENT FILL (Gravel, some Sand, small amount Silt, occasional Cobble, subangular, medium to coarse
	32 (100%)	very moist, light brown to gray, moderately dense to dense	SAND, some Silt, fine, slightly micaceous
	31 (100%)	slightly moist, reddish brown with orange mottling, soft to moderately hard	Decomposed GNEISS/SCHIST (Clay, occasional Silt and Sand, slightly micaceous)
5			(groundwater flowing through FILL layer on top of Decomposed GNEISS/SCHIST layer?)
	R (100%)		(sample @ 5½ feet refused in rock (gneiss/schist)
			End of Boring @ 6.34 ft
10			
15			
20			

TEST RESULTS

ATTERBERG LIMITS
PL LL
WATER CONTENT
STANDARD PEN TEST, N-VALUE (OBSERVED)
3" SPLIT SPOON PENETRATION, BLOWS/FT

10 20 30 40 50 60 70 80 90

+100

LWWWT P07370 BORING LOGS.GPJ BUDINGER.GDT 2/7/08

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 5-4**

Project: 24th and Veracrest Drive
Location: City of Spokane Valley
Number: P07370

TEST PIT 1

RE-TP-1

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: West end of proposed Lane C
Surface: duff and topsoil

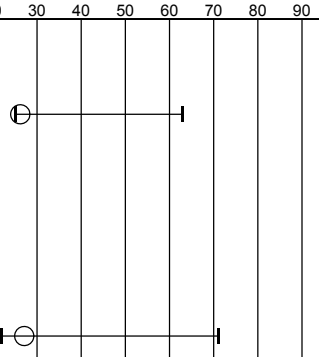
Elevation: 2280 ft
Logged by: J. Pritzl
Size of hole: 12 X 16 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, orange-gray, very stiff	CLAYEY SAND	
5				
10		dry, light gray, hard		
		no free groundwater observed	End of Boring @ 11 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90



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TEST PIT LOGS **FIGURE 4-1**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 2

RE-TP-2

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Center of intersection of proposed Lane C & Steen
Surface: duff and topsoil

Elevation: 2290 ft
Logged by: J. Pritzl
Size of hole: 10 X 20 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)
		moist, brown, medium dense	SILTY SAND, medium to fine, moderate roots
5		moist, brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular
10		moist, brown, medium dense	SAND with Silt, medium to fine, subangular
		moist, grayish brown, dense	SAND with Gravel and Cobbles, angular to subangular, micaceous
15		no free groundwater observed	End of Boring @ 14 ft
20			
25			
30			
35			
40			

SOIL LOG

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-2**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 3

RE-TP-3

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Center of intersection of proposed Lane D & Steen
Surface: duff and topsoil

Elevation: 2266 ft
Logged by: J. Pritzl
Size of hole: 6 X 15 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, orange-brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular	
5				
10		no free groundwater observed	End of Boring @ 8.5 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS

FIGURE 4-3

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 4

RE-TP-4

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: West end of proposed Lane D
Surface: duff and topsoil

Elevation: 2254 ft
Logged by: J. Pritzl
Size of hole: 8 X 8 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, dense	GRAVEL with Sand and Cobbles, angular to subangular	
5		no free groundwater observed	(excavator refused on strong basalt rock at 3.5 feet)	
			End of Boring @ 3.5 ft	
10				
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS

PL ——— LL

WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-4**

Project: Ridgemont 5

Location: Spokane Valley, WA

Number: S17073

TEST PIT 5

RE-TP-5

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: North side of proposed Lot 3 to north of Lane D
Surface: duff and topsoil

Elevation: 2232 ft
Logged by: J. Pritzl
Size of hole: 6 X 11 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
5		moist, brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular	
		dry, orange-gray, stiff	Perched water flowing across top of clay horizon at 7 feet CLAYEY SAND	
10			End of Boring @ 9 ft	

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-5**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 6

RE-TP-6

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Northeast corner of proposed Lot 1 to north of Lane D
Surface: duff and topsoil

Elevation: 2247 ft
Logged by: J. Pritzl
Size of hole: 7 X 12 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular, occasional Boulders	
5				
			CLAYEY SAND lens at 8 feet	
10		no free groundwater observed	End of Boring @ 9 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-6**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 7

RE-TP-7

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Center of intersection between proposed Lane E & Lane F
Surface: duff and topsoil

Elevation: 2224 ft
Logged by: J. Pritzl
Size of hole: 6 X 10 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular	
		no free groundwater observed	(excavator refused on strong basalt rock at 3 feet)	
5			End of Boring @ 3 ft	
10				
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-7**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 8

RE-TP-8

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: North of intersection of proposed Lane E & Lane F
Surface: duff and topsoil

Elevation: 2206 ft
Logged by: J. Pritzl
Size of hole: 5 X 9 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, medium dense	SAND with Silt, coarse to medium, subangular, micaceous	
5				
10		no free groundwater observed	End of Boring @ 8 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-8**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 9

RE-TP-9

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Northeast of intersection of proposed Lane E & Lane F
Surface: duff and topsoil

Elevation: 2202 ft
Logged by: J. Pritzl
Size of hole: 6 X 12 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)
		moist, brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular
5		moist, brownish gray, medium dense	SAND with Silt, coarse to medium, subangular, micaceous
10			Coarse sand interbeds confined by 1 to 2 centimeter thick silty clay laminates beginning at 9 feet and extending to 12 feet
		no free groundwater observed	End of Boring @ 12 ft
15			
20			
25			
30			
35			
40			

SOIL LOG

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-9**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 10

RE-TP-10

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Northwest of intersection of proposed Lane E & Lane F
Surface: duff and topsoil

Elevation: 2193 ft
Logged by: J. Pritzl
Size of hole: 5 X 13 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, medium dense	SILTY SAND with Gravel, occasional Cobbles and Boulders, subangular to subrounded, micaceous	
5		dry, brownish gray, medium dense	SAND with Silt, coarse to medium, angular to subangular, micaceous	
10		no free groundwater observed	End of Boring @ 9 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-10**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 11

RE-TP-11

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: Northwest of intersection of proposed Lane E & Lane F
Surface: duff and topsoil

Elevation: 2188 ft
Logged by: J. Pritzl
Size of hole: 6 X 8 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, dense	SILTY GRAVEL with Sand and Cobbles, angular to subangular	
5				
		moist, brownish gray, medium dense	SAND with Gravel, coarse, subangular to subrounded	
		moist, light brown, medium dense	SILTY, CLAYEY, fine SAND, micaceous	
10		no free groundwater observed	End of Boring @ 10 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-11**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST PIT 12

RE-TP-12

Date: 4-11-17
Excavator: Murphy Brothers
Equipment: CAT 336D
Location: West of intersection of proposed Lane E & Lane F
Surface: duff and topsoil

Elevation: 2212 ft
Logged by: J. Pritzl
Size of hole: 6 X 12 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)	
		moist, brown, dense	SILTY GRAVEL with Sand, Cobbles and Boulders, angular to subangular	
5		moist, brownish gray, medium dense	SAND, medium, angular to subangular, micaceous, occasional clay rip-up clasts	
10		no free groundwater observed	End of Boring @ 9 ft	
15				
20				
25				
30				
35				
40				

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS **FIGURE 4-12**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST BORING 13

RE-B-13

Date of Boring: 4-13-17
Driller: Budinger & Assoc., Inc.
Type of Drill: Longyear 28
Location: Northwest of west end of proposed Lane D
Surface: duff and topsoil

Elevation: 2218 ft
Logged by: J. Pritzl
Size of hole: 6.5" O.D. (3-1/4" I.D.) hollow stem auger

DEPTH	SAMPLES RQD, SPT BLOW COUNTS (% RECOVERY)	MOISTURE, COLOR, CONDITION	DESCRIPTION
0	2 (85%)	moist, dark brown, very loose	SILTY SAND with Gravel, occasional Cobbles, moderate roots (TOPSOIL)
	R (85%)	moist, medium brown, stiff	SILT with Sand, micaceous, moderate plasticity, stratified
5	18 (60%)		Basalt boulder at 4 feet, fresh, strong, (colluvium)
		moist, grayish white, very stiff	Iron staining
		orange-yellow	
10		grayish white	
	35 (100%)	dry, light brownish white, hard pinkish gray	Iron staining
		pinkish purple	CLAY, high plasticity, stratified
15		grayish purple	
	57 (100%)	dry, hard	Micaceous
			(decreased advancement rate)
20	36 (100%)	dry, hard	
			Less micaceous
25	35 (100%)	dry, hard	
30		no free groundwater observed	End of Boring @ 30 ft
35			
40			

SOIL LOG

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED)
3" SPLIT SPOON PENETRATION, BLOWS/FT

10 20 30 40 50 60 70 80 90

+100

LOGS WITHOUT WELL WITH TESTS S17073.GPJ BUDINGER.GDT 7/31/17

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BORING LOGS **FIGURE 4-13**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

TEST BORING 14

RE-B-14

Date of Boring: 4-14-17
Driller: Budinger & Assoc., Inc.
Type of Drill: Longyear 28
Location: North end of proposed Vera Crest
Surface: pine needles and grass

Elevation: 2180 ft
Logged by: J. Pritzl
Size of hole: 6.5" O.D. (3-1/4" I.D.) hollow stem auger

DEPTH	SAMPLES RQD, BLOW COUNTS N (% RECOVERY)	MOISTURE, COLOR, CONDITION	DESCRIPTION
0		wet, brownish gray, soft	CLAY, high plasticity; slightly micaceous; some iron staining
5	5 (100%)	wet, grayish brown, firm	
		moist, light brown, firm	
10	8 (100%)	moist, pinkish gray, stiff	SILT with Sand, elastic, micaceous, heavy iron staining, stratified
15	15 (100%)	dry, purple-brown, stiff	Very micaceous, some iron staining
20	33 (100%)	dry, purple-gray, hard	(attempted shelby tube sampler but could not advance)
			(decreasing advancement rate)
25	31 (100%)	dry, hard	
30	38 (100%)	dry, grayish purple, hard	Slightly micaceous
	57 (100%)		
35	51 (100%)	hard	
			End of Boring @ 34.5 ft
40			

SOIL LOG

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ◪
3" SPLIT SPOON PENETRATION, BLOWS/FT ■

10 20 30 40 50 60 70 80 90

LOGS WITHOUT WELL WITH TESTS S17073.GPJ BUDINGER.GDT 6/2/17

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BORING LOGS **FIGURE 4-14**

Project: Ridgemont 5
Location: Spokane Valley, WA
Number: S17073

Table A-1

Compilation of Subsurface Data from Existing Explorations

Ridgemont Estates Stormwater Improvements Project

City of Spokane Valley

Spokane Valley, Washington

GeoEngineers' Designation	Investigator	Report	Project Site	Exploration Designation	Exploration Type	Date Completed	Location [4,5]			Approximate Exploration Elevation [2] (feet)	Total Depth (feet bgs)	Groundwater				Crystalline Bedrock [3]		Limiting Stratigraphic Layer [4]		Permeable Sediments [5]			Notes
							Location Identified in Google Earth? [1]	Latitude [1] (degrees)	Longitude [1] (degrees)			Depth to Groundwater (feet bgs)	Groundwater Elevation (feet)	Date of Groundwater Measurement	Aquifer System Well is Open To	Depth to Crystalline Bedrock (feet bgs)	Top of Crystalline Bedrock (feet)	Depth to Limiting Stratigraphic Layer (feet bgs)	Top of Limiting Stratigraphic Elevation [6] (feet)	Depth to Top of Permeable Sediments (feet bgs)	Depth to Bottom of Permeable Sediments (feet bgs)	Permeable Sediment Thickness (feet)	
BE-TP-1	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-1	Test Pit	07/06/17	Yes	47.639971	-117.16744	2335	6.5	Not Encountered	NA	07/06/17	NA	>6.5	<2328.5	>6.5	NA	3	>6.5	>3.5	Refusal at 6.5 feet - no cause noted.
BE-TP-2	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-2	Test Pit	07/06/17	Yes	47.640272	-117.167265	2340	7	Not Encountered	NA	07/06/17	NA	5	2335	5	NA	3	5	2	Refusal at 7.0 feet - no cause noted.
BE-TP-3	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-3	Test Pit	07/06/17	Yes	47.640618	-117.167302	2339	7	Not Encountered	NA	07/06/17	NA	6.5	2333	6.5	NA	2	6.5	4.5	Refusal at 7.0 feet on basalt.
BE-TP-4	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-4	Test Pit	07/06/17	Yes	47.640862	-117.167709	2336	10	Not Encountered	NA	07/06/17	NA	>10	<2326	>10	NA	5	>10	>5	
BE-TP-5	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-5	Test Pit	07/06/17	Yes	47.640501	-117.168134	2345	3	Not Encountered	NA	07/06/17	NA	2.5	2343	2.5	NA	NA	NA	0	Refusal at 3.0 feet on basalt.
BE-TP-6	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-6	Test Pit	07/06/17	Yes	47.640805	-117.168243	2338	10	Not Encountered	NA	07/06/17	NA	>10	<2328	>10	NA	5	10	5	
BE-TP-7	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-7	Test Pit	07/06/17	Yes	47.640872	-117.168699	2338	5	Not Encountered	NA	07/06/17	NA	4	2334	4	NA	NA	NA	0	Refusal at 5.0 feet on basalt.
BE-TP-8	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-8	Test Pit	07/06/17	Yes	47.640514	-117.1688	2341	4	Not Encountered	NA	07/06/17	NA	3	2338	3	NA	NA	NA	0	Refusal at 4.0 feet on basalt.
BE-TP-9	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-9	Test Pit	07/06/17	Yes	47.640004	-117.168782	2343	0.5	Not Encountered	NA	07/06/17	NA	0	2343	0	NA	NA	NA	0	Refusal at 0.5 feet on basalt.
BE-TP-10	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-10	Test Pit	07/06/17	Yes	47.639812	117.168819	2339	10	Not Encountered	NA	07/06/17	NA	>10	<2329	>10	NA	3.5	>10	>6.5	
BE-TP-11	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-11	Test Pit	07/06/17	Yes	47.639835	-117.169479	2340	2.5	Not Encountered	NA	07/06/17	NA	>2.5	<2337.5	>2.5	NA	NA	NA	0	Refusal at 2.5 feet - no cause noted.
BE-TP-12	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-12	Test Pit	07/06/17	Yes	47.640195	-117.169479	2341	4	Not Encountered	NA	07/06/17	NA	3.5	2338	3.5	NA	NA	NA	0	Refusal at 4.0 feet on basalt.
BE-TP-13	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-13	Test Pit	07/06/17	Yes	47.640552	-117.169528	2339	9	Not Encountered	NA	07/06/17	NA	>9	<2338	>9	NA	4	9	5	Refusal at 9.0 feet - no cause noted.
BE-TP-14	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-14	Test Pit	07/06/17	Yes	47.640899	-117.16951	2339	6	Not Encountered	NA	07/06/17	NA	4	2335	4	NA	NA	NA	0	Refusal at 6.0 feet on basalt.
BE-TP-15	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-15	Test Pit	07/06/17	Yes	47.641339	-117.169318	2339	3	Not Encountered	NA	07/06/17	NA	>3	<2336	>3	NA	NA	NA	0	Refusal at 3.0 feet - no cause noted.
BE-TP-16	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-16	Test Pit	07/06/17	Yes	47.641452	-117.168924	2339	5	Not Encountered	NA	07/06/17	NA	>5	<2334	>5	NA	2	5	3	Refusal at 5.0 feet - no cause noted.
BE-TP-17	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-17	Test Pit	07/06/17	Yes	47.641428	-117.168405	2337	5	Not Encountered	NA	07/06/17	NA	4.5	2333	4.5	NA	NA	NA	0	Refusal at 5.0 feet - on basalt.
BE-TP-18	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-18	Test Pit	07/06/17	Yes	47.641397	-117.167854	2334	4.5	Not Encountered	NA	07/06/17	NA	4	2330	4	NA	1	4	3	Refusal at 4.5 feet - on basalt.
BE-TP-19	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-19	Test Pit	07/06/17	Yes	47.64124	-117.167261	2333	10	Not Encountered	NA	07/06/17	NA	>10	<2323	>10	NA	NA	NA	0	
BE-TP-20	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-20	Test Pit	07/06/17	Yes	47.641086	-117.16689	2330	6	Not Encountered	NA	07/06/17	NA	5.5	2325	5.5	NA	1	5.5	4.5	Refusal at 6.0 feet - on basalt.
BE-TP-21	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-21	Test Pit	07/06/17	Yes	47.640813	-117.166458	2331	7	Not Encountered	NA	07/06/17	NA	6.5	2325	6.5	NA	6	6.5	0.5	Refusal at 7.0 feet - on basalt.
BE-TP-22	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-22	Test Pit	07/06/17	Yes	47.640579	-117.166342	2332	7	Not Encountered	NA	07/06/17	NA	6	2326	6	NA	1.5	6	4.5	Refusal at 7.0 feet - on basalt.
BE-TP-23	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-23	Test Pit	07/06/17	Yes	47.640271	-117.165953	2335	8	Not Encountered	NA	07/06/17	NA	6	2329	6	NA	4	6	2	Refusal at 8.0 feet - on basalt.
BE-TP-24	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-24	Test Pit	07/06/17	Yes	47.639646	-117.16613	2334	10	Not Encountered	NA	07/06/17	NA	>10	<2324	>10	NA	6	>10	>4	
BE-TP-25	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-25	Test Pit	07/06/17	Yes	47.639649	-117.166661	2336	10	Not Encountered	NA	07/06/17	NA	6	2330	6	NA	NA	NA	0	
BE-TP-26	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-26	Test Pit	07/06/17	Yes	47.639788	-117.167545	2338	3	Not Encountered	NA	07/06/17	NA	>3	<2335	>3	NA	NA	NA	0	Refusal at 3.0 feet - no cause noted.
BE-TP-27	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-27	Test Pit	07/06/17	Yes	47.639858	-117.168131	2340	3	Not Encountered	NA	07/06/17	NA	>3	<2337	>3	NA	NA	NA	0	Refusal at 3.0 feet - no cause noted.
BE-TP-28	Allwest Testing & Engineering	Allwest (2017)	Bellaire Subdivision Phase 3	TP-28	Test Pit	07/06/17	Yes	47.640334	-117.167725	2344	1	Not Encountered	NA	07/06/17	NA	>1	<2343	>1	NA	NA	NA	0	Refusal at 1.0 feet - no cause noted.
SL-TP-2	Budinger & Associates	Budinger (2006)	Shelly Lake 5th Addition	TP-2	Test Pit	05/19/06	Yes	47.64638	-117.182878	2050	14	Not Encountered	NA	05/19/06	NA	>14	<2036	>14	NA	0	>14	>14	
SL-TP-10	Budinger & Associates	Budinger (2006)	Shelly Lake 5th Addition	TP-10	Test Pit	06/27/06	Yes	47.647637	-117.181481	2027	14	Not Encountered	NA	06/27/06	NA	>14	<2013	>14	NA	0	>14	>14	
SL-TP-11	Budinger & Associates	Budinger (2006)	Shelly Lake 5th Addition	TP-11	Test Pit	06/27/06	Yes	47.647471	-117.180828	2025	14	Not Encountered	NA	06/27/06	NA	>14	<2011	>14	NA	0	>14	>14	
RH-TP-101	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	TP-101	Test Pit	01/27/95	Yes	47.628613	-117.179979	2218	6	Not Encountered	NA	01/27/95	NA	5.5	2213	5.5	NA	NA	NA	0	Basalt encountered at 5.5 feet.
RH-TP-102	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	TP-102	Test Pit	01/27/95	Yes	47.630538	-117.1804	2233	6	Not Encountered	NA	01/27/95	NA	3.5	2230	1	NA	NA	NA	0	Granitic basement encountered at 3.5 feet.
RH-TP-103	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	TP-103	Test Pit	01/27/95	Yes	47.630831	-117.181295	2233	6	Not Encountered	NA	01/27/95	NA	4	2229	4	NA	NA	NA	0	Granitic basement encountered at 4.0 feet.
RH-TP-104	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	TP-104	Test Pit	01/27/95	Yes	47.631098	-117.182726	2275	6	Not Encountered	NA	01/27/95	NA	>6	<2269	2.5	NA	1	2.5	1.5	
RH-TP-105	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	TP-105	Test Pit	01/27/95	Yes	47.630264	-117.181736	2223	4	Not Encountered	NA	01/27/95	NA	3.5	2220	0	NA	NA	NA	0	Granitic basement encountered at 3.5 feet.
RH-TP-106	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	TP-106	Test Pit	01/27/95	Yes	47.630618	-117.184142	2209	5.5	Not Encountered	NA	01/27/95	NA	5	2204	5	NA	NA	NA	0	Granitic basement encountered at 5.0 feet.
RH-B-201	Gifford Consultants, Inc.	Gifford (1995)	Remington Hill Subdivision	B-201	Boring	02/07/95	Yes	47.630618	-117.184142	2221	11.5	Not Encountered	NA	02/07/95	NA	3	2218	3	NA	0	3	3	Refusal at 11.5 feet - on crystalline bedrock.
VE-TP-101	Gifford Consultants, Inc.	Gifford (1999)	Vera Water Tanks	TP-101	Test Pit	02/24/95	Yes	47.643353	-117.178515	2209	14	Not Encountered	NA	02/24/95	NA	>14	<2195	5	2204	NA	NA	0	
VE-TP-102	Gifford Consultants, Inc.	Gifford (1999)	Vera Water Tanks	TP-102	Test Pit	02/24/95	Yes	47.643735	-117.178344	2217	22	Not Encountered	NA	02/24/95	NA	>22	<2195	7	2210	NA	NA	0	
SC-B-1	Spokane County Engineers	Spokane County Engineers (1990)	23rd and Timberlane	B-1	Boring	03/13/90	Yes	47.635363	-117.191945	2029	15	Not Encountered	NA	03/13/90	NA	>15	<2014	>15	NA	5	>15	>10	
SC-B-2	Spokane County Engineers	Spokane County Engineers (1990)	23rd and Timberlane	B-2	Boring	03/13/90	Yes	47.635526	-117.19281	2027	15	Not Encountered	NA	03/13/90	NA	>15	<2012	>15	NA	5	>15	>10	
VC-B-1	Budinger & Associates	Budinger (2008)	24th Avenue and Veracrest Dr.	B-1	Boring	01/04/08	Yes	47.635079	-117.192758	2041	8	Not Encountered	NA	01/04/08	NA	>8	<2033	>8	NA	5	>8	>3	
VC-B-2	Budinger & Associates	Budinger (2008)	24th Avenue and Veracrest Dr.	B-2	Boring	01/04/08	Yes	47.635066	-117.191306	2046	10.5	Not Encountered	NA	01/04/08	NA	8	2038	8	NA	4	8	4	
VC-B-3	Budinger & Associates	Budinger (2008)	24th Avenue and Veracrest Dr.	B-3	Boring	01/04/08	Yes	47.63587	-117.187836	2123	8.3	6	2117	01/04/08	Latah Formation	>8.3	<2037.7	2.5	2121	NA	NA	0	
VC-B-4	Budinger & Associates	Budinger (2008)	24th Avenue and Veracrest Dr.	B-4	Boring	01/04/08	Yes	47.635082	-117.1896	2072	6.3	2	2070	01/04/08	Glaciofluvial	5.5	2067	3.5	NA	2	3.5	1.5	
RE-TP-1	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-1	Test Pit	04/11/17	Yes	47.643619	-117.176684	2283	11	Not Encountered	NA	04/11/17	NA	>11	<2272	1.5	2282	NA	NA	0	
RE-TP-2	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-2	Test Pit	04/11/17	Yes	47.643671	-117.17557	2289	14	Not Encountered	NA	04/11/17	NA	>14	<2275	>14	NA	9	>14	>5	
RE-TP-3	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-3	Test Pit	04/11/17	Yes	47.644194	-117.175603	2268	8.5	Not Encountered	NA	04/11/17	NA	>8.5	<2259.5	>8.5	NA	NA	NA	0	
RE-TP-4	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-4	Test Pit	04/11/17	Yes	47.644202	-117.176662	2257	3.5	Not Encountered	NA	04/11/17	NA	3.5	2253.5	>3.5	NA	1	3.5	2.5	Refusal at 3.5 feet - on basalt.
RE-TP-5	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-5	Test Pit	04/11/17	Yes	47.644671	-117.176681	2232	9	7	2225	04/11/17	Glaciofluvial	>9	<2223	7	2225	NA	NA	0	
RE-TP-6	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-6	Test Pit	04/11/17	Yes	47.644649	-117.175624	2251	9	Not Encountered	NA	04/11/17	NA	>9	<2242	>9	NA	NA	NA	0	
RE-TP-7	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-7	Test Pit	04/11/17	Yes	47.645079	-117.175922	2227	3	Not Encountered	NA	04/11/17	NA	3	2253.5	3	NA	NA	NA	0	Refusal at 3.0 feet - on basalt.
RE-TP-8	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-8	Test Pit	04/11/17	Yes	47.645647	-117.176073	2201	8	Not Encountered	NA	04/11/17	NA	>8	<2193	>8	NA	1.5	>8	>6.5	
RE-TP-9	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-9	Test Pit	04/11/17	Yes	47.645638	-117.17543	2210	12	Not Encountered	NA	04/11/17	NA	>12	<2198	>12	NA	4	>12	>8	
RE-TP-10	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-10	Test Pit	04/11/17	Yes	47.645894	-117.176395	2187	9	Not Encountered	NA	04/11/17	NA	>9	<2178	>9	NA	5	>9	>4	
RE-TP-11	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-11	Test Pit	04/11/17	Yes	47.645523	-117.176921	2190	9	Not Encountered	NA	04/11/17	NA	10	<2180	>10	NA	6	8.5	2.5	
RE-TP-12	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	TP-12	Test Pit	04/11/17	Yes	47.645088	-117.17699	2210	9	Not Encountered	NA	04/11/17	NA	>9	<2201	>9	NA	5	>9	>4	
RE-B-13	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	B-13	Boring	04/11/17	Yes	47.644515	-117.177571	2213	30	Not Encountered	NA	04/11/17	NA	>30	<2183	1.5	2212	NA	NA	0	
RE-B-14	Budinger & Associates	Budinger (2019)	Ridgemont Estates No. 5	B-14	Boring	04/11/17	Yes	47.644548	-117.179362	2158	34.5	Not Encountered	NA	04/11/17	NA	>30	<2128	0	2158	NA	NA	0	
GE-B-1	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-B-1	Boring	10/17/23	Yes	47.63728	-117.18712	2131	10.1	Not Encountered	NA	10/17/23	NA	5	2253.5	0.3	2131	NA	NA	0	
GE-B-2	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-B-2	Boring	10/17/23	Yes	47.63904	-117.18511	2142	26.5	Not Encountered	NA	10/17/23	NA	>26.5	<2118.5	15	2127	0.3	15	14.7	
GE-B-3	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-B-3	Boring	10/18/23	Yes	47.64093	-117.18176	2183	26.5	Not Encountered	NA	10/18/23	NA	>26.5	<2159.5	0.8	2182	NA	NA	0	
GE-B-4	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-B-4	Boring	10/18/23	Yes	47.63868	-117.18186	2215	26.5	Not Encountered	NA	10/18/23	NA	>26.5	<2190.5	0.7	2214	NA	NA	0	
GE-B-5	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-B-5	Boring	10/19/23	Yes	47.6371	-117.18417	2214	26.5	Not Encountered	NA	10/19/23	NA	>26.5	<2191.5	4.5	2209	0.7	4.5	3.8	
GE-TP-1	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-TP-1	Test Pit	03/18/24	Yes	47.64061	-117.18603	2018	2	Not Encountered	NA	03/18/24	NA	>2	<2016	>2	<2016	NA	NA	0	
GE-TP-2	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-TP-2	Test Pit	03/18/24	Yes	47.64055	-117.18601	2019	12	Not Encountered	NA	03/18/24	NA	>12	<2007	1	2018	5.5	>12	>6.5	
GE-TP-3	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-TP-3	Test Pit	03/18/24	Yes	47.64118	-117.18514	2018	11.5	Not Encountered	NA	03/18/24	NA	>11.5	<2006.5	0.7	2017	NA	NA	0	
GE-TP-4	GeoEngineers	GeoEngineers (current study)	Ridgemont Estates Stormwater	GE-TP-4	Test Pit	03/18/24	Yes	47.64160	-117.18442	2018	12	Not Encountered	NA	03/18/24	NA	>12	<2006	0.8	2017	NA	NA	0	

Notes:

[1] Exploration sites were geolocated in Google Earth by GeoEngineers using site plans provided in the respective reports. Locations and associated coordinates should be considered approximate.

[2] Elevations were estimated using Google Earth.

[3] Crystalline bedrock refers to Miocene-age Columbia River Basalt Group basalt flows or pre-Miocene basement rock.

[4] Sequences of stiff to hard silt and/or clay were interpreted to represent Miocene-age Latah Formation sediments.

[5] Permeable sediments are defined as either: (1) sand and/or gravel with less than 12 percent fines (silt- and clay-sized particles passing the U.S. No. 200 sieve); or (2) sediment described as silty but associated with infiltration testing in excess of 72 inches per hour.

bgs = below ground surface; -- = not provided; NA = not applicable

Appendix B
Water Well Reports

Please print, sign and return by mail to Department of Ecology

24M1

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE60662

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*

☑ Resource Protection

☐ Geotech Soil Boring

Consulting Firm Budinger and Associates, Inc.

Unique Ecology Well ID Tag No. _____

Property Owner Vera Water and Power

Site Address _____

City Spokane Valley County Spokane

Location SW 1/4-1/4 SW 1/4 Sec 24 Twn 25N R 44 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Ethan Hageman

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. 2968

If trainee, licensed driller's Signature and License No. 2968

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

Cased or Uncased Diameter 4.5 O.D Static Level N/A

Work/Decommission Start Date 12/21/2016

Work/Decommission Completed Date 12/21/2016

Construction/Design	Well Data	Formation Description
		GRAVEL
		SILT
		SILTY GRAVEL
		5 Feet
		CLAYEY SILTY
		End boring at 15 feet BAI S16690 TB1

RECEIVED
APR 14 2017
Department of Ecology
Eastern Regional Office

SCALE: 1"= _____

PAGE 1 OF 1

ECY 050-12 (Rev. 2/03)

Ecology is an Equal Opportunity Employer.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

25H1

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

505421

Notice of Intent Number _____

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other Ground Src

TYPE OF WORK: Owner's number of well (if more than one) 1

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 3 inches, drilled 100 ft. Depth of completed well _ ft.

CONSTRUCTION DETAILS

Casing Installed: ☐ Welded _____" Diam. from _____ ft. to _____ ft.
☐ Liner installed _____" Diam. from _____ ft. to _____ ft.
☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 100 ft.

Material used in seal Cement

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level N/A ft. below top of well Date 11/5/13

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest N/A gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. GE00473

Unique Ecology Well ID Tag No. BIO-001

Water Right Permit No. _____

Property Owner Name Forrest and Cheryl Renslow

Well Street Address 16914 E. 27th

City Greenacres County Spokane

Location SE1/4-1/4 NE1/4 Sec 25 Twn 25N R 44 **(s, t, r Still REQUIRED)** EWM ☒ Or WWM ☐

Lat/Long Lat Deg ____ Lat Min/Sec ____
Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 452541102

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil & fill	0	6
Sand & Gravel	6	24
Clay	24	100
Installed Copper Tubing		
Cemented to Ground Surface		
Ground Source Heat Pump Boring		

RECEIVED
JAN 14 2014
Department of Ecology
Eastern Regional Office

Start Date 11/4/13 Completed Date 11/5/13

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Tom Richardson

Driller/Engineer/Trainee Signature

Driller or trainee License No. 1295

IF TRAINEE: Driller's License No:

Driller's Signature: Tom Richardson

Drilling Company H2O Well Service Inc.

Address 582 W. Hayden Ave.

City, State, Zip Hayden , ID, 83835

Contractor's Registration No. H2OWESI101DW Date 11/27/13

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

25H2

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number 505422

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other Ground Src

TYPE OF WORK: Owner's number of well (if more than one) 2

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 3 inches, drilled 100 ft. Depth of completed well _ ft.

CONSTRUCTION DETAILS

Casing Installed: ☐ Welded _____" Diam. from _____ ft. to _____ ft. ☐ Liner installed _____" Diam. from _____ ft. to _____ ft. ☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 100 ft.

Material used in seal Cement

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level N/A ft. below top of well Date 11/5/13

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest N/A gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. GE00473

Unique Ecology Well ID Tag No. BIO-002

Water Right Permit No. _____

Property Owner Name Forrest and Cheryl Renslow

Well Street Address 16914 E. 27th

City Greenacres County Spokane

Location SE1/4-1/4 NE1/4 Sec 25 Twn 25N R 44 **(s, t, r Still REQUIRED)** EWM ☒ Or WWM ☐

Lat/Long Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 452541102

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil & fill	0	6
Sand & Gravel	6	24
Clay	24	80
Granite Boulder	80	85
Clay	85	100
Installed Copper Tubing		
Cemented to Ground Surface		
Ground Source Heat Pump Boring		

RECEIVED

JAN 14 2014

Department of Ecology
Eastern Regional Office

Start Date 11/6/13 Completed Date 11/12/13

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Tom Richardson

Driller/Engineer/Trainee Signature

Driller or trainee License No. 1295

IF TRAINEE: Driller's ~~License~~ No:

Driller's Signature: Tom Richardson

Drilling Company H2O Well Service Inc.

Address 582 W. Hayden Ave.

City, State, Zip Hayden , ID, 83835

Contractor's Registration No. H2OWESI101DW Date 11/27/13

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

25H3

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

505423

☒ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

CURRENT

Notice of Intent No. GE00473

Unique Ecology Well ID Tag No. BIO-003

Water Right Permit No. ____

Property Owner Name Forrest and Cheryl Renslow

Well Street Address 16914 E. 27th

City Greenacres County Spokane

Location SE1/4-1/4 NE1/4 Sec 25 Twn 25N R 44 EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 452541102

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other Ground Src

TYPE OF WORK: Owner's number of well (if more than one) 3
☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven
☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 3 inches, drilled 100 ft. Depth of completed well ft.

CONSTRUCTION DETAILS

Casing Installed: ☐ Welded ____" Diam. from ____ ft. to ____ ft.
☐ Liner installed ____" Diam. from ____ ft. to ____ ft.
☐ Threaded ____" Diam. From ____ ft. to ____ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used ____
SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ____
Materials placed from ____ ft. to ____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 100 ft.
Material used in seal Cement
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level N/A ft. below top of well Date 11/5/13
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? ____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest N/A gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil & fill	0	6
Sand & Gravel	6	24
Clay	24	70
Boulder	70	74
Clay	74	85
Boulder	85	89
Clay	89	100
Installed Copper Tubing		
Cemented to Ground Surface		
Ground Source Heat Pump Borin		

RECEIVED
JAN 14 2014
Department of Ecology
Eastern Regional Office

Start Date 11/12/13 Completed Date 11/14/13

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Tom Richardson
Driller/Engineer/Trainee Signature
Driller or trainee License No. 1295
IF TRAINEE: Driller's License No:
Driller's Signature: [signature]

Drilling Company H2O Well Service Inc.
Address 582 W. Hayden Ave.
City, State, Zip Hayden , ID, 83835
Contractor's Registration No. H2OWESI101DW Date 11/27/13

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

25H4

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number 505-424

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other Ground Src

TYPE OF WORK: Owner's number of well (if more than one) 4

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 3 inches, drilled 100 ft. Depth of completed well _ ft.

CONSTRUCTION DETAILS

Casing Installed: ☐ Welded _____" Diam. from _____ ft. to _____ ft. ☐ Liner installed _____" Diam. from _____ ft. to _____ ft. ☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 100 ft.

Material used in seal Cement

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level N/A ft. below top of well Date 11/5/13

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest N/A gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. GE00473

Unique Ecology Well ID Tag No. BIO-004

Water Right Permit No. _____

Property Owner Name Forrest and Cheryl Renslow

Well Street Address 16914 E. 27th

City Greenacres County Spokane

Location SE1/4-1/4 NE1/4 Sec 25 Twn 25N R 44 **(s, t, r Still REQUIRED)** EWM ☒ Or WWM ☐

Lat/Long Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 452541102

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	6
Sand & Gravel	6	25
Clay	25	75
Boulder	75	79
Clay	79	100
Installed Copper Tubing		
Cemented to Ground Surface		
Ground Source Heat Pump Boring		

RECEIVED
JAN 14 2014
Department of Ecology
Eastern Regional Office

Start Date 11/14/13 Completed Date 11/15/13

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Tom Richardson

Driller/Engineer/Trainee Signature

Driller or trainee License No. 1295

IF TRAINEE: Driller's License No:

Driller's Signature: Tom Richardson

Drilling Company H2O Well Service Inc.

Address 582 W. Hayden Ave.

City, State, Zip Hayden , ID, 83835

Contractor's Registration No. H2OWESI101DW Date 11/27/13

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

25H5

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number 505425

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other Ground Src

TYPE OF WORK: Owner's number of well (if more than one) 5

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 3 inches, drilled 100 ft. Depth of completed well _ ft.

CONSTRUCTION DETAILS

Casing Installed: ☐ Welded _____" Diam. from _____ ft. to _____ ft. ☐ Liner installed _____" Diam. from _____ ft. to _____ ft. ☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 100 ft.

Material used in seal Cement

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level N/A ft. below top of well Date 11/5/13

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest N/A gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. GE00473

Unique Ecology Well ID Tag No. BIO-005

Water Right Permit No. _____

Property Owner Name Forrest and Cheryl Renslow

Well Street Address 16914 E. 27th

City Greenacres County Spokane

Location SE1/4-1/4 NE1/4 Sec 25 Twn 25N R 44 **(s, t, r Still REQUIRED)** EWM ☒ Or WWM ☐

Lat/Long Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. (Required) 452541102

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	6
Sand & Gravel	6	35
Clay	24	76
Boulder	76	79
Clay	79	90
Boulder	90	92
Clay	92	100
Installed Copper Tubing		
Cemented to Ground Surface		
Ground Source Heat Pump Boring		

RECEIVED

JAN 14 2014

Department of Ecology
Eastern Regional Office

Start Date 11/18/13 Completed Date 11/19/13

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Tom Richardson

Driller/Engineer/Trainee Signature

Driller or trainee License No. 1295

IF TRAINEE: Driller's License No:

Driller's Signature: Tom Richardson

Drilling Company H2O Well Service Inc.

Address 582 W. Hayden Ave.

City, State, Zip Hayden , ID, 83835

Contractor's Registration No. H2OWESI101DW Date 11/27/13

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

30M1

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 057597

Water Right Permit No.

(1) OWNER: Name Dave Bastain Address 1906 S Ridgemont, Verdale, WA 99037

LOCATION OF WELL: County Spokane ¼ SW ¼ Sec. 30 T 25 N., R 45 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) 32nd. Saltese Cemt. Greenacres, WA

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)

Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 200 feet. Depth of completed well 200 ft.

(6) CONSTRUCTION DETAILS:

Casing Installed: 6 " Diam. from +1 ft. to 173 ft.
Welded [X]
Liner installed [ ] " Diam. from ft. to ft.
Threaded [ ] " Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 80 ft. below top of well Date 7/24/91
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: 15 gal./min. with ft. drawdown after hrs.
Air test approx. 15 G.P.M. " " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil	0	1
Basalt-highly fract.	1	34
Cemented sand	34	90
Clay-brn.	90	174
Basalt-hard	174	178
Clay-brn. w/some sand	178	200

RECEIVED

Work started 7/23/91, 19. Completed 7/24/, 19 91

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME J & J DRILLING INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address S 5613 Linke Rd. Greenacres, WA 99016

(Signed) (WELL DRILLER) License No. 1447

Contractor's Registration No. JJDRII-177KU Date 7/26/, 19 91

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

30M2

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy -- Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name William C. Lebow Address E. 10119-44, Spokane, Wa. 99206

(2) LOCATION OF WELL: County Spokane, Wa. 99206 — SW¼ SW¼ Sec. 30 T. 25 N., R. 45 W.M.

ng and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Drilled 202 ft. Diameter of well 6 inches. Depth of completed well 202 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 179 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☑ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☑ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☑ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level
Static level 50 ft. below top of well Date 4/10/87
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☑ If yes, by whom?
Yield: 35 gal./min. with ft. drawdown after hrs.
" " " "
" Air test approx " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☑

6/17/87

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	2
Basalt cobble w/br. clay	2	20
Clay, br. + tan w/seamsolts	20	160
coarse sand, clay	160	195
Basalt, grey, soft w/water	195	202

RECEIVED
JUN 17 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4/10, 19 87 Completed 4/10, 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J&J DRILLING, Inc. (Person, firm, or corporation) (Type or print)

Address S. 5613 Linke Rd., Greenacres, Wa.

[Signed] Keith D. Heinrikin (Well Driller)

License No. 1079 Date 4/10, 19 87

(USE ADDITIONAL SHEETS IF NECESSARY)

50-1-20

30N1

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No
Permit No

(1) OWNER: Name Bill Cabbage Address Station R Spokane, Wa.

LOCATION OF WELL: County Spokane -SE ¼SW¼ Sec 30 T25 N., R43 E W.M.
ig and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 240 ft. Depth of completed well 240 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 140 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P

(8) WATER LEVELS: Land-surface elevation above mean sea level 2200 ft.
Static level 50 ft. below top of well Date 12-10-77
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
Air Test Approx 150 G.P.M. "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	2
Broken Basalt	2	18
Yellow Clay	18	37
Brown Clay	37	68
Broken Basalt	68	135
Basalt	135	240

RECEIVED
APR 26 1979
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 12-8, 19 77 Completed 12-10, 19 77

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J. J. Rollins Inc. (Person, firm, or corporation) (Type or print)
Address 5635 Link Rd Otis Orchards, Wa.
[Signed] (Well Driller)
License No. 0215 Date 12-30, 19 77

4/27/79

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20

30N2

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

1) OWNER: Name Bill Cabbage Address 15217 E 16th Spokane Wa. 99216

2) LOCATION OF WELL: County Spokane — SE ¼ SW ¼ Sec. 30 T. 25 N., R. 45 E W.M.

Bearing and distance from section or subdivision corner

3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

5) DIMENSIONS: Diameter of well 6 inches.
Drilled 240 ft. Depth of completed well 240 ft.

6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 140 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☑ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 15 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

7) PUMP: Manufacturer's Name
Type: H.P.

8) WATER LEVELS: Land-surface elevation above mean sea level 2200 ft.
Static level 140 ft. below top of well Date 12-16-77
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
Air Test Approx 150 GPM "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	6
Broken Basalt	6	140
Basalt	140	240

Work started 12-8, 19 77 Completed 12-10, 19 77

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J & J Drilling Inc. (Person, firm, or corporation) (Type or print)

Address 13021 E 9th Spokane, WA.

[Signed] Gerald R Johnson (Well Driller)

License No. 0215 Date 12-23, 1977

7/25/78

Fremont 7½

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

3

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

30N3

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No .....

(1) OWNER: Name Ken Britos Address RT-1 Cheney, WA 99004

(2) LOCATION OF WELL: County Spokane — SE ¼ SW ¼ Sec 30 T 25 N., R 45 W.M.

...g and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 260 ft. Depth of completed well 260 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 53 ft.
Threaded ☐ ..." Diam. from ... ft. to ... ft.
Welded ☐ ..." Diam. from ... ft. to ... ft.

Perforations: Yes ☐ No ☑
Type of perforator used .....
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name .....
Type ... Model No .....
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: .....
Gravel placed from ... ft. to ... ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ... Depth of strata ...
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level ... 2200
Static level 71 ft. below top of well Date 11-5-81
Artesian pressure ... lbs. per square inch Date ...
Artesian water is controlled by ... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ... gal./min. with ... ft. drawdown after ... hrs.
" " " "
Air test Approx. 30-35 GPM
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

...te of test .....
Bailer test ... gal./min. with ... ft. drawdown after ... hrs.
Artesian flow ... g.p.m. Date ...
Temperature of water ... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	1
Basalt Boulders	1	5
Brn Clay w/ Basalt Rock	5	45
Fract- Basalt Strips Clay	45	70
Brn Clay	70	75
Basalt - Mud w/ Fractures	75	85
Basalt - Hard	85	108
Yellow Clay - Basalt Rock	108	137
Basalt (Hard)	137	139
Brn, Sand (Firm)	139	155
Basalt - Fract.	155	158
DK. Brn. Clay	158	165
Fract. Basalt w/ Brn. Clay	165	205
Brn. Shale - Strips Basalt	205	241
Basalt - Frac - Water	241	244
Basalt - Hard	244	260
244ft 4" Pvc		
Perforated From - 54 to 94 ft		
234' to 260 ft - Formation		
Packer set at 233 Ft		

RECEIVED
OCT 29 1982
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 11-3, 19 81 Completed 11-5, 19 81

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J & J Drilling Inc. (Person, firm, or corporation) (Type or print)
Address 563 S Linke Rd Cheney
[Signed] Gerald A John (Well Driller)
License No. 0215 Date 12-5, 19 81

ECY 050-1-20 (USE ADDITIONAL SHEETS IF NECESSARY)

10/29/82

30N4

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name Lyle Burnett Address 19804 Mica Dr. Greenacres WA

(2) LOCATION OF WELL: County Spokane — SE ¼ SW ¼ Sec. 30 T. 25 N., R. 45 E.W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 290 ft. Depth of completed well 290 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 119 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
perforations from ..... ft. to ..... ft.
perforations from ..... ft. to ..... ft.
perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 15 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level 2200 ft.
Static level 70 ft. below top of well Date 12-7-77
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " "
Air Test Approx 35 GPM "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	2
Broken Basalt	2	43
Brown Clay	43	58
Yellow Clay	58	75
Broken Basalt	75	290
Lined with 190 ft 4" Sch 160 PVC w/Formation Packer set at 240 ft		

Work started 12-5-77 19.... Completed 12-7-77 19..

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J & J Drilling Inc. (Person, firm, or corporation) (Type or print)
Address 13021 E. 9th Spokane, WA.
[Signed] Gerald R Johnson (Well Driller)
License No. 0215 Date 1-15, 1978

7/26/78 (USE ADDITIONAL SHEETS IF NECESSARY) Freeman 7½

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

30N5

Application No. .....

Permit No. .....

(1) **OWNER:** Name MR. PAUL MAY Address .....

(2) **LOCATION OF WELL:** County SPOKANE SE ¼ SW ¼ Sec 30 T 25 N., R 45 W.M.

Bearing and distance from section or subdivision corner

PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 163 ft. Depth of completed well 163 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 159 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☑ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☑
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite + Clay
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level .... 1200 ft.
Static level 75 ft. below top of well Date 5-22
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☑ If yes, by whom? .....
Yield: gal./min. with ft. drawdown after hrs.
AIR TEST" APPROX 30-40 GPM
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
er test ..... gal./min. with ..... ft. drawdown after ..... hrs.
...esian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☑

(10) WELL LOG:
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
SAND - BASALT BOULDERS	0	38
YELLOW CLAY	38	55
BEN CLAY	55	108
DARK BEN CLAY (HARD)	108	155
BASALT + SAND (WATER)	155	163

RECEIVED
Hand Carried
MAY 2 1974
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 5-21 19 74 Completed 5-22 19 74

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME J-H Drilling Co. INC.
(Person, firm, or corporation) (Type or print)
Address Box 441 SPOKANE 99211
[Signed] Norman D. Hoagland
(Well Driller)
License No. 0188 Date 5-22 19 74

S. F. No. 7356—OS—(Rev. 4-71). (USE ADDITIONAL SHEETS IF NECESSARY)

5/20/74

Table B-1

Compilation of Subsurface Data from Water Well Reports[1]

Ridgemont Estates Stormwater Improvements Project
City of Spokane Valley
Spokane Valley, Washington

Water Well Report Designation	Unique Well ID Tag No.	Owner	Well Use	Date Completed	Location [2]									Total Depth (feet bgs)	Open Borehole or Screen Depth (feet bgs)	Groundwater				Depth to Crystalline Bedrock [3] (feet bgs)	Interpreted Latah Formation Depth [4] (feet bgs)	Permeable Sediments [5]			Notes
					1/4-1/4 Section	1/4-Section	Section	Township	Range	Latitude (degrees)	Longitude (degrees)	Provided Well Address	Parcel No.			Depth to Groundwater (feet bgs)	Date of Groundwater Measurement	Aquifer System Well is Open To	Reported Yield (gpm)			Depth to Top of Permeable Sediments (feet bgs)	Depth to Bottom of Permeable Sediments (feet bgs)	Permeable Sediment Thickness (feet)	
24M1		Vera Water and Power	Resource Protection	12/21/16	SW	SE	24	25N	44E	--	--	--	--	15	NA	--	--	Latah	NA	>15	5	0	5	5	
25H1	BIO-001	Forrest and Cheryl Renslow	Ground Source	11/05/13	SE	NE	25	25N	44E	--	--	16914 E. 27th	452541102	100	NA	--	--	NA	NA	>100	24	6	24	18	
25H2	BIO-002	Forrest and Cheryl Renslow	Ground Source	11/12/13	SE	NE	25	25N	44E	--	--	16914 E. 27th	452541102	100	NA	--	--	NA	NA	>100	24	6	24	18	
25H3	BIO-003	Forrest and Cheryl Renslow	Ground Source	11/14/13	SE	NE	25	25N	44E	--	--	16914 E. 27th	452541102	100	NA	--	--	NA	NA	>100	24	6	24	18	
25H4	BIO-004	Forrest and Cheryl Renslow	Ground Source	11/15/13	SE	NE	25	25N	44E	--	--	16914 E. 27th	452541102	100	NA	--	--	NA	NA	>100	25	6	25	19	
25H5	BIO-005	Forrest and Cheryl Renslow	Ground Source	11/19/13	SE	NE	25	25N	44E	--	--	16914 E. 27th	452541102	100	NA	--	--	NA	NA	>100	35	6	35	29	
30M1		Dave Bastain	Domestic	07/26/91	--	SW	30	25N	45E	--	--	32nd Saltese Court, Greenacres, WA	--	200	173 to 200	80	07/24/91	Basalt and Latah	15	1	34 to 174; 178 to 200	NA	NA	0	
30M2		William C. Lebow	Domestic	04/10/87	SW	SW	30	25N	45E	--	--	--	--	202	179 to 202	50	04/10/87	Basalt and Latah	35	195	2	NA	NA	0	
30N1		Bill Cabbage	Domestic	12/10/77	SE	SW	30	25N	45E	--	--	--	--	240	140 to 240	50	12/10/77	Basalt	150	2	18 to 40	NA	NA	0	
30N2		Bill Cabbage	Domestic	12/10/77	SE	SW	30	25N	45E	--	--	--	--	240	140 to 240	140	12/10/77	Basalt	150	6	NA	NA	NA	0	
30N3		Ken Crites	Domestic	11/05/81	SE	SW	30	25N	45E	--	--	--	--	260	53 to 260	71	11/05/81	Basalt and Latah	30 to 35	1	5 to 75; 108 to 137; 158 to 165	NA	NA	0	
30N4		Lyle Burnett	Domestic	12/07/77	SE	SW	30	25N	45E	--	--	--	--	290	119 to 290	70	12/07/77	Basalt and Latah	35	2	42 to 75	NA	NA	0	
30N5		Mr. Paul May	Domestic	05/22/74	SE	SW	30	25N	45E	--	--	--	--	165	159 to 165	75	05/22/74	Basalt and Latah	30 to 40	155	38 to 155	0	38	38	

Notes:

[1] Water Well Reports were inventoried for the following sections: the south half of Section 24 and all of Section 25, Township 25 North, Range 44 East; and the west half of Section 30 of Township 25 North, Range 45 East. Water Well Reports that contained lithologic information were included herein.

[2] Water Well Report location information is reported herein as provided in the Water Well Reports. Locations should be considered approximate.

[3] Crystalline bedrock refers to Miocene-age Columbia River Basalt Group basalt flows or pre-Miocene basement rock.

[4] Sequences of stiff to hard silt and/or clay were interpreted to represent Miocene-age Latah Formation sediments.

[5] Within Water Well Reports, permeable sediments are defined as sediments described as sand and gravel overlying crystalline bedrock and/or Intepreted Latah Formation.

bgs = below ground surface; -- = not provided; NA = not applicable; gpm = gallons per minute

Appendix C
Field and Laboratory Procedures

Appendix C
Field and Laboratory Procedures

SITE EXPLORATION

GeoEngineers advanced five soil borings (GE-B-1 through GE-B-5) to depths of 10 to 26½ feet bgs, completed four soil boring as monitoring wells (GE-B-2 through GE-B-5), advanced four test pits (GE-TP-1 through GE-TP-4) to depths of 2 to 12 feet bgs and eight pavement cores (GE-C-1 through GE-C-9) to bottom of observed based course.

The approximate locations of the explorations are shown in Figure 2. Drilling, well installation and excavation activities were continuously monitored by a geologist from our firm who collected, examined and classified representative sediment samples and maintained a detailed log of the explorations.

Exploration locations were determined using GPS. Sediment was classified in general accordance with the ASTM International (ASTM) D 2487 described in Figure C-1. The boring, well construction and test pit logs for the explorations are presented in Appendix B, Figures C-2 through C-10.

MONITORING WELL CONSTRUCTION AND DEVELOPMENT

Monitoring wells completed in explorations GE-B-2 through GE-B-5 were constructed using 2-inch-inside-diameter Schedule 40 PVC riser and well screen material. Well screen slot size was about 0.010 inches. Processed 10-20 silica sand was used as filter pack. Bentonite chips were used as impermeable backfill. At the ground surface, the well is protected by a secured flush mount traffic-rated monument.

LABORATORY TESTING

Sediment samples obtained from the explorations were returned to our laboratory for further examination and testing. Gradation tests by ASTM C136 were conducted on representative sediment samples. Results of ASTM C136 analyses are presented in Sieve Analysis Results, Figures C-11 through C-16.

GROUNDWATER LEVELS

During infiltration testing, groundwater levels were measured by the following:

- A Solinst Model 101 electric water level meter. The polyethylene tapes were clearly marked allowing measurements with a precision of 0.01 feet, which was recorded in field sheets concurrent with time.

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.

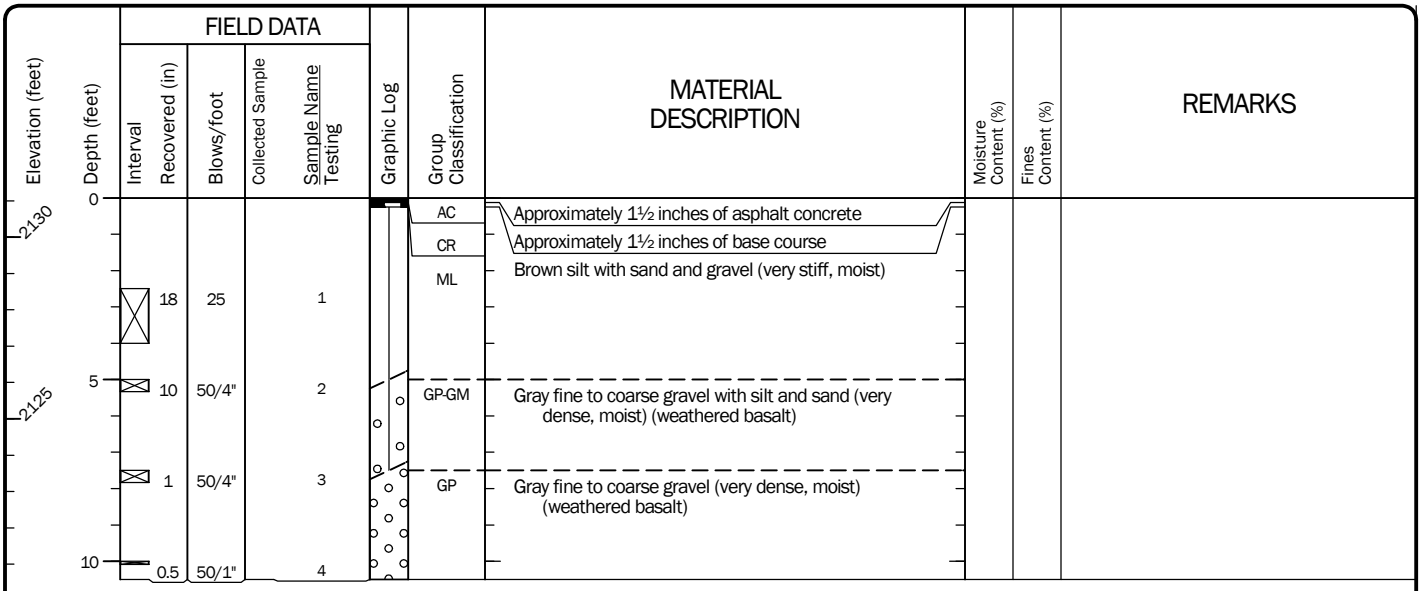
Key to Exploration Logs

GeoEngineers

Figure C-1

Drilled Start 10/17/2023 End 10/17/2023	Total Depth (ft) 10.5	Logged By MMS Checked By JER	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2131.08 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75	
Latitude 47.63728 Longitude -117.18712		System Datum Decimal Degrees WGS84 (feet)		Groundwater not observed at time of exploration	

Notes:



Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Boring GE-B-1

GeoEngineers

Project: Ridgemont Estates Stormwater Improvements Project
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-2
Sheet 1 of 1

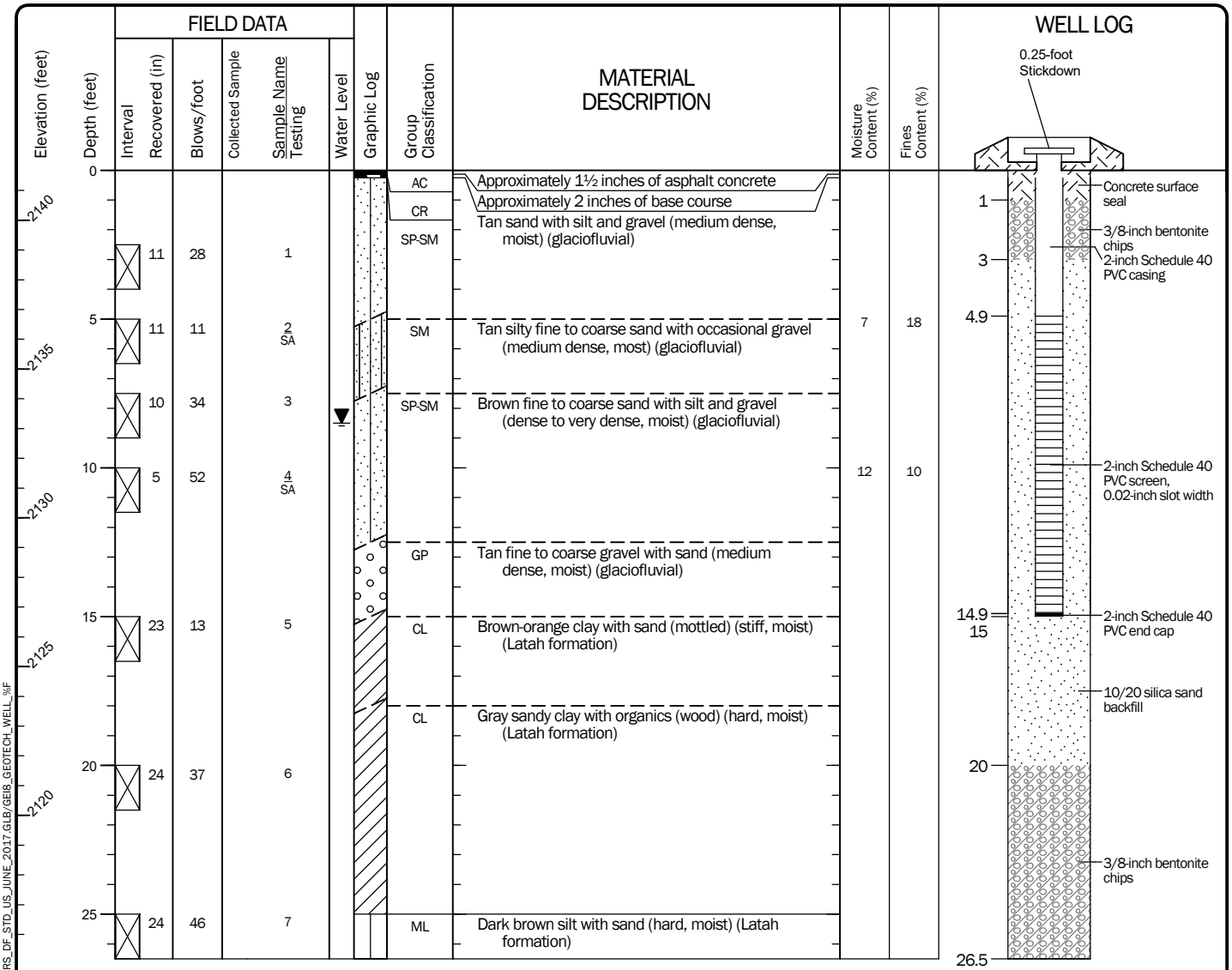
Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	10/17/2023	10/17/2023	26.5	MMS	JER	GeoEngineers, Inc.	Hollow-stem Auger

Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	2141.68 NAVD88	Top of Casing Elevation (ft)	2141.43
Latitude Longitude	47.63904 -117.18511	Horizontal Datum	Decimal Degrees WGS84 (feet)

DOE Well I.D.: BPX 827
A 2-in well was installed on 10/17/2023 to a depth of 15 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
10/17/2023	8.50	2133.18

Notes:



Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Boring with Monitoring Well GE-B-2

GeoEngineers

Project: Ridgemont Estates Stormwater Improvements Project
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-3
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	10/18/2023	10/18/2023	26.5	MMS	JER	GeoEngineers, Inc.	Hollow-stem Auger

Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	2182.71 NAVD88	Top of Casing Elevation (ft)	2182.41
Latitude Longitude	47.64093 -117.18176	Horizontal Datum	Decimal Degrees WGS84 (feet)

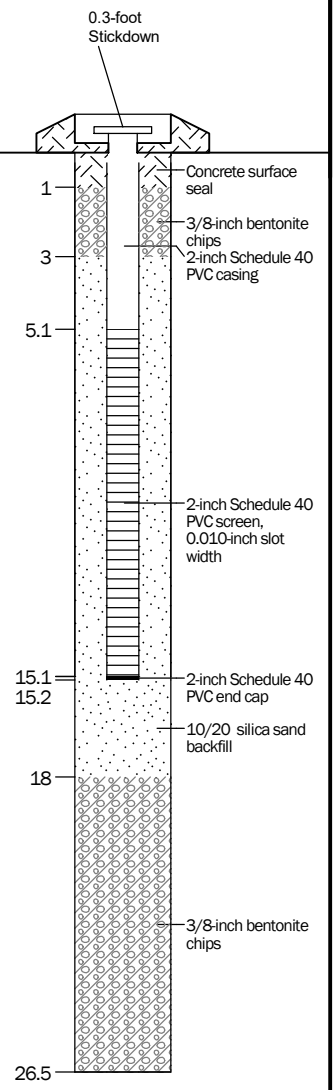
DOE Well I.D.: BPX 828
A 2-in well was installed on 10/18/2023 to a depth of 15.2 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Notes: Groundwater not measured at time of exploration

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0								AC	Approximately 5 inches of asphalt concrete		
									CR	Approximately 4 inches of base course		
2180									ML	Tan silt with sand (stiff, moist)		
			14	10		1						
	5		18	8		2 SA					47	67
2175			18	10		3			CL	Tan clay (stiff, moist)		
	10		18	8		4						
2170												
	15		0.5	39		5			CL	Tan sandy clay (hard, moist) (Latah formation)		
2165												
	20		18	12		6			CL	Tan clay (stiff to very stiff, moist) (mottled) (Latah formation)		
2160												
	25		18	16		7						

WELL LOG



Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Boring with Monitoring Well GE-B-3

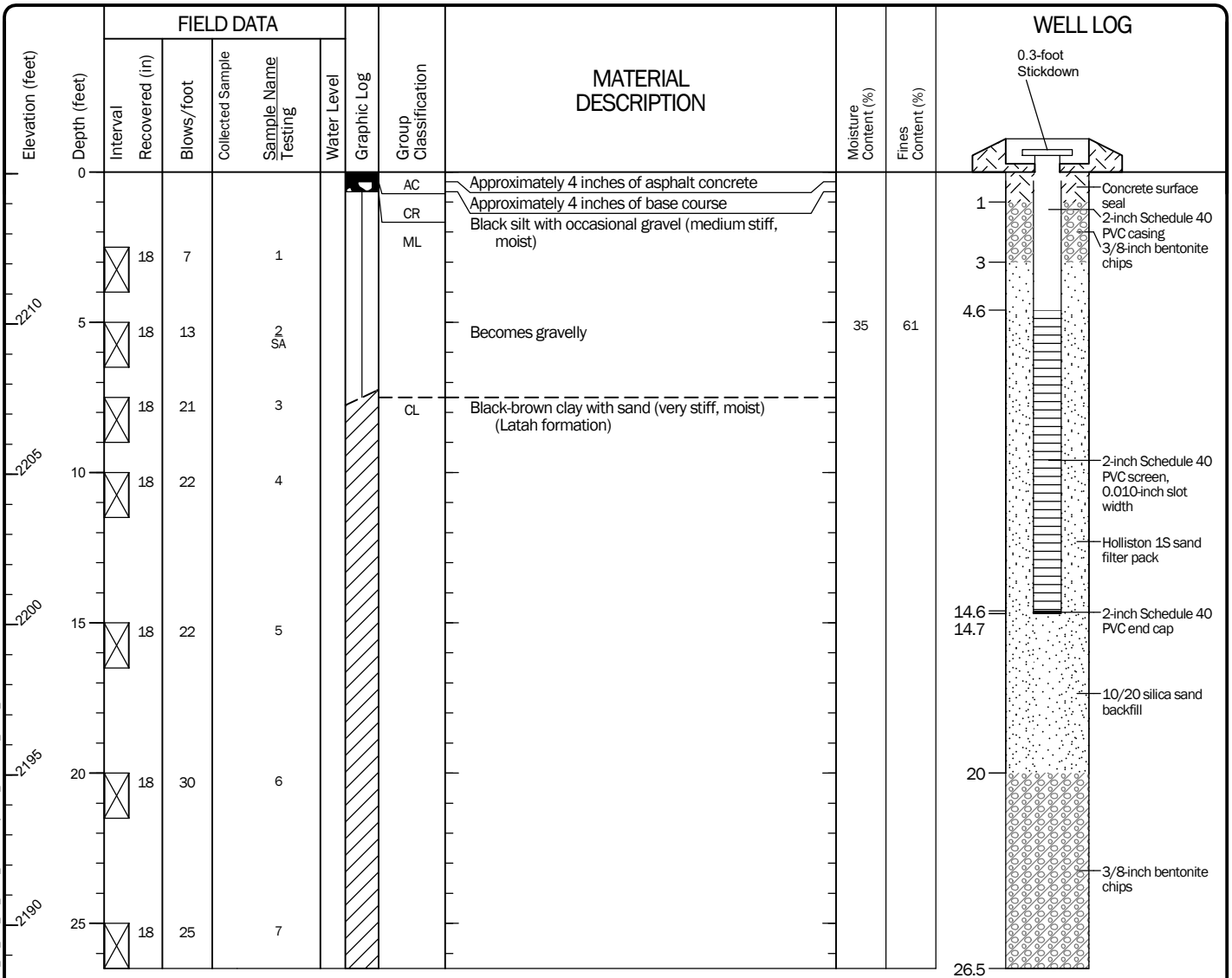
GeoEngineers

Project: Ridgemont Estates Stormwater Improvements Project
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-4
Sheet 1 of 1

Drilled Start 10/18/2023 End 10/18/2023	Total Depth (ft) 26.5	Logged By MMS Checked By JER	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment: CME 75		DOE Well I.D.: BPX 829 A 2-in well was installed on 10/18/2023 to a depth of 14.7 ft.	
Surface Elevation (ft) Vertical Datum: 2215.06 NAVD88		Top of Casing Elevation (ft): 2214.76		Groundwater Date Measured:	Depth to Water (ft): Elevation (ft):
Latitude 47.63868 Longitude -117.18186		Horizontal Datum: Decimal Degrees WGS84 (feet)			

Notes: Groundwater not measured at time of exploration



Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Boring with Monitoring Well GE-B-4

GeoEngineers

Project: Ridgemont Estates Stormwater Improvements Project
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

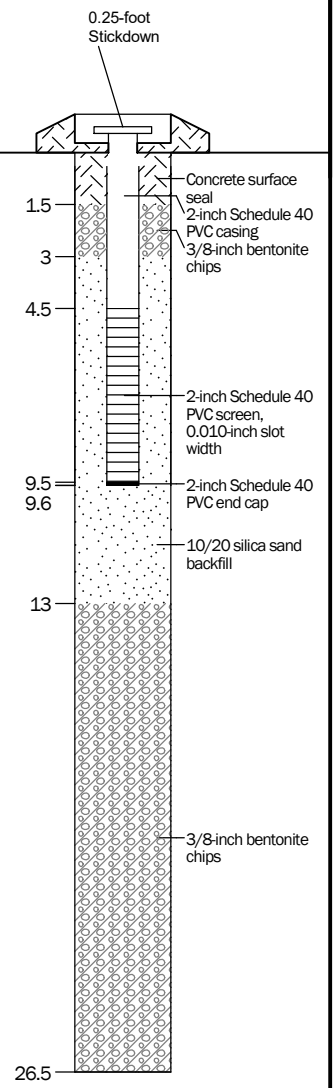
Figure C-5
Sheet 1 of 1

Drilled Start 10/19/2023 End 10/19/2023	Total Depth (ft) 26.5	Logged By MMS Checked By JER	Driller GeoEngineers, Inc.	Drilling Method Hollow-stem Auger	
Hammer Data: Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment: CME 75		DOE Well I.D.: BPX 830 A 2-in well was installed on 10/19/2023 to a depth of 9.6 ft.	
Surface Elevation (ft) Vertical Datum: 2213.93 NAVD88		Top of Casing Elevation (ft): 2213.68		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	
Latitude 47.6371 Longitude -117.18417		Horizontal Datum: Decimal Degrees WGS84 (feet)			

Notes: Groundwater not measured at time of exploration

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0								AC	Approximately 3 inches of asphalt concrete		
									CR	Approximately 4 inches of base coarse		
2210		1	5	13		1 SA			SM	Brown silty fine to coarse sand with occasional gravel (medium dense, moist) (glaciofluvial)	7	21
	5	2	10	13		2			CL	Brown sandy clay with gravel (stiff, moist)		
2205		3	18	14		3			CL	Brown clay with sand and occasional gravel (stiff, moist)		
	10	4	18	12		4						
2200												
	15	5	2 16	22		5A 5B			CL	Tan-white clay (very stiff, moist) (mottled) (Latah formation)		
2195												
	20	6	18	25		6						
2190									CL	Gray-orange sandy clay (stiff, moist) (mottled) (Latah formation)		
	25	7	18	14		7						

WELL LOG



Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Boring with Monitoring Well GE-B-5

GeoEngineers

Project: Ridgemont Estates Stormwater Improvements Project
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-6
Sheet 1 of 1

Date Excavated	3/18/2024	Total Depth (ft)	2	Logged By AN Checked By JER	Excavator SES, Inc. Equipment CAT 313F	Groundwater not observed Caving not observed
Surface Elevation (ft) 2021 Vertical Datum NAVD88		Latitude 47.6406 Longitude -117.186		Coordinate System Decimal Degrees Horizontal Datum WGS84 (feet)		

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
2020	1				TS	Approximately 12 inches of dark brown silt with organic matter (roots) (soft, moist) (topsoil)			
					ML	Light tan silt with sand (hard, moist)			PP = 4.0 tons/ft^2
2019	2		1		GM	Brown silty fine to medium gravel with sand (medium dense, moist) (glaciofluvial)			

Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Test Pit GE-TP-1

GeoEngineers

Project: Ridgemont Estates
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-7
Sheet 1 of 1

Date Excavated	3/18/2024	Total Depth (ft)	12	Logged By AN Checked By JER	Excavator SES, Inc. Equipment CAT 313F	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	2022 NAVD88	Latitude Longitude	47.6405 -117.186	Coordinate System Horizontal Datum	Decimal Degrees WGS84 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
2021	0		1		TS	Approximately 12 inches of dark brown silt with sand and organic matter (roots) (soft, moist) (topsoil)			
	1				ML	Tan silt with trace sand (medium dense, moist)			
2020	2		2 SA				58	90	
2019	3								
2018	4		3		GM	Brown silty fine to medium gravel with sand (medium dense, moist) (glaciofluvial)			
2017	5								
2016	6				GP	Brown fine to coarse gravel with sand, trace silt and occasional cobbles (medium dense, moist) (glaciofluvial)			Minor caving observed from 6 to 12 feet
2015	7		4 SA				4	4	
2014	8								
2013	9								
2012	10								
2011	11		5						
2010	12								

Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Test Pit GE-TP-2

GeoEngineers

Project: Ridgemont Estates
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-8
Sheet 1 of 1

Date Excavated	3/18/2024	Total Depth (ft)	11.5	Logged By AN Checked By JER	Excavator SES, Inc. Equipment CAT 313F	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	2020 NAVD88	Latitude Longitude	47.6412 -117.1851	Coordinate System Horizontal Datum	Decimal Degrees WGS84 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
2019	0				TS	Approximately 8 inches of dark brown silt with sand and organic matter (roots) (soft, moist) (topsoil)			
	1				ML	Tan silt with trace sand (very stiff, moist) (glaciolacustrine)			
2018	2	✓	1 SA				47	97	PP = 2.0 tons/ft^2
2017	3	✓	2		ML	Grayish brown silt with fine sand (medium dense, moist) (glaciolacustrine)			
2016	4	✓	3		ML	Tan silt with sand (hard, moist) (glaciolacustrine)			PP = 2.5 tons/ft^2
2015	5								
2014	6								
2013	7	✓	4		ML	Brown silt (soft, moist) (glaciolacustrine)			
2012	8								
2011	9								
2010	10	✓	5 SA		GM	Brown silty fine to coarse gravel with sand (medium dense, moist) (glaciofluvial)	4	18	
2009	11								

Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Test Pit GE-TP-3

GeoEngineers

Project: Ridgemont Estates
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-9
Sheet 1 of 1

Date Excavated	3/18/2024	Total Depth (ft)	12	Logged By AN Checked By JER	Excavator SES, Inc. Equipment CAT 313F	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	2020 NAVD88	Latitude Longitude	47.6416 -117.1844	Coordinate System Horizontal Datum	Decimal Degrees WGS84 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
2019	1		1		TS	Approximately 9 inches of dark brown silt with organic matter (roots) (soft, moist) (topsoil)			
					ML	Tan silt with trace organic matter (roots) (hard, moist) (glaciolacustrine)			PP = 5+ tons/ft^2
2018	2								
2017	3				ML	Grayish brown silt with fine sand (medium dense, moist) (glaciolacustrine)			
2016	4		2 SA				67	82	
					ML	Tan silt with fine sand (hard, moist) (glaciolacustrine)			
2015	5		3						PP = 5+ tons/ft^2
2014	6								
2013	7								
2012	8								
2011	9		4		ML	Dark brown silt (hard, moist) (glaciolacustrine)			PP = 5+ tons/ft^2
2010	10								
2009	11								
2008	12		5						

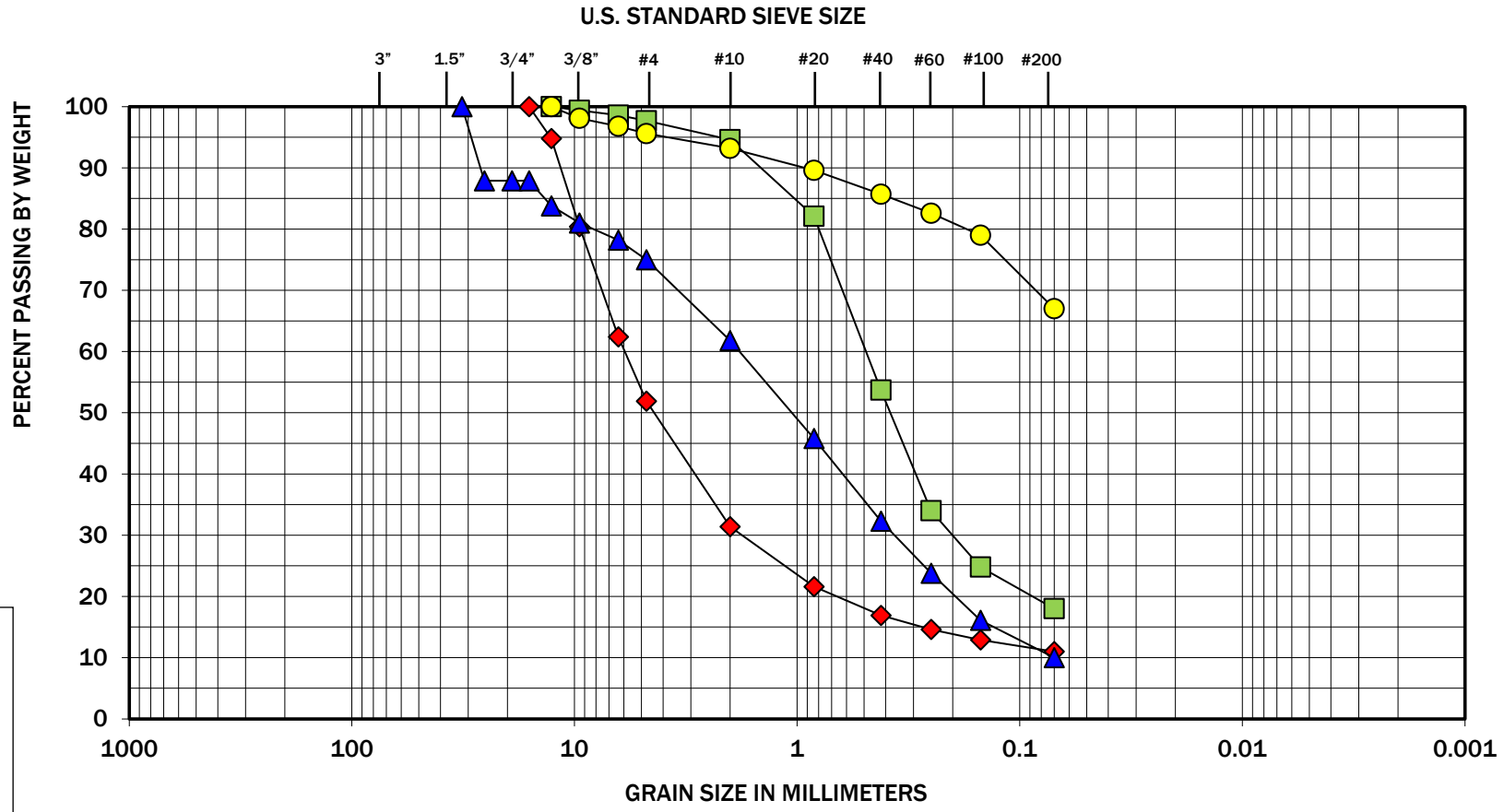
Note: See Figure C-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on GPS (Rec). Vertical approximated based on GPS (Rec).

Log of Test Pit GE-TP-4

GeoEngineers

Project: Ridgemont Estates
Project Location: Spokane Valley, Washington
Project Number: 11264-044-00

Figure C-10
Sheet 1 of 1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-2	Base Course	3	Fine gravel with silt and sand
■	B-2	5 – 6.5	7	Silty fine to coarse sand
▲	B-2	10 – 11.5	12	Fine to coarse sand with silt and gravel
●	B-3	5 – 6.5	47	Silt with sand

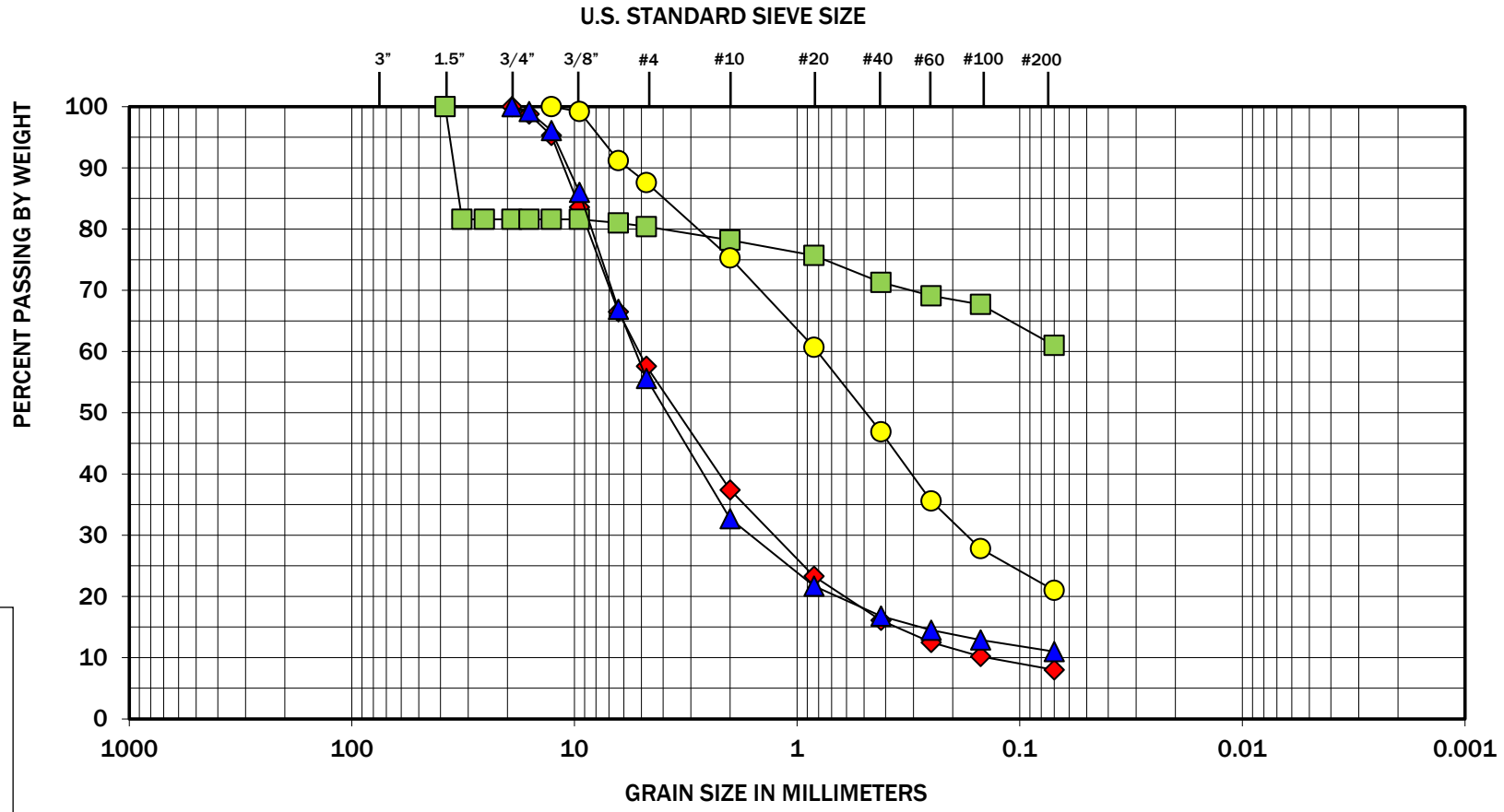
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure C-11

Northwest Stormwater Basin Planning
Spokane, Washington

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	B-4	Base Course	2	Well-graded sand with silt and gravel
■	B-4	5 – 6.5	35	Gravelly silt
▲	B-5	Base Course	3	Sand with silt and gavel
●	B-5	2.5 – 4	7	Silty fine to coarse sand

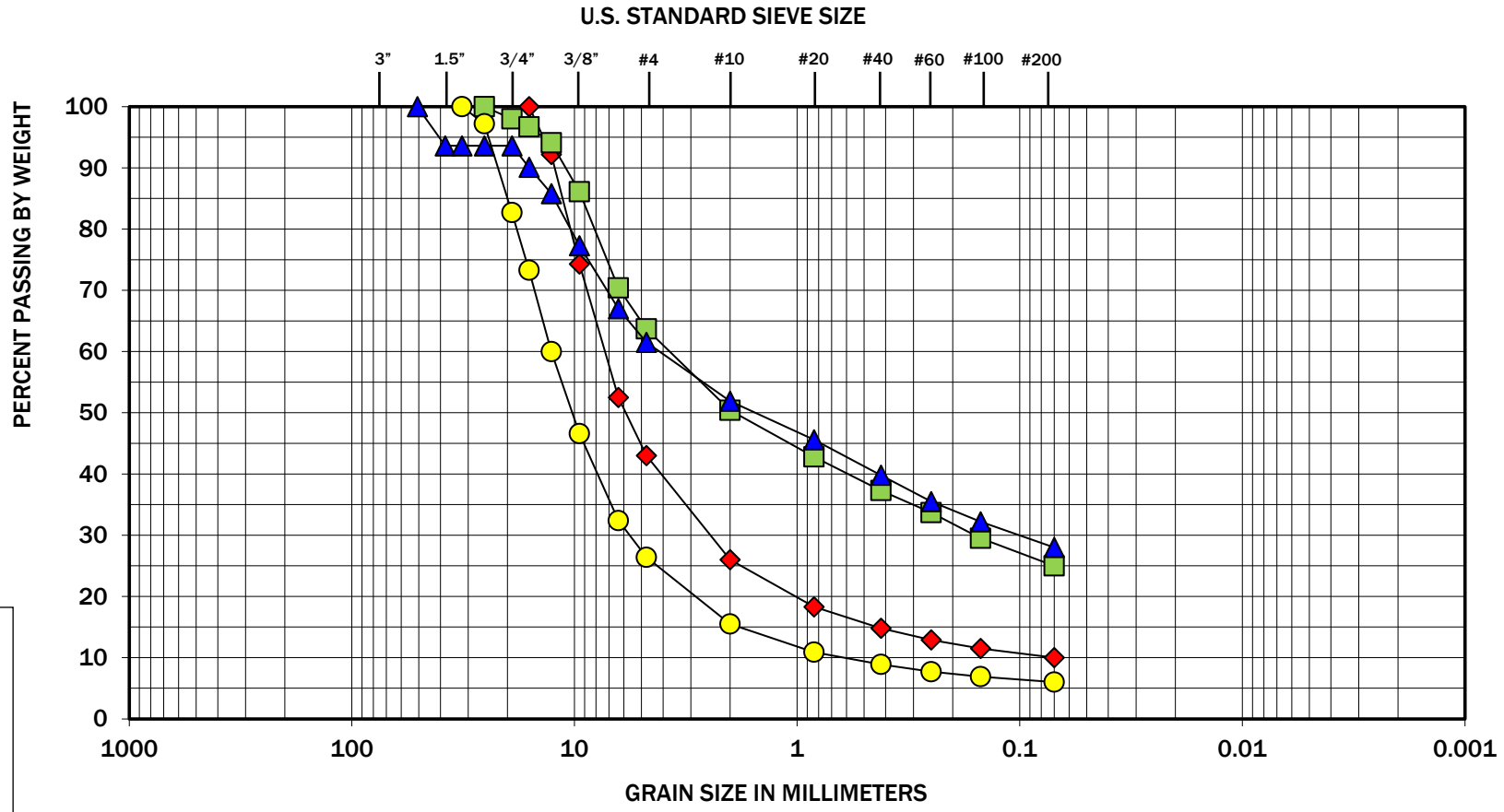
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure C-12

Northwest Stormwater Basin Planning
Spokane, Washington

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	C-1	Base Course	4	Gravel with silt and sand
■	C-1	Subgrade	9	Silty sand with gravel
▲	C-3	Subgrade	8	Silty gravel with sand
●	C-4	Base Course	2	Gravel with silt and sand

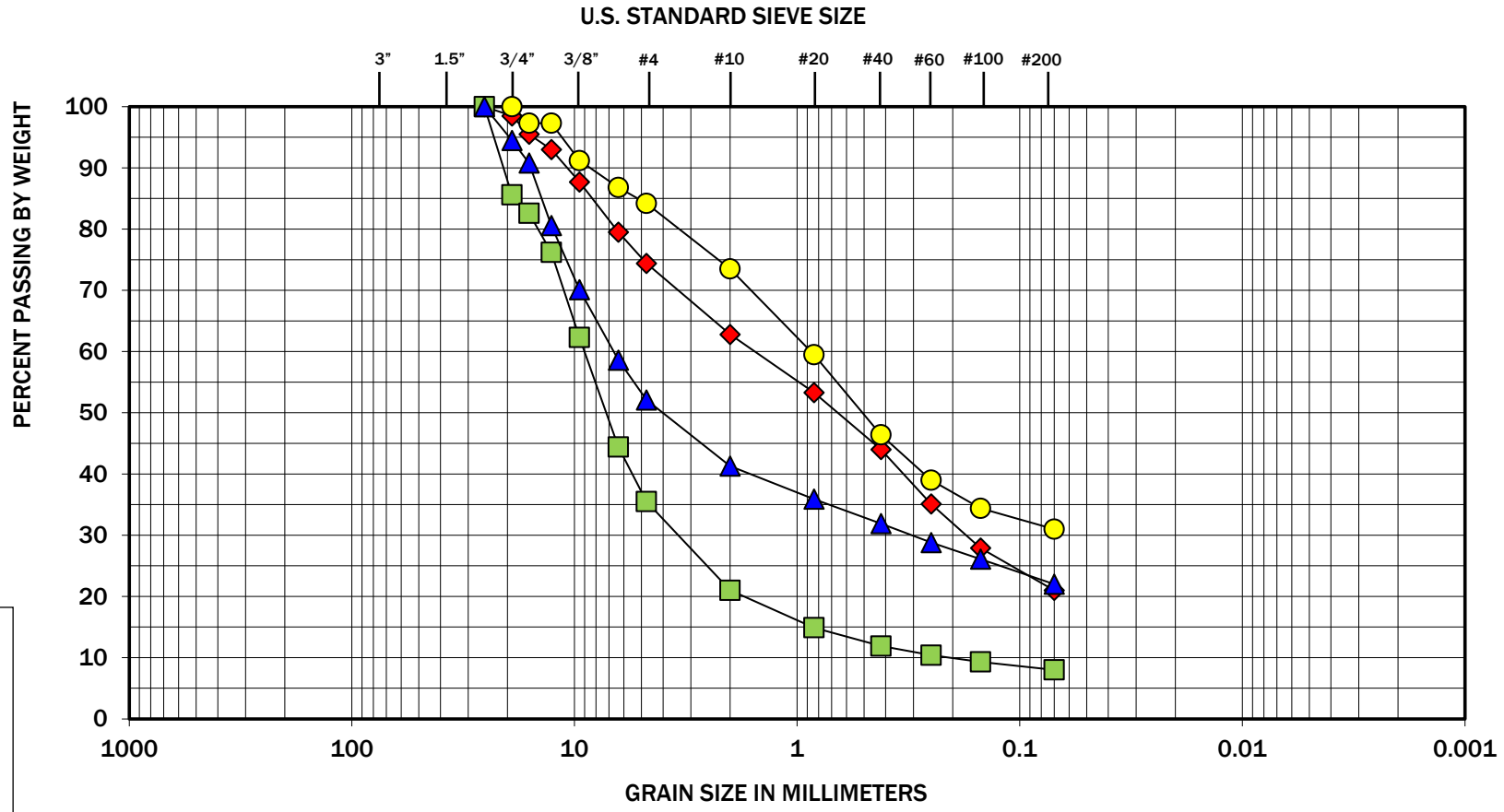
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Northwest Stormwater Basin Planning
Spokane, Washington

Sieve Analysis Results

Figure C-13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	C-4	Subgrade	6	Silty sand with gravel
■	C-8	Base Course	4	Silty gravel with sand
▲	C-8	Subgrade	6	Silty gravel with sand
●	C-9	Subgrade	9	Silty sand with gravel

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

GeoEngineers

Northwest Stormwater Basin Planning
Spokane, Washington

Sieve Analysis Results

Figure C-14

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Test Pit Number	Depth (feet)	Moisture (%)	Soil Description
◆	TP-2	2 – 3	58	Silt with trace sand
■	TP-2	7 – 8	4	Fine to coarse gravel with sand and trace silt
▲	TP-3	1.5 – 2	47	Silt with trace sand
●	TP-3	10 – 11	4	Silty fine to coarse gravel with sand

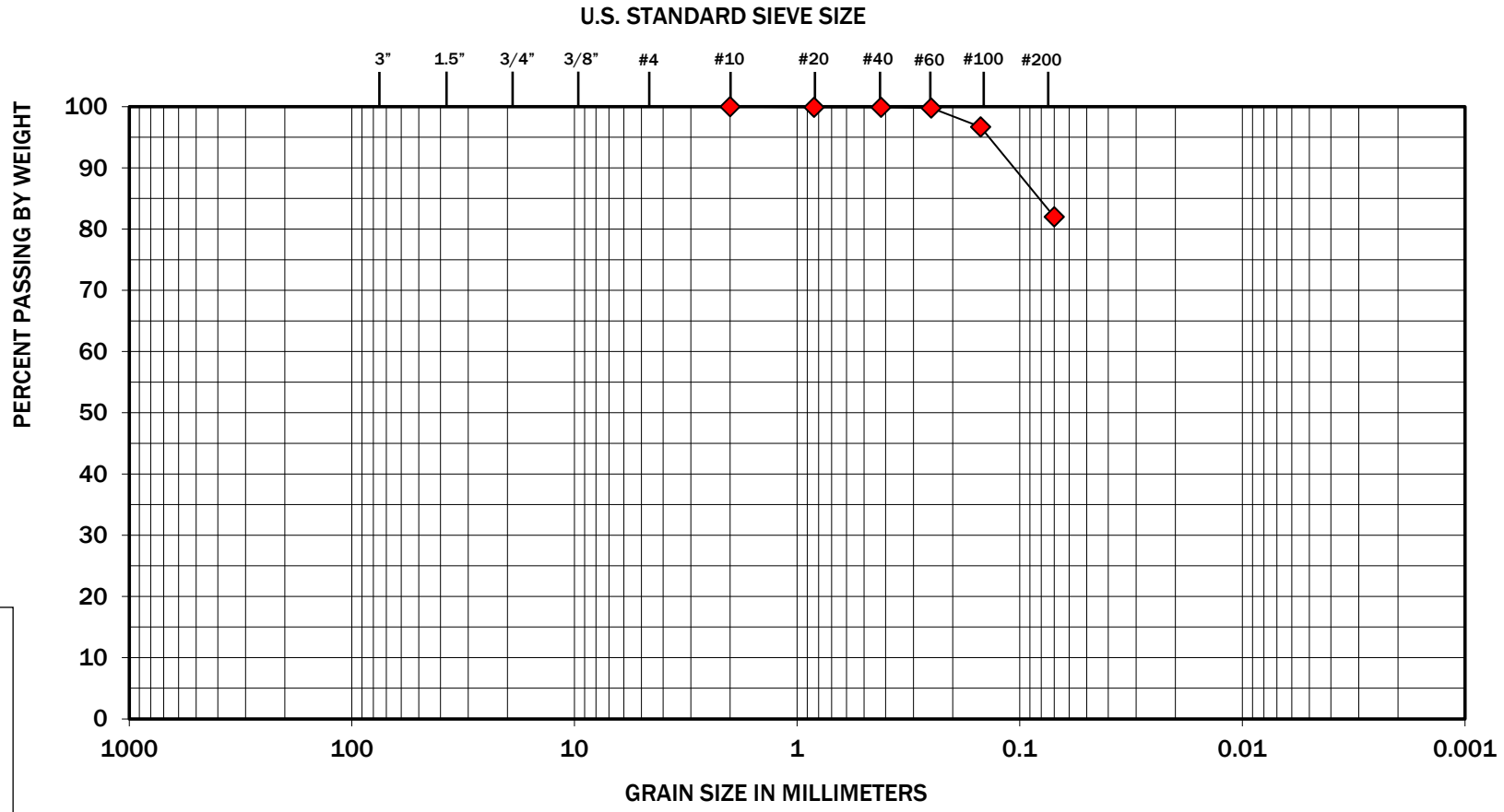
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GeoEngineers

Figure C-15

Northwest Stormwater Basin Planning
Spokane, Washington

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Test Pit Number	Depth (feet)	Moisture (%)	Soil Description
◆	TP-4	3½ - 4	67	Silt with fine 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

Northwest Stormwater Basin Planning
Spokane, Washington

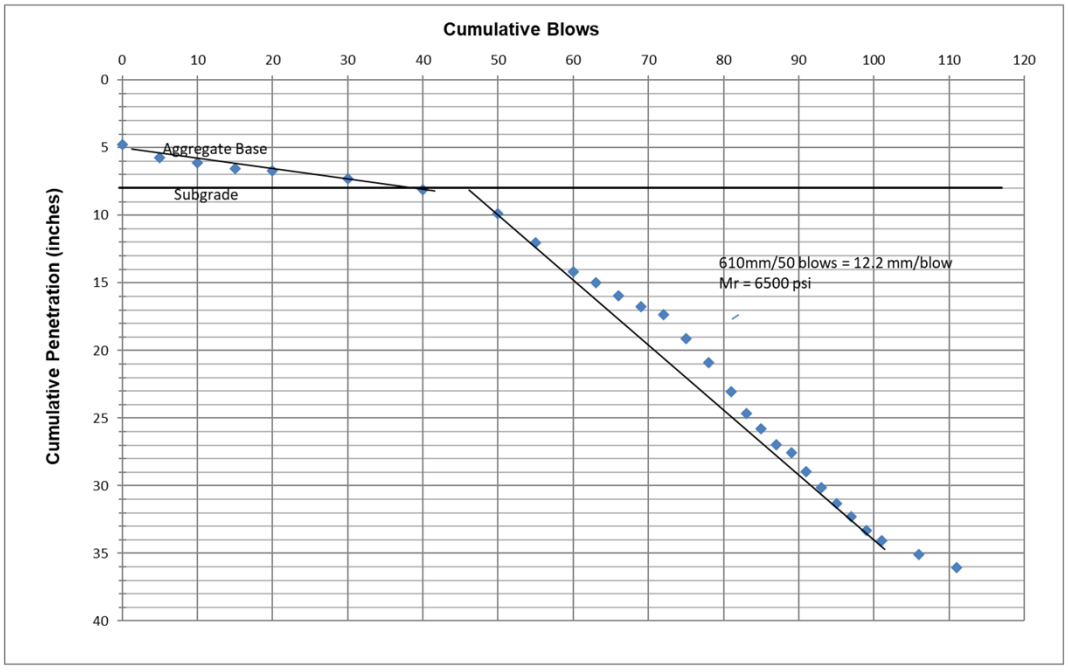
Sieve Analysis Results

Figure C-16

Appendix D
Dynamic Cone Penetration Test Log

Location:	Spokane Valley, WA		Date:	10/18/2023			Test Hole Number:	C-1					
Start Depth Below							Test Method:	Dynamic Cone Penetration					
Top of Pavement:	4.75												
Tester's Name:	Olivia Kelly						GeoEngineers Job:	11264-044-00					
Tester's Company:	GeoEngineers, Inc.												

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	4.8	-	121	4.8	-	-	1	-	-	-
2	5	5	5.7	25.0	146	5.7	1.0	0.2	1	0.20	5.00	48
3	5	10	6.1	10.0	156	6.1	0.4	0.1	1	0.08	2.00	134
4	5	15	6.5	10.0	166	6.5	0.4	0.1	1	0.08	2.00	134
5	5	20	6.7	5.0	171	6.7	0.2	0.0	1	0.04	1.00	292
6	10	30	7.3	15.0	186	7.3	0.6	0.1	1	0.06	1.50	185
7	10	40	8.1	20.0	206	8.1	0.8	0.1	1	0.08	2.00	134
8	10	50	9.9	45.0	251	9.9	1.8	0.2	1	0.18	4.50	54
9	5	55	12.0	55.0	306	12.0	2.2	0.4	1	0.43	11.00	20
10	5	60	14.2	55.0	361	14.2	2.2	0.4	1	0.43	11.00	20
11	3	63	15.0	20.0	381	15.0	0.8	0.3	1	0.26	6.67	35
12	3	66	16.0	25.0	406	16.0	1.0	0.3	1	0.33	8.33	27
13	3	69	16.8	20.0	426	16.8	0.8	0.3	1	0.26	6.67	35
14	3	72	17.3	15.0	441	17.3	0.6	0.2	1	0.20	5.00	48
15	3	75	19.1	45.0	486	19.1	1.8	0.6	1	0.59	15.00	14
16	3	78	20.9	45.0	531	20.9	1.8	0.6	1	0.59	15.00	14
17	3	81	23.1	55.0	586	23.1	2.2	0.7	1	0.72	18.33	11
18	2	83	24.6	40.0	626	24.6	1.6	0.8	1	0.79	20.00	10
19	2	85	25.8	30.0	656	25.8	1.2	0.6	1	0.59	15.00	14
20	2	87	27.0	30.0	686	27.0	1.2	0.6	1	0.59	15.00	14
21	2	89	27.6	15.0	701	27.6	0.6	0.3	1	0.30	7.50	31
22	2	91	29.0	35.0	736	29.0	1.4	0.7	1	0.69	17.50	12
23	2	93	30.1	30.0	766	30.1	1.2	0.6	1	0.59	15.00	14
24	2	95	31.3	30.0	796	31.3	1.2	0.6	1	0.59	15.00	14
25	2	97	32.3	25.0	821	32.3	1.0	0.5	1	0.49	12.50	17
26	2	99	33.3	25.0	846	33.3	1.0	0.5	1	0.49	12.50	17
27	2	101	34.1	20.0	866	34.1	0.8	0.4	1	0.39	10.00	22
28	5	106	35.1	25.0	891	35.1	1.0	0.2	1	0.20	5.00	48
29	5	111	36.0	25.0	916	36.0	1.0	0.2	1	0.20	5.00	48



DCP-1

Ridgemont Estates
Spokane Valley, Washington

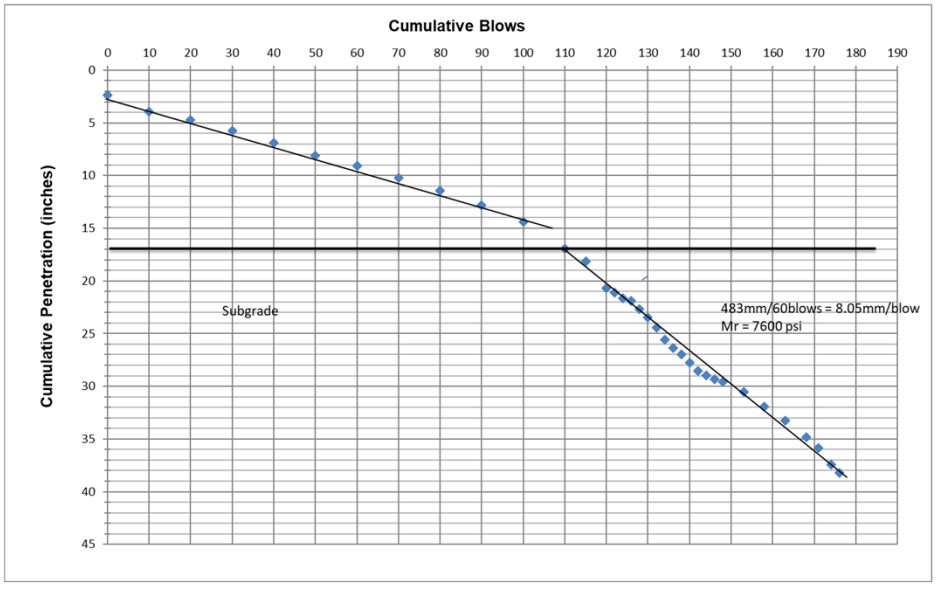
GeoEngineers

Figure D-1

XXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA		Date:	10/18/2023		Test Hole Number:	C-2					
Start Depth Below Top of Pavement:	2.375					Test Method:	Dynamic Cone Penetration					
Tester's Name:	Olivia Kelly					GeoEngineers Job:	11264-044-00					
Tester's Company:	GeoEngineers, Inc.											

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	2.4	-	60	2.4	-	-	1	-	-	-
2	10	10	3.9	40.0	100	3.9	1.6	0.2	1	0.16	4.00	62
3	10	20	4.7	20.0	120	4.7	0.8	0.1	1	0.08	2.00	134
4	10	30	5.7	25.0	145	5.7	1.0	0.1	1	0.10	2.50	105
5	10	40	6.9	30.0	175	6.9	1.2	0.1	1	0.12	3.00	85
6	10	50	8.1	30.0	205	8.1	1.2	0.1	1	0.12	3.00	85
7	10	60	9.1	25.0	230	9.1	1.0	0.1	1	0.10	2.50	105
8	10	70	10.2	30.0	260	10.2	1.2	0.1	1	0.12	3.00	85
9	10	80	11.4	30.0	290	11.4	1.2	0.1	1	0.12	3.00	85
10	10	90	12.8	35.0	325	12.8	1.4	0.1	1	0.14	3.50	72
11	10	100	14.4	40.0	365	14.4	1.6	0.2	1	0.16	4.00	62
12	10	110	16.9	65.0	430	16.9	2.6	0.3	1	0.26	6.50	36
13	5	115	18.1	30.0	460	18.1	1.2	0.2	1	0.24	6.00	39
14	5	120	20.7	65.0	525	20.7	2.6	0.5	1	0.51	13.00	17
15	2	122	21.1	10.0	535	21.1	0.4	0.2	1	0.20	5.00	48
16	2	124	21.7	15.0	550	21.7	0.6	0.3	1	0.30	7.50	31
17	2	126	21.9	5.0	555	21.9	0.2	0.1	1	0.10	2.50	105
18	2	128	22.7	20.0	575	22.7	0.8	0.4	1	0.39	10.00	22
19	2	130	23.4	20.0	595	23.4	0.8	0.4	1	0.39	10.00	22
20	2	132	24.4	25.0	620	24.4	1.0	0.5	1	0.49	12.50	17
21	2	134	25.6	30.0	650	25.6	1.2	0.6	1	0.59	15.00	14
22	2	136	26.4	20.0	670	26.4	0.8	0.4	1	0.39	10.00	22
23	2	138	27.0	15.0	685	27.0	0.6	0.3	1	0.30	7.50	31
24	2	140	27.8	20.0	705	27.8	0.8	0.4	1	0.39	10.00	22
25	2	142	28.6	20.0	725	28.6	0.8	0.4	1	0.39	10.00	22
26	2	144	28.9	10.0	735	28.9	0.4	0.2	1	0.20	5.00	48
27	2	146	29.3	10.0	745	29.3	0.4	0.2	1	0.20	5.00	48
28	2	148	29.5	5.0	750	29.5	0.2	0.1	1	0.10	2.50	105
29	5	153	30.5	25.0	775	30.5	1.0	0.2	1	0.20	5.00	48
30	5	158	31.9	35.0	810	31.9	1.4	0.3	1	0.28	7.00	33
31	5	163	33.3	35.0	845	33.3	1.4	0.3	1	0.28	7.00	33
32	5	168	34.9	40.0	885	34.9	1.6	0.3	1	0.31	8.00	28
33	3	171	35.8	25.0	910	35.8	1.0	0.3	1	0.33	8.33	27
34	3	174	37.4	40.0	950	37.4	1.6	0.5	1	0.52	13.33	16
35	2	176	38.2	20.0	970	38.2	0.8	0.4	1	0.39	10.00	22



DCP-2

Ridgemont Estates
Spokane Valley, Washington

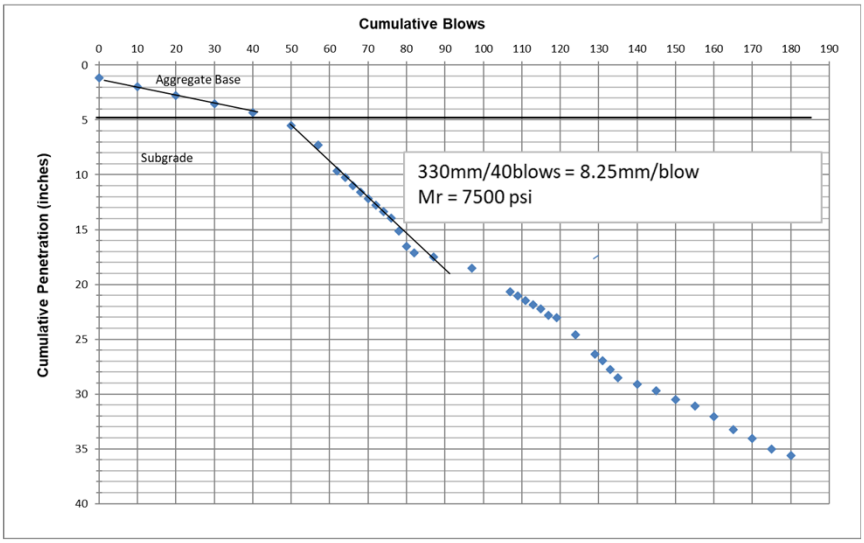
GeoEngineers

Figure D-2

XXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA		Date:	10/18/2023		Test Hole Number:	C-3					
Start Depth Below						Test Method:	Dynamic Cone Penetration					
Top of Pavement:	1.175											
Tester's Name:	Olivia Kelly					GeoEngineers Job:	11264-044-00					
Tester's Company:	GeoEngineers, Inc.											

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	1.2	-	30	1.2	-	-	1	-	-	-
2	10	10	2.0	20.0	50	2.0	0.8	0.1	1	0.08	2.00	134
3	10	20	2.7	20.0	70	2.7	0.8	0.1	1	0.08	2.00	134
4	10	30	3.5	20.0	90	3.5	0.8	0.1	1	0.08	2.00	134
5	10	40	4.3	20.0	110	4.3	0.8	0.1	1	0.08	2.00	134
6	10	50	5.5	30.0	140	5.5	1.2	0.1	1	0.12	3.00	85
7	7	57	7.3	45.0	185	7.3	1.8	0.3	1	0.25	6.43	36
8	5	62	9.6	60.0	245	9.6	2.4	0.5	1	0.47	12.00	18
9	2	64	10.2	15.0	260	10.2	0.6	0.3	1	0.30	7.50	31
10	2	66	11.0	20.0	280	11.0	0.8	0.4	1	0.39	10.00	22
11	2	68	11.6	15.0	295	11.6	0.6	0.3	1	0.30	7.50	31
12	2	70	12.2	15.0	310	12.2	0.6	0.3	1	0.30	7.50	31
13	2	72	12.8	15.0	325	12.8	0.6	0.3	1	0.30	7.50	31
14	2	74	13.4	15.0	340	13.4	0.6	0.3	1	0.30	7.50	31
15	2	76	14.0	15.0	355	14.0	0.6	0.3	1	0.30	7.50	31
16	2	78	15.2	30.0	385	15.2	1.2	0.6	1	0.59	15.00	14
17	2	80	16.5	35.0	420	16.5	1.4	0.7	1	0.69	17.50	12
18	2	82	17.1	15.0	435	17.1	0.6	0.3	1	0.30	7.50	31
19	5	87	17.5	10.0	445	17.5	0.4	0.1	1	0.08	2.00	134
20	10	97	18.5	25.0	470	18.5	1.0	0.1	1	0.10	2.50	105
21	10	107	20.7	55.0	525	20.7	2.2	0.2	1	0.22	5.50	43
22	2	109	21.1	10.0	535	21.1	0.4	0.2	1	0.20	5.00	48
23	2	111	21.5	10.0	545	21.5	0.4	0.2	1	0.20	5.00	48
24	2	113	21.8	10.0	555	21.8	0.4	0.2	1	0.20	5.00	48
25	2	115	22.2	10.0	565	22.2	0.4	0.2	1	0.20	5.00	48
26	2	117	22.8	15.0	580	22.8	0.6	0.3	1	0.30	7.50	31
27	2	119	23.0	5.0	585	23.0	0.2	0.1	1	0.10	2.50	105
28	5	124	24.6	40.0	625	24.6	1.6	0.3	1	0.31	8.00	28
29	5	129	26.4	45.0	670	26.4	1.8	0.4	1	0.35	9.00	25
30	2	131	27.0	15.0	685	27.0	0.6	0.3	1	0.30	7.50	31
31	2	133	27.7	20.0	705	27.7	0.8	0.4	1	0.39	10.00	22
32	2	135	28.5	20.0	725	28.5	0.8	0.4	1	0.39	10.00	22
33	5	140	29.1	15.0	740	29.1	0.6	0.1	1	0.12	3.00	85
34	5	145	29.7	15.0	755	29.7	0.6	0.1	1	0.12	3.00	85
35	5	150	30.5	20.0	775	30.5	0.8	0.2	1	0.16	4.00	62
36	5	155	31.1	15.0	790	31.1	0.6	0.1	1	0.12	3.00	85
37	5	160	32.1	25.0	815	32.1	1.0	0.2	1	0.20	5.00	48
38	5	165	33.3	30.0	845	33.3	1.2	0.2	1	0.24	6.00	39
39	5	170	34.0	20.0	865	34.0	0.8	0.2	1	0.16	4.00	62
40	5	175	35.0	25.0	890	35.0	1.0	0.2	1	0.20	5.00	48
41	5	180	35.6	15.0	905	35.6	0.6	0.1	1	0.12	3.00	85



DCP-3

Ridgemont Estates
Spokane Valley, Washington

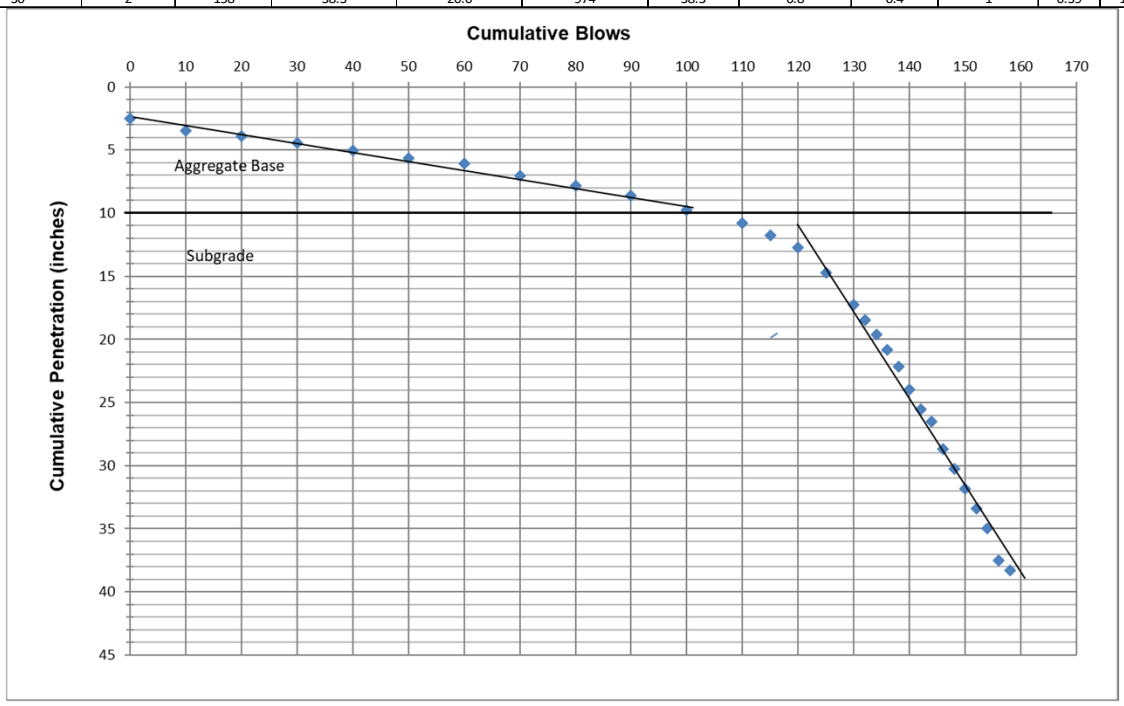
GeoEngineers

Figure D-3

XXXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA	Date:	10/18/2023	Test Hole Number:	C-4
Start Depth Below Top of Pavement:	2.5			Test Method:	Dynamic Cone Penetration
Tester's Name:	Olivia Kelly			GeoEngineers Job:	11264-044-00
Tester's Company:	GeoEngineers, Inc.				

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	2.5	-	64	2.5	-	-	1	-	-	-
2	10	10	3.5	25.0	89	3.5	1.0	0.1	1	0.10	2.50	105
3	10	20	3.9	10.0	99	3.9	0.4	0.0	1	0.04	1.00	292
4	10	30	4.5	15.0	114	4.5	0.6	0.1	1	0.06	1.50	185
5	10	40	5.1	15.0	129	5.1	0.6	0.1	1	0.06	1.50	185
6	10	50	5.6	15.0	144	5.6	0.6	0.1	1	0.06	1.50	185
7	10	60	6.0	10.0	154	6.0	0.4	0.0	1	0.04	1.00	292
8	10	70	7.0	25.0	179	7.0	1.0	0.1	1	0.10	2.50	105
9	10	80	7.8	20.0	199	7.8	0.8	0.1	1	0.08	2.00	134
10	10	90	8.6	20.0	219	8.6	0.8	0.1	1	0.08	2.00	134
11	10	100	9.8	30.0	249	9.8	1.2	0.1	1	0.12	3.00	85
12	10	110	10.8	25.0	274	10.8	1.0	0.1	1	0.10	2.50	105
13	5	115	11.8	25.0	299	11.8	1.0	0.2	1	0.20	5.00	48
14	5	120	12.7	25.0	324	12.7	1.0	0.2	1	0.20	5.00	48
15	5	125	14.7	50.0	374	14.7	2.0	0.4	1	0.39	10.00	22
16	5	130	17.3	65.0	439	17.3	2.6	0.5	1	0.51	13.00	17
17	2	132	18.4	30.0	469	18.4	1.2	0.6	1	0.59	15.00	14
18	2	134	19.6	30.0	499	19.6	1.2	0.6	1	0.59	15.00	14
19	2	136	20.8	30.0	529	20.8	1.2	0.6	1	0.59	15.00	14
20	2	138	22.2	35.0	564	22.2	1.4	0.7	1	0.69	17.50	12
21	2	140	24.0	45.0	609	24.0	1.8	0.9	1	0.89	22.50	9
22	2	142	25.5	40.0	649	25.5	1.6	0.8	1	0.79	20.00	10
23	2	144	26.5	25.0	674	26.5	1.0	0.5	1	0.49	12.50	17
24	2	146	28.7	55.0	729	28.7	2.2	1.1	1	1.08	27.50	7
25	2	148	30.3	40.0	769	30.3	1.6	0.8	1	0.79	20.00	10
26	2	150	31.8	40.0	809	31.8	1.6	0.8	1	0.79	20.00	10
27	2	152	33.4	40.0	849	33.4	1.6	0.8	1	0.79	20.00	10
28	2	154	35.0	40.0	889	35.0	1.6	0.8	1	0.79	20.00	10
29	2	156	37.5	65.0	954	37.5	2.6	1.3	1	1.28	32.50	6
30	2	158	38.3	20.0	974	38.3	0.8	0.4	1	0.39	10.00	22



DCP-4

Ridgemont Estates
Spokane Valley, Washington

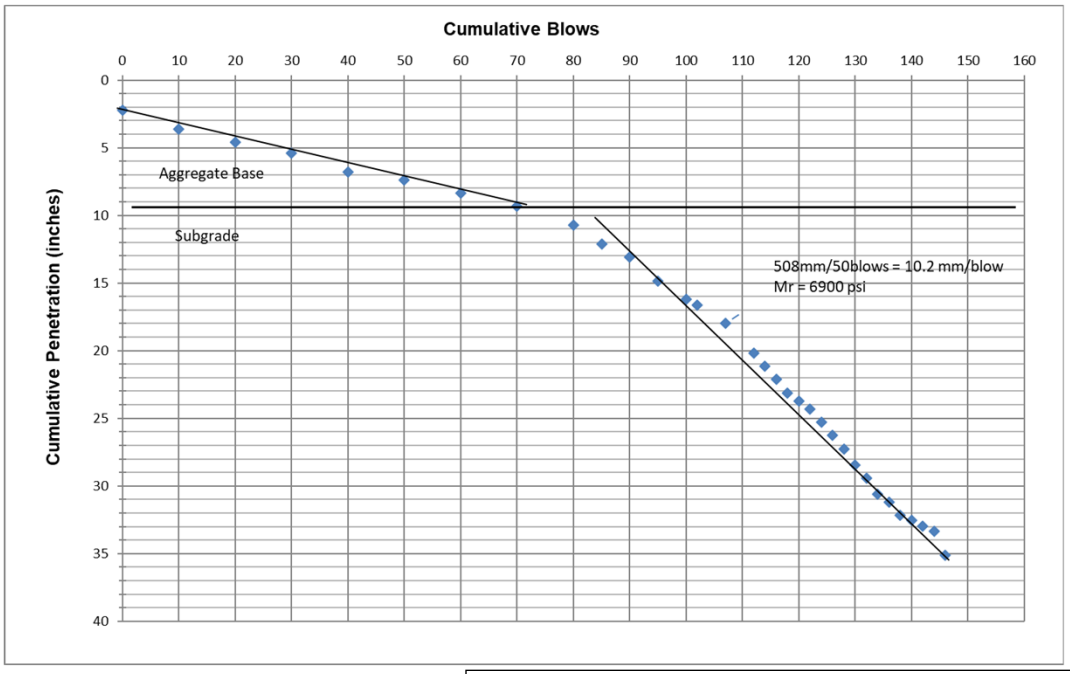
GeoEngineers

Figure D-4

XXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA	Date:	10/18/2023	Test Hole Number:	C-5
Start Depth Below Top of Pavement:	2.25			Test Method:	Dynamic Cone Penetration
Tester's Name:	Olivia Kelly			GeoEngineers Job:	11264-044-00
Tester's Company:	GeoEngineers, Inc.				

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	2.3	-	57	2.3	-	-	1	-	-	-
2	10	10	3.6	35.0	92	3.6	1.4	0.1	1	0.14	3.50	72
3	10	20	4.6	25.0	117	4.6	1.0	0.1	1	0.10	2.50	105
4	10	30	5.4	20.0	137	5.4	0.8	0.1	1	0.08	2.00	134
5	10	40	6.8	35.0	172	6.8	1.4	0.1	1	0.14	3.50	72
6	10	50	7.4	15.0	187	7.4	0.6	0.1	1	0.06	1.50	185
7	10	60	8.4	25.0	212	8.4	1.0	0.1	1	0.10	2.50	105
8	10	70	9.3	25.0	237	9.3	1.0	0.1	1	0.10	2.50	105
9	10	80	10.7	35.0	272	10.7	1.4	0.1	1	0.14	3.50	72
10	5	85	12.1	35.0	307	12.1	1.4	0.3	1	0.28	7.00	33
11	5	90	13.1	25.0	332	13.1	1.0	0.2	1	0.20	5.00	48
12	5	95	14.8	45.0	377	14.8	1.8	0.4	1	0.35	9.00	25
13	5	100	16.2	35.0	412	16.2	1.4	0.3	1	0.28	7.00	33
14	2	102	16.6	10.0	422	16.6	0.4	0.2	1	0.20	5.00	48
15	5	107	18.0	35.0	457	18.0	1.4	0.3	1	0.28	7.00	33
16	5	112	20.2	55.0	512	20.2	2.2	0.4	1	0.43	11.00	20
17	2	114	21.1	25.0	537	21.1	1.0	0.5	1	0.49	12.50	17
18	2	116	22.1	25.0	562	22.1	1.0	0.5	1	0.49	12.50	17
19	2	118	23.1	25.0	587	23.1	1.0	0.5	1	0.49	12.50	17
20	2	120	23.7	15.0	602	23.7	0.6	0.3	1	0.30	7.50	31
21	2	122	24.3	15.0	617	24.3	0.6	0.3	1	0.30	7.50	31
22	2	124	25.3	25.0	642	25.3	1.0	0.5	1	0.49	12.50	17
23	2	126	26.3	25.0	667	26.3	1.0	0.5	1	0.49	12.50	17
24	2	128	27.3	25.0	692	27.3	1.0	0.5	1	0.49	12.50	17
25	2	130	28.4	30.0	722	28.4	1.2	0.6	1	0.59	15.00	14
26	2	132	29.4	25.0	747	29.4	1.0	0.5	1	0.49	12.50	17
27	2	134	30.6	30.0	777	30.6	1.2	0.6	1	0.59	15.00	14
28	2	136	31.2	15.0	792	31.2	0.6	0.3	1	0.30	7.50	31
29	2	138	32.2	25.0	817	32.2	1.0	0.5	1	0.49	12.50	17
30	2	140	32.6	10.0	827	32.6	0.4	0.2	1	0.20	5.00	48
31	2	142	33.0	10.0	837	33.0	0.4	0.2	1	0.20	5.00	48
32	2	144	33.4	10.0	847	33.4	0.4	0.2	1	0.20	5.00	48
33	2	146	35.1	45.0	892	35.1	1.8	0.9	1	0.89	22.50	9



DCP-5

Ridgemont Estates
Spokane Valley, Washington

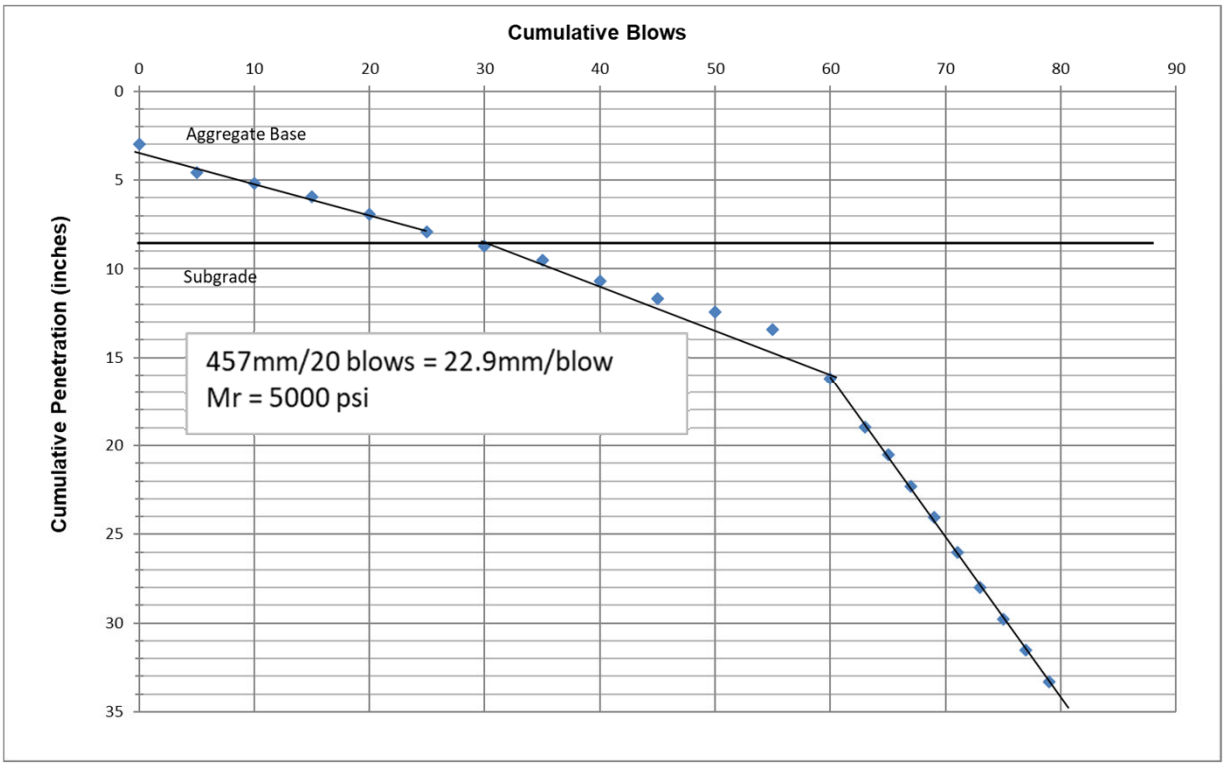
GeoEngineers

Figure D-5

XXXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA	Date:	10/18/2023	Test Hole Number:	C-6
Start Depth Below Top of Pavement:	3			Test Method:	Dynamic Cone Penetration
Tester's Name:	Olivia Kelly			GeoEngineers Job:	11264-044-00
Tester's Company:	GeoEngineers, Inc.				

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	3.0	-	76	3.0	-	-	1	-	-	-
2	5	5	4.6	40.0	116	4.6	1.6	0.3	1	0.31	8.00	28
3	5	10	5.2	15.0	131	5.2	0.6	0.1	1	0.12	3.00	85
4	5	15	6.0	20.0	151	6.0	0.8	0.2	1	0.16	4.00	62
5	5	20	6.9	25.0	176	6.9	1.0	0.2	1	0.20	5.00	48
6	5	25	7.9	25.0	201	7.9	1.0	0.2	1	0.20	5.00	48
7	5	30	8.7	20.0	221	8.7	0.8	0.2	1	0.16	4.00	62
8	5	35	9.5	20.0	241	9.5	0.8	0.2	1	0.16	4.00	62
9	5	40	10.7	30.0	271	10.7	1.2	0.2	1	0.24	6.00	39
10	5	45	11.7	25.0	296	11.7	1.0	0.2	1	0.20	5.00	48
11	5	50	12.4	20.0	316	12.4	0.8	0.2	1	0.16	4.00	62
12	5	55	13.4	25.0	341	13.4	1.0	0.2	1	0.20	5.00	48
13	5	60	16.2	70.0	411	16.2	2.8	0.6	1	0.55	14.00	15
14	3	63	18.9	70.0	481	18.9	2.8	0.9	1	0.92	23.33	9
15	2	65	20.5	40.0	521	20.5	1.6	0.8	1	0.79	20.00	10
16	2	67	22.3	45.0	566	22.3	1.8	0.9	1	0.89	22.50	9
17	2	69	24.1	45.0	611	24.1	1.8	0.9	1	0.89	22.50	9
18	2	71	26.0	50.0	661	26.0	2.0	1.0	1	0.98	25.00	8
19	2	73	28.0	50.0	711	28.0	2.0	1.0	1	0.98	25.00	8
20	2	75	29.8	45.0	756	29.8	1.8	0.9	1	0.89	22.50	9
21	2	77	31.5	45.0	801	31.5	1.8	0.9	1	0.89	22.50	9
22	2	79	33.3	45.0	846	33.3	1.8	0.9	1	0.89	22.50	9



DCP-6

Ridgemont Estates
Spokane Valley, Washington

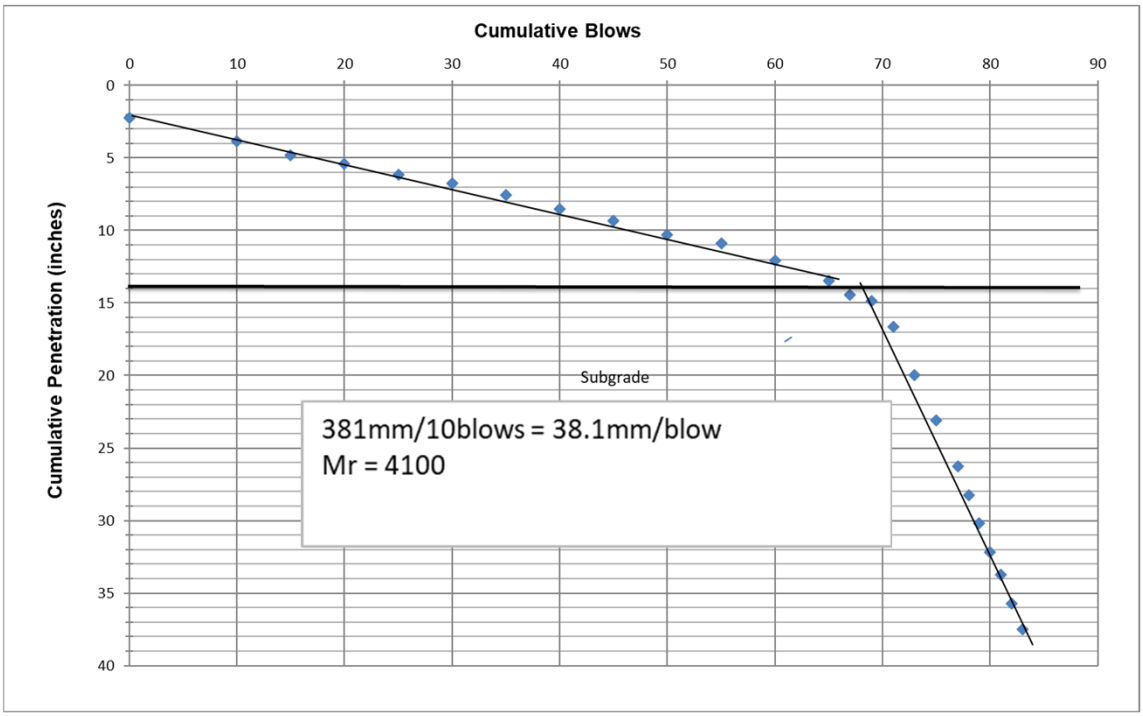
GeoEngineers

Figure D-6

XXXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA	Date:	10/18/2023	Test Hole Number:	C-7
Start Depth Below Top of Pavement:	2.25			Test Method:	Dynamic Cone Penetration
Tester's Name:	Olivia Kelly			GeoEngineers Job:	11264-044-00
Tester's Company:	GeoEngineers, Inc.				

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	2.3	-	57	2.3	-	-	1	-	-	-
2	10	10	3.8	40.0	97	3.8	1.6	0.2	1	0.16	4.00	62
3	5	15	4.8	25.0	122	4.8	1.0	0.2	1	0.20	5.00	48
4	5	20	5.4	15.0	137	5.4	0.6	0.1	1	0.12	3.00	85
5	5	25	6.2	20.0	157	6.2	0.8	0.2	1	0.16	4.00	62
6	5	30	6.8	15.0	172	6.8	0.6	0.1	1	0.12	3.00	85
7	5	35	7.6	20.0	192	7.6	0.8	0.2	1	0.16	4.00	62
8	5	40	8.5	25.0	217	8.5	1.0	0.2	1	0.20	5.00	48
9	5	45	9.3	20.0	237	9.3	0.8	0.2	1	0.16	4.00	62
10	5	50	10.3	25.0	262	10.3	1.0	0.2	1	0.20	5.00	48
11	5	55	10.9	15.0	277	10.9	0.6	0.1	1	0.12	3.00	85
12	5	60	12.1	30.0	307	12.1	1.2	0.2	1	0.24	6.00	39
13	5	65	13.5	35.0	342	13.5	1.4	0.3	1	0.28	7.00	33
14	2	67	14.4	24.0	366	14.4	0.9	0.5	1	0.47	12.00	18
15	2	69	14.8	11.0	377	14.8	0.4	0.2	1	0.22	5.50	43
16	2	71	16.6	45.0	422	16.6	1.8	0.9	1	0.89	22.50	9
17	2	73	20.0	85.0	507	20.0	3.3	1.7	1	1.67	42.50	4
18	2	75	23.1	80.0	587	23.1	3.1	1.6	1	1.57	40.00	5
19	2	77	26.3	80.0	667	26.3	3.1	1.6	1	1.57	40.00	5
20	1	78	28.2	50.0	717	28.2	2.0	2.0	1	1.97	50.00	4
21	1	79	30.2	50.0	767	30.2	2.0	2.0	1	1.97	50.00	4
22	1	80	32.2	50.0	817	32.2	2.0	2.0	1	1.97	50.00	4
23	1	81	33.7	40.0	857	33.7	1.6	1.6	1	1.57	40.00	5
24	1	82	35.7	50.0	907	35.7	2.0	2.0	1	1.97	50.00	4
25	1	83	37.5	45.0	952	37.5	1.8	1.8	1	1.77	45.00	4



DCP-7

Ridgemont Estates
Spokane Valley, Washington

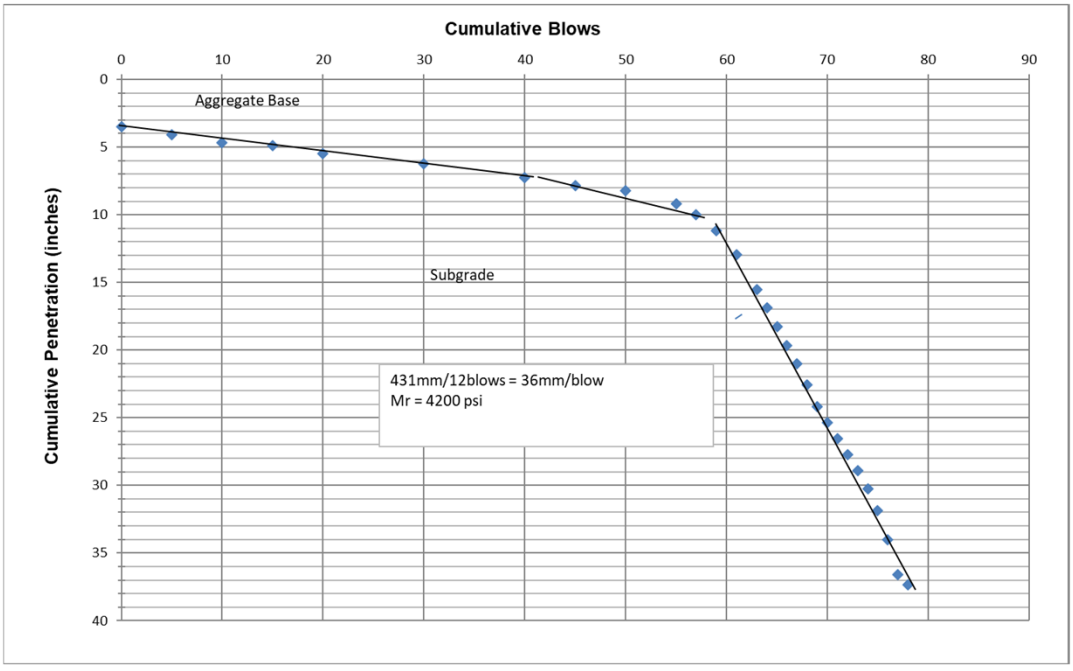
GeoEngineers

Figure D-7

XXXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA	Date:	10/18/2023	Test Hole Number:	C-8
Start Depth Below Top of Pavement:	3.5			Test Method:	Dynamic Cone Penetration
Tester's Name:	Olivia Kelly			GeoEngineers Job:	11264-044-00
Tester's Company:	GeoEngineers, Inc.				

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	3.5	-	89	3.5	-	-	1	-	-	-
2	5	5	4.1	15.0	104	4.1	0.6	0.1	1	0.12	3.00	85
3	5	10	4.7	15.0	119	4.7	0.6	0.1	1	0.12	3.00	85
4	5	15	4.9	5.0	124	4.9	0.2	0.0	1	0.04	1.00	292
5	5	20	5.5	15.0	139	5.5	0.6	0.1	1	0.12	3.00	85
6	10	30	6.3	20.0	159	6.3	0.8	0.1	1	0.08	2.00	134
7	10	40	7.2	25.0	184	7.2	1.0	0.1	1	0.10	2.50	105
8	5	45	7.8	15.0	199	7.8	0.6	0.1	1	0.12	3.00	85
9	5	50	8.2	10.0	209	8.2	0.4	0.1	1	0.08	2.00	134
10	5	55	9.2	25.0	234	9.2	1.0	0.2	1	0.20	5.00	48
11	2	57	10.0	20.0	254	10.0	0.8	0.4	1	0.39	10.00	22
12	2	59	11.2	30.0	284	11.2	1.2	0.6	1	0.59	15.00	14
13	2	61	12.9	45.0	329	12.9	1.8	0.9	1	0.89	22.50	9
14	2	63	15.5	65.0	394	15.5	2.6	1.3	1	1.28	32.50	6
15	1	64	16.9	35.0	429	16.9	1.4	1.4	1	1.38	35.00	5
16	1	65	18.3	35.0	464	18.3	1.4	1.4	1	1.38	35.00	5
17	1	66	19.6	35.0	499	19.6	1.4	1.4	1	1.38	35.00	5
18	1	67	21.0	35.0	534	21.0	1.4	1.4	1	1.38	35.00	5
19	1	68	22.6	40.0	574	22.6	1.6	1.6	1	1.57	40.00	5
20	1	69	24.2	40.0	614	24.2	1.6	1.6	1	1.57	40.00	5
21	1	70	25.4	30.0	644	25.4	1.2	1.2	1	1.18	30.00	6
22	1	71	26.5	30.0	674	26.5	1.2	1.2	1	1.18	30.00	6
23	1	72	27.7	30.0	704	27.7	1.2	1.2	1	1.18	30.00	6
24	1	73	28.9	30.0	734	28.9	1.2	1.2	1	1.18	30.00	6
25	1	74	30.3	35.0	769	30.3	1.4	1.4	1	1.38	35.00	5
26	1	75	31.8	40.0	809	31.8	1.6	1.6	1	1.57	40.00	5
27	1	76	34.0	55.0	864	34.0	2.2	2.2	1	2.17	55.00	3
28	1	77	36.6	65.0	929	36.6	2.6	2.6	1	2.56	65.00	3
29	1	78	37.4	20.0	949	37.4	0.8	0.8	1	0.79	20.00	10



DCP-8

Ridgemont Estates
Spokane Valley, Washington

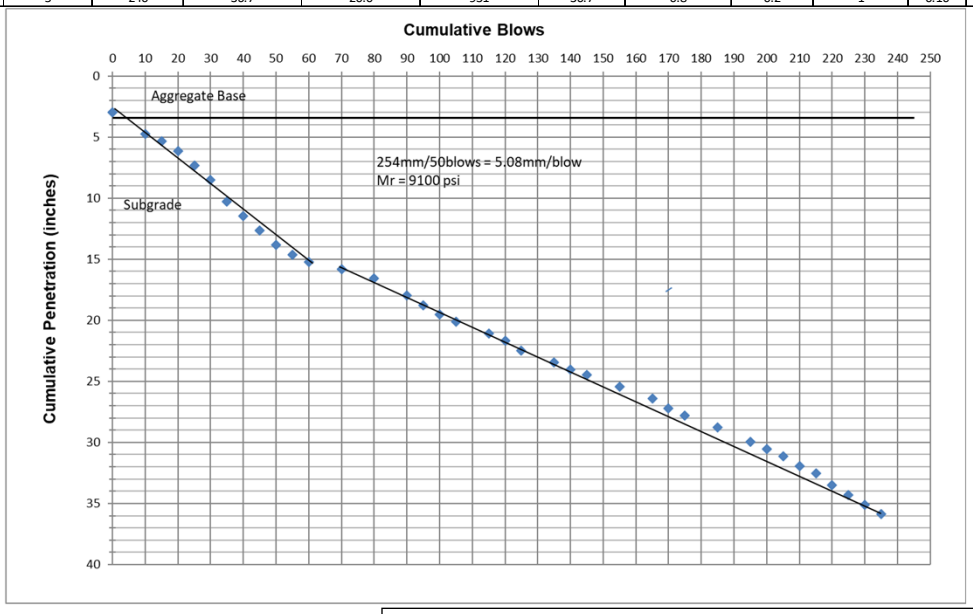
GeoEngineers

Figure D-8

XXXXX-XXX-XX Date Exported: 04/09/15

Location:	Spokane Valley, WA		Date: 10/18/2023			Test Hole Number:	C-9					
Start Depth Below						Test Method:	Dynamic Cone Penetration					
Top of Pavement:	3											
Tester's Name:						GeoEngineers Job:	11264-044-00					
Tester's Company:	GeoEngineers, Inc.											

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%
1	-	0	3.0	-	76	3.0	-	-	1	-	-	-
2	10	10	4.8	45.0	121	4.8	1.8	0.2	1	0.18	4.50	54
3	5	15	5.4	15.0	136	5.4	0.6	0.1	1	0.12	3.00	85
4	5	20	6.1	20.0	156	6.1	0.8	0.2	1	0.16	4.00	62
5	5	25	7.3	30.0	186	7.3	1.2	0.2	1	0.24	6.00	39
6	5	30	8.5	30.0	216	8.5	1.2	0.2	1	0.24	6.00	39
7	5	35	10.3	45.0	261	10.3	1.8	0.4	1	0.35	9.00	25
8	5	40	11.5	30.0	291	11.5	1.2	0.2	1	0.24	6.00	39
9	5	45	12.6	30.0	321	12.6	1.2	0.2	1	0.24	6.00	39
10	5	50	13.8	30.0	351	13.8	1.2	0.2	1	0.24	6.00	39
11	5	55	14.6	20.0	371	14.6	0.8	0.2	1	0.16	4.00	62
12	5	60	15.2	15.0	386	15.2	0.6	0.1	1	0.12	3.00	85
13	10	70	15.8	15.0	401	15.8	0.6	0.1	1	0.06	1.50	185
14	10	80	16.6	20.0	421	16.6	0.8	0.1	1	0.08	2.00	134
15	10	90	18.0	35.0	456	18.0	1.4	0.1	1	0.14	3.50	72
16	5	95	18.7	20.0	476	18.7	0.8	0.2	1	0.16	4.00	62
17	5	100	19.5	20.0	496	19.5	0.8	0.2	1	0.16	4.00	62
18	5	105	20.1	15.0	511	20.1	0.6	0.1	1	0.12	3.00	85
19	10	115	21.1	25.0	536	21.1	1.0	0.1	1	0.10	2.50	105
20	5	120	21.7	15.0	551	21.7	0.6	0.1	1	0.12	3.00	85
21	5	125	22.5	20.0	571	22.5	0.8	0.2	1	0.16	4.00	62
22	10	135	23.5	25.0	596	23.5	1.0	0.1	1	0.10	2.50	105
23	5	140	24.1	15.0	611	24.1	0.6	0.1	1	0.12	3.00	85
24	5	145	24.5	10.0	621	24.5	0.4	0.1	1	0.08	2.00	134
25	10	155	25.4	25.0	646	25.4	1.0	0.1	1	0.10	2.50	105
26	10	165	26.4	25.0	671	26.4	1.0	0.1	1	0.10	2.50	105
27	5	170	27.2	20.0	691	27.2	0.8	0.2	1	0.16	4.00	62
28	5	175	27.8	15.0	706	27.8	0.6	0.1	1	0.12	3.00	85
29	10	185	28.8	25.0	731	28.8	1.0	0.1	1	0.10	2.50	105
30	10	195	30.0	30.0	761	30.0	1.2	0.1	1	0.12	3.00	85
31	5	200	30.6	15.0	776	30.6	0.6	0.1	1	0.12	3.00	85
32	5	205	31.1	15.0	791	31.1	0.6	0.1	1	0.12	3.00	85
33	5	210	31.9	20.0	811	31.9	0.8	0.2	1	0.16	4.00	62
34	5	215	32.5	15.0	826	32.5	0.6	0.1	1	0.12	3.00	85
35	5	220	33.5	25.0	851	33.5	1.0	0.2	1	0.20	5.00	48
36	5	225	34.3	20.0	871	34.3	0.8	0.2	1	0.16	4.00	62
37	5	230	35.1	20.0	891	35.1	0.8	0.2	1	0.16	4.00	62
38	5	235	35.9	20.0	911	35.9	0.8	0.2	1	0.16	4.00	62
39	5	240	36.7	20.0	931	36.7	0.8	0.2	1	0.16	4.00	62



DCP-9

Ridgemont Estates
Spokane Valley, Washington

GeoEngineers

Figure D-9

XXXX-XXX-XX Date Exported: 04/09/15

Appendix E
Climate Data

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 06/17/2024

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 2355 ft. Lat: 47.6217° N Lon: 117.5280° W

Station: **SPOKANE INTERNATIONAL AIRPORT, WA US USW00024157**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2023	11	01	44	29		0.06		0.0		0.0								
2023	11	02	46	36		0.56		0.0		0.0								
2023	11	03	52	41		0.00		0.0		0.0								
2023	11	04	53	41		0.58		0.0		0.0								
2023	11	05	52	40		T		0.0		0.0								
2023	11	06	49	39		0.27		0.0		0.0								
2023	11	07	49	35		0.02		0.0		0.0								
2023	11	08	47	32		0.00		0.0		0.0								
2023	11	09	40	31		T		0.0		0.0								
2023	11	10	40	34		0.05		0.0		0.0								
2023	11	11	51	39		T		0.0		0.0								
2023	11	12	48	36		0.00		0.0		0.0								
2023	11	13	44	36		0.04		0.0		0.0								
2023	11	14	42	32		0.00		0.0		0.0								
2023	11	15	37	31		0.18		0.0		0.0								
2023	11	16	37	29		0.00		0.0		0.0								
2023	11	17	38	29		0.00		0.0		0.0								
2023	11	18	42	29		0.00		0.0		0.0								
2023	11	19	45	31		0.10		0.5		0.0								
2023	11	20	44	31		0.00		0.0		0.0								
2023	11	21	42	29		0.00		0.0		0.0								
2023	11	22	47	31		0.01		0.0		0.0								
2023	11	23	45	26		0.00		0.0		0.0								
2023	11	24	41	23		0.00		0.0		0.0								
2023	11	25	29	18		T		T		0.0								
2023	11	26	30	25		T		T		0.0								
2023	11	27	37	25		0.00		0.0		0.0								
2023	11	28	36	21		0.00		0.0		0.0								
2023	11	29	26	23		T		T		0.0								
2023	11	30	28	24		0.02		0.3		T								
		Summary	42	31		1.89		0.8										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCEI's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 06/17/2024

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 2355 ft. Lat: 47.6217° N Lon: 117.5280° W

Station: **SPOKANE INTERNATIONAL AIRPORT, WA US USW00024157**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2023	12	01	32	25		0.26		3.5		T								
2023	12	02	38	26		0.35		1.8		3.9								
2023	12	03	39	25		0.07		T		3.1								
2023	12	04	39	32		0.12		0.0		2.0								
2023	12	05	52	37		0.56		0.0		T								
2023	12	06	50	44		0.64		0.0		0.0								
2023	12	07	44	33		0.13		0.0		0.0								
2023	12	08	41	27		T		T		0.0								
2023	12	09	35	26		0.33		4.2		0.0								
2023	12	10	36	33		0.44		1.8		5.9								
2023	12	11	36	33		0.01		0.0		3.1								
2023	12	12	37	34		T		0.0		2.0								
2023	12	13	36	28		0.00		0.0		1.2								
2023	12	14	36	28		0.00		0.0		0.0								
2023	12	15	40	30		0.00		0.0		0.0								
2023	12	16	35	27		0.00		0.0		0.0								
2023	12	17	35	30		0.00		0.0		0.0								
2023	12	18	38	30		0.11		0.0		0.0								
2023	12	19	39	33		0.11		0.0		0.0								
2023	12	20	44	35		T		0.0		0.0								
2023	12	21	39	33		0.00		0.0		0.0								
2023	12	22	36	32		0.12		0.2		0.0								
2023	12	23	33	23		0.00		0.0		0.0								
2023	12	24	34	23		0.00		0.0		0.0								
2023	12	25	35	26		0.00		0.0		0.0								
2023	12	26	33	30		0.08		0.3		T								
2023	12	27	37	32		T		0.0		T								
2023	12	28	42	32		0.00		0.0		0.0								
2023	12	29	45	35		0.00		0.0		0.0								
2023	12	30	41	32		0.00		0.0		0.0								
2023	12	31	40	33		0.01		0.0		0.0								
		Summary	39	31		3.34		11.8										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCEI's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

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National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 2355 ft. Lat: 47.6217° N Lon: 117.5280° W

Station: **SPOKANE INTERNATIONAL AIRPORT, WA US USW00024157**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2024	01	01	36	31		0.00		0.0		0.0								
2024	01	02	38	32		0.00		0.0		0.0								
2024	01	03	37	33		0.05		0.1		T								
2024	01	04	37	32		0.02		T		0.0								
2024	01	05	37	31		0.00		0.0		0.0								
2024	01	06	40	31		0.19		2.0		0.0								
2024	01	07	31	22		T		T		1.2								
2024	01	08	33	21		0.15		1.1		1.2								
2024	01	09	39	31		0.28		0.1		2.0								
2024	01	10	32	24		T		0.1		1.2								
2024	01	11	29	13		T		T		1.2								
2024	01	12	13	-7		0.00		0.0		T								
2024	01	13	2	-10		0.00		0.0		T								
2024	01	14	10	-4		0.00		0.0		T								
2024	01	15	11	-2		0.00		0.0		T								
2024	01	16	18	5		T		T		T								
2024	01	17	20	9		0.49		5.1		1.2								
2024	01	18	21	7		0.01		T		3.9								
2024	01	19	22	18		0.10		1.1		5.1								
2024	01	20	30	22		0.04		T		5.1								
2024	01	21	36	30		0.23		0.0		3.9								
2024	01	22	42	34		0.05		0.0		3.1								
2024	01	23	40	35		0.01		0.0		1.2								
2024	01	24	39	31		0.06		0.0		T								
2024	01	25	40	32		T		0.0		T								
2024	01	26	46	31		0.02		0.0		0.0								
2024	01	27	45	35		0.35		0.0		0.0								
2024	01	28	55	39		0.03		0.0		0.0								
2024	01	29	49	36		0.00		0.0		0.0								
2024	01	30	41	34		0.00		0.0		0.0								
2024	01	31	46	35		T		0.0		0.0								
Summary			33	23		2.08		9.6										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCEI's quality control tests. "At Obs." = Temperature at time of observation

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Station: **SPOKANE INTERNATIONAL AIRPORT, WA US USW00024157**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2024	02	01	43	38		0.13		0.0		0.0								
2024	02	02	43	37		0.02		0.0		0.0								
2024	02	03	39	36		0.08		0.0		0.0								
2024	02	04	40	33		0.10		T		0.0								
2024	02	05	41	35		0.15		0.0		0.0								
2024	02	06	46	35		0.00		0.0		0.0								
2024	02	07	42	34		0.00		0.0		0.0								
2024	02	08	39	34		0.01		0.0		0.0								
2024	02	09	41	28		0.01		0.2		T								
2024	02	10	40	26		0.00		0.0		0.0								
2024	02	11	39	32		0.02		T		0.0								
2024	02	12	41	30		0.35		0.0		0.0								
2024	02	13	36	26		0.00		0.0		0.0								
2024	02	14	36	24		0.00		0.0		0.0								
2024	02	15	31	25		0.15		2.7		T								
2024	02	16	35	18		0.00		0.0		2.0								
2024	02	17	38	17		0.00		0.0		2.0								
2024	02	18	35	28		0.09		0.8		2.0								
2024	02	19	38	29		0.10		T		2.0								
2024	02	20	44	35		0.03		T		1.2								
2024	02	21	47	34		0.10		0.0		0.0								
2024	02	22	48	34		0.00		0.0		0.0								
2024	02	23	51	29		0.00		0.0		0.0								
2024	02	24	50	37		0.00		0.0		0.0								
2024	02	25	47	38		T		0.0		0.0								
2024	02	26	42	29		T		T		0.0								
2024	02	27	37	24		0.02		0.4		0.0								
2024	02	28	45	33		0.35		0.7		1.2								
2024	02	29	48	34		0.32		0.1		0.0								
		Summary	41	31		2.03		4.9										

Empty, or blank, cells indicate that a data observation was not reported.

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"s" This data value failed one of NCEI's quality control tests. "At Obs." = Temperature at time of observation

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Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2024	03	01	42	32		0.04		T		T								
2024	03	02	37	28		0.23		2.6		T								
2024	03	03	39	23		T		0.1		2.0								
2024	03	04	38	27		0.04		0.7		1.2								
2024	03	05	40	23		0.00		0.0		1.2								
2024	03	06	40	22		0.00		0.0		T								
2024	03	07	41	22		0.00		0.0		T								
2024	03	08	47	25		0.00		0.0		T								
2024	03	09	52	32		0.03		0.0		0.0								
2024	03	10	49	35		0.05		T		0.0								
2024	03	11	49	35		0.05		0.0		0.0								
2024	03	12	50	34		T		T		0.0								
2024	03	13	48	29		T		0.0		T								
2024	03	14	53	28		0.00		0.0		0.0								
2024	03	15	58	32		0.00		0.0		0.0								
2024	03	16	68	37		0.00		0.0		0.0								
2024	03	17	70	41		0.00		0.0		0.0								
2024	03	18	69	39		0.00		0.0		0.0								
2024	03	19	69	40		0.00		0.0		0.0								
2024	03	20	64	43		0.00		0.0		0.0								
2024	03	21	56	41		0.00		0.0		0.0								
2024	03	22	61	40		0.01		0.0		0.0								
2024	03	23	49	39		T		0.0		0.0								
2024	03	24	44	33		0.07		T		0.0								
2024	03	25	49	30		T		T		0.0								
2024	03	26	50	35		0.02		0.0		0.0								
2024	03	27	45	33		0.42		0.0		0.0								
2024	03	28	49	35		0.02		0.0		0.0								
2024	03	29	52	34		0.00		0.0		0.0								
2024	03	30	55	31		0.00		0.0		0.0								
2024	03	31	57	35		0.00		0.0		0.0								
		Summary	51	33		0.98		3.4										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCEI's quality control tests. "At Obs." = Temperature at time of observation

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Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2024	04	01	66	35		0.00		0.0		0.0								
2024	04	02	73	45		0.00		0.0		0.0								
2024	04	03	59	43		0.01		0.0		0.0								
2024	04	04	55	40		0.17		0.0		0.0								
2024	04	05	43	32		0.26		1.0		0.0								
2024	04	06	49	38		T		0.0		0.0								
2024	04	07	51	35		0.00		0.0		0.0								
2024	04	08	52	34		0.01		0.0		0.0								
2024	04	09	61	37		0.01		0.0		0.0								
2024	04	10	58	32		0.00		0.0		0.0								
2024	04	11	63	39		0.00		0.0		0.0								
2024	04	12	65	49		0.00		0.0		0.0								
2024	04	13	71	45		0.00		0.0		0.0								
2024	04	14	77	47		0.00		0.0		0.0								
2024	04	15	63	44		0.00		0.0		0.0								
2024	04	16	52	32		0.02		T		0.0								
2024	04	17	53	29		0.00		0.0		0.0								
2024	04	18	53	34		0.03		0.0		0.0								
2024	04	19	58	34		0.00		0.0		0.0								
2024	04	20	67	35		T		0.0		0.0								
2024	04	21	56	39		T		0.0		0.0								
2024	04	22	60	32		0.00		0.0		0.0								
2024	04	23	68	38		0.00		0.0		0.0								
2024	04	24	66	42		0.00		0.0		0.0								
2024	04	25	61	45		T		0.0		0.0								
2024	04	26	63	46		0.00		0.0		0.0								
2024	04	27	61	44		0.00		0.0		0.0								
2024	04	28	60	43		0.00		0.0		0.0								
2024	04	29	55	36		0.01		T		0.0								
2024	04	30	52	31		0.04		T		0.0								
		Summary	60	39		0.56		1.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

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Station: **SPOKANE INTERNATIONAL AIRPORT, WA US USW00024157**

Observation Time Temperature: Unknown Observation Time Precipitation: 2400

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		"Soil Temperature (F)"					
			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2024	05	01	58	36		T		0.0		0.0								
2024	05	02	65	36		0.00		0.0		0.0								
2024	05	03	66	42		0.00		0.0		0.0								
2024	05	04	68	52		T		0.0		0.0								
2024	05	05	56	46		0.36		0.0		0.0								
2024	05	06	60	41		0.10		0.0		0.0								
2024	05	07	62	37		T		0.0		0.0								
2024	05	08	63	41		0.00		0.0		0.0								
2024	05	09	77	42		0.00		0.0		0.0								
2024	05	10	82	51		0.00		0.0		0.0								
2024	05	11	83	54		0.00		0.0		0.0								
2024	05	12	84	56		0.00		0.0		0.0								
2024	05	13	77	54		0.00		0.0		0.0								
2024	05	14	76	49		0.00		0.0		0.0								
2024	05	15	78	51		0.00		0.0		0.0								
2024	05	16	79	54		T		0.0		0.0								
2024	05	17	64	47		0.00		0.0		0.0								
2024	05	18	61	41		T		0.0		0.0								
2024	05	19	61	42		0.04		T		0.0								
2024	05	20	69	37		0.00		0.0										
2024	05	21	64	42		0.07		0.0		0.0								
2024	05	22	57	45		0.22		0.0		0.0								
2024	05	23	66	42		0.00		0.0		0.0								
2024	05	24	70	47		0.00		0.0		0.0								
2024	05	25	63	47		0.00		0.0		0.0								
2024	05	26	64	41		T		0.0		0.0								
2024	05	27	76	52		0.00		0.0		0.0								
2024	05	28	74	51		0.03		0.0		0.0								
2024	05	29	65	44		0.01		0.0		0.0								
2024	05	30	66	37		0.00		0.0		0.0								
2024	05	31	71	44		0.00		0.0		0.0								
		Summary	69	45		0.83		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

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			"24 Hrs. Ending at Observation Time"			24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.	At Obs.	Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2024	06	01	71	51		T		0.0		0.0								
2024	06	02	67	49		0.25		0.0		0.0								
2024	06	03	64	48		0.23		0.0		0.0								
2024	06	04	70	45		0.03		0.0		0.0								
2024	06	05	70	47		0.00		0.0		0.0								
2024	06	06	79	50		0.00		0.0		0.0								
2024	06	07	82	55		0.00		0.0		0.0								
2024	06	08	84	53		0.00		0.0		0.0								
2024	06	09	80	58		0.00		0.0		0.0								
2024	06	10	81	54		0.00		0.0		0.0								
2024	06	11	84	56		0.00		0.0		0.0								
2024	06	12																
2024	06	13																
2024	06	14																
2024	06	15																
2024	06	16																
2024	06	17																
2024	06	18																
2024	06	19																
2024	06	20																
2024	06	21																
2024	06	22																
2024	06	23																
2024	06	24																
2024	06	25																
2024	06	26																
2024	06	27																
2024	06	28																
2024	06	29																
2024	06	30																
		Summary	69	47		0.51		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

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Appendix F
Hydraulic Test Data

Table F-1

Pilot Infiltration Test Analysis - Main Pond (IT-1)[1]

Ridgemont Estates Stormwater Improvement Project

Spokane Valley, Washington

Pilot Infiltration Test	Property	Date Completed	Test Pit Length (ft)	Test Pit Width (ft)	Test Pit Depth (ft)	Test Pit Area (ft^2)	Test Pit Area (in^2)	Time	Time Interval (minutes)	Elapsed Time (hours)	Depth to Water (ft)	Water Height (ft)	Totalizer (gallons)	Interval Discharge (gallons)	Flow Rate [2] (gpm)	Flow Rate [2] (in^3/hr)	Constant Head		Falling Head		Notes
																	Interval Infiltration Rate [3] (in/hr)	Stabilized Infiltration Rate [3,4] (in/hr)	Interval Infiltration Rate [3] (in/hr)	Stabilized Infiltration Rate [3,5] (in/hr)	
IT-1	Ridgemont Estates	03/18/24	10.2	11.0	2.00	111.9	16,109	11:00	--	0.00	Dry	0.00	448605.0	--	--	--	--				Pit is dry. Begin injection.
								11:14	14	0.23	2.28	1.33	449576.0	971.0	69.36	961,290	59.67				Injection paused.
								12:05	51	1.08	2.35	1.25	47411.2	0.0	0.00	0	0.00		1.06		Flow meter replaced to accommodate low flow.
								12:30	25	1.50	2.39	1.21	47411.2	0.0	0.00	0	0.00		1.20		
								13:07	37	2.12	2.44	1.17	47411.2	0.0	0.00	0	0.00		0.89		
								13:18	11	2.30	2.45	1.15	47411.2	0.0	0.00	0	0.00		1.02		Injection resumed.
								13:30	12	2.50	2.45	1.16	47423.8	12.6	1.05	14,553	0.90				
								13:45	15	2.75	2.45	1.15	47451.8	28.0	1.87	25,872	1.61				
								14:00	15	3.00	2.43	1.17	47476.2	24.4	1.63	22,546	1.40				
								14:15	15	3.25	2.43	1.17	47499.8	23.6	1.57	21,806	1.35				Flow rate adjusted to maintain head.
								14:30	15	3.50	2.44	1.17	47500.6	0.8	0.05	739	0.05				
								14:45	15	3.75	2.43	1.17	47517.1	16.5	1.10	15,246	0.95				
								15:00	15	4.00	2.44	1.17	47531.5	14.4	0.96	13,306	0.83				
								15:15	15	4.25	2.44	1.17	47546.4	14.9	0.99	13,768	0.85				
								15:30	15	4.50	2.44	1.17	47560.4	14.0	0.93	12,936	0.80				
								15:45	15	4.75	2.44	1.17	47575.0	14.6	0.97	13,490	0.84				
								16:00	15	5.00	2.44	1.17	47590.5	15.5	1.03	14,322	0.89	0.85			Water off. Begin falling head
								16:10	10	5.17	2.45	1.16							0.75		
								16:20	10	5.33	2.46	1.14							1.13		
								16:30	10	5.50	2.48	1.13							1.13		
								16:40	10	5.67	2.49	1.11							0.75		
								16:50	10	5.83	2.50	1.10							0.75		
								17:00	10	6.00	2.51	1.09							0.75		
								17:10	10	6.17	2.53	1.08							1.13		
								17:20	10	6.33	2.54	1.07							0.75		
								17:30	10	6.50	2.55	1.05							1.13		
								17:40	10	6.67	2.57	1.03							1.50		
								17:50	10	6.83	2.60	1.01							1.88		
								18:00	10	7.00	2.61	0.99							0.75	1.03	

Notes:

[1] Infiltration test performed in general accordance with the 2019 Stormwater Management Manual for Eastern Washington.

[2] Flow rate represents the injection rate into the pit.

[3] Infiltration rate is calculated by the following equation: Infiltration rate (I) = Flow Rate (Q) / Pit Area (A).

[4] Average infiltration rate for the final hour of the constant head period.

[5] Average infiltration rate for the falling head period.

ft = feet; in = inches; gpm = gallons per minute; hr = hour.

Table F-2

Full-Scale Drywell Test Analysis - Radco Pond (IT-2)[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
10:10	0	449,583	0	0	0	0	11.67	0	Static conditions - Flow begins
10:20	10	451,174	159	0.35	1,591	213	8.70	2.97	Begin constant-head test
10:25	15	452,662	298	0.66	3,079	412	8.60	3.07	
10:30	20	454,105	289	0.64	4,522	605	8.50	3.17	
10:35	25	455,412	261	0.58	5,829	779	8.40	3.27	
10:40	30	456,752	268	0.60	7,169	958	8.48	3.19	
10:45	35	458,138	277	0.62	8,555	1,144	8.30	3.37	
10:50	40	459,528	278	0.62	9,945	1,330	8.30	3.37	
10:55	45	460,948	284	0.63	11,365	1,519	8.22	3.45	
11:00	50	462,391	289	0.64	12,808	1,712	8.28	3.39	
11:05	55	463,705	263	0.59	14,122	1,888	8.22	3.45	
11:10	60	465,170	293	0.65	15,587	2,084	8.23	3.44	
11:15	65	466,642	294	0.66	17,059	2,281	8.17	3.50	
11:20	70	467,836	239	0.53	18,253	2,440	8.19	3.48	
11:25	75	469,221	277	0.62	19,638	2,625	8.09	3.58	
11:30	80	470,610	278	0.62	21,027	2,811	8.10	3.57	
11:35	85	472,054	289	0.64	22,471	3,004	8.08	3.59	
11:40	90	473,377	265	0.59	23,794	3,181	8.10	3.57	
11:50	100	476,145	277	0.62	26,562	3,551	8.08	3.59	
11:55	105	477,524	276	0.61	27,941	3,735	8.07	3.60	
12:00	110	478,923	280	0.62	29,340	3,922	8.09	3.58	
12:05	115	480,300	275	0.61	30,717	4,107	8.07	3.60	
12:10	120	481,717	283	0.63	32,134	4,296	8.06	3.61	Falling Head Test
12:10:30	121						9.55	2.12	
12:11:00	121						9.87	1.80	
12:11:30	122						10.32	1.35	
12:12:00	122						10.48	1.19	
12:12:30	122						10.81	0.86	
12:13:00	123						11.12	0.55	
12:14:00	124						11.28	0.39	
12:15:00	125						11.51	0.16	
12:16:00	126						11.67	0.00	Dry
Design Outfall Rate[6]									
Stabilized flow rate (Q) in cubic feet per second (cfs)								0.617	
Head within drywell (H) in feet								3.56	
Maximum design drywell head (H_D) in feet								11.7	
Normalized outflow rate (q_A) in cfs								2.030	
Factor of Safety (FS)								2.5	%Fines = unknown
Design outflow rate (q_D) in cfs								0.812	

Notes:

[1] Infiltration test performed in general accordance with the 2019 Stormwater Management Manual for Eastern Washington.

[2] Elapsed time referenced to beginning of test on March 19, 2024.

[3] Depth to water measured from the top of the drywell rim.

[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 = 11.67 ft; active barrel = 8.17 ft; filter fabric exterior lining.

Table F-3

Full-Scale Drywell Test Analysis - East 24th Avenue (IT-3)[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
9:35	0	481,753	0.00	0	0	0	11.67	0	Static conditions - Flow begins
9:45	10	482,005	25.20	0.056	252	34	7.52	4.15	Begin constant-head test
9:50	15	482,169	32.80	0.073	416	56	7.50	4.17	
10:00	25	47,604.3	1.05	0.002	427	57	7.84	3.83	Flow meter replaced to accommodate low flow
10:10	35	47,671.2	6.69	0.015	493	66	7.72	3.95	
10:15	40	47,684.0	2.56	0.006	506	68	7.68	3.99	
10:20	45	47,701.8	3.56	0.008	524	70	7.65	4.02	
10:25	50	47,724.7	4.58	0.010	547	73	7.60	4.07	
10:30	55	47,742.3	3.52	0.008	565	75	7.60	4.07	
10:35	60	47,758.0	3.14	0.007	580	78	7.60	4.07	
10:40	65	47,773.9	3.18	0.007	596	80	7.60	4.07	
10:45	70	47,790.0	3.22	0.007	612	82	7.61	4.06	
10:50	75	47,811.8	4.36	0.010	634	85	7.58	4.09	
10:55	80	47,828.5	3.34	0.007	651	87	7.60	4.07	
11:00	85	47,845.2	3.34	0.007	667	89	7.60	4.07	
11:05	90	47,862.4	3.44	0.008	685	92	7.60	4.07	
11:10	95	47,879.2	3.36	0.007	701	94	7.60	4.07	
11:15	100	47,895.8	3.32	0.007	718	96	7.60	4.07	
11:20	105	47,912.7	3.38	0.008	735	98	7.60	4.07	
11:25	110	47,929.4	3.34	0.007	752	100	7.60	4.07	
11:30	115	47,946.2	3.36	0.007	768	103	7.60	4.07	
11:35	120	47,962.8	3.32	0.007	785	105	7.60	4.07	Falling Head Test
11:40	125						7.69	3.98	
11:45	130						7.86	3.81	
11:50	135						8.02	3.65	
11:55	140						8.13	3.54	
12:00	145						8.22	3.45	
12:05	150						8.33	3.34	
12:10	155						8.43	3.24	
12:15	160						8.54	3.13	
12:20	165						8.62	3.05	
12:25	170						8.70	2.97	
Design Outfall Rate[6]									
Stabilized flow rate (Q) in cubic feet per second (cfs)								0.008	
Head within drywell (H) in feet								4.07	
Maximum design drywell head (H_D) in feet								7.42	
Normalized outflow rate (q_A) in cfs								0.014	
Factor of Safety (FS)								2.5	%Fines = unknown
Design outflow rate (q_D) in cfs								0.0055	

Notes:

[1] Infiltration test performed in general accordance with the 2019 Stormwater Management Manual for Eastern Washington.

[2] Elapsed time referenced to beginning of test on March 19, 2024.

[3] Depth to water measured from the top of the drywell rim.

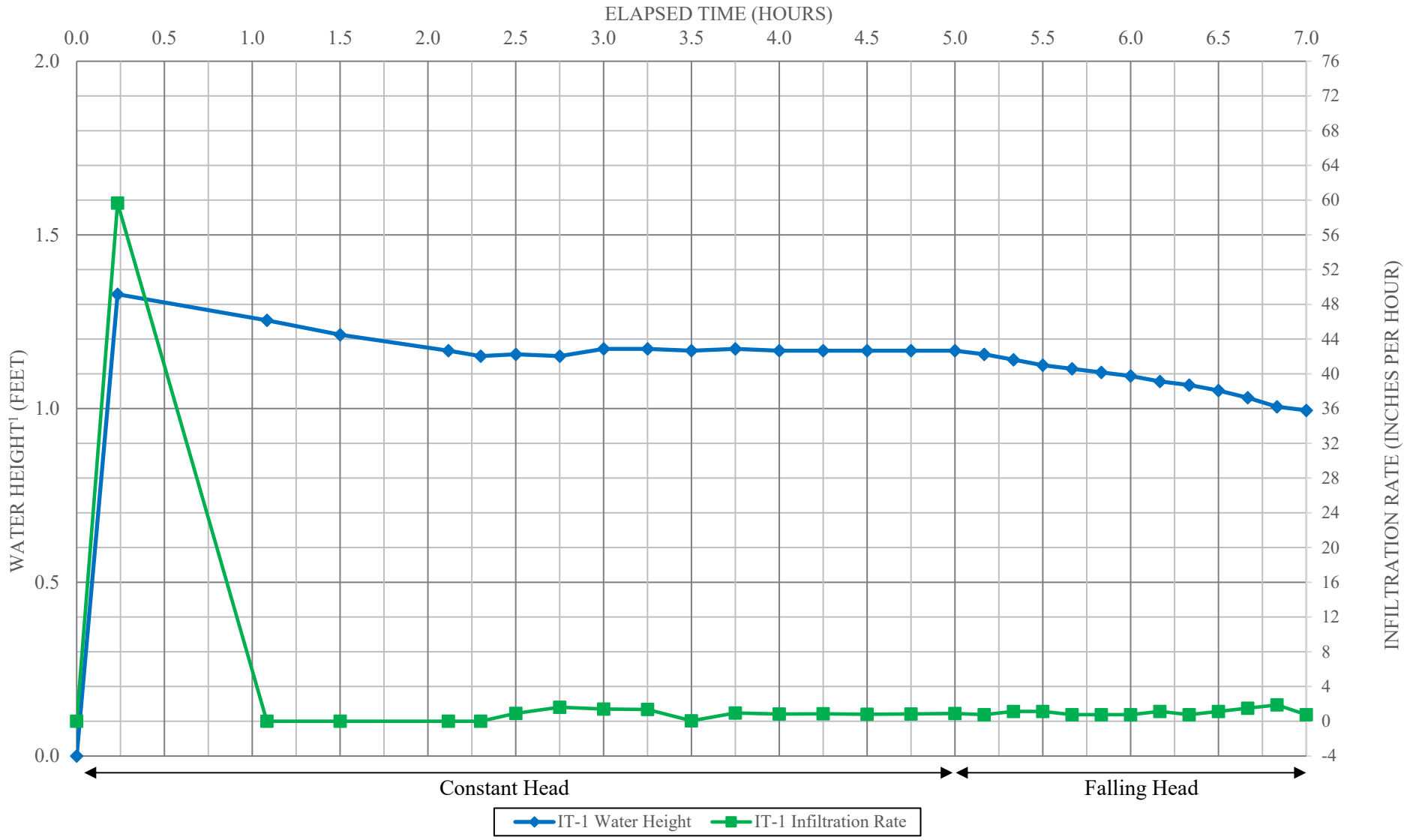
[4] Head refers to induced head level within the drywell.

[5] Constant-head maintained at the maximum flow rate that could be achieved given the available drywell infiltration area 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 = 11.67 ft; approx. active barrel = 6.08 ft (base to bottom of outfall pipe); approx. 10-inch-diameter inlet pipe on south side of drywell at 4.25 ft below rim (measured to bottom of inlet); approx. 8-inch-diameter outlet pipe on west side of drywell at 5.58 ft below rim (measured to bottom); moderately silted bottom barrel.

11264-044-00



Note:

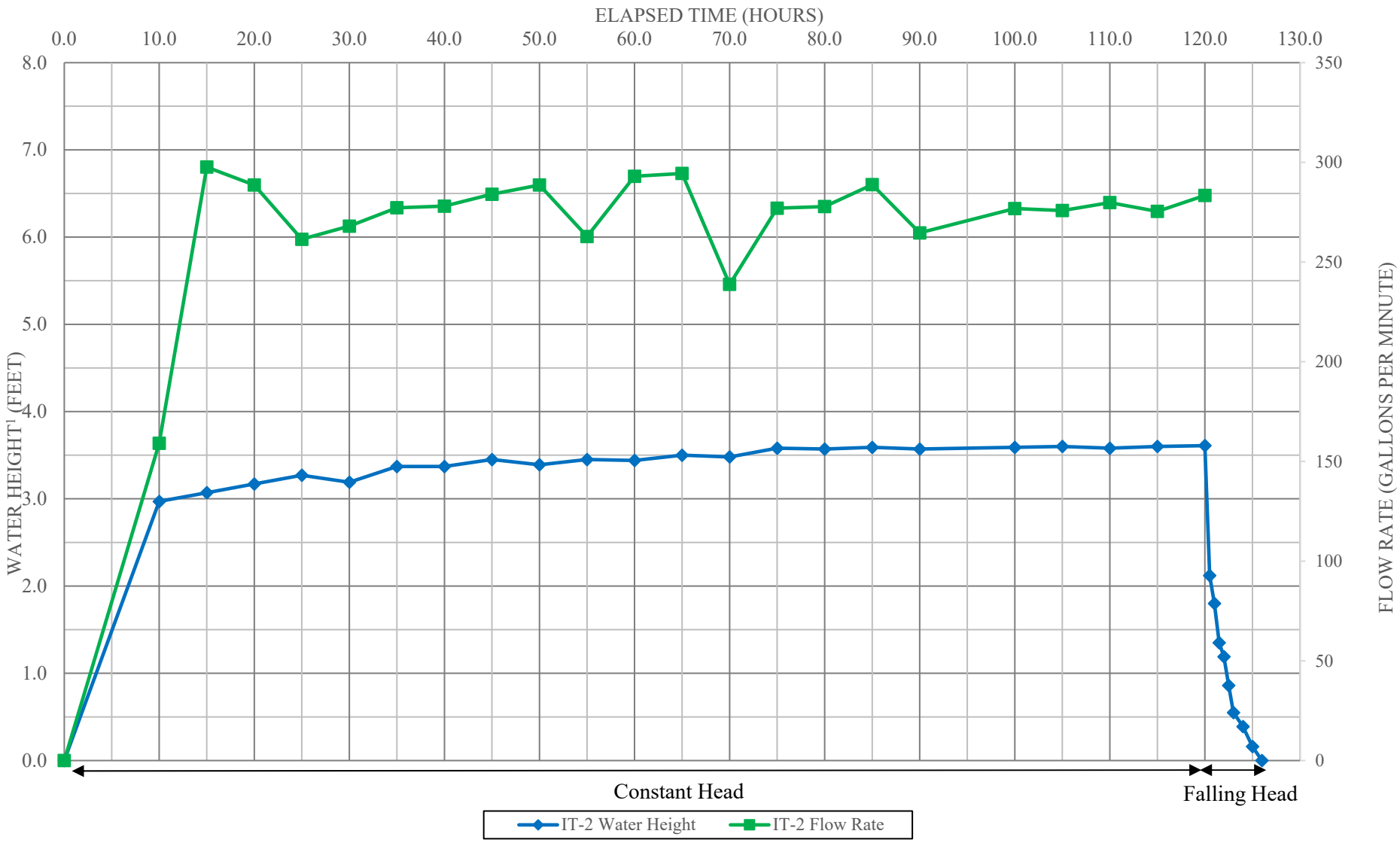
1. Water height refers to water level above the bottom of the test pit.

IT-1 Water Height and Infiltration Rate

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

GeoEngineers

Figure F-1



Note:

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

IT-2 Water Height and Infiltration Rate

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

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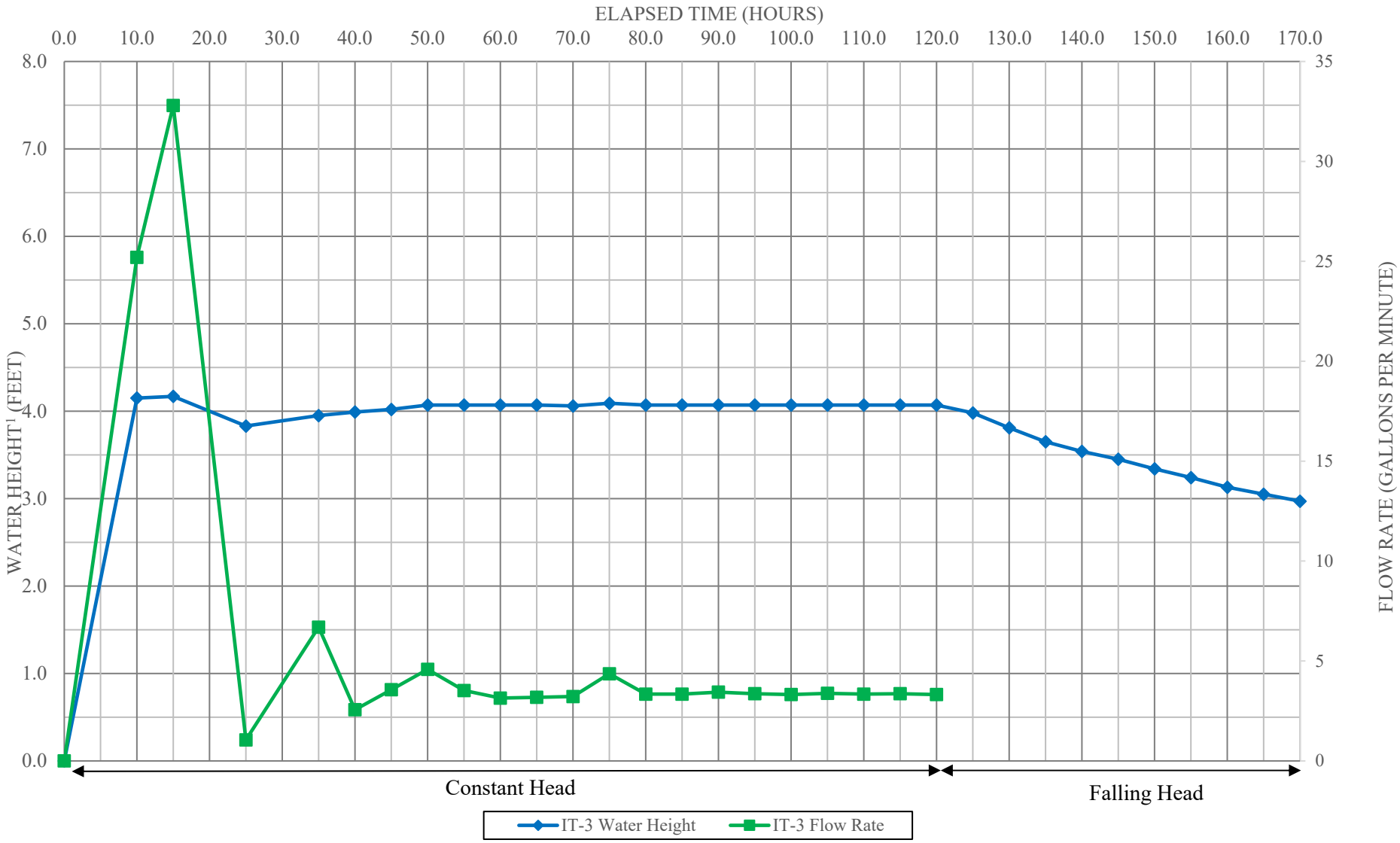
Figure F-2



Note:

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

IT-3 Water Height and Infiltration Rate

Ridgemont Estates Stormwater Improvements Project
Spokane Valley, Washington

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Figure F-3

Appendix G
Report Limitations and Guidelines for Use

Appendix G
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

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or hydrogeology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear 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 use by Osborn Consulting and the City of Spokane Valley. This report may be made available in its entirety to others for information only. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a hydrogeologic and/or geotechnical study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Each hydrogeologic and/or geotechnical study is unique and prepared solely for the specific client and project site. No one except Osborn Consulting or the City of Spokane Valley should rely on this report without first conferring with GeoEngineers. This report should not be applied for any purpose or project except the one originally contemplated.

A Hydrogeologic and/or Geotechnical Report Is Based on a Unique Set of Project-Specific Factors

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, do not 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.

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

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

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 manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Hydrogeologic and/or Geotechnical Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

A Hydrogeologic and/or Geotechnical Report Could Be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a hydrogeologic and/or geotechnical report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable but recognize that separating logs from the report can elevate risk.