Appendix B

Soils, Geology, Groundwater, and Geologic Hazards Report
Associated Earth Sciences, Inc.

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Soils, Geology, Groundwater and Geologic Hazards Report
for the Draft Environmental Impact Statement

EARTH AND GROUNDWATER

SNOQUALMIE MILL SITE

Snoqualmie, Washington

Prepared for

SNOQUALMIE MILL VENTURES, LLC

Project No. 20120126H012
March 10, 2020



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SOILS, GEOLOGY, GROUNDWATER AND GEOLOGIC HAZARDS REPORT FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

EARTH AND GROUNDWATER

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Snoqualmie, Washington

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EARTH AND GROUNDWATER EXECUTIVE SUMMARY

This Technical Report has been prepared in support of the Draft Environmental Impact Statement (EIS) for the Snoqualmie Mill Site (Mill site) Planned Commercial/Industrial (PCI) Plan. The project site is located in the city of Snoqualmie, Washington (Figure 1). It is bounded by the City limits on the north, Borst Lake (Mill Pond) on the south, SE Mill Pond Road on the west, and the "hillside" area owned by King County along 396th Drive SE on the east. The site is located within Sections 29, 30, and 32 of Township 24, Range 8 East. Other nearby features and uses include the Snoqualmie River on the west, the City's sanitary sewer treatment plant, the City's North Well Field public water supply, and an existing gravel mining operation to the north. The Borst Lake/Mill Pond is not owned by the applicant and is not part of the Proposed Action.

EARTH AND GROUNDWATER

This section of the EIS presents the probable significant earth- and groundwater-related impacts from development of the Mill site, focusing specifically on Planning Area 1. Associated Earth Sciences, Inc. (AESI) has previously completed multiple subsurface studies both on- and offsite. Previous reports completed by AESI for the Mill site include a geotechnical engineering report (AESI, 2012) and an environmental site assessment current conditions report (AESI, 2015a) documenting existing conditions at the site. AESI has completed many geologic and groundwater studies for other nearby projects since the mid-1980's. Subsurface information from these studies include exploration pits, exploration borings, groundwater level data from groundwater monitoring wells in different aquifers, and surface water monitoring data from the Snoqualmie River, Tokul Creek, and the Mill Pond. Aquifer tests were also completed in many of the wells.

Our study included the review of available geologic literature, analysis of previously completed exploration pits, exploration borings, and groundwater wells, visual geologic reconnaissance of the site, review of Light Detection and Ranging (LIDAR) imagery of the region, and evaluation of nearby water well logs. Additional subsurface exploration completed specifically for the current project included advancing one exploration boring and two cone penetrometer tests (CPTs).

Affected Environment

The project site lies within the Puget Sound Lowland, which is a broad topographic and structural basin extending generally north-south between the Cascade Range on the east to the Olympic Mountains on the west. The project site was part of several previous geologic studies including AESI (2010, 2012, 2015a), Turney et al. (1995), Booth (1990), Frizzell et al. (1984), Tabor et al. (1993), and Dragovich et al. (2009b).

Geology

The geology surrounding the site is complex with a wide range of geologic units exposed in close proximity to the site. Geology in the vicinity of the site is shown on Figure 6 and geologic cross-sections are shown on Figures 7 through 10. Based on the referenced geologic mapping and AESI's previous work, two erosional valleys incised into Tertiary-age bedrock have been identified in the area. The ancient Snoqualmie River established a course through a bedrock valley in the immediate vicinity of the site (Figure 11). One of these paleovalleys is located under the present-day Lake Alice Plateau, south and west of the current Snoqualmie River and west of the Mill site (Figure 11).

The bedrock valleys have been filled by a series of younger, Quaternary-age sediments. These sediments accumulated as a result of alternating glacial and non-glacial deposition. Ice advanced southward from British Columbia into the Puget Lowland multiple times within the last 2 million years. The ice was part of the widespread Cordilleran continental ice sheet that covered much of northwestern North America and periodically extended down into the Puget Sound as a broad, tongue of ice commonly referred to as the Puget Lobe. In addition to the erosion and scouring of the Lowland, the Puget Lobe deposited a variety of glacial sediments, including outwash sand and gravel from meltwater streams, proglacial lacustrine (lake) silts and clays, deltaic sediments deposited in ice-dammed lakes, and glacial till deposited at the base and along the margins of the active glacial ice. Mountain glaciers also extended down the major river valleys such as the Snoqualmie, scouring the landscape and depositing sediments. During interglacial periods, erosion and deposition occurred primarily through the action of river systems flowing to the northwest, most notably the Snoqualmie River in the vicinity of the project. Non-glacial sediments were deposited in a wide variety of environments and include fluvial sands and gravels, lacustrine silt/clay, and peat.

During the retreat of the Vashon-age ice, a proglacial lake formed in the ancient Snoqualmie River valley. Meltwater from the receding ice sheet created a prograding delta system at Tokul Creek. This resulted in vast quantities of Vashon-age recessional sand and gravel deposited in what has been referred to in the geologic literature as the Tokul Creek Delta. This delta is located just north of the Mill site and is the source material for the Snoqualmie Sand and Gravel Pit. The delta forms a relatively level bench near elevation 550 feet and covers approximately 1.5 square miles. This thick deltaic sequence prevented the Snoqualmie River from re-establishing its pre-ice course, resulting in the development of post-glacial Lake Snoqualmie in the vicinity of the Mill site and deposition of lacustrine silts and clays. The outlet for Lake Snoqualmie was diverted by the delta to the location of the present-day Snoqualmie Falls.

Hydrogeology

Surface water features in the vicinity of the site include on-site wetlands, on-site streams, the Mill Pond south of the site, and the Snoqualmie River west-southwest of the site. The Snoqualmie River Shallow Aquifer is present beneath the site and is formed within near-surface Snoqualmie River deposits. A deeper aquifer (Tokul Creek Delta Aquifer) is formed within sand

and gravel deposits of the Tokul Creek Delta. Throughout most of the site, the Snoqualmie River Shallow Aquifer is hydraulically separated from the Tokul Creek Delta Aquifer by a thick deposit of recent (Holocene) lacustrine silt and clay.

In general, a groundwater divide is present in the central portion of the Mill site. In the south and western portions of the site, groundwater flows towards the Snoqualmie River and the Mill Pond. In the northern portion of the site, groundwater flows to the north toward the Tokul Creek Delta. The gradient in the shallow aquifer steepens to the north of the site as it merges with the Tokul Creek Delta Aquifer. Ultimately, the groundwater in the Tokul Creek Delta Aquifer flows to the north and discharges at a spring zone along Tokul Creek, north of the project (Figure 12).

Soils

Soils on the site formed primarily over post-glacially deposited alluvial sediments; however, much of the Mill site has been significantly modified through grading and filling during and subsequent to the operation of the mill, disturbing the natural soil profile. The soils that are present onsite have not had sufficient time to develop the deep weathering profiles present in soils of many unglaciated terrains. Instead, they exhibit a direct relationship to the underlying parent material, local climate, and vegetation. The vast majority of soils present onsite consist of Arents and Nooksack silt loam (Figure 5), which formed over a mixture of volcanic ash and other deposits or alluvium on floodplains and river terraces, respectively. Barneston gravelly ashy coarse sandy loam formed in areas over glacial outwash and is present primarily near the northeastern corner of the site, where the topography slopes up to the Tokul Creek Delta north of the site.

Geologic Hazards

Erosion, landslide, steep slope, seismic, channel migration, and flood hazard areas and critical aquifer recharge areas (CARAs) are regulated under the *Snoqualmie Municipal Code* (SMC) Chapter 19.12 - "Critical Areas." Based on published critical areas maps produced by the City of Snoqualmie, King County, and our observations of regional and local topographic and geologic conditions, as documented in this report, these types of geologic hazards all exist to a variable extent in areas of the project site

Landslide/Steep Slope Hazards

The landslide/steep slope hazard risks on the property have been subdivided into two hazard zones based on local geotechnical engineering and geologic hazard standards. These hazard zones are illustrated on Figure 15 and are described below.

> *Landslide/Steep Slope Hazard Zone 1*: Landslide/Steep Slope Hazard Zone 1 encompasses the vast majority of the site and is considered to possess a low landslide hazard risk due to low slope gradients.

Landslide/Steep Slope Hazard Zone 2: Landslide/Steep Slope Hazard Zone 2 is generally localized to the eastern margin of the site. Portions of the slopes in this area appear to meet the definition of steep slope hazards – slopes with inclinations greater than 40 percent over a vertical height of at least 10 feet. Portions of these slopes also appear to meet criterion #1 for landslide hazards. Zone 2 is considered to possess a low to moderate risk of landslides if disturbed by improper grading/clearing or uncontrolled drainage. In their existing conditions these areas do not show evidence of slide activity.

Erosion Hazards

Erosion Hazard Areas are defined under SMC Section 19.12.100. Erosion Hazards are limited to the slopes at 15 percent or greater on the eastern margin of the site, mapped as Barneston Series soils on the *USDA Soil Conservation Service, King County Soils Survey*. This area is shown on Figure 14. A discussion of on-site soils is presented under "Soils," Section 1.2.1.

Based on the sediment characteristics and slope gradients, two zones with differing degrees of potential erosion hazards are shown on Figure 14 and are discussed further below.

Erosion Hazard Zone 1: Erosion Hazard Zone 1 includes the majority of the Mill site, which is relatively flat. Because of the low slope gradient, this area is considered to possess a low erosion hazard risk. These areas are underlain by Arents and Nooksack Series soils at slopes of 0 to 2 percent.

Erosion Hazard Zone 2: Erosion Hazard Zone 2 is considered to possess a slight to moderate risk of erosion. This area is located on the northeastern margin of the Mill site. These areas are underlain by Barneston Series soils at slopes of 15 percent or greater.

Seismic Hazards

Seismic hazards (including surficial ground rupture, seismic-induced landslides, liquefaction, lateral spreading, and ground motion) were also analyzed for the Mill site. No evidence of surface faults or associated ground rupture was observed at the Mill site; however, strands of the Rattle Snake Mountain Fault Zone (RMF) and the Snoqualmie Valley Fault may be present beneath the site based on regional geologic mapping. While these faults are potentially active, they do not displace Holocene sediments, suggesting that they have not been active within the last 10,000 years. There is no other evidence that either of these faults are currently active (Dragovich et al., 2009a,b). The risk of fault rupture is considered to be low at the site.

Most of the site is underlain by loose existing fill, overbank deposits, river channel deposits, and lacustrine sediments, some of which are saturated. These materials are potentially at risk of liquefaction and lateral spreading during a design-level seismic event, shown as Seismic Hazard Zone 2 on Figure 18.

Flood Hazards

Flood hazard areas are regulated under SMC Section 15.12 and 19.12.150. Most of the Mill site is within the 100-year floodplain Zone AE shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) of the area, below the base flood elevation (BFE). Zones AE are areas that have a 1 percent probability of flooding every year (100-year floodplain) and where predicted flood water elevations above mean sea level have been established. Properties in Zone AE are considered to be at high risk of flooding under the National Flood Insurance Program (NFIP). The southwestern portion of Planning Area 1 is within the delineated floodway. The floodway is defined as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The 100-year floodplain and floodway are both shown on Figure 19.

Proposed development within the floodway and 100-year floodplain is regulated by the City of Snoqualmie's Flood Hazard Regulations (SMC 15.12) and federal FEMA regulations. Site development will require compliance with general standards in the SMC, including requirements for final grades after construction, the protection of site utilities from adverse impacts due to flooding, and the demonstration that the proposed development will not increase the flood levels during the occurrence of the base flood discharge.

Channel Migration Hazards

Per the SMC, Channel Migration Zones (CMZs) along the Snoqualmie River are categorized into Potential Hazard Areas, Moderate Hazard Areas, and Severe Hazard Areas. Based on the maps in the referenced report and shown on Figure 14, a section along the southwestern edges of Planning Area 1 and Planning Area 3 are within the Moderate Hazard Area. The majority of Planning Area 1 and the western portion of Planning Area 3 are within mapped Potential Hazard Areas (Figure 14). Development is not limited in potential hazard areas; however, only certain development or activities are allowed in severe and moderate CMZs. Based on current site planning, new structures are not currently planned within either the Severe or Moderate Hazard Areas except for the realignment of SE Mill Pond Road. Structures are planned within the mapped Potential Hazard Area.

Critical Aquifer Recharge Areas (CARAs)

Review of the map *King County Critical Aquifer Recharge Areas* dated March 1, 2012 (shown on Figure 20) indicates that the area immediately surrounding the Mill site to the north, and portions of the site on the west and northwest parts of the property are classified as a Category 1 CARA. The areas mapped as Category 1 CARA appear to generally correspond to the mapped 10-year time-of-travel (TOT) wellhead protection areas (WPAs) for groundwater production wells. The area immediately south of the Mill site, including the Mill Pond, and portions of the site on the southeast and southwest parts of the property are classified as a

Category 2 CARA. The majority of the Mill site, however, is not classified. Many of the WPAs shown on the above-referenced King County map appear to be delineated using a calculated fixed radius (CFR) technique, which can lead to misleading WPAs in complex hydrogeologic settings, such as those underlying the Mill site and vicinity.

AESI developed numerical groundwater flow models, using MODFLOW, to evaluate the groundwater capture zones for both the North Well Field (NWF) and South Well Field (SWF) (AESI, 1994, 1995c, 1996), north and south of the Mill site. The capture zones delineated by the MODFLOW modeling incorporate a conceptual hydrogeologic model developed by AESI through analysis of subsurface conditions observed in explorations completed on- and offsite, review of conditions reported on Ecology well logs, water level monitoring, and detailed hydrogeologic mapping. The MODFLOW model indicates that the TOT zones for the well field are highly elliptical (AESI, 1994, 1995c, 1996).

The wells for the NWF withdraw groundwater from the Deep Aquifer, which is separated from shallower aquifers by multiple low-permeability aquitards and receives limited recharge from shallower aquifers near the well field. Particle tracking plots, which illustrate flowpaths generated by the MODFLOW computer model, support this interpretation. Most of the water discharging from the well field comes directly from upgradient sources in the Deep Aquifer, originating a few miles upvalley (southeast) of the 10-year TOT boundary. Modeling suggests only about 5 to 10 percent of the water at the well field would originate in the Tokul Creek Delta Aquifer, Snoqualmie River Shallow Aquifer, or surface water sources within the 10-year TOT zone (AESI, 1996). The vast majority of recharge from the Mill site will bypass the deeper aquifer system within the 10-year TOT zone, discharging directly into the Snoqualmie River to the west or into the Tokul Creek Delta Aquifer to the north and emerge at the spring zone along Tokul Creek, ultimately flowing to the Snoqualmie River downgradient of the falls.

Impacts and Mitigations

This section describes our evaluation of probable environmental impacts relative to geologic hazards, surface water, and groundwater resources that could occur as a result of proposed development of the Mill site without mitigation. Our analysis of probable significant impacts associated with geologic hazards includes the following: erosion hazards including stream/river erosion (channel migration), landslide hazards, seismic hazards, flood hazards, and critical aquifer recharge areas (CARAs). Our analysis of CARAs is limited to groundwater quantity impacts. Geotechnical development impacts are also discussed.

<u>Geologic Hazard Impacts and Mitigations</u>

Potential impacts from geologic hazards at the site include potential landslide/steep slope, erosion, seismic, flood, and channel migration hazards.

Landslide and Steep Slope Hazards

The existing landslide and steep slope hazards onsite could be adversely impacted from three primary activities during development. These include clearing, grading (earthwork), and stormwater management.

Clearing could increase the existing landslide hazard potential by removing vegetation which would normally intercept some of the rainfall, resulting in higher runoff volumes. Grading (earthwork) activities could increase the existing landslide hazard potential. Fill material placed on or adjacent to a steep slope will increase the driving forces acting in the subsurface, which would increase the risk of slope failures. Surface drainage patterns are typically altered by grading. If the new drainage pattern results in an increase in either surface or subsurface water flow on or near a slope, landslides could occur.

Non-structural fills could fail due to inadequate compactive effort, use of organic soils, improper site preparation, oversteepened slopes, or other factors. Cut slopes could also fail if they are oversteepened, toe support is removed, or drainage is improperly directed.

Since most of the steep slope areas are located just offsite, potential landslide and steep slope hazards under the No Action Alternative would remain substantially unchanged from either the Proposed Action or Alternative 1.

With proper design and installation of the temporary and permanent stormwater management systems; establishment of minimum building and vegetation clearing setbacks onsite; and, review and approval of proposed development plans by a geotechnical engineer prior to construction, no significant landslide hazard impacts are expected.

Erosion Hazards

The most significant increase in erosion hazard potential onsite will be during construction. Clearing and grading activities during construction will increase erosion potential onsite through the removal of vegetation and by exposing soil directly to precipitation and runoff. Exposed soil will be subject to erosion and sediment transport. Nearby surface water features that could be adversely impacted by increased sedimentation include on-site wetlands and streams, the Mill Pond, and the Snoqualmie River. Post-construction (developed) conditions impacts should be similar to existing conditions, since exposed surfaces would be covered with structures, roadways, or new plantings.

The stormwater management plan for the Mill site proposes to discharge to the Snoqualmie River. Stormwater runoff from the western side of the site will be conveyed through storm pipes to a broad surface swale that will be constructed along a portion of the new SE Mill Pond Road. The stormwater will be conveyed as surface water flow through the swale to the Ordinary High Water Mark (OHWM) elevation of the river. Stormwater runoff from the eastern

side of the site will be conveyed to the river through the existing system of on- and off-site wetlands.

Potential adverse impacts include erosion along the swale or along the system of wetlands and streams if significant flows are routed to these features or if the base or side slopes are not properly protected with vegetation or constructed of stable material.

Erosion hazard impacts would be mitigated with the provision of landscaping and impervious coverage of soils, the implementation of a temporary erosion and sediment control (TESC) plan during construction per City of Snoqualmie standards. It is our opinion that with the proper implementation of the TESC plans and by field-adjusting appropriate mitigation elements (best management practices [BMPs]) during construction, the potential adverse impacts from erosion hazards on the project may be mitigated.

Seismic Hazards

Due to the lack of evidence of surface faults in the vicinity of the Tehaleh EBPC site, the potential for surface rupture impacting the site is low, and no mitigation is necessary in relation to surface rupture.

The risk of seismically induced landslides onsite is low due to the general lack of steep slopes onsite, and the slopes just east of the site consist of glacially consolidated sediments that are typically resistant to landslide activity. These slopes are along the eastern boundary of Planning Areas 2 and 3, which are analyzed at a programmatic level in the EIS; and therefore, planned development in this area is very preliminary. Later in the design process, once a development concept has been formulated, the geotechnical engineer for the project should review the site plans to determine whether a quantitative assessment of slope stability on the eastern part of the site is warranted.

The subject site is underlain by alluvial sediments that are potentially susceptible to liquefaction during an earthquake. Liquefiable sediments were identified at depths continuing from 25 to 70 feet below ground surface, and the liquefaction-induced settlement calculated for the site ranges from about 2 to 8 inches over this depth range. We anticipate that any future structures onsite will be supported on deep foundation systems or use ground improvement techniques to mitigate the risk of settlement and the risk of liquefaction-related damage to the new structures.

Lateral spreading is a hazard on sites where liquefaction-prone material is located near exposed slopes. In the case of the Mill site, this includes areas near the banks of the Snoqualmie River. The liquefied soil layers and non-liquefiable overburden may spread horizontally toward the water due to the reduction of soil strength and lack of confinement on the water side. The potential lateral displacement in Planning Area 1 was calculated at a distance of 100 to 150 feet from the Snoqualmie River. Our analysis indicates that the magnitude of lateral spreading could be on the order of 1 to 2 feet towards the shoreline for a design seismic event. Additional

analyses will be necessary when development plans are formalized and more subsurface information is available. Potential mitigation options include: 1) relocation of the new road alignment and roundabout near the Snoqualmie River, 2) installation of structural elements along the roadway edge such as a continuous, large-diameter drilled shaft wall, or 3) use of ground improvement methods such as stone columns or deep soil mixing to strengthen weak native soils presumed to exist adjacent to the river. In the event that the SE Mill Pond Road is damaged, the existing haul road will provide a secondary route onto and off of the site. We anticipate that risks of damage to the new structures resulting from lateral spreading will be mitigated by use of deep foundation systems or ground improvement techniques.

Structural design for the project under all of the Alternatives should follow 2015 *International Building Code* (IBC) standards. The 2015 IBC defines Site Classification by reference to Table 20.3.-1 of the *American Society of Civil Engineers* Publication ASCE 7, the current version of which is ASCE 7-16. In our opinion, the subsurface conditions at the site are consistent with a Site Classification of "E" or "F" as defined in the referenced documents depending upon local site conditions. Sites that are classified as Site Class "F" require a site-specific evaluation of ground motion. There is an unavoidable adverse impact related to a large seismic event causing some non-structural damage to buildings onsite.

Flood Hazards

Potential adverse impacts from flood hazards could be created by proposed site development due to filling portions of the site within the floodplain of the Snoqualmie River, including raising various site areas, roads, and building pads above the delineated BFE.

Compliance with flood hazard regulations, as defined in the SMC Sections 15.12 and 19.12.150, requires an analysis demonstrating that the proposed development will not increase flood levels during the occurrence of the base flood discharge. Watershed Science and Engineering (WSE) prepared a "No Net Rise Hydraulic Analysis" for the Mill site (WSE, 2018). The WSE report is described under Section 1.4 "Proposed Mitigations." Based on the hydraulic modeling by WSE, the proposed grading plan and compensating storage will provide suitable mitigation for flood hazard impacts related to a potential rise in the BFE. There is an unavoidable potential adverse impact related to very large flood events (greater than 100-year) that could inundate the proposed development.

Channel Migration Hazards

A section along the southwestern edges of Planning Area 1 and Planning Area 3 are within the Moderate Channel Migration Hazard Area. The majority of Planning Area 1 and the western portion of Planning Area 3 are within a mapped Potential Hazard Area, which represents a lower level of channel migration hazard than the moderate or severe CMZs. Structures, roadways, or other facilities built within the severe or moderate CMZs may be susceptible to damage due to the gradual channel erosion and migration of the Snoqualmie River. Project planning should incorporate appropriate channel migration protection standards where

possible to limit potential impacts to the roadway. There is an unavoidable potential adverse impact to proposed site structures due to the long-term erosion and channel migration of the Snoqualmie River.

Surface Water and Groundwater Impacts and Mitigations

Surface Water

The site lies entirely within the Snoqualmie River Basin and currently drains to the Snoqualmie River. The entire site (with the exception of some small areas of the site above the BFE) as well as all downstream areas lie within the 100-year floodplain of the river. The strategy for stormwater management for development of the Mill site is primarily flood control and compliance with flood hazard regulations. During typical rainfall events, stormwater management will include collection, treatment, and direct discharge to the Snoqualmie River and collection, treatment, and discharge to on-site and off-site wetlands to maintain wetland and stream hydrology. The Snoqualmie River is designated as a Direct Discharge Receiving Water Body by the 2016 *King County Surface Water Design Manual* (KCSWDM) and the 2012/2014 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (Ecology Manual), thus the site is exempt from flow control requirements.

In summary, the Stormwater Management Plan for the Mill site will include: 1) direct discharge to the Snoqualmie River, 2) maintenance of existing sub-basin hydrology to on-site and off-site wetlands, 3) runoff treatment of pollutant-generating impervious surfaces (PGIS), and 4) flood control and compliance with flood hazard regulations. Discharge to on- and off-site wetlands and streams consistent with existing conditions is a key component of the proposed stormwater management for the Mill site with the intent to maintain existing hydrology on- and offsite, and prevent significant adverse impacts to nearby surface waters.

Groundwater

Development has the potential to change the amount of surface water and groundwater recharge. Clearing vegetation and replacing it with suburban landscaping (such as lawns) reduces evapotranspiration, increasing the amount of water available for groundwater recharge and runoff. Depending upon how stormwater is managed, the increase in groundwater recharge may be counteracted by an increase in impervious surfaces (building and pavement areas), and other factors. On-site stormwater management will include collection, treatment, and direct discharge to the Snoqualmie River and collection, treatment, and discharge to on-site and off-site wetlands to maintain wetland hydrology. The intent of the proposed plan is to maintain discharge to on-site and off-site wetlands and streams consistent with existing conditions; therefore, groundwater recharge post-development is also expected to be similar to existing conditions, and no adverse impacts are anticipated.

Critical Aquifer Recharge Areas (CARAs)

The analysis of potential impacts to CARAs is limited to a consideration of potential groundwater quantity (recharge) impacts and does not take into account potential sources of contamination. Probable water quality impacts are not addressed in this technical report. As described above, groundwater recharge post-development is expected to be similar to existing conditions, and therefore no adverse impacts to CARAs are anticipated with respect to water quantity.

Geotechnical Impacts and Mitigations

The Mill site will require mass grading in some areas to achieve desired roadway, parking, and building pad elevations. Preliminary engineering estimates indicate that between 300,000 to 350,000 cubic yards (cy) of displacement (fill) could occur, and an equal volume of compensating storage will be created to ensure no increase in flooding. Cut and fill quantities are assumed to be similar for the Proposed Action and Alternative 1.

Potential geotechnical impacts could include various construction-related elements, such as: 1) site preparation, 2) structural fill placement, and 3) foundations. Examples of potential adverse impacts could include sloughing of temporary or permanent cut slopes if oversteepened, failure of fill soils due to improper placement and compaction, or excessive foundation settlement if the loose, soft native sediments underlying the site are not mitigated. However, since geotechnical oversight is an integral part of the project design and construction, no adverse impacts are considered likely. "Geotechnical Mitigations" are presented in Section 1.4.3 of this report.

In summary, the following are geotechnical design elements that should be considered in the future development planning process to mitigate settlement and risks from liquefaction and lateral spreading:

- The site development plan should be done in a way that does not increase loads on weak subsurface materials, if possible.

- Final site ground surface elevations should be kept at or below existing site grades, if possible. Mitigations that could be used to reduce the potential for settlement beneath newly filled areas could include removal and replacement of the old fill, preloading of the old fill, or support of structures upon deep foundations or other ground improvement methods.

- New structures, including buildings, substantial retaining walls, and similar structures with significant foundation loads, will require deep foundations or possibly deep ground improvement approaches. Floor slabs will also need to be supported on deep foundations or areas of deep ground improvement.

- New paving will require remedial preparation of the existing fill. Remedial preparation is likely to include placement of a geogrid or geotextile material in conjunction with a layer of sand and gravel or crushed rock fill. The purpose of this layer is to make the expected settlement of the paving more uniform. Settlement of paved surfaces will occur, and will require periodic maintenance that is more frequent and more extensive than is typical for sites that are not underlain by weak subsurface materials.

- New buried utilities, particularly those that are sensitive to grade changes such as gravity sewers, should be supported on a layer of new structural fill similar to that which will be used below paving. The incorporation of a layer of new fill below planned utilities will reduce but not eliminate the risk of future differential settlement and associated repairs.

Significant Unavoidable Adverse Impacts

Development of the Mill site will result in potential earth- and groundwater-related impacts associated with construction (site clearing and grading, installation of utilities/infrastructure), geologic hazards, groundwater, and surface water. With the implementation of the mitigation measures related to these hazards, as discussed in detail in this report, no significant unavoidable adverse earth- or groundwater-related impacts would be anticipated, except for potential adverse impacts related to long-term erosion of the Snoqualmie River, very large flood events, and very large seismic events.

1.1 EARTH AND GROUNDWATER

1.1.1 Introduction and Project Description

The Proposed Action is approval of a Planned Commercial/Industrial (PCI) Plan for the Snoqualmie Mill site (Mill site). The project site is located in the city of Snoqualmie, Washington (Figure 1). It is bounded by the City limits on the north, Borst Lake (Mill Pond) on the south, SE Mill Pond Road on the west, and the "hillside" area owned by King County along 396th Drive SE on the east. The site is located within Sections 29, 30, and 32 of Township 24, Range 8 East. Other nearby features and uses include the Snoqualmie River on the west, the City's sanitary sewer treatment plant, the City's North Well Field public water supply, and an existing gravel mining operation to the north. The Borst Lake/Mill Pond is not owned by the applicant and is not part of the Proposed Action.

The 261-acre Mill site was annexed to the City in 2012; however, a 15-acre area in the northeastern portion of the site (Planning Area 2) remains within unincorporated King County. Annexation of this area would occur before any specific development is proposed on this portion of the Mill site. This area is included in the PCI Plan, however, and most of it is proposed to remain undeveloped.

Proposed Action

The applicant is seeking approval of a PCI Plan and a development agreement for the Mill site. The proposed development agreement will help guide subsequent planning and development of the overall site.

The Draft Environmental Impact Statement (EIS) addresses development of the Mill site in several phases over an approximate 15-year period. Buildout would include a total of approximately 1.83 million gross square feet leasable area (1.879 building footprint) of light industrial/manufacturing, warehouse, office, retail, and residential uses. When fully developed, the site could generate an estimated 3,350 jobs. A majority of the overall site (157 acres, 60 percent) would remain undeveloped and be maintained for open space, landscaping, wetlands and streams, wildlife habitat, and flood storage.

The site has been divided into three distinct areas for purposes of planning and permitting. The PCI Plan application provides detailed information for Planning Area 1, an approximate 102-acre area in the northwestern portion of the site proposed as the first phase of development. Planning Area 1 is proposed to be comprised of a combination of warehouse/manufacturing, light industrial, second-story residential, and destination retail uses. This area is identified as the "Village." The Village center will be aligned along an east-west pedestrian-oriented corridor and main private drive known as Mill Street. This will be the primary gateway for the entire developed Mill site.

More conceptual information is provided for Planning Areas 2 and 3, and site planning is currently at a programmatic level. These areas would be developed after Planning Area 1.

Planning Area 2 is approximately 56 acres in size and is located in the northeastern portion of the Mill site. It is anticipated that Planning Area 2 would consist of warehouse and manufacturing uses. Large-scale industrial spaces/warehouses for a variety of light industrial uses with associated parking are envisioned in this northern planning area. The large blocks of industrial warehouse construction will accommodate light industrial production spaces, assuming homogeneous buildings spaced equally apart and docking areas between. The finished floor (FF) of the warehouses are assumed to be at or above the base flood elevation (BFE), while the docking and parking areas are assumed to be approximately 4 feet lower in elevation.

Planning Area 3, the Office/Campus District, is approximately 104 acres in size. It includes significant areas of the open space in the center and southeast portions of the site. It has the potential to be developed as a corporate or institutional campus, possibly by a single large user.

A lot line adjustment application has also been submitted to modify the boundaries, but not the number, of existing lots. Applications for building permits and other required development approvals will be submitted during or following the approval process for the PCI Plan.

Primary access to the site would be from SR 202 and SE Mill Pond Road. As shown on Figure 2, existing SE Mill Pond Road would be realigned and moved farther to the north to cross Planning Area 3 in a general east-west direction and at the main western entrance into the site, SE Mill Pond Road would be moved slightly to the northeast to accommodate a new roundabout. Segments of the realigned road would be developed in conjunction with individual planning areas. The new road would be a public road built to City standards. Most of the existing SE Mill Pond Road would be abandoned as the new road segments are completed, portions of which could be converted to a recreational trail.

1.1.2 Project Alternatives

Three alternatives have been developed based on State Environmental Policy Act (SEPA) requirements and the applicant's stated project objectives: No Action Alternative, PCI Plan Application Alternative, and Alternative 1. The purpose of an alternative in an EIS is to provide a comparison to the proposal and to explore opportunities for impact mitigation. While the alternative articulates a theoretically possible development scenario, it is not a plan that is necessarily proposed or desired by the applicant.

1. <u>No Action Alternative</u>

SEPA requires that an EIS contain a No Action Alternative. For the Mill site, "no action" means that the Proposed Action, the PCI Plan (Alternative 2 below), would not go forward and the City would not act on the proposal. Since City policies and regulations require approval of a PCI Plan as a pre-requisite for redevelopment, no redevelopment would occur. Existing on-site uses, including the Dirtfish Rally School and other uses identified in Section 2.2.1, would continue indefinitely, as permitted by the Pre-Annexation Agreement. While redevelopment is likely at

some point in the future, it is not assumed in the near term or in the context of the current proposal. The No Action Alternative in the EIS primarily serves as a baseline against which the proposal and other alternatives can be measured.

2. PCI Plan Alternative

This alternative would be substantially similar to the submitted PCI application, with the exception of the outdoor performance space. The outdoor performance space would be eliminated in this alternative at the request of the applicant. This alternative is described under "Proposed Action" above. Table 1.1-1 below provides approximate land use totals for each of the planning areas for the proposed development (PCI Plan Alternative).

TABLE 1.1-1
SNOQUALMIE MILL DEVELOPMENT PLAN
PCI PLAN ALTERNATIVE
(Gross Leasable Area/Gross Acres[1])

	Planning Areas			
Land Use	**1**	**2**	**3**	**Site Totals[1]**
Warehouse/Manufacturing	280,000	400,000		680,000
Light Industrial	120,000			120,000
Retail/Restaurant[2]	70,000		25,000	95,000
Residential (Mixed-Use)[3]	134,000			134,000
Office/Campus	--	--	800,000	800,000
Total	604,000	400,000	825,000	1,829,000
Building Footprint/Gross Area	13 acres	9 acres	19 acres	40 acres
Open Space[4]	65 acres	28 acres	64 acres	157 acres
Roads/Other Impervious[5]	24 acres	19 acres	21 acres	65 acres
Total Area	101 acres	56 acres[6]	104 acres	261 acres

[1] Numbers rounded.

[2] Includes restaurant uses (approximately 15,000 square feet), tasting rooms, specialty retail, and indoor event center space (10,000 square feet).

[3] Assumes 160 residential units located on the second floor through fourth or fifth floors of mixed-use buildings in Planning Area 1. Units would be rental, market rate, in a mix of one- and two-bedroom apartments.

[4] Total open space includes wetlands, streams and their associated buffers; constructed wetlands; landscaped areas; undeveloped land used for compensatory flood storage, habitat and passive open space; active open spaces including public plazas and lawn areas, small outdoor spaces adjacent to individual buildings (26 acres); and the portion of Planning Area 1 subject to a conservation easement (32 acres of proposed Lot 5).

[5] Includes roads, sidewalks, parking areas, etc.

[6] Approximately 15 acres in the northern portion of Planning Area 2 is currently located within unincorporated King County. This area would be annexed to the City prior to development; most of the area would be retained as open space.

3. Alternative 1

An alternative redevelopment program is shown in Table 1.1-2 below. The alternative includes 1.85 million square feet, which is generally comparable to the proposal (Table 1.1-1), but with a different land-use mix and emphasis. Open space and building/impervious site coverage would be comparable to the proposed PCI Plan – 60 percent and 40 percent, respectively. Building layout in Planning Area 1 would also be comparable to the proposed PCI Plan. Holding development amount and site coverage constant is intended to help focus on the environmental effects of changing land uses.

Land use would be predominantly warehouse; combined with manufacturing and light industrial use, these land-use categories would comprise 80 percent of total development, compared to 45 percent for the PCI Plan. Compared to the Proposed Action, retail and office uses would be reduced, and a smaller indoor event space would be developed. Residential uses would be less than the PCI Plan. Compared to the proposed PCI Plan, total development in Planning Area 1 would be less and development in Planning Area 3 would be somewhat greater.

Alternative 1 (Alternative 1) includes an outdoor performance space in Planning Area 3. It assumes approximately 3.7 acres of landscaped open space with a constructed stage, with capacity for approximately 5,000. Planning Area 3 is not expected to develop until the latter stages of site development.

Alternative 1 could generate approximately 42 percent fewer jobs compared to the PCI Plan (1,550 compared to approximately 3,350 jobs for the proposal) which is a result of the lower employment associated with warehouse and industrial uses compared to office uses. In terms of environmental consequences, fewer jobs would also result in reduced impacts to many elements of the environment, including traffic, water consumption, public services and facilities, and utilities.

TABLE 1.1-2
ALTERNATIVE 1
(Gross Square Feet)

	Planning Areas			
Land Use	**1**	**2**	**3**	**Site Totals[(1)]**
Warehouse/Mfg	291,000	390,000	715,000	1,396,000
Lt. Industrial	96,000			96,000
Retail/Restaurant	82,000	0	0	82,000
Office	0	0	156,000	156,700
Residential[(2)]	104,000	0	0	104,000

Land Use	Planning Areas			Site Totals[1]
	1	2	3	
Outdoor Performance Space[3]	0	0	2,000 (stage)	2,000
Event Center	15,000	0	0	15,000
Totals	588,000	390,000	873,000	1,851,700

[1] Numbers rounded.

[2] Assumes 120 market rate rental units in a mix of one- and two-bedroom units, averaging 835 square feet.

[3] Assumes a 3.7-acre landscaped/grass open space area with a permanent stage (2,000 square feet), and a capacity for approximately 5,000. An average of two concerts per week are assumed to occur primarily on weekend evenings from June through September.

1.1.3 Existing Development

Current Site Uses and Facilities

In 2003, the mill was closed and demolition of existing buildings and site cleanup activities began. Several original industrial buildings remain, however, and some are currently used for storage. The old brick Powerhouse, which housed a steam-powered generator, and an associated 211-foot-tall brick stack still exists onsite and is designated as a King County Landmark. Remnants and foundations from numerous buildings are still present, generally on the eastern portion of the site. The hillside (42 acres) contiguous to the site on the east was acquired by King County Parks in 2015 and is planned to become part of the Snoqualmie Valley Trail. This area is not part of the Mill site and is not included in the PCI application.

There are several current uses of the site that will continue in the near term but will be displaced by planned development over time. Ultimate Rally LLC (aka Dirtfish Rally School) has been leasing land for operating a driving instruction school on a portion of the site since 2006. The Dirtfish Rally School uses the site's network of paved and unpaved roads, primarily in the central portion of the site. Associated facilities provide space for storage of equipment and parts, maintenance of vehicles, and an office/classroom building located on the eastern hillside. The site's road system will be modified or displaced over time, and activities curtailed, as phased development occurs.

Other current activities include storage of wood recycling materials, production and storage of topsoil for local construction projects, a bee hive operation, temporary construction staging, and truck storage.

Borst Lake (aka the Mill Pond) is a separate property located south of the Mill site. The pond was excavated and used by Weyerhaeuser for log sorting. The lake is not owned or controlled by the applicant and is not part of the Snoqualmie Mill PCI Plan.

1.1.4 Purpose and Scope

The purpose of this study was to document existing conditions of the Mill site property and immediate surrounding vicinity in terms of soil, geology, groundwater, and geologic hazards, and to evaluate the environmental impacts of the Proposed Action. The information obtained for the characterization of existing conditions was used to identify potential impacts to the affected environments.

Our study included the review of available geologic literature, analysis of previously completed exploration pits, exploration borings, and groundwater wells, visual geologic reconnaissance of the site, review of Light Detection and Ranging (LIDAR) imagery of the region, and evaluation of nearby water well logs. Additional subsurface exploration completed specifically for the current project included advancing one exploration boring and two cone penetrometer tests (CPTs). With this data, the type, thickness, distribution, and physical properties of the subsurface sediments and groundwater conditions were evaluated.

Figure 2 shows proposed Mill site land-use diagrams for the Proposed Action. The locations of monitoring wells and area water wells are shown on Figure 3. Other explorations completed in the vicinity of the subject property are shown on Figure 4.

Exploration boring, exploration pit, and CPT logs completed onsite are included in Appendix A, Off-site boring and well logs are included in Appendix B, laboratory testing results are included in Appendix C, and water level monitoring data is included in Appendix D. Slope stability modeling results are included in Appendix E. Summary tables containing ground surface elevation, depth, and other information are included in relevant appendices. This report summarizes our findings, opinions, and conclusions.

1.1.5 Literature Review

Associated Earth Sciences, Inc. (AESI) has completed many geologic and groundwater studies at the Mill site and for other nearby projects since the mid-1980's. Subsurface information from these studies include exploration pits, exploration borings, groundwater level data from groundwater monitoring wells in different aquifers, and surface water monitoring data from the Snoqualmie River, Tokul Creek, and the Mill Pond. Aquifer tests were also completed in many of the wells. The following section summarizes the information reviewed for the preparation of this technical report, organized by project.

- Mill Site

AESI previously completed a geotechnical engineering report (AESI, 2012) and an environmental site assessment current conditions report (AESI, 2015a) documenting existing conditions at the site. Work completed on the Mill site included excavation of 32 exploration

pits and advancing 2 exploration borings completed as wells (MW-1 and MW-2). MW-2 was installed as a combination monitoring and dust suppression supply well for the on-site rally school, extending to a depth of 232 feet.

- Tokul Creek Water Rights

AESI completed a hydrogeologic evaluation (AESI, 2010) in support of the temporary (5-year) donation of the Weyerhaeuser's Tokul Creek water right (SWC 180(A)) to the Washington State Trust Rights Program. The 2010 report provides documentation necessary to identify the extent to which the water right was exercised during the 5 years prior to the donation. The study included extensive surface water and groundwater monitoring to characterize hydrogeology at the site and the relation between water levels in the shallow aquifer, deeper aquifers, the Mill Pond, and the Snoqualmie River in relation to the diversion of water from Tokul Creek.

- Snoqualmie Sand and Gravel (previously Milwaukee Pit) - North of the Mill Site

Between 1986 and 1991, 16 exploration borings (EB and SS&G) were drilled for previous studies by AESI at the Snoqualmie Sand and Gravel Pit. Monitoring wells were installed in three of the borings (SS&G#3, EB-B4W, and EB-C1W), and production wells were installed in two of the borings (SS&G#1 and SS&G#2). Studies completed at the Snoqualmie Sand and Gravel Pit are described briefly below.

    - 1986 sand and gravel evaluation for the Milwaukee Pit (AESI, 1986), which included drilling of two exploration borings (EB-1 and EB-2, later re-named well SS&G#1), laboratory testing, and pump tests.

    - Several studies (AESI, 1991, 1993a, 1993c) completed for the expansion of the Snoqualmie Sand and Gravel Pit, which included completion of multiple exploration borings and groundwater wells, refractive seismic analyses, and the pump testing of wells in both the Deep Aquifer (well SS&G#2) and Tokul Creek Delta Aquifer (well SS&G#3).

    - 2001 study (AESI, 2001) to assess the impacts of the proposed bedrock mining at the Snoqualmie Sand and Gravel Pit, using information in the exploration pits, borings, and wells completed for the previous studies described above.

- Snoqualmie Shallow Aquifer Analysis

AESI completed an analysis of the shallow Snoqualmie River Aquifer (AESI, 1993b) for the Snoqualmie Falls Hydroelectric Project. The purpose was to study the impacts of changes to the Snoqualmie River stage on the groundwater levels in the adjacent floodplain and terraces due to the Snoqualmie Falls Hydroelectric Project. The study included the installation of many shallow groundwater monitoring wells around Snoqualmie, two of which (EB-3 and EB-4) were

installed on the Mill site. An extensive database of periodic shallow groundwater level monitoring extended from 1992 to 2003 for most of the wells. AESI currently monitors EB-4 at the Mill site.

- Snoqualmie North Well Field

Various studies (AESI, 1990, 1993d, 1994, 1996) were completed by AESI in support of the Snoqualmie Ridge North Well Field (NWF), subsequently transferred to the City of Snoqualmie, located just north of the Mill site. The work included the installation and pump testing of various water supply wells (including TW-6, TW-7, and TW-8). A groundwater flow model was developed to delineate a wellhead protection area for the NWF and estimate potential impacts to both deep and shallow aquifers and surface water due to pumping at the NWF. The extensive aquifer testing and flow modeling was required to obtain water rights from the Washington State Department of Ecology, and source approval from the Department of Health.

- Snoqualmie South Well Field

Studies were completed by AESI and others (AESI, 1995c; GeoEngineers, 1995; Gray & Osborne, Inc., 2005) at the Snoqualmie South Well Field (SWF), south of the Mill site. Work included installation of deep water supply wells, aquifer testing, and development of a groundwater flow model to delineate a wellhead protection area for the SWF and evaluate impacts to deep and shallow aquifers and surface water due to pumping at the SWF.

- Snoqualmie Waste Water Treatment Plant

AESI completed a hydrogeology and water quality evaluation for the proposed Snoqualmie Waste Water Treatment Plant (WWTP) project (AESI, 1995a) just northwest of the site. Work included installation of monitoring wells and analysis of groundwater samples to evaluate impacts to groundwater quality for the proposed expansion of the WWTP. AESI also completed a geotechnical engineering report for the WWTP (AESI, 1989), which included completion of exploration pits and borings on the WWTP site.

- Mount Si High School

AESI completed geotechnical engineering reports for the Mount Si High School, south of the Mill site, and immediately adjacent to the SWF (AESI, 2004b, 2015b, 2017). Our work included completion of exploration borings and cone penetrometer tests (CPTs) at the site as well as development of a stone column ground improvement system for support of building foundations. Pacific Groundwater Group completed studies (Pacific Groundwater Group, 2009, 2010) to evaluate the feasibility of a groundwater heat-pump system at Mount Si High School. The work included completing a groundwater flow model for the Deep Aquifer and installation of three deep wells for the heat-pump system. Aquifer testing was also completed on the wells.

1.2 AFFECTED ENVIRONMENT

Subsurface conditions at the Snoqualmie Mill site (Mill site) were inferred from AESI's extensive previous hydrogeologic and geotechnical studies as described under Section 1.1.5, including on-site and off-site explorations by AESI and others. Available subsurface exploration completed for this study was augmented by data obtained from other nearby projects, including the Snoqualmie Waste Water Treatment Plant (WWTP), Snoqualmie Sand and Gravel Mine (SSG), Snoqualmie Shallow Aquifer study (SSA), Snoqualmie North Well Field (NWF), Snoqualmie South Well Field (SWF), and others. AESI previously completed a geotechnical report (AESI, 2012) and environmental site assessment (AESI, 2015a) for the Mill site.

We also inferred subsurface conditions from our visual reconnaissance of the site and surrounding areas, and from our review of applicable geologic literature, LIDAR maps, and other pertinent documents.

1.2.1 Soils

Soils on the site formed primarily over post-glacially deposited alluvial sediments; and therefore, have not had sufficient time to develop the deep weathering profiles present in soils of many unglaciated terrains. Instead, they exhibit a direct relationship to the underlying parent material, local climate, and vegetation.

The soil types identified on the site are extrapolated from the United States Department of Agriculture (USDA) Soil Conservation Service (SCS), subsequently identified as the Natural Resources Conservation Service (NRCS), and the geologic information obtained from the exploration pits. In general, four major soil types were identified on the Mill site, and two minor soil units were also mapped by the SCS onsite. An additional unit, the Tokul Series located immediately offsite to the east, is described due to proximity and topographic (upslope) position. These units include:

- Arents
- Barneston Series
- Nooksack Series
- Edgewick silt loam
- Tokul Series
- Seattle Muck

The locations of these soils are graphically illustrated on Figure 5 and are described in detail below. The extent of the soils shown on the figure are based on mapping by the SCS. Based on extensive subsurface exploration, SCS-mapped soil extents were edited to more closely match site-specific conditions. Topographic gradients which typically subdivide each soil series into subunits have been combined on the map to simplify presentation.

Arents

Arents soils are mapped over the majority of the central, eastern, and southeastern areas of the site. These soils are described by the SCS as moderately deep to very deep, moderately well drained to somewhat excessively drained soils formed in a mixture of volcanic ash and a variety of other deposits. They occur over various types of environments at slopes ranging from 0 to 8 percent. No single profile is representative of these soils, and they are typically disturbed, having been used for mill yards, sorting yards, mills, dams, or old towns. Permeability in the Arents soils is considered to be moderate or moderately rapid. Runoff is slow, and the hazard of water erosion is slight.

Barneston Series

The Barneston gravelly coarse sandy loam is composed of excessively drained soils that typically form over glacial outwash. These soils are characterized by dark grayish brown gravelly coarse sandy loam 9 inches thick. The subsoil is dark yellowish brown very gravelly sandy loam 5 inches thick. The upper 7 inches of the substratum is dark brown extremely gravelly sand. The lower part to a depth of 60 inches is dark yellowish brown extremely gravelly sand.

The Barneston Series soils were mapped by the SCS at the northeastern corner of the site along the southern edge of the Tokul Delta, adjacent to the Snoqualmie Sand and Gravel Mine. Due to its high permeability, surface runoff within the Barneston Series soils is considered slow, and erosion hazards are considered low to moderate on gentle slopes as surface water has more of a tendency to percolate downward.

Edgewick Silt Loam

The Edgewick silt loam is mapped by the SCS in a very small area at the far southeastern corner of the site. This unit is composed of well drained soils on river terraces. These soils are characterized by an 8-inch-thick surface layer of dark brown silt loam. The subsoil is olive brown silt loam 12 inches thick. The upper 13 inches of the substratum is olive brown fine sandy loam. The next 13 inches is olive brown loamy sand. The lower part to a depth of 60 inches is dark grayish brown very gravelly sand. Permeability in the Edgewick silt loam is considered to be moderate. This soil is subject to occasional, brief periods of seasonal flooding. Channeling and deposition are common along streambanks.

Nooksack Series

The Nooksack silt loam is mapped on the western and northwestern areas of the site. This soil series consists of moderately well drained soils formed in alluvium on floodplains and river terraces. Typically, these soils are characterized by a very dark grayish brown silt loam 11 inches thick. The subsoil is dark grayish brown silt loam 18 inches thick. The substratum to a depth of 60 inches is dark grayish brown and grayish brown silt loam. Surface runoff is generally very

slow, and erosion hazard is generally low due to the very low slope gradient (typically 0 to 2 percent).

Seattle Muck

The Seattle Muck is mapped by the SCS in a very small area just west of Wetland 10 at the north end of the Mill site. The Seattle Muck very deep, very poorly drained soil is in depressions in river valleys. Typically, the surface layer is dark brown muck 8 inches thick. The underlying material to a depth of 60 inches is dark brown and black, stratified highly organic soil. Permeability is moderate in this soil. Runoff is very slow, and there is little to no hazard of erosion.

Tokul Series

The Tokul gravelly loam is a moderately deep, moderately well drained, nearly level to very steep soil in areas underlain by glacially derived deposits. These soils are mapped on the slopes just east of the Mill site. These soils are characterized by brown and grayish brown, gravelly loam up to about 60 inches in depth developed over a substratum of dense glacial till.

Permeability in the Tokul Series is considered to be moderate in the surface layer and subsoil, becoming very slow to nil in the underlying till. Runoff is slow. Sheet and concentrated flow erosion hazards are considered to be low for slopes under about 20 percent and moderate to high for slopes over about 20 percent.

1.2.2 Regional Geologic Setting

The project site lies within the Puget Sound Lowland, which is a broad topographic and structural basin extending generally north-south between the Cascade Range on the east to the Olympic Mountains on the west. The project site was part of several previous geologic studies including AESI (2010, 2012, 2015a), Turney et al. (1995), Booth (1990), Frizzell et al. (1984), Tabor et al. (1993), and Dragovich et al. (2009b).

The geology in the vicinity is complex with a wide range of geologic units exposed in close proximity to the site. Geology in the vicinity of the site is shown on Figure 6 and geologic cross-sections are shown on Figures 7 through 10. Based on the referenced geologic mapping and AESI's previous work in the area, two erosional valleys incised into Tertiary-age bedrock have been identified in the area. The ancient Snoqualmie River established a course through a bedrock valley in the immediate vicinity of the site (Figure 11). One of these paleovalleys is located under the present-day Lake Alice Plateau, south and west of the current Snoqualmie River and west of the Mill site (Figure 11).

The bedrock valleys have been filled by a series of younger, Quaternary-age sediments. These sediments accumulated as a result of alternating glacial and non-glacial deposition. Ice

advanced southward from British Columbia into the Puget Lowland multiple times within the last 2 million years. The ice was part of the widespread Cordilleran continental ice sheet that covered much of northwestern North America and periodically extended down into the Puget Sound as a broad, tongue of ice commonly referred to as the Puget Lobe. In addition to the erosion and scouring of the Lowland, the Puget Lobe deposited a variety of glacial sediments, including outwash sand and gravel from meltwater streams, proglacial lacustrine silts and clays, deltaic sediments deposited in ice-dammed lakes, and glacial till deposited at the base and along the margins of the active glacial ice. Mountain glaciers also extended down the major river valleys such as the Snoqualmie, scouring the landscape and depositing sediments. During interglacial periods, erosion and deposition occurred primarily through the action of river systems flowing to the northwest, most notably the Snoqualmie River in the vicinity of the project. Non-glacial sediments were deposited in a wide variety of environments and include fluvial sands and gravels, lacustrine silt/clay, and peat.

During the retreat of the Vashon-age ice, a proglacial lake formed in the ancient Snoqualmie River valley. Meltwater from the receding ice sheet created a prograding delta system at Tokul Creek. This resulted in vast quantities of Vashon-age recessional sand and gravel deposited in what has been referred to in the geologic literature as the Tokul Creek Delta. This delta is located just north of the Mill site and is the source material for the Snoqualmie Sand and Gravel Pit. The delta forms a relatively level bench near elevation 550 feet and covers approximately 1.5 square miles. This thick deltaic sequence prevented the Snoqualmie River from re-establishing its pre-ice course, resulting in the development of post-glacial Lake Snoqualmie in the vicinity of the Mill site, resulting in the deposition of lacustrine silts and clays. The outlet for Lake Snoqualmie was diverted by the delta to the location of the present-day Snoqualmie Falls.

1.2.3 Site Geology/Stratigraphy

The primary geologic units interpreted to be present at the site or in the vicinity of the site include the following:

1. Tertiary Bedrock;
2. Olympia and pre-Olympia-age undifferentiated deposits;
3. Vashon Stade deposits - advance outwash, lodgement till, and recessional deposits (including the Tokul Creek Delta); and
4. Holocene (Recent) deposits

A map showing surficial geology in the project vicinity is presented on Figure 6. AESI's interpretation of the subsurface conditions are shown on Cross-Sections A-A' and B-B' (Figures 7 through 10). Both cross-sections are subdivided into two separate figures covering the span of each section. The information presented on these cross-sections is a combination of geologic mapping, subsurface data obtained from our explorations for this project, explorations that we completed for previous projects in the vicinity, and explorations completed by others.

These cross-sections are discussed further in subsequent parts of this report in context with specific geologic units and groundwater conditions.

Many explorations have been completed by AESI on the Mill site and other projects in the vicinity since the late 1980's. In order to differentiate between AESI explorations at different sites with the same name, suffixes have been added to exploration names in this report as needed. These include the following: "MS" for the Mill site, "WWTP" for the expansion of the Snoqualmie WWTP (northwest of the site), "SSG" for Snoqualmie Sand and Gravel (north of the site), "NWF" for the Snoqualmie Ridge North Well Field (north of the site), "SWF" for the South Well Field (south of the site), and "SSA" for the Snoqualmie Shallow Aquifer analysis (both on- and offsite).

The following section presents more detailed subsurface information organized from the oldest (deepest) to youngest (shallowest) sediment/bedrock types encountered in the explorations completed for the project.

Bedrock

Surface exposures of bedrock in the vicinity of the site can be observed at Snoqualmie Falls to the northwest, along Tokul Creek to the north and northeast. Bedrock in the area has been mapped by Tabor et al. (1993), Frizzell et al. (1984), and Dragovich et al. (2009b) as primarily volcanic in origin. Volcanic rocks exposed north and northeast of the Mill site in the Tokul Creek valley are late-Eocene in age (47 to 36 million years ago [Ma]) and have been interpreted to be volcanic rocks of Mount Persis (Tabor et al., 1993). These rocks are described as porphyritic andesite flows, andesite to dacite breccia, dacite to rhyolite tuff, and minor interbedded lithic sandstone, tuffaceous siltstone, and conglomerate, and rare basalt. These Eocene rocks unconformably overlie older Cretaceous to Jurassic-age (with dated ages ranging from about 96 to 147 Ma) western mélange belt metasedimentary rocks, consisting of metamorphosed sandstone, tuff, conglomerate, and argillite, which are exposed northeast and east of the site.

Younger Miocene-age (dated to about 18 to 23 Ma) volcanic rocks are exposed at the surface north and northwest of the site, particularly at Snoqualmie Falls and along the lower section of Tokul Creek. These Miocene rocks consist of andesite to trachyandesite flows and lithic tuff breccia with minor lahars and rare vitric tuff. They form a bedrock topographic high near Snoqualmie Falls, which has been interpreted to represent an ancient Miocene volcanic center. The Miocene rocks are faulted against the older Eocene volcanic rocks along the Snoqualmie Valley Fault, which is mapped to lie along the eastern edge of the site (Dragovich et al., 2009b). The Snoqualmie River flows over the relatively resistant Miocene bedrock forming Snoqualmie Falls, situated approximately 2,300 feet west-northwest of the Mill site.

Bedrock was encountered in explorations completed for the Snoqualmie Sand and Gravel Pit (AESI, 1993a, 2001) just north of the Mill site, including borings EB-A1 through EB-A3 (Figure 4) at various elevations (ranging from about 460 feet to 604 feet). North of the project site, the

upper surface of the bedrock was encountered during drilling of the wells for the NWF (TW-5 through TW-8) at elevations ranging from about minus 190 feet to minus 120 feet (AESI, 1994). Just northwest of the Mill site, bedrock was encountered during drilling at the City of Snoqualmie WWTP at an elevation of about 358 feet in OBW-2 (AESI, 1995a). Bedrock was not encountered in any of the explorations completed on the Mill site. Where observed, all bedrock extended below the termination depth of the explorations.

The variations in relief of the top of the bedrock corresponds with erosional bedrock valleys of the ancestral Snoqualmie River (Figure 11). Evidence for the valley include subsurface exploration, seismic reflection profiles (Liberty, 2009), and gravity analysis near the site and west of the site at Snoqualmie Ridge (AESI, 1987, 1988a, and 1995b).

Pre-Olympia Deposits

Pre-Olympia undifferentiated deposits, consisting of laminated to massive silt, clay, sand, gravel, and clayey diamicton, have been documented in limited areas surrounding the site. These sediments have been mapped from discontinuous surface exposures in areas to the west and east of the city of Snoqualmie (Dragovich et al., 2009b). Current evidence suggests that these sediments have a limited distribution. The pre-Olympia-age deposits include both glacial and non-glacial sediments. The exact age of these sediments are unknown; however, because of their stratigraphic position beneath Olympia-age deposits (see below) in areas, they are considered to be greater than 60,000 years. These sediments are generally dense since they have been glacially consolidated.

In addition to the limited surface exposures, pre-Olympia glacial sediments have been documented within test wells drilled by AESI at the NWF (Figure 7) and on the Lake Alice Plateau for the Snoqualmie Ridge project (AESI, 1987, 1995b) within the western, ancestral Snoqualmie River paleovalley, west of the site (Figure 11).

Pre-Olympia to Olympia-age (described below) sediments were also encountered in wells TW-5, TW-6, TW-7, and TW-8 completed for the NWF just north of the Mill site (AESI, 1994, 2004a) within the eastern, ancestral Snoqualmie River paleovalley (Figure 11). At the locations of TW-5, TW-6, TW-7, and TW-8 the pre-Olympia/Olympia deposits directly overlie bedrock.

Olympia/Pre-Olympia Non-Glacial

Surface exposures of Olympia to pre-Olympia-age sediments have been mapped extensively to the west of Snoqualmie (Dragovich et al., 2009b). Olympia-age sediments accumulated in non-glacial alluvial/fluvial environments prior to the Fraser Glaciation. The upper boundary of the Olympia sediments varies significantly in age since it represents the top of a southward migrating facies boundary at the limit of direct influence of the advancing Cordilleran ice sheet. Measured ages for Olympia-age deposits range from about 15,000 to 60,000 years ago (Troost, 2016). They were deposited in a wide variety of non-glacial environments and range from

lacustrine silts and clays, fluvial sand and gravel, and occasional organics. These sediments are generally dense since they have been glacially consolidated.

Olympia/pre-Olympia sediments have been observed in various borings, wells, and exploration pits completed by AESI for other off-site, nearby projects. Based on well log data at the NWF (TW-5, TW-6, TW-7, and TW-8) and SWF (well nos. 1, 1-R, and 2), Olympia or pre-Olympia deposits directly overlie bedrock within the paleovalley in the vicinity of the Mill site.

Pre-Vashon non-glacial deposits that are likely to be Olympia in age were encountered in explorations EB-A7 and EB-A8 at the Snoqualmie Sand and Gravel Pit, just north of the Mill site. The upper surface to this material ranged from approximately elevation 497 feet in EB-A7 to elevation 265 feet in EB-A8. The non-glacial deposits were observed to extend below the termination depth of the explorations. The non-glacial deposits varied in composition but generally consisted of highly oxidized, sandy gravelly silt, equigranular fine sand and organic-laden silt with localized sand and gravel lenses, and silty fine sand to sandy silt.

The one deep subsurface exploration (MW-1) at the Mill site indicates that older overbank and river channel deposits related to the Snoqualmie River directly underlie the lacustrine deposits. These older deposits were interpreted to be pre-Vashon and may be Olympia in age. These deposits consisted of fine sand with silt and clay (overbank) and gravel and fine to coarse sand (channel). These deposits were about 30 feet thick where encountered in boring MW-1 and at a depth of about 200 feet (elevation of about 220 feet).

Radiocarbon dating has been performed on selected samples from various wells completed by AESI at the Mill site and vicinity since the 1990's. Samples from pre-Vashon sediments were tested from wells TW-8 at the NWF and City of Snoqualmie well no. 2 at the SWF. The results of radiocarbon dating are summarized in Table 1.2-1. The oldest age date that can be reliably measured using radiocarbon dating techniques varies somewhat based upon the method and sample preservation history but is generally up to 50,000 years. The reported dates from the samples in Table 1.2-1 were all older than maximum age limit, which in this case ranged from about 40,000 to 42,000 years ago. Therefore, these non-glacial sediments may either represent older Olympia-age deposits (Olympia-age deposits range from approximately 15,000 to 60,000 years ago), or they may represent older pre-Olympia non-glacial sediments.

TABLE 1.2-1
RADIOCARBON DATING SUMMARY
OLYMPIA - PRE-OLYMPIA DATES

Project	Exploration	Sample Depth (feet)	Sample Elevation (feet)	Material Tested	Calibrated BP ^{14}C Age
South Well Field	City Well #2	474	-52	Wood	> 41940
North Well Field	TW-8	245	260	Wood	> 41240
North Well Field	TW-8	395	110	Wood	> 40380

Dates are reported as radiocarbon years before present (BP), where present is defined as 1950 AD by convention.
Conventional dates were calibrated using OxCal 4.3 using the calibration curve IntCal 13.
Radiocarbon dating performed by Beta Analytic, Inc.

Vashon Stade Deposits

The Vashon sediments described below were deposited during the Vashon Stade of the Fraser Glaciation. The Fraser Glaciation began about 25,000 years ago with the expansion of alpine glaciers, which coalesced to form the Puget Lobe that gradually advanced southward, eventually reaching the north Washington border about 18,000 years ago and reaching the Seattle area by about 17,000 years ago (Haugerud et al., 2017). Its maximum extent south of Olympia occurred approximately 16,000 years ago, after which the ice stagnated and retreated rapidly to the north (Troost, 2016).

The Fraser Glaciation was the last major continental glaciation of the region. Much of the existing geomorphology around the project area was created by processes related to the Vashon-age glacier, and these units dominate the near-surface geology in the upland areas surrounding the site.

Vashon Advance

During the advance of the Vashon ice sheet, an ice-dammed lake formed in the ancient Snoqualmie River valley. A high-energy river flowing southward from the ice sheet deposited a delta in the proglacial lake downstream of the glacier. Deltaic sediments of advance gravelly sand and sandy gravel overlain by fine to medium sand and cobbley sandy gravel represent deltaic foreset beds and topset beds (AESI, 1987). This unit was observed primarily by AESI west of the Mill site in explorations completed for the Snoqualmie Ridge development (AESI, 2003). Foreset bedding was well exposed in a gravel pit located in the vicinity of Snoqualmie Ridge as well as in excavation completed during development of the site. The thickness of this unit is expected to approach 150 feet along the northern flank of the Lake Alice Plateau. Non-deltaic Vashon advance sediments were also deposited by meltwater streams and on the margins of

the delta complex (AESI, 1987). Vashon advance silt and clay was deposited in a low-energy environment, and may represent lacustrine sediments of the proglacial lake that formed in the Snoqualmie River valley.

Vashon advance deposits are exposed at the ground surface on the northern slopes of the Lake Alice Plateau west of the Mill site and on upland slopes surrounding the Mill site. Surface exposures of the advance lacustrine sediments are mapped in various areas surrounding the site, generally underlying the coarser-grained advance outwash or deltaic deposits. In the immediate vicinity of the site, Vashon advance outwash deposits overlying advance lacustrine deposits are mapped on the slopes along the eastern margin of the Mill site (Dragovich et al., 2009b).

Vashon advance deposits were observed in limited explorations in the immediate vicinity of the Mill site. For example, advance outwash was encountered in OBW-1 completed for the Snoqualmie WWTP (AESI, 1995a) just north of the Mill site at a depth of about 20 feet overlying bedrock and underlying Vashon lodgement till. Vashon advance sediments were not observed in any of the explorations completed onsite. MW-1 completed in the southeastern area of the site encountered recent (Holocene) river channel and lacustrine deposits directly overlying older Snoqualmie River alluvium, interpreted as pre-Fraser (possibly Olympia) in age, with no intervening Vashon-age deposits.

Vashon Lodgement Till

Vashon lodgement till consists of an unsorted mixture of silt, sand, gravel, cobbles, and occasional boulders deposited at the base of the Vashon-age ice sheet. As a result, the till has been consolidated into a very dense condition by the massive weight of glacial ice. Vashon lodgement till deposits are extensive and mapped across much of the upland surrounding the Mill site. They are one of the predominate surficial deposits throughout the topographically higher upland areas that surround the Mill site, which is characterized by elongate, generally northwest-southeast-trending hills and swales that parallel the flow direction of the Vashon-age ice sheet.

Vashon lodgement till was not encountered in any explorations completed at the site except for EP-1000 completed at the site's northeastern corner near the toe of the eastern slopes. This pit encountered medium dense to dense silty fine to medium sand with gravel underlying the existing fill that was interpreted to be lodgement till. The till extended to the full depth explored of about 7 feet at this location. The till is expected to be absent underneath the majority of the site.

Vashon till was encountered in limited areas directly overlying the bedrock just north of the Mill site in explorations completed for the Snoqualmie Sand and Gravel Pit and just northeast of the site at the Snoqualmie WWTP project. Lodgement till is exposed at the surface on the slopes just east of the site, overlying Vashon advance outwash (Dragovich et al., 2009b).

Due to the large amount of fine-grained sediment and relative high density, unweathered Vashon till generally has a very low permeability and is considered a barrier to groundwater flow.

Tokul Creek Delta

As the Vashon ice sheet receded following the ice maximum, a proglacial lake again formed in the ancient Snoqualmie River valley. Meltwater from the receding ice sheet created a prograding delta system at Tokul Creek. This resulted in vast quantities of Vashon-age recessional sand and gravel deposited in what has been referred to in the geologic literature as the Tokul Creek Delta. This delta is located just north of the Mill site and is the source material for the Snoqualmie Sand and Gravel Pit. Exploration borings completed at the sand and gravel pit indicate that the delta deposits are up to about 280 feet in this area (AESI, 1986, 1988b, 1993a, 2001). The delta forms a relatively level bench near elevation 550 feet and covers approximately 1.5 square miles.

The recessional rivers eroded older sediments and in most areas the Tokul Creek Delta deposits directly overlie older pre-Vashon deposits. The delta onlaps bedrock under some areas of the Snoqualmie Sand and Gravel Pit to the north of the Mill site and just east of Snoqualmie Falls, northwest of the Mill site (Figure 9).

The thick deltaic sequence prevented the Snoqualmie River from re-establishing its pre-ice course, resulting in the development of post-glacial Lake Snoqualmie in the vicinity of the Mill site. The outlet for Lake Snoqualmie was diverted by the delta to the location of the present-day Snoqualmie Falls. Medium dense sand, interpreted to be deposits of the Tokul Creek Delta, was encountered at a depth of approximately 55 feet in both EB-1 and CPT-1 completed near the northeast corner of the Mill site (Figure 4) underlying lacustrine sediments that were deposited in post-glacial Lake Snoqualmie. In general, this deltaic sand is expected to be present at depth underneath the northern portion of the site. The deltaic deposits are interpreted to pinch out to the south (Figure 7).

Recent (Holocene) Deposits

As described previously, the thick Tokul Creek deltaic sequence prevented the Snoqualmie River from re-establishing its pre-ice course, resulting in a lake within the valley. Recent, also termed Holocene-age (<10,000 years old), lacustrine silts and clays were subsequently deposited within this lake. Once the lake filled with sediment, a fluvial environment established the modern-day Snoqualmie River. Recent Snoqualmie River channel deposits, generally consisting of gravelly sand, and overbank floodplain silts and clays were deposited on the fine-grained lacustrine sediments. The recent Snoqualmie River deposits are limited to the modern Snoqualmie River valley and underlie the Mill site at shallow depths, directly underlying recent fill material.

The units encountered in the exploration borings and exploration pits onsite are consistent with sediments deposited in channel and overbank environments of a meandering river system. The present-day meandering Snoqualmie River channel occupies a small part of its alluvial plain, and lies within a meander belt which consists of a complex of active channels, abandoned channels, and near-channel environments. Through time, the meander belt shifts its position on the alluvial plain forming a complex pattern of juxtaposed environments resulting in abrupt changes in grain size vertically and laterally throughout the system. The near-surface deposits may range from channel deposited sands and gravels, overbank silts, and/or lacustrine silt/clays within relatively short distances both laterally and vertically.

Recent alluvium is present beneath the entire site, except for the limited sloping areas near the project boundary on the northeastern and eastern margins of the site. The vast majority of the site lies within the floodplain of the Snoqualmie River and is underlain by Holocene alluvium at relatively shallow depths just below the existing fill. The depositional environment of the near-surface deposits (just below the fill) range from river channel, overbank deposits, and lacustrine sediments. Figure 6 shows AESI's interpretation of the extent of these depositional environments of the native material just below the existing fill onsite. The river channel deposits are limited to a relatively small area on the eastern portion of the site and are interpreted to be the result of deposition by a smaller stream that had crossed the Mill site prior to development of the original Mill site. The existing stream (S-1) enters the north end of the site and is diverted into a system of conveyance swales just after entering the site. The stream is routed to the northwest corner of the site, and ultimately discharges to the Snoqualmie River.

Recent sediments were encountered to depths ranging from about 55 to 60 feet near the northwest corner of the site (at the locations of EB-1 and CPT-1), where they overlie sand interpreted to represent deposits of the Tokul Creek Delta. The recent alluvium is interpreted to be substantially thicker to the south and east, farther from the delta. CPT-2 on the eastern side of Planning Area 1 encountered alluvium to the full depth explored of 80 feet.

Based on deeper explorations completed onsite, the near-surface fluvial and floodplain deposits overlie a thick section of lacustrine silts and clays deposited in post-glacial Lake Snoqualmie. MW-1 completed near the south end of the site encountered lacustrine sediments between approximately 40 and 200 feet in depth. Older Snoqualmie River deposits interpreted to represent pre-Fraser non-glacial fluvial sediments were encountered beneath the lacustrine sediments. Deep borings completed for other projects in the vicinity of the site also encountered lacustrine deposits. For example, the City of Snoqualmie well no. 2 at the SWF, located approximately 4,000 feet south of the site just south of the Snoqualmie River, encountered recent lacustrine deposits to a depth of about 290 feet overlying pre-Fraser sediments. The lacustrine deposits form a significant hydraulic barrier to vertical ground water flow beneath the Mill site.

Radiocarbon dating was performed on selected samples from various wells completed by AESI at the Mill site and vicinity since the 1990's. Samples from Holocene sediments were tested from MW-1 completed onsite, City of Snoqualmie well no. 2 at the SWF, EB-1 from the Kimball Creek Pump Station, and EB-2 from Mount Si High School. The results of radiocarbon dating are summarized in Table 1.2-2. The ages generally range from 8840 years before present (BP) at an elevation of 227 feet to 3210 years BP at an elevation of 392 feet. The trend of younger dates at shallower elevations reflects the gradual sedimentation and filling of post-glacial Lake Snoqualmie over time.

TABLE 1.2-2
RADIOCARBON DATING SUMMARY
RECENT DEPOSITS

Project	Exploration	Sample Depth (feet)	Sample Elevation (feet)	Material Tested	Calibrated BP ^{14}C Age
South Well Field	City Well #2	95	327	Charred Material	6530 (±140)
Mill Site	MW-1	37.5	383	Wood	6310 (±40)
Mill Site	MW-1	194	227	Wood	8840 (±150)
Kimball Creek Pump Station	EB-1	25	392	Wood	3210 (±200)
Mount Si High School	EB-2	45	375	Organic Sediment	6820 (±80)
Mount Si High School	EB-2	45	375	Plant Material	6720 (±70)
Mount Si High School	EB-2	65	355	Plant Material	6720 (±70)

Dates are reported as radiocarbon years before present (BP), where "*present*" is defined as 1950 AD by convention.
Conventional dates were calibrated using OxCal 4.3 using the calibration curve IntCal 13.
Radiocarbon dating performed by Beta Analytic, Inc.

Existing Fill

Fill material was placed across the property at various times in the past to accommodate mill operations. Existing fill was encountered in all of the explorations completed at the site. Several exploration pits were terminated in existing fill without encountering the underlying native sediments, and therefore the full depth of fill at those locations was not measured. In general, the fill is thinner (3 to 4 feet) in the east beneath the primary Mill site area and thickens to the west (9 to 16 feet) toward the Snoqualmie River.

The existing fill was of variable composition, generally characterized by loose to medium dense sand with gravel, silt, cobbles, and boulders. Woody debris, including logs, dimensional lumber, and sawdust, was also frequently observed over wide areas and in substantial thicknesses.

Other materials encountered in the existing fill included buried intact asphalt-cement-paved surfaces, crushed rock, metal and wood stave pipes, ash, geotextile fabric, steel, asphalt rubble, and other similar materials.

There is a large pile of wood debris over 20 feet in height in the north-central portion of Planning Area 3. Exploration pit EP-1005 was completed approximately in the center of the log pile. The existing wood waste and other fill extended to the full depth of the exploration pit, approximately 15 feet.

1.2.4 Hydrogeology

This section of the report provides information on surface water and groundwater resources. The hydrogeology study for the property included a review of existing literature and an extensive array of groundwater wells to acquire information on the regional groundwater regime. This data was used in conjunction with the subsurface explorations and visual field reconnaissance. Copies of the water wells logs are presented in Appendices A and B. The locations of these wells are shown on Figure 3.

Surface water features in the vicinity of the site include on-site wetlands, on-site streams, the Mill Pond south of the site, and the Snoqualmie River west-southwest of the site. A shallow aquifer is present beneath the site, formed within near-surface Snoqualmie River deposits. A deeper aquifer is formed within sand and gravel deposits of the Tokul Creek Delta, which are exposed north of the site. Throughout most of the site, the shallow aquifer is hydraulically separated from the Tokul Creek Delta Aquifer by a thick deposit of recent (Holocene) lacustrine silt and clay.

In general, a groundwater divide is present in the central portion of the Mill site. In the south and western portions of the site, groundwater flows towards the Snoqualmie River and the Mill Pond. In the northern portion of the site, groundwater flows to the north toward the Tokul Creek Delta. The gradient in the shallow aquifer steepens to the north of the site as it merges with the Tokul Creek Delta Aquifer. Ultimately, the groundwater in the Tokul Creek Delta flows to the north and discharges at a spring zone along Tokul Creek, north of the project (Figure 12).

AESI initiated surface water level monitoring at the Mill site from July 2008 to October 2011 to document: 1) water level fluctuations in the Mill Pond due to the Tokul Creek diversion, and 2) the degree of hydraulic connection between groundwater within the Snoqualmie River Shallow Aquifer and surface water within the Mill Pond and the Snoqualmie River. Monitoring stations were established in two wells (EB-1 and EB-4), at a staff gauge in the Snoqualmie River, and a staff gauge in the Mill Pond near the fire flow pump station. In addition, historic data for wells EB-1 and EB-4 and the Mill Pond staff gauge is available from a study of the Snoqualmie River Shallow Aquifer completed as part of Puget Sound Energy's Snoqualmie Falls Hydroelectric Project (AESI, 1993b). As part of the current EIS process for the site, water level monitoring was reinitiated at the Mill Pond, Snoqualmie River, EB-4, and MW-2 onsite and is

currently ongoing. Off-site water level data from various aquifers is also available from different projects near the Mill site, including the NWF, the SWF, SSG, and the Snoqualmie WWTP. Hydrographs of the current and historic water level data are included in Appendix D. Monitoring stations are shown on Figure 3. Data from this surface water and groundwater level monitoring is described further in following sections, where relevant.

The following sections provide detailed information about surface and groundwater onsite and in the vicinity.

Surface Water

The distribution of surface water features on the site is limited to various wetlands, multiple surface water drainage ditches, and six streams. The wetlands, on-site streams, and drainage ditches are described in detail in technical reports prepared for the site by Raedeke Associates, Inc. (Raedeke, 2012) and Cedarock Consultants, Inc. (Cedarock, 2012). In addition to on-site wetlands and streams, significant surface water near the site includes the Mill Pond just south of the site, Tokul Creek north of the site, and the Snoqualmie River located west and south of the site. These different surface water features are described further below.

Snoqualmie River

In the vicinity of the Mill site, the Snoqualmie River flows approximately to the north-northwest just west-southwest of the site. The river flows over the relatively resistant bedrock forming Snoqualmie Falls approximately 2,300 feet west-northwest of the site. The Snoqualmie River watershed upstream of Snoqualmie Falls drains an area of about 375 square miles. Principal tributaries include the North, Middle, and South Forks of the Snoqualmie River. The confluence of the tributaries is in the vicinity of North Bend, about 2 miles southeast of the city of Snoqualmie. The average discharge for the Snoqualmie River just downstream of the falls from 1959 to present was about 2,700 cubic feet per second (cfs) (U.S. Geological Survey [USGS], 2018). Precipitation in the watershed ranges from over 180 inches per year in the Cascades to approximately 60 inches at Snoqualmie (Washington State Department of Ecology [Ecology], 1995).

A water level monitoring station located in the Snoqualmie River upstream of Snoqualmie Falls and downstream of the Mill Pond has been monitored to record Snoqualmie River water levels, for comparison with groundwater levels in the Snoqualmie River Shallow Aquifer, and surface water levels in the Mill Pond. Monitoring stations are shown on Figure 3. Monitoring data are summarized in Appendix D.

Tokul Creek

Tokul Creek flows generally from the northeast to the southwest, flowing into the Snoqualmie River just over ½ mile downstream from Snoqualmie Falls. The creek is located over 5,000 feet

north of the site, where is flows through a steep-walled ravine that is incised with an overall height up to about 350 feet through the Tokul Creek Delta deposits (described previously in this report). According to the WRIA 7 *Salmonid Habitat Limiting Factors Analysis* (Washington State Conservation Commission, 2002), the Tokul Creek watershed drains an estimated 21,704 acres.

Surface water flow in Tokul Creek was monitored to determine groundwater inflow from the Tokul Creek Delta Aquifer (described separately later in this report). Two flow stations, one at the southeast Tokul Road bridge (Upper Station, SG-3) and one just downstream of the SR 202 bridge (Lower Station, SG-4) were monitored in 2008, 2009, and 2010, during the months of July (2008 only), August, September (2008 and 2009), and October. The monitoring stations are shown on Figure 3. The difference in flow between the Upper and Lower Stations represents groundwater discharge into Tokul Creek from the Tokul Creek Delta Aquifer. Based on the monitoring results, aquifer flow (spring discharge) from the Tokul Creek Delta Aquifer ranges from about 3½ to 8 cfs. Total flow at the lower monitoring station ranged from about 18 to 40 cfs, with an average measured flow of about 28 cfs.

Tokul Creek has a limited hydraulic connection to aquifer systems below the Tokul Creek Delta Aquifer in the vicinity of Snoqualmie. AESI's hydrogeologic report for the Snoqualmie Ridge NWF (AESI, 1994), quantified instream flow impacts to Tokul Creek due to pumping from a deeper pre-Vashon aquifer (described separately later in this report). The results of groundwater modeling calculated instream flow impacts of approximately 50 to 55 gallons per minute (gpm) for the average annual water right amount of 425 gpm from the NWF. Ecology used 55 gpm and 88.3 acre-feet per year (afy) as the estimated impact to surface water. To mitigate potential impacts to instream flow, 0.122 cfs and 88.3 afy was transferred from Weyerhaeuser's Surface Water Certificate (SWC) 180 to the State Trust Water Right (TWR) Program for instream flows.

The Mill site operated starting in the mid-1920's through 2003, and up until 1991 obtained all of its water supply from Tokul Creek. The original surface water right certificate was issued to the Snoqualmie Falls Lumber Company, predecessor to Weyerhaeuser, with a priority date of November 27, 1926. The instantaneous quantity was originally 15 cfs, but was reduced after donation of the "Record B" portion to the TWR Program on July 27, 1995 as mitigation for new groundwater appropriation by the City of Snoqualmie to supply the Snoqualmie Ridge development, as described above.

A diversion was installed on Tokul Creek, directing surface water (by gravity flow) to an adjacent storage pond. The point of diversion was located in the NE ¼ NW ¼ of Section 20, Township 24 North, Range 8 East. The maximum rate of withdrawal from Tokul Creek was measured to be 2.08 cfs (corresponding to an annual quantity of 863.8 afy) in February 2006 (AESI, 2010). An electrical pump lifted water from the diversion pond to two elevated storage tanks that supplied the mill operations. The water was pumped through a WWTP and then to two 250,000-gallon storage tanks. These tanks remained full throughout the year to supply industrial water uses and the mill's fire protection system. When full, the tanks overflowed into

a drainage system consisting of pipes and surface flow which conveyed water through the Mill site to the Mill Pond.

The Tokul Creek diversion is no longer active. An application to enter the water right into the TWR Program was submitted to Ecology on January 3, 2011. The water was put into trust as a temporary donation of 863.8 acre-feet of water per year to assist in providing instream flows in Tokul Creek, the Snoqualmie River, and the Snohomish River. The water right is now owned by the Snoqualmie Valley Watershed Improvement District (SVWID). The SVWID and the Snoqualmie Valley Preservation Alliance (SVPA) have recently developed a Water Bank to facilitate the seasonal exchange and use of water rights located within the SVWID for irrigation purposes in the Snoqualmie River valley downstream of Snoqualmie Falls (AESI, 2018).

Mill Pond

The Mill Pond/Borst Lake is a circular pond, located just south of the site and is not part of the current Mill site owned by Snoqualmie Mill Ventures, LLC (SMV) or included in the proposed PCI Plan. It was excavated and enlarged to facilitate mill activities, and was primarily used to sort logs when the mill was in operation. The water surface of the pond was maintained artificially high while the Tokul Creek diversion was active (described above). The water level in the Mill Pond was historically controlled by a weir (with the bottom of the V-notch set an elevation of 411.24 feet) located in an overflow channel along the south shore of the pond adjacent to the Snoqualmie River. Overflow water from the pond would flow through the weir, through a box culvert underneath SE Mill Pond Road, and ultimately discharge to the Snoqualmie River. At the time of the writing of this report, a gap has eroded through the berm southeast of the weir, lowering the pond level several feet below the level of the weir. Water currently flows through this gap in the berm, along the roadside ditch northeast of SE Mill Pond Road, and through the culvert underneath the road. During major flood events, the Snoqualmie River will flood and backflow to the culvert and weir area.

An extensive description of AESI's interpretation of the combined surface water and groundwater level monitoring from 2008 to 2011 is provided in AESI's 2010 Trust Water Right Temporary Donation Report for Tokul Creek (AESI, 2010). In summary, from July 2008 to September 2009, the Tokul Creek diversion pumps operated on a limited basis to allow the Mill Pond to drain to a more "natural" level. The water level data shows that the Mill Pond level was directly influenced by the Tokul Creek diversion and in general showed no direct response to the Snoqualmie River, except under extreme flood events.

Well EB-4 (SSA) is completed onsite in the Snoqualmie River Shallow Aquifer. Monitoring data from the 1990's illustrate that the historic water elevations are very similar to EB-4 water elevations monitored July 2008 through November 2010. During the 1993 to 1995 time-period, the Mill Pond was kept full to support Mill site activities. From July 2008 to September 2009, the diversion was shut down to allow the Mill Pond to drain to a lower level. With the Tokul Creek diversion shut down, the water levels in the Mill Pond declined and then stabilized at

about 408.5 feet in late 2008. Flooding during subsequent winter storms caused erosion of the weir and berm, creating a new outlet at a lower elevation for the Mill Pond. In response, water levels in the Mill Pond fell, with a minimum recorded level of approximately 406 feet in the summer of 2009. Comparison of the historic and current data shows that the Snoqualmie Shallow Aquifer level (monitored at EB-4) remains similar, and the drop of the Mill Pond water level in late 2008 is directly attributable to removing the inflow from the Tokul Creek diversion. Although some component of flow in the shallow aquifer on the southern end of the site likely discharges to the Mill Pond, the quantity of discharge into the pond from the Snoqualmie River Shallow Aquifer cannot maintain the Mill Pond water level at the higher historic levels.

Differing water level elevations and response timing trends between the Mill Pond and shallow aquifer suggest the hydraulic connection between the shallow aquifer and the Mill Pond is somewhat limited. For example, on Figure D-1 in Appendix D, location "C" highlights a time of water level rise in well EB-4 as the regional Snoqualmie River Shallow Aquifer is recharged by October 2008 rains. This rise does not occur in the Mill Pond surface water level. Mill Pond water levels remain flat to very slightly declining, unaffected by the rise in water level in the Snoqualmie River Shallow Aquifer. This difference in water level trend demonstrates the Snoqualmie River Shallow Aquifer does not maintain surface water levels in the Mill Pond above about elevation 406 feet in the summer and elevation 409 feet in the winter (AESI, 2010).

Streams

Six streams (S-1 through S-6) have been identified in the immediate vicinity of the site (Raedeke, 2012 and Cedarock, 2012). S-1 and S-2 flow through the site. S-3 through S-6 flow down the slopes just east of the site. Fifteen other watercourses on the site are classified as drainage ditches based on location, physical characteristics, and the absence of a natural surface water source (Cedarock, 2012). Surface water features, including streams and wetlands, are shown on Figure 12.

S-1 flows down the eastern slopes and enters the site at the northeast corner, confined within a relatively steep-walled ravine. Upon discharging to the valley floor, the stream flows west through Wetland 10, and passes through a culvert underneath the Snoqualmie Sand and Gravel haul road into a deep roadside ditch that follows the haul road south and then west, situated between the haul road and Wetland 11. S-1 flows offsite along the western project boundary where it continues to flow west offsite another 800 feet before discharging directly to the Snoqualmie River. The supply of water for S-1 onsite is primarily streamflow entering the site at the northeast. Depending upon seasonal conditions, Wetlands 8 and 9 and other ditches on the north end of the site may contribute flow to stream S-1. Observations made by Cedarock in July 2012 (Cedarock, 2012) indicate that all the flow at the time was sourced from off-site stream inflow at the northeast corner, as other potentially contributing wetlands and ditches were dry. Flow within S-1 at that time was estimated to be approximately 0.5 cfs.

S-2 is located in the south-central portion of the site and generally flows north to south, discharging to the Mill Pond through a culvert under the levee at the north end of the pond. The supply of water for S-2 is a combination of surface runoff, nearby roadside/drainage ditches, and shallow groundwater seepage. Surveyed water levels in S-2 in May and June 2012 ranged from about 408 to 410 feet, and surveyed water levels on March 6, 2018 ranged from about 411 to 413 feet. The corresponding water levels in EB-4 (located northwest of S-2) and MW-2 (located northeast of S-2) were higher, suggesting groundwater seepage contributes flow to S-2 and is likely to be the primary source of flow in the summer. In August 2012, the flow through S-2 was estimated to be approximately 30 gpm (Cedarock, 2012).

Streams S-3 through S-6 are all located on the slopes east of the site. These streams eventually discharge into the onsite storm/sewer system. Cedarock (2012) indicates that these are all perennial streams, while Raedeke (2012) indicates that some of them may be seasonal in nature. AESI observed S-4, S-5, and S-6 on March 28, 2018 from 396th Drive SE. At this time, all three streams were flowing through culverts underneath the road and continued down the slope. The streams continued upslope of the road, and the source of water was not determined. The regional geologic map shows Vashon advance outwash overlying Vashon advance lacustrine just upslope of the roadway. The observed surface flow may be due to groundwater seepage emanating from the Vashon advance outwash, where it overlies the low-permeability lacustrine sediments. The surface water flow may also be due to seasonal interflow seepage from the adjacent till-mantled uplands.

Wetlands

Twenty-six wetlands have been delineated across the site (Raedeke, 2012, 2015). Surface water features at the site, including wetlands, are shown on Figure 3. Generally, the wetlands onsite can be categorized into two distinct types: 1) a seepage wetland, which receives water from groundwater seepage that is sourced, at least in part, outside of its topographic basin, and 2) a basin wetland, which receives water from within its topographic basin through surface runoff or interflow (shallow groundwater flow, unrelated to the Snoqualmie River Shallow Aquifer).

Water levels in the on-site wetlands were surveyed in May and June 2012 and on March 6, 2018 by Goldsmith Engineering (Goldsmith). These surface water levels were compared to groundwater levels in the on-site groundwater monitoring wells that are screened in the shallow aquifer (EB-4 and MW-2) in order to evaluate which wetlands may be supported by groundwater seepage. Those wetlands where the surface water level is lower than the groundwater level in the shallow aquifer are likely to be supported, at least in part, by groundwater seepage. Surface water levels are summarized in Table 1.2-3. The groundwater elevations from EB-4 and MW-2 from the closest date to the wetland survey are shown on Table 1.2-3 for reference. The August 2012 groundwater levels were measured two to three months after the wetland survey. Based on the period of record from EB-4 at the site, the groundwater levels in August of a given year are approximately 1 to 2 feet lower than the shallow aquifer levels in May and June; therefore, for the purpose of comparison to wetland

levels, it should be noted that groundwater levels in EB-4 and MW-2 were likely to be 1 to 2 feet higher in May/June 2012 than the water levels measured in August 2012.

TABLE 1.2-3
WATER LEVEL ELEVATIONS
WETLANDS

Wetland/Well	2012 Elevation (feet)	2018 Elevation (feet)
EB-4	415.91 (8/15/12)	417.4 (3/6/18)
MW-2	412.99 (8/14/12)	414.56 (3/28/18)
	May/June 2012	**March 6, 2018**
Wetland 8	415.9-416.9	417.8
Wetland 9	418.5	417.2
Wetland 10	416-417	-
Wetland 11	413.9	-
Wetland 12	408.0-413.3	411.6-413.9
Wetland 13	411.4-413.3	413.4
Wetland 14	413.1-415.2	413.1
Wetland 15	413.5-413.7	413.7
Wetland 19	417.2-418.3	-
Wetlands 20, 21, 22	418.9-419.4	-
Wetland 24	415.3-416.7	415.8
Wetland 25	417.9-418.4	-
Wetland 26	420.8-421.4	-
Wetland 27	421.3-421.7	-
Wetland 28	420.6-422.0	-
Wetland 29	417.5	-

The delineated wetlands can be categorized by their source of hydrology, as follows:

1. Wetlands 12, 13, 14, and 15: These wetlands are limited to the areas surrounding the deep drainage ditches that cross the site and, based on the water level data appear to be supported by groundwater seepage from the Snoqualmie River Shallow Aquifer. Wetland 12 is much larger than Wetlands 13, 14, and 15 and extends throughout much

of the central and western portions of the site (Figure 3) within a drainage ditch. Wetland 12 runs along the south side of the haul road, along the north side of Planning Area 1, and extends to the south through the central portion of the site. At the south end of the site, Wetland 12 contains stream S-2, which discharges into the Mill Pond through a culvert under the levee. Wetlands 13, 14, and 15 are relatively smaller and located just east of and flow into Wetland 12.

2. Wetland 1 through Wetland 7: Except for a small portion of Wetland 7, these wetlands are located offsite on the slopes just east of the site. Streams S-3, S-4, S-5, and S-6 flow down these eastern slopes as well and contribute to the hydrology of Wetlands 1, 2, and 4. As described above, AESI observed S-4, S-5, and S-6 in March 2018 from 396th Drive SE, and all three streams were flowing through culverts underneath the road and continued down the slope toward the site. The streams continued upslope of the road. The source of hydrology for the wetlands and related streams has not been determined but appears to be groundwater seepage (Raedeke, 2012). The regional geologic map (Dragovich et al., 2009b) shows Vashon advance outwash overlying Vashon advance lacustrine just upslope of the roadway. The observed surface water may be due to groundwater seepage emanating from the Vashon advance outwash, where it overlies the low-permeability lacustrine sediments. The surface water flow may also be due to seasonal interflow seepage from the adjacent till-mantled uplands. Wetlands 1, 2, 4, 5, and 6 flow into the existing stream channels or drainage ditches that ultimately discharge into the existing stormwater system for the Mill site. On-site observations by Raedeke (2012) indicate that Wetland 3 infiltrates offsite on the slope downgradient of the wetland. The southern, downgradient end of Wetland 7 crosses the far southeastern corner of the site and discharges to the Mill Pond.

3. Wetlands 8, 9, 19, and 24: It is not clear from the available data weather these wetlands are supported by groundwater seepage. The surveyed water elevations are similar to the measured levels in EB-4 and MW-2 onsite. Several other lines of evidence suggest that these wetlands may not be supported by groundwater. For example, Wetland 19 is located within a topographic low that extends beyond the wetland to the north at lower elevations. If Wetland 19 was groundwater-supported, the wetland would likely fill the full extent of the topographic low. Observations of Wetlands 8 and 9 in July 2012 (Cedarock, 2012) suggest that these two wetlands go dry in the summer.

4. Wetlands 10 and 11: The hydrology of Wetlands 10 and 11 is primarily supported by stream S-1, which flows through them. S-1 enters the site at the northeast corner, flowing down the slopes northeast of the site. The surveyed water level in Wetland 11 within the roadside ditch north of the haul road is several feet below the water level in EB-4, such that groundwater seepage may partially contribute to the hydrology of Wetland 11 in this area.

5. Wetlands 20, 21, 22, 25, 26, 27, 28, and 29: These wetlands are generally above the elevation of the Snoqualmie River shallow groundwater and do not appear to be groundwater-supported. These wetlands are located in the southwest area of the site.

Groundwater

Water that exists in the pore spaces of sediments is part of the hydrologic cycle. In the natural state, the hydrologic cycle begins with infiltration of precipitation (recharge) and ends with discharge to springs, streams, wetlands, and/or wells. Under natural conditions, groundwater recharge and discharge may shift with climatic cycles but remain in overall balance. Groundwater will flow under saturated conditions, preferentially through materials with greater porosity and permeability, such as clean gravels and sands. Where geologic conditions limit discharge, groundwater accumulates in such permeable zones, which are termed *aquifers*.

Ecology's well records were reviewed for wells in the vicinity of the Mill site. The locations of these wells are shown on Figure 3 and their logs are presented in Appendix B. Most well logs on file with Ecology are prepared by non-geologists, and standardized geologic descriptions commonly are not used. The interpretations from these well data are considered a rough approximation, and provide a general overview of regional conditions.

Groundwater level monitoring has been conducted in wells on and near the site in different aquifers. Groundwater level data obtained from the groundwater monitoring program by AESI are presented in Appendix D.

The groundwater system in the vicinity of the project site has been subdivided into five "aquifers." These include: 1) Bedrock "aquifer(s)," 2) Deep Aquifer, 3) Pre-Fraser Aquifer, 4) Tokul Creek Delta Aquifer, and 5) Snoqualmie River Shallow Aquifer.

Bedrock "Aquifer(s)"

Bedrock was not encountered in any of the wells completed on the Mill site. No seepages were observed from exposures of bedrock observed by AESI at Snoqualmie Sand and Gravel (AESI, 1993a, 2001). North of the site at the NWF, wells TW-5, TW-6, TW-7, and TW-8 were drilled into bedrock, but were completed in an overlying aquifer since no significant amounts of water were found in the bedrock. Several of the reviewed Ecology logs indicate a relatively discontinuous occurrence of groundwater in bedrock (locations 1, 2, 17, 34, 41, 42, 64, and 66) that appears to be perched at relatively high elevations. These domestic wells are primarily located on upland areas northeast of the Mill site.

Flow to wells is interpreted to originate primarily in fracture zones within the rock mass since intergranular porosity and permeability are interpreted to be very low. Although the volcanic rock in the vicinity of the site is capable of supplying limited quantities of water to wells, the bulk hydraulic conductivity of the rock mass is low, and the units typically behave as a barrier to

groundwater flow. The term bedrock "aquifer" is used in this report since a few wells do produce from the rock mass; however, within the context of the overall hydrogeologic setting in Snoqualmie surrounding the site, rocks are considered aquitards or aquicludes relative to the highly transmissive aquifer intervals in the Pleistocene/Holocene deposits. This characterization of groundwater in bedrock is consistent with previous studies within East King County (Turney et al., 1995).

Flow through fractured rock is highly anisotropic (preferential orientation), controlled by discontinuities in the rock mass. Discontinuities include fractures (joints), faults, bedding planes, and other geological discontinuities. Groundwater preferentially flows through open fractures and other permeable discontinuities. Typically, most of the flow is through only a small percentage of the total fracture set. Groundwater storage in a rock mass with low primary porosity and permeability is relatively limited with a low capacity to transmit groundwater.

Groundwater recharge is interpreted to be primarily from: 1) direct precipitation where bedrock is exposed at the ground surface, 2) leakage from streams, wetlands, or lakes in direct contact with bedrock, and 3) leakage through overlying geologic materials into bedrock. Discharge from the bedrock occurs: 1) where saturated fractures daylight at the ground surface, 2) into adjacent geologic units, and 3) to production wells.

Deep Aquifer

The Deep Aquifer is developed in Olympia or pre-Olympia-age fluvial sands and gravels. Wells TW-5, TW-6, TW-7, and TW-8 at the NWF, SS&G#1 and SS&G#2 at the SSG north of the site, and City well nos. 1, 1-R, and 2 at the SWF were screened in this aquifer. The Deep Aquifer has a lenticular map pattern since it represents an ancient Snoqualmie River system confined within a narrow bedrock valley. The Deep Aquifer extends upvalley (southeast) from the site to the Grouse Ridge/Middle Fork Embankment area east of Tanner (AESI, 1996). The downvalley extent of the aquifer is uncertain; however, discharge from this aquifer occurs downstream of Snoqualmie Falls. The width of the Deep Aquifer is about 2,000 feet in the vicinity of the NWF, just north of the Mill site. Based on a seismic reflection study south of the Mill site (Liberty, 2009), the width of the Deep Aquifer may be wider (over 3,000 feet) in the vicinity of the SWF.

The Deep Aquifer is separated from overlying aquifers by a discontinuous aquitard that consists of approximately 50 to 100 feet of fine-grained pre-Olympia/Olympia deposits (AESI, 1994, 1995c). The Deep Aquifer does not have a direct connection with the waters of surface streams due to the presence of intervening aquifers and aquitards totaling several hundred feet in thickness.

Pump tests have been conducted on various wells in the Deep Aquifer, including TW-6 and TW-7 (AESI, 1993d, 1994), TW-8 (AESI, 2004a) at the NWF and well nos. 1 and 2 (GeoEngineers, 1995) and well no. 1-R (Gray & Osborne, Inc., 2005) at the SWF, and three deep wells for the groundwater heat-pump system at Mount Si High School, just south of the SWF (Pacific

Groundwater Group, 2009, 2010). Only test data from two wells (IW1 and EW1) are included in the Pacific Groundwater Group reports. IW2 was installed later in 2012. In general, these pump tests show that the Deep Aquifer behaves as a semi-confined leaky aquifer. The fine-grained confining layer overlying the Deep Aquifer is apparently discontinuous, allowing for some limited hydraulic connectivity with overlying aquifers. During a combined pump test of TW-6 and TW-7 at the NWF (AESI, 1994), four observation wells (EB-C1W, SS&G#3, and OBW-1 [NWF] and OBW-2 [NWF]) completed in the Tokul Creek Delta Aquifer (described further below) each exhibited minor drawdown as a result of the 8-day pump test. Drawdown was 0.1 to 0.2 feet in EB-C1W, approximately 1.2 feet in SS&G#3, and very small to negligible (less than 0.1 feet) in OBW-1 and OBW-2. These results indicate that the confining layers (aquitards) in the vicinity of the NWF (OBW-1 and OBW-2) effectively limit the hydraulic connection between the Deep Aquifer and shallower aquifers, while the observed drawdown over 2,000 feet northwest (EB-C1W) and over 2,000 feet east (SS&G#3) of the NWF indicate greater aquifer interconnection, implying significant stratigraphic variability across the study area. Drawdown in observation wells completed in the Deep Aquifer were much larger – a drawdown up to 4.5 feet was observed in well no. 1 (SWF) about 1.5 miles south of the NWF, and a drawdown of up to 55 feet was observed at TW-5 at the NWF. Drawdown in TW-5 stabilized after approximately 4,000 minutes of pumping, supporting the interpretation of leaky aquifer conditions.

Aquifer testing at the SWF (GeoEngineers, 1995) included a 7-day dual well (well no. 1 and well no. 2) pump test. During the test, about 2 feet of drawdown was observed in TW-6 and TW-7 at the NWF. In contrast, shallow observation wells completed in the immediate vicinity of the pumping wells at the SWF did not respond to pumping from the Deep Aquifer interval, indicating a limited hydraulic connection between the Deep Aquifer and shallower aquifers in the vicinity of the SWF.

Aquifer testing at Mount Si High School included step testing of well IW1 up to a rate of 295 gpm for 350 minutes and a constant-rate test of EW1 (Pacific Groundwater Group, 2010). During the step test water levels were monitored in IW1 and EW1 at Mount Si High School and City well no. 1-R at the SWF. During the step test a drawdown of 0.6 feet was measured at well no. 1-R at the SWF. Both EW1 and well no. 1-R were monitored during the constant-rate test. About 4 feet of drawdown was measured in well no. 1-R during the constant-rate test. IW2 was installed in 2012 after the referenced Pacific Groundwater Group report. AESI analyzed the pump test data reported on the Ecology well log for IW2 by using correlations between specific capacity and transmissivity (see Figure 100 in Theis et al., 1963). Using this method, the calculated transmissivity for IW2 is about 13,500 square feet per day (ft^2/day), which is relatively similar to the transmissivity of 18,700 ft^2/day for the constant-rate pump test of EW1 calculated by Pacific Groundwater Group (2010).

Based on water level measurements at SS&G#1, SS&G#2, TW-5, TW-6, and TW-7, and a ground water modeling evaluation performed for the NWF (AESI, 1994), groundwater in the Deep Aquifer flows toward the northwest with a hydraulic gradient of about 1.5 percent. Recharge to the Deep Aquifer occurs from limited vertical leakage through the overlying aquitard and

primarily from throughflow of groundwater coming downvalley from the southeast. Particle tracking plots, generated from groundwater flow models completed for both the NWF (AESI, 1994) and the SWF (AESI, 1995c), support this interpretation. Based on the models, most of the water discharging at the NWF and SWF comes directly from upgradient sources in the Deep Aquifer, originating a few miles upvalley (southeast) of the delineated 10-year time-of-travel (TOT) boundary. The modelling suggests only about 5 to 10 percent of the water discharging at the well fields would originate within the 10-year TOT zone. Therefore, recharge from shallower aquifers in the vicinity of the well fields account for no more than about 10 percent of the water pumped at the NWF and SWF (AESI, 1995c, 2007).

Several aquifer characteristics have been determined from various pump tests performed on the Deep Aquifer. These include the coefficient of transmissivity (T), the storage coefficient (S), horizontal hydraulic conductivity of the aquifer (K), and the vertical hydraulic conductivity of the overlying aquitard (K'). Average values for these parameters are presented in Table 1.2-4. Detailed descriptions of pump test methods, analyses, and results are presented in previous studies conducted by AESI (AESI, 1990, 1994, 1995c, 2004a), GeoEngineers (1995), Gray & Osborne, Inc. (2005), and Pacific Groundwater Group (2010).

TABLE 1.2-4
DEEP AQUIFER PARAMETERS FROM PUMP TESTS
AT THE NORTH WELL FIELD, SOUTH WELL FIELD, AND MOUNT SI HIGH SCHOOL

Pumping Well ID	T[1] (ft^2/day)[2]	S[3]	K[4] (ft/day)[5]	K'[6] (ft/day)[5]
TW-7 (NWF)	1,400	2×10^{-4}	28	6.3×10^{-3}
TW-6 (NWF)	2,020	8×10^{-4}	31	0.4×10^{-3}
TW-8 (NWF)	3,000 - 3,500	1×10^{-4}	45 - 55	-
Well No. 1-R	2,000-3,000	-	-	-
Well No. 2	7,000	6×10^{-4}	130	-
IW1	5,700	2.5×10^{-3}	-	-
EW1	18,700	4×10^{-4}	-	-
IW2	13,500	-	-	-

[1] T -= coefficient of transmissivity
[2] ft^2/day = square feet per day
[3] S = storage coefficient
[4] K = horizontal hydraulic conductivity of the aquifer
[5] ft/day = feet per day
[6] K' = vertical hydraulic conductivity of the overlying aquitard

Aquifer transmissivity in the Deep Aquifer generally appears to increase upvalley from the site. Pump tests indicated transmissivity exceeds 20,000 ft^2/day east of Tanner (Golder Associates, 1996).

Pre-Fraser Aquifer

The Pre-Fraser Aquifer is developed in Olympia-age non-glacial or other undifferentiated pre-Fraser deposits underlying the site. Well MW-1 completed on the Mill site is screened in fluvial sand and gravel at a depth of 220 to 230 feet, interpreted to be ancient Snoqualmie River deposits, possibly Olympia-age. No other groundwater wells are set in this aquifer; however, it was also identified in wells completed at the NWF during completion of wells in the Deep Aquifer and Tokul Creek Delta Aquifer (see below), where it consisted primarily of silty fine sand.

The thickness of the Pre-Fraser Aquifer at the NWF ranges from about 60 feet to over 120 feet. At the NWF, the Pre-Fraser Aquifer is separated from the underlying Deep Aquifer by 50 to 100 feet of low-permeability sediments. This aquitard is discontinuous and may not be present southeast of the NWF in the vicinity of the Mill site, where in some areas the Pre-Fraser Aquifer is interpreted to have a more direct hydraulic connection with the underlying Deep Aquifer (AESI, 1994, 1995c, 2001). Limited information is available on the flow direction of this aquifer as MW-1 is the only well in the vicinity producing from this interval. However, the groundwater flow direction is expected to be similar to the underlying Deep Aquifer. The aquifer is interpreted to extend both upvalley (south) and downvalley (north) from the subject site, but like the Deep Aquifer, its width would be limited by the narrow bedrock valley of the ancient Snoqualmie River.

The leaky confined aquifer behavior determined from pump tests in the Deep Aquifer suggests that the Pre-Fraser Aquifer acts as a "source zone" providing some water to the Deep Aquifer by leakage through the semi-confining layer.

Tokul Creek Delta Aquifer

The Tokul Creek Delta Aquifer is interpreted to be developed in the Vashon recessional delta deposits north of the Mill site and beneath the northern portion of the Mill site underlying the recent lacustrine deposits. Several wells north of the site are completed within this aquifer, including EB-C1W, OWB-1 (NWF), OBW-2 (NWF), MW-3 (SSG), and SS&G#3. Water level measurements in these wells indicate that groundwater in the Tokul Creek Delta Aquifer flows toward the west to northwest with a hydraulic gradient of approximately 3 percent. The Snoqualmie Sand and Gravel Pit wells did not extend to the bottom of this aquifer; however, where this aquifer was penetrated at the NWF, the Tokul Creek Delta Aquifer is separated from the underlying aquifers by a thick sequence of fine-grained, undifferentiated pre-Fraser sediments. Aquifer pump tests at the NWF suggest some limited hydraulic connection between the Tokul Creek Delta Aquifer and deeper aquifers (AESI, 1994).

North of the Mill site at the NWF, the aquifer has been documented to be about 140 feet thick. EB-1 completed near the northwest corner of the Mill site encountered Tokul Creek Delta

deposits at a depth of approximately 55 feet and was saturated below a depth of about 65 feet, but EB-1 did not fully penetrate the aquifer. The extent of the Tokul Creek Delta Aquifer is limited by the distribution of the recessional deltaic deposits. This unconfined aquifer is bounded by bedrock to the north and west and is interpreted to pinch out beneath the northern portion of the Mill site (Figure 7).

Recharge to the Tokul Creek Delta Aquifer is primarily from direct precipitation, with some additional recharge from the adjacent Snoqualmie River Shallow Aquifer (see below). Based on data presented by the USGS (Turney et al., 1995), the Tokul Creek Delta Aquifer in the site vicinity is recharged at a rate of about 40 inches per year from direct precipitation. Recharge amounts from the Snoqualmie River Aquifer have not been quantified at this time. The Tokul Creek Delta Aquifer discharges at Tokul Creek in the vicinity of SR 202. Based on summertime stream gauging data (AESI, 1994), the aquifer discharges at a rate of about 3½ to 8 cfs. This measured flow includes discharge into the creek from both the north and south. According to data presented by Turney et al. (1995), groundwater on the northwest side of Tokul Creek also flows toward Tokul Creek. This suggests that Tokul Creek serves as a hydraulic barrier between the site and areas located northwest of Tokul Creek.

Groundwater contours within the Snoqualmie River Shallow Aquifer and the Tokul Creek Delta Aquifer are shown on Figure 13. The average groundwater elevation north of the site at SS&G#3 is about 320 to 340 feet, with a seasonal range of 10 to 20 feet since 1994 (Appendix D). In the vicinity of OBW-1 and OBW-2 at the NWF, average groundwater elevations of about 300 to 320 feet have been documented. Downgradient in EB-C1W, the average groundwater elevation of the Tokul Creek Delta has been documented at about 260 feet. Measurements in August 1999 indicated that EB-B4W is a dry well, and the water table for the aquifer is lower than elevation 285 feet at this location. At the WWTP wells northwest of the Mill site, groundwater levels at OBW-2A, OBW-3, and OBW-5 indicate a localized easterly to northeasterly hydraulic gradient that appears to be influenced by the Snoqualmie River Shallow Aquifer (see below). These groundwater levels and flow directions are consistent with those presented by Turney et al. (1995).

Limited pump test information indicates that transmissivity (T) and hydraulic conductivity (K) are highly variable in the Tokul Creek Delta Aquifer (AESI, 1996). As shown in Table 1.2-5, relatively low values of T and K were determined from a low-rate aquifer test performed on SS&G#3. However, high values of T and K were calculated from an aquifer test at the NWF. This broad range in T and K values reflects significant differences in the nature of the aquifer media at the two tested localities. The aquifer media at the Snoqualmie Sand and Gravel site consisted of fine sand deposited in a low-energy pro-delta environment. In contrast, the aquifer media in the tested interval at the NWF consisted of clean sandy gravels and cobbles deposited at the mouth of the recessional meltwater stream.

TABLE 1.2-5
TOKUL CREEK DELTA AQUIFER PARAMETERS

	T[(1)]	K[(2)]
Snoqualmie Sand and Gravel Pit	220 ft^2/day[(3)]	3.6 ft/day[(4)]
NWF	24,000 ft^2/day[(3)]	200 ft/day[(4)]

[(1)] T = coefficient of transmissivity
[(2)] K = horizontal hydraulic conductivity of the aquifer
[(3)] ft^2/day = square feet per day
[(4)] ft/day = feet per day

Snoqualmie River Shallow Aquifer

The Snoqualmie River Shallow Aquifer is located within the present-day Snoqualmie River valley, including the Mill site. The Snoqualmie River Shallow Aquifer generally consists of fine to medium sand with gravel, deposited in channel and near-channel environments of a meandering river system. The aquifer is shallow, typically less than 50 feet, and is discontinuous in map pattern (AESI, 1993b), primarily contained within the coarse-grained river channel deposits.

Most of the groundwater in this aquifer discharges towards the Snoqualmie River. However, a groundwater divide is present in the central portion of the Mill site where a portion of this aquifer discharges by subsurface flow into the Tokul Creek Delta Aquifer to the north. A steep hydraulic gradient has been identified at the interface between these two aquifers. Water levels drop approximately 200 feet in a distance of about 1¼ miles, from an average elevation of 400 feet in the Snoqualmie River Shallow Aquifer, near the City of Snoqualmie, to approximately 200 feet where the Tokul Creek Delta Aquifer discharges at Tokul Creek. Recharge to the Snoqualmie River Shallow Aquifer occurs from upvalley aquifer sources and direct precipitation within the valley.

At the south end of the Mill site, the shallow aquifer is interpreted to discharge to some extent into the Mill Pond; however, the hydraulic connection appears to be somewhat limited based on water level monitoring data (as described under the "Mill Pond" section above).

In general, Snoqualmie River Shallow Aquifer groundwater levels rise during periods of recharge (rainfall). Groundwater levels also rise when discharge is slowed or reversed by a rise in the level of the Snoqualmie River. When the Snoqualmie River rises, a temporary backflow occurs from the river into its banks. This phenomenon is known as bank storage. Groundwater elevations are controlled by the relationship between recharge and discharge, including bank storage, and by the material properties of the soils through which the groundwater moves.

Hydraulic testing has been performed on eight observation wells completed in the Snoqualmie River Shallow Aquifer within and near the City of Snoqualmie (AESI, 1993b). Maximum hydraulic conductivity values and the range of storage coefficients calculated from falling-head slug tests are summarized in Table 1.2-6.

TABLE 1.2-6
SNOQUALMIE RIVER SHALLOW AQUIFER PARAMETERS

K[(1)]	S[(2)]
70 ft/day[(3)]	1×10^{-5} to 7×10^{-4}

[(1)] K = horizontal hydraulic conductivity of the aquifer
[(2)] S = storage coefficient
[(3)] ft/day = feet per day

The slug test results indicated that the Snoqualmie River Shallow Aquifer behaves as a confined system. However, in similar hydrogeologic settings, delayed yield behavior has been observed from pump tests. Groundwater modeling suggests that the aquifer can behave either as a confined or unconfined system depending on seasonal water levels (AESI, 1996).

Interflow Network

Interflow is the shallowest of all groundwater types and forms within a soil that is more permeable than the geologic parent material from which it was derived. Rainfall will generally soak into the ground through relatively permeable surficial soil until it encounters less-permeable sediments (such as very low-permeability, unweathered Vashon lodgement till), which act as a barrier to further downward movement. Interflow zones do not develop in the soils of coarse-grained surficial sediments such as the Vashon recessional delta deposits. An interflow network is interpreted to develop where lodgement till is present at relatively shallow depths, typically throughout till-mantled uplands east of the Mill site. Water within the interflow network flows downslope closely following the existing topography. Interflow seepage may be the source of water for the streams flowing downslope just east of the site (as described above under “Streams”).

The interflow network is seasonal and is generally not active during prolonged periods of dry weather. Water in this zone may be randomly distributed within the soil horizon, and the interflow zone is generally not capable of supporting production wells. Therefore, the interflow zone is not considered an aquifer.

Water Quality

Water quality samples of surface water were taken at three locations onsite on December 18, 2017 from streams S-1 and S-2. The sample locations are shown on Figure 12. The samples

were measured in the field by AESI for temperature, pH, turbidity, dissolved oxygen, and conductivity. Samples were submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington and tested for biochemical oxygen demand (BOD), total alkalinity, fecal coliforms, total suspended solids, total ammonia-nitrogen, nitrate plus nitrite-nitrogen, total phosphorus, ortho phosphate, total petroleum hydrocarbons, oil and grease, dissolved copper, dissolved lead, dissolved zinc, calcium, magnesium, and hardness. Testing results are summarized below in Table 1.2-7 and attached in Appendix C.

TABLE 1.2-7
WATER QUALITY RESULTS

	S-1 Inlet	**S-1 Discharge**	**S-2 Discharge**
Temperature (°C)(1)	6.74	5.81	7.25
Specific Conductance ($\mu S/cm^3$)(2)	74	84	117
Conductivity (µS/cm)(3)	49	44	77
DO(4) Saturation (%)(5)	92.5	26.6	60.6
DO(4) (mg/L)(6)	11.31	3.32	7.32
pH	6.62	5.94	6.01
Turbidity (NTU)(7)	14.2	14.2	1362*
BOD(8) (mg/L)(6)	2.0	1.6	2.8
Fecal Coliforms (CFU/100 ml)(9)	135	5	160
TSS(10) (mg/L)(6)	10.1	4.7	502
Total Ammonia-Nitrogen (mg/L)(6)	ND(15)	0.045	0.161
Nitrate + Nitrate-Nitrogen (mg/L)(6)	0.258	0.044	0.054
Total Phosphorus (mg/L)(6)	0.0580	0.460	0.374
Ortho Phosphate (mg/L)(6)	0.0140	0.0130	0.0100
HEM(11) Oil & Grease (mg/L)(6)	ND(15)	ND(15)	ND(15)
SGT-HEM(12) NP(13) Oil & Grease (mg/L)(6)	ND(15)	ND(15)	ND(15)
HEM(11) Polar Oil & Grease (mg/L)(6)	ND(15)	ND(15)	ND(15)
Diesel Range Organics (C12-C24) (mg/L)(6)	ND(15)	0.567	ND(15)

	S-1 Inlet	S-1 Discharge	S-2 Discharge
Motor Oil Range Organics (C24-C38) (mg/L)[6]	ND[15]	3.29	ND[15]
Dissolved Lead (µg/L)[14]	0.161	0.108	0.227
Dissolved Copper (µg/L)[14]	1.54	1.42	3.05
Dissolved Zinc (µg/L)[14]	2.15	5.90	9.30
Hardness (mg/L)[6]	27.8	33.5	125
Calcium (mg/L)[6]	6.21	7.86	23.5
Magnesium (mg/L)[6]	2.98	3.38	16.2
Total Alkalinity (mg/L)[6]	24.8	34.9	60.8

[1] °C = degrees Celsius
[2] µS/cm³ = microsiemens per cubic centimeter
[3] µS/cm = microsiemens per centimeter
[4] DO = Dissolved Oxygen
[5] % = percent
[6] mg/L = milligrams per liter
[7] NTU = Nephelometric Turbidity Units
[8] BOD = Biochemical Oxygen Demand
[9] CFU/100 ml = Colony Forming Unit per 100 milliliters
[10] TSS = Total Suspended Solids
[11] HEM = Hexane Extractable Material
[12] SGT-HEM = Silica Gel Treated-Hexane Extractable Material
[13] NP = Non Polar
[14] µg/L = micrograms per liter
[15] ND = Non Detect

Monitoring Program

AESI has an extensive database of groundwater and surface water levels collected from various wells and surface water monitoring locations over the past 30 years. Monitoring locations include groundwater wells on the Mill site, the NWF, the SWF, Snoqualmie Sand and Gravel, the Snoqualmie WWTP, and various wells in Snoqualmie screened in the Snoqualmie River Shallow Aquifer, and others. Surface water stations that have periodically been monitored include the Mill Pond, Tokul Creek, and the Snoqualmie River.

Current monitoring stations related to the Mill site include two wells (MW-1 and EB-4) located at the Mill site, and staff gauges in the Snoqualmie River and at the Mill Pond near the fire flow pump station. Continuously reading pressure transducer/data logger equipment was installed in the wells and in staff gauges. Manual water levels are typically measured monthly and data logger equipment is downloaded during site visits.

AESI maintains historical water level information for the majority of the wells and staff gauge locations shown on Figure 3, many of which were installed in the early to middle 1990's. Relevant AESI groundwater and surface water level hydrographs are attached in Appendix D.

1.2.5 Geologic Hazards

Erosion, landslide, steep slope, seismic, channel migration, and flood hazard areas and critical aquifer recharge areas (CARAs) are regulated under the *Snoqualmie Municipal Code* (SMC) Chapter 19.12 - "Critical Areas." Based on published critical areas maps produced by the City of Snoqualmie, King County, and our observations of regional and local topographic and geologic conditions, as documented in this report, these types of geologic hazards all exist to a variable extent in areas of the project site. A discussion of these critical areas as they relate to the Mill site is presented in the following sections.

Erosion Hazard Areas (SMC 19.12.100)

Erosion Hazard Areas are defined under SMC Section 19.12.100 as follows: *those areas of the city containing soils which, according to the USDA Soil Conservation Service, King County Soils Survey, dated 1973, and any subsequent revisions or additions thereto, and the USDA Soil Conservation Service, Soils Survey for Snoqualmie Pass Area, Parts of King and Pierce Counties, WA, dated December 1992, may experience severe to very severe erosion hazard, and which occur on slopes of 15 percent or greater.*

Erosion Hazards are limited to the slopes at 15 percent or greater on the northeastern margin of the site, mapped as Barneston Series soils on the above-referenced Soil Survey. This area is shown on Figure 14. A discussion of on-site soils is presented under "Soils," Section 1.2.1.

Erosion Processes

In order to evaluate potential erosion impacts (and subsequently provide mitigation) as a result of the proposed development, it is important to understand where and how erosion occurs. The sediment begins motion by a process called *gross erosion*, which can be subdivided into *sheet erosion* and *channel erosion*.

Sheet erosion is caused by shallow "sheets" of water flowing over the cleared land surface and transporting soil particles which have been detached by raindrops. The shallow surface flow rarely moves as a uniform sheet for more than a few feet before concentrating in surface irregularities and resulting in rill erosion. Additional sediment is thus picked up and transported. This erosion process is continuous over several storm or normal rainfall events. If the rills become more than a few inches deep, then the erosive regime changes to gully erosion where concentrated water flow can transport large quantities of sediment during a single storm event. In the Puget Sound region this usually occurs on slopes greater than 20 percent.

Different soil types and geologic parent materials can have widely differing susceptibilities toward each separate erosive regime. As an example, the lodgement till typically develops a soil horizon (Tokul Soil Series) that is significantly less dense than the geologic parent material; however, it contains about the same percentages of fines. This soil is susceptible to sheet erosion or channel erosion (concentrated flow) due to its lower density. The geologic parent material is significantly less susceptible to channel erosion for a given storm event due to its high density and cohesive nature. Conversely, the glacial outwash deposits develop a soil horizon (Barneston Series soils) that is much less susceptible to sheet erosion, primarily due to its high permeability preventing the development of sheet flow during normal rainfall events. However, the parent material (mostly sand and gravel) is highly susceptible to erosion under concentrated (channel) flow regimes, even on relatively gentle slopes.

In addition, slope gradients and vegetation also play an important role in determining erosional impacts. In general, steeper slopes have a higher susceptibility to erosion as surface water has the capability of achieving higher velocities and, hence, has more energy available to erode and transport sediments. Vegetation, on the other hand, has a tendency to reduce the potential development of concentrated flows by dispersing rainfall, impeding surface water flow, and reducing surface water velocities.

Based on the sediment characteristics and slope gradients, two zones with differing degrees of potential erosion hazards are shown on Figure 14 and are discussed further below.

Erosion Hazard Zone 1

Erosion Hazard Zone 1 includes the majority of the Mill site, which is relatively flat. Because of the low slope gradient, this area is considered to possess a low erosion hazard risk. These areas are underlain by Arents and Nooksack Series soils at slopes of 0 to 2 percent.

Erosion Hazard Zone 2

Erosion Hazard Zone 2 is considered to possess a slight to moderate risk of erosion. This area is located on the northeastern margin of the Mill site. These areas are underlain by Barneston Series soils at slopes of 15 percent or greater.

Landslide Hazard Areas (SMC 19.12.110) & Steep Slope Hazard Areas (SMC 19.12.120)

The SMC defines Landslide Hazard Areas as *"those areas of the city subject to a risk of landslide, including the following areas:*

1. *Any area with slopes greater than 15 percent and impermeable soils (typically silt and clay) frequently interbedded with granular soils (predominantly sand and gravel) and springs or groundwater seepage;*

2. *Any area that includes areas with significant visible evidence of groundwater seepage, and which also includes existing landslide deposits regardless of slope;*

3. *Any area which has shown movement during the Holocene epoch (from 10,000 years ago to present) or which is underlain by mass wastage debris of that epoch as determined by a geologist;*

4. *Any area potentially unstable as a result of rapid stream incision or stream bank erosion;*

5. *Any area located on an alluvial fan, presently or potentially subject to inundation by debris flow or deposition of stream-transported sediments."*

The SMC separately defines Steep Slope Hazards as "*those areas of the city where the ground rises at an inclination of 40 percent or more within a vertical elevation change of at least 10 feet".*

The attached "Landslide & Steep Slope Hazards" map (Figure 15) illustrates Landslide/Steep Slope Hazard Areas identified at the site.

Landslide/Steep Slope Hazard Zones

The landslide/steep slope hazard risks on the property have been subdivided into two hazard zones based on local geotechnical engineering and geologic hazard standards. These hazard zones are illustrated on Figure 15 and are described below.

Landslide/Steep Slope Hazard Zone 1

Landslide/Steep Slope Hazard Zone 1 encompasses the vast majority of the site and is considered to possess a low landslide hazard risk due to low slope gradients.

Landslide/Steep Slope Hazard Zone 2

Landslide/Steep Slope Hazard Zone 2 is generally localized to the eastern margin of the site. Portions of the slopes in this area appear to meet the definition of steep slope hazards – slopes with inclinations greater than 40 percent over a vertical height of at least 10 feet. Portions of these slopes also appear to meet criterion #1 for landslide hazards.

The large wood waste pile located in Planning Area 3, just east of the eastern edge of Planning Area 1, contains slopes that are 40 percent or greater. These slopes meet the steep slope hazard definition in the City code even though they are not naturally occurring.

Zone 2 is considered to possess a low to moderate risk of landslides if disturbed by improper grading/clearing or uncontrolled drainage. In their existing conditions these areas do not show evidence of slide activity.

Seismic Hazard Areas (SMC 19.12.130)

Regional seismicity is discussed in the following sections, followed by a description of potential seismic hazards, including ground rupture, ground motion response, liquefaction, and seismically induced landslides.

Stresses that cause earthquakes in western Washington are mainly due to the interaction of tectonic plates that meet off the coast of Washington State, referred to as the Cascadia Subduction Zone (CSZ). The Juan de Fuca oceanic plate, which forms the floor of the northeastern Pacific Ocean, moves northeastward with respect to the North American continental plate at an average rate of about 1.3 inches per year (Miller et al., 2001). Differences in density of the two plates cause the denser oceanic Juan de Fuca plate to sink or subduct beneath the less dense North American continental plate. This subduction zone defines the fault boundary between the Juan de Fuca plate and the North American plate that overrides and overlies it. The Juan de Fuca plate underlies the North American plate at a depth of about 15 to 20 miles beneath much of the Puget Lowland. Tectonic processes active in the CSZ region include accretion, subduction, deep earthquakes, and active volcanism of the Cascades.

Local Seismicity

The Mill site is located in an area of low to moderate historical seismicity. Table 1.2-8 summarizes historical and recorded seismic events greater than magnitude (M) 3.0 in the vicinity (less than 20 miles) of the site as obtained from the University of Washington's Pacific Northwest Seismic Network (PNSN). Figure 16 shows the locations and magnitudes for all events $M \geq 2$. A significant number of seismic events of $M < 2$ have been recorded in the site vicinity that are not presented here. An M 4.2 earthquake, which occurred on December 30, 1978 and was located about 4 miles north-northwest of the site boundary, is the largest and nearest seismic event recorded in the site vicinity since the installation of the Pacific Northwest Seismic Network in 1970.

TABLE 1.2-8
HISTORICAL SEISMICITY IN THE VICINITY
OF THE MILL SITE (M>3.0)

Date	Latitude (°N)	Longitude (°W)	Depth (mi)[1]	Magnitude
9/4/1970	47.6167	-121.803	9.2	3.2
6/9/1973	47.5987	-121.812	3.3	3.3
12/30/1978	47.595	-121.844	11	4.2
2/1/1979	47.5307	-121.908	4.2	3.5
10/4/1983	47.4603	-121.838	13.1	3
12/29/1990	47.4738	-121.812	10.3	3.5
4/19/1992	47.461	-122.054	14	3.1
1/21/1996	47.4507	-121.788	12.7	3.3
2/14/2001	47.5182	-121.897	3.9	3.1
9/12/2015	47.5178	-121.75	11.7	3.9
10/22/2016	47.5378	-121.917	15	3

Source: Pacific Northwest Seismic Network.
[1]mi - miles

Earthquake Types

Three types of earthquakes occur in the Pacific Northwest that affect western Washington: 1) deep intraplate earthquakes that occur within the subducting Juan de Fuca plate, 2) shallow to deep interplate earthquakes that occur at the boundary between the subducting Juan de Fuca plate and the overriding North American plate, and 3) shallow crustal earthquakes that occur within the North American plate.

The Juan de Fuca plate must bend as it subducts beneath the North American plate causing deep intraplate earthquakes within the Juan de Fuca plate. There is evidence that six such earthquakes have occurred in the Puget Sound region with estimated magnitudes greater than 6.0 since 1870 (Cascadia Region Earthquake Workgroup, 2008). Three such historical earthquake events in Washington State include the 1949 Olympia earthquake (M 6.8), the 1965 Seattle-Tacoma earthquake (M 6.5), and the 2001 Nisqually earthquake (M 6.8). These and several other historical earthquakes in Washington State had deep epicenters at depths of about 20 to 30 miles or more below the Puget Lowland. These depths imply that the epicenters were located within the Juan de Fuca plate underlying the CSZ (Lidke et al., 2003). An earthquake recurrence interval for this type of earthquake can be estimated at approximately 20 to 25 years, given the historic record referenced above.

Shallow to deep interplate (or subduction zone) ruptures occur between the Juan de Fuca plate and the North American plate. The last known great earthquake in the northwest was in 1700. Records provided by buried soil layers, tree ring and radiocarbon dating of dead trees, and

deep-sea deposits indicate that this subduction earthquake occurred with a magnitude of approximately 8.9 (Adams, 1996; Atwater, 1987, 1996; Atwater et al., 1991; and Yamaguchi, 1997). A documented tsunami occurred in Japan that has been correlated to this earthquake (Satake et al., 1996). Geological evidence indicates that great earthquakes (> M 8.0) may have occurred sporadically at least seven times in the last 3,500 years, suggesting a return time of about 500 years (Atwater et al., 2003, 2005), while seafloor core evidence indicates that there have been forty-one subduction zone earthquakes on the CSZ in the past 10,000 years, suggesting a general average earthquake recurrence interval of approximately 240 years (Goldfinger et al., 2012).

The third type of event is a shallow, crustal earthquake occurring within the North American plate. Although no evidence of surface faults or associated ground rupture was observed at the Mill site, there are several active crustal faults in western Washington that may pose significant, though very infrequent, seismic hazards in the Puget Sound region. The most notable of these near the site, the Seattle and Rattlesnake Mountain Fault Zones, are described below.

Surficial Fault Zones

Two primary components contribute to the active deformation of western Washington – 1) southwest-northeast contraction driven by locking of the Cascadia subduction zone, and 2) the clockwise rotation of Washington and western Oregon around a pole of rotation centered around the junction of Washington, Oregon, and Idaho (McCaffrey et al., 2013). This compression and rotation causes the north-south shortening of the crust in western Washington, which is estimated to range from 3 to 5 millimeters (mm) per year (Mazzotti et al., 2002; McCaffrey et al., 2013). Crustal faulting within the Puget Lowland shows a pattern of deformation that generally consists of reverse faults (thrust faults) to accommodate this north-south shortening linked by strike-slip transfer (horizontal motion) zones. The various fault zones mapped throughout the Puget Lowland are manifestations of this shortening, including the Seattle Fault Zone (SFZ), Tacoma Fault Zone (TFZ), South Whidbey Island Fault Zone (SWIF), and in the vicinity of the Mill site, the Rattlesnake Mountain Fault Zone (RMF) which is interpreted to be an extension of the SWIF (Dragovich et al., 2009b). This complex of faults is shown on Figure 17.

The SFZ is a south-dipping thrust fault system. The SFZ ranges from 2.5 to 4 miles wide and is approximately 50 miles long extending through Seattle and connects on its western edge to the Saddle Mountain Fault near the Olympic Mountains and connects on its eastern edge to the RMF, forming a transpressional (combined compression and horizontal translation) zone that facilitates the north-south shortening of the crust (Anderson et al., 2017). The SFZ generally marks the northern edge of an area of uplifted crustal bedrock (the Seattle uplift) and the southern edge of a basin infilled with younger glacial and non-glacial sediments (Seattle basin).

The connection between the SFZ and the RMF is located near Fall City, approximately 3 to 4 miles northwest of the Mill site. The RMF consists of a band of faults showing both vertical and

horizontal components of motion and essentially marks the eastern, lateral edge of the Seattle uplift. Recent geologic mapping (Dragovich et al., 2009a,b) has identified strands of the RMF and other faults in the vicinity of the Mill site. The closest of these faults to the project are the Snoqualmie Valley Fault and RMF-8 (a strand of the RMF), both of which are mapped to cross the site and are shown on Figure 18. The Snoqualmie Valley Fault trends north-south through the eastern margin of the site, and the RMF-8 trends northwest-southeast through the central portion of the site. While both of these faults are potentially active, they do not displace Holocene sediments, suggesting that they have not been active within the last 10,000 years. There is no other evidence that either of these faults is currently active (Dragovich et al., 2009a,b).

There is indirect evidence that the main strand of the RMF zone (RMF-1) may be active locally in the North Bend Quadrangle (Dragovich et al, 2009a), where deformed Quaternary sediments have been observed southwest of North Bend and southeast of Rattlesnake Lake. RMF-1 is inferred to be present about 1 mile west of the Mill site (Dragovich et al., 2009b) and directly west of Snoqualmie Falls (Figure 18). It has been speculated that RMF-1 has caused disturbance of Quaternary sediments in the vicinity of the falls (Dragovich et al, 2009b); however, direct evidence of the deformation or displacement of Quaternary sediments is currently very limited. The recurrence interval of the RMF is not currently known.

Seismic Hazards

Seismic Hazards in the SMC are defined as "*those areas of the city subject to severe risk of earthquake damage as a result of seismically induced landslides, earth adjustments, settlement or soil liquefaction.*" The potential for each of these hazards to adversely impact the proposed project is discussed below. Seismic Hazards are shown on Figure 18.

1. Earthquake Induced Landslide Hazard Areas: Earthquake vibration may cause unstable material to fail by influencing existing planes of weakness within bedrock (such as bedding planes or fault planes) or within unconsolidated material (such as existing landslides). The USGS documented many earthquake-induced landslides throughout the Puget Lowland that occurred due to shaking from the 2001 Nisqually event, and several researchers have correlated previous mass movements in Lake Washington to an earthquake on the Seattle Fault about 1,100 years ago (Jacoby et al., 1992; Karlin and Abella, 1992, 1996).

   It is our opinion that the risk of damage to the proposed structures by seismically induced landsliding is low over the majority of the site due to the lack of steep slopes. However, the risk would be higher in those areas where slopes exceed 40 percent. These include areas mapped as Landslide Hazard Zone 2 on Figure 15. The site includes slopes along the east edge of the parcel that appear to be underlain at shallow depths by glacially consolidated sediments that tend to be resistant to slope failures during a seismic event. Development on or near the east slopes of the parcel may warrant a

quantitative assessment of slope stability during a seismic event, though the risks of such slope failures are likely to be low. There is no evidence of landslide activity either onsite or on the slopes offsite along the eastern project boundary. Landslide Hazards are discussed in more detail under "Landslide Hazard Areas (SMC 19.12.110) & Steep Slope Hazard Areas (SMC 19.12.120)."

The existing wood waste pile is large and has tall and relatively steep side slopes. If the existing wood waste pile is to remain as it currently exists, and new development is planned nearby, consideration of slope stability during a seismic event may need to be considered. However, we understand the wood waste pile will be removed, prior to development in the area.

2. Liquefaction Hazard Areas: The term *liquefaction* refers to a dramatic loss of shear strength occurring in a subsurface soil deposit when subjected to shaking, as during an earthquake. The seismically-induced loss of soil strength can result in failure of the ground surface and can be expressed as landslides or lateral spreads, surface cracks and settlement, and/or sand boils. Seismically-induced liquefaction typically occurs in loose, saturated, non-cohesive sandy and silty soils commonly associated with recent river, lake, and beach sedimentation. In addition, seismically induced liquefaction can be associated with areas of loose, saturated fill.

   The low-lying areas of the site contains existing fill, overbank deposits, river channel deposits, and lacustrine sediments, some of which are saturated. These materials are potentially at risk of liquefaction during a design-level seismic event, shown as Seismic Hazard Zone 2 on Figure 18.

   The eastern and northeastern slopes along the eastern margin of the site are underlain by glacially consolidated material that is not expected to be susceptible to seismically-induced liquefaction.

3. Lateral Spreading: Due to the low strength of the existing fill and lacustrine sediments, the lower-lying parts of the site could be susceptible to failure by lateral spreading during a seismic event, even on relatively gently inclined slopes. This area includes Seismic Hazard Zone 2 on Figure 18.

4. Fault Rupture Hazard Areas: Ground rupture occurs as offsets of the ground surface and is limited to the immediate area of the fault. As described previously, a strand of the RMF (RMF-8) and the Snoqualmie Valley Fault may cross through the Mill site, based on recent geologic maps. There is no evidence that these are active faults. Holocene-age sediments do not appear to be disturbed beneath the site, suggesting that, if these faults exist, they have not been active for the last 10,000 years. No evidence of surface faults or associated ground ruptures were observed on the Mill site. The main strand of the RMF (RMF-1) is located approximately 0.75 miles west of the Mill site and is the

nearest known fault to the project that may be active. Studies of the RMF Zone indicate that RMF-1 may be an active fault capable of generating surface ruptures, although the recurrence interval of movements along the fault is unknown. It is our opinion, based on existing geologic data, that the risk of surface rupture impacting the Mill site is low.

Ground Motion

Ground motion from an earthquake results from shear, pressure, and surface waves propagating through the earth's crust from the earthquake's hypocenter. The ground motion caused by these waves is the seismic shaking felt during an earthquake. The intensity of the shaking felt at a given location during and immediately after an earthquake, is a result of several variables including: 1) the magnitude of the earthquake, 2) distance from the earthquake, 3) depth of the earthquake, 4) the type of rocks and unconsolidated sediments underlying a given site, and 5) attenuation of the seismic energy between the earthquake and a given site.

The Nisqually 2001 earthquake provided opportunities for direct observation of ground motion during a large regional earthquake. The University of Washington's PNSN created a "shake map" of peak acceleration and velocity from wave forms collected from the earthquake. Peak acceleration is the maximum acceleration experienced by a particle at the earth's surface during the course of the earthquake motion. The event was located between Olympia and Tacoma at a depth of 32.6 miles. Based on PNSN data the Mill site experienced moderate to strong shaking.

The Mill site is underlain by relatively soft, saturated sediments that may amplify the ground motion. Based on the relative density of the subsurface soils obtained from standard penetration test (SPT) data to a depth of 100 feet in EB-1 onsite and seismic shear wave velocity data obtained from CPT-1 and CPT-2 onsite, the site soils are consistent with Site Class "E" or possibly Site Class "F", since the site is underlain by liquefiable soils, in accordance with the 2015 *International Building Code* (IBC) and *American Society of Civil Engineers* Publication ASCE 7-16 *Minimum Design Load and Associated Criteria for Buildings and Other Structures*. Site Class "E" applies to sites underlain by soft silts and clays. Site Class "F" applies to sites underlain by soft or loose soils that are also liquefiable and requires completion of a site-specific seismic response analysis.

<u>Flood Hazard Areas (SMC 15.12 and SMC 19.12.150)</u>

Flood hazard areas are regulated under SMC Section 15.12 and 19.12.150. Most of the Mill site is within the 100-year floodplain Zone AE shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) of the area, below the base flood elevation (BFE). Zones AE are areas that have a 1 percent probability of flooding every year (100-year floodplain) and where predicted flood water elevations above mean sea level have been established. Properties in Zone AE are considered to be at high risk of flooding under the National Flood Insurance Program (NFIP). The southwestern portion of Planning Area 1 is within

the delineated floodway. The floodway is defined as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The 100-year floodplain and floodway are both shown on Figure 19.

Proposed development within the floodway and 100-year floodplain is regulated by the City of Snoqualmie's Flood Hazard Regulations (SMC 15.12) and federal FEMA regulations. Site development will require compliance with general standards in the SMC, including requirements for final grades after construction, the protection of site utilities from adverse impacts due to flooding, and the demonstration that the proposed development will not increase the flood levels during the occurrence of the base flood discharge. Compliance with these standards is described in the "Snoqualmie Mill Planned Commercial-Industrial Plan – Master Drainage Plan, Preliminary Draft," dated April 6, 2018 and prepared by Goldsmith (DEIS Appendix X).

Channel Migration Zones (SMC 19.12.140)

Channel Migration Zones (CMZs) are regulated under SMC Section 19.12.140 and are defined as "*the area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings as delineated on the Snoqualmie River Channel Migration Area Map, contained in Channel Migration in the Three Forks Area of the Snoqualmie River*" (King County Department of Natural Resources, Surface Water Management Division, Seattle, WA, 1996).

The referenced report delineates CMZs along the Snoqualmie River in the vicinity of the site, categorizing areas into Potential Hazard Areas, Moderate Hazard Areas, and Severe Hazard Areas. Based on the maps in the referenced report and shown on Figure 14, a section along the southwestern edges of Planning Area 1 and Planning Area 3 are within the Moderate Hazard Area. The majority of Planning Area 1 and the western portion of Planning Area 3 are within mapped Potential Hazard Areas (Figure 14).

Development is not limited in potential hazard areas; however, only certain development or activities are allowed in severe and moderate CMZs. Per SMC 19.12.140(C), only the "*following activities are allowed within the severe and moderate channel migration zone:*

1. *Trails and boardwalks;*

2. *Forest practices;*

3. *Ongoing agriculture;*

4. *Bridges, utilities and transportation structures when no other feasible alternative exists;*

5. *Development with a primary purpose of protecting or restoring ecological functions."*

Based on current site planning, new structures are not currently planned within either the Severe or Moderate Hazard Areas except for the realignment of SE Mill Pond Road. Structures are planned within the mapped Potential Hazard Area.

Critical Aquifer Recharge Areas (SMC 19.12.200)

Title 19.12.200 of the SMC presents the definitions of CARA as follows:

1. *"Category I critical aquifer recharge areas include those areas mapped by King County and are determined to be highly susceptible to groundwater contamination and that are located within a sole source aquifer or a wellhead protection area.*

2. *Category II critical aquifer recharge areas include those areas mapped by King County and determined to:*

    a. *Have a medium susceptibility to ground water contamination and are located in a sole source aquifer or a wellhead protection area; or*

    b. *Are highly susceptible to ground water contamination and are not located in a sole source aquifer or wellhead protection area.*

3. *Category III critical aquifer recharge areas include those areas mapped by King County and determined to have a low susceptibility to groundwater contamination."*

Review of the map *King County Critical Aquifer Recharge Areas* dated March 1, 2012 (shown on Figure 20) indicates that the area immediately surrounding the Snoqualmie Mill site to the north, and portions of the site on the west and northwest parts of the property are classified as a Category 1 CARA. The areas mapped as Category 1 CARA appear to generally correspond to the mapped 10-year TOT wellhead protection areas (WPAs) for groundwater production wells. The area immediately south of the Mill site, including the Mill Pond, and portions of the site on the southeast and southwest parts of the property are classified as a Category 2 CARA. The majority of the Mill site, however, is not classified.

As identified in the SMC Title 19.12.200(C), certain uses or activities are prohibited in a Category 1 CARA. According to SMC Title 19.12.200(F), certain activities and uses not prohibited require a hydrogeologic assessment to be completed prior to approval of that activity or use. Storage tanks constructed in a CARA need to comply with containment and corrosion protection requirements and other uses such as agriculture, sewage disposal, golf courses, and vehicle repair need to implement best management practices with respect to their operations.

Many of the WPAs shown on the above-referenced King County map consist of a circular WPA centered around the groundwater source, including the WPA delineated for the NWF just north of the Mill site. These circular WPAs appear to have been delineated using a calculated fixed radius (CFR) technique. The CFR is a simple two-dimensional analysis, assumes that the initial hydraulic gradient is horizontal (i.e., that there is no ambient groundwater flow), and does not take into account complex hydrogeologic conditions, such as aquifer heterogeneities, varied aquifer geometry, bedrock boundaries, and a sloping hydraulic gradient, all of which are present in the vicinity of the Mill site. As a result, delineated WPAs obtained via the CFR method for the NWF may be misleading.

AESI developed numerical groundwater flow models, using MODFLOW, to evaluate the groundwater capture zones for both the NWF and SWF (AESI, 1994, 1995c, 1996), north and south of the Mill site. The capture zones delineated by the MODFLOW modeling incorporate a conceptual hydrogeologic model developed by AESI through analysis of subsurface conditions observed in explorations completed on- and offsite, review of conditions reported on Ecology well logs, water level monitoring, and detailed hydrogeologic mapping. The resulting capture zone calculated by the three-dimensional MODFLOW model takes into account existing conditions and represents a more realistic estimate of the TOT zones to the production wells at the NWF and SWF.

The MODFLOW model indicates that the TOT zones for the well field are highly elliptical (AESI, 1994, 1995c, 1996). For example, at the NWF the 10-year TOT zone extends just over 2 miles south of the well field, through the Mill site and Mill Pond, but only a few hundred feet to the north. The calculated capture zone is relative narrow, generally in the range of 3,000 feet (AESI, 1996). The overall shape is controlled by the hydrogeologic setting and reflects the combination of a narrow bedrock bounded aquifer with a steep hydraulic gradient.

The wells for the NWF withdraw groundwater from the Deep Aquifer, which is separated from shallower aquifers by multiple low-permeability aquitards and receives limited recharge from shallower aquifers near the well field. As described previously under “Deep Aquifer,” particle tracking plots, which illustrate flowpaths generated by the MODFLOW computer model, support this interpretation. Most of the water discharging from the well field comes directly from upgradient sources in the Deep Aquifer, originating a few miles upvalley (southeast) of the 10-year TOT boundary. Modeling suggests only about 5 to 10 percent of the water at the well field would originate in the Tokul Creek Delta Aquifer, Snoqualmie River Shallow Aquifer, or surface water sources within the 10-year TOT zone (AESI, 1996). The vast majority of recharge from the Mill site will bypass the deeper aquifer system within the 10-year TOT zone, discharging directly into the Snoqualmie River to the west or into the Tokul Creek Delta Aquifer to the north and emerge at the spring zone along Tokul Creek, ultimately flowing to the Snoqualmie River downgradient of the falls.

1.3 POTENTIAL IMPACTS

The following sections of this report describe our evaluation of probable significant environmental impacts relative to geologic hazards, surface water, and groundwater resources that might result from development of the Snoqualmie Mill site (Mill site), without mitigation. Our analysis of probable significant impacts associated with geologic hazards includes the following: erosion hazards including stream/river erosion (channel migration), landslide hazards, seismic hazards, flood hazards, and critical aquifer recharge areas (CARAs). Our analysis of CARAs is limited to groundwater quantity impacts. Geotechnical development impacts are also discussed.

The potential impacts presented in the following sections are discussed in reference to the Proposed Action. Any differences in the potential impacts in relation to the No Action Alternative or Alternative 1 are presented at the end of each section.

Proposed Stormwater Management

Stormwater management for the Mill site (aside from flood regulations) is regulated by the 2016 *King County Surface Water Design Manual* (KCSWDM) and the 2012/2014 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (Ecology Manual). In addition, development at the site will be required to comply with the Floodplain Management Regulations of the National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency (FEMA).

As described in the "Snoqualmie Mill Planned Commercial-Industrial Plan – Master Drainage Plan, Preliminary Draft," dated April 6, 2018 and prepared by Goldsmith Engineers [Goldsmith], the site lies entirely within the Snoqualmie River Basin and currently drains to the Snoqualmie River from one Threshold Discharge Area. As defined by the KCSWDM, a Threshold Discharge Area is an on-site area draining to a single natural discharge location, or multiple natural discharge locations that combine within one-quarter-mile downstream. Drainage leaves the site at three locations; directly to the river via overland flow, through the Mill Pond via on-site ditches (the Mill Pond drains through a culvert under SE Mill Pond Road to the Snoqualmie River), and the Northeast portion of the site that drains to the river via a large off-site wetland complex lying north of the property. The entire site (with the exception of some small areas of the site above the base flood elevation [BFE]) as well as all downstream areas lie within the 100-year floodplain of the river.

The strategy for stormwater management for development of the Mill site is primarily flood control and compliance with flood hazard regulations. During typical rainfall events, stormwater management will include collection, treatment and direct discharge to the Snoqualmie River and collection, treatment and discharge to on-site and off-site wetlands to maintain wetland and stream hydrology. The Snoqualmie River is designated as a Direct Discharge Receiving Water Body by the KCSWDM and the Ecology Manual, thus the site is

exempt from flow control requirements. Proposed developed discharge to on-site and off-site wetlands will be evaluated for consistency with existing conditions by the wetland biologist. This applies to all wetlands and drainages between the site and the Snoqualmie River.

Therefore, the Stormwater Management Plan for the Mill site can be described in four primary components:

1. Direct Discharge to the Snoqualmie River

2. Maintenance of Existing Sub-Basin Hydrology to On-Site and Off-Site Wetlands

3. Runoff Treatment of Pollutant Generating Impervious Surfaces (PGIS)

4. Flood Control and Compliance with Flood Hazard Regulations

1.3.1 Hydrogeologic Impacts

Surface Water Impacts

Under both the Proposed Action and Alternative 1, stormwater runoff will be collected, treated for water quality, and then conveyed to surface water discharge locations – to the Snoqualmie River directly or through on-site wetlands and streams (and the Mill Pond) before ultimately discharging to the Snoqualmie River. Stormwater routed to on-site wetlands will first receive enhanced water quality treatment by passing through stormwater wetlands.

Snoqualmie River

The Mill site qualifies for Direct Discharge Flow Control Exemption per the KCSWDM since it is considered a Major Receiving Water by the manual and meets the other requirements in KCSWDM Section 1.2.3.1, which in part includes the requirements that the flowpath from the project site to the point-of-discharge be no longer than one-quarter mile and the direct discharge will not divert flows from or increase flow to an existing wetland or stream sufficient to cause a significant adverse impact. Discharge to on- and off-site wetlands and streams consistent with existing conditions is a key component of the proposed stormwater management for the Mill site with the intent to maintain existing hydrology on- and offsite, and prevent significant adverse impacts.

The average discharge for the Snoqualmie River just downstream of the falls from 1959 to present was about 2,700 cubic feet per second (cfs) (U.S. Geological Survey [USGS], 2018). The quantity of proposed discharge of on-site stormwater runoff to the Snoqualmie River will be insignificant compared to existing instream flow. No potential adverse impacts to the Snoqualmie River have been identified.

Potential impacts to the Snoqualmie River for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, there would be no direct discharge of stormwater runoff to the Snoqualmie River.

Tokul Creek

The Tokul Creek Delta Aquifer discharges into Tokul Creek north of the site. As described in Section 1.2.4, based on the flow monitoring results in the creek, aquifer flow (spring discharge) from the Tokul Creek Delta Aquifer ranges from about 3½ to 8 cfs. The Snoqualmie River Shallow Aquifer underneath the northern portion of the site flows to the north and ultimately merges with the Tokul Creek Delta Aquifer north of the site. Reduced or increased recharge onsite could therefore impact the overall quantity of water flowing in the shallow aquifer to the north and impact flows in Tokul Creek.

Potential impacts to the Tokul Creek Delta Aquifer and Snoqualmie River Shallow Aquifer are discussed below under "Groundwater Impacts." In general, groundwater recharge under developed conditions is expected to be similar to recharge under existing conditions, such that no adverse impacts to groundwater quantity are anticipated, and therefore, no adverse impacts to the Tokul Creek spring discharge are anticipated.

Potential impacts to the Tokul Creek for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, discharge into Tokul Creek from the Tokul Creek Delta Aquifer would be unchanged.

Mill Pond

Most of the surface water runoff generated on the Mill site is collected by the linear Wetland 12 system, which extends to the south end of the site where it discharges directly to the Mill Pond. There are also limited areas where surface water runoff directly discharges to the Mill Pond; however, there is no development proposed in these areas, except at the southeastern corner of the site.

The Tokul Creek diversion to the Mill Pond (described under Section 1.2.4) was ceased in 2011. The current level of the Mill Pond is controlled primarily by the outlet elevation with some variation due to stormwater runoff directed to the pond from the Mill site and occasional flooding of the Snoqualmie River. The current outlet of the pond is through a breach in the berm just southeast of the control weir, which was reconstructed in 2009 after a previous breach in the berm. Based on ongoing monitoring, the water level in the Mill Pond is maintained at an elevation of about 409 feet with minor variation. This variation appears to be primarily due the discharge of stormwater into the pond from the Mill site, instead of an expression of shallow groundwater fluctuations. As described under Section 1.2.4, differing water level elevations and response timing trends between the Mill Pond and shallow aquifer suggest the hydraulic connection between the shallow aquifer and the Mill Pond is somewhat

limited. The observed water level fluctuations in the Mill Pond are consistent with discharge into the pond from stormwater runoff.

Potential impacts to the Mill Pond due to development could include: 1) an increase/decrease in total volume of surface water runoff that is conveyed to the pond, and 2) an increase in peak discharge to the pond during storms. Large uncontrolled discharge to the pond could cause the water levels to fluctuate to a greater degree than existing conditions and potentially increase discharge flows from the Mill Pond, which could cause additional erosion of an existing breach in the Mill Pond berm.

The stormwater management plan for the site includes maintaining discharge to the on-site wetlands and streams consistent with existing conditions, and thus discharge to the Mill Pond is also expected to be similar to existing conditions. Therefore, no adverse impacts relative to surface water quantity at the Mill Pond are anticipated.

Potential impacts to the Mill Pond for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, surface water flows to the Mill Pond would continue similar to existing conditions with similar water level fluctuations observed on the recent hydrographs.

Streams

Six streams (S-1 through S-6) have been identified in the immediate vicinity of the site (Raedeke Associates, Inc. [Raedeke], 2012 and Cedarock Consultants, Inc. [Cedarock], 2012). S-1 and S-2 flow through the site and could potentially be impacted by site development. S-3 through S-6 flow down the slopes just east of the site.

Stream S-1 flows down the eastern slopes and enters the site at the northeast corner. After entering the site, the stream flows west through Wetland 10 and then through a deep roadside ditch that follows the Snoqualmie Sand and Gravel haul road south and then west. The supply of water for S-1 onsite is primarily streamflow entering the site at the northeast corner; however, S-1 does receive additional flow from on-site stormwater runoff at the northeast area of the site, including seasonal flow from Wetlands 8 and 9. The northeast area of the site is within Planning Area 3, which is being analyzed on a programmatic level in the EIS. Conceptually, under developed conditions stormwater runoff in Planning Area 3 will be routed to existing wetland conveyance systems and then to the Snoqualmie River.

S-2 is located in the south-central portion of the site and generally flows north to south, discharging to the Mill Pond. The supply of water for S-2 is a combination of surface runoff, nearby roadside/drainage ditches, and shallow groundwater seepage. Under the Proposed Action, a portion of the stormwater runoff from the site will be routed to S-2 and then to the river through the Mill Pond.

Both of these streams have the potential to be affected by the proposed project. Potential impacts could include: 1) an increase/decrease in total volume of surface water runoff and 2) an increase in peak discharge during storms. However, the stormwater management plan for the site includes maintaining discharge to the on-site wetlands and streams consistent with existing conditions; therefore, no adverse impacts to the on- and off-site streams are anticipated.

Potential impacts to the streams for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, surface water flows to the streams would continue similar to existing conditions.

Wetlands

The preliminary draft Master Drainage Plan by Goldsmith (2018) delineated several sub-basins at the site. The majority of the Mill site is tributary to and drains through the extensive Wetland 12 system. Approximately 149 acres (57 percent) of the site (most of the central, west, and eastern areas) flows to Wetland 12 (or to Wetland 28 then to Wetland 12) and eventually to the Mill Pond. Approximately 31 acres (12 percent) at the northeast corner of the Mill site drains to Wetland 9 and then flows to a large wetland complex at the north end of the site, which includes Wetland 11, and eventually discharges to the Snoqualmie River. The only areas onsite that do not directly flow to the on-site wetlands are relatively small areas along the southern edge of the site that flow to the Mill Pond and along the western edge of the site that flow to the Snoqualmie River.

A portion of stormwater runoff generated onsite will be routed to the Wetland 12 system in the central area of the site and the Wetland 9 system at the northeastern corner of the site. The proposed development could alter the amount of flow routed to the wetlands, which could in turn impact their existing, natural seasonal fluctuation in water level.

As described in the preliminary Master Drainage Plan (Goldsmith, 2018), development in Planning Area 1 could potentially impact three wetland sub-basins, including the two Wetland 12 sub-basins (WL 12 W and WL 12 NW) on the western side of the site and the Wetland 28 sub-basin (which ultimately flows to Wetland 12). These sub-basins are shown on Figure 6-1 in the Master Drainage Plan (Goldsmith, 2018). The conversion of pervious surfaces to impervious surfaces due to development in Planning Area 1 based on the Planned Commercial/Industrial (PCI) Plan was analyzed in the Master Drainage Plan (Goldsmith, 2018). The total Effective Impervious Area (EIA) for the three sub-basins under existing conditions is 9.95 acres, and the total EIA under developed conditions is 33.28 acres. This increase in total EIA has the potential to increase the quantity of stormwater runoff flowing to the wetlands in Planning Area 1, depending upon the stormwater management plan for the site.

Development in Planning Areas 2 and 3 is still conceptual at this time, and the PCI Plan does not provide details for proposed development in these areas; therefore, an analysis similar to

Planning Area 1 above is not possible. However, the PCI Plan does define a maximum level of buildout as part of the PCI approval, indicating that the total EIA in Planning Area 2 and Planning Area 3 will be approximately 78 acres, which is a reduction of about 30 percent from existing conditions. This reduction in EIA has the potential to increase recharge to the shallow aquifer and subsequently increase seepage into on-site groundwater-supported wetlands. Planning Areas 2 and 3 are still at a programmatic level, such that it is not possible at this time to define the configuration of the wetland sub-basins under developed conditions.

It is the intent of the stormwater management plan for the site to maintain flows to existing on- and off-site wetlands similar to existing conditions, such that adverse impacts are not anticipated. Many of the on-site wetlands are supported primarily by shallow groundwater (as described in Section 1.2.4, "Hydrogeology"), such that they are not susceptible to minor changes in discharge from stormwater runoff. Stormwater runoff routed to the wetlands quickly flows through the on-site system of interconnected wetlands and drainage ditches before discharging offsite.

Potential impacts to the wetlands in Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, surface water flows to the wetlands would continue similar to existing conditions.

Groundwater Impacts

Under the proposed stormwater management plan for the site, stormwater runoff will be collected and directed to the Snoqualmie River. The stormwater runoff will be either discharged directly to the Snoqualmie River or discharged to existing on-site wetlands, which indirectly convey water to the Snoqualmie River through the Mill Pond. Proposed stormwater control at the Mill site under the Proposed Action is described in detail in Goldsmith's preliminary Master Drainage Plan (2018).

In general, potential impacts to groundwater recharge due to site development could include –

1. Gain or loss of groundwater recharge resulting from conversion of undeveloped land (or redevelopment of existing developed areas) into the various proposed industrial, commercial, and residential uses;

2. Impacts to underlying aquifers and downgradient usage as a result of a change in recharge; and

3. Impacts to surface water features as a result of a change in recharge.

Development has the potential to change the amount of surface water and groundwater recharge. Clearing vegetation and replacing it with suburban landscaping (such as lawns) reduces evapotranspiration, increasing the amount of water available for groundwater

recharge and runoff. Depending upon how stormwater is managed, the increase in groundwater recharge may be counteracted by an increase in impervious surfaces (building and pavement areas), and other factors. The primary factors that would increase the amount of groundwater recharge are: 1) infiltration of stormwater runoff, 2) infiltration of imported water such as that used for irrigation, and 3) conversion of existing forestland to cleared, pervious surfaces (lawns, shrubbery, etc.). The primary factors that would decrease the amount of groundwater recharge are: 1) addition of impervious surfaces, and 2) diverting stormwater runoff to off-site locations.

The stormwater management plan for the site is described above under "Proposed Stormwater Management." In general, on-site stormwater management will include collection, treatment and direct discharge to the Snoqualmie River and collection, treatment and discharge to on-site and off-site wetlands to maintain wetland hydrology. The intent of the proposed plan is to maintain discharge to on-site and off-site wetlands and streams consistent with existing conditions; therefore, groundwater recharge post-development is also expected to be similar to existing conditions.

AESI has conducted ongoing groundwater level monitoring at the Snoqualmie Ridge development since 1996, located about 1.5 miles west of the Mill site. Similar to the Mill site, the stormwater management approach for the initial phase of buildout at Snoqualmie Ridge included collection, treatment, and direct discharge to the Snoqualmie River. The groundwater level data from Snoqualmie Ridge provides a long-term record of the trend of aquifer levels both prior and subsequent to extensive development in the area and provides an analog for comparison to assess potential impacts to groundwater levels due to development at the Mill site. Groundwater monitoring well MW-1, located in the Snoqualmie Ridge development, is screened in the Lake Alice Aquifer, which is an unconfined aquifer developed within Vashon advance fluvial and deltaic sand and gravel deposits. The Vashon advance outwash is overlain by relatively low-permeability Vashon lodgement till, which mantles the Lake Alice Plateau where the Snoqualmie Ridge development is situated. No evidence of development-related reductions in the Lake Alice Aquifer levels have been noted in the 22-year period of record obtained from MW-1 since monitoring began in 1996. This data is consistent with other long-term groundwater level monitoring data that AESI has collected at other sites throughout the Puget Sound and indicates that no adverse groundwater quantity impacts are expected due to development at the Mill site.

Bedrock "Aquifer(s)"

Probable significant adverse impacts to the bedrock aquifer could occur if development of the Mill site resulted in a significant reduction in recharge. However, as described above, groundwater recharge is anticipated to be similar to existing conditions. Therefore, no probable significant adverse impacts to the bedrock aquifer, or yields to neighboring wells completed in the bedrock aquifer, have been identified.

Potential impacts to the bedrock aquifer for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, no significant reduction in recharge to the bedrock aquifer would be expected. Individual water supply wells could potentially be constructed and withdraw groundwater from the bedrock aquifer. However, daily demands would likely be small and no probable significant impacts are anticipated.

Deep Aquifer

The Deep Aquifer is developed in Olympia or pre-Olympia-age fluvial sands and gravels. It represents an ancient Snoqualmie River system confined within a narrow bedrock valley. Its presence is limited by the ancient bedrock valley, extending upvalley (southeast) from the Mill site towards North Bend and downvalley (northwest) downstream of Snoqualmie Falls.

The Deep Aquifer exhibits leaky confined aquifer behavior and is separated from surface water sources and aquifers by multiple aquitards with combined thicknesses of about 300 feet. The Deep Aquifer does not have a direct connection with the waters of surface streams due to the presence of intervening aquifers and aquitards totaling several hundred feet in thickness.

Recharge to the Deep Aquifer occurs from limited vertical leakage through the overlying aquitards and is primarily from throughflow of groundwater coming downvalley from the southeast. As described in detail under "Affected Environment," groundwater flow models indicate that most of the water discharging at the North Well Field (NWF) and South Well Field (SWF) comes directly from upgradient sources in the Deep Aquifer, originating a few miles upvalley (southeast) of the Mill site. The modeling suggests that recharge from shallower aquifers in the vicinity of the Mill site account for no more than about 10 percent of the water pumped at the NWF and SWF (AESI, 1995c, 2007).

Because of the limited recharge from overlying aquifers in the vicinity of the Mill site (as described above) and since no significant reduction in recharge to overlying aquifers is expected, no significant reduction in recharge to the Deep Aquifer is anticipated. Therefore, no probable significant impacts to the Deep Aquifer have been identified from the Proposed Action.

Potential impacts to the Deep Aquifer for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, no significant reduction in recharge to the Deep Aquifer would be expected. Individual water supply wells could potentially be constructed and withdraw groundwater from the Deep Aquifer. However, daily demands would likely be small and no probable significant impacts are anticipated.

Pre-Fraser Aquifer

The Pre-Fraser Aquifer is developed in Olympia-age non-glacial or other undifferentiated pre-Fraser deposits underlying the site. The thickness of the Pre-Fraser Aquifer near the

Mill site ranges from about 60 feet to over 120 feet, based on borings at the NWF. The Pre-Fraser Aquifer encountered in onsite well MW-1 is separated from the underlying Deep Aquifer by 50 to 100 feet of low-permeability sediments. This aquitard is discontinuous and may not be present southeast of the NWF in the vicinity of the Mill site, where in some areas the Pre-Fraser Aquifer is interpreted to have a more direct hydraulic connection with the underlying Deep Aquifer (AESI, 1994, 1995c, 2001). The Pre-Fraser Aquifer is separated from overlying aquifers and surface water due to the presence of about 200 feet of low-permeability, Holocene-age lacustrine silt and clay underlying the Mill site. Recharge to the Pre-Fraser Aquifer occurs from limited vertical leakage through the overlying aquitard and throughflow from upgradient sources.

Since no significant reduction in recharge to overlying aquifers is expected, no significant reduction in recharge to the Pre-Fraser Aquifer, is anticipated, and therefore, no probable significant impacts to the Pre-Fraser Aquifer have been identified from the Proposed Action.

Potential impacts to the Pre-Fraser Aquifer for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, no significant reduction in recharge to the Pre-Fraser Aquifer would be expected.

Tokul Creek Delta Aquifer

The Tokul Creek Delta Aquifer is interpreted to be developed in the Vashon recessional delta deposits north of the Mill site and beneath the northern portion of the Mill site underlying the recent lacustrine deposits. Recharge to the Tokul Creek Delta Aquifer is from direct precipitation where the delta is exposed at the ground surface north of the Mill site, which will not be impacted by on-site development. Additional recharge occurs from the Snoqualmie River Shallow Aquifer, which flows to the north below the north end of the Mill site and eventually merges with the Tokul Creek Delta Aquifer. Since the stormwater management plan will be designed to maintain hydrology to the on-site wetlands and other surface water features, recharge to the Snoqualmie River Shallow Aquifer will not be significantly impacted, and therefore, recharge to the Tokul Creek Delta from the shallow aquifer will not be significantly impacted due to site development.

Potential impacts to the Tokul Creek Delta Aquifer for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, no significant reduction in recharge to the Tokul Creek Delta Aquifer would be expected.

Snoqualmie River Shallow Aquifer

The Snoqualmie River Shallow Aquifer is located within the present-day Snoqualmie River valley, including the Mill site. The Snoqualmie River Shallow Aquifer generally consists of fine to medium sand with gravel deposited in channel and near-channel environments of a

meandering river system. Recharge to the Snoqualmie River Shallow Aquifer occurs from upvalley aquifer sources and direct precipitation within the valley, including on the Mill site.

Development in general could potentially reduce recharge to the Snoqualmie River Shallow Aquifer underlying the site if stormwater runoff was conveyed directly into off-site streams or the Snoqualmie River, which would quickly transport the water downstream away from the site. However, as described previously, since the stormwater management plan will be designed to maintain hydrology to the on-site wetlands and other surface water features, recharge to the Snoqualmie River Shallow Aquifer will not be significantly impacted by development onsite.

Potential impacts to the Snoqualmie River Shallow Aquifer for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, no significant reduction in recharge to the Snoqualmie River Shallow Aquifer would be expected.

Interflow

As described under "Groundwater" in Section 1.2.4 an interflow network is present at shallow depths in areas underlain by lodgement till, including the slopes just east of the Mill site. Since development on these slopes is not part of the Proposed Action or Alternative 1, we do not anticipate adverse impacts to shallow interflow.

1.3.2 Geologic Hazard Impacts

Erosion Hazard Impacts

The most significant increase in erosion hazard potential onsite will be during construction. Clearing and grading activities during construction will increase erosion potential onsite through the removal of vegetation and by exposing soil directly to precipitation and runoff. Exposed soil will be subject to erosion and sediment transport. Nearby surface water features that could be adversely impacted by increased sedimentation include on-site wetlands and streams, the Mill Pond, and the Snoqualmie River. Post-construction (developed) conditions impacts should be similar to existing conditions, since exposed surfaces would be covered with structures, roadways, or new plantings.

The stormwater management plan for the Mill site proposes to discharge to the Snoqualmie River. Stormwater runoff from the western side of the site will be conveyed through storm pipes to a broad surface swale that will be constructed along a portion of the new SE Mill Pond Road. The stormwater will be conveyed as surface water flow through the swale to the Ordinary High Water Mark (OHWM) elevation of the river. Stormwater runoff from the eastern side of the site will be conveyed to the river through the existing system of on- and off-site wetlands.

Potential adverse impacts include erosion along the swale or along the system of wetlands and streams if significant flows are routed to these features or if the base or side slopes are not properly protected with vegetation or constructed of stable material.

Potential erosion hazards for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative, there would be no potential erosion hazards related to the surface swale since there would no direct discharge to the river.

Landslide and Steep Slope Hazard Impacts

The existing landslide and steep slope hazards onsite could be adversely impacted from three primary activities during development. These include clearing, grading (earthwork), and stormwater management.

Clearing could increase the existing landslide hazard potential by removing vegetation which would normally intercept some of the rainfall, resulting in higher runoff volumes. Grading (earthwork) activities could increase the existing landslide hazard potential. Fill material placed on or adjacent to a steep slope will increase the driving forces acting in the subsurface, which would increase the risk of slope failures. Surface drainage patterns are typically altered by grading. If the new drainage pattern results in an increase in either surface or subsurface water flow on or near a slope, landslides could occur.

Non-structural fills could fail due to inadequate compactive effort, use of organic soils, improper site preparation, oversteepened slopes, or other factors. Cut slopes could also fail if they are oversteepened, toe support is removed, or drainage is improperly directed.

Potential landslide and steep slope hazards for Alternative 1 would remain substantially unchanged from the Proposed Action. Since most of the steep slope areas are located just offsite, potential landslide and steep slope hazards under the No Action Alternative would remain substantially unchanged from either the Proposed Action or Alternative 1, with the exception of the wood waste pile in Planning Area 3 which would remain in-place under the No Action Alternative. Under the Proposed Action and Alternative 1 the wood waste pile would eventually be removed to allow development in Planning Area 3.

Seismic Hazard Impacts

Liquefaction

The subject site is underlain by alluvial sediments that are potentially susceptible to liquefaction during an earthquake. To assess the liquefaction risk, we performed a liquefaction analysis for this site in accordance with guidelines published in Seed & Idriss, 1982; Seed et al., 1985; and Kramer, 1996. Our liquefaction analysis was completed with the aid of LiquefyPro computer software Version 5.8h (2009) by CivilTech Corporation. This program accepts input for cone

penetrometer test (CPT) data, groundwater levels, soil unit weight, and the depth and grain-size distribution of the sediments of concern to calculate seismically induced settlement. The liquefaction analysis was conducted based on the subsurface conditions encountered in the CPTs advanced at the site.

Based on liquefaction analysis utilizing soil data from CPT-01, CPT-02a, and groundwater data from boring EB-1, the subsurface conditions encountered at the site are predicted to experience liquefaction during a design-level seismic event. Liquefiable sediments were identified at depths continuing from 25 to 70 feet below ground surface, and the liquefaction-induced settlement calculated for the site ranges from about 2 to 8 inches over this depth range.

Lateral Spreading

Lateral spreading is a hazard on sites where liquefaction-prone material is located near exposed slopes. In the case of the Mill site, this includes areas near the banks of the Snoqualmie River. The liquefied soil layers and non-liquefiable overburden may spread horizontally toward the water due to the reduction of soil strength and lack of confinement on the water side. We performed a preliminary lateral spread analysis based on methods presented by Youd et al. (2002). The potential lateral displacement in Planning Area 1 was calculated at a distance of 100 to 150 feet from the Snoqualmie River. Our analysis indicates that the magnitude of lateral spread could be on the order of 1 to 2 feet towards the shoreline for a design seismic event. Additional analyses will be necessary when development plans are formalized and more subsurface information is available.

Earthquake-Induced Landslide Hazards

The site includes slopes near the east edge of the parcel underlain at shallow depths by glacially consolidated sediments, based on geologic mapping (Dragovich et al., 2009b), that tend to be resistant to slope failures during a seismic event. These slopes are offsite; however, landslide activity on the slopes could impact site development near the toe of the slope. Development near the east slopes may warrant a quantitative assessment of slope stability during a seismic event, though the risks of such slope failures are interpreted to be low due to the very dense nature of the glacially consolidated sediments. These slopes are along the eastern boundary of Planning Areas 2 and 3, which are analyzed at a programmatic level in the EIS; and therefore, planned development in this area is very preliminary. Later in the design process, once a development concept has been formulated, the geotechnical engineer for the project should review the site plans to determine whether a quantitative assessment of slope stability on the eastern part of the site is warranted.

The existing wood waste pile at the north end of Planning Area 3 is large and has tall and relatively steep side slopes. At this time, development in Planning Area 1 is not planned in close proximity to the wood waste pile. We understand that the wood waste pile will be removed

during the development in Planning Area 3; therefore, no adverse impacts are anticipated in relation to the wood waste pile.

Future development along the bank of the Snoqualmie River and shoreline of the Mill Pond could be at-risk from landslide activity along the river bank or shoreline during a strong seismic event. Very limited subsurface information is available in these two areas and bathymetry of both water bodies is limited. Development in Planning Area 1 would be accessed using SE Mill Pond Road which parallels the northern river bank and could be impacted by earthquake-induced landslide activity.

SE Mill Pond Road

During development of Planning Area 1, the portion of the road immediately adjacent to the site entry will be moved slightly to the northeast to accommodate the construction of a new roundabout. Southeast of the proposed western site entry, SE Mill Pond Road will remain in its existing location along the banks of the river. Eventually, during development of Planning Areas 2 and 3, this southeastern portion of SE Mill Pond Road will be realigned farther to the north in a general east-west direction, as shown on Figure 2. As described above, the existing alignment of SE Mill Pond Road is susceptible to damage due to earthquake-induced landslide activity where it lies adjacent to the banks of the Snoqualmie River or the Mill Pond.

Surface Ground Rupture

Ground rupture occurs as offsets of the ground surface and is limited to the immediate area of the fault. As described previously, a strand of the Rattlesnake Mountain Fault Zone (RMF) (RMF-8) and the Snoqualmie Valley Fault may cross through the Mill site, based on recent geologic mapping (Dragovich et al., 2009b). There is no evidence that these are active faults in the vicinity of the Mill site. Movement along these hypothesized faults do not appear to disturb Holocene-age sediments, suggesting that, if they exist, they have not been active for the last 10,000 years. No evidence of surface faults or associated ground ruptures was observed on the Mill site. The nearest known fault to the project site that may be active is the main strand of the RMF (RMF-1), which is located approximately 1 mile west of the Mill site based on regional mapping (Dragovich, 2009b). Studies of the RMF Zone indicate that RMF-1 may be an active fault capable of generating surface ruptures, although the recurrence interval of movements along the fault is unknown. It is our opinion, based on existing geologic data, that the risk of surface rupture impacting the Mill site is low.

Ground Motion

Structural design for the project under all of the alternatives should follow *International Building Code* (IBC) standards. As of the writing of this report, the currently adopted version of the IBC by the City of Snoqualmie is the 2015 edition. The 2015 IBC defines Site Classification by reference to Table 20.3.-1 of the *American Society of Civil Engineers* Publication ASCE 7, the

current version of which is ASCE 7-16. In our opinion, the subsurface conditions at the site are consistent with a Site Classification of "E" or "F" as defined in the referenced documents depending upon local site conditions.

Seismic Hazard Impacts - Alternatives

Potential seismic hazards for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative the existing historic Mill site structures would remain, which are susceptible liquefaction, lateral spreading, and ground motion hazards. Under the No Action Alternative, the wood waste pile would likely remain, which is potentially susceptible to earthquake-induced landslide activity under current conditions.

Flood Hazard Impacts

As stated in the "Affected Environment" section of this report, most of the Mill site is within the 100-year floodplain shown on the FEMA Flood Insurance Rate Map of Snoqualmie, below the BFE. Potential adverse impacts from flood hazards could be created by proposed site development due to filling portions of the site within the floodplain of the Snoqualmie River, including raising various site areas, roads, and building pads above the delineated BFE.

Compliance with flood hazard regulations, as defined in the *Snoqualmie Municipal Code* (SMC) Sections 15.12 and 19.12.150, requires an analysis demonstrating that the proposed development will not increase flood levels during the occurrence of the base flood discharge. Watershed Science and Engineering (WSE) prepared a "No Net Rise Hydraulic Analysis" for the Mill site (WSE, 2018). The WSE report is described under Section 1.4 "Proposed Mitigations."

Potential flood hazards for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative there would be no site grading within the floodplain; therefore, flood hazards would remain unchanged from existing conditions.

Channel Migration Impacts

As described in "Affected Environment" and shown on Figure 14, a section along the southwestern edges of Planning Area 1 and Planning Area 3 are within the Moderate Channel Migration Hazard Area. The majority of Planning Area 1 and the western portion of Planning Area 3 are within a mapped Potential Hazard Area, which represents a lower level of channel migration hazard than the moderate or severe channel migration zones (CMZs). Structures, roadways, or other facilities built within the severe or moderate CMZs may be susceptible to damage due the gradual channel erosion and migration of the Snoqualmie River.

Potential channel migration hazards for Alternative 1 would remain substantially unchanged from the Proposed Action. Under the No Action Alternative there would be no structures built near the Snoqualmie River, so the risk from channel migration would be lower.

Critical Aquifer Recharge Areas (CARA)

This discussion of CARAs is limited to a consideration of potential groundwater quantity (recharge) impacts and does not take into account potential sources of contamination. Probable water quality impacts are not addressed in this technical report. As described under "Affected Environment," portions of the site lie within a delineated Category II CARA, but much of the site has not been classified on the published King County maps. Potential groundwater quantity impact due to site development could include –

1. Gain or loss of groundwater recharge resulting from conversion of undeveloped land (or redevelopment of existing developed areas) into various proposed industrial, commercial, and residential uses; and

2. Impacts to underlying aquifers and downgradient usage as a result of change in recharge.

Potential adverse impacts to aquifers underlying the site are described in detail in their respective sections under "Groundwater" in Section 1.2.4. Potential impacts to CARAs for Alternative 1 would remain substantially unchanged from the Proposed Action. Potential impacts to CARAs under the No Action Alternative would remain similar to the Proposed Action since groundwater recharge under developed conditions will be similar to existing conditions.

1.3.3 Geotechnical Impacts

The Mill site will require mass grading in some areas to achieve desired roadway, parking, and building pad elevations. Preliminary engineering estimates indicate that between 300,000-350,000 cubic yards (cy) of displacement (fill) could occur, and an equal volume of compensating storage will be created to ensure no increase in flooding. Cut and fill quantities are assumed to be similar for the Proposed Action and Alternative 1.

Potential geotechnical impacts could include various construction-related elements, such as: 1) site preparation, 2) structural fill placement, and 3) foundations. Examples of potential adverse impacts could include sloughing of temporary or permanent cut slopes if oversteepened, failure of fill soils due to improper placement and compaction, or excessive foundation settlement if the loose, soft native sediments underlying the site are not mitigated. However, since geotechnical oversight is an integral part of the project design and construction, no adverse impacts are considered likely. "Geotechnical Mitigations" are presented in Section 1.4.3 of this report.

1.4 PROPOSED MITIGATIONS

The following sections discuss recommended mitigations for potential adverse impacts to earth, groundwater, and geologic hazards at the Snoqualmie Mill site (Mill site). Geologic hazards considered include erosion, landslide, seismic, flood, and channel migration hazards and critical aquifer recharge areas (CARAs). A summary of the hazards, potential impacts, and mitigation measures discussed in this report are presented in Tables 1.4-1 and 1.4-2. Proposed mitigation measures, if necessary, are described for each of the identified geologic hazards. The recommended mitigations described in this section apply to both the Proposed Action and Alternative 1, since the proposed development between these alternatives is substantially similar with respect to potential earth and groundwater-related impacts. Under the No Action Alternative, existing site uses would continue indefinitely with no significant additional impacts; therefore, the mitigations described in the following sections would not apply.

1.4.1 Hydrogeologic Mitigations

TABLE 1.4-1
GROUNDWATER
SUMMARY OF IMPACTS AND MITIGATIONS

Hazard	Unmitigated Probable Significant Impacts	Proposed Mitigation Measures Designed into the Proposal	Unavoidable Impacts
Groundwater			
Interflow	• No anticipated on-site interflow.	• None.	• None.
Aquifers	• Change in recharge if all runoff is collected and directly discharged to the Snoqualmie River.	• Stormwater concept will maintain existing flows to on- and off-site streams and wetlands.	• None.
Surface Water			
Streams	• Volume of discharge to streams could be increased due to increased impervious area.	• Discharge of stormwater runoff to streams will be designed to be similar to existing conditions. Additional runoff will be directed to the Snoqualmie River.	• None.
Snoqualmie River	• None. Volume of discharge to the river will be insignificant relative to existing instream flows.	• None.	• None.

Hazard	Unmitigated Probable Significant Impacts	Proposed Mitigation Measures Designed into the Proposal	Unavoidable Impacts
Tokul Creek	• Spring flow from the Tokul Creek Delta Aquifer will not be impacted.	• None.	• None.
Mill Pond	• Reduced flow to the Mill Pond if all site stormwater is discharged directly to river.	• Maintain surface runoff discharges from the site to the wetlands and streams that flow to the Mill Pond.	• None.
Wetlands	• Reduced flow to wetlands if all site stormwater is discharged to river.	• Maintain surface runoff discharges from the site to the wetlands, consistent with existing conditions.	• None.

Surface Water

Under the No Action Alternative, there would be no direct discharge to the Snoqualmie River and discharge to other existing surface water features on- and offsite would remain unchanged; therefore, no mitigation would be required. The mitigations described below apply to both the Proposed Action and Alternative 1.

Snoqualmie River

The Mill site will discharge stormwater runoff directly to the Snoqualmie River. The quantity of discharge will be insignificant relative to the instream flows in the Snoqualmie River. No adverse impacts are anticipated, and no mitigation measures are required.

Tokul Creek

As described under Section 1.3.1, groundwater recharge at the site is not anticipated to be significantly impacted due to site development; and therefore, water levels in the Snoqualmie River Shallow Aquifer and Tokul Creek Delta Aquifer downgradient of the site will also not be significantly impacted.

Since significant impacts to the Tokul Creek Delta Aquifer are not anticipated, spring discharge into Tokul Creek from this aquifer will not be adversely impacted, and no mitigation measures are required.

Mill Pond, Wetlands, and Streams

The stormwater management plan is designed to maintain runoff and hydrology to the on-site wetlands and streams, such that the discharge into the Mill Pond under developed conditions

should be similar to existing conditions. No adverse impacts to the Mill Pond, wetlands, and streams are anticipated, and no additional mitigation measures are required.

Groundwater Mitigations

No probable adverse impacts to aquifers were identified in Section 1.3.1, "Hydrogeologic Impacts," and no mitigation measures are required.

1.4.2 Geologic Hazard Mitigations

TABLE 1.4-2
GEOLOGIC HAZARDS
SUMMARY OF IMPACTS AND MITIGATIONS UNDER THE PROPOSED ACTION

Hazard	Probable Significant Impacts	Proposed Mitigation Measures Designed into the Proposal	Unavoidable Impacts
Erosion Hazards	Erosion Zone: Zone 1: Low Zone 2: Slight to Moderate	• Cover exposed soils of areas not actively worked within 48 hours. • Establish and implement erosion and sedimentation control plan utilizing applicable best management practices (BMPs) from the applicable *King County Surface Water Design Manual* (KCSWDM) pertaining to wet season requirements, subject to approval by the Washington State Department of Ecology, for any earthwork construction during the wet season, defined as October 1 to April 30. • Establishment of post-development landscaping. • Direct stormwater into stormwater facilities. • Control runoff and reduce velocities (rock dams, revegetate). • Trap sediments (silt fences, ponds). • Inspections by Certified Erosion and Sediment Control Lead (CESCL) onsite during construction.	• Some short-term soil loss during construction. Stabilized developed conditions similar to pre-developed condition.

Hazard	Probable Significant Impacts	Proposed Mitigation Measures Designed into the Proposal	Unavoidable Impacts
Landslide and Steep Slope Hazards	Zone 1: Low Zone 2: Low to Moderate	• Control cut and fill slope gradients. • Remove log/debris pile prior to development in Planning Area 3. • Site-specific analysis of impacts related to slopes just east of site prior to development in Planning Areas 2 and 3.	• None. No unavoidable impacts due to eastern slopes are anticipated due to the dense nature of the glacially consolidated sediments that comprise the slope.
Seismic Hazards			
Surficial Ground Rupture	• Low	• None recommended. No known active fault.	• None.
Earthquake-Induced Landslide	• Low for majority of site.	• Control cut and fill slope gradients. • Remove log/debris pile prior to development in Planning Area 3.	• None.
SE Mill Pond Road	• Risk of landslide activity along banks adjacent to the Snoqualmie River and Mill Pond.	• Ground improvement techniques along realigned portions of SE Mill Pond Road, such as the installation of stone columns or deep soil mixing. • Existing haul road will provide access onto and off of the site from the east, connecting to 396th Drive SE.	• Existing, unmitigated segments of SE Mill Pond Road adjacent to the Snoqualmie River and Mill Pond are potentially subject to landslide activity during a large seismic event.

Hazard	Probable Significant Impacts	Proposed Mitigation Measures Designed into the Proposal	Unavoidable Impacts
Liquefaction	• High potential risk for alluvium underlying majority of site.	• Support structures on deep foundation systems or using ground improvement techniques.	• Unmitigated segments of SE Mill Pond Road adjacent to the Snoqualmie River and Mill Pond are potentially subject to lateral spread during a large seismic event.
Ground Motion	• Potential risk of structural damage.	• Construct per *International Building Code* standards for the appropriate site class - Site Class "E" or "F" based on site conditions. • Site-specific geotechnical analysis will be required for Site Class "F".	• Non-structural damage anticipated for some large seismic events.
Channel Migration	• Higher risk for moderate to severe channel migration zones.	• Locate structures outside of moderate to severe channel migration zones. • Implement appropriate channel migration protection standards where possible to limit potential impacts to SE Mill Pond Road.	• Risk of erosion over the long term along the banks of the Snoqualmie River.
Flood Hazards	• Possible rise in base flood elevation (BFE) due to new development in floodplain.	• Excavate compensating storage for areas with raised grades. • Zero-rise floodway analysis.	• Risk of large flood inundating proposed developed areas.
Critical Aquifer Recharge Areas	• No significant impact to aquifer recharge.	• None.	• None.

Erosion Hazard Mitigation

The on-site soils are considered susceptible to erosion when exposed to surface water, particularly in a sloping environment. Proper control of surface water runoff will be important in alleviating potential erosion hazards. To mitigate and reduce erosion hazard potential on the site, project planning and construction should follow City of Snoqualmie standards of practice with respect to temporary erosion and sedimentation control (TESC) and management of erosion hazards. Specific best management practices (BMPs) to be implemented during construction will be outlined in the geotechnical engineering reports and the TESC plans for each project element.

The recommendations in the "Erosion Hazard Mitigation" section of this report are consistent with current City of Snoqualmie and the Washington State Department of Ecology (Ecology) standards and are considered industry standard practices. The following mitigations apply under all Alternatives. The recommended erosion control BMPs to be used at the site should include, but not be limited to:

- A TESC plan should be established for the project during the design phase and submitted to the City for approval. The geotechnical engineer should review the grading, erosion, and drainage plans prior to final plan design. An erosion control inspector should be onsite during construction to monitor the performance of proposed mitigation measures, and propose changes as needed.

- Construction activity should be scheduled or phased as much as possible to reduce the amount of earthwork activity that is performed during the winter months. Prior to the wet season, any exposed subgrades should be hydroseeded, covered with plastic sheeting, or otherwise protected. Seeding should take place prior to September so that the grass will be established prior to the wet season.

- TESC measures should be installed prior to any site activity or disturbance.

- Filter fences are temporary structures utilized to trap sediment transported from sheet erosion while allowing some conveyance of water through the filter fabric. Filter fences are not designed for concentrated flows, but are most effective in retaining sediment transported from sheet flow in relatively small catchment areas. Filter fences should be used as a perimeter sediment interception measure, as warranted, adjacent to wetlands, stream and river corridors, open space areas, and other sensitive areas located in or adjacent to construction zones to reduce the risk of sediment transport into these features.

- Source control measures are practices that are used to reduce erosion risks before they occur. These measures typically involve cover practices and drainage control. During the

wetter months of the year, or when large storm events are predicted during the summer months, work areas should be stabilized, so the site can receive the rainfall without excessive erosion or sediment transport. The required measures will depend on the time of year and the duration that the area will be left un-worked. During the winter months, areas that are to be left un-worked should be covered with straw or plastic. During the summer months, stabilization may consist of seal-rolling the subgrade. The stabilization should include establishing temporary stormwater conveyance to route runoff to the approved discharge location.

- Surface runoff and discharge should be controlled during and following development. Uncontrolled discharge may promote erosion and sediment transport. Under no circumstances should concentrated discharges be allowed to flow over the top of steep slopes.

- Soils that are to be reused around the site should be stored in such a manner as to reduce erosion from the stockpile. Protective measures may include, but are not limited to, covering with plastic sheeting, the use of low stockpiles in flat areas, and the use of silt fences around pile perimeters.

- All temporary or permanent devices used to collect surface runoff should be directed into tightlined systems or constructed ditch systems that discharge into approved stormwater control facilities, such as detention ponds or dispersion facilities. Permanent water quality ponds or detention ponds may be used as temporary sediment ponds. The permanent detention facilities must be cleaned of all accumulated sediment after the completion of construction activities.

- After construction is complete, disturbed areas should be revegetated as soon as possible. If it is outside of the growing season, the disturbed areas should be covered with mulch or plastic sheeting, as recommended in the erosion control plan.

It is our opinion that with the proper implementation of the TESC plans and by field-adjusting appropriate mitigation elements (BMPs) during construction, the potential adverse impacts from erosion hazards on the project may be mitigated.

<u>Landslide and Steep Slope Hazard Mitigation</u>

It is our opinion that construction of the Mill site will not increase the existing landslide hazard risks, provided the recommendations presented in this report are properly followed. To reduce the potential landslide risks as a result of development, the following mitigation measures should be implemented. The following mitigations apply under all Alternatives.

- Except for the northeastern corner of the site and the wood/debris pile in Planning Area 3, the Mill site is relatively flat, and landslide/steep slope mitigation is not necessary.

- No fill, topsoil, or other debris should be placed on steep slopes. Uncontrolled material placed on steep sloping ground is susceptible to movement. Any fill planned for slopes steeper than 5H:1V (Horizontal:Vertical) elsewhere on the property should be benched into the slope and placed as structural fill. Compaction values and drainage recommendations for structural fill can be provided by the geotechnical engineer once specific grading plans have been determined as part of development applications.

- The wood waste/debris pile at the north end of Planning Area 3 should be removed prior to development in this area.

- To reduce the risk of increasing slope stability hazards as a result of construction, it is recommended that all permanent cut slopes in the natural sediments be graded to a maximum 3H:1V. Cut slopes in fill soils should be no steeper than 3H:1V unless approved by the geotechnical engineer. Where steeper gradients are required, an approved erosion protection structure or retaining structure should be utilized. It should be noted that rockeries are not considered retaining structures but erosion protection devices. Rockeries should not be used in association with unstable soil or non-reinforced, fill soils.

- No surface water should be directed toward or over steep slopes. Stormwater may be tightlined down steep slopes provided the alignment, discharge location, and design are approved by the geotechnical engineer. Currently, such activities are not contemplated.

- Site-specific studies should be completed to analyze potential impacts related to the slopes just east of the site, prior to development in Planning Areas 2 and 3. These slopes are generally underlain by very dense glacially consolidated sediments that are typically resistant to landslide activity; therefore, adverse impacts are not anticipated.

<u>Seismic Hazard Mitigation</u>

Earthquake Induced Landslide Hazards

The off-site slopes near the east edge of the parcel appear to be underlain at shallow depths by glacially consolidated sediments that tend to be resistant to slope failures during a seismic event. In general, we do not anticipate any mitigation will be required; however, depending upon the nature of the planned development near the toe of the steep slopes, a quantitative assessment of slope stability may be warranted. Once a development concept has been formulated, the geotechnical engineer for the project should review the site plans to determine if slope stability modeling is recommended.

No mitigation is required for potential landslide hazards related to the wood waste pile since we understand that it will be removed during the development of Planning Area 3.

SE Mill Pond Road

Future development along the bank of the Snoqualmie River (including the existing SE Mill Pond Road) and shoreline of the Mill Pond, could be at-risk from landslides during a strong seismic event. Limited subsurface information is available in the immediate vicinity of these two surface water features adjacent to the site. Additional subsurface exploration and stability analyses should be completed in the future in this area by the municipal agency responsible for the roadway during the design process. Similarly, subsurface explorations and stability analyses should be completed for future development along the shoreline of the Mill Pond. At both locations, bathymetric surveys should be completed to determine the geometry of the underwater portion of the river bank and lake shoreline.

During development of Planning Area 1, the portion of the road immediately adjacent to the site entry will be moved slightly to the northeast to accommodate the construction of a new roundabout. Later during development of Planning Areas 2 and 3, the portion of SE Mill Pond Road southeast of the site entry will be realigned farther to the north in a general east-west direction, as shown on Figure 2. These realigned areas of the road can be mitigated during their construction. Preliminary slope stability analyses indicate that the risk of river bank failure along the Snoqualmie River can be mitigated as described in the following section.

Slope Stability Analysis

We completed a preliminary static and seismic slope stability analysis for the bank along the Snoqualmie River adjacent to the current SE Mill Pond Road where a future road realignment and roundabout for the Phase 1 development is planned. We interpreted subsurface conditions using the nearest subsurface explorations to the road and river, bathymetry information for the Snoqualmie River completed for a previous study in the vicinity of the site, and river level information from as-built plans for the existing bridge that crosses the Snoqualmie River downstream of the site.

Slope stability analyses were conducted using the computer program Slope/W, Version 2016, by Geoslope International Ltd. The program used Spencer's method for evaluating a rotational failure. Input parameters for the analysis included slope geometry, geology, and groundwater conditions, soil strength parameters, and dynamic (i.e., seismic) conditions. For evaluation of slope stability under dynamic conditions, a peak horizontal ground acceleration (PGA) of 0.26g was used in our analysis. This seismic coefficient is equal to 0.5 times the PGA determined from USGS website https://earthquake.usgs.gov/designmaps/beta/us/. Soil strength parameters used for our analysis were assumed based on laboratory testing of samples obtained from boring EB-1 (2018), typical published values, and our prior experience.

The stability of a slope can be expressed in terms of its factor of safety. The factor of safety is the ratio between the forces that resist sliding to the forces that drive sliding. For example, a factor of safety of 1.0 would indicate a slope where the driving forces and the resisting forces are exactly equal. Increasing factor of safety values greater than 1.0 indicate increased stability. Factors of safety below 1.0 indicate conditions where driving forces exceed resisting forces and slope failure is imminent. Factors of safety of 1.5 and 1.1 are typically considered to be the minimum acceptable values for slope stability under static and seismic conditions, respectively. The slope stability analyses indicate that the minimum factor of safety for the static condition is greater than 1.5, but for seismic conditions the factor of safety is below 1.0. The results of our slope stability analyses are included in Appendix E.

In our opinion, possible mitigation options for consideration to address seismic stability could include the following:

1. Relocation of the new road alignment and roundabout with a setback sufficient that a slope failure will not impact the road. Our stability analysis indicates that a setback of about 70 feet would be necessary from the top of the existing river bank. Review of current plans appears to show the roadway alignment from 80 to 100 feet from the river bank.

2. Installation of structural elements along the roadway edge such as a continuous, large-diameter drilled shaft wall (secant pile wall) to constrain the roadway prism from being undermined by a slope failure. With this option the river bank would be allowed to experience failure during a strong earthquake, but the ground behind the continuous wall would remain in place so that the roadway could remain in service.

3. Use of ground improvement methods such as stone columns or deep soil mixing to strengthen weak native soils presumed to exist beneath the river bank and area adjacent area near the top of the bank. Our analysis indicates that stone columns or deep soil mixing would be needed to depths of about 70 feet below existing roadway elevation and need to extend about 30 feet back from the top of the river bank.

Secondary Site Access

Initially only the areas of roadway immediately adjacent to the western site entry will be realigned during development of Planning Area 1. Other portions of the SE Mill Pond Road adjacent to the Snoqualmie River or Mill Pond will remain in their existing, unmitigated condition and could be impacted by landslides due to a seismic event. In the event that the SE Mill Pond Road is damaged, the existing haul road will provide a secondary route onto and off of the site. The haul road runs east-west along the northern border of Planning Area 1, continues east through Planning Area 2, and then climbs the eastern slope up to 396th Drive SE. The slopes just east of the site are underlain by geologic units that have been glacially

consolidated to a very dense condition; therefore, they are much less susceptible to earthquake-induced landslide activity.

Surface Ground Rupture

In general, the risk of surface ground rupture is low at the site. No known active faults are present beneath the site; mitigation measures are not currently required.

Liquefaction

The site contains existing fill, overbank deposits, river channel deposits, and lacustrine sediments, some of which are saturated. Our analysis indicates that these materials are at risk of liquefaction during a design-level seismic event and settlement of liquefaction is estimated to range from 2 to 8 inches. Because we anticipate that any future structures onsite will be supported on deep foundation systems or use ground improvement techniques to mitigate settlement risks, we anticipate that risks of liquefaction-related damage to the new structures will also be mitigated.

Lateral Spreading

Due to the low strength of the existing fill and lacustrine sediments, the lower-lying parts of the site could be susceptible to failure by lateral spreading during a seismic event, even on relatively gently inclined slopes. Our preliminary analysis suggests that structures in Planning Area 1 located near the northern bank of the Snoqualmie River could experience horizontal displacement due to lateral spreading on the order of 1 to 2 feet. Because we anticipate that any future structures onsite will be supported on deep foundation systems or use ground improvement techniques to mitigate settlement risks, we anticipate that risks of damage to the new structures resulting from lateral spreading will also be mitigated.

Ground Motion

Structural design for the project under all of the Alternatives should follow 2015 *International Building Code* (IBC) standards. The 2015 IBC defines Site Classification by reference to Table 20.3.-1 of the *American Society of Civil Engineers* Publication ASCE 7, the current version of which is ASCE 7-16. In our opinion, the subsurface conditions at the site are consistent with a Site Classification of "E" or "F" as defined in the referenced documents depending upon local site conditions. Sites that are classified as Site Class "F" require a site-specific evaluation of ground motion.

There is an unavoidable adverse impact related to a large seismic event causing some non-structural damage to buildings onsite.

Flood Hazard Mitigation

Mitigating flood hazards at the site will involve compliance with applicable flood hazard regulations developed by the City and Federal Emergency Management Agency (FEMA). The Proposed Action and Alternative 1 will involve raising site grades for various site areas, roads, and building pads above the mapped base flood elevation (BFE). In order to mitigate potential adverse impacts that would raise the BFE, grades will be lowered in other areas to create compensating flood storage. Compensating flood storage is assumed to be available between BFE and the seasonal high groundwater level in the shallow aquifer. Based on groundwater level monitoring at the site, the seasonal high groundwater level in the Snoqualmie River Shallow Aquifer is about 418 feet elevation at the location of EB-4.

A hydraulic model was developed by Watershed Science and Engineering (WSE) in order to verify that the proposed site grading and compensating storage will not result in an increase in flood levels during the occurrence of the base flood discharge (WSE, 2018). The model was used to simulate surface water elevations from a 100-year flood event under both pre-development and post-development conditions. No rise in the floodwater surface elevation was predicted for the proposed grading conditions model as compared to the existing conditions model.

The hydraulic model was also used to assess potential impacts downstream of the site (WSE, 2018). The downstream model extended from upstream of the confluence of the South Fork Snoqualmie River at its upstream end to approximately NE 124th Street in Duvall at its downstream end. The results indicate that there will be no increase in downstream flooding. The model predicted that the proposed grading conditions at the Mill site will lower the water surface elevations by approximately 0.01 feet at three of the five locations considered.

Based on the hydraulic modeling, the proposed grading plan and compensating storage will provide suitable mitigation for flood hazard impacts related to a potential rise in the BFE. There is an unavoidable potential adverse impact related to very large flood events (greater than 100-year) that could inundate the proposed development.

Channel Migration

Potential adverse impacts due to channel migration will be mitigated by following the development standards described in *Snoqualmie Municipal Code* (SMC) 19.12.140, which regulates channel migration and associated erosion hazard zones. Except for SE Mill Pond Road, no structures will be built within the mapped moderate or severe channel migration zones (CMZs) as required by the SMC. The proposed relocation of the SE Mill Pond Road at the entrance onto the site is located within a moderate CMZ. Per SMC 19.12.140(C), transportation structures (such as roads) are allowed in moderate and severe CMZs when no other feasible alternative exists. Project planning should incorporate appropriate channel migration protection standards where possible to limit potential impacts to the roadway. There is an

unavoidable potential adverse impact to proposed site structures due to the long-term erosion and channel migration of the Snoqualmie River.

Critical Aquifer Recharge Areas (CARAs)

Potential impacts and recommended mitigation measures related to CARAs in this technical report are limited to a consideration of groundwater quantity. As described under "Groundwater Impacts," on-site recharge will be maintained near existing levels. Since groundwater recharge under developed conditions is expected to be similar to existing conditions, no potential adverse impacts to groundwater quantity have been identified and no mitigation is required.

1.4.3 Geotechnical Mitigations

Introduction

The exploration and analysis completed for the Mill site indicates, from a geotechnical standpoint, the site is suitable for the proposed development provided the mitigation recommendations contained herein are properly followed. As with any large-scale project, detailed geotechnical review must be performed throughout the design phase and construction process to verify that geotechnical issues/considerations have been adequately understood and the recommendations properly implemented. Site-specific geotechnical engineering recommendations must be provided as development plans and construction methods are determined. The geotechnical recommendations presented in this section are preliminary and subject to revision as project designs evolve.

The majority of the site is underlain by existing fill that is of variable composition but typically contains substantial wood waste. The existing fill is underlain by low-strength overbank and lacustrine sediments. These subsurface conditions pose geotechnical challenges to construction at the site. The existing fill, overbank, and lacustrine sediments are prone to consolidation under foundation loads, and are therefore not suitable to support conventional shallow foundations. Liquefaction that may occur in subsurface materials during a seismic event may also present a risk of settlement to future site improvements. Lateral spreading that may occur during a seismic event may create unacceptable horizontal and vertical displacements in locations of future structures near the shorelines of the Snoqualmie River and the Mill Pond.

The following are geotechnical design elements that should be considered in the future development planning process to mitigate settlement and risks from liquefaction and lateral spreading:

- The site development plan should be done in a way that does not increase loads on weak subsurface materials, if possible.

- Final site ground surface elevations should be kept at or below existing site grades, if possible. If final grades must be raised substantially, the weight of the new fill is likely to induce settlement in weak subsurface soils and to result in the risk of long-term settlement of the new fill along with any new structures, buried utilities, and paving in the areas that are founded directly on new fill. Mitigations that could be used to reduce the potential for settlement beneath newly filled areas could include removal and replacement of the old fill, preloading of the old fill, or support of structures upon deep foundations or other ground improvement methods.

- New structures, including buildings, substantial retaining walls, and similar structures with significant foundation loads, will require deep foundations or possibly deep ground improvement approaches. The site conditions will pose challenges to these foundation support approaches.

- New floor slabs will also need to be supported on deep foundations or areas of deep ground improvement.

- New paving will require remedial preparation of the existing fill. Remedial preparation is likely to include placement of a geogrid or geotextile material in conjunction with a layer of sand and gravel or crushed rock fill. The purpose of this layer is to make the expected settlement of the paving more uniform. Settlement of paved surfaces will occur, and will require periodic maintenance that is more frequent and more extensive than is typical for sites that are not underlain by weak subsurface materials.

- New buried utilities, particularly those that are sensitive to grade changes such as gravity sewers, should be supported on a layer of new structural fill similar to that which will be used below paving. The incorporation of a layer of new fill below planned utilities will reduce but not eliminate the risk of future differential settlement and associated repairs.

The geotechnical mitigation recommendations provided herein are consistent with the "Updated Subsurface Exploration, Geologic Hazards, and Preliminary Geotechnical Engineering Report" by AESI (2012).

Site Preparation

Existing buildings, foundations, buried utilities, vegetation, topsoil, and any other deleterious materials should be removed where they are located below planned construction areas. Where existing wells are not compatible with future site development plans, they should be decommissioned in accordance with *Washington Administrative Code* (WAC) Section 173-160 by a Washington State licensed well driller. All disturbed soils resulting from demolition activities should be removed to expose underlying undisturbed native sediments and replaced with structural fill, as needed. All excavations below final grade made for demolition activities

should be backfilled, as needed, with structural fill. Erosion and surface water control should be established around the clearing limits to satisfy local requirements.

Once demolition has been completed, existing fill should be addressed. Addressing existing fill may employ various strategies depending on the nature of the project that is proposed. For building pads where foundation and floor loads will be supported on deep foundation or ground improvement systems, most of the existing fill will likely be left in place, and a construction working surface would be constructed. Paving areas would likely be prepared by removing and reworking or replacing 2 feet of existing fill. Buried utility areas would likely be prepared by excavating 2 feet of the existing fill below the planned pipe bedding elevation and replacing the overexcavated material with new structural fill.

Site Drainage and Surface Water Control: The site is subject to flooding by the Snoqualmie River. Flood risks and potential regulatory requirements related to development in potentially flood-prone areas should be reviewed. The site should be graded to prevent water from ponding in construction areas and/or flowing into excavations. Exposed grades should be crowned, sloped, and smooth-drum rolled at the end of each day to facilitate drainage. Accumulated water must be removed from subgrades and work areas immediately prior to performing further work in the area.

Groundwater Control: The Snoqualmie River Shallow Aquifer seasonal high groundwater elevation has been measured to be about 418 feet. Groundwater is expected to be encountered less than 5 to 10 feet below ground surface across most of the site and is likely to be encountered in excavations completed during construction. If significant groundwater is encountered, dewatering in advance of excavation and/or shoring may be required for deep excavations.

Subgrade Protection and Compaction: To the extent that it is possible, the existing gravel surfacing should be used for construction staging. If building construction will proceed during the winter, a working surface of sand and gravel, crushed rock, or quarry spalls should be used to protect the building pad and any other exposed soils, particularly in areas supporting concentrated equipment traffic. Subgrade conditions are expected to be soft and silty, and a geotextile separation fabric such as Mirafi 500X, should be used between the subgrade and the new fill. For building pads where floor slabs and foundation construction will be completed in the winter, a similar working surface should be used. Construction of working surfaces from advancing fill pads could be used to avoid directly exposing the subgrade soils to vehicular traffic.

Following demolition, site stripping, and planned excavation, the stripped subgrade within the building and pavement areas should be proof-rolled with a fully loaded dump truck to identify any soft or yielding areas. Any soft/loose, yielding, or organic soils should be removed to a stable subgrade, if possible. The subgrade should then be scarified, adjusted in moisture content, and recompacted to the required density. All soft or yielding soils should be

overexcavated to the satisfaction of the geotechnical engineer and replaced with structural fill, as needed or treated with an admixture such as cement. If the subgrade sediments are soft and cannot be recompacted to a firm and unyielding condition, a section of crushed rock underlain by engineering/stabilization fabric (such as Mirafi 500X or equivalent) may be required to provide a stable base. We recommend at least 2 feet of crushed rock be placed over the fabric; however, due to the variable nature of the on-site sediments, this thickness may need to be adjusted in the field depending upon performance.

Most of the on-site soils, contain a high percentage of fine-grained material which makes them moisture-sensitive and subject to disturbance when wet. The contractor must use care during site preparation and excavation operations so that the underlying soils are not softened. If disturbance occurs, the softened soils should be removed and the area brought to grade with structural fill. Consideration should be given to protecting access and staging areas with an appropriate section of crushed rock.

If crushed rock is used for the access and staging areas, it should be underlain by engineering separation/stabilization fabric, such as Mirafi 500X, to reduce the potential of fine-grained materials pumping up through the rock and turning the area to mud. We generally recommend that at least 2 feet of crushed rock be placed over the fabric; however, due to the variable nature of the near-surface soils and differences in wheel loads, this thickness may have to be adjusted by the contractor in the field.

Temporary and Permanent Slopes: Stable temporary slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, however, temporary, unsupported cut slopes in unsaturated existing fill and native sediments can be made at a maximum slope of 1.5H:1V. Below the shallow groundwater level, excavations will need to be shored, dewatering may be required, and/or cut slopes will need to be significantly flatter than 1.5H:1V. Permanent cut slope angles must be determined once the project design is available. As is typical with earthwork operations, some sloughing and raveling may occur and cut slopes may have to be adjusted in the field. In addition, WISHA/OSHA regulations should be followed at all times.

Structural Fill

Structural fill will be necessary to establish desired grades in some areas onsite. All references to structural fill in this report assume that proper attention will be given to subgrade preparation, fill type, placement, and compaction of materials, as discussed in this section. Percent compaction in other applications, such as wall backfill, could be different than the values reported in this section and must be evaluated by the geotechnical engineer, as appropriate. The compaction specifications identified for specific applications should be used as described.

Subgrade Preparation: After overexcavation/stripping has been performed to the satisfaction of the geotechnical engineer/engineering geologist, the upper 12 inches of exposed ground should be recompacted to a firm and unyielding condition, as determined by the geotechnical representative. The condition of all subgrades should be verified by a geotechnical representative before fill placement begins. If the subgrade contains too much moisture, adequate recompaction could be difficult or impossible to obtain, and should probably not be attempted. As described in "*Subgrade Protection and Compaction,*" soft areas may need to be underlain by a section of crushed rock underlain by engineering/stabilization fabric to provide a stable base. After compaction of the exposed ground is tested and approved, or a free-draining rock course is laid, structural fill could be placed to attain desired grades.

Soil Moisture Considerations: The suitability of soils used for structural fill depends primarily on their grain-size distribution and moisture content when they are placed. Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (by weight as measured on the minus No. 4 sieve size) should be considered moisture-sensitive. Generally, these materials cannot be consistently compacted to a specified structural fill density when the moisture content is more than 2 percentage points above or below optimum. Use of moisture-sensitive soil in structural fills should be limited to favorable dry weather conditions. Much of the on-site soils contained significant amounts of silt and are considered moisture-sensitive.

Structural Fill Materials and Placement: Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer, placed in horizontal loose lifts with a maximum thickness of 12 inches. Each lift should be compacted by mechanical methods to at least 95 percent of the maximum density, using the modified Proctor test (*American Society for Testing and Materials* [ASTM] D-1557) as the reference standard. Proposed fill soils must be evaluated by the geotechnical engineer prior to their use in fills. This would require that a Proctor test be performed on a sample of the proposed fill material in advance of its placement onsite to determine its field compaction standard.

The existing fill soils present onsite were highly variable, ranging from quarry spall and granular fill to materials that contained significant amounts of organic material, demolition waste and silt and are considered highly moisture-sensitive. In our opinion, these soils are not suitable for reuse as structural fill. Non-organic on-site soils free of demolition waste and other deleterious materials may be reused in structural fill applications if moisture conditions can be achieved that allow compaction to a firm and unyielding condition and to the specified minimum density for the application where they are used. If fill is placed during wet weather or if proper compaction cannot be obtained, a select import material consisting of a clean, free-draining gravel and/or sand should be used. Free-draining fill consists of non-organic soil with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction with at least 25 percent retained on the No. 4 sieve. Organic-rich soils are not suitable as structural fill under any circumstances. Soils used for structural fill should not contain any organic matter, debris, environmental contaminants, or individual particles greater than about 6 inches in diameter.

The geotechnical engineer's representative must observe the stripped subgrade and be present during placement of structural fill to monitor the work and perform a representative number of in-place density tests. In this way, the adequacy of the earthwork could be evaluated as filling progresses and any problem areas may be corrected at that time.

Foundations

Due to the presence of deep, soft native soils and potential for the loose to medium dense granular layers to liquefy during a strong seismic event, foundation and floor slab loads for new structures should be supported either by deep foundation systems or a deep ground improvement system. Since a consistently dense layer of subsurface materials does not exist within accessible depths for foundation piles or common ground improvement techniques, foundation elements with substantial end-bearing capacity appear unlikely. Deep foundation elements that rely on friction along the pile shaft, or ground improvement techniques such as stone columns or compacted aggregate piers that are completed above remaining underlying weak sediments should be considered, depending on structural support requirements and location-specific subsurface conditions. Existing fill soils were observed to contain wood waste, logs, rock fills, and metal debris, which will make it difficult to install deep foundations or to use ground improvement tools using driven or drilled methods. It may be necessary to remove obstacles to foundation construction or to relocate deep foundation elements to avoid obstacles. The existing fill soils are expected to include wood waste and rock fills, which can allow cement grout to escape during construction of deep foundation elements. This may limit the available deep foundation approaches that could be considered and may make it more difficult to install deep foundation systems that are selected.

Spread footings may be used for building support when founded directly on existing fill and native soils that have been mitigated using ground improvement techniques, such as stone columns. No footing should be founded in or above loose, organic, or existing uncontrolled fill soils. Allowable foundation soil bearing pressures can be determined once detailed project plans are available.

It should be noted that the area bounded by lines extending downward at 1H:1V from any footing must not intersect another footing or intersect a filled area that has not been compacted to at least 95 percent of ASTM D-1557. In addition, a 1.5H:1V line extending down from any footing must not daylight because sloughing or raveling could eventually undermine the footing. Thus, footings should not be placed near the edge of steps or cuts in the bearing soils.

Disturbed soil not removed from footing excavations prior to footing placement could result in increased settlements. All footing areas should be inspected by the geotechnical engineer prior to placing concrete to verify that the design bearing capacity of the soils has been attained and that construction conforms with the geotechnical recommendations. Perimeter footing drains should be provided as recommended by the geotechnical engineer.

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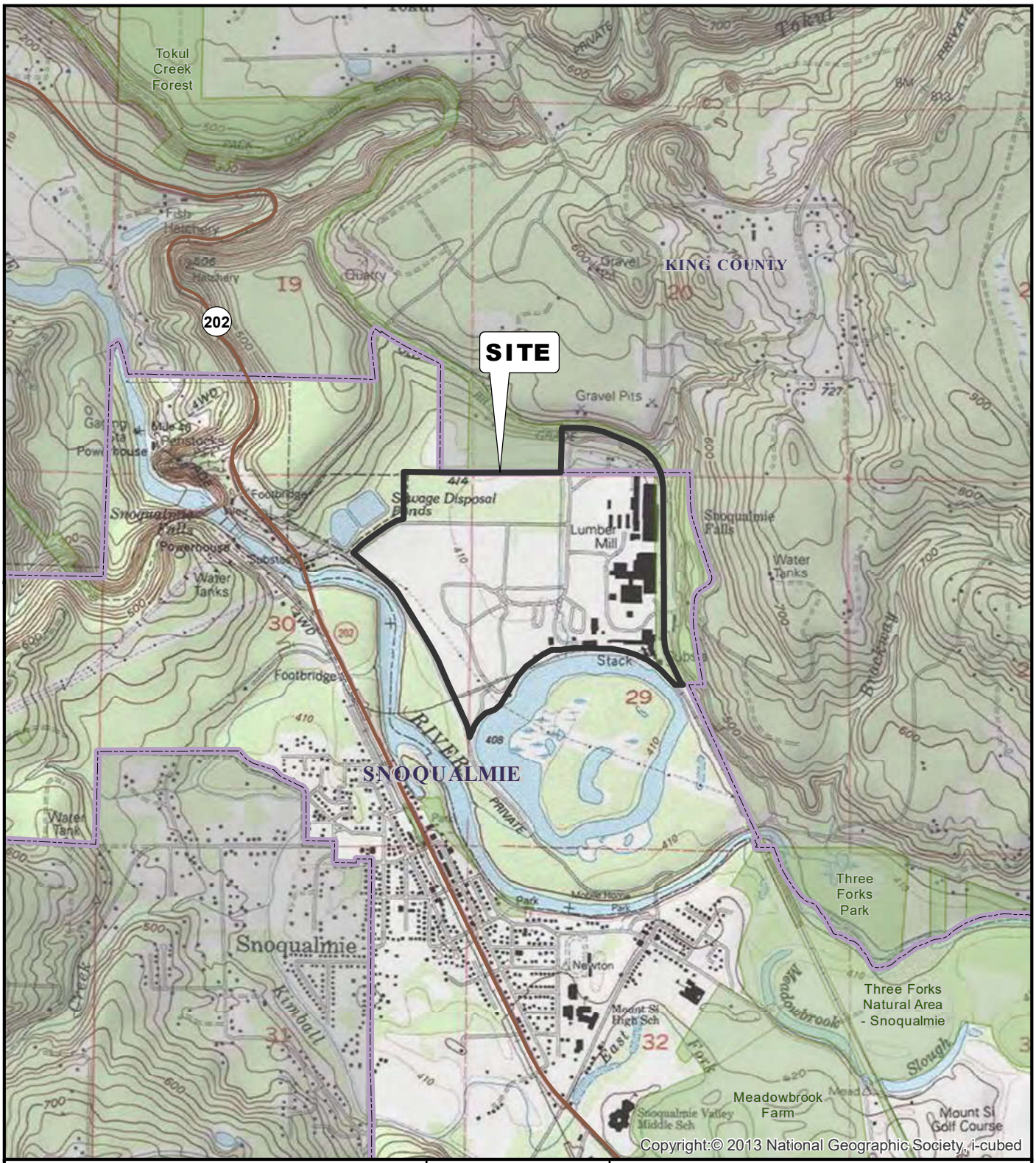



DATA SOURCES / REFERENCES:
USGS: 7.5' SERIES TOPOGRAPHIC MAPS, ESRI/I-CUBED/NGS 2013
KING CO: STREETS, PARCELS, CITY LIMITS 1/18

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 1000 2000

FEET

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

VICINITY MAP

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	1

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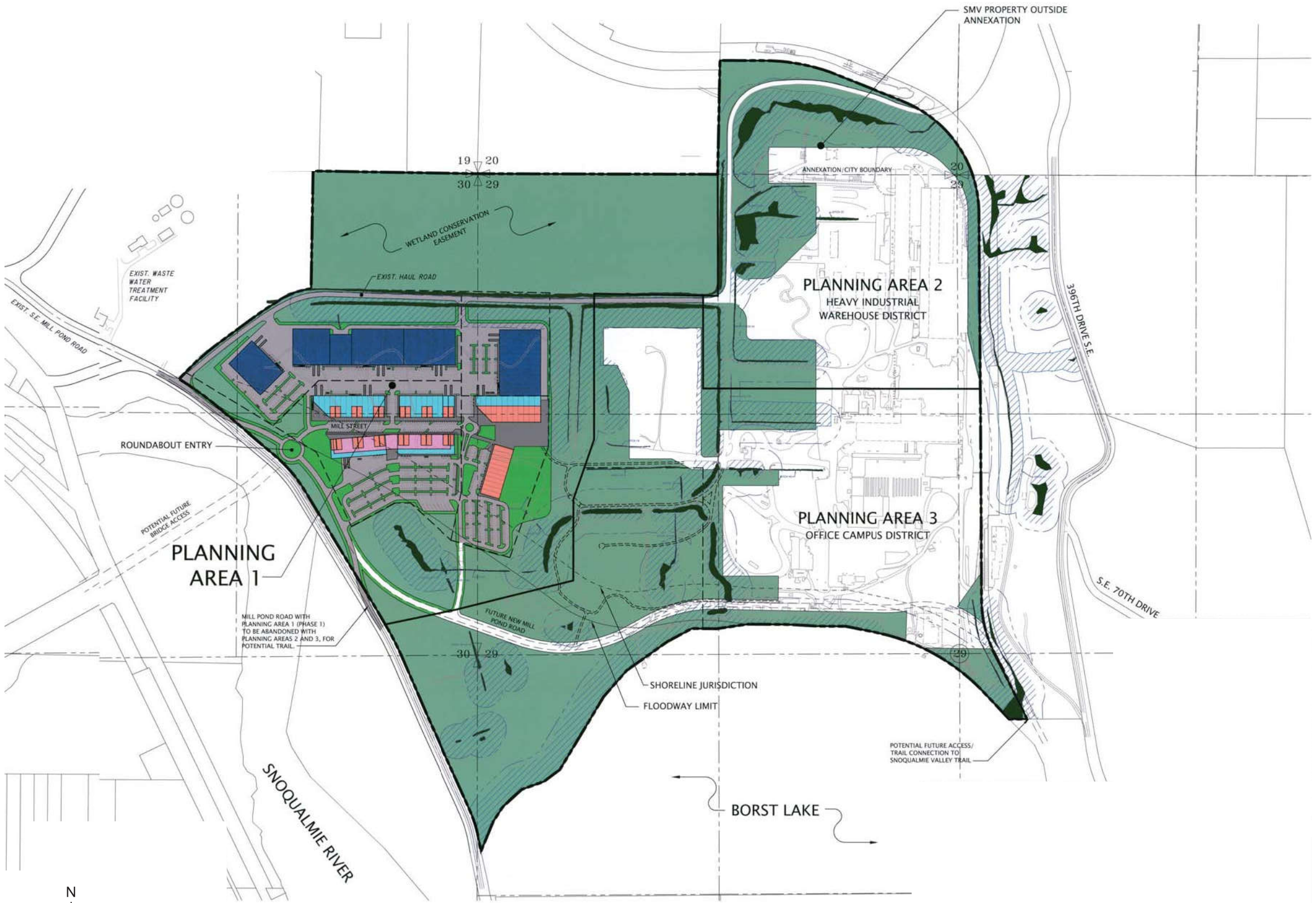

LEGEND:

- RETAIL
- HEAVY INDUSTRIAL
- LIGHT INDUSTRIAL
- RESIDENTIAL
- ROADS / PARKING
- PEDESTRIAN HARDSCAPE / SIDEWALK
- LANDSCAPE AREAS (GREENS, COMMONS, PUBLIC ASSEMBLY AREAS, TRAILS, GENERAL LANDSCAPE AREAS)
- OPEN SPACE: NATURAL AREAS (SENSITIVE AREAS, STORMWATER MANAGEMENT, FLOODPLAIN MANAGEMENT GRADED REVEGETATED BUFFERS)
- WETLAND / STREAM
- EXISTING CONDITIONS FUNCTIONAL BUFFER
- PROPERTY BOUNDARY
- PLANNING AREA BOUNDARY
- LLA PARCEL BOUNDARY
- PROPOSED TRAIL SYSTEM
- EXISTING BUILDINGS

CONTOUR INTERVAL = N/A

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. BASE MAP REFERENCE: GOLDSMITH, SNOQUALMIE MILL, OVERALL SITE PLAN, SHEET SP-1, 3/22/17 AND GOLDSMITH, SNOQUALMIE MILL, SITE PLAN-PLANNING AREA 1, SHEET SP-1, 6/8/18

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

associated earth sciences incorporated

SITE PLAN

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	3/18	2

120126 Snoqualmie Mill Site \ 120126H012 F2 S-P.cdr



LEGEND:

- WATER SUPPLY WELL, AESI LABEL FOR WELL REPORT
- MONITORING WELL, AESI LABEL FOR WELL LOG

AESI PROJECT NAME

- MILL SITE
- TOKUL WATER RIGHTS
- SOUTH WELL FIELD
- NORTH WELL FIELD
- WASTEWATER TREATMENT PLANT
- SNOQUALMIE CASINO SEWER
- SHALLOW AQUIFER
- SAND AND GRAVEL / BEDROCK MINING
- CROSS SECTION
- CITY BOUNDARY
- CONTOUR 100 FT
- CONTOUR 20 FT

NOTE: MUCH OF MILL SITE IS AT ELEVATION 415 - 425'
NO WELL REPORTS AVAILABLE FOR 61 - 66

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'. CONTOURS FROM LIDAR
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
KING CO: PARCELS, STREETS, HYDRO 1/18
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 850 1700
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

WELL LOCATIONS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	3

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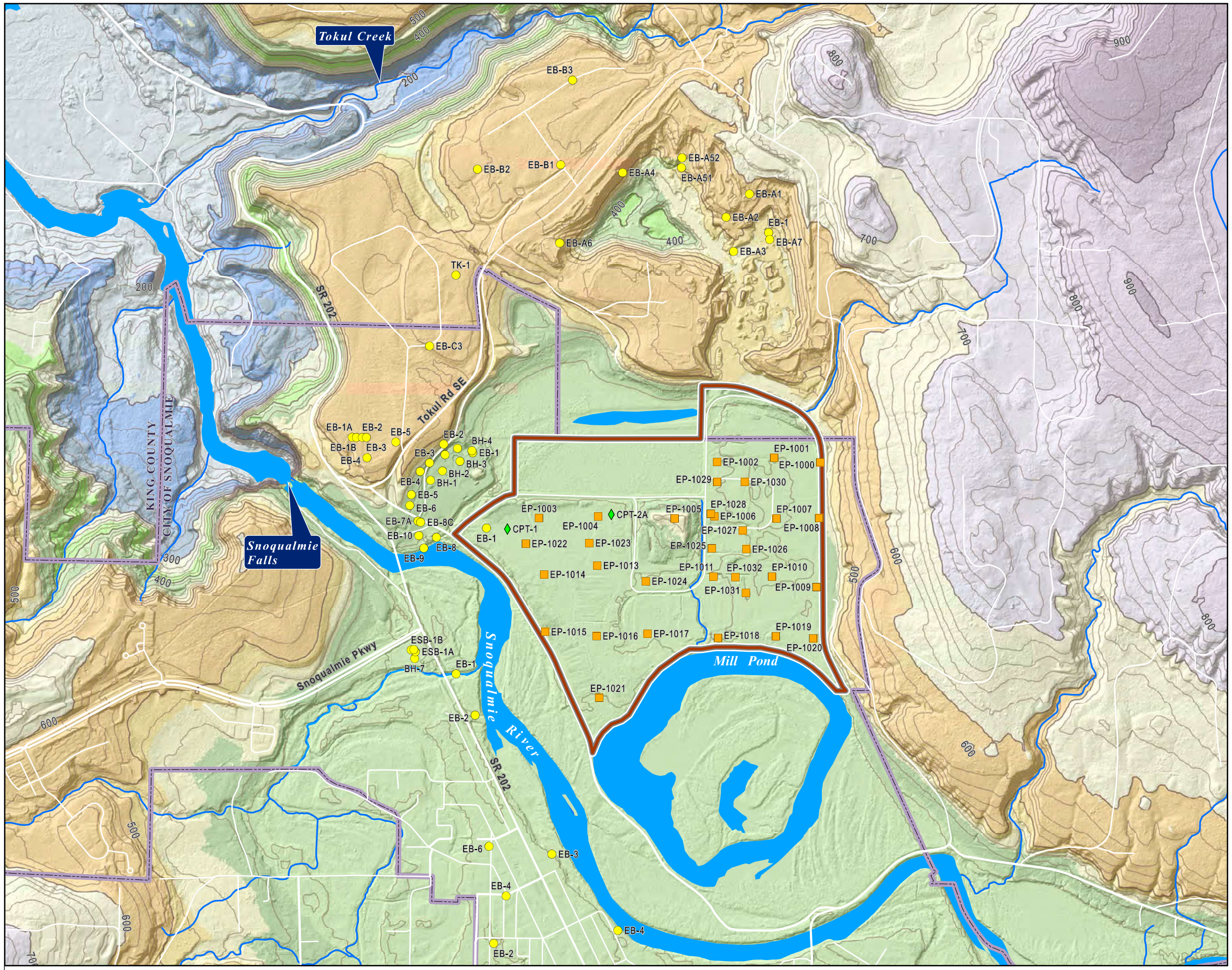

LEGEND:

- SITE
- EXPLORATION BORING
- CONE PENETROMETER
- EXPLORATION PIT
- CITY BOUNDARY
- CONTOUR 100 FT
- CONTOUR 20 FT

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO.
DELIVERY 4 FLOWN 3/26/16 - 8/27/16
GRID CELL SIZE IS 3'.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
KING CO: PARCELS, STREETS, HYDRO 1/18

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 600 1200
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

EXPLORATION PITS AND BORINGS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	4

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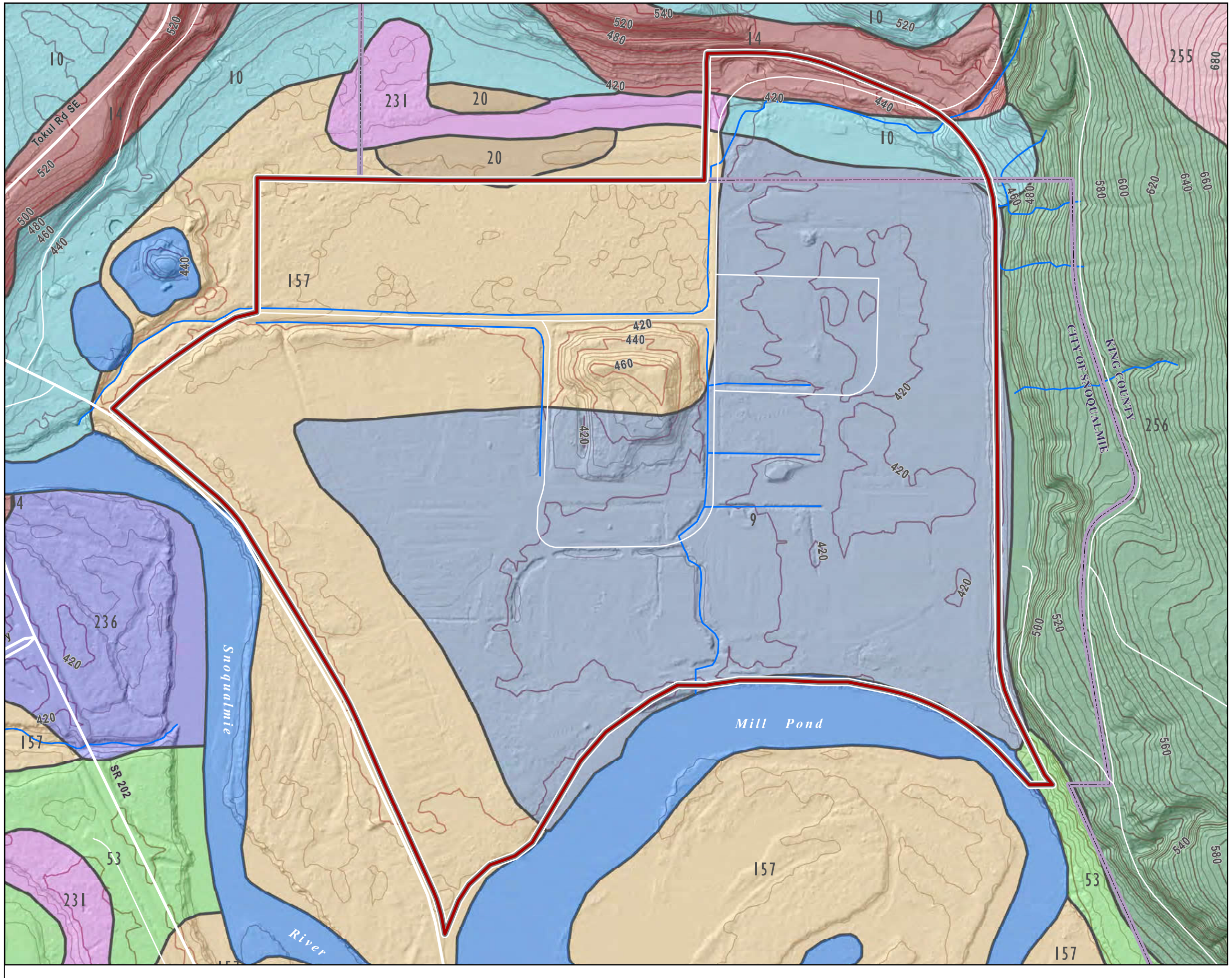

LEGEND:

- SITE
- 9 - Arents, 0-8% slope
- 10 - Barneston gravelly ashy coarse sandy loam, 0-8% slope
- 14 - 10 - Barneston gravelly ashy coarse sandy loam, 8-30% slope
- 20 - Belfast silt loam, 0-2% slope
- 53 - Edgewick silt loam, 0-3% slope
- 157 - Nooksack silt loam, 0-2% slope
- 231 - Seattle muck, 0-1% slope
- 236 - Si silt loam, 0 - 2% slope
- 255 - Tokul gravelly medial loam, 8-15% slope
- 256 - Tokul gravelly medial loam, 15-30% slope
- CITY BOUNDARY
- CONTOUR 20 FT
- CONTOUR 5 FT

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN 3/26/16 - 8/27/16,
CEDAR RIVER WATERSHED 2014, DELIVERY2 JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET, GRID CELL SIZE IS 3'.
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
CONTOURS FROM LIDAR
KING CO: STREETS, 1/18
NRCS SOILS

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 250 500
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

SOILS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	5

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af - ARTIFICIAL FILL
Qp - PEAT
Qa - ALLUVIUM
Qoa - OLDER ALLUVIUM
Qls; Qls? - LANDSLIDE DEPOSIT
Qaf - ALLUVIAL FAN
Qgod - VASHON DELTAIC OUTWASH
Qgic; Qgik - VASHON ICE-CONTACT DEPOSIT
Qgof - VASHON FLUVIAL OUTWASH
Qgog - VASHON OUTWASH GRAVEL
Qgl(r) - VASHON RECESSIONAL LAKE DEPOSIT
Qgos - VASHON OUTWASH SAND
Qgt - VASHON LODGEMENT TILL
Qga(v)- VAHSON ADVANCE OUTWASH
Qgl(v) - VASHON ADVANCE LAKE DEPOSIT
Qc(o); Qc(o)?; Qc(oc) - PRE-FRASER OLYMPIA BED
Qgo(p) - POSSESSION DRIFT OUTWASH
Qc(w)? - WHIDBEY FORMATION
Eva(p); KJms(w); KJmv(w); Mva(s); Mvbx(s); Qtz; tz - BEDROCK

LEGEND:

SITE

GEOLOGY UNITS UNDER FILL ONSITE

RIVER CHANNEL
LACUSTRINE
OVERBANK
CITY BOUNDARY
CONTOUR 100 FT
CONTOUR 20 FT

NOTE:
MAPPING OF GEOLOGY UNITS UNDERLYING THE EXISTING ONSITE FILL IS BASED ON AESI EXPLORATION PITS.

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'.
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
CONTOURS FROM LIDAR
KING CO: PARCELS, STREETS, HYDRO 1/18
WADNR: GEOLOGY, 24K 11/17, SNOQUALMIE 7.5 MINUTE QUAD, GM-75, 7/09

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N
0 600 1200
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

GEOLOGY

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	6

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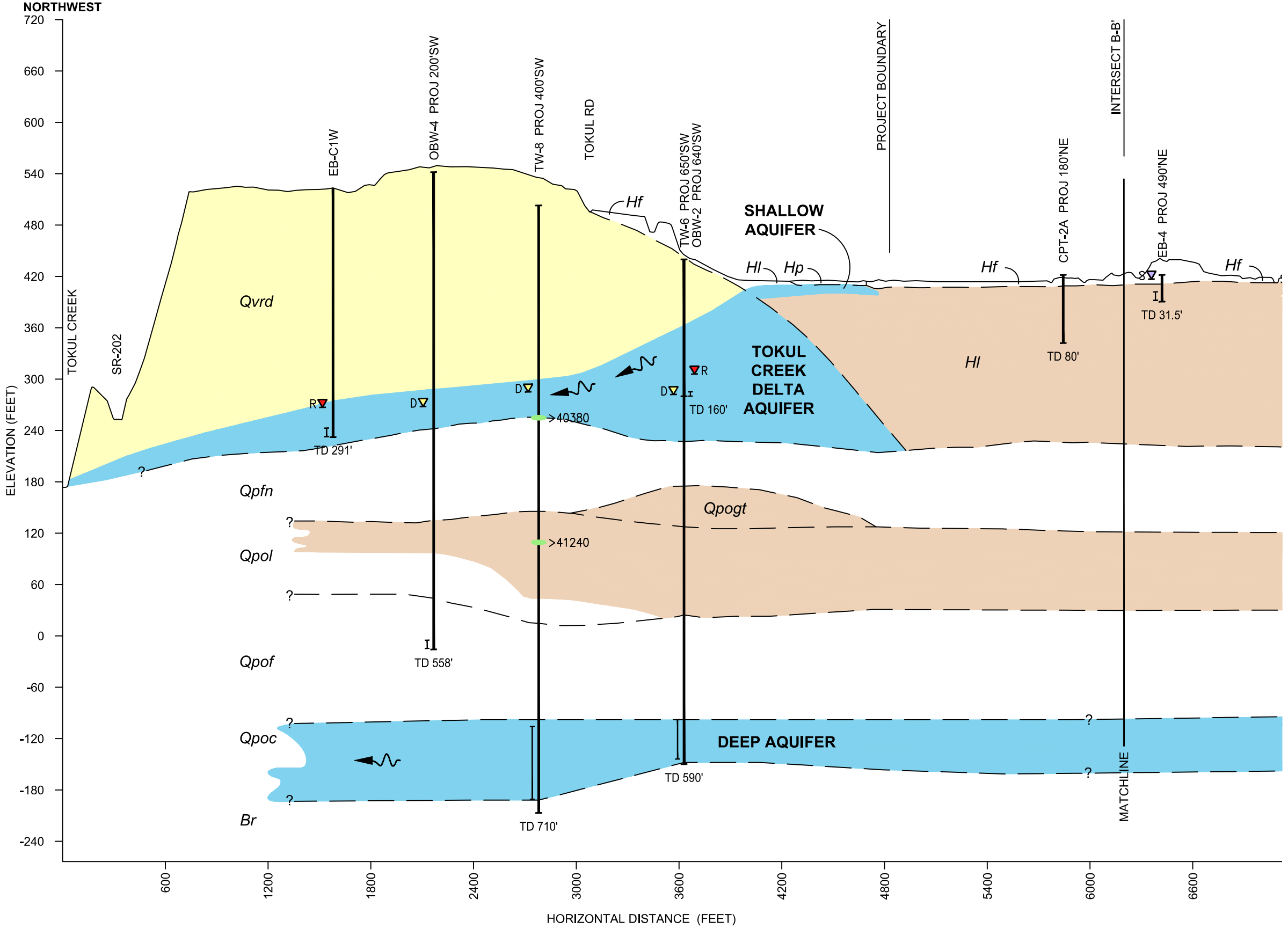
A

NORTHWEST



LEGEND:

Hf	HOLOCENE FILL
Hp	HOLOCENE PEAT
Ha	HOLOCENE ALLUVIUM
Hl	HOLOCENE LACUSTRINE
Qvrd	VASHON RECESSIONAL OUTWASH DELTA - COARSE GRAINED
Qvr	VASHON RECESSIONAL OUTWASH UNDIFFERENTIATED
Qvt	VASHON LODGEMENT TILL
Qva	VASHON ADVANCE OUTWASH
Qvlc	VASHON ADVANCE LACUSTRINE
Qpfn	PRE-FRASER NONGLACIAL UNDIFFERENTIATED
Qpogt	PRE-OLYMPIA GLACIAL TILL
Qpol	PRE-OLYMPIA LACUSTRINE
Qpof	PRE-OLYMPIA FLUVIAL FINE GRAINED
Qpoc	PRE-OLYMPIA FLUVIAL COARSE GRAINED
Qpou	PRE-OLYMPIA UNDIFFERENTIATED
Br	BEDROCK
	COARSE GRAINED
	LOW PERMEABILITY - FLOW BARRIER
	EXPLORATION / WELL
	SCREENED INTERVAL
	AQUIFER:
S	SHALLOW
R	TOKUL CREEK DELTA
PF	PRE-FRASER
D	DEEP
	GROUNDWATER FLOW DIRECTION
TD	TOTAL DEPTH OF BORING
	GEOLOGIC CONTACT
	^{14}C CAL BP

VERTICAL EXAGGERATION = 5X

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:
1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS ENCOUNTERED IN WIDELY SPACED EXPLORATIONS COMPLETED AT THE SUBJECT SITE AND RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUNDWATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

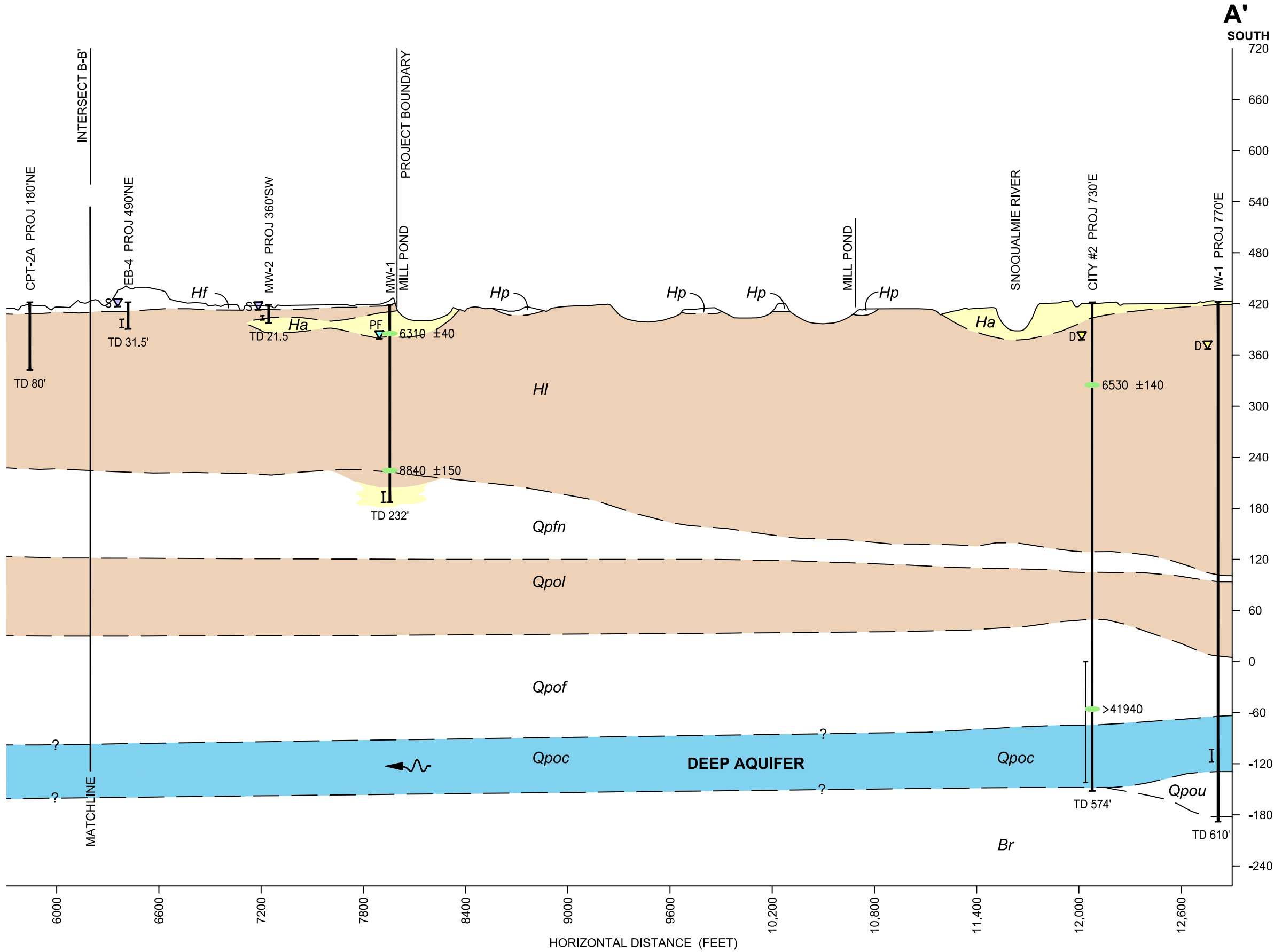
associated earth sciences incorporated

HYDROGEOLOGIC CROSS-SECTION A - A' NORTHWEST

EIS SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	5/18	7

120126 Snoqualmie Mill Site \ 120126 Geo Sects 3-18.dwg LAYOUT: F7 Sect A-A North



LEGEND:

Hf	HOLOCENE FILL
Hp	HOLOCENE PEAT
Ha	HOLOCENE ALLUVIUM
Hl	HOLOCENE LACUSTRINE
Qvrd	VASHON RECESSIONAL OUTWASH DELTA - COARSE GRAINED
Qvr	VASHON RECESSIONAL OUTWASH UNDIFFERENTIATED
Qvt	VASHON LODGEMENT TILL
Qva	VASHON ADVANCE OUTWASH
Qvlc	VASHON ADVANCE LACUSTRINE
Qpfn	PRE-FRASER NONGLACIAL UNDIFFERENTIATED
Qpogt	PRE-OLYMPIA GLACIAL TILL
Qpol	PRE-OLYMPIA LACUSTRINE
Qpof	PRE-OLYMPIA FLUVIAL FINE GRAINED
Qpoc	PRE-OLYMPIA FLUVIAL COARSE GRAINED
Qpou	PRE-OLYMPIA UNDIFFERENTIATED
Br	BEDROCK
	COARSE GRAINED
	LOW PERMEABILITY - FLOW BARRIER
	EXPLORATION / WELL
	SCREENED INTERVAL
	AQUIFER:
S	SHALLOW
R	TOKUL CREEK DELTA
PF	PRE-FRASER
D	DEEP
	GROUNDWATER FLOW DIRECTION
TD	TOTAL DEPTH OF BORING
	GEOLOGIC CONTACT
	^{14}C CAL BP

VERTICAL EXAGGERATION = 5X

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:
1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS ENCOUNTERED IN WIDELY SPACED EXPLORATIONS COMPLETED AT THE SUBJECT SITE AND RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUNDWATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

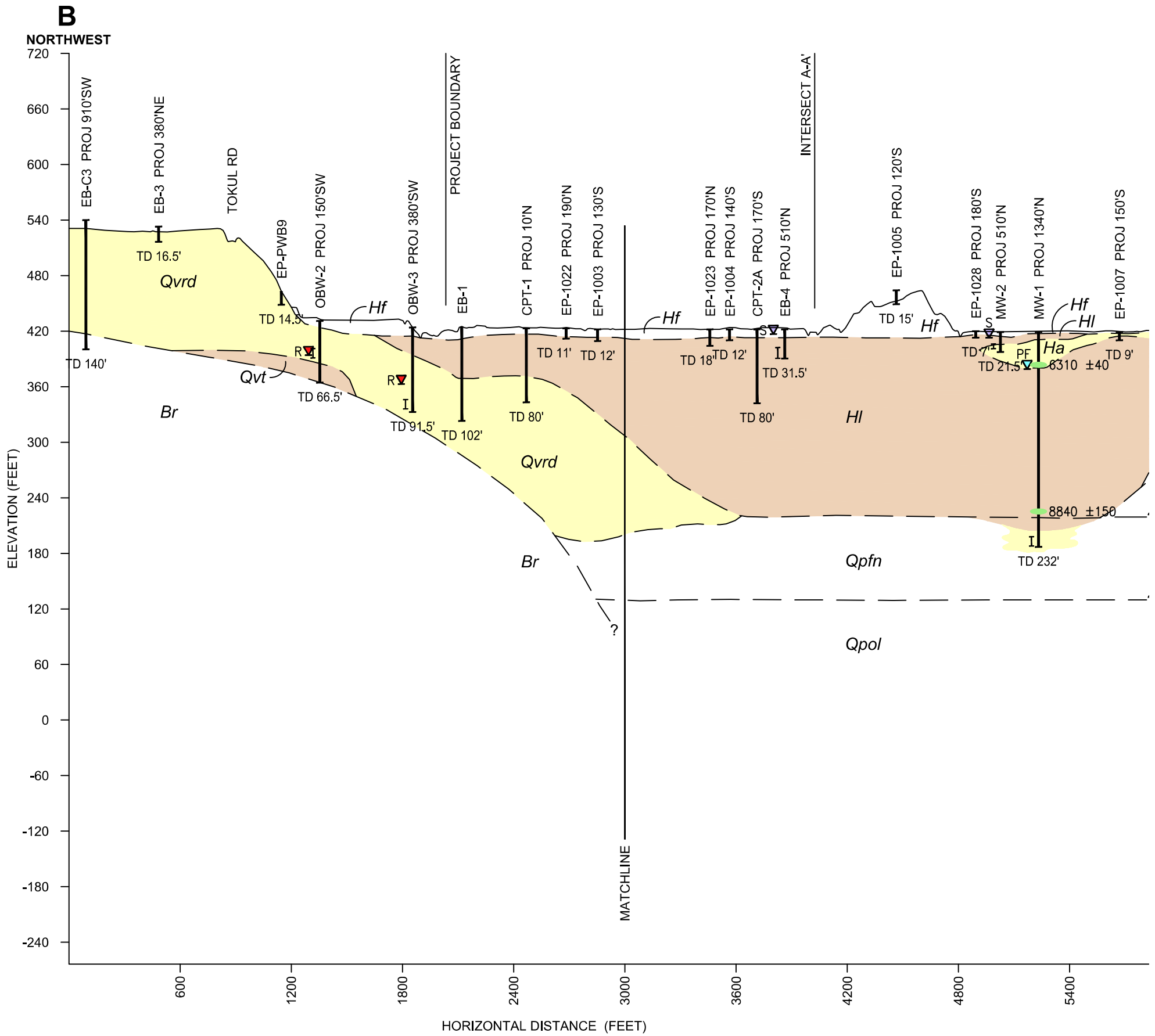
associated earth sciences incorporated

HYDROGEOLOGIC CROSS-SECTION A - A' SOUTH

EIS SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	5/18	8

120126 Snoqualmie Mill Site \ 120126 Geo Sects 3-18.dwg LAYOUT: F8 Sect A-A South



LEGEND:

Hf	HOLOCENE FILL
Hp	HOLOCENE PEAT
Ha	HOLOCENE ALLUVIUM
Hl	HOLOCENE LACUSTRINE
Qvrd	VASHON RECESSIONAL OUTWASH DELTA - COARSE GRAINED
Qvr	VASHON RECESSIONAL OUTWASH UNDIFFERENTIATED
Qvt	VASHON LODGEMENT TILL
Qva	VASHON ADVANCE OUTWASH
Qvlc	VASHON ADVANCE LACUSTRINE
Qpfn	PRE-FRASER NONGLACIAL UNDIFFERENTIATED
Qpogt	PRE-OLYMPIA GLACIAL TILL
Qpol	PRE-OLYMPIA LACUSTRINE
Qpof	PRE-OLYMPIA FLUVIAL FINE GRAINED
Qpoc	PRE-OLYMPIA FLUVIAL COARSE GRAINED
Qpou	PRE-OLYMPIA UNDIFFERENTIATED
Br	BEDROCK
	COARSE GRAINED
	LOW PERMEABILITY - FLOW BARRIER
	EXPLORATION / WELL
	SCREENED INTERVAL
	AQUIFER:
S	SHALLOW
R	TOKUL CREEK DELTA
PF	PRE-FRASER
D	DEEP
	GROUNDWATER FLOW DIRECTION
TD	TOTAL DEPTH OF BORING
	GEOLOGIC CONTACT
	^{14}C CAL BP

VERTICAL EXAGGERATION = 5X

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:
1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS ENCOUNTERED IN WIDELY SPACED EXPLORATIONS COMPLETED AT THE SUBJECT SITE AND RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUNDWATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

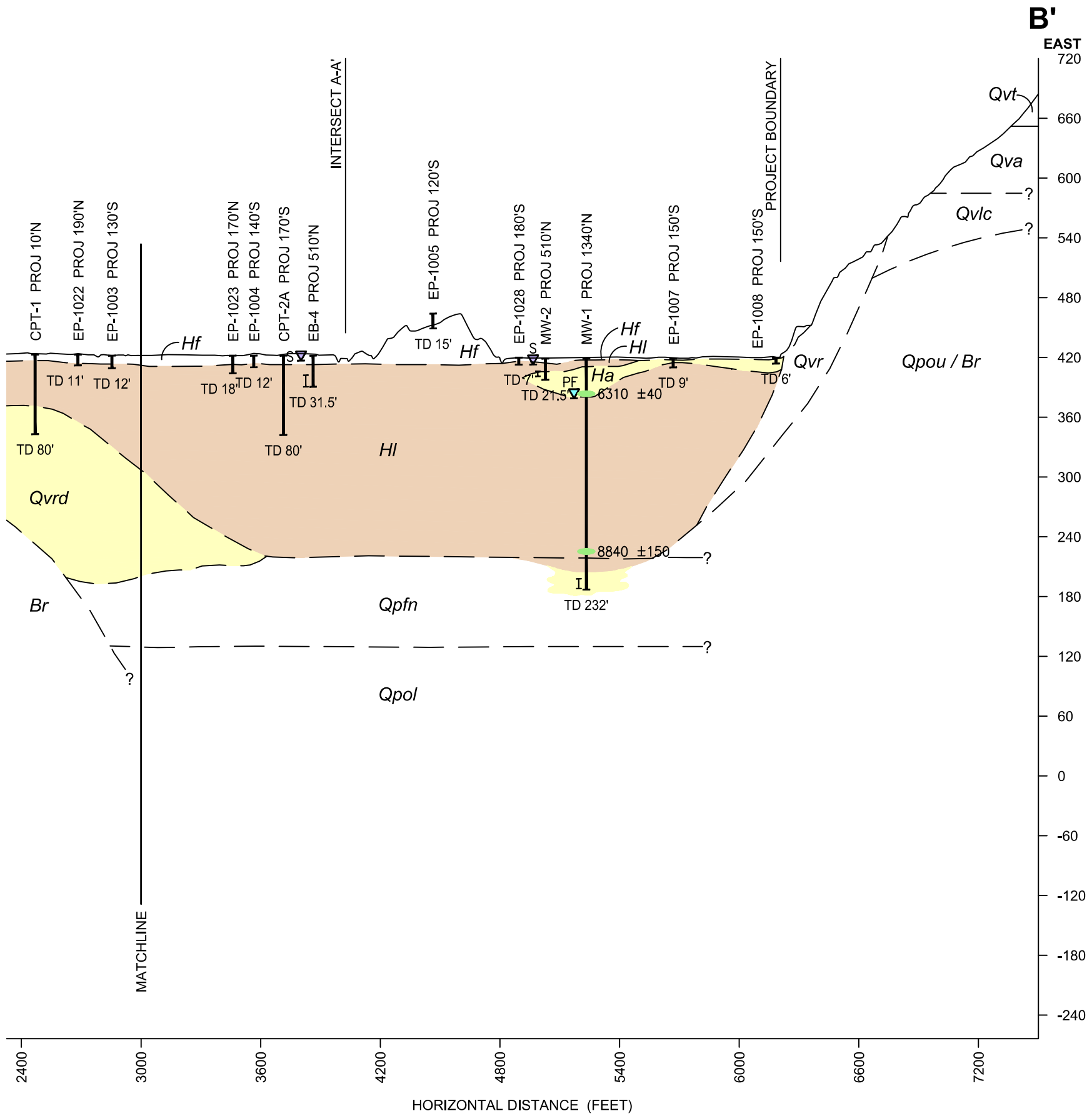
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

HYDROGEOLOGIC CROSS-SECTION B - B' NORTHWEST
EIS SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	5/18	9

120126 Snoqualmie Mill Site \ 120126 Geo Sects 3-18.dwg LAYOUT: F9 Sect B-B North



LEGEND:

Hf	HOLOCENE FILL
Hp	HOLOCENE PEAT
Ha	HOLOCENE ALLUVIUM
Hl	HOLOCENE LACUSTRINE
Qvrd	VASHON RECESSIONAL OUTWASH DELTA - COARSE GRAINED
Qvr	VASHON RECESSIONAL OUTWASH UNDIFFERENTIATED
Qvt	VASHON LODGEMENT TILL
Qva	VASHON ADVANCE OUTWASH
Qvlc	VASHON ADVANCE LACUSTRINE
Qpfn	PRE-FRASER NONGLACIAL UNDIFFERENTIATED
Qpogt	PRE-OLYMPIA GLACIAL TILL
Qpol	PRE-OLYMPIA LACUSTRINE
Qpof	PRE-OLYMPIA FLUVIAL FINE GRAINED
Qpoc	PRE-OLYMPIA FLUVIAL COARSE GRAINED
Qpou	PRE-OLYMPIA UNDIFFERENTIATED
Br	BEDROCK
	COARSE GRAINED
	LOW PERMEABILITY - FLOW BARRIER
	EXPLORATION / WELL
	SCREENED INTERVAL
	AQUIFER:
S	SHALLOW
R	TOKUL CREEK DELTA
PF	PRE-FRASER
D	DEEP
	GROUNDWATER FLOW DIRECTION
TD	TOTAL DEPTH OF BORING
	GEOLOGIC CONTACT
	^{14}C CAL BP

VERTICAL EXAGGERATION = 5X

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:
1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS ENCOUNTERED IN WIDELY SPACED EXPLORATIONS COMPLETED AT THE SUBJECT SITE AND RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUNDWATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

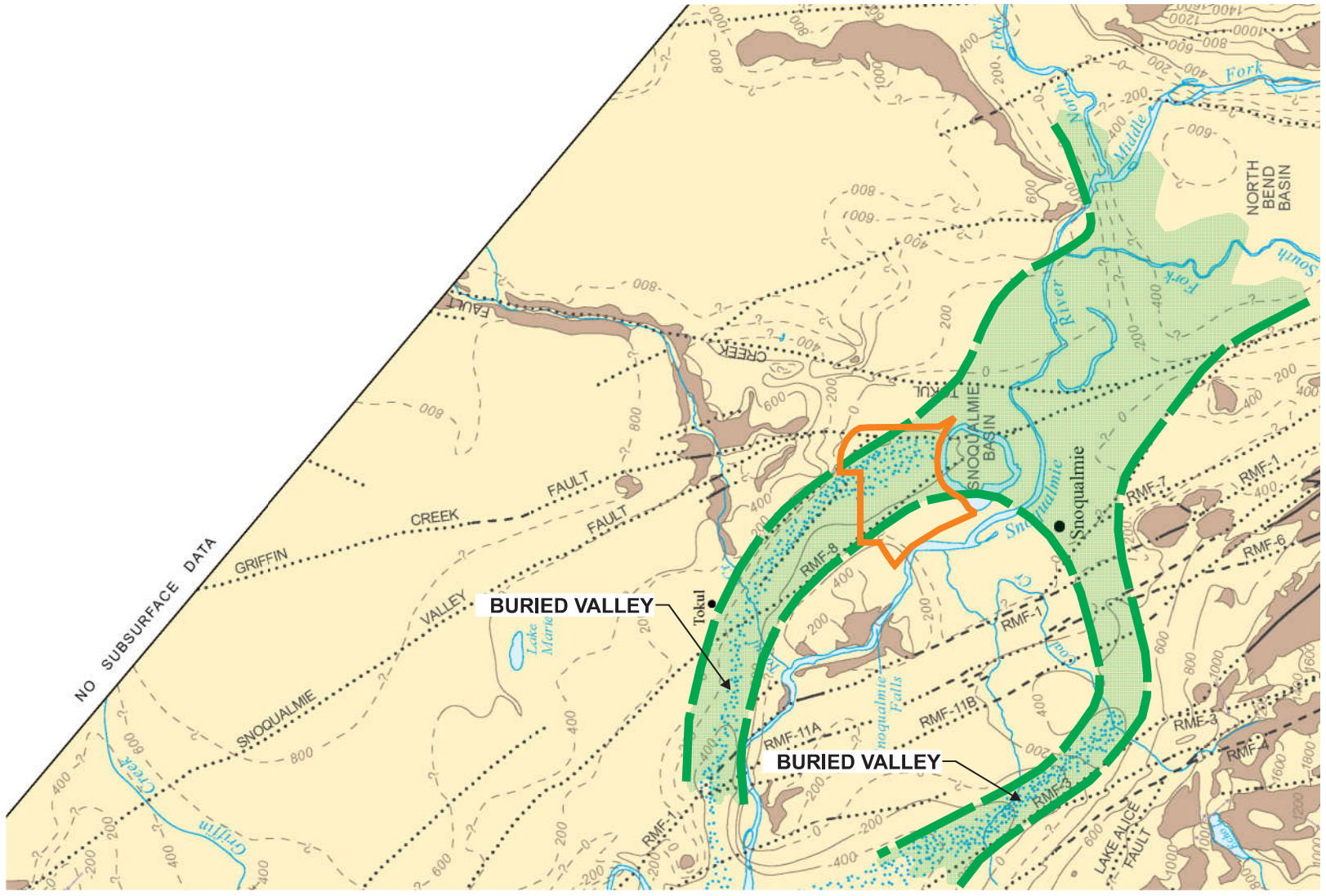
associated earth sciences incorporated

HYDROGEOLOGIC CROSS-SECTION B - B' EAST

EIS SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	5/18	10

120126 Snoqualmie Mill Site \ 120126 Geo Sects 3-18.dwg LAYOUT: F10 Sect B-B South



LEGEND:

- ANCIENT SNOQUALMIE RIVER CHANNEL
- SUBSURFACE BEDROCK CONTOUR
- SUBSURFACE BEDROCK CONTOUR INFERRED
- BEDROCK OUTCROP OR SHALLOW BEDROCK OVERLAIN BY THIN QUATERNARY DEPOSITS
- FAULT - DASHED WHERE INFERRED; DOTTED WHERE CONCEALED
- PROJECT BOUNDARY
- BURIED VALLEY

CONTOUR INTERVAL = 200'

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. BASE MAP REFERENCE: DNR (DRAGOVICH J.D.) 2009, GEOLOGIC MAP #75 PLATE 2 OF 2

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

associated earth sciences incorporated

BURIED VALLEY MAP

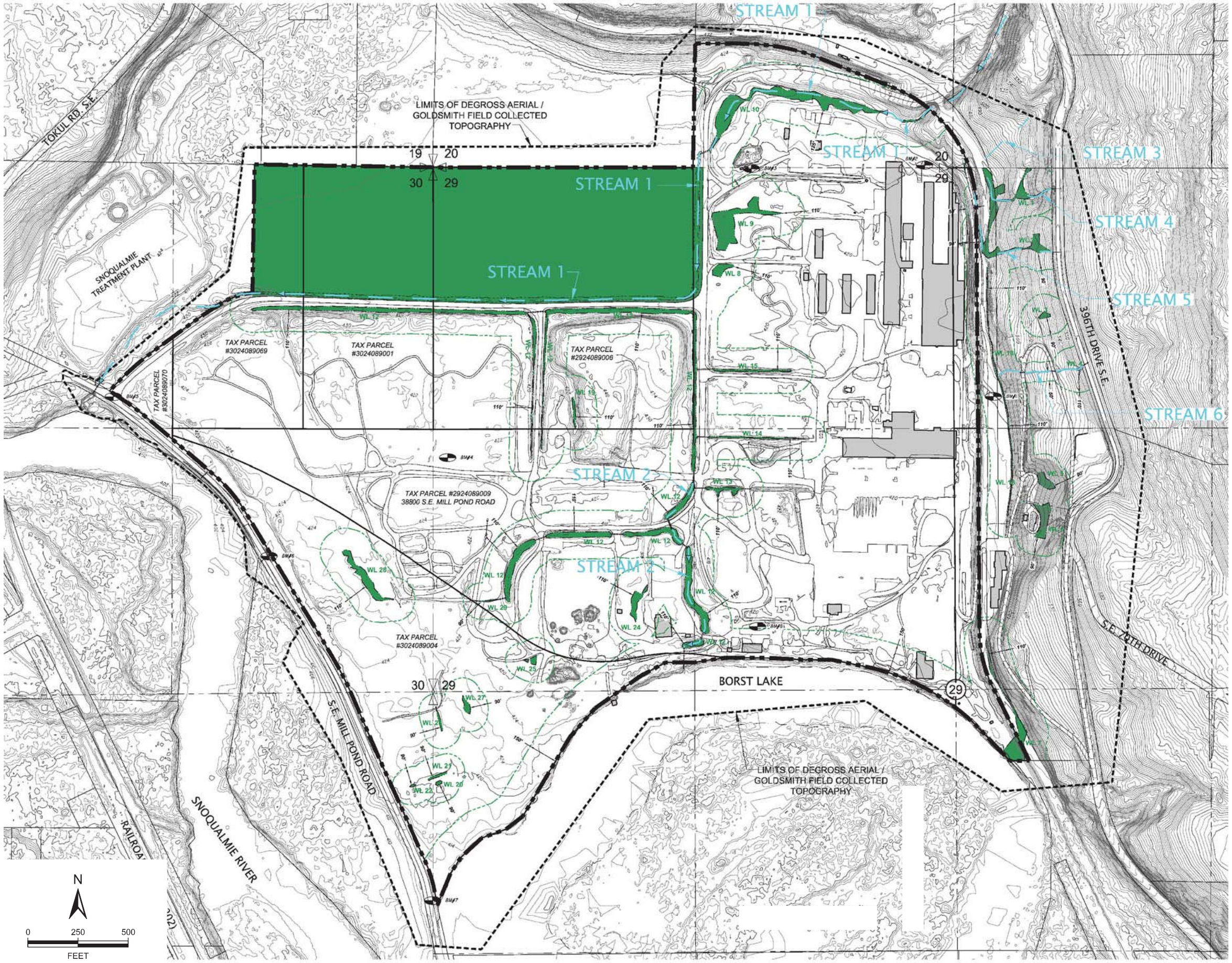
SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	11

N

0 2500 5000
FEET

120126 Snoqualmie Mill Site \ 120126H012 F11 Explanation.cdr



LEGEND:

- SITE BOUNDARY
- WETLAND BUFFER
- WETLANDS
- STREAMS

CONTOUR INTERVAL = 2'

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. BASE MAP REFERENCE: GOLDSMITH, SNOQUALMIE MILL SITE, WETLANDS AND STREAMS EXHIBIT, FIGURE 4-3, 5/17

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

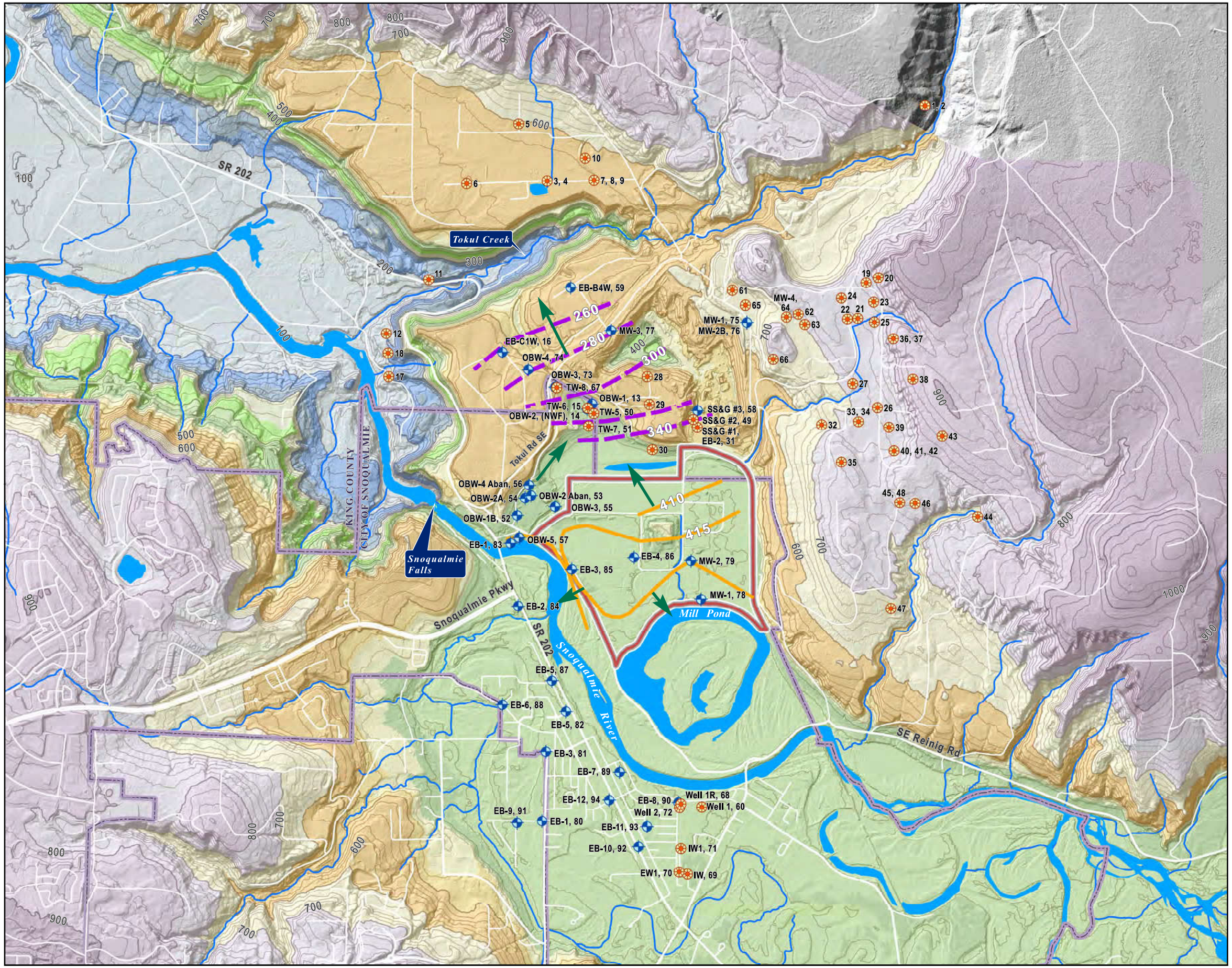
associated earth sciences incorporated

SURFACE WATER FEATURES

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	3/18	12

120126 Mill Site \ 120126H012 F12 Surface Water.cdr



LEGEND:

- GROUNDWATER FLOW DIRECTION
- WATER SUPPLY WELL, AESI LABEL FOR WELL REPORT
- MONITORING WELL, AESI LABEL FOR WELL LOG
- TOKUL CREEK DELTA AQUIFER
- SNOQUALMIE RIVER SHALLOW AQUIFER
- CITY BOUNDARY
- CONTOUR 100 FT
- CONTOUR 20 FT

NOTE: MUCH OF MILL SITE IS AT ELEVATION 415 - 425'
NO WELL REPORTS AVAILABLE FOR 61 - 66

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'. CONTOURS FROM LIDAR
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
KING CO: PARCELS, STREETS, HYDRO 1/18
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 850 1700
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

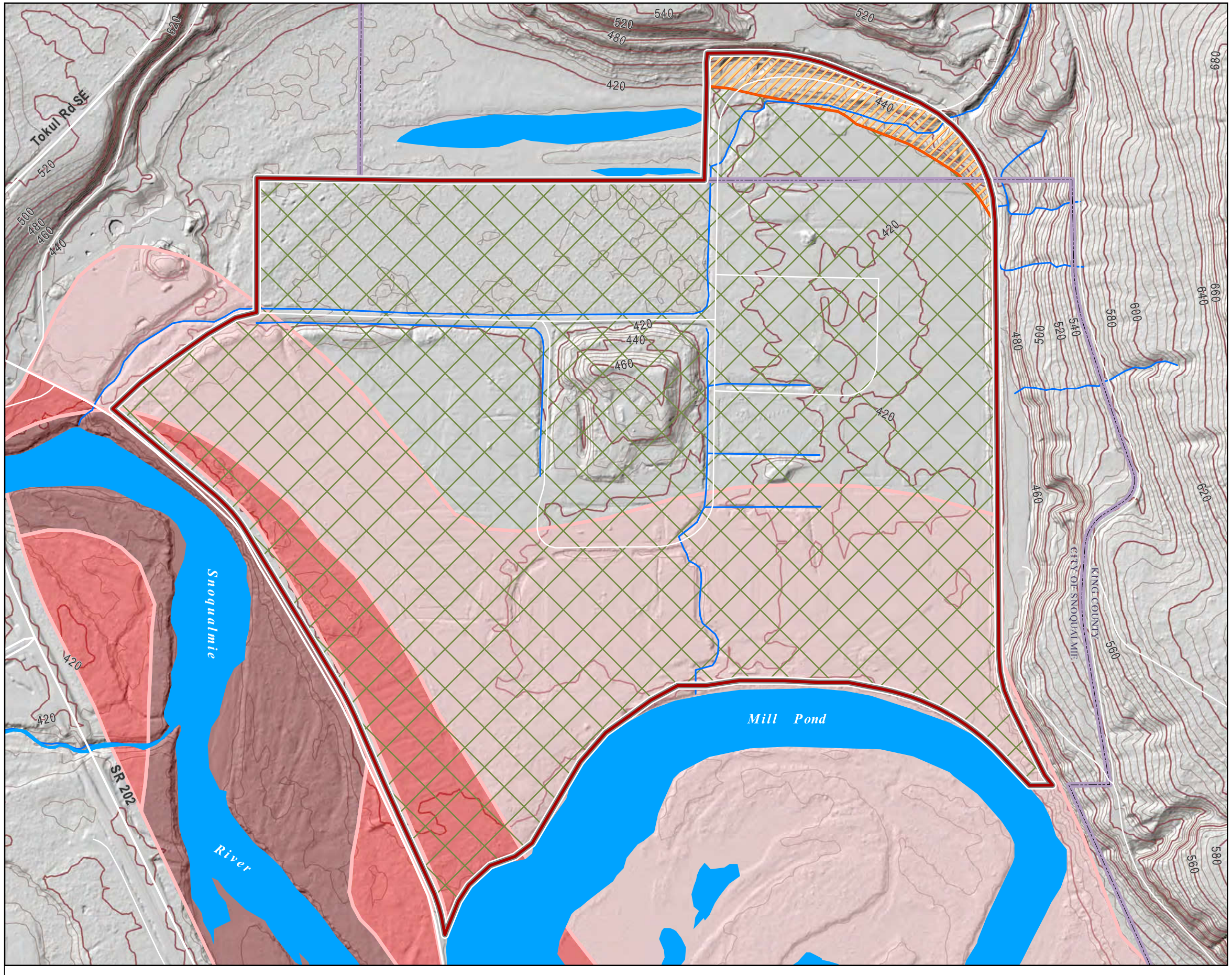
associated earth sciences incorporated

WELL LOCATIONS GROUNDWATER ELEVATION

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	13

Document Path: G:\GIS_Projects\Y12post0716\120126 Sno Mill Site\mxd\H012ES\120126H012 F13 Wells_GWCont_SMS.mxd



LEGEND:

- SITE

EROSION HAZARD RISK

- ZONE 1 - LOW RISK
- ZONE 2 - SLIGHT TO MODERATE RISK

CHANNEL MIGRATION ZONE

- POTENTIAL
- MODERATE
- SEVERE
- CITY BOUNDARY
- CONTOUR 20 FT
- CONTOUR 5 FT

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'.
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
CONTOURS FROM LIDAR
KING CO: PARCELS, STREETS, HYDRO 1/18
KING CO: CHANNEL MIGRATION 9/17
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 250 500
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

EROSION HAZARDS CHANNEL MIGRATION ZONES

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	14

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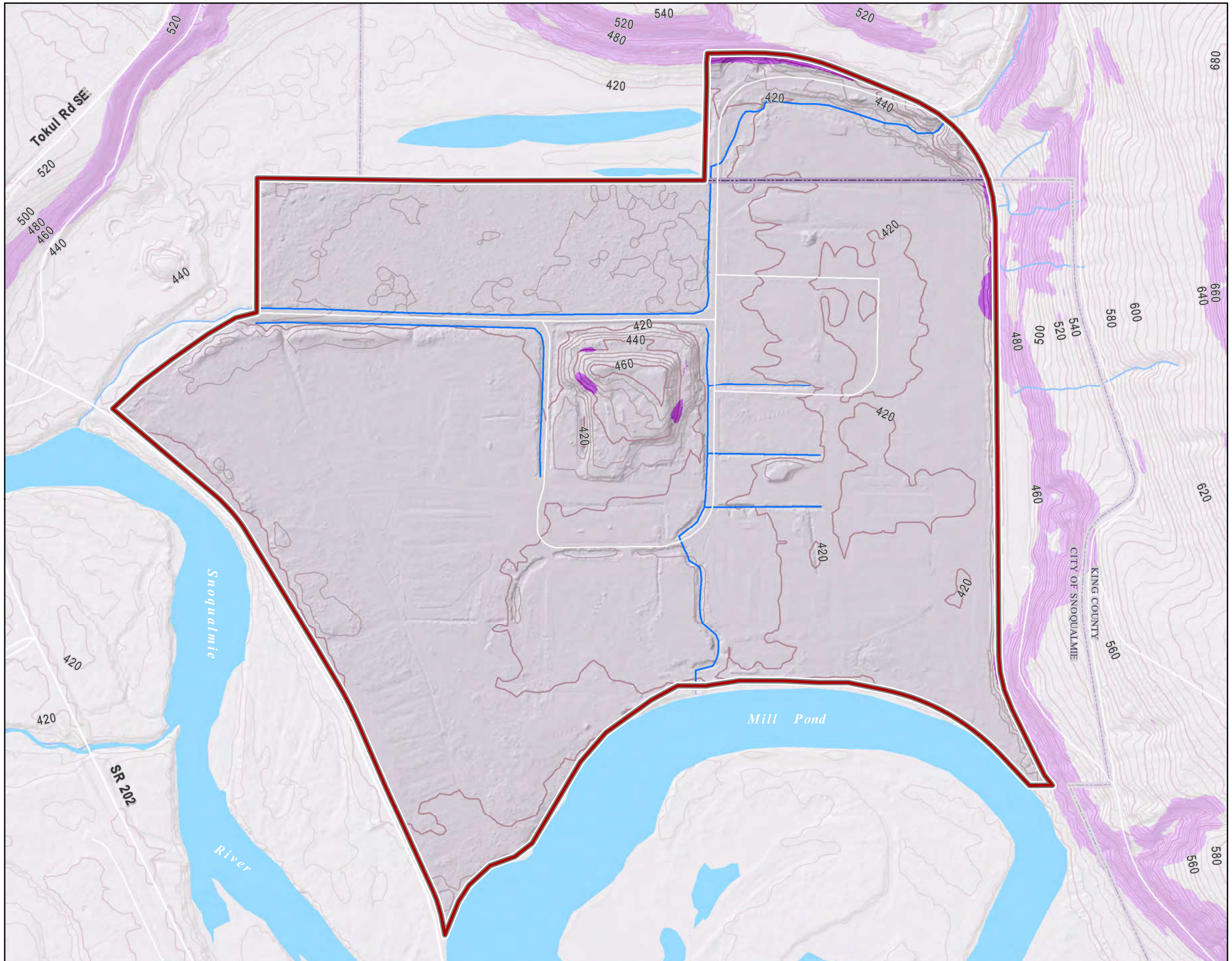

LEGEND:

- SITE
- LANDSLIDE / STEEP SLOPE HAZARD ZONE 1
- LANDSLIDE / STEEP SLOPE HAZARD ZONE 2
- CITY BOUNDARY
- CONTOUR 20 FT
- CONTOUR 5 FT

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'.
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
CONTOURS FROM LIDAR
KING CO: PARCELS, STREETS, HYDRO 1/18

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 250 500
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

LANDSLIDE AND STEEP SLOPE HAZARDS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	15

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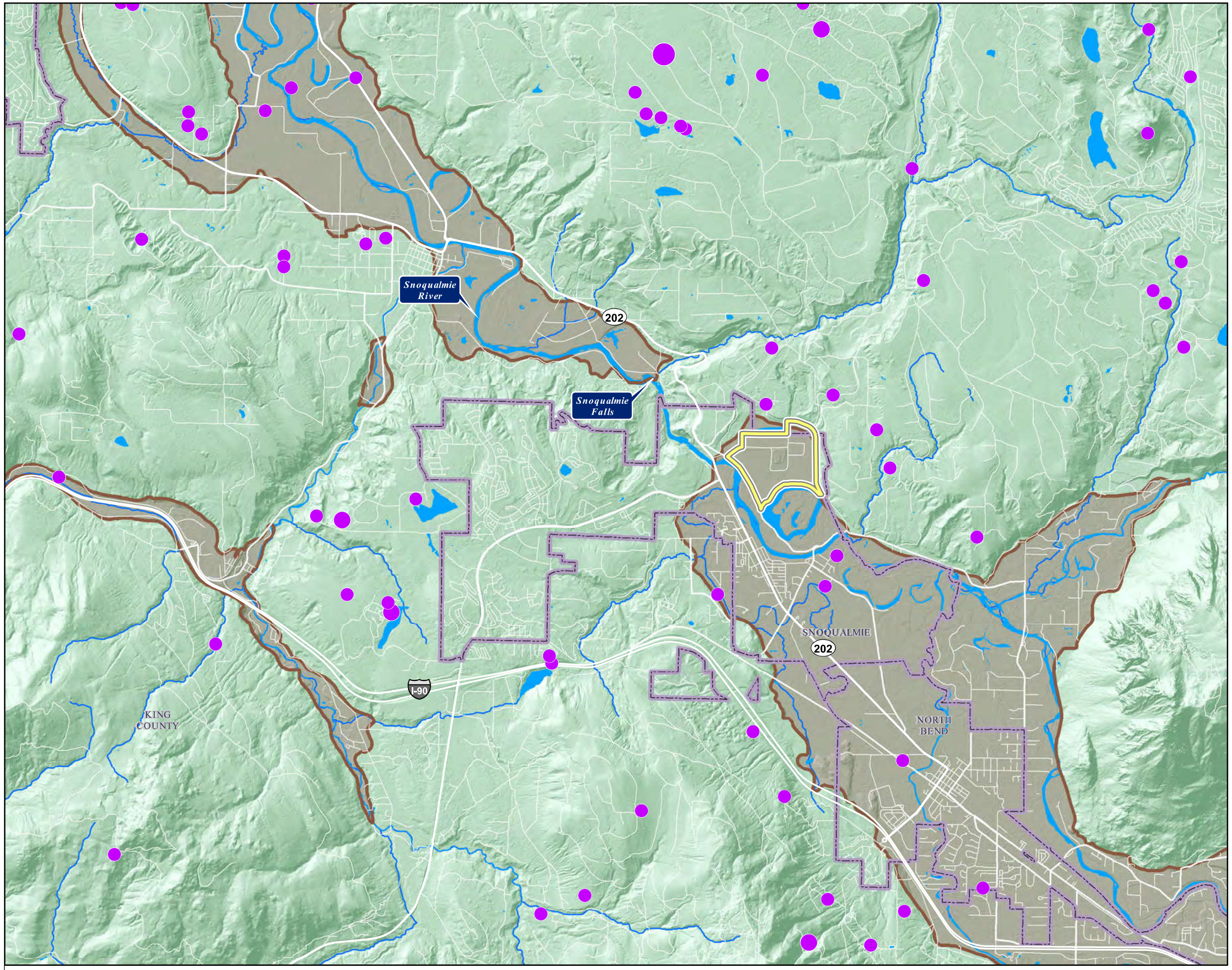


LEGEND:

SITE

EARTHQUAKE_MAGNITUDE

- 2 - 2.9
- 3 - 3.9
- >3.99

SEISMIC HAZARD AREA (KING CO.)

CITY BOUNDARY

DATA SOURCES / REFERENCES:
PSLC: 2005 SUPERMOSIC HILLSHADE, 6' CELL
KING CO: PARCELS, STREETS, HYDRO 1/18
KING CO: SEISMIC HAZARD AREA 1/13
WADNR: PNWSN 4/13

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 2500 5000

FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

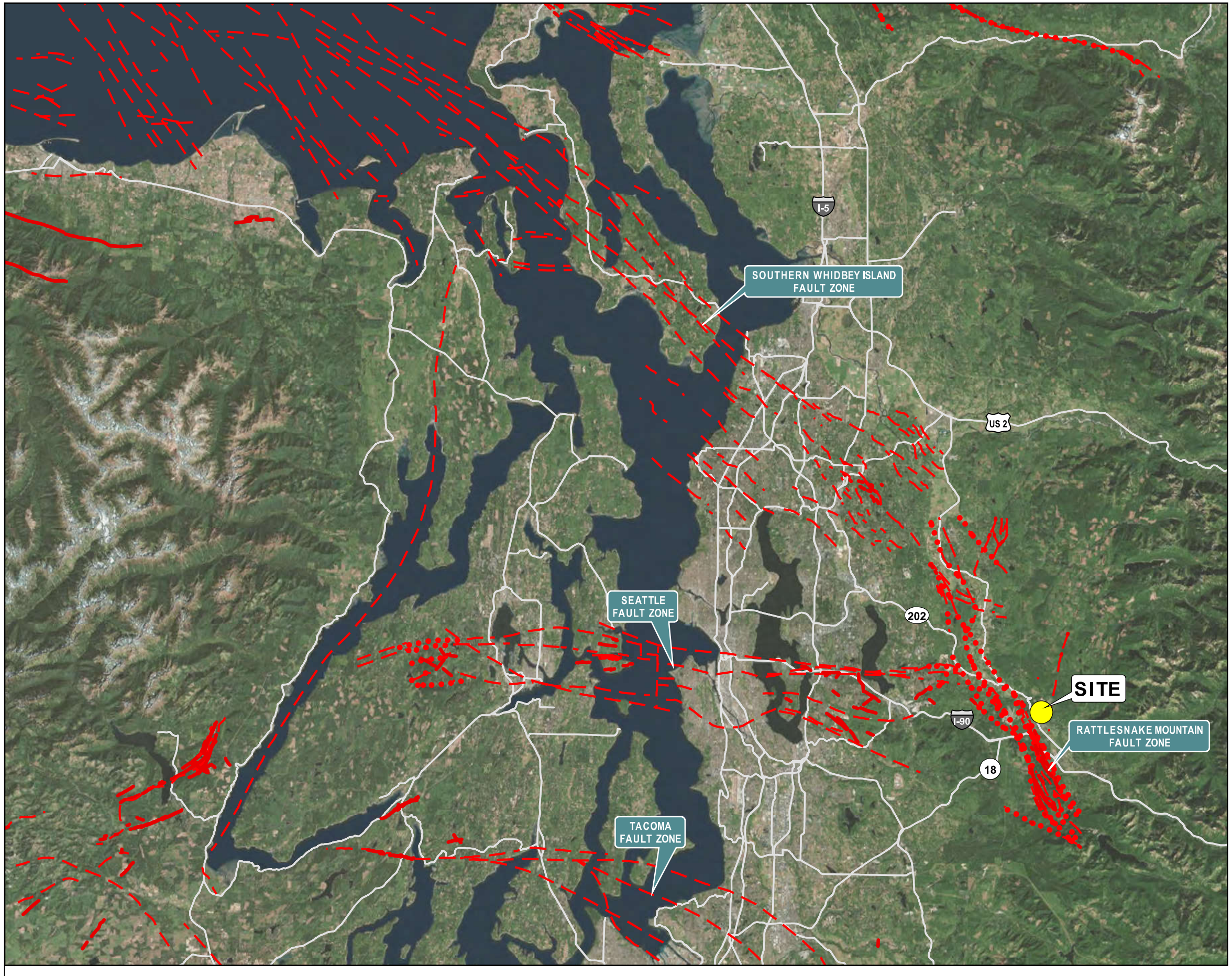
associated earth sciences incorporated

EARTHQUAKE LOCATIONS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	16

Document Path: G:\GIS_Projects\a Y12\post\0716\120126 Sno Mill Site\mxd\H012EIS\120126H012 F16 Earthquake_SMS.mxd



LEGEND:

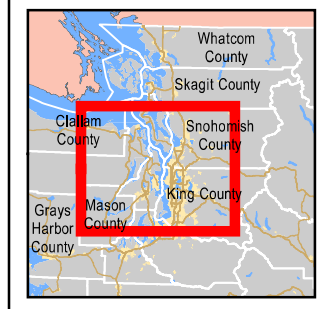
FAULT VISIBILITY DESCRIPTION

- CONCEALED FAULT TRACE
- INFERRED FAULT TRACE
- VISIBLE FAULT TRACE

DATA SOURCES / REFERENCES:

WADNR REGIONAL ACTIVE FAULTS 4/13
AERIAL: ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNE S/A AIRBUS DS, USDA

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 20000 40000
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

REGIONAL FAULTS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	17

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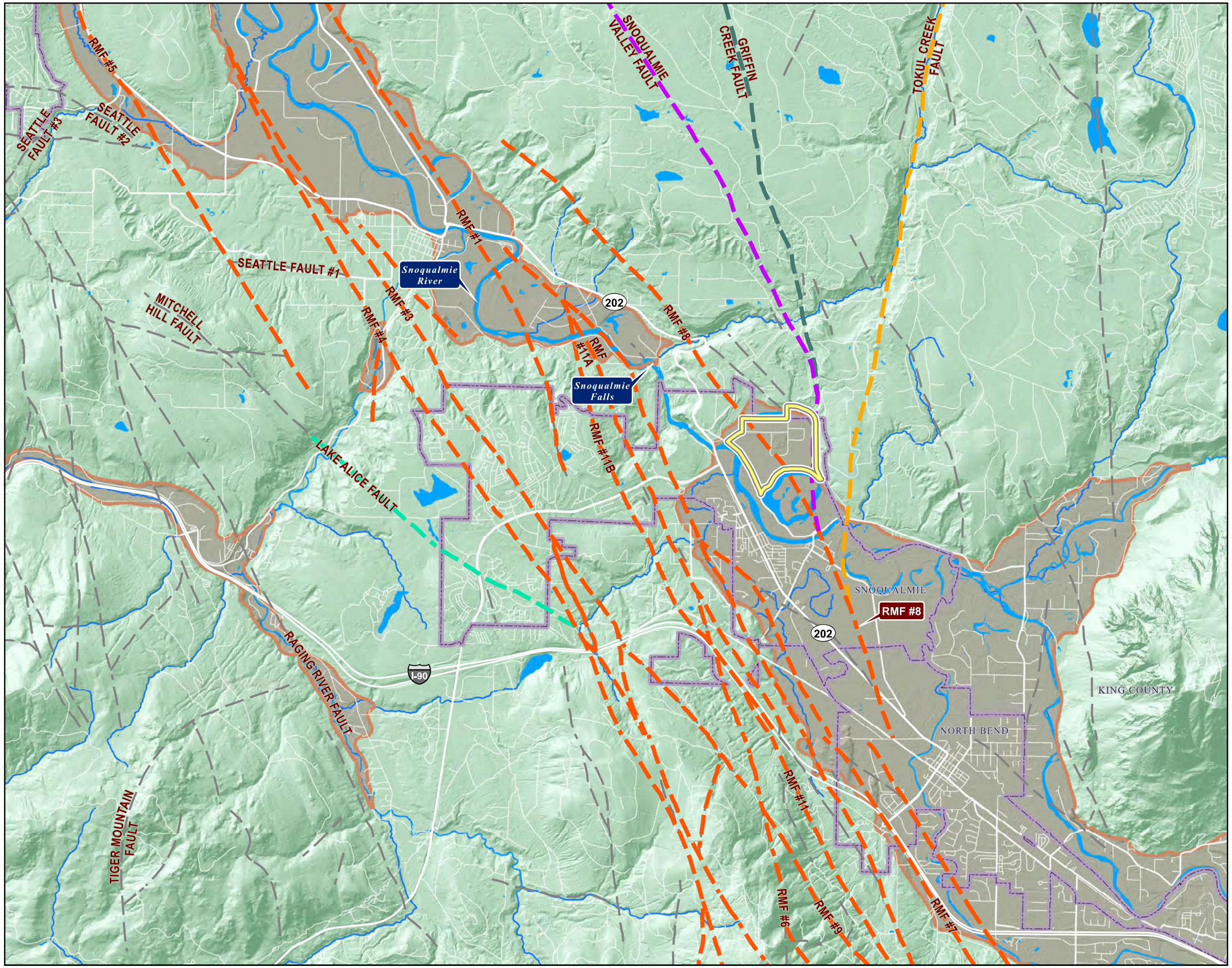
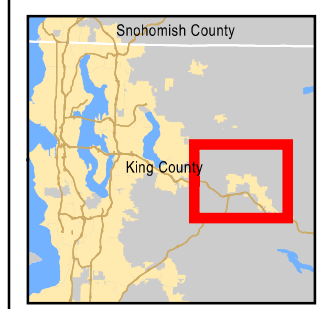


LEGEND:

- SITE
- SNOQUALMIE VALLEY
- RATTLESNAKE MOUNTAIN FAULT ZONE (RMF)
- GRIFFIN CREEK
- LAKE ALICE
- TOKUL CREEK
- FAULTS, MISC
- SEISMIC HAZARD AREA (KING CO.)
- CITY BOUNDARY

DATA SOURCES / REFERENCES:
PSLC: 2005 SUPERMOSIC HILLSHADE, 6' CELL
KING CO: PARCELS, STREETS, HYDRO 1/18
KING CO: SEISMIC HAZARD AREA 1/13
WADNR: 24K FAULTS 12/16

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 2500 5000
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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SEISMIC HAZARD FAULT LOCATIONS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	18

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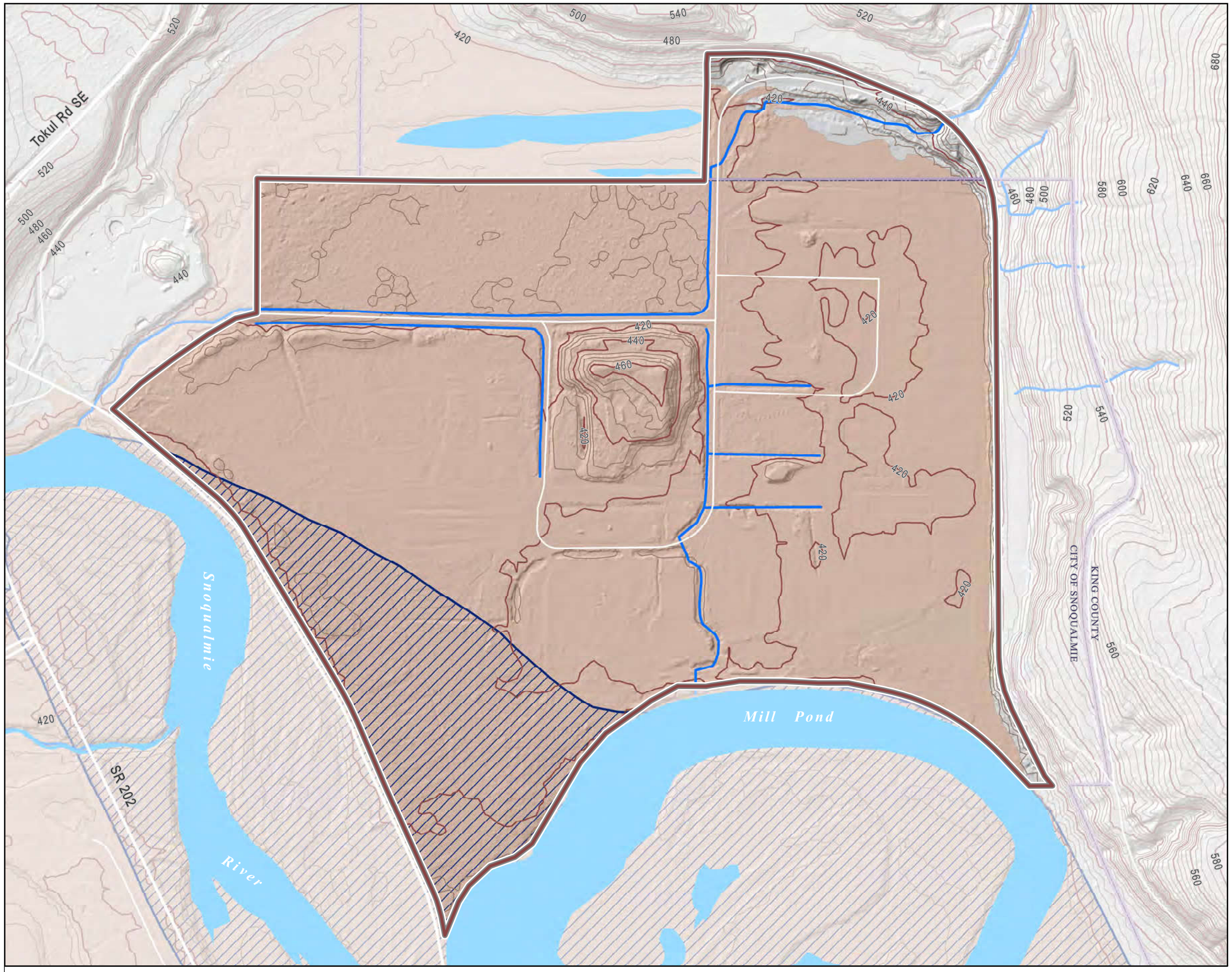

LEGEND:

- SITE
- FLOODWAY
- 100 YR FLOODPLAIN
- CITY BOUNDARY
- CONTOUR 20 FT
- CONTOUR 5 FT

NOTE: SITE RANGES FROM ABOUT 415' TO 425'
MILL POND AT TIME OF LIDAR FLIGHT IS ELEVATION OF 411.5'. LIDAR WATER IS FLATTENED.
SNOQUALMIE RIVER AT EAST CITY LIMITS IS ABOUT 402.8
SNOQUALMIE RIVER AT SR 202 IS ABOUT 400.5

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN 3/26/16 - 8/27/16, GRID CELL SIZE IS 3'.
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
CONTOURS FROM LIDAR
KING CO: PARCELS, STREETS, HYDRO. 1/18, FLOODWAY AND FLOODPLAIN 3/18,

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 250 500
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

FLOOD HAZARDS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	19

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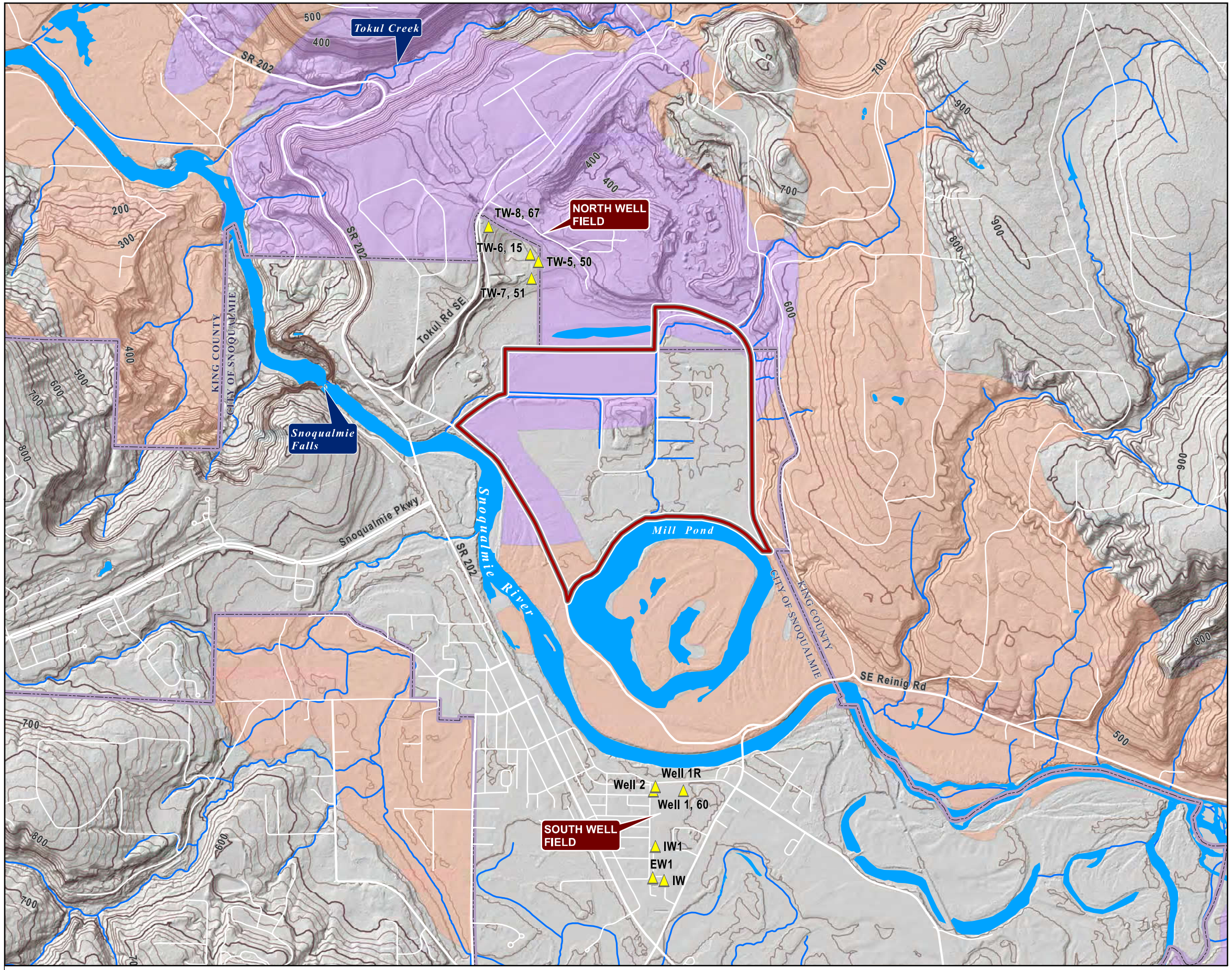

LEGEND:

- SITE
- WATER SUPPLY WELL, AESI LABEL FOR WELL REPORT

CRITICAL AQUIFER RECHARGE AREA CATEGORY

- 1 - HIGH SUSCEPTIBILITY
- 2 - MODERATE SUSCEPTIBILITY
- CITY BOUNDARY
- CONTOUR 100 FT
- CONTOUR 20 FT

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'.
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
CONTOURS FROM LIDAR
KING CO: PARCELS, STREETS, HYDRO 1/18, CARA 9/17

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



N

0 750 1500
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

CRITICAL AQUIFER RECHARGE AREAS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	20

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APPENDIX A

On-Site Exploration Logs

Coarse-Grained Soils - More than 50% [1] Retained on No. 200 Sieve	Gravels - More than 50% [1] of Coarse Fraction Retained on No. 4 Sieve	≦5% Fines [5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≧12% Fines [5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50% [1] or More of Coarse Fraction Passes No. 4 Sieve	≦5% Fines [5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≧12% Fines [5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50% [1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

	Density	SPT [2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50
	Consistency	**SPT [2] blows/foot**
Fine-Grained Soils	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

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

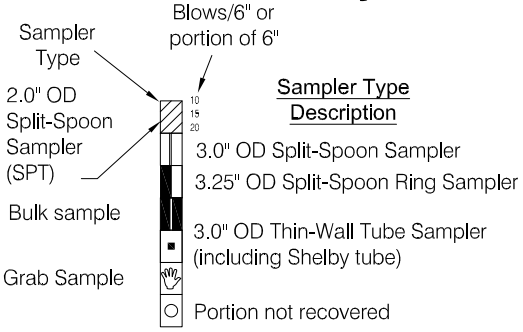
[3] Estimated Percentage

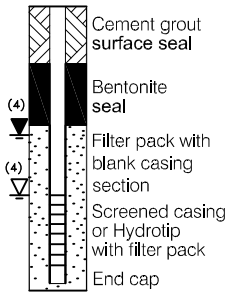
Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

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

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
▼ ATD = At time of drilling
▽ Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 12%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

blocks \ dwg \ log_key.dwg LAYOUT: Layout 4 -2014 Qty Chng

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
120126H012	EB-1	1 of 3

Project Name	Snoqualmie Mill Site	Ground Surface Elevation (ft)	
Location	Snoqualmie, WA	Datum	N/A
Driller/Equipment	GDI / D-50	Date Start/Finish	12/19/17,12/19/17
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	~8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Fill					
5		S-1		Very moist, grayish brown, silty, gravelly, fine to coarse SAND; woody debris (SM).			3 5 7	▲12	
				Alluvium					
				Silty drilling action at 8 feet.					
10		S-2		Wet, gray, sandy, SILT, trace organics; massive (ML).		▼	1 1 1	▲2	
		S-3		Wet, gray, SILT (ML).					
15				No recovery.			2 4 4	▲8	
		S-4		Wet, gray, silty, fine SAND; occasional organic rich layer (0.5 to 1 inch thick); finely stratified (SM).			2 2 3	▲5	
20				No recovery.					
		S-5		Wet, gray, sandy, SILT; stratified (ML).			2 2 2	▲4	
25		S-6		Wet, gray, SILT, trace sand, trace organics; massive (ML).			3 3 3	▲6	
30		S-7		Shelby tube, no recovery. Pushed SPT sampler into disturbed material from Shelby Tube. Wet, gray, clayey, SILT (ML).					
		S-8		Shelby tube, no recovery. SPT sample in disturbed material from Shelby tube. As above (ML).					
35									
		S-9		Wet, gray, clayey, SILT; massive (ML).			2 1 2	▲3	

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: LDM
Approved by: CJK

AESIBOR 120126H012.GPJ March 7, 2018

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
120126H012	EB-1	2 of 3

Project Name	Snoqualmie Mill Site	Ground Surface Elevation (ft)	
Location	Snoqualmie, WA	Datum	N/A
Driller/Equipment	GDI / D-50	Date Start/Finish	12/19/17,12/19/17
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	~8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-10		Wet, gray, clayey, SILT; massive (MH).			1 1 2	▲3	
45		S-11		Wet, gray, silty, CLAY; faintly stratified (CH).			1 2 1	▲3	
50		S-12		First 12 inches: Wet, gray, clayey, SILT to silty, CLAY (MH-CH). Last 6 inches: Wet, gray to brown, fine to medium SAND, trace silt (SP).			5 7 21	▲28	
55		S-13		Wet, gray, fine to medium silty, SAND; massive (SM).			5 7 10	▲17	
				Tokul Creek Delta Deposits					
60		S-14		Moist, light brown, fine SAND, trace silt; massive (SP).			4 11 13	▲24	
65		S-15		Very moist to wet, oxidized reddish brown grading to brown, fine to medium silty, SAND, faintly stratified (SM).			9 10 11	▲21	
70				No recovery.			11 15 18	▲33	
75		S-16		Wet, brown to reddish brown, silty, fine to medium SAND to fine SAND; massive (SM).			5 10 10	▲20	

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: LDM

Approved by: CJK

AESIBOR 120126H012.GPJ March 7, 2018

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
120126H012	EB-1	3 of 3

Project Name	Snoqualmie Mill Site	Ground Surface Elevation (ft)	
Location	Snoqualmie, WA	Datum	N/A
Driller/Equipment	GDI / D-50	Date Start/Finish	12/19/17,12/19/17
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	~8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-17		Wet, brown to reddish brown, fine to medium SAND, trace silt; massive (SP).			11 15 12	▲27	
85		S-18		Wet, brown to dark brown, silty, fine to medium SAND; massive (SM).			5 8 10	▲18	
90		S-19		Wet, brown grading down to gray, SILT (ML). Wet, dark brown, fine to medium SAND, some silt (SP-SM).			8 9 10	▲19	
95		S-20		Wet, brown, silty, fine SAND (SM). Wet, brown, fine to medium SAND, trace silt (SP).			8 16 17	▲33	
				Older Alluvium					
100		S-21		Wet, gray, fine to medium SAND, trace silt; massive (SP). Wet, gray, SILT, trace dropstones (≤0.25 inches in diameter); massive (ML).			11 10 14	▲24	
				Bottom of exploration boring at 101.5 feet					
105									
110									
115									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

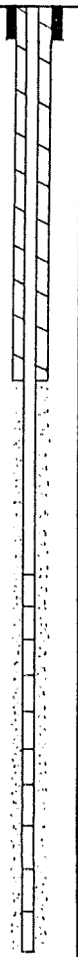
Logged by: LDM

Approved by: CJK

AESIBOR 120126H012.GPJ March 7, 2018

EXPLORATION BORING LOG

EB-3



SEDIMENT DESCRIPTION	DEPTH
Gray-brown silt with scattered organics. (Fill)	
Mottled tan silt, scattered organics.	5
As above with thin peat layers.	
	10
Gray, micaceous silt.	
	15
As above with abundant organics.	
As above with scattered organics.	
	20
As above with minor gravel.	
	25
BOH @ 26½'	
Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flushed monument ; sandpacked. Surface El.: 414.97'	30

SAMPLE | GROUND WATER | STANDARD PENERATION RESISTANCE Blows/Foot (10, 20, 30, 40)

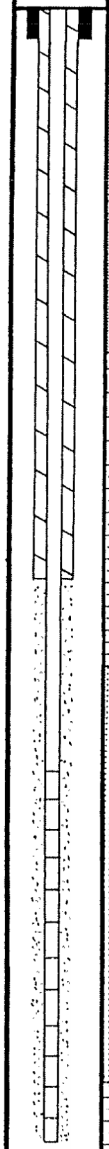
Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229A	10/92

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB-4



SEDIMENT DESCRIPTION	DEPTH
Gray, fine to medium, sandy gravel, abundant rock fragments, asphaltic roof tile. (Fill)	
Dark brown, gravelly silt with scattered organics. (Fill)	5
Gray-brown, fine, sandy silt.	10
Mottled gray silt with scattered organics.	
Mottled gray, micaceous, very fine, sandy silt, scattered organics.	15
Gray, silty, very fine sand, scattered organics.	
Gray, micaceous, fine sand, some silt, scattered organics, occasional rock fragments.	20
As above, no rock fragments.	
Gray, fine to medium sand, overlying gray clay, scattered organics.	25
Gray, very fine, sandy silt, scattered organics.	30
BOH @ 31½' Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flushed monument ; sandpacked. Surface El.: 418.45'	35

SAMPLE

GROUND WATER

STANDARD PENERATION RESISTANCE
Blows/Foot
10 20 30 40

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229A	10/92

ASSOCIATED EARTH SCIENCES, INC

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH120126A	MW-1	1 of 6

Project Name: Snoqualmie Mill Site
Elevation (Top of Well Casing):
Water Level Elevation: 40.0 bgs on 5/3/12
Drilling/Equipment: Aquatech / Air Rotary
Hammer Weight/Drop: 140# / 30"

Location: Snoqualmie, WA
Surface Elevation (ft): ~419
Date Start/Finish: 4/16/12,4/18/12
Hole Diameter (in): 6 inches

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		2'-foot stickup				**Fill**
		10-inch-diameter surface seal 0 to 18 feet; bentonite chips				**Overbank Deposits** Very moist, brown, silty fine SAND to sandy SILT, trace disseminated organics (wood fragments)
5						
10						Adding water.
						Adding water.
15						**River Channel Deposits** Driller reports possible saturated silty fine SAND.
						4 to 5 feet of water in boring after welding. Wet, grayish brown, micaceous silty fine SAND.
20						Wet, brown, micaceous fine SAND, few silt.
		6-inch I.D. steel casing from 2 feet above ground surface to 223.3 feet				
25						Wet, gray, fine to medium SAND, trace silt, trace organics (wood fragments).
						Wet, gray, fine to medium SAND, trace silt, trace organics.
30						Increased wood fragments.
35						Increased fine sand.
						Driller reports heave at 38 feet.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (5/3/12)
Water Level at time of drilling (ATD)

Logged by: SST
Approved by:

NWWELL- B 120126.GPJ BORING.GDT 6/4/12

Associated Earth Sciences, Inc.	Geologic & Monitoring Well Construction Log		
	Project Number	Well Number	Sheet
	KH120126A	MW-1	2 of 6

Project Name	Snoqualmie Mill Site	Location	Snoqualmie, WA
Elevation (Top of Well Casing)		Surface Elevation (ft)	~419
Water Level Elevation	40.0 bgs on 5/3/12	Date Start/Finish	4/16/12,4/18/12
Drilling/Equipment	Aquatech / Air Rotary	Hole Diameter (in)	6 inches
Hammer Weight/Drop	140# / 30"		

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		6-inch I.D. steel casing from 2 feet above ground surface to 223.3 feet				**Lacustrine Deposits** Soft, wet, gray, CLAY/SILT.
45						Soft, wet, gray, CLAY/SILT, scattered woody debris.
50						
55						Soft, wet, gray, CLAY/SILT, scattered woody debris.
60						No sample. CLAY/SILT washed through sieve.
						No sample. CLAY/SILT washed through sieve.
65						No sample. CLAY/SILT washed through sieve.
						Soft, wet, gray, CLAY/SILT.
70						
75						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (5/3/12)
- Water Level at time of drilling (ATD)

Logged by: SST

Approved by:

NWWELL-B 120126.GPJ BORING.GDT 6/4/12

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH120126A	MW-1	3 of 6

Project Name: Snoqualmie Mill Site
Elevation (Top of Well Casing):
Water Level Elevation: 40.0 bgs on 5/3/12
Drilling/Equipment: Aquatech / Air Rotary
Hammer Weight/Drop: 140# / 30"

Location: Snoqualmie, WA
Surface Elevation (ft): ~419
Date Start/Finish: 4/16/12,4/18/12
Hole Diameter (in): 6 inches

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		6-inch I.D. steel casing from 2 feet above ground surface to 223.3 feet				Soft, wet, gray, CLAY/SILT.
85						
90						
95						
100						Soft, wet, gray, CLAY/SILT.
105						
110						
115						

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (5/3/12)
Water Level at time of drilling (ATD)

Logged by: SST
Approved by:

NWWELL-B 120126.GPJ BORING.GDT 6/4/12

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH120126A	MW-1	4 of 6

Project Name: Snoqualmie Mill Site
Elevation (Top of Well Casing):
Water Level Elevation: 40.0 bgs on 5/3/12
Drilling/Equipment: Aquatech / Air Rotary
Hammer Weight/Drop: 140# / 30"

Location: Snoqualmie, WA
Surface Elevation (ft): ~419
Date Start/Finish: 4/16/12,4/18/12
Hole Diameter (in): 6 inches

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		6-inch I.D. steel casing from 2 feet above ground surface to 223.3 feet				Soft, wet, gray, CLAY/SILT.
125						
130						
135						Soft, wet, gray, CLAY/SILT.
140						
145						
150						
155						Soft, wet, gray, CLAY/SILT.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (5/3/12)
Water Level at time of drilling (ATD)

Logged by: SST
Approved by:

NWWELL-B 120126.GPJ BORING.GDT 6/4/12

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH120126A	MW-1	5 of 6

Project Name: Snoqualmie Mill Site
Elevation (Top of Well Casing):
Water Level Elevation: 40.0 bgs on 5/3/12
Drilling/Equipment: Aquatech / Air Rotary
Hammer Weight/Drop: 140# / 30"

Location: Snoqualmie, WA
Surface Elevation (ft): ~419
Date Start/Finish: 4/16/12,4/18/12
Hole Diameter (in): 6 inches

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		6-inch I.D. steel casing from 2 feet above ground surface to 223.3 feet				Soft, wet, gray, CLAY/SILT.
165						
170						Soft, wet, gray, CLAY/SILT.
175						
180						Soft, wet, gray, CLAY/SILT.
185						Wet, gray, CLAY.
190						Wet, gray, CLAY.
195						Wet, gray, CLAY, trace sand, trace wood fragments.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (5/3/12)
Water Level at time of drilling (ATD)

Logged by: SST
Approved by:

NWWELL-B 120126.GPJ BORING.GDT 6/4/12

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH120126A	MW-1	6 of 6

Project Name: Snoqualmie Mill Site
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft): ~419
Water Level Elevation: 40.0 bgs on 5/3/12
Date Start/Finish: 4/16/12,4/18/12
Drilling/Equipment: Aquatech / Air Rotary
Hole Diameter (in): 6 inches
Hammer Weight/Drop: 140# / 30"

Depth (ft)	WELL CONSTRUCTION	DESCRIPTION
205	6-inch I.D. steel casing from 2 feet above ground surface to 223.3 feet	**Older Snoqualmie River Overbank Deposits** Wet, gray to trace brown, fine SAND, and silt/clay, trace wood chips, (silt/clay overstated due to clay coating of drill tooling). At 206 feet, color changes from gray to brown in discharge water.
210		**Older Snoqualmie River Channel Deposits** Wet, brown to grayish brown, fine SAND and gravel, with clay, trace wood chips. Wet, grayish brown, GRAVEL, and fine sand, little clay (gray clasts inferred to be from drill tooling). Wet, brown, fine to medium SAND, and gravel, little silt/clay, trace wood chips. (Driller not adding water.)
215		Wet, brown, fine to coarse GRAVEL, trace wood chips, water. Gray in brown matrix, fine to coarse GRAVEL with fine to coarse sand, few silt, decreased wood chips.
220	5-inch O.D. K-packer 220.2 to 221 feet	Wet, brown, fine to coarse SAND, with fine to coarse gravel, trace silt (estimated); clast colors: gray, white, orange, brown, and green). Continuous heave as drilling is taking place.
225	5-inch O.D. stainless steel well screen: 0.010-inch slot width 221 to 231.1 feet	Wet, brown, fine to coarse SAND, and fine to coarse gravel. Approximately 6 inches of gray discharge (clay/silt layer?). Decreased flow.
230	6-inch borehole backfilled with native slough 231.3 to 232 feet.	Wet, brown, fine to coarse GRAVEL, with fine to coarse sand, trace silt (estimated). At 230 feet, cuttings include occasional brown, fine to medium sandy SILT clasts. Wet, brown, fine to coarse SAND, and fine to coarse gravel, few silt.
235		Boring terminated at 232 feet. Well completed at 231.3 feet on 4/18/12.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (5/3/12)
Water Level at time of drilling (ATD)

Logged by: SST
Approved by:

NWWELL- B 120126.GPJ BORING.GDT 6/4/12

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH120126A	MW-2	1 of 1

Project Name: Snoqualmie Mill Site
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 8/13/12,8/13/12
Drilling/Equipment: Geologic Drill / HSA
Hole Diameter (in): 8 inches
Hammer Weight/Drop: 140# / 30"

Depth (ft)	Water Level	WELL CONSTRUCTION (Above ground monument)	ST	Blows/6"	Graphic Symbol	DESCRIPTION
		8-inch-diameter concrete surface seal 0 to 18 inches				**Fill**
		1.5 to 12 feet; medium bentonite chips		10 10 5		Moist, brown, fine SAND, trace silt, trace fine to coarse gravel, trace organics.
5	▽					**Overbank Deposits**
				2 1 1		Wet, gray, SILT, trace clay; 3 inch woody debris / peat interval, scattered organics (grass, etc) (ML).
		2-inch I.D. Schedule 40 PVC from 2 feet above ground surface to 12.8 feet		0 0 0		Wet, gray, SILT, trace clay, scattered organics (grasses, sticks) (ML).
10				0 0 1		Very moist to wet, brownish gray, SILT, few brown sand stringers, trace organics (ML).
	▼	Sand Pack (10/20 Monterey silica sand) 12 to 17.8 feet		1 1 2		Upper 6 inches: Wet, brown to gray mottled, SILT, few fine to very fine sand (ML). Lower 12 inches: Very moist to wet, gray, very fine sandy SILT, grading to silty fine sand (ML/SM).
15		2-inch I.D. Schedule 40 PVC screen, 0.020-inch slot width, 12.8 to 17.8 feet		2 4 5		**River Channel Deposits** Upper 4 inches: Wet, gray, fine SAND, with interbeds of brown SILT with organics (grasses / seeds) (SW/ML). Next 8 inches: very moist, brown, SILT, trace organics (seeds, reeds) (ML). Lower 8 inches: Gray, wet, fine SAND (SW).
		Native heave from 17.8 to 21.5 feet.		5 5 8		Wet, gray, fine SAND (SW).
20				5 5 7		Slightly interbedded with brown, silty fine SAND, in lower 3 inches (SM at 21.2).
						Boring terminated at 21.5 feet. Well completed at 17.8 feet on 8/13/12.
		WDOE Tag #DHJ-139				
25						
30						
35						

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (8/15/12)
Water Level at time of drilling (ATD)

Logged by: SST
Approved by:

NWWELL- B 120126.GPJ BORING.GDT 8/23/12

LOG OF EXPLORATION PIT NO. EP-1000

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
1	**Fill** Loose, very moist, variable brown and gray, silty fine to medium SAND, with gravel. Encountered 12-inch galvanized culvert and 6-inch wood stave water pipe.
2	
3	**Vashon Lodgement Till** Medium dense to dense, moist, blue gray, silty fine to medium SAND, little gravel.
4	
5	
6	
7	Bottom of exploration pit at depth 7 feet No apparent seepage; water flowing in from galvanized culvert. Slight sloughing from 0 to 3 feet.
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by: SST

Approved by:

Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1001

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Gravel / crushed rock over 2-inch asphalt slab.
	Medium dense, wet, gray and blue gray, 3/4-inch minus CRUSHED ROCK.
2	
3	**Overbank Deposits**
4	Soft to medium stiff and loose to medium dense, moist, gray, fine sandy SILT / silty fine SAND, and gray, very fine sand.
5	4-inch diameter root
6	
7	
8	
9	Wood debris (appears in-place)
10	
11	**Lacustrine Deposits ?**
12	Loose, very moist, gray, silty CLAY, and very fine sandy SILT, trace scattered organic debris.
13	Bottom of exploration pit at depth 12 feet No seepage. Minor sloughing from 0 to 3 feet.
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Logged by: SST
Approved by:

Associated Earth Sciences, Inc.



Project No. KV120126A
5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1002

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Medium dense, very moist, brown, fine to coarse SAND, with fine to coarse gravel, trace cobbles, trace silt.
2	1-inch black organic layer (original topsoil?) at 1.5 feet.
	River Channel Deposits
3	Medium dense, moist to very moist, gray, fine to medium SAND, trace mica flakes.
4	
5	
6	
7	Horizon of organics (peat, sticks, organic debris) at 6.5 feet.
	Overbank Deposits
8	Soft, moist greenish gray, SILT / CLAY, abundant scattered organics.
9	
10	Bottom of exploration pit at depth 9 feet Slight seepage at 1.5 feet and at 3 feet. No sloughing.
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by: SST

Approved by:

Project No. KV120126A

5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1003

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Moist, brown, fine to coarse GRAVEL, with fine to coarse sand, few cobbles, abundant woody debris.
2	
3	
4	Woody debris, few fine to coarse GRAVEL, and fine to coarse SAND. Digs dense.
5	
6	
7	
8	
9	
10	**Lacustrine Deposits ?**
11	Soft, wet, gray with greenish gray mottling, SILT / CLAY, trace fine sand, trace rootlets.
12	
13	Bottom of exploration pit at depth 12 feet Seepage at 3.5 feet and at 5 feet. No sloughing.
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by: SST

Approved by:

Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1004

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Quarry spalls (to 6-inch diameter) with wood debris, logs, fine to coarse SAND, and fine to coarse GRAVEL, variable silt. Digs very dense.
2	
3	
4	
5	
6	
7	
8	
9	2-inch original topsoil horizon at 10 feet.
10	**Overbank Deposits**
11	Medium stiff, wet, gray to greenish gray, SILT, trace fine sand, trace organics.
12	
13	Bottom of exploration pit at depth 12 feet Seepage at 3 feet. Water flowing into excavation at 8.5 feet. Slight sloughing from 0 to 3 feet.
14	
15	
16	
17	
18	
19	
20	

KCTP3 120126.GPJ July 12, 2012

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.



Logged by: SST

Approved by:

Project No. KV120126A

5/7/12

LOG OF EXPLORATION PIT NO. EP-1005

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Fill
1	Moist, gray, fine to coarse GRAVEL, with fine to coarse sand, few silt. Digs dense.
2	Moist, brown, WOODY DEBRIS, few fine to coarse gravel, and fine to coarse sand - primarily wood waste.
3	Tough digging.
4	
5	
6	
7	
8	
9	
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14	
15	
16	Bottom of exploration pit at depth 15 feet Seepage at 12.5 feet. No sloughing.
17	
18	
19	
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KCTP3 120126.GPJ July 12, 2012

Snoqualmie Mill Site
Snoqualmie, WA

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Associated Earth Sciences, Inc.



Project No. KV120126A

5/8/12

LOG OF EXPLORATION PIT NO. EP-1006

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Moist to wet, brown to gray, fine to coarse GRAVEL, and fine to coarse SAND, with cobbles, asphalt refuse, roots.
2	
3	
4	1-inch topsoil horizon at 4 feet.
	Overbank Deposits
5	Medium stiff, black grading to light brown grading to gray with orange mottling, fine sandy SILT.
6	
7	
8	
9	Bottom of exploration pit at depth 8 feet Seepage from 2 to 4 feet. No sloughing.
10	
11	
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Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

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5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1007

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Medium dense, brown, fine to coarse SAND, with fine to coarse GRAVEL, little silt (Fill).
2	Filter fabric at 1.5 feet.
	River Channel Deposits
3	Dark gray stained, fine to coarse SAND, and fine to coarse GRAVEL, with silt.
4	6-inch wood staved water pipe at 4 feet.
5	
6	**Overbank Deposits**
7	Log and other woody debris at 6 feet.
8	Soft, moist, light greenish gray, SILT / CLAY, occasional brown sand stringer, trace organics.
9	
10	Bottom of exploration pit at depth 9 feet No seepage. Minor sloughing from 0 to 4 feet.
11	
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Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

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KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1008

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

DESCRIPTION

Fill

Loose, wet, black, organic-rich silty fine to medium SAND, few gravel.

River Channel Deposits

Loose, very moist to wet, brown, silty fine SAND, trace gravel.

Loose, wet, brown, fine to coarse SAND, trace fine to coarse gravel.

Bottom of exploration pit at depth 6 feet

6-inch concrete drain line encountered at 4 feet which flooded excavation. Seepage at 3 feet. No sloughing.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Project No. KV120126A

5/7/12

LOG OF EXPLORATION PIT NO. EP-1009

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Loose, wet, brown, fine to coarse GRAVEL, and fine to coarse SAND, trace to few sand (pit run fill).
2	
3	
4	
5	
6	
7	
	Bottom of exploration pit at depth 7 feet Seepage at 32 inches. Ruptured water line at 4 feet which flooded excavation. Severe sloughing from 0 to 7 feet.
8	
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10	
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Snoqualmie Mill Site
Snoqualmie, WA

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Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1010

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Fill
1	Loose, wet, brown, fine to coarse SAND, and fine to coarse GRAVEL; contains asphalt and woody debris.
2	2-inch black soot/ash horizon.
3	**Overbank Deposits**
4	Soft to loose, brown to gray, fine sandy SILT / silty fine SAND, occasional thin stringer of wet, brown, fine sand.
5	
6	
7	
8	Bottom of exploration pit at depth 8 feet Water flowing into excavation from 2 to 3 feet. Sever sloughing from 0 to 4 feet.
9	
10	
11	
12	
13	
14	
15	
16	
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19	
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KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1011

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Fill
1	Moist, brown, fine to coarse SAND, and fine to coarse GRAVEL.
2	
	River Channel Deposits
3	Medium dense, moist, brown, fine to medium SAND, trace silt (weathered).
4	Becomes gray.
5	
6	
7	Becomes wet at 7 feet.
8	Bottom of exploration pit at depth 7.5 feet No seepage. Slight sloughing at 6 feet.
9	
10	
11	
12	
13	
14	
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16	
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18	
19	
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Snoqualmie, WA

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Project No. KV120126A

5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1013

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Quarry spalls (to 10 inches diameter), crushed rock. Digs dense.
2	
3	
4	Becomes brown, moist, WOOD DEBRIS / LOG DEBRIS, with gravel and sand. Digs dense.
5	
6	
7	
8	
9	**Lacustrine Deposits ?**
10	Soft, wet, gray with brown mottling, fine sandy SILT.
11	Soft, wet, greenish gray with brown mottling, fine sandy SILT, trace clay.
12	
13	Includes trace fine sand.
14	
15	
16	
17	**Overbank Deposits**
18	Medium dense, wet, gray with some brown mottling, fine SAND, trace to few silt, trace mica.
19	Bottom of exploration pit at depth 18 feet Seepage at 3 feet and at 10 feet. Slight to moderate sloughing from 0 to 9 feet.
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

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Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1014

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Quarry spalls (to 6-inch diameter), with fine to coarse gravel, and fine to coarse sand, few silt. Digs dense.
2	
3	Filter fabric at 3 feet
	Medium dense, wet, brown, fine to coarse GRAVEL, and fine to coarse SAND, with woody debris.
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	**Lacustrine Deposits ?**
	Soft, gray with greenish brown mottling, SILT / CLAY
17	
18	Bottom of exploration pit at depth 17 feet Water flowing into excavation at 3 feet on top of filter fabric. Moderate sloughing from 0 to 3 feet.
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

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Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1015

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
	Fill
1	Wet, brown, COBBLES, little fine to coarse sand, and fine gravel.
	Lacustrine Deposits ?
2	Soft, wet, gray, CLAY / SILT.
3	
4	
5	
6	
7	
	Bottom of exploration pit at depth 7 feet Minor seepage at 1.5 feet. No sloughing.
8	
9	
10	
11	
12	
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14	
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Snoqualmie, WA

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5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1016

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Moist, gray, fine to coarse GRAVEL, and fine to coarse SAND, little cobbles, occasional boulder. Digs dense.
2	
3	
4	Moist, grayish brown, silty fine SAND.
5	Abandoned 2-inch steel pipe encountered at 5 feet.
6	
7	
8	
9	
	Lacustrine Deposits ?
10	Soft, wet, gray with greenish brown mottling, SILT / CLAY.
11	
12	
13	
14	Thin stringer of brown fine SAND.
15	
16	Bottom of exploration pit at depth 15 feet Seepage at 5 feet and at 9.5 feet. Slight sloughing at 9.5 feet.
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

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Project No. KV120126A

5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1017

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Fill** Wet, brown, fine to coarse GRAVEL, and fine to coarse SAND, few silt, trace cobbles, occasional boulder.
2	
3	
4	**Overbank Deposits** Soft, very moist, gray, CLAY / SILT, occasional brown fine sand stringer, trace organics
5	
6	
7	Bottom of exploration pit at depth 6 feet Water piping at 4 feet through clean gravel fill. No sloughing.
8	
9	
10	
11	
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14	
15	
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Snoqualmie, WA

Associated Earth Sciences, Inc.

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KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1018

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Fill** Construction debris (concrete debris, rebar, metal debris, etc.), with fine to coarse SAND, and fine to coarse gravel.
2	
3	
4	**Overbank Deposits** Soft, moist to very moist, brown, SILT / CLAY, trace very fine sand, trace organics.
5	
6	**Lacustrine Deposits ?** Soft very moist, gray, CLAY.
7	
8	Bottom of exploration pit at depth 8 feet No seepage. No sloughing.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

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5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1019

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Soft, very moist, black, ash.
2	
3	Loose, very moist, brown, fine to coarse GRAVEL, and fine to coarse SAND, few silt.
4	**Overbank Deposits**
5	Soft to medium stiff, moist, gray with brown mottling, sandy SILT, trace organics.
6	
7	
8	**Lacustrine Deposits ?**
9	Soft, very moist, fine sandy SILT / CLAY.
10	
11	
12	Becomes mottled brown.
13	
14	
15	**Overbank Deposits** Loose to medium dense, wet, silty fine SAND / fine sandy SILT, trace organics (rushes).
16	**River Channel Deposits**
17	Wet, gray, fine to medium SAND.
18	
19	Bottom of exploration pit at depth 19 feet
20	Seepage from 3 to 4 feet, and from 8.5 to 9 feet. Slight to moderate sloughing from 5 to 19 feet.

Snoqualmie Mill Site
Snoqualmie, WA

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5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1020

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
1	**Fill** Medium dense, moist, brown, fine to coarse SAND, with fine to coarse gravel, few silt; debris includes 6-foot steel rail, geotextile fabric at 2 feet.
2	Wood debris. 1-foot thick wedge of gray, wet, fine to coarse GRAVEL, and fine to coarse SAND, little silt.
3	
4	**Overbank Deposits** Soft, wet, brown, SILT, trace organics.
5	
6	
7	
8	
9	Medium dense, wet, brown, fine to coarse SAND, with silt, trace organics.
10	
11	
12	**River Channel Deposits**
13	Medium dense, wet, gray, fine to coarse SAND, with fine to coarse gravel, trace silt.
14	
15	
16	
17	
18	
19	Bottom of exploration pit at depth 18 feet Seepage at 9 feet. Hit abandoned fire line at 4 feet, water poured into excavation. Slight sloughing from 9 to 18 feet.
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.



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Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1021

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION
	Fill
1	Very moist, gray, fine to medium SAND, and fine to coarse GRAVEL, few silt.
2	Dark brown to black, organic layer.
3	
	Overbank Deposits
4	Soft, very moist to wet, greenish gray, SILT / CLAY, slight brown mottling, trace organics, occasional thin fine sand stringer.
5	
6	
7	
8	Bottom of exploration pit at depth 7 feet Slight seepage at 1.5 feet. No sloughing.
9	
10	
11	
12	
13	
14	
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16	
17	
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Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

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5/8/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1022

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Medium dense, moist, gray, fine to coarse GRAVEL, with fine to coarse sand, trace silt.
2	WOODY DEBRIS, with fine to coarse gravel, and fine to coarse sand, few silt; woody debris includes dimensional lumber. Digs dense.
3	
4	
5	
6	
7	
8	
9	
10	**Lacustrine Deposits ?**
11	Soft, light gray with slight greenish gray mottling, SILT / CLAY.
12	Bottom of exploration pit at depth 11 feet Water flowing into excavation at 6 feet. Slight sloughing from 0 to 3 feet.
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

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KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1023

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
	Fill
1	Moist, gray, QUARRY SPALLS (to 6-inch diameter), with fine to medium sand, and fine to coarse gravel, trace to few silt, occasional woody debris.
2	
3	Wet, brown, WOOD DEBRIS, LOGS, with fine to coarse gravel, and fine to coarse gravel.
4	
5	
6	
7	
8	
9	
10	**Overbank Deposits**
11	Soft to medium stiff, wet, tan to gray with reddish mottling, SILT, few fine sand, trace organics.
12	
13	
14	
15	
16	
17	**Lacustrine Deposits ?**
18	Soft, wet, gray with brown mottling, SILT / CLAY, few fine sand.
19	Bottom of exploration pit at depth 18 feet Seepage at 5 feet. Water pouring into excavation at 6.5 feet. Slight sloughing from 0 to 18 feet.
20	

KCTP3 120126.GPJ July 12, 2012

Snoqualmie Mill Site
Snoqualmie, WA

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Project No. KV120126A

5/7/12

LOG OF EXPLORATION PIT NO. EP-1024

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION
1	**Fill** Wood chips
2	Loose to medium dense, very moist, gray, fine to coarse SAND, and fine to coarse GRAVEL, few to little silt.
3	
4	**Overbank Deposits**
5	Loose, wet, brown, SILT / CLAY, with wood debris.
6	
7	
8	
9	
10	**Peat** **Overbank Deposits**
11	Loose to medium stiff, gray with brown mottling, SILT / CLAY, abundant rootlets, leave, mica flakes.
12	
13	
14	**River Channel Deposits** Medium dense, wet, very fine SAND, stratified, trace rootlets, leaves, mica flakes.
15	
16	
17	Bottom of exploration pit at depth 16 feet Abundant seepage from 1 to 1.5 feet. No sloughing.
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

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Project No. KV120126A

5/7/12

KCTP3 120126.GPJ July 12, 2012

LOG OF EXPLORATION PIT NO. EP-1025

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Grass / Weeds over Fill

3 inch layer of black ash at base of fill.

Overbank Deposits

Loose to medium dense, moist, gray with slight black mottling, fine SAND, few silt, slightly stratified, trace plant material (rushes).

Lacustrine Sediments ?

Soft, very moist, gray, SILT / CLAY, trace fine sand, trace rushes and grasses.

Bottom of exploration pit at depth 10.5 feet
Water seeping from approximately 5 to 5.5 feet. Moderate sloughing from 2 to 5 feet.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Snoqualmie, WA

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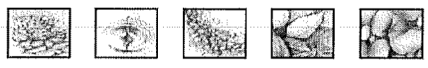

Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1026

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Fill

Primarily wood chips.

4 inch layer of black ash at base of fill.

Lacustrine Sediments ?

Soft, very moist, gray with brown mottling, SILT, few clay.

Bottom of exploration pit at depth 6 feet
Slight sloughing from 0 to 2.5 feet.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Snoqualmie Mill Site
Snoqualmie, WA

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Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1027

Depth (ft)

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

DESCRIPTION

Fill

Includes wood chips, cobbles, boulders.

8 inch layer of black ash at base of fill.

Overbank Deposits

Loose to medium stiff, moist to very moist, gravelly SILT, trace fine sand, trace clay, abundant disseminated organics.

Lacustrine Sediments ?

Medium stiff, moist, gray with brown mottling, SILT, few to little clay.

Bottom of exploration pit at depth 7 feet
Seepage from 2.5 to 3 feet. no sloughing.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by:

Approved by:

Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1028

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Fill** Brown to gray, SAND, gravel cobbles, boulders.
2	
3	
4	**Overbank Deposits**
5	Medium stiff, moist, gray with brown mottling SILT, trace very fine sand, trace clay, scattered plant material, rhizospheres (red ox occuring - hydric).
6	At west end of pit at 4.5 feet: Medium stiff, very moist, light brown with reddish brown mottling, SILT, little very fine sand (redox).
7	
8	Bottom of exploration pit at depth 7 feet No seepage. No sloughing.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by:

Approved by:

Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1029

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
1	**Fill**
2	
3	
4	**River Channel Deposits** Medium dense, moist to very moist, gray, fine to medium SAND, trace scattered organics.
5	
6	**Overbank Deposits** Loose to medium dense, very moist, gray, SILT, scattered grasses, rushes, pockets of peat.
7	
8	Bottom of exploration pit at depth 7 feet Seepage at 5 feet. Slight sloughing from 4 to 5.5 feet.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by:

Approved by:



Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1030

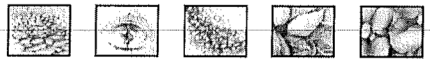
Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Fill** Brown / black / gray, SAND, and gravel.
2	
3	**River Channel Deposits** Medium dense, moist, gray, very fine SAND, few to little silt.
4	
5	Few clasts of dense, brownish gray, silty fine to medium SAND, trace fine to coarse gravel, unsorted (diamict) at 5 feet. Tree roots at 5.5 feet.
6	**Overbank Deposits** Medium stiff, moist, gray with brown mottling, SILT, trace to few fine SAND, trace scattered organics, trace clay; twin horizons of peat.
7	
8	Bottom of exploration pit at depth 7.5 feet No seepage. No sloughing.
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by:

Approved by:



Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1031

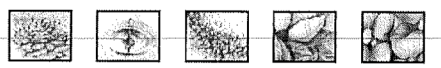
Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered. **DESCRIPTION**
1	**Fill** Includes gravel, cobbles, boulders, debris.
2	
3	
4	**Overbank Deposits**
5	Soft, very moist, gray / brown, SILT, trace to few very fine sand, trace scattered organics (rushes, grasses); (not hydric soil).
6	Loose, very moist grading to wet, light brown, very fine SAND, few silt, trace mica, and organics.
7	
8	
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. Sloughing from 4 feet to 10 feet.
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by:

Approved by:



Project No. KV120126A

7/24/12

KCTP3 120126.GPJ July 28, 2012

LOG OF EXPLORATION PIT NO. EP-1032

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION**
1	**Fill** Includes, sand, gravel, ash deposits, cobbles.
2	
3	
4	**Overbank Deposits**
5	Soft to medium stiff, moist to very moist, brownish gray, SILT, few very fine sand, trace scattered organics.
6	Medium stiff, very moist to wet, gray with brown mottling, SILT, little clay, trace very fine sand.
7	
8	Stratified with lenses of gray, fine to medium SAND at 8 feet.
9	
10	
11	Bottom of exploration pit at depth 10 feet No seepage. No sloughing.
12	
13	
14	
15	
16	
17	
18	
19	
20	

Snoqualmie Mill Site
Snoqualmie, WA

Associated Earth Sciences, Inc.

Logged by:

Approved by:

Project No. KV120126A

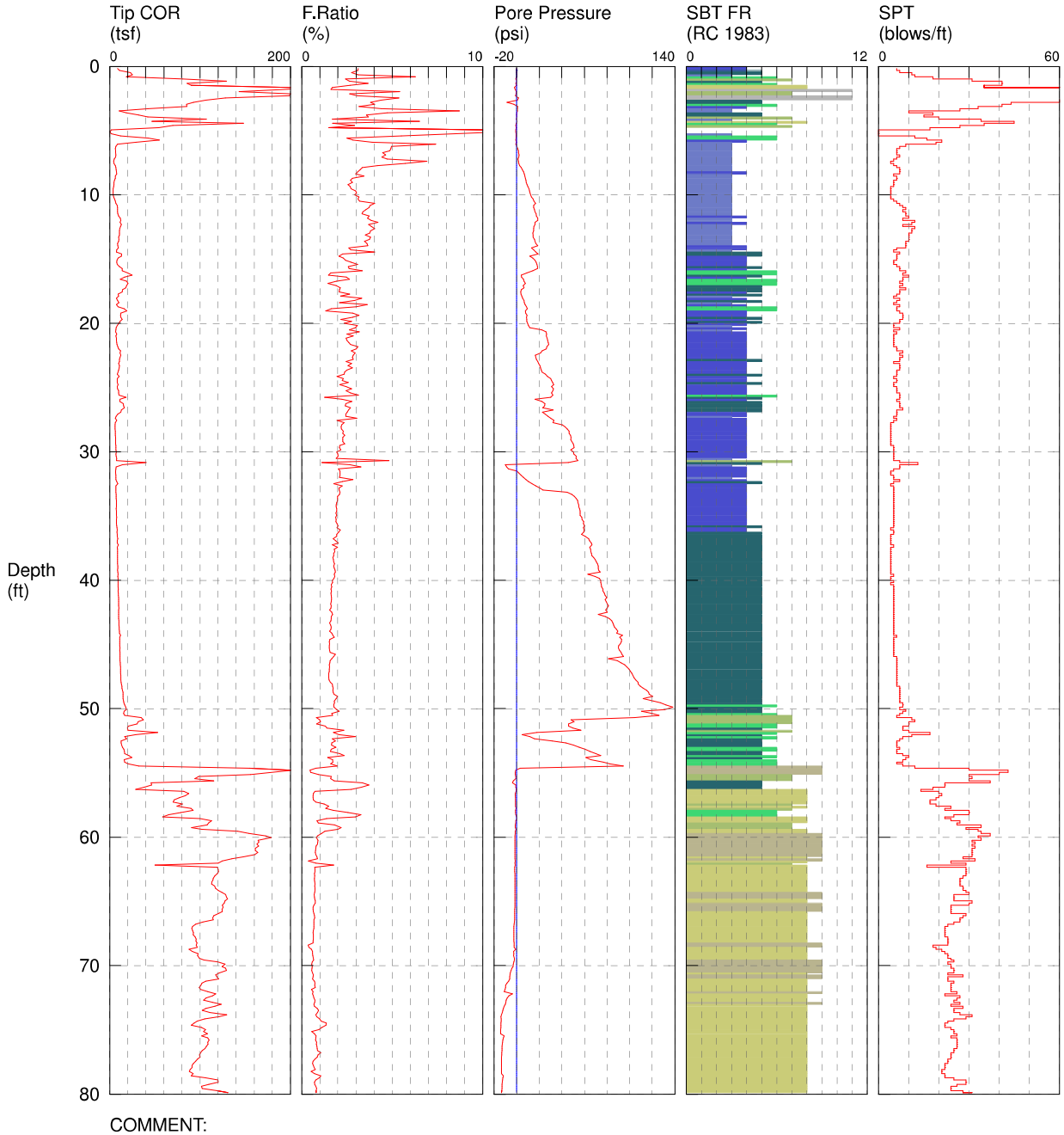
7/24/12

KCTP3 120126.GPJ July 28, 2012

CPT-01

CPT CONTRACTOR: InSitu Engineering
CUSTOMER: AES
LOCATION: Snoqualmie
JOB NUMBER: 120126H012

OPERATOR: Romanelli
CONE ID: DDG1263
TEST DATE: 12/7/2017 9:08:30 AM
PREDRILL: N/A
BACKFILL: 20% Bentonite Grout
SURFACE PATCH: Granular Bentonite Chip

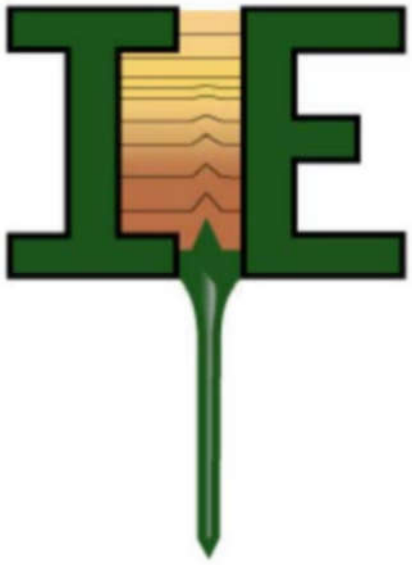


COMMENT:

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

HOLE NUMBER: CPT-01



OPERATOR: Romanelli

CUSTOMER: AES

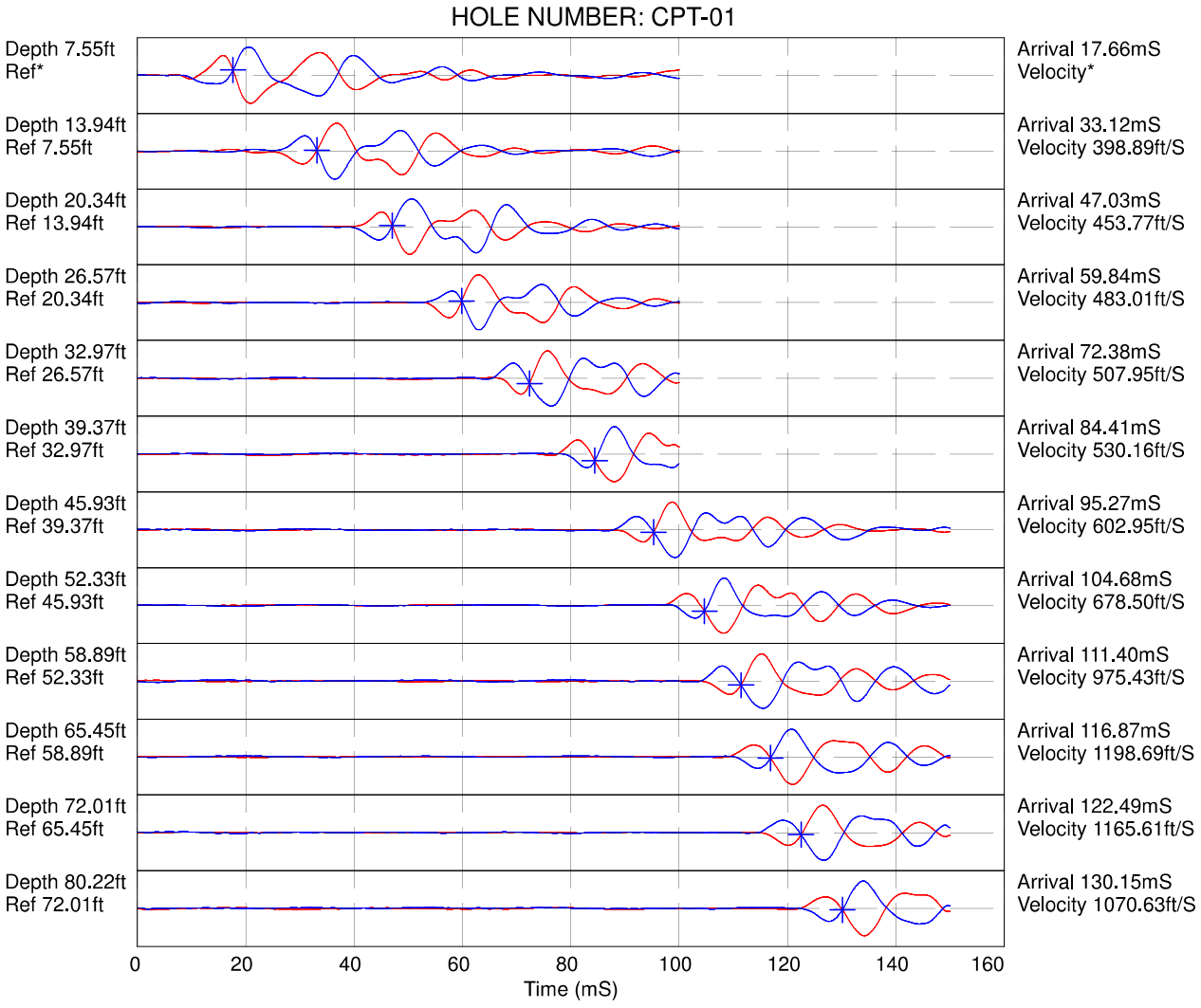
LOCATION: Snoqualmie

JOB NUMBER: 120126H012

CPT CONTRACTOR: InSitu Engineering

CONE ID: DDG1263

TEST DATE: 12/7/2017 9:08:30 AM

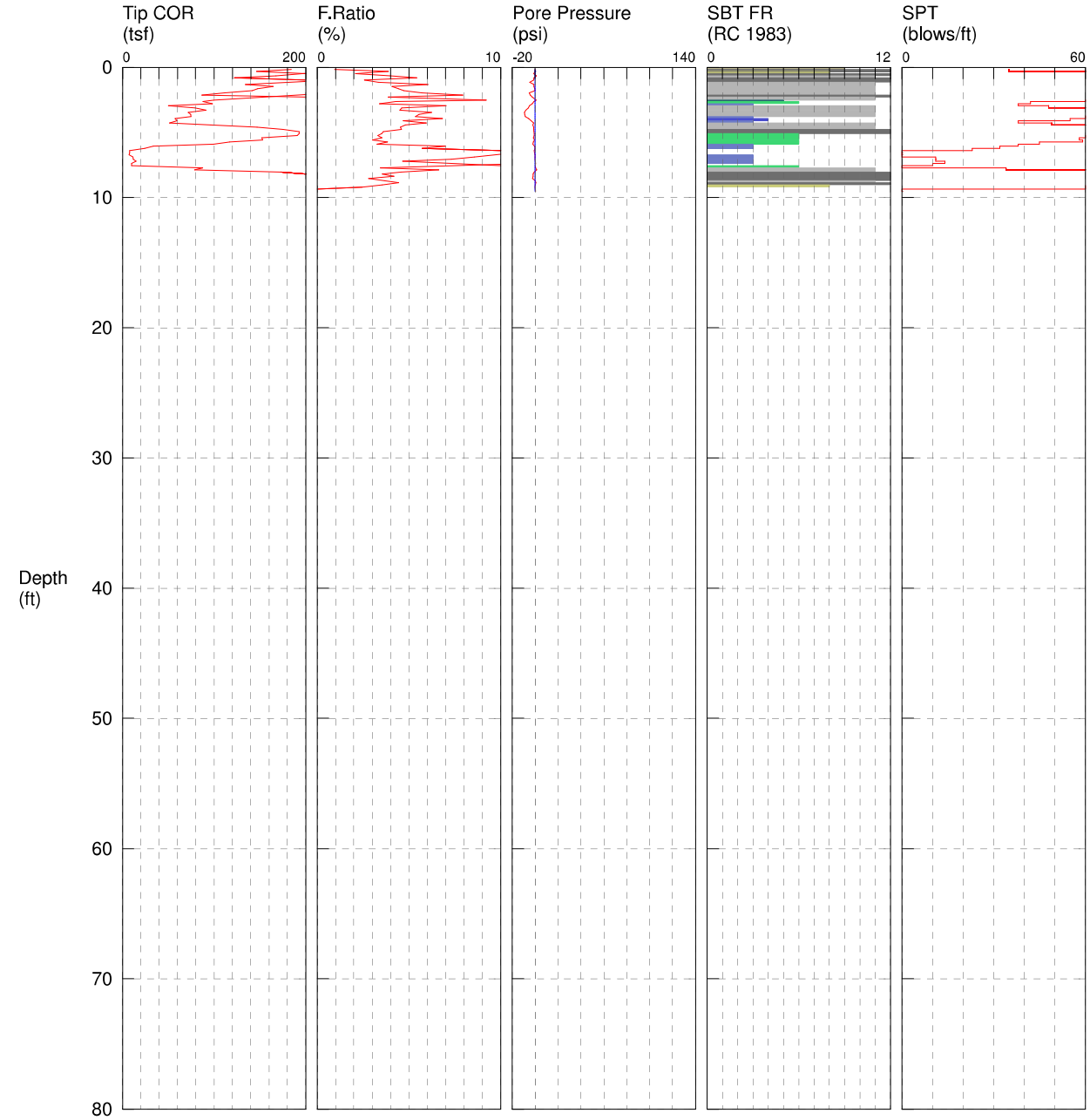


Hammer to Rod String Distance (ft): 2.82
* = Not Determined

CPT-02

CPT CONTRACTOR: InSitu Engineering
CUSTOMER: AES
LOCATION: Snoqualmie
JOB NUMBER: 120126H012

OPERATOR: Romanelli
CONE ID: DDG1263
TEST DATE: 12/7/2017 10:30:47 AM
PREDRILL: N/A
BACKFILL: 20% Bentonite Grout
SURFACE PATCH: Granular Bentonite Chip



COMMENT:

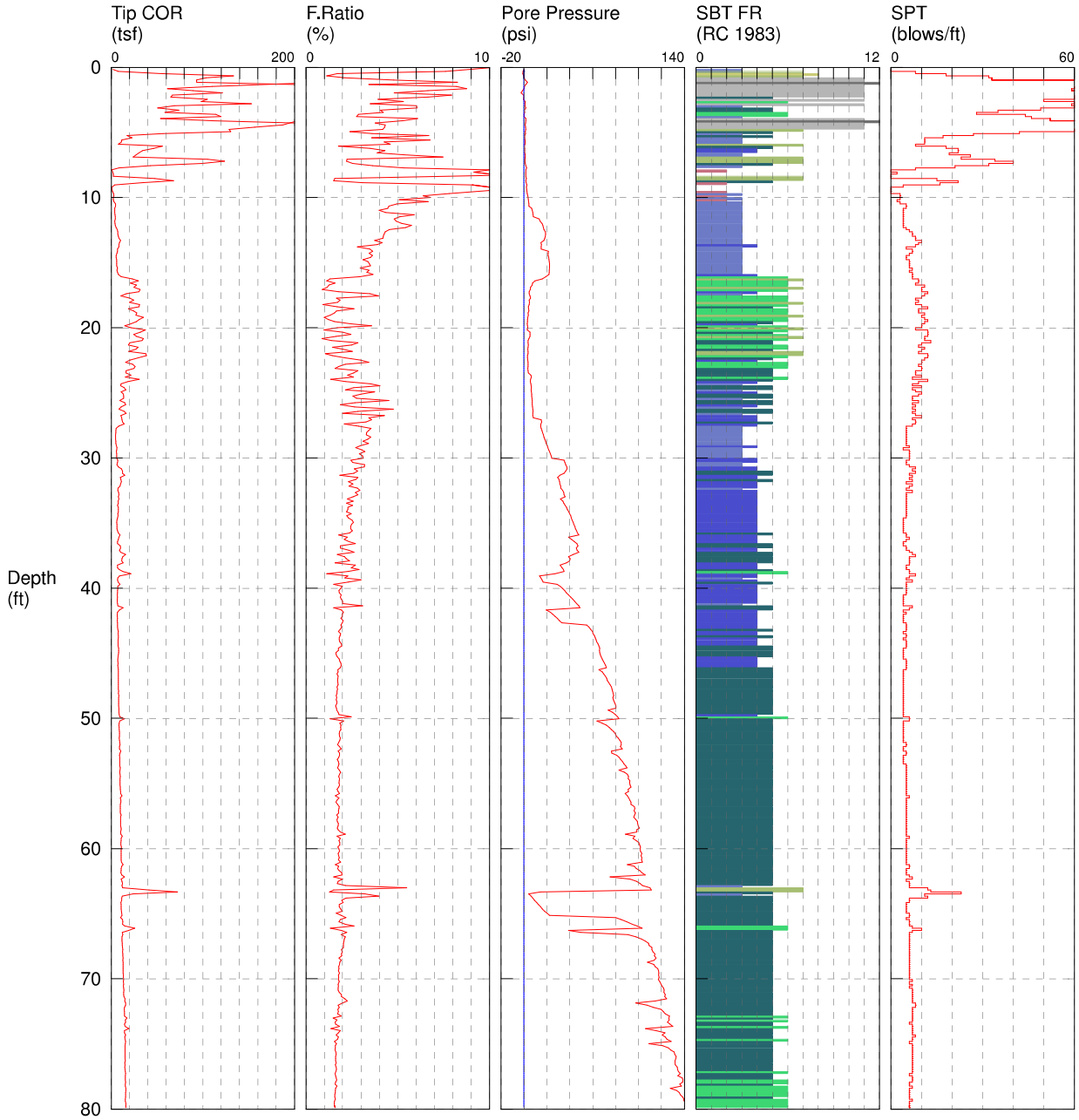
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

CPT-02a

CPT CONTRACTOR: InSitu Engineering
CUSTOMER: AES
LOCATION: Snoqualmie
JOB NUMBER: 120126H012

OPERATOR: Romanelli
CONE ID: DDG1263
TEST DATE: 12/7/2017 10:49:48 AM
PREDRILL: N/A
BACKFILL: 20% Bentonite Grout
SURFACE PATCH: Granular Bentonite Chip

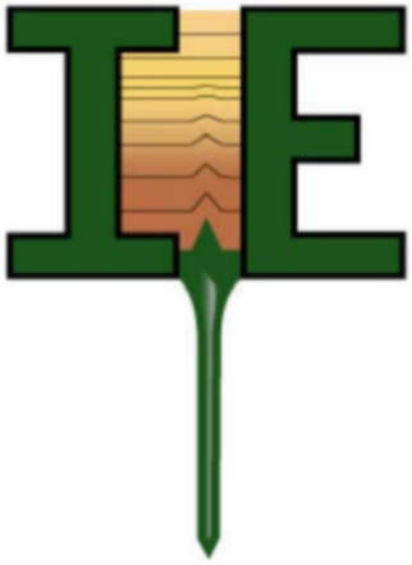


COMMENT:

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

HOLE NUMBER: CPT-02a



OPERATOR: Romanelli

CUSTOMER: AES

LOCATION: Snoqualmie

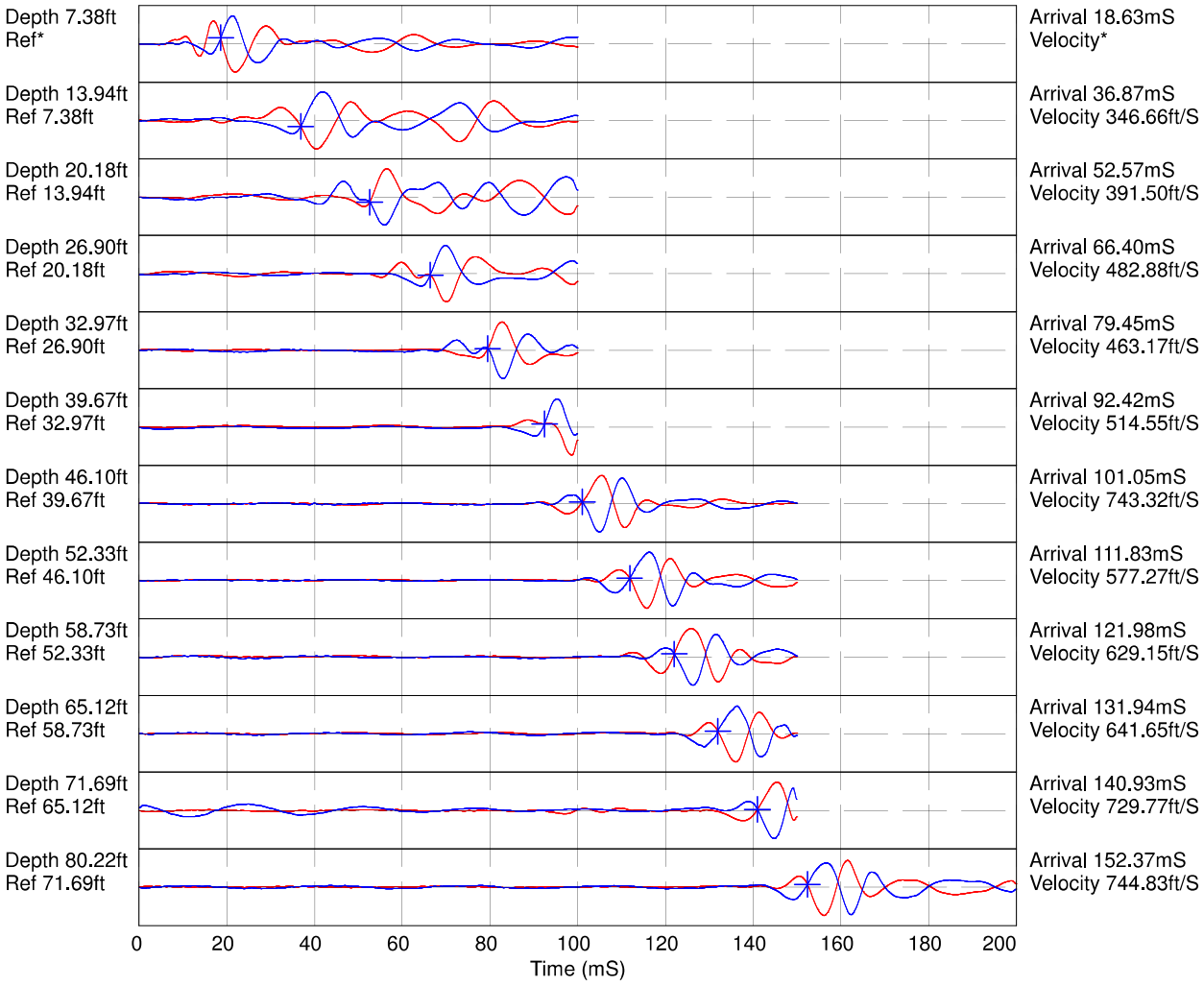
JOB NUMBER: 120126H012

CPT CONTRACTOR: InSitu Engineering

CONE ID: DDG1263

TEST DATE: 12/7/2017 10:49:48 AM

HOLE NUMBER: CPT-02a



Hammer to Rod String Distance (ft): 2.82
* = Not Determined

APPENDIX B

Off-Site Boring & Well Logs

LEGEND

- COBBLES
- GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- BEDROCK

DRILLING METHOD: Cyclone TH-60 with air-operated, down-hole, DDH-15 hammer.

SAMPLING METHOD: continuous sampling of cuttings; 3.75" I.D. split spoon sampler 18" in length, at 20' intervals beginning 18' below surface elevation; samples transferred to Weyerhaeuser storage.

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10	tan-gray, sandy GRAVEL with moderate cobbles (Qvdg)	
	20		
	30		
	40	tan-gray, medium SAND with occasional gravel (Qvds)	
	50		

NOTES: Tokul Creek Delta boring (TK-1) is located about 2000 feet north and 1700 feet east of the SE corner of S. 19, T. 24 N., R. 8 E.

PROJECT NO. 837-1
BORING NO. TK-1
ELEVATION 541
PAGE 1 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
13717 PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES
- GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- BEDROCK

DRILLING METHOD : same

SAMPLING METHOD : same

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	tan-gray, medium SAND with occasional gravel (Qvds)	
	70		
	80		
	90	tan-gray, sandy GRAVEL with occasional cobbles (Qvdg)	
	100		

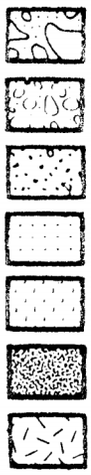
NOTES:

PROJECT NO. 837-1
BORING NO. TK-1
ELEVATION same
PAGE 2 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
137½ PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND



COBBLES

GRAVEL

POORLY SORTED SAND

WELL SORTED SAND

DIAMICTON

SILT - CLAY

BEDROCK

DRILLING METHOD :

same

SAMPLING METHOD :

same

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	tan-gray, sandy GRAVEL with occasional cobbles (Qvdg)	
	120	tan-gray, fine to medium SAND with occasional gravel (Qvds)	
	130		
	140	tan-gray, sandy GRAVEL with minor to moderate cobbles (Qvdg)	
	150		

NOTES:

PROJECT NO. 837-1
BORING NO. TK-1
ELEVATION same
PAGE 3 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
13717 PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES
- GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- BEDROCK

DRILLING METHOD : same

SAMPLING METHOD : same

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	tan-gray, sandy GRAVEL with minor to moderate cobbles (Qvdg)	
	170		
	180		
	190		
	200		

NOTES:

PROJECT NO. 837-1
BORING NO. TK-1
ELEVATION same
PAGE 4 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
137½ PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

EXPLORATION BORING LOG

EB #1

GRAPH	USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE BLOWS/FOOT 10 20 30 40
		Wet, brown, sandy, gravelly silt.	0	ele.421'	
		Moist, brown, silty sand. Some organics to 12'.	5	416'	
			10	411'	
			15	406'	
			20	401'	
			25	396'	
			30	391'	
			35	386'	
			40	381'	

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec 1988

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #1 Cont.

GRAPH	USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER
		Moist, brown, silty sand.	40	ele.381'
		Moist, brown, fine sandy silt.		
		BOH at 44'	45	376'
			50	
			55	
			60	
			65	
			70	
			75	
			80	

STANDARD PENETRATION RESISTANCE
BLOWS/FOOT
10 20 30 40

▲

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec 1988

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #2



USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE (BLOWS/FOOT) 10 20 30 40
	Moist, brown, silty, sandy gravel, with cobbles. Rough drilling. (RR grade fill)	0 ele.443'		▲
		5 438'		70 ▲
		10 433'		▲
	Damp, brown mottled grey, sandy gravel, with some silt. Very rough drilling. Qvr	15 428'		65 ▲
		20 423'		50/6 ▲
	BOH at 24'	25 418'		
	Note: Stopped due to lack of penetration by auger.			

PRELIMINARY

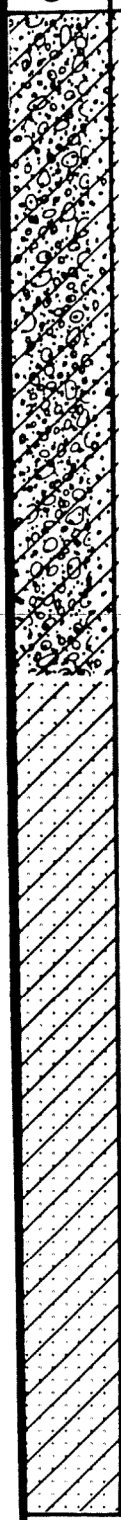
Snoqualmie WWTP

8811-18G | Dec. 1988 | B.T.S.

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #3



USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER
	Moist, dark brown, silty gravelly sand. Some organics. (RR grade fill)	0	ele.443'
		5	438'
		10	433'
		15	428'
	Moist, brown, silty, well sorted medium sand. Qvr	20	423'
		25	418'
		30	413'
		35	408'
		40	403'

STANDARD PENETRATION RESISTANCE
BLOWS/FOOT
10 20 30 40

PRELIMINARY

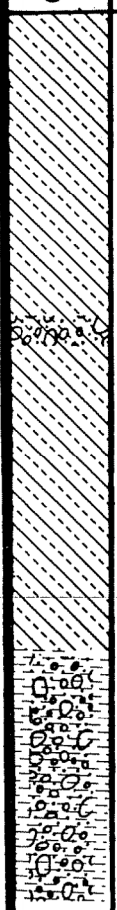
Snoqualmie WWTP

8811-18G | Dec 1988

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #3 Cont.



USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE BLOWS/FOOT 10 20 30 40
	Moist, brown, silty, well sorted medium sand.	40	ele.403'		▲
		45	398'		
	2" gravel layer with water. Moist to wet, grey-brown, silty sand.	50	393'	▽	▲
	Moist, grey-brown, silty, very fine sand, with scattered gravel and cobbles. Rough drilling. Qvr	55	388'		▲
	Very wet, grey-brown, silty, clayey gravel, with cobbles. Qva	60	383'		▲
	BOH at 63½'	65	378'		50/4
	Note: Stopped due to lack of penetration by auger.	70	373'		
		75			
		80			

PRELIMINARY

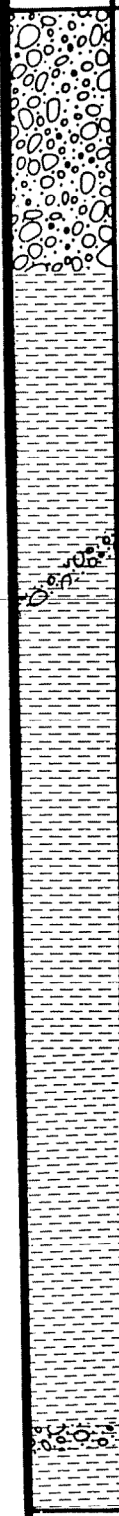
Snoqualmie WWTP

8811-18G | Dec 1988

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #4



USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE BLOWS/FOOT (10 20 30 40)
	Moist, brown, silty, gravelly sand (RR grade fill).	0	ele.437'	
		5	432'	▲
	Some water.			
	Wet, grey mottled brown, silt.	10	427'	▲
	Moist, grey, clayey, silty sand, with some gravel.	15	422'	59 ▲
	Damp, grey, clayey silt.	20	417'	▲
	-Moist-	25	412'	▲
		30	407'	▲
	-Wet-	35	402'	▲
	2" gravel layer with water. Moist, grey, clayey silt.	40	397'	▲

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec. 1988 | B. A.

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #4 Cont.

GRAPH	USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE BLOWS/FOOT 10 20 30 40
		Moist, grey, clayey silt.	40	ele.397'	
			45	392'	
			50	387'	
			55	382'	
		BOH at 59'	60	377'	67
			65		
			70		
			75		
			80		

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec. 1988 | W. L.

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #5



USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER
	Forest duff and cobbles. Very rough drilling.	0	ele.437'
	Moist, grey mottled brown, silt, with trace scattered gravel.	5	432'
	Moist, grey, clayey silt. Smooth drilling. Qva	10	427'
		15	422'
	-Wet-		
	-Moist-	20	417'
		25	412'
		30	407'
	-Wet-		
	-Moist-	35	402'
		40	397'

STANDARD PENETRATION RESISTANCE
BLOWS/FOOT
10 20 30 40

PRELIMINARY

8811-18G | Dec 1988

Snoqualmie WWTP

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #5 Cont.

GRAPH	USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE (BLOWS/FOOT) 10 20 30 40
		Moist, grey, clayey silt. Smooth drilling. Qvg	40	ele.397'	
			45	392'	
		-Wet-	50	387'	
			55	382'	
		BOH at 59'	60	377'	
		Note: No groundwater or bedrock.	65		
			70		
			75		
			80		

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec. 1988

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #6

GRAPH	USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE BLOWS/FOOT 10 20 30 40
		Forest duff with cobbles.	0	ele.439		
		Wet, grey/brown, silty, gravelly sand, with some cobbles.	5	434'		
			10	429'		58
		Wet, grey, clayey silt. Smooth drilling.	15	424'		
		Damp, grey, fine sandy, silt. Qvg	20	419'		
		Moist to wet, grey, silt, with trace scattered gravel. Qvg	25	414'		
			30	409'		53
			35	404'		61
			40	399'		55

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec. 1988 | B. A

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB #6 Cont.

GRAPH	USCS	SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE BLOWS/FOOT 10 20 30 40
		Moist, grey, silt. Very hard drilling.	40	ele. 399		
			45	394'		64
		Very dark grey to black bedrock.				50/2
		BOH at 50'	50	389'		
		Note: Stopped due to lack of penetration by auger.	55	384'		
			60			
			65			
			70			
			75			
			80			

PRELIMINARY

Snoqualmie WWTP

8811-18G | Dec. 1988

ASSOCIATED EARTH SCIENCES, INC

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10	Silty, sandy, wood derbis. (Fill) Poor sample recovery.	
	20	Brown, dry, slightly silty, fine to coarse sand with gravels and wood fragmwents.	
	30	Brown, dry, cobbly, sandy gravels. Becoming moist at 28'	
	40		
	50	Brown, moist, gravelly, fine to medium sand. Fining downward with less gravels with depth. Cobbles and boulders between 49-52'	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A1
ELEVATION 660
PAGE 1 **OF** 2

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, moist, fine to medium sand 52-54'	
		Granite boulders at 54'	
	60	Dry, brown, silty, gravelly, fine to coarse sand with cobbles.	
		Grey bedrock. (Refusal)	
		TD 57'	
	70		
	80		
	90		
	100		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A1
ELEVATION 660
PAGE 2 **OF** 2

DRILLING LOG

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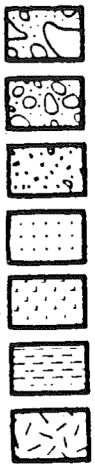
LEGEND



SANDY GRAVEL WITH COBBLES

SANDY GRAVEL

POORLY SORTED SAND

WELL SORTED SAND

DIAMICTON

SILT - CLAY

PEAT

BEDROCK

SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, dry, gravelly cobbles.	
	10	Brown, moist, gravelly, fine to coarse sand with cobbles.	
	20	Brown, dry, gravelly cobbles.	
	30	Brown, dry, sandy, cobbly gravels.	
	40	Brown, moist, gravelly, fine to coarse sand. Coarsening downward with cobbles below 45 feet.	
	50		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A2
ELEVATION 590
PAGE 1 OF 2

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Brown, moist, fine to medium sand with scattered gravels between 49-51'	
		Brown, moist, gravelly, fine to coarse sand. Becoming medium to coarse sand with gravels. Containing occasional very dense, fine sand lenses.	
	70	Brown, moist, silty, gravelly, fine to coarse sand. containing cobbles and clay between 56-58 feet.	
		Grey bedrock.	
	80	TD 65' (Refusal)	
	90		
	100		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A2
ELEVATION 590
PAGE 2 OF 2

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10	Brown, dry, sandy, gravelly, cobbles.	
	20	Cobbly, boulders at 12' Cobbly, boulders at 16'	
	30	Cobbly, boulders at 26-28'	
	40	Brown, moist, sandy gravel with cobbles. Containing very dense fine sand lenses at 28-30'. Slightly silty 34-36'	
	50	Containing some clay at 46-47' Coarsening downward into slightly sandy gravels at 48-50 feet.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A3
ELEVATION 580
PAGE 1 OF 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Grading into brown, moist, slightly silty, sandy gravel with cobbles at 50'	
	70	Grading into medium to coarse sand at 64-66 feet.	
	80	Brown, moist, slightly silty, sandy gravel with cobbles. Increase in cobble content with depth.	
	90	Brown, moist, sandy gravel.	
	100	Brown, dry, sandy gravel with cobbles. Increase in cobble content with depth.	
		Brown, moist, gravelly, fine to coarse sand.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A3
ELEVATION 580
PAGE 2 OF 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	Fining downward to fine sand at 114 feet.	
	120	Brown, moist, gravelly, fine to coarse sand.	
		Grey, dry, silty, angular gravel and sand. (Crushed Bedrock)	
	130	TD 118½' (Refusal)	
	140		
	150		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A3
ELEVATION 580
PAGE 3 OF 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10	Brown, dry 1-2" size gravels.	
	20	Brown and grey, sandy, gravelly, cobbles. Granodiorite boulder at 6'	
	30		
	40	Brown, moist to dry, cobbly, sandy gravel. Containing some clay at 33-35 feet.	
	50		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A4
ELEVATION 580
PAGE 1 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	As above	
	70		
	80	Gravelly, medium to coarse sand layers at 76-78' and 80-82 feet.	
	90	Brown, dry, gravelly, slightly silty, fine to coarse sand with cobbles.	
	100	Brown, moist, gravelly, medium to coarse sand with scattered cobbles.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A4
ELEVATION 580
PAGE 2 **OF** 4

DRILLING LOG

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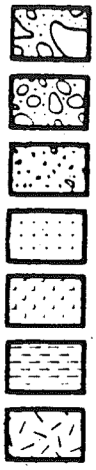
LEGEND



SANDY GRAVEL WITH COBBLES
SANDY GRAVEL
POORLY SORTED SAND
WELL SORTED SAND
DIAMICTON
SILT - CLAY
BEDROCK
PEAT
SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL					
DATE					
TIME					

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above	
	110		
		Brown, dry, sandy gravel.	
	120		
	130	Grey, dry, cobbly, gravelly, fine to coarse sand.	
		Brown, moist, gravelly, fine to coarse sand with cobbles.	
	140		
		Brown, moist, sandy gravel.	
		Cobbly boulder zone 147-150'	
	150		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A4
ELEVATION 580
PAGE 3 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above	
	160	Brown, dry, sandy, well sorted $\frac{1}{2}$" size gravels. Becoming sandier with depth.	
	170	Brown, moist, sandy gravels with cobbles, gravels up to 2" in size. Grading into gravelly, coarse sand at 170 feet.	
	180	Cobbles and boulders.	
		TD 175' (Refusal)	
	190		
	200		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A4
ELEVATION 580
PAGE 4 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10	Brown, dry, silty, sandy, cobbly, gravels with wood pieces. (Fill)	
		Brown to grey, sandy gravelly cobbles.	
	20	Cobbly boulder zone 11-17'	
	30		
	40	Cobbly boulder zone 34-46½'. Containing some clay.	
	50	Brown, moist, sandy gravel.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A51
ELEVATION 590
PAGE 1 **OF** 2

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Grading into gravelly, fine to coarse sand at 50 feet. Gravel layer at 58-59 feet.	
	70	Fine to coarse sandy layer with gravels at 64 feet. Boulder at 67½ feet.	
	80	Grading into fine to medium sand with occasional gravels and cobbles.	
	90		
		Saturated, grey, sandy clay with gravels.	▼ WD 89' 8/13/90
		Saturated, brown, sandy, clayey cobbles and boulders.	
	100	TD 98' (Refusal)	

NOTES: WD= While drilling. Water added to hole to prevent clay from binding up sample hose.

PROJECT NO. E93013A
BORING NO. EB-A51
ELEVATION 590
PAGE 2 **OF** 2

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, oxidized, dry, silty, gravelly, fine to coarse sand with wood pieces and minor organics. (Fill)	
	10	Grey, dry, sandy, gravelly, cobbles with boulders. Boulder zone 5-7 feet. Containing fine to coarse sand layer at 9-10 feet.	
	20	Pushing boulders with drill bit 20-29 feet. Poor recovery on samples.	
	30		
	40	Gravelly, fine to coarse sand layer at 34-36 feet. Coarsening downward into cobbles at 38-39 feet.	
		Brown, moist, gravelly, medium to coarse sand.	
		Cobble zone at 47 feet.	
	50		

NOTES: Drilled 30 Ft. North of EB-A51

PROJECT NO. E93013A
BORING NO. EB-A52
ELEVATION 590
PAGE 1 **OF** 2

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above	
	60	Grey, dry, gravelly cobbles.	
		Boulder at 66 feet.	
	70	TD 67' (Refusal)	
	80		
	90		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A52
ELEVATION 590
PAGE 2 **OF** 2

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, moist, silty, fine to medium sand with gravels.	
		Brown, dry, gravelly, silty fine to coarse sand. Containing cobbles at 6 feet.	
	10	Grading into grey, dry, sandy gravels with cobbles. Cobbly zone at 8-11 feet.	
	20	Brown, moist, gravelly fine to coarse sand with cobbles.	
		Gravelly coarse sand layer at 26'	
	30	Cobble zone at 33-35 feet.	
	40	Cobble zone at 38-40 feet.	
		Brown, moist, gravelly, coarse sand with scattered cobbles.	
		Cobble zone at 46-48 feet.	
	50		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A6
ELEVATION 560
PAGE 1 **OF** 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Sandy, well sorted $\frac{1}{2}$ to 1" gravels at 50-52 feet.	
		Brown, dry, gravelly cobbles.	
	70	Brown, moist, gravelly, medium to coarse sand. Coarsening downward to gravelly coarse sand.	
	80	Brown, moist, sandy, well sorted gravels ($\frac{1}{2}$-1") with cobbles. grading into sandy, cobbly, poorly sorted gravel at 82 feet.	
	90	Brown, moist, gravelly, coarse sand.	
	100	Grey, dry, gravelly cobbles.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A6
ELEVATION 560
PAGE 2 **OF** 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	As above with clayey, sandy, cobbly gravel layer at 99-101 feet.	
	120	Cobble zone 119-120 feet.	
		Brown, moist, gravelly, medium to coarse sand.	
	130	Brown, moist, sandy gravel with scattered cobbles	
	140	Cobble zone at 130-133 feet.	
	150		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A6
ELEVATION 560
PAGE 3 OF 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	Cobbly, medium to coarse sand 150-153 feet Sandy gravel layer at 156-158 feet.	
	170	Becoming sandy, cobbly gravels at 166 feet.	
	180	Brown, dry, sandy gravel.	
		Brown, dry, gravelly cobbles.	
	190	Brown, moist, cobbly, gravelly, fine to coarse sand.	
	200	Fining downward into fine to coarse sand at 192-195'	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A6
ELEVATION 560
PAGE 4 **OF** 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	210	As above. Cobble zone at 200-201 feet. Cobble zone at 205-206 feet. Containing less cobbles below 208 feet.	
	220	Gravelly, medium to coarse sand layer with cobbles at 218-220 feet.	
	230	Brown, dry, sandy, gravelly, cobbles and boulders.	
	240	TD 229' (Refusal)	
	250		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A6
ELEVATION 560
PAGE 5 **OF** 5

DRILLING LOG

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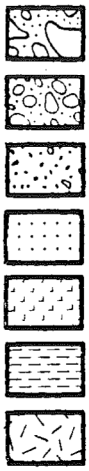
LEGEND



- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- GRAVELLY SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD :

HOLLOW-STEM AUGER

SAMPLING METHOD :

2.5 Inch I.D. Split Spoon diven by a 300 lb. hammer falling 30 inches.

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	5	Slightly silty to silty, medium to coarse sandy GRAVEL --Qvdg	
	10		
	15		
	20	Gravelly, poorly sorted SAND --Qvdg	
	25	Poorly sorted sandy GRAVEL --Qvdg	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A7
ELEVATION 590'
PAGE 1 **OF** 4

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


GRAVELLY SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD :

SAMPLING METHOD :

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	30	Poorly sorted sandy GRAVEL--Qvdg	
	35		
	40	Gravelly, poorly sorted SAND --Qvdg	
	45		
	50		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A7
ELEVATION 590'
PAGE 2 **OF** 4

DRILLING LOG

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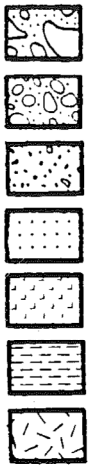
LEGEND



SANDY GRAVEL WITH COBBLES

SANDY GRAVEL

GRAVELLY SAND

WELL SORTED SAND

DIAMICTON

SILT - CLAY

PEAT

BEDROCK

SILTY

DRILLING METHOD :

SAMPLING METHOD :

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	55	Gravelly, poorly sorted SAND--Qvdg	
	60	Fine to medium, sandy GRAVEL--Qvdg	
	65	Gravelly. fine to medium SAND--Qvdg	
	70	Poorly sorted SAND with scattered gravel--Qvds	
	75		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A7
ELEVATION 590'
PAGE 3 **OF** 4

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


GRAVELLY SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD :

SAMPLING METHOD :

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	80	Poorly sorted SAND with scattered gravel--Qvds	
	85	Gravelly, well sorted, medium SAND--Qvds	
	90	Well sorted, fine to medium SAND--Qvds	
		Gravelly, well sorted, medium SAND--Qvds	
	95	Sandy, gravelly SILT--Qpvu	
TD	100		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-A7
ELEVATION 590'
PAGE 4 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10	Brown, dry, cobbly, gravelly, silty fine to coarse sand. (Fill)	
	20	Brown, dry, gravelly, cobbles with boulders. Boulder zone at 12-16 feet.	
	30	Brown, dry becoming moist with depth, sandy, gravel with cobbles.	
	40	Increase in cobble content below 31 feet.	
	50	Cobbly boulder zone between 36-38 feet	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B1
ELEVATION 580
PAGE 1 OF 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Pushing boulders with drill bit Poor sample recovery between 50-60 feet. Becoming less cobbly 59-60 feet.	
	70	Cobble zone 66-70'	
	80		
	90	Brown, moist, gravelly, fine to coarse sand.	
	100	Gravelly, medium to coarse sand layer between 94-98'	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B1
ELEVATION 580
PAGE 2 OF 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above.	
	110	Grading into brown, moist, gravelly, medium to coarse sand.	
	120		
	130	Brown, moist, sandy gravel.	
	140	Brown, moist, slightly silty, fine to coarse sand.	
	150	Brown, moist, sandy, gravel, grading to slightly sandy, well sorted 1" gravels.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B1
ELEVATION 555
PAGE 3 OF 5

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	Brown, moist, gravelly, fine to coarse sand. Sandy gravel layer 153-160 feet.	
	170		
	180	Grading into brown, moist, gravelly, medium to coarse sand. Becoming cobbly, gravelly, fine to coarse sand with depth.	
	190	Containing some clay 181-184 feet.	
	200	Grading into brown, moist, gravelly, medium to coarse sand. Cobble zone at 199-200 feet.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B1
ELEVATION 555
PAGE 4 **OF** 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above.	
	210	Brown, moist, cobbly boulders with some clay.	
		Brown, moist, fine to coarse sand.	
	220	Cobbly boulder zone at 216-219 feet.	
		Grading into brown, moist, fine to medium sand with scattered gravels.	
	230		
		Grading into brown, moist, gravelly, fine to coarse sand. Cobbles and boulders at 234-236 feet.	
	240	Brown, moist, sandy gravel with cobbles.	
		TD 241'	
	250		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B1
ELEVATION 555
PAGE 5 **OF** 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, dry, silty, fine to coarse sand with gravels. (Fill)	
	10	Brown, dry, sandy, gravelly, cobbles.	
	20	Boulder zone at 12 feet. Pushing boulders with drill bit. Poor sample recovery between 12-50 feet.	
	30		
	40		
	50		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B2
ELEVATION 535
PAGE 1 OF 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above.	
		Brown, moist, gravelly, fine to coarse sand.	
	60	Brown, moist, sandy gravel with cobbles.	
	70		
	80	Cobbly boulders 75-82 feet. Poor sample recovery 75-79 feet Pushing boulder with drill bit.	
	90	Brown, moist, gravelly, fine to coarse sand. Cobble content increasing below 93 feet.	
	100	Gravelly cobble zone 93-97 feet.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B2
ELEVATION 535
PAGE 2 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse Air

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above.	
	110	Grading into brown, silty, gravelly, fine to coarse sand with cobbles.	
	120	Highly oxidized 113-114 feet.	
	130	Containing less silt below 128 feet.	
	140	Sandy, gravelly, cobble zone 134-137 feet.	
	150	Sandy, gravelly, cobble zone at 144-147 feet.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B2
ELEVATION 535
PAGE 3 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse Air

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	As above. Brown, moist, fine to coarse sand with minor gravels. Increase gravel content below 160 feet.	
	170	Cobble zone at 172-174 feet.	
	180	Grading into sandy gravels with cobbles. Coarsening downward with depth. Boulders at 183 feet.	
	190	TD 183' (Refusal)	
	200		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B2
ELEVATION 535
PAGE 4 **OF** 4

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	Initiated 3/29/91 DESCRIPTION	WATER TABLE(S)
		Brown, dry, sandy, gravelly cobbles.	
	10	Brown, dry, cobbles with gravels.	
	20	Boulders and cobbles 18'-23'.	
	30	Brown, dry, sandy gravel.	
	40	Grading interbeds of brown, moist, gravelly, fine to coarse sand and sandy gravel with occasional cobbles.	
	50		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B3
ELEVATION 555
PAGE 1 **OF** 5

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	As above. Cobble zone 57'-58'.	
	70	Highly oxidized, gravelly cobbles 63'-64'.	
	80		
	90	Gravelly cobble zone 80'-83'.	
	100	Cobble zone 97'-101'.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B3
ELEVATION 555
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DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	Grading interbeds of brown, moist, gravelly, fine to coarse sand and sandy gravel with occasional cobbles. Gravelly cobble zone 110'-112'. Cobble zone 114'-116'. Cobble zone 119'-122'.	
	140	Becoming brown, moist to wet, fine to medium sand 134'-144'.	
	150	Grading interbeds of brown, moist, gravelly, fine to coarse sand and sandy gravel with cobbles. Cobble zone 148'-150'.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B3
ELEVATION 555
PAGE 3 OF 5

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	As above.	
	170	Sandy, gravelly cobble zone 167'-171'.	
	180		
	190	Cobble zones 190'-191' 194'-195' 197'-198'.	
	200		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B3
ELEVATION 555
PAGE 4 OF 5

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	210	As above. Containing minor silt clast and silt/clay on gravels.	
	220	Becoming moist to wet 218'-220'.	
	230	Gravelly, cobble zone 227'-229'. Boulder 229'-232'	
	240	Brown, moist, cemented (?), sandy, cobbly gravels. (Hard drilling) Cobble zone 237'-238'.	
	250	TD @ 244' 4/4/91 Refusal	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B3
ELEVATION 555
PAGE 5 **OF** 5

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	Initiated 4/8/91 DESCRIPTION	WATER TABLE(S)
	10	Brown, wet, sandy gravelly cobbles.	
	20	Becoming dry with some silt content below 10'.	
	30		
	40	Brown, wet, gravelly, fine to coarse sand with scattered cobbles. Cobble zone at 38-40'	
		Brown, moist, sandy, well sorted sand with scattered cobbles.	
	50	Brown, moist, gravelly, fine to coarse sand with cobbles. Containing less cobbles below 48'.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 1 **OF** 6

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above. Well sorted ½"-1" gravels at 50'-56½'.	
	60	Grading interbeds of brown, moist, sandy gravel and gravelly, fine to coarse sand.	
		Well sorted 1" gravels 60'-63'.	
	70		
	80		
	90		
	100		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 2 OF 6

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	As above.	
	120		
	130	Interbedded zones of brown, cemented, dry, silty, fine to coarse sand (hard drilling) and brown, moist, fine to coarse sand with varying gravel content.	
	140		
	150		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 3 OF 6

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	As above.	Water added 152'-180'
	170	Becoming brown-grey 156'-177'. Losing fines content between 152'-180' due to adding water.	
	180	Cobble zone 166'-170'.	
	190		
	200		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 4 OF 6

DRILLING LOG

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LEGEND

SANDY GRAVEL WITH COBBLES
SANDY GRAVEL
POORLY SORTED SAND
WELL SORTED SAND
DIAMICTON
SILT - CLAY
PEAT
BEDROCK
SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above	Water added 205'-208'
	210		
	220	Brown, dry, sandy, well sorted 1" gravels at 222'-224'. Limited sample return 224'-232'.	
	230		▽
		Brown, wet, sandy, well sorted 3/4"-1" gravels with minor cobbles.	Trace while drilling
		Brown, wet to saturated, unsorted, clayey, sandy silt.	
	240	Brown, dry, silty, fine to coarse sand with minor cobbles and gravels. Becoming wet below 246' where water added. (Hard drilling)	Water added 246'-248'
	250		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 5 OF 6

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, dry becoming wet where water added, subangular medium to coarse sand	Water added 251'-260'
	260	Brown, wet to saturated, unsorted, sandy silt. (Hard drilling) Losing some fines content due to adding water.	
	270	TD 260' 4/13/91 Refusal	
	280		
	290		
	300		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 6 **OF** 6

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD :

Reverse air circulation

SAMPLING METHOD :

Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	Initiated 2/7/91 DESCRIPTION	WATER TABLE(S)
	10	Brown, dry to moist, oxidized, gravelly, silty, fine to coarse sand with cobbles.	
	20	Cobbles with gravels 13'-22'.	
	30	Cobbles 24'-26'.	
	40		
	50	Brown, moist, medium to coarse sand with scattered cobbles.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 1 **OF** 6

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Brown, moist, slightly oxidized, silty to slightly silty, gravelly, fine to coarse sand with scattered cobbles. Cobble zone 52'-54'.	
	70	Becoming gravellier below 64' with silt/clay on gravels. Containing scattered lenses of silt. Cobble zone at 68'.	
		Brown, moist, gravelly, medium to coarse sand.	
	80	Moist, sandy, cobbly gravels.	
	90	Brown, dry to moist, slightly oxidized, gravelly, silty to slightly silty, fine to coarse sand with cobbles.	
		Gravelly cobbles 90'-94'.	
	100	Brown, dry becoming moist, gravelly, fine to medium sand with occasional cobbles. Slightly silty in areas. Silt/clay on gravels.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 2 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	As above.	
	120		
	130		
	140	Brown, dry to moist, sandy, cobbly gravels.	
		Grading into cobbly, gravelly, fine to coarse sand.	
	150	Grading into cobbly, sandy gravel.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 3 OF 6

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, dry, cobbly, sandy gravels.	
	160	Brown, moist, slightly silty, fine to medium sand. Containing scattered gravels and less silt with depth. Cobble zone 158'-159'.	
	170		
	180		
	190		
	200	Increase gravel content 194'-195'. Cobbles and boulders 195'-197'.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
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DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	210	As above. Slightly silty 206'-208'.	
	220	Brown, dry, cemented (?), gravelly, fine to coarse sand with cobbles. Brown, dry, sandy, gravelly cobbles 220'-224'	
		Brown, dry, sandy, cobbly gravels with some boulders.	
	230	Brown, moist, fine to medium sand with occasional gravels and silt lenses.	
	240	Brown, moist, cemented (?), silty, fine to coarse sand with well sorted gravels. Containing silt lenses. Sandy, gravelly cobbles and boulders 233'-235'.	
	250	Grading into brown, moist, silty, fine to medium sand with gravels.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
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DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	260	As above.	
	270	Brown, moist, sandy, coarse silt with inter-bedded, fine sand lenses.	▽ 259.3' 3/28/91 ▽ 266' While drilling 2/8/91
	280	Becomes wet at 274'. Grading into silty, fine sand below 278'. Predominant amount of fines lost due to addition of water.	Water added while drilling at 281
	290		
	300	TD @ 291' 3/28/91	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
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DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Initiated 2/6/91	
		Topsoil	
	10	Brown, dry, slightly oxidized, silty, gravelly fine to coarse sand w/ cobbles. Increase in cobble content below 8'-25'	
	20	cobble zone 16-18'	
	30	sample return 32-38', drill bit pushing cobbles. Little	
	40		
	50	Cobble zone 46-48	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C2
ELEVATION 515
PAGE 1 OF 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above	
	60	Brown, dry, sandy, gravelly cobbles with boulders.	
	70		
77'			
	80	Brown, moist, fine to medium sand with scattered gravels and cobbles. Containing occassional clay/silt lenses and less cobbles with depth.	
	90		
	100	gravelly cobbles and boulders 98-106	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C2
ELEVATION _____
PAGE 2 **OF** 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Gravelly cobbles and boulders 98 - 106	
	110	Brown moist fine to coarse sand w/ cobbles Grading into fine Sand w/ depth	
	120	Brown, moist, fine to medium sand w/ occassional gravels. Containing silt/clay on on gravels. Grading into fine sand, Containing, clay Clasts at 118?	
	130	TD 128 2/6/91	
	140		
	150		

NOTES:

PROJECT NO. 9006-18E
BORING NO. ES-C2
ELEVATION _____
PAGE 3 **OF** 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	Initiated 2/6/91 DESCRIPTION	WATER TABLE(S)
	10	Brown, moist, silty, gravelly, fine to coarse sand with cobbles. Containing silt/ clay on gravels.	
	20	Brown, moist, sandy, cobbly gravels. Increase in sand content 18'-19'.	
	30	Brown, dry to moist, silty, gravelly, fine to coarse sand with cobbles.	
	40	Brown, moist, sandy, cobbly gravels. Cobble zone 38'-40'.	
	50	Cobble zone 48'-50'.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C3
ELEVATION 545
PAGE 1 OF 3

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, moist, sandy, cobbly gravels.	
	60	Brown, moist, slightly silty, gravelly, fine to coarse sand with scattered cobbles. Silt/clay on gravels. Cobble zone 61'-65'.	
	70	Cobble zone 69'-75'.	
		Brown, dry, silty, sandy gravels with cobbles.	
	80	Brown, dry, gravelly cobbles.	
	90		
	100		

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C3
ELEVATION 545
PAGE 2 OF 3

DRILLING LOG

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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD :

Reverse air circulation

SAMPLING METHOD :

Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above. Boulder 101'-102'.	
		Brown, dry, cemented (?), sandy gravels.(Hard drilling)	
	110	Brown, moist, fine to medium sand with scattered gravels. Containing less gravels with depth. Silt/clay on gravels.	
	120	Becoming slightly silty 120'-130'.	
	130		
		Brown, moist, slightly silty, fine sand.	
		Becoming very silty 135'-137'.	
	140		
		TD @ 140' 2/7/91	
	150		

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C3
ELEVATION 545
PAGE 3 **OF** 3

DRILLING LOG

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LEGEND



COBBLES AND GRAVEL



SANDY GRAVEL



GRAVELLY SAND



SAND



DIAMICTON



SILT - CLAY



PEAT



BEDROCK



SILTY

DRILLING METHOD :

Air Rotary

SAMPLING METHOD :

Continuous

WATER LEVEL	161.0		161.0	
DATE	11-1-85		10-29-85	
TIME	12:45pm		10:25	am

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Topsoil	
	5	Grey, GRAVEL with Cobbles --Qvdg	
	10	Grey, brown sandy GRAVEL --Qvdg	
	15	With COBBLES	
	20	Brown, sandy GRAVEL --Qvdg	
	25		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 1 **OF** 15

DRILLING LOG

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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above with Cobbles	
	30	Brown, slightly silty, GRAVEL --Qvdg	
	35	Brown, sandy GRAVEL interbedded with brown, medium SAND--Qvdg	
	40		
	45		
	50	With COBBLES	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 2 OF 15

DRILLING LOG

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LEGEND

COBBLES AND GRAVEL

SANDY GRAVEL

GRAVELLY SAND

SAND

DIAMICTON

SILT - CLAY  PEAT

BEDROCK  SILTY

DRILLING METHOD :

Air Rotary

SAMPLING METHOD :

Continuous

WATER LEVEL				
DATE				
TIME				

DEPTH	DESCRIPTION	WATER TABLE(S)
	As Above	
55	Brown, gravelly SAND--Qvdg	
60		
	Brown, medium-coarse, sandy GRAVEL--Qvdg	
65		
70		
	With COBBLES	
75		

ES:

CT NO. 8412-06

NO. SS&G#1

VATION 505'

3 OF 15

DRILLING LOG

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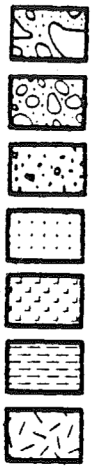
LEGEND



- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	105	Brown, medium to coarse, sandy GRAVEL --Qvdg	
	110		
	115	With COBBLES	
	120		
	125	Brown, slightly sandy GRAVEL --Qvdg	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

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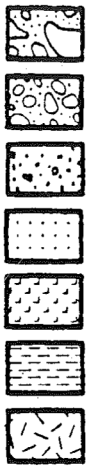
LEGEND



COBBLES AND GRAVEL
SANDY GRAVEL
GRAVELLY SAND
SAND
DIAMICTON
SILT - CLAY
PEAT
BEDROCK
SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	130	As Above	
	135	Brown, medium to coarse sandy GRAVEL--Qvdg	
	140		
	145		
	150	Brown, gravelly SAND --Qvdg	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

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LEGEND


COBBLES AND GRAVEL


SANDY GRAVEL


GRAVELLY SAND


SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above:	
	155	Brown, medium to coarse SAND--Qvds	
	160		▼
	165		
	170		
	175		

NOTES:

PROJECT NO. 8412-08
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

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LEGEND


COBBLES AND GRAVEL


SANDY GRAVEL


GRAVELLY SAND


SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	180	As Above	
	185	Grey, silty SAND with some clay--Qvds	
	190		
	195		
	200	Brown, medium SAND --Qvds	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 8 **OF** 15

DRILLING LOG

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LEGEND


COBBLES AND GRAVEL


SANDY GRAVEL


GRAVELLY SAND


SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	205	As Above	
	210		
	215		
	220		
	225		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	230	Grey, silty very fine SAND --Qvds	
	235	Grey, silty CLAY with scattered GRAVEL --Qvds	
	240		
	245	Interbedded grey SILT and SAND --Qpvu	
	250		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	255	As Above	
	260		
	265	Grey to brown GRAVEL with Cobbles --Qpvu	
	270		
	275		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 1 1 **OF** 15

DRILLING LOG

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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	280	Grey, silty, very fine SAND--Qpvu	
	285	Interbedded, grey, silty SAND with brown sandy GRAVEL--Qpvu	
	290		
	295		
	300	Grey SILT--Qpvu	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	305	Silty, fine SAND with scattered GRAVEL and abundant wood chips	
	310		
	315		
	320		
	325		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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137½ PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	330	As Above	
	335		
	340		
	345	Dry, very silty, gravelly, fine SAND to SANDY GRAVEL	
	350		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 14 **OF** 15

DRILLING LOG

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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	355	As Above	
	360		
	365	Gravelly, medium to coarse SAND	
	370		
TD	375		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1 SS46#1
ELEVATION 505'
PAGE 15 **OF** 15

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10		
	20	Brown gravel and coarse sand.	
	30	Brown gravel with sand, high % of fractured rock chips.	
	40	Brown gravel with coarse sand.	
	50	Brown gravel/cobbles with coarse sand, rock fragments.	

NOTES: 8" surface casing to 20'; 6" casing surface to TD; 8" casing later pulled. Surface seal from 0-20'.

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 1 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Brown sandy gravel with cobbles, rock fragments	
	70	Brown gravel with cobbles with interbedded coarse sand, rock fragments.	
	80	Gray-brown gravel with coarse sand, rock fragments.	
	90	Gray gravel with rock fragments with trace sand.	
	100	Gray gravel with rock fragments with trace sand.	

NOTES:

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 2 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	100	Gray gravel with rock fragments with trace sand.	
	110	Brown coarse sand and gravel with some rock fragments.	
	120	Brown coarse sand with some gravel and rock fragments.	
	130	Brown coarse sand with rock fragments and some gravel.	
	140	Grayish-brown gravel with rock fragments and trace sand.	
	150	Gray gravel with sand and rock fragments and some silt	

NOTES:

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 3 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

			while drilling	
WATER LEVEL	~70		163.25	
DATE	6/25/92		6/26/92	
TIME	12:10		1:30pm	

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		@155 dark brown fine to medium sand with some scattered gravel.	
	160	Dark brown medium sand and thin layers of silt inter-bedded in gray gravel with coarse sand.	
		@165 dark brown medium sand.	▼
	170	Dark brown medium sand, wet.	▽ WD
		@175 brown fine to medium sand and silt, saturated.	
	180	Brown fine to medium sand, silt, and clay, woody fragments, saturated.	
		@185 brown fine sand and silt, saturated.	
	190	Gray-brown fine to coarse sand with some silt.	
		@195 brown fine to coarse sand and silt.	
	200	Brown fine to medium sand.	

NOTES: 10' of No 12 screen installed from 188'-198'.

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 4 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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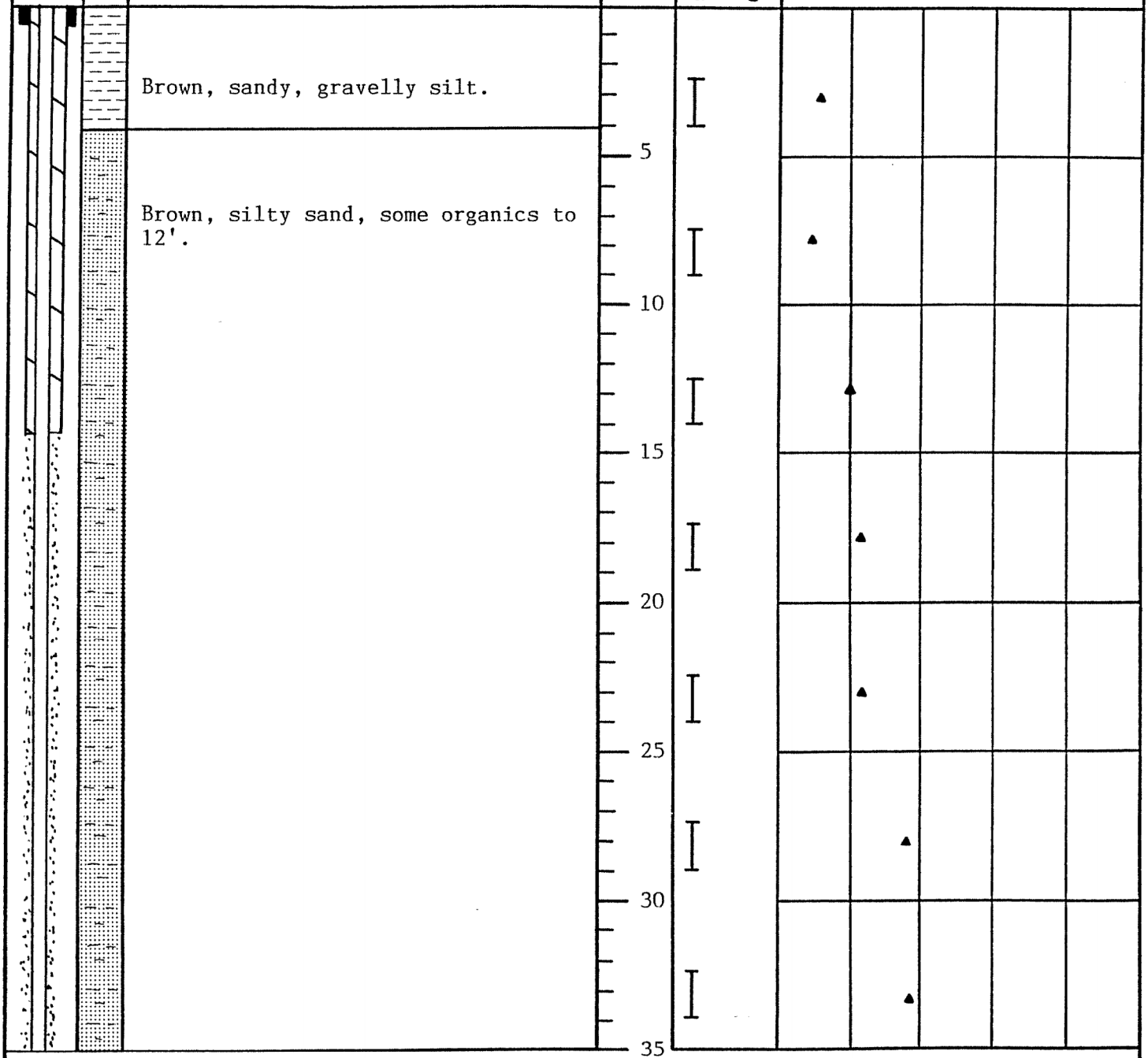
EXPLORATION BORING LOG

EB-1
Page 1 of 2



Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

W92229A	10/92	

Snoqualmie Shallow
Aquifer Evaluation
Snoqualmie, Washington

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG

EB-1
Page 2 of 2

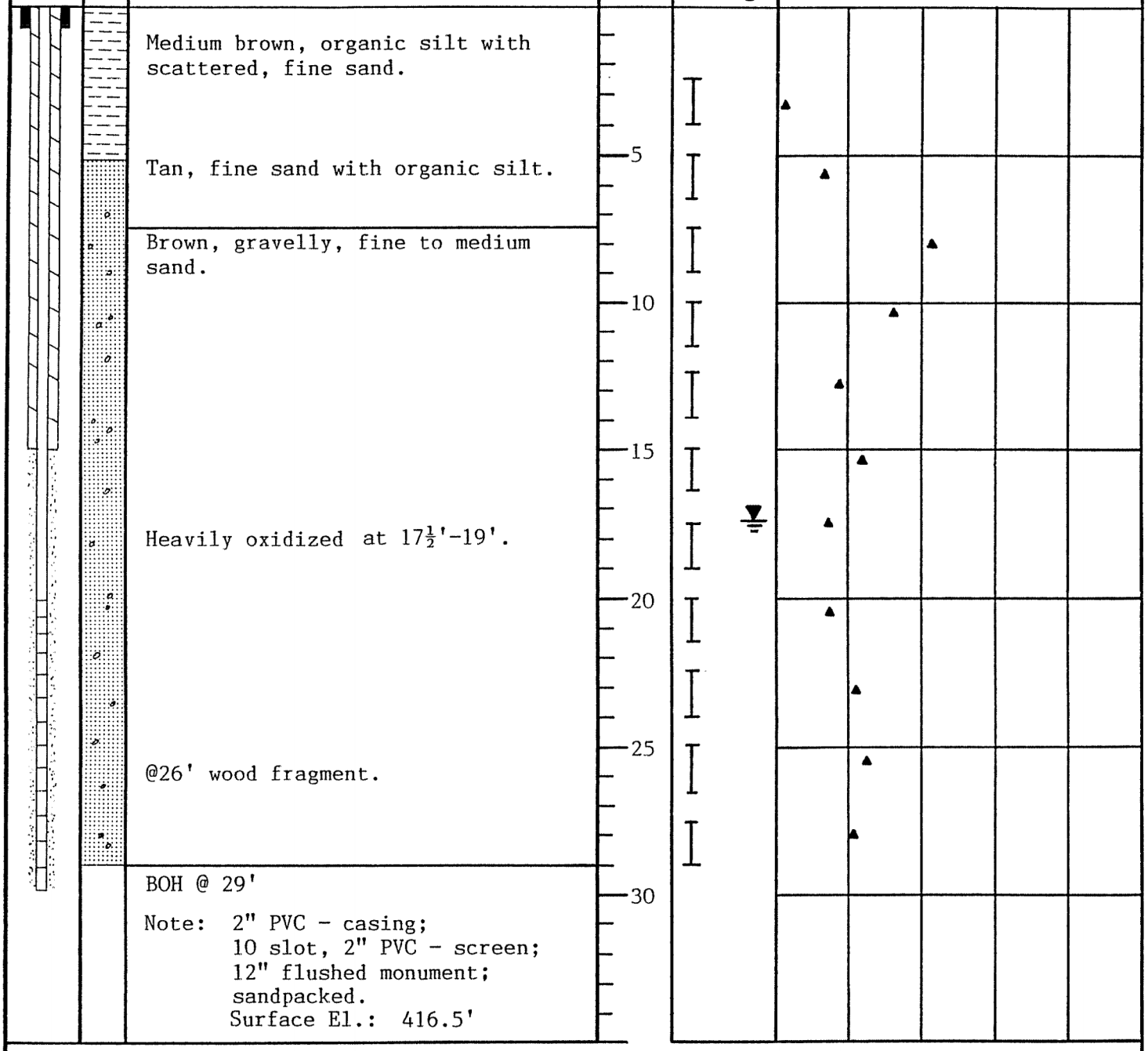
WELL COMPL.	GRAPH	SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENERATION RESISTANCE Blows/Foot 10 20 30 40
		Brown, silty sand.	40			
		Brown, fine sandy silt.				
		BOH @ 44'	45			
		Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flush monument; sand packed. Surface El.: 421'				

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229A	10/92

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-2



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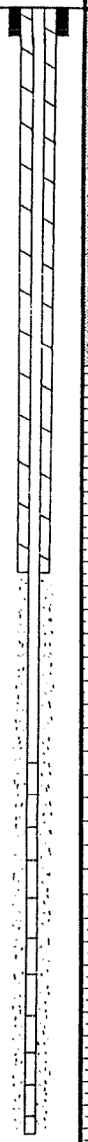
Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229A	10/92

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-5



SEDIMENT DESCRIPTION	DEPTH
Brown silt and clay, scattered organics. (Fill)	
Topsoil overlying mottled tan silt, widely scattered organics. (Fill)	5
Brown, sandy silt, organic rich. (Fill)	
Tan to brown, micaceous, sandy silt, scattered organics.	10
	15
Tan to brown, micaceous, coarse silt, scattered organics.	20
Gray, micaceous silt, scattered organics.	
Gray, silty clay, scattered organics.	25
	30
Gray, silty clay, scattered organics.	
BOH @ 31½'	35

Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flushed monument; sandpacked.

Surface El.: 416.30'

SAMPLE

GROUND WATER

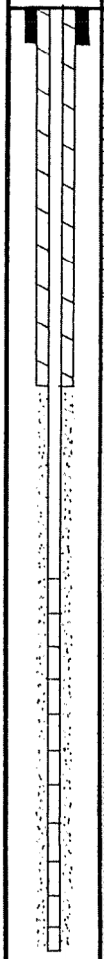
STANDARD PENERATION RESISTANCE
Blows/Foot
10 20 30 40

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229A	10/92

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-6



SEDIMENT DESCRIPTION	DEPTH
Medium brown silt, trace fine sand, blocky texture.	
Light brown silt, trace fine sand, blocky texture, scattered organics.	5
Brown, very silty, fine sand, micaceous.	
Brown, slightly silty, fine sand, scattered organics.	10
Dark brown, fine sand, trace silt, scattered organics.	
Dark brown, fine to medium sand, scattered organics.	15
Gray, gravelly, fine to medium sand, scattered organics.	
	20
	25
BOH @ 26½'	
Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flushed monument ; sand-packed. Surface El.: 415.32'	30
	35

SAMPLE | GROUND WATER

STANDARD PENERATION RESISTANCE
Blows/Foot
10 20 30 40

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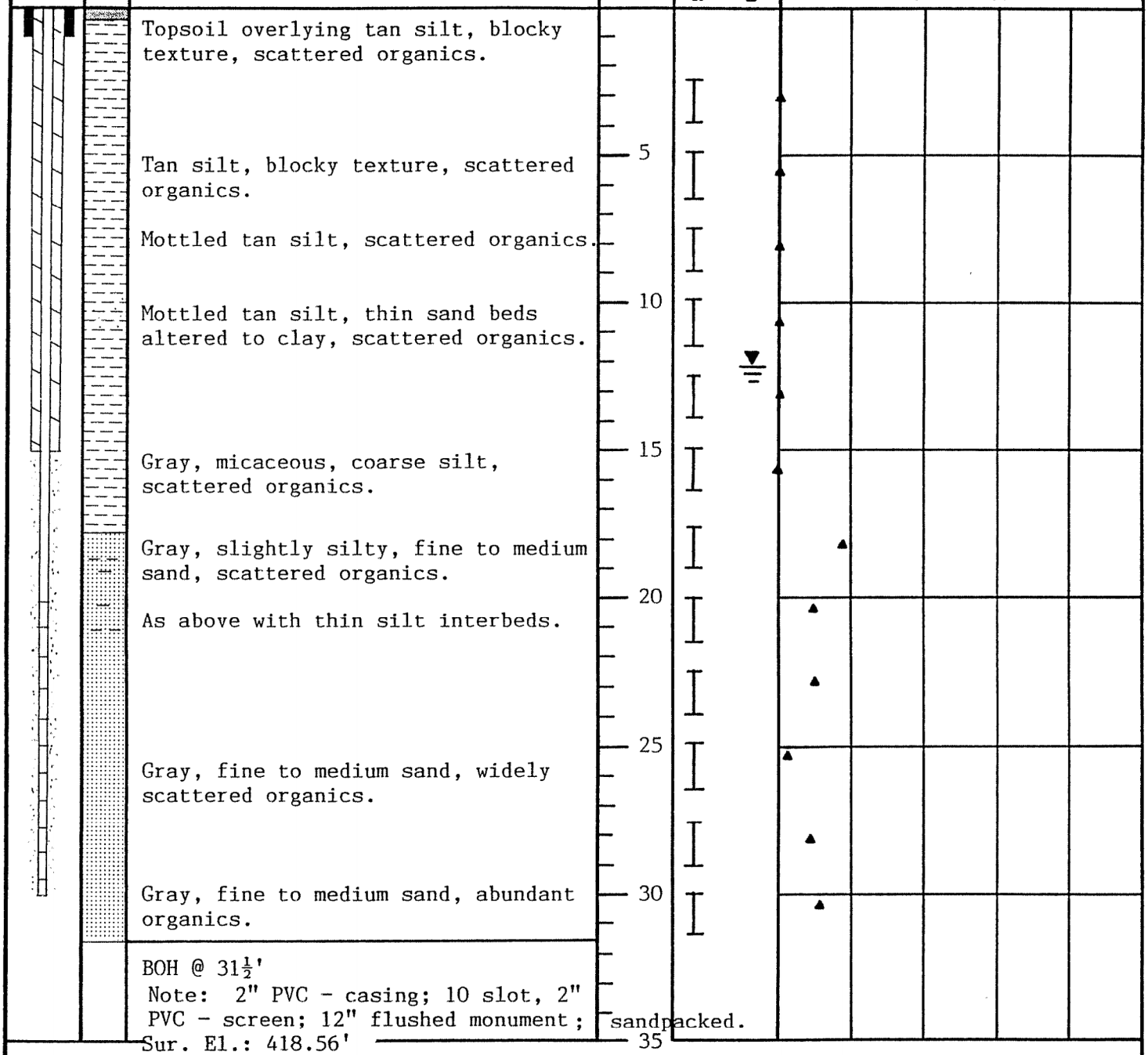
W92229A	10/92	

Snoqualmie Shallow
Aquifer Evaluation
Snoqualmie, Washington

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-7



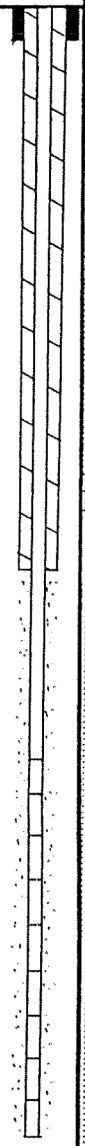
Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

W92229A	10/92	

Snoqualmie Shallow
Aquifer Evaluation
Snoqualmie, Washington

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-8



SEDIMENT DESCRIPTION	DEPTH
Tan silt, blocky texture, scattered organics.	
Tan, very fine sand with thin silt interbeds, scattered organics.	5
Tan to brown fine sand, scattered organics.	10
Tan, interbedded silt and oxidized fine to medium sand.	
Brown, micaceous, fine to medium sand.	15
Brown, fine to coarse sand.	
Brown, slightly gravelly, fine to coarse sand, oxidized.	20
Brown, fine to coarse sand, oxidized	
Brown, fine to coarse sand with gray silt and fine sand interbeds, scattered organics.	25
Brown, fine to medium sand, some silt.	30
BOH @ 31½' Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flushed monument ; sandpacked. Sur.El.: 418.42'	35

WELL COMPL | GRAPH | SAMPLE | GROUND WATER

STANDARD PENERATION RESISTANCE
Blows/Foot
10 20 30 40

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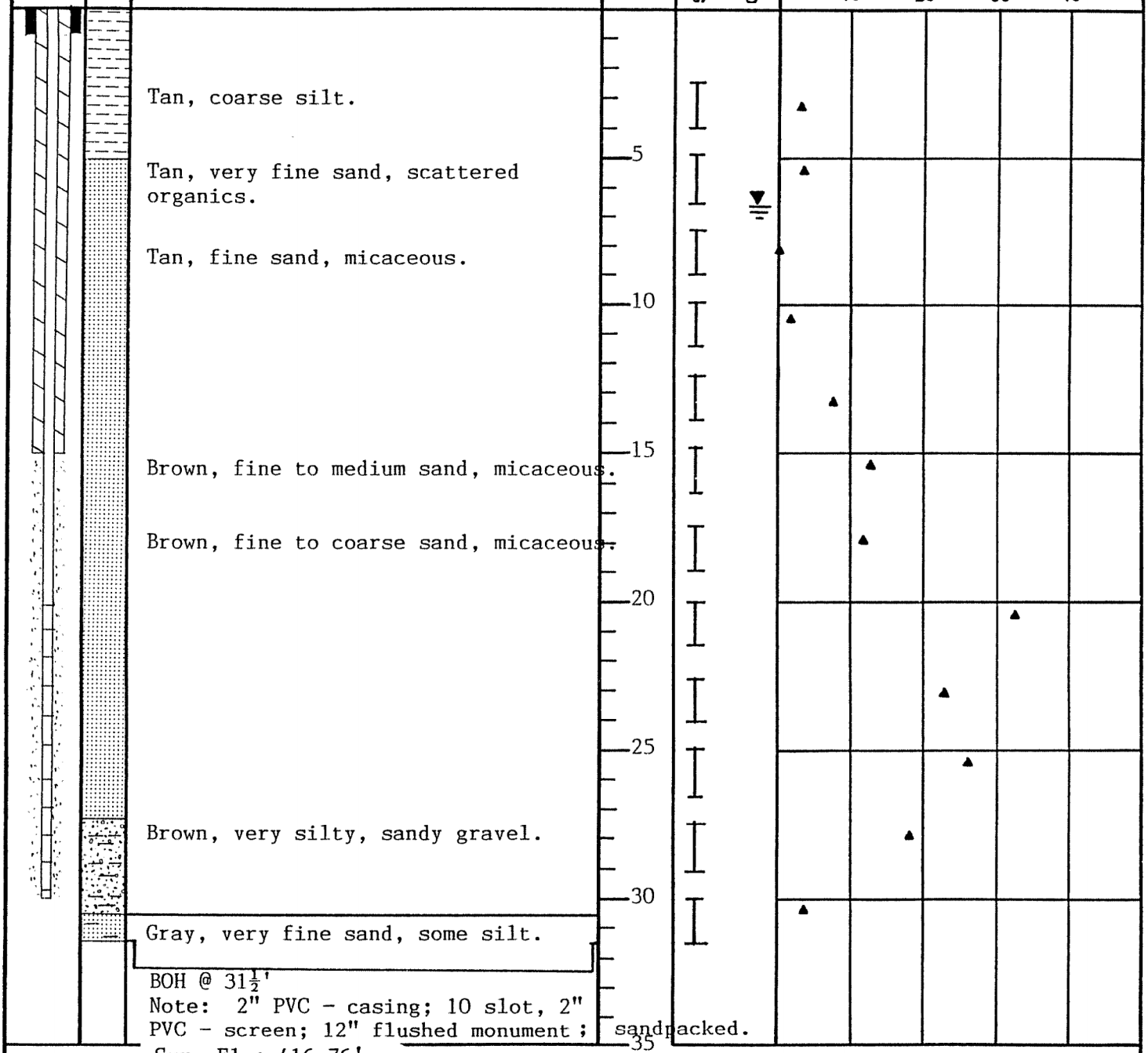
W92229A	10/92	

Snoqualmie Shallow
Aquifer Evaluation
Snoqualmie, Washington

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-9



BOH @ 31½'
Note: 2" PVC - casing; 10 slot, 2" PVC - screen; 12" flushed monument ; sandpacked.
Sur. El.: 416.76'

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

W92229A	10/92	

Snoqualmie Shallow
Aquifer Evaluation
Snoqualmie, Washington

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-10

WELL COMPL.	GRAPH	SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENERATION RESISTANCE Blows/Foot 10 20 30 40
		Medium brown, coarse silt to very fine sand, organics.				
		As above.	5			
		As above.				
		Gray-brown, fine to coarse sand with scattered gravel.			▼	
		Gray-brown, fine to coarse sand and gravel.	10			
		Gray-brown, gravelly, fine to medium sand.				
		Gray-brown, fine to coarse sand and gravel.	15			
		As above, heavily oxidized 18.7'-19'.				
		Gray-brown, gravelly, fine to coarse sand.	20			
		Gray-brown, fine to coarse sand and gravel, trace silt at 23½'-24', oxidized at 24'.				
		Gray-brown, first ½' fine to coarse sand, last 1' fine to coarse sand and gravel with trace silt.	25			
		Gray, fine to coarse sand and gravel with some silt.				
		Gray, fine to coarse sand, inter-bedded with sandy gravel.	30			
		BOH @ 31½' Note: 2" PVC - casing; 10 slot; 2" PVC - screen; 8" flushed monument; sandpacked.	35			

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229F	8/93

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-11

WELL COMPL.	GRAPH	SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENERATION RESISTANCE Blows/Foot (10 20 30 40)
		Medium brown silt with trace fine sand.				
		Medium brown fine sand.	5			
		Gray-brown, fine to medium sand.			▼	
		As above, with trace silt.	10			
		Gray-brown, gravelly, fine to coarse sand.				
		Gray-brown, fine to coarse sand with scattered gravel.	15			
		Gray-brown, fine to coarse, sandy gravel, oxidized last 0.2'.				
		As above, with trace silt, heavily oxidized.	20			
		Gray-brown, fine to coarse, sandy gravel with some silt.				
		Gray-brown, gravelly, fine to coarse sand, woody fragments.	25			
		Dark gray, first 0.4', silty, fine to medium sand, next 0.6' silt and clay with woody fragments, last 0.5' fine to medium sand, organics.	30			
		Gray, medium sand with trace silt.				
		BOH @ 31½'	35			

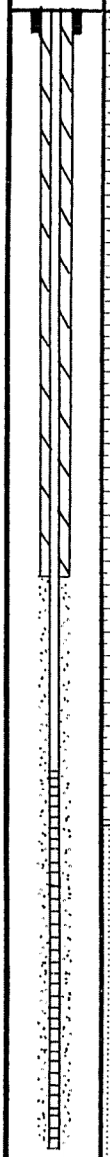
Note: 2" PVC - casing; 10 slot'; 2" PVC - screen; 8" flushed monument; sandpacked

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229F	8/93

ASSOCIATED EARTH SCIENCES, INC

EXPLORATION BORING LOG EB-12



SEDIMENT DESCRIPTION	DEPTH
Medium brown silt with trace fine sand, organics.	
As above.	5
Medium brown silt, organics.	
As above, oxidized.	10
As above.	
First 0.6' medium-brown, oxidized silt with trace fine sand.	15
Last 0.9' gray, clayey silt, organics.	
As above.	
As above.	20
Gray, fine sand, some organics.	
As above.	25
As above, with trace silt.	
As above.	30
BOH @ 31½' Note: 2" PVC - casing; 10 slot'; 2" PVC - screen; 8" flushed monument; sandpacked.	35

SAMPLE | GROUND WATER

STANDARD PENERATION RESISTANCE
Blows/Foot
10 20 30 40

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Snoqualmie Shallow Aquifer Evaluation Snoqualmie, Washington	W92229F	8/93

ASSOCIATED EARTH SCIENCES, INC

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 1 of 4 Boring No. OBW-1

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	10	Brown SAND AND GRAVEL.	
	20		
	30		
	40		
	50		

NOTES: Lithologic information from driller's log.

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 2 of 4 Boring No. OBW-1

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	60	Brown SAND AND GRAVEL.	
	70		
	80		
	90		
	100		

NOTES: Lithologic information from driller's log.

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Kirkland, Washington 98033
Phone: 206-827-7701
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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 3 of 4 Boring No. OBW-1

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	160	Brown SAND AND GRAVEL.	
	170		
	180		
	190		
	200		

NOTES: Lithologic information from driller's log.

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 4 of 4 Boring No. OBW-1

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	160	Brown SAND AND GRAVEL.	
	170		
	180		
	190		
	200	BOH @ 200'	

NOTES: Lithologic information from driller's log.

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911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 1 of 4 Boring No. OBW-2

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	10	Brown SAND AND GRAVEL.	
	20		
	30		
	40		
	50		

NOTES: Lithologic information from driller's log.

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Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 2 of 4 Boring No. OBW-2

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	60	Brown SAND AND GRAVEL.	
	70		
	80		
	90		
	100		

NOTES: Lithologic information from driller's log.

Associated Earth Sciences, Inc.
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Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 3 of 4 Boring No. OBW-2

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	160	Brown SAND AND GRAVEL.	
	170		
	180		
	190		
	200		

NOTES: Lithologic information from driller's log.

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Strata

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab Samples
Elevation:
Boring Diameter:
Drilling Contractor:
Page 4 of 4 Boring No. OBW-2

Water Level			
Date			
Time			

Strata	Depth	Description	Well Compl..
	160	Water bearing SAND AND GRAVEL at 154'.	
	170	BOH @ 160'	
	180		
	190		
	200	BOH @ 200'	

NOTES: Lithologic information from driller's log.

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	1 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
5						**Vashon Recessional Deltaic Deposits "Tokul Creek Delta"** Brown, SILTY fine to medium SAND with occasional coarse sand and gravel.
10						
15						Black-gray, fine to coarse GRAVEL.
20						
25						
30						
35						
40						Black-gray, fine to coarse GRAVEL.
45						
50						
55						
60						
65						
70						
75						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 00005.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	2 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
85						Black-gray, medium to coarse SAND.
90						
95						
100						
105						
110						Black-gray, fine to coarse GRAVEL.
115						
120						Black-gray, fine to coarse GRAVEL.
125						
130						
135						
140						
145						
150						
155						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 00005.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	3 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
165						Black-gray, fine to coarse GRAVEL.
170						
175						
180						
185						
190						
195						
200						Black-gray, fine to coarse GRAVEL.
205						
210						
215						
220						
225						
230						
235						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	4 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
245						Black-gray, medium to coarse SAND with gravel.
250						
255						
260						
265						Gray, SILTY fine to medium SAND with gravel.
270						
275						
280						
285						Black-gray, medium to coarse SAND with gravel.
290						
295						
300						
305						
310						
315						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	5 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
325						Gray SILT with occasional fine to medium sand.
330						
335						
340						
345						
350						
355						
360						**Undifferentiated Olympia/pre-Olympia Lacustrine and Fluvial Deposits**
365						Gray SILT with occasional fine to medium sand.
370						
375						
380						
385						
390						
395						

NOTE FOR MOVE PTB TO 325' compare to ? PW-8 This is way off

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	6 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
405						Gray SILT with occasional fine to medium sand.
410						
415						
420						
425						
430						
435						
440						Gray SILT with occasional fine to medium SAND.
445						
450						
455						
460						
465						
470						Black-gray, medium to coarse SAND.
475						Gray SILT with occasional fine to medium SAND.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	7 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
485						
490						
495						
500						
505						
510						
515						
520						
525						
530						
535						
540						
545						
550						
555						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	8 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
565						
570						
575						
580						Gray SILT with occasional fine to medium SAND.
585						
590						
595						
600						
605						
610						
615						
620						
625						
630						
635						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	9 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
645						
650						
655						**Undifferentiated Olympia/pre-Olympia Coarse-Grained Fluvial Deposits** Black-gray, medium to coarse SAND with occasional gravel.
660						
665						
670						
675						
680						
685						
690						
695						
700						
705						**Tertiary Bedrock** Black-gray basalt with occasional red and white rock pieces (Basalt Flow Top).
710						
715						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by:
Approved by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH00005C	OBW-3	10 of 10

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft):
Water Level Elevation:
Date Start/Finish: 09/12/00,9/21/2000
Drilling/Equipment: Hayes Dirlling / Gefco Speedstor 30K
Hole Diameter (in): 6"
Hammer Weight/Drop: Mud Rotary

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
725						Black-gray basalt (Basalt Flow)
730						Boring terminated at 730 feet on 9/21/2000 Boring grouted and sealed.
735						
740						
745						
750						
755						
760						
765						
770						
775						
780						
785						
790						
795						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	SS&G-2	1 of 5

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): ~474'
Water Level Elevation: 310'
Drilling/Equipment: Air Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): 474'
Date Start/Finish: March 1988,April 1988
Hole Diameter (in): 8"

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
0		8" diameter well casing 0-332'				**Vashon Recessional Deltaic Deposits "Tokul Creek Delta"** Brown, SANDY GRAVEL.
5						
10						
15						
20						
25						
30						
35						
40						
45						
50						
55						
60						
65						
70						
75						

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by:
Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	SS&G-2	2 of 5

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): ~474'
Water Level Elevation: 310'
Drilling/Equipment: Air Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): 474'
Date Start/Finish: March 1988,April 1988
Hole Diameter (in): 8"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
85						
90						
95						
100						
105						
110						
115						
120		8" diameter well casing 0-332'				
125						
130						
135						
140						
145						
150						
155						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-2.GPJ BORING.GDT 1/5/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	SS&G-2	3 of 5

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): ~474'
Water Level Elevation: 310'
Drilling/Equipment: Air Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): 474'
Date Start/Finish: March 1988,April 1988
Hole Diameter (in): 8"

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
165						Brown, SILTY SAND with gravel.
170						
175						
180						
185						
190						
195						
200		8" diameter well casing 0-332'				
205						
210						
215						
220						Blue, SILTY SAND, occasional gravel.
225						
230						
235						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by:
Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	SS&G-2	4 of 5

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): ~474'
Water Level Elevation: 310'
Drilling/Equipment: Air Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): 474'
Date Start/Finish: March 1988,April 1988
Hole Diameter (in): 8"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
245						
250						
255						
260						
265						
270						As above.
275						
280		8" diameter well casing 0-332'				
285						
290						
295						
300						
305						Gray SAND with gravel.
310						
315						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by:
Approved by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	SS&G-2	5 of 5

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): ~474'
Water Level Elevation: 310'
Drilling/Equipment: Air Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): 474'
Date Start/Finish: March 1988,April 1988
Hole Diameter (in): 8"

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
325		8" diameter well casing 0-332'				
330						
335		8" diameter 10-slot well screen 332'-344'				
340						
345		8" diameter 80-slot well screen 344'-354'				
350						
355						Boring terminated at 354 feet on April 1988
360						
365						
370						
375						
380						
385						
390						
395						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-2.GPJ BORING.GDT 1/5/04

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 1 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	10	0 to 49' Brown to gray, silty, sandy GRAVEL. Fast smooth drilling.	
	20		
	30		
	40		
	50	@ 50' to 130' Brown, silty SAND with some gravel (dirty sand). Fast, smooth drilling.	

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 2 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	60	@ 50' to 130' Brown, silty SAND with some gravel (dirty sand). Fast, smooth drilling.	
	70		
	80		
	90		
	100		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 3 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	110	@ 50' to 130' Brown, silty SAND with some gravel (dirty sand). Fast, smooth drilling.	
	120	Slight increase in gravel.	
	130	@ 120' to 215' gray, coarse, sandy GRAVEL with some silt and scattered cobbles. Medium rough drilling.	
	140		
	150		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 4 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	160	@ 120' to 215' gray, coarse, sandy GRAVEL with some silt and scattered cobbles. Medium rough drilling.	▽ While Drilling
	170		
	180		
	190		
	200		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 5 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	210	@ 120' to 215' gray, coarse, sandy GRAVEL with some silt and scattered cobbles. Medium rough drilling.	
	220	@ 215' to 250' gray, coarse, sandy GRAVEL with trace silt. Slow rough drilling. Heaving sands and gravels.	100 gpm ▽ While Drilling
	230		
	240		
	250		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 6 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	260	@ 250' to 425' gray, silty SAND with some gravel. Slow to medium rough drilling. Some clasts of blue silt/clay. Heaving conditions.	
	270		
	280		
	290		
	300	@ 300 no gravel. Fast smooth drilling.	

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 7 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	310	@ 250' to 425' gray, silty SAND with some gravel. Slow to medium rough drilling. Some clasts of blue silt/clay. Heaving conditions. @ 300' no gravel; fast smooth drilling.	▽ While Drilling
	320		
	330		
	340		
	350		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 8 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	360	@ 250' to 425' gray, silty SAND with some gravel. Slow to medium rough drilling. Some clasts of blue silt/clay. Heaving conditions. @ 300' no gravel; fast smooth drilling.	
	370		
	380	@ 380' organics with trace clay clasts.	
	390		▽ While Drilling
	400		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 9 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	410	@ 250' to 425' gray, silty SAND with some gravel. Slow to medium rough drilling. Some clasts of blue silt/clay. Heaving conditions. @ 300' no gravel; fast smooth drilling.	
	420		
	430	@ 425' to 500' gray, gravelly, silty, fine to coarse SAND with some silt/clay clasts. No hammer needed to drive casing.	75 gpm ▽ While Drilling
	440		
	450		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 10 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
	460	@ 425' to 500' gray, gravelly, silty, fine to coarse SAND with some silt/clay clasts. No hammer needed to drive casing.	
	470		
	480		
	490		
	500		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 11 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Strata	Depth	Description	Well Compl..
		@ 500' to 510' gray, silty, fine SAND with trace gravel.	
	510	@ 510' to 540' gray, gravelly SAND with some silt. Alternating hard and easy drilling.	
	520		
	530		
	540	@ 540' to 560' gray GRAVEL with some silt.	
	550		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
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- Well sorted sand
- Bedrock
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- Peat
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- Silt

Strata

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Air Rotary
Sampling Method: Grab
Elevation: 450'
Boring Diameter:
Drilling Contractor:
Page 12 of 12 Boring No. TW-5

Water Level	139'	167'	139'	181'	
Date	9/27/	9/30/	10/3/	11/6	
Time	3:00	8:30	9:00	8:30	

Depth	Description	Well Compl..
560	@ 540' to 560' gray GRAVEL with some silt.	
570	@ 560' to 580' BEDROCK, black basalt and purple andesite.	
580		
590	BOH @ 580'	
600		

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Drilling Log

LEGEND

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- Sandy gravel
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- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 1 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	10	@ 0' to 35' medium dense, damp, brown, sandy GRAVEL with trace silt and some cobbles and boulders. Added water.	
	20		
	30		
	40	@ 35' to 90' brown, slightly silty, coarse SAND with some gravel. Less cobbles and gravel. Casing falling as drilling.	
	50		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 2 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	60	@ 35' to 90' brown, slightly silty, coarse SAND with some gravel. Less cobbles and gravel. Casing falling as drilling.	
	70		
	80		
	90		
	100	@ 90' gray, silty, well sorted, fine SAND. Smooth drilling.	

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LEGEND

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- Sandy gravel
- Poorly sorted sand
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- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 3 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	110		
	120		
	130		
	140		
	150	Brownish-gray, fine to coarse SAND AND GRAVEL with some cobbles with trace silt to 211'. Unit taking lots of water. Hammer needed.	

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
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- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 4 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	160	Brownish-gray, fine to coarse SAND AND GRAVEL with some cobbles with trace silt to 211'. Unit taking lots of water. Hammer needed.	
	170		
	180		
	190		
	200		

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LEGEND

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- Sandy gravel
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 5 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	210	@ 211' dark blue to gray SAND AND GRAVEL with some cobbles and some clasts of blue to gray silt. Able to drill some open hole.	
	220		
	230		
	240		
	250		

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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 6 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	260		
	270	Dark gray, silty, fine to coarse SAND with scattered gravel and cobbles. Cobbles up to 8"-10" with silt adhering to them. (Lodgement Till)	
	280		
	290		
	300		

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LEGEND

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- Sandy gravel
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- Bedrock
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- Peat
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- Silt

Strata

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 7 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Depth	Description	Well Compl..
310	Dark gray, silty, fine to coarse SAND with scattered gravel and cobbles. Cobbles up to 8"-10" with silt adhering to them. (Lodgement Till)	
	@ 315' gray, silty, fine SAND with some scattered gravel.	
320	Greenish-gray, clayey SILT with some scattered gravel.	
330		
340		
350		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
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- Well sorted sand
- Bedrock
- Diamicton
- Peat
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 8 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	360	Greenish-gray, clayey SILT with some scattered gravel.	
	370		
	380		
	390		
	400	Unit becoming siltier.	

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LEGEND

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- Sandy gravel
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 9 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	410	Gray, clayey SILT with trace very fine sand and occasional scattered gravel. Trace wood fragments.	
	420	Gray, silty, very fine SAND with trace wood fragments.	
	430		
	440		
	450		

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Drilling Log

LEGEND

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- Sandy gravel
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- Well sorted sand
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- Diamicton
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- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 10 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
	460	Gray, silty, very fine SAND.	
	470		
	480		
		Gray, sandy GRAVEL with some silt and cobbles. Rough drilling. Strata is not producing much water.	
	490	Gray, silty, fine SAND. Some heaving.	
	500		

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LEGEND

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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 11 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Strata	Depth	Description	Well Compl..
		Gray, slightly silty, fine SAND.	
	510		
	520		
	530	@ 530' increase in gravels.	
	540	@ 540' gray, slightly silty SAND with scattered gravel.	
	550		

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LEGEND

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Strata

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method:
Elevation: 428'
Boring Diameter:
Drilling Contractor:
Page 12 of 12 Boring No. TW-6

Water Level					
Date					
Time					

Depth	Description	Well Compl..
560	Gray, slightly silty SAND with scattered gravel.	
570	Gray GRAVEL with some sand and trace silt.	
580		
	Gray, silty SAND with some scattered gravel and cobbles. (Lodgement Till) Able to drill open hole.	
590	Purple, andesitic TILL and weathered BEDROCK. Black BASALT (BEDROCK).	
	BOH @ 590'	
600		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
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- Peat
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 1 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Yellow-brown, gravelly SAND with trace silt and some cobbles.	
		Yellow-brown, gravelly SAND with cobbles and some silt.	
	10	Yellow-brown, gravelly SAND with some cobbles and some silt.	Surface Seal
	20	Yellow-brown, gravelly SAND with some silt and trace cobbles.	
	30	Yellow-brown, fine to coarse SAND with gravel and some silt.	20" Steel Casing
	40		
	50	Yellow-brown, gravelly SAND with trace of silt.	

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 2 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Yellow-brown, fine to coarse SAND with gravel and silt.	20" Steel Casing
	60	Yellow-brown, gravelly SAND with some silt.	
		Yellow-brown, gravelly SAND with some silt and some cobbles.	
	70	Yellow-brown, gravelly SAND with some cobbles and some silt.	
	80	Yellow-brown, sandy GRAVEL with cobbles and some silt.	
	90		
		Yellow-brown, sandy GRAVEL with some cobbles and trace silt.	
	100		

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Drilling Log

LEGEND

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Project Name: Snoqualmie North Well Field
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Drilling Method: Cable Tool
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Elevation: 436.55'
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Drilling Contractor: Armstrong Drilling, Inc.
Page 3 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	110	Yellow-brown, sandy GRAVEL with some cobbles and trace silt. Yellow-brown, sandy GRAVEL with some silt and some cobbles.	20" Steel Casing
	120	Gray-brown, gravelly SAND.	
	130	Gray, gravelly SAND with trace silt and some cobbles. Yellow-brown and gray, gravelly SAND with some cobbles and some silt.	
	140	Gray-brown, gravelly SAND with some silt and a few cobbles.	
	150		

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Drilling Log

LEGEND

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Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 4 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	160	Gray-brown, gravelly SAND with some silt.	20" Steel Casing
	170	Gravelly SAND with some cobbles grading into sandy GRAVEL with cobbles.	
	180	Dark gray, sandy GRAVEL with cobbles.	
	190	Gray-brown, gravelly SAND with some silt and trace cobbles.	
	200	Dark gray, gravelly SAND with some silt and trace cobbles.	
		Dark gray, gravelly SAND with some cobbles.	

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LEGEND

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Project Name: Snoqualmie North Well Field
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Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 5 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	210	Gray-brown, gravelly SAND with some silt. Siltier lenses present.	20" Steel Casing
	220		
	230		
	240	Gray-brown, gravelly, silty SAND.	
	250	Brown, sandy GRAVEL to silty SAND with gravel.	

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Drilling Log

LEGEND

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Drilling Method: Cable Tool
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Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 6 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Brown, sandy GRAVEL with cobbles and trace silt..	20" Steel Casing
	260	Some heaving 260'-270'.	
	270	Gray, cobbly, gravelly, very silty SAND (till-like); hard drilling.	
	280	Gray, gravelly SAND with silt. Able to drive and bail without drilling.	
	290		
	300		

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LEGEND

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Strata

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Page 7 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Depth	Description	Well Compl..
310	Gray, gravelly SAND with silt. Able to drive and bail without drilling.	20" Steel Casing
320		
330	Gray, cobbly, sandy, silty GRAVEL. Very dense, hard drilling. "Till-like." Top 16" Casing 328'-4"	
340	Top Cement Grout 16" to 20" @ 340'	16" Steel Casing
350		

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Page 8 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Depth	Description	Well Compl..
360	Gray, cobbly, sandy, silty GRAVEL. Very dense, hard drilling. "Till-like."	16" Steel Casing
370		
	Gray, very silty SAND.	
380	Gray, cobbly, sandy, silty GRAVEL. Very dense, hard drilling.	
390		
	@ 394' large cobbles/boulders	
400		

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LEGEND

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Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	410	Gray, silty, fine SAND. @ 405'-409' large cobbles.	
	420	Gray, sandy SILT. Bottom 20" Casing @ 415'	
	430	Gray, clay-rich, sandy SILT with lenses of fine sand.	
	440		16" Steel Casing
	450		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Strata

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Depth	Description	Well Compl..
460	Gray, clay-rich, sandy SILT with lenses of fine sand.	16" Steel Casing
470		
480	Gray, clayey SILT with scattered lenses of fine sand, trace peat, local gravelly zones.	
490		
500		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 11 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	510	Gray, clayey SILT with scattered lenses of fine sand, trace peat, local gravelly zones. Top 10" Riser Flanged to 12"	10" Riser
	520	Gray, cobbly GRAVEL with silt/clay matrix. Top Screen 516'-7"	
	530	Gray, gravelly, fine SAND with silt; coarsens with depth. Bottom 16" Casing @ 527'-7"	10" Pipe Size, 50 Slot, Stainless Steel Screen
	540	Gray, cobbly, sandy GRAVEL with thin lenses of silty, fine sand.	8-12 Colorado Sand
	550		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Strata

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 12 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Depth	Description	Well Compl..
	Gray, cobbly, sandy GRAVEL with thin lenses of silty, fine sand.	
	"Till-like", gravelly, silty SAND (hard silt matrix).	
560	Very hard, gravelly SAND with large cobbles.	Top Tailpipe 556'-5" Cement Plug 558'-564'
	Maroon, gray-green, and black, basaltic flows/flow breccia BEDROCK.	
	BOH @ 564'	
570		
580		
590		
600		

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Drilling Log

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	1 of 9

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 502.19'
Water Level Elevation: 244' bgs
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~500'
Date Start/Finish: November 2000, July 2001
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/6"	Graphic Symbol	DESCRIPTION
5		12" and 16" diameter steel casing inside 20" diameter casing 0-409' bgs				**Vashon Recessional Deltaic Deposits "Tokul Creek Delta"**
5						Brown, fine to coarse SAND with fine to coarse gravel and silt.
10						With cobbles (very hard drilling).
15						Brown gravel and cobbles with sand and silt.
20						
25						Brown, fine to coarse SAND with gravel and occasional cobbles (drilling easier).
30						With silt.
35						With cobbles and boulders at 36'.
40						Cobble zone at 42' (hard drilling).
45						Gravel and cobbles with fine to coarse sand.
50						Brown, fine to coarse SAND and GRAVEL with cobbles and silt.
55						
60						Brown, fine to coarse SAND with gravel, cobbles, and silt.
65						
70						
75						Becoming brown-gray.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by: DJB
Approved by:

NWWELL 01005.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	2 of 9

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing): 502.19'
Surface Elevation (ft): ~500'
Water Level Elevation: 244' bgs
Date Start/Finish: November 2000,July 2001
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hole Diameter (in): Variable
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
85						
90						Brown-gray, fine to coarse SAND with fine to coarse gravel, cobbles, and silt.
95						Becoming brown.
100						
105						
110						
115						Increase in silt content at 114'. Brown, fine to coarse SAND with gravel and silt.
120		12" and 16" diameter steel casing inside 20" diameter casing 0-409' bgs				
125						Brown, fine to coarse SAND with silt, gravel, and cobbles.
130						Brown, SILTY fine to coarse SAND with fine to coarse gravel and occasional cobbles (increase in gravel content).
135						
140						Increase in cobble content.
145						
150						
155						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:

NWWELL 01005.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	3 of 9

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 502.19'
Water Level Elevation: 244' bgs
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~500'
Date Start/Finish: November 2000, July 2001
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Brown, SILTY fine to coarse SAND with gravel.
165						
170						
						Becoming gray at 173'.
175						Gray, SILTY fine to coarse SAND with fine to coarse gravel and cobbles.
180						Gray-brown, fine to coarse SAND with fine to coarse gravel and cobbles.
185						Becoming brown with silt.
190						Gray-brown, fine to coarse SAND with fine to coarse gravel, occasional cobbles and trace silt.
195						Becoming brown.
						Becoming gray-brown. Less silt content.
200		12" and 16" diameter steel casing inside 20" diameter casing 0-409' bgs				
205						Increase in silt content at 204'.
						Becoming coarser at 208'.
210						
215						
220						
225						
						Brown, unsorted, SILTY fine to coarse SAND with gravel. Brown, fine to coarse SAND with gravel and cobbles.
230						
235						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

Water Level (08/14/01)

Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	4 of 9

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 502.19'
Water Level Elevation: 244' bgs
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~500'
Date Start/Finish: November 2000,July 2001
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
245	▼	12" and 16" diameter steel casing inside 20" diameter casing 0-409' bgs				Gray-brown, fine to medium SAND with gravel and cobbles.
250						Consolidated peat layer; C^{14} dating > 41,240 bp.
255	▽					
260						Cobble zone at 261' and 265'.
265						
270						
275						Becoming gray at 274'. Cobble zone at 276'.
280						
285						
290						
295						Gray, SILTY fine to medium SAND with trace gravel.
300						
305						Grading into SILTY fine SAND with trace gravel.
310						Occasional cobbles at 310'.
315						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	5 of 9

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing): 502.19'
Surface Elevation (ft): ~500'
Water Level Elevation: 244' bgs
Date Start/Finish: November 2000,July 2001
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hole Diameter (in): Variable
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
325						
330						
335						
340						
345						
350						
355						
360		12" and 16" diameter steel casing inside 20" diameter casing 0-409' bgs				**Undifferentiated Olympia/pre-Olympia Lacustrine Deposits** Gray, CLAYEY SILT to CLAYEY fine SAND.
365						
370						
375						Harder drilling below 373'.
380						
385						
390						
395						Wood fragment at 395'. C^{14} dating > 40,380 bp.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by: DJB
Approved by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	6 of 9

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing): 502.19'
Surface Elevation (ft): ~500'
Water Level Elevation: 244' bgs
Date Start/Finish: November 2000,July 2001
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hole Diameter (in): Variable
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
405		12" and 16" diameter steel casing inside 20" diameter casing 0-409' bgs				Containing trace gravel and coarse sand.
410		12" diameter steel casing inside 16" diameter steel casing 409'-557' bgs				
415						
420						
425						
430						
435						
440						
445						
450						As above.
455						
460						Gray, SILTY fine SAND. Coarsening to fine to medium SAND with depth, trace gravel.
465						Boulder at 465'.
470						Gray, SILTY SAND and GRAVEL with cobbles and interbedded silt layers.
475						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by: DJB
Approved by:

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Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	7 of 9

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing): 502.19'
Surface Elevation (ft): ~500'
Water Level Elevation: 244' bgs
Date Start/Finish: November 2000,July 2001
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hole Diameter (in): Variable
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
485						Gray, SILTY fine SAND with trace gravel and cobbles.
490						**Undifferentiated Olympia/pre-Olympia Fine-Grained Fluvial Deposits**
495						Gray, fine SAND with silt, trace gravel.
500						
505						
510						
515		12" diameter steel casing inside 16" diameter steel casing 409'-557' bgs				
520						
525						
530						
535						
540						As above.
545						
550						
555		12" diameter steel casing 0-627' bgs				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by: DJB
Approved by:

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Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	8 of 9

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 502.19'
Water Level Elevation: 244' bgs
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~500'
Date Start/Finish: November 2000,July 2001
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
565						Gray, SILTY fine to medium SAND with interbedded SILT.
570						
575						Gray, SILTY fine SAND.
580						
585						
590		12" diameter steel casing 0-627' bgs				
595						
600						**Undifferentiated Olympia/pre-Olympia Coarse-Grained Fluvial Deposits**
605						Gray SAND and GRAVEL with cobbles and trace silt.
610		8" diameter 30-slot stainless steel well screen 609'-631'				
615						
620						
625						At 727.5', cable tool refusal; change to dual rotary drill rig.
630		No filter pack 8" diameter 50-slot stainless steel well screen 631'-694'				As above.
635						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by: DJB
Approved by:

NWWELL 01005.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH01005C	PW-8	9 of 9

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing): 502.19'
Surface Elevation (ft): ~500'
Water Level Elevation: 244' bgs
Date Start/Finish: November 2000,July 2001
Drilling/Equipment: Hokkaido/Cable Tool and Dual Rotary
Hole Diameter (in): Variable
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
645						
650						
655		8" diameter 50-slot stainless steel well screen 631'-694'				
660						
665						
670		No filter pack				
675						Gray, fine to coarse SAND with gravel and cobbles, trace silt.
680						
685						
690						
695		Tailpipe 694'-700'				**Tertiary Bedrock** Black BASALT.
700						
705						
710						Boring terminated at 710 feet on July 2001 For detailed well completion schematic see Figure 10.
715						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by: DJB
Approved by:

NWWELL 01005.GPJ BORING.GDT 1/8/04

EXPLORATION BORING LOG

Number BH-1

SEDIMENT DESCRIPTION ELEVATION 423'	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
1" Gravels (Fill)				
Wet, dark brown, silty, fine to medium SAND. (Fill)				
Moist, brown to gray SILT. (Qa)	5	I		37 ▲ ①
Moist to wet, gray SILT. (Qa)	10	I		18 ▲ ①
Moist, gray, fine SAND. (Qvrs)	15	I		29 ▲ ①
Moist, gray, stratified, coarse SILT to very fine SAND. (Qvrs)	20	I		47 ▲ ①
BOH @ 21-1/2'				
I ① Dames & Moore California Modified Ring Sampler (140 lb. hammer)	25			
	30			

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By CJK

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number BH-3

SEDIMENT DESCRIPTION ELEVATION 423'	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
1/4" to 1" Gravels (Fill)			
Moist, dark brown, silty, fine to coarse SAND with gravel. (Fill) Limited sample return. Increase in gravel content below 9'.	5		65/ 12" ▲
Moist, tan and brown, mottled, silty, gravelly, fine to coarse SAND. (Fill)	10		▲ 31
Moist, brown, fine to medium SAND, minor gravel upper 6" of sample. (Qvrs)	15	*	19 ▲ ①
Moist, brown, fine to medium SAND. (Qvrs)	20		18 ▲ ①
BOH @ 21-1/2'	25		
	30		

I Split spoon sampler

I ① Dames & Moore California Modified Ring Sampler (140 lb. hammer)

* No sample return with split spoon 15' to 16-1/2'; rock in driveshoe. Re-sampled with Dames & Moore Ring Sampler.

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By CJK

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number BH-4

SEDIMENT DESCRIPTION ELEVATION 422'	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
Wet, black, odoriferous, organic SAND AND SILT with minor plastic debris. (Fill)				
Moist, brown, mottled, silty, fine to coarse SAND. (Fill)	5			6 ▲
Wet, brown, mottled, silty, fine to coarse SAND with gravel and organics. (Fill?)	10	②		53/ 12" ▲ ①
Moist, brown, fine to medium SAND. (Qvrs)	15			17 ▲ ①
Moist, brown, fine to medium SAND with minor gravel and organics. (Qvrs)	20	②		51/ 12" ▲ ①
Moist, brown, fine to medium SAND. (Qvrs)	25			20 ▲ ①
BOH @ 26-1/2'	30			

I Split spoon sampler

I ① Dames & Moore California Modified Ring Sampler (140 lb. hammer)

② Sample sloughed out of rings; placed in bags. No undisturbed sample recovered.

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number BH-5

SEDIMENT DESCRIPTION ELEVATION 435'	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
Topsoil.				
Moist, brown, oxidized, sandy GRAVEL to gravelly SAND. (Qvrg)	5			▲ 34
Moist, brown, sandy GRAVEL. (Qvrg)	10			
Moist, brown, fine to medium SAND. (Qvrs)				19 ▲
Moist, brown, fine to medium SAND with minor gravel. (Limited sample return with ring sample; rock in drive-shoe) (Qvrs)	15			38 ▲ ①
Moist, brown, fine to medium SAND. (Qvrs)	20			27 ▲ ①
Moist, brown, fine to medium SAND. (Qvrs)	25			19 ▲ ①
BOH @ 26-1/2'	30			

I Split spoon sampler

I ① Dames & Moore California Modified Ring Sampler (140 lb. hammer)

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By GSK

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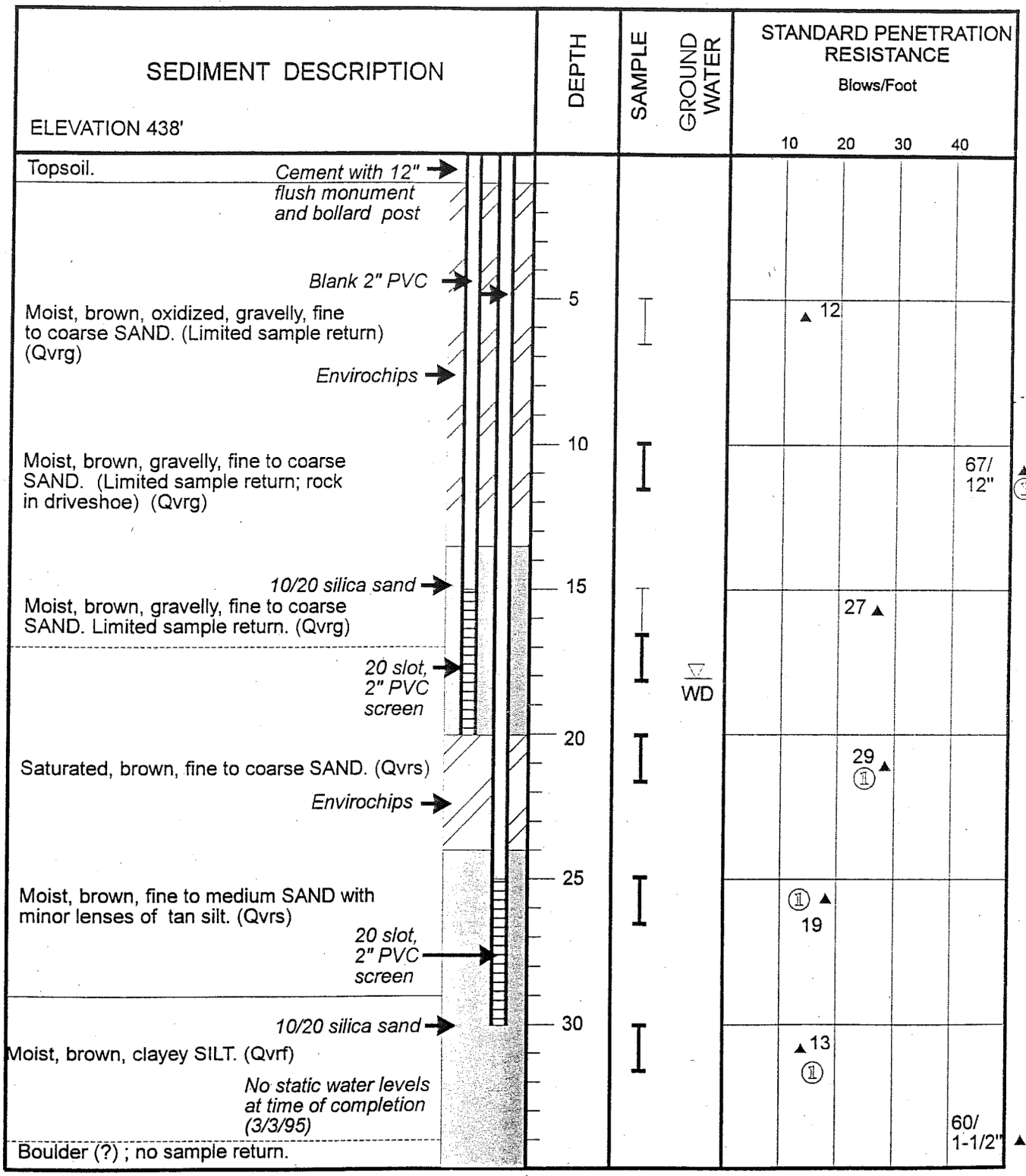
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number OBW-4 (BH-6) Page 1 of 2



Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number OBW-4 (BH-6) Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
BOH @ 35' Refusal				
Split spoon sampler	40			
① Dames & Moore California Modified Ring Sampler (140 lb. hammer)				
WD Ground water encountered while drilling	45			
DOE Well ID #ABN-114				

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

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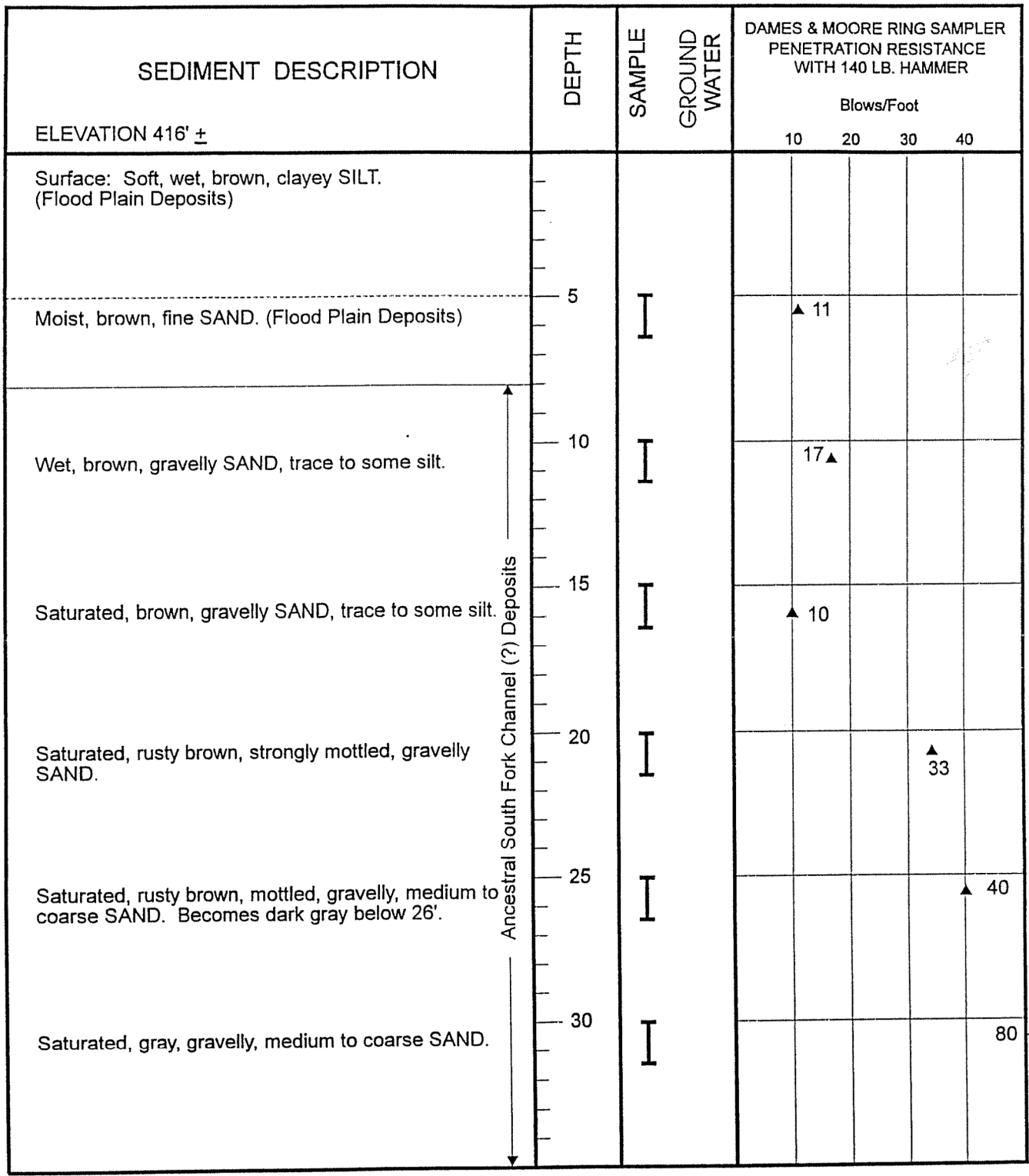
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number BH-7 Page 1 of 2



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Snoqualmie Waste Water Treatment Plant - Pump Station
Snoqualmie, Washington
Project No. G94263B
March 1995

EXPLORATION BORING LOG

Number BH-7 Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	DAMES & MOORE RING SAMPLER PENETRATION RESISTANCE WITH 140 LB. HAMMER Blows/Foot 10 20 30 40
Saturated, as above. (Ancestral South Fork Channel (?) Deposits)		I	▲ 35
Saturated, as above.	40	I	50 ▲
Saturated, as above with some silt.	45	I	66 ▲
Wet, gray, clayey SILT, trace heaved sand in upper part of sample. (Lacustrine (?) Deposits)	50	I	8 ▲
BOH @ 51-1/2'	55		
I Dames & Moore California Modified Ring Sampler (140 lb. hammer)	60		
	65		

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Reviewed By CJK

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Snoqualmie Waste Water Treatment Plant - Pump Station
Snoqualmie, Washington
Project No. G94263B
March 1995

EXPLORATION BORING LOG

Number OBW-1

SEDIMENT DESCRIPTION ELEVATION 423.6'	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
Moist, brown, silty, fine SAND. (Fill?) Rocks in tip affected blow counts.	5			50/ 5-1/2"
No recovery. Rocks in tip. Driller reported change at approximately 7-1/2' to 8' to silty material.				
No recovery. Rocks in tip.	10		WD	
Damp, gray SILT with sand, gravel. (Lodgement Till) Approximate 3" recovery.				50/ 3" ①
Damp, gray, sandy SILT to silty SAND with gravel. (Lodgement Till) Approximate 6" recovery.	15			50/ 6" ①
Damp, gray, silty SAND with gravel. (Lodgement Till) Approximate 6" recovery.				50/ 5" ①
Saturated, brown SAND AND GRAVEL with silt. (Qva)	20			50/ 4" ①
BOH @ 23' Note: Probable bedrock at approximately 23'. Twisted off auger in hole. Hole abandoned.	25			
WD = while drilling				
Split spoon sampler	30			
① Dames & Moore California Modified Ring Sampler (140 lb. hammer)				

Qvt

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Reviewed By GJK

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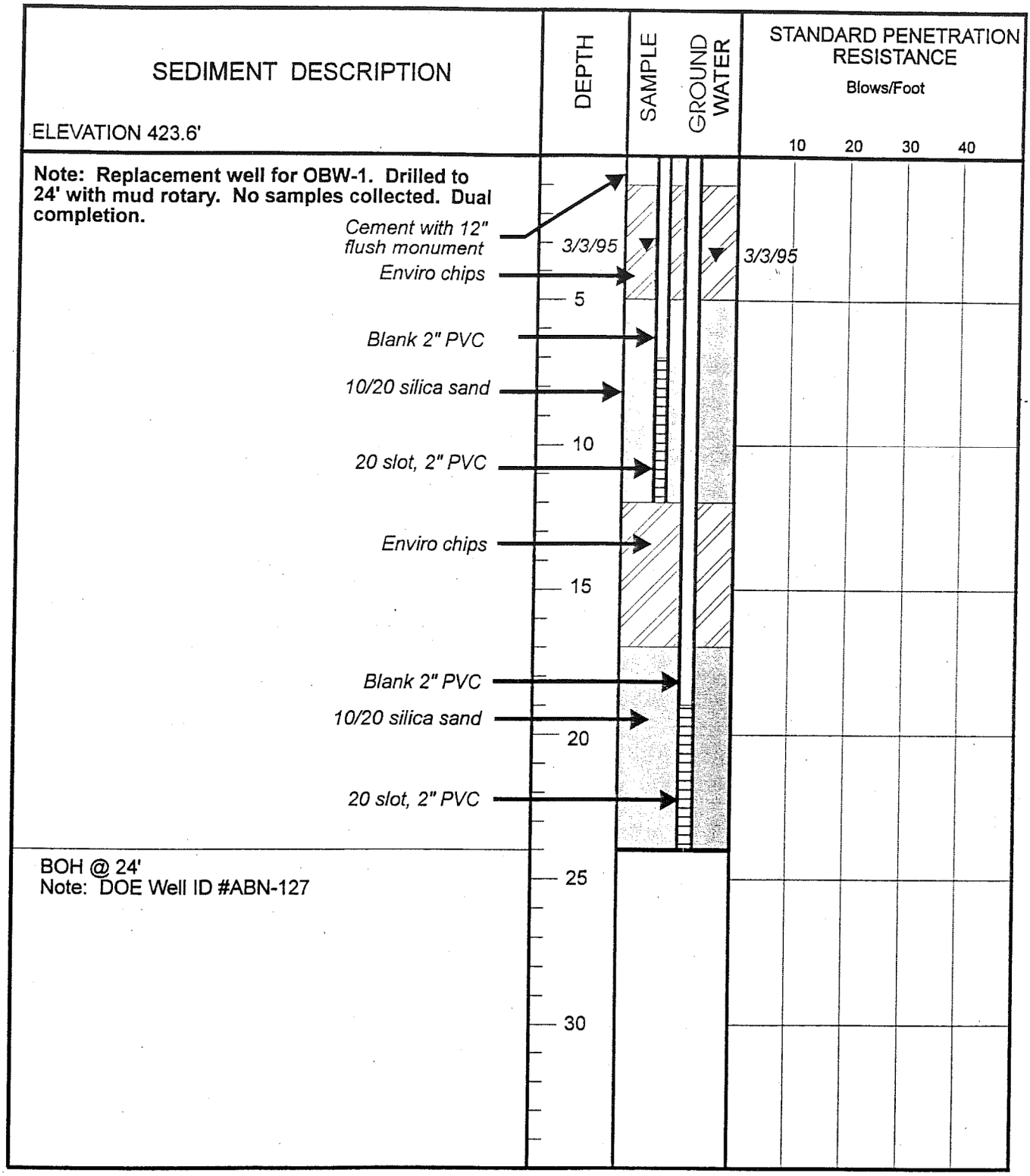
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-1B



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Reviewed By CTK

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Snoqualmie Waste Water Treatment Plant
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Project No. W94236A
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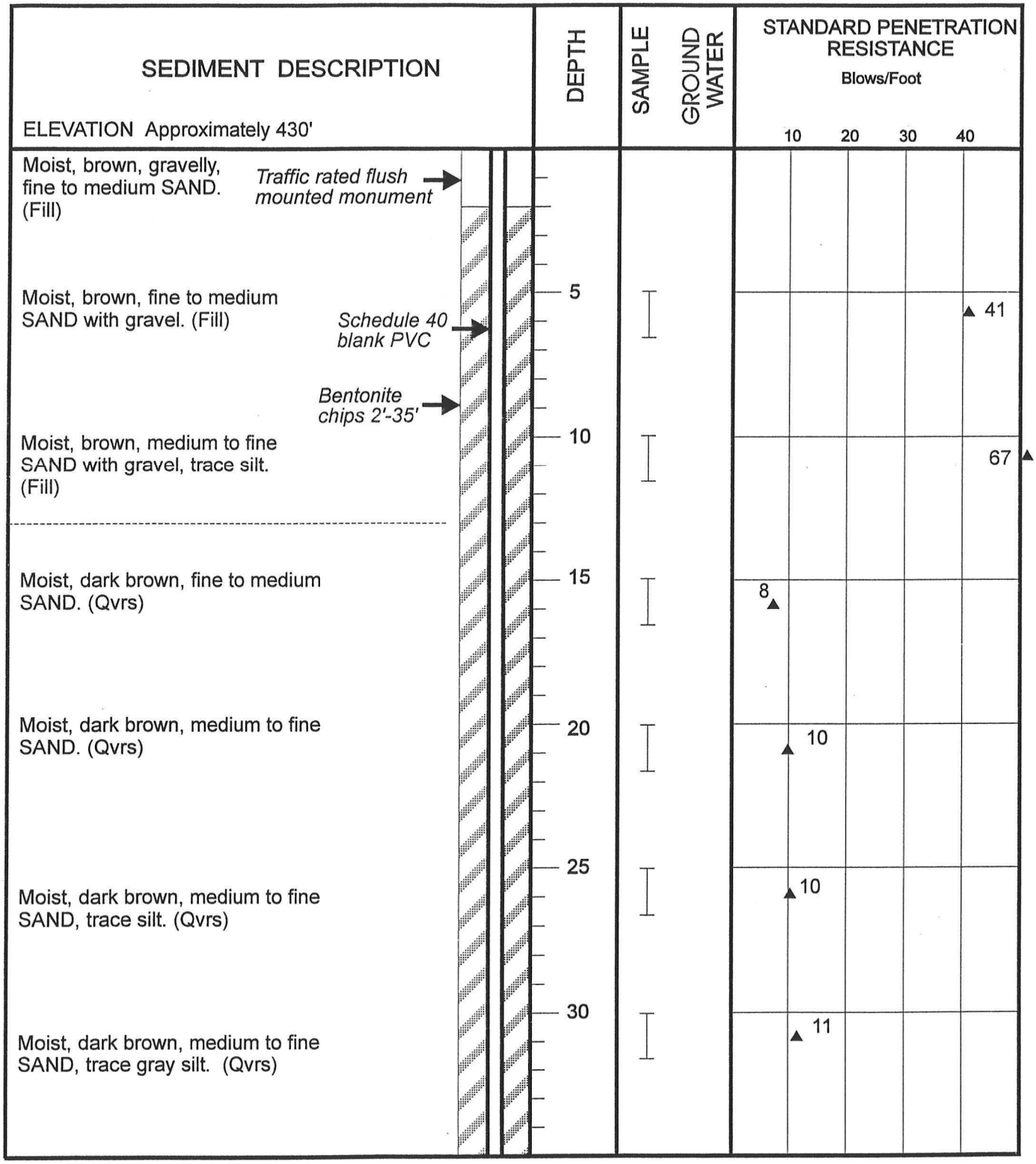
RNM

EXPLORATION BORING LOG

Number OBW-2A Page 1 of 2



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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94263C
July 1996

EXPLORATION BORING LOG

Number OBW-2A Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE / GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot (10 20 30 40)
Moist, dark brown, medium to fine SAND, trace gray silt. (Qvrs)			▲12
Colorado silica sand 35' to 51-1/2' →	40		
Moist, dark brown, medium to fine SAND, trace silt. (Qvrs)			▲12
0.020 Slot Schedule 40 screen 40'-50' →			
Moist, dark brown, medium to fine SAND, trace gray silt. (Qvrs)	45	▼ 07/27/96	▲12
Saturated, brown, medium to fine SAND with gray silt. (Qvrs)	50		▲14
BOH @ 51-1/2' Note: DOE Well ID #ACJ290 replacement for OBW-2 DOE Well ID #ABN-126 which was abandoned.	55		
	60		
	65		

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Snoqualmie Waste Water Treatment Plant
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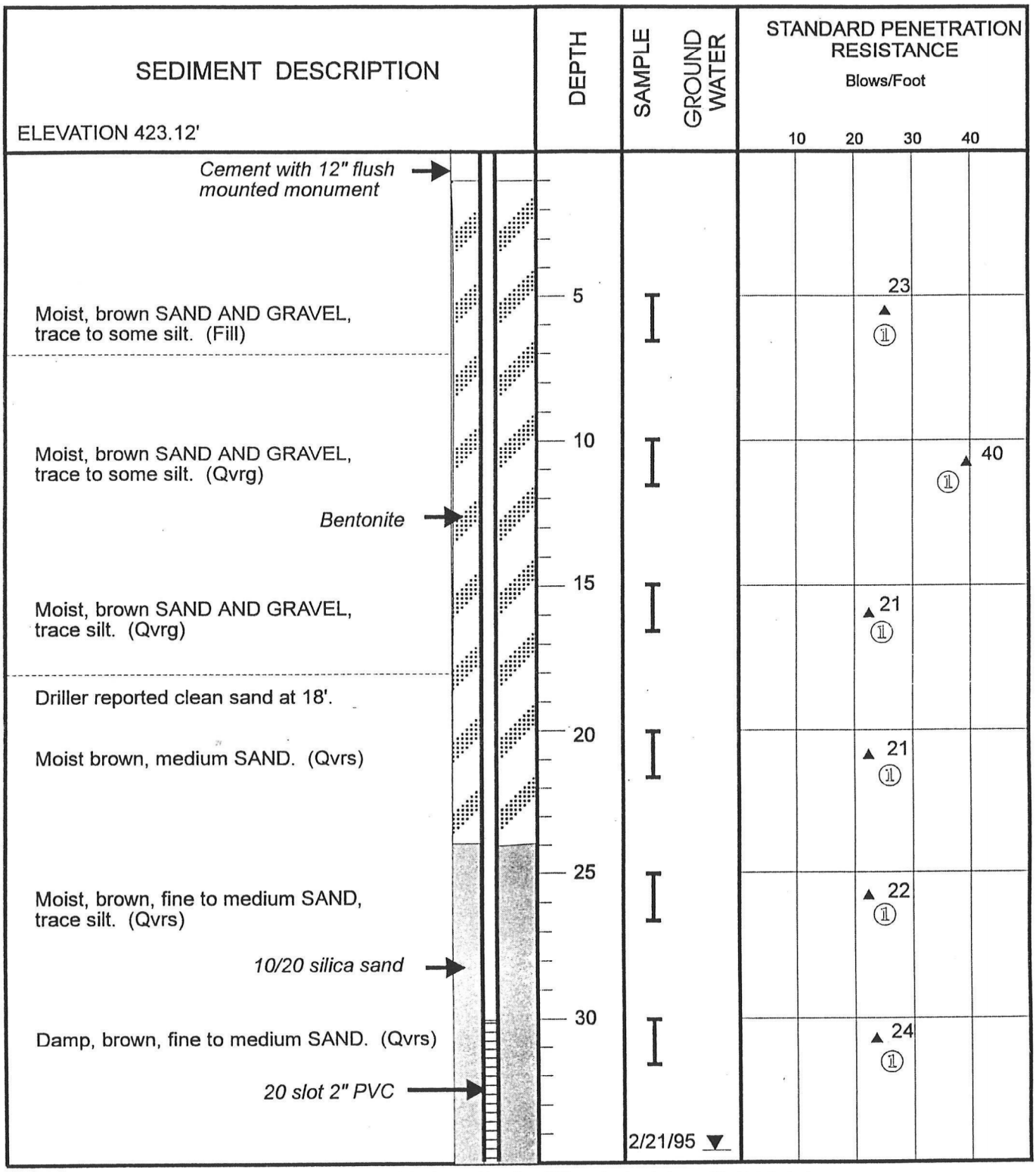
Project No. W94263C
July 1996

EXPLORATION BORING LOG

Number OBW-2 Page 1 of 2



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Reviewed By CSK

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-2 Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot (10 20 30 40)
Wet, brown, fine to medium SAND. (Qvrs)				24
Wet, brown, fine to medium SAND to silty, very fine SAND. (Qvrs)	40			16
Saturated, brown and gray, clayey SILT with minor very thin lenses of very fine sand, occasional rootlets. (Qvrf)	45			10
@ 47' gravelly material; hard drilling.				
Moist, gray, silty, sandy GRAVEL. (Lodgement Till/Qvt)	50			75
10/20 silica sand →				
Moist, gray, silty, sandy GRAVEL. Approximate 3" recovery.	55			96
Moist, gray, gravelly, silty SAND. (Lodgement Till/Qvt) Gravel zone at approximately 58'.				
Moist, gray, gravelly, silty SAND. (Lodgment Till/Qvt)	60			55/6"
Black and green bedrock.	65			50/2"

BOH @ 66-1/2'
Note: DOE Well ID #ABN-126

I Split spoon sampler

I ① Dames & Moore California Modified Ring Sampler (140 lb. hammer)

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Snoqualmie Waste Water Treatment Plant
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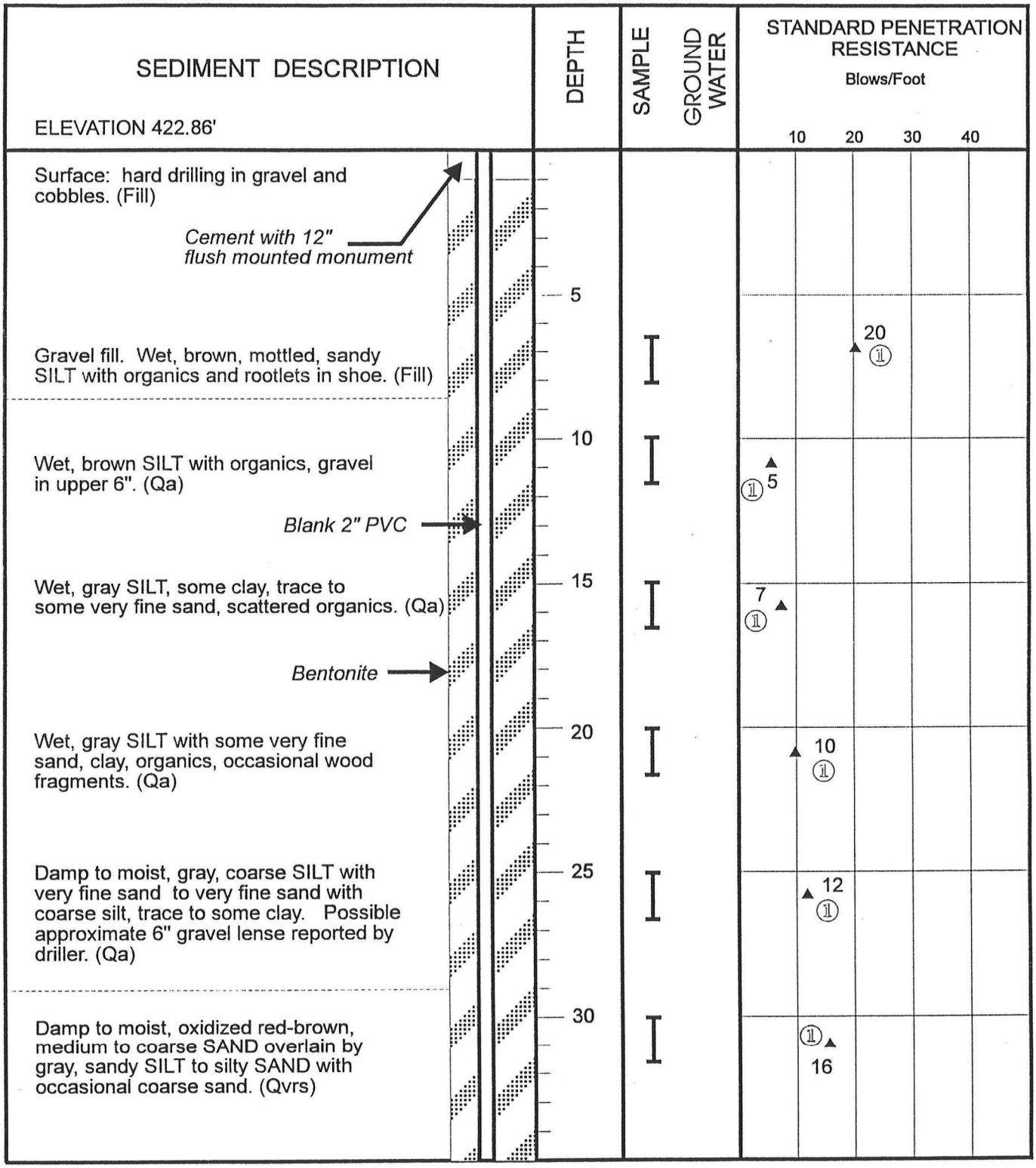
EXPLORATION BORING LOG

Number OBW-3 Page 1 of 3



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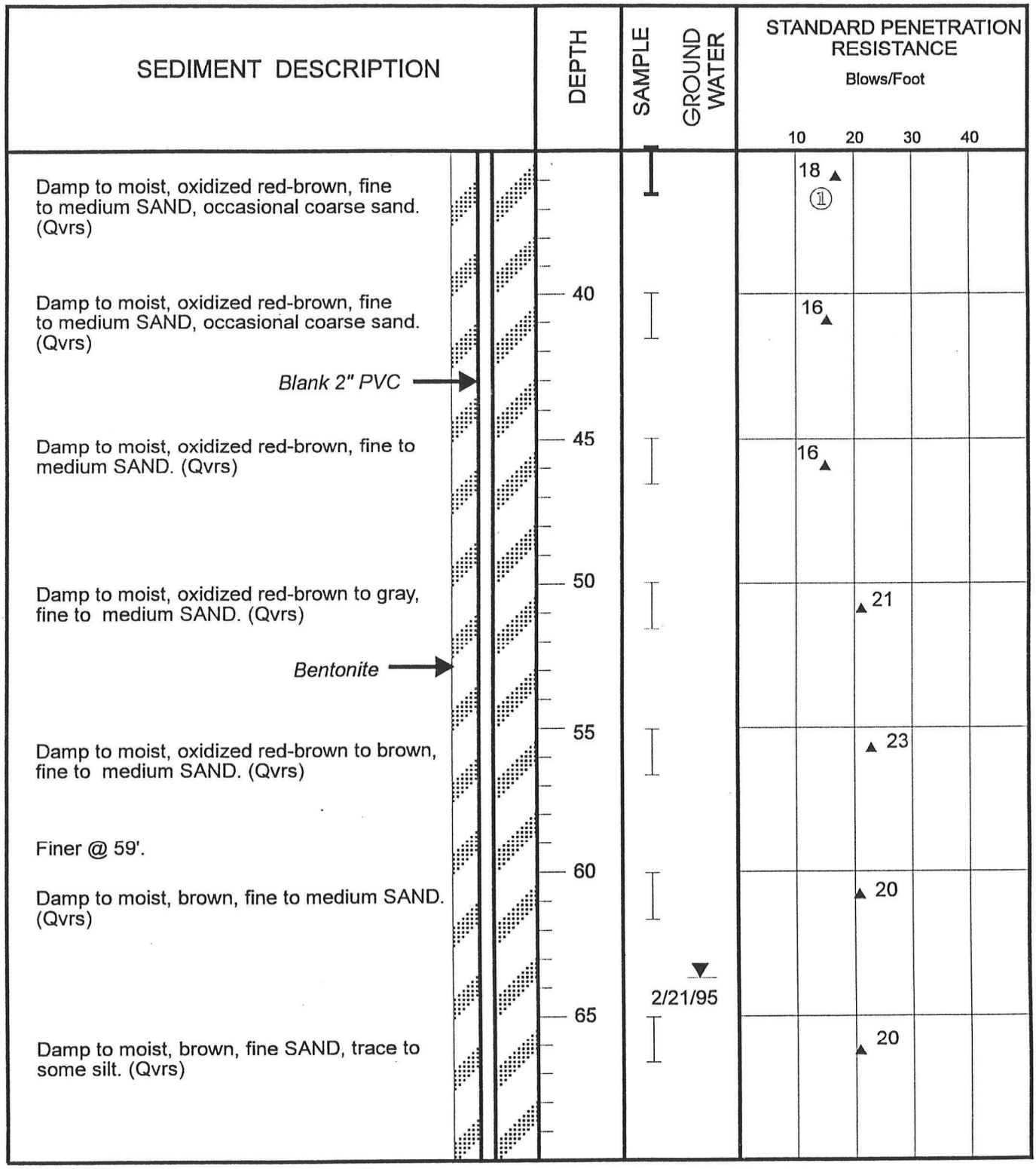
EXPLORATION BORING LOG

Number OBW-3 Page 2 of 3



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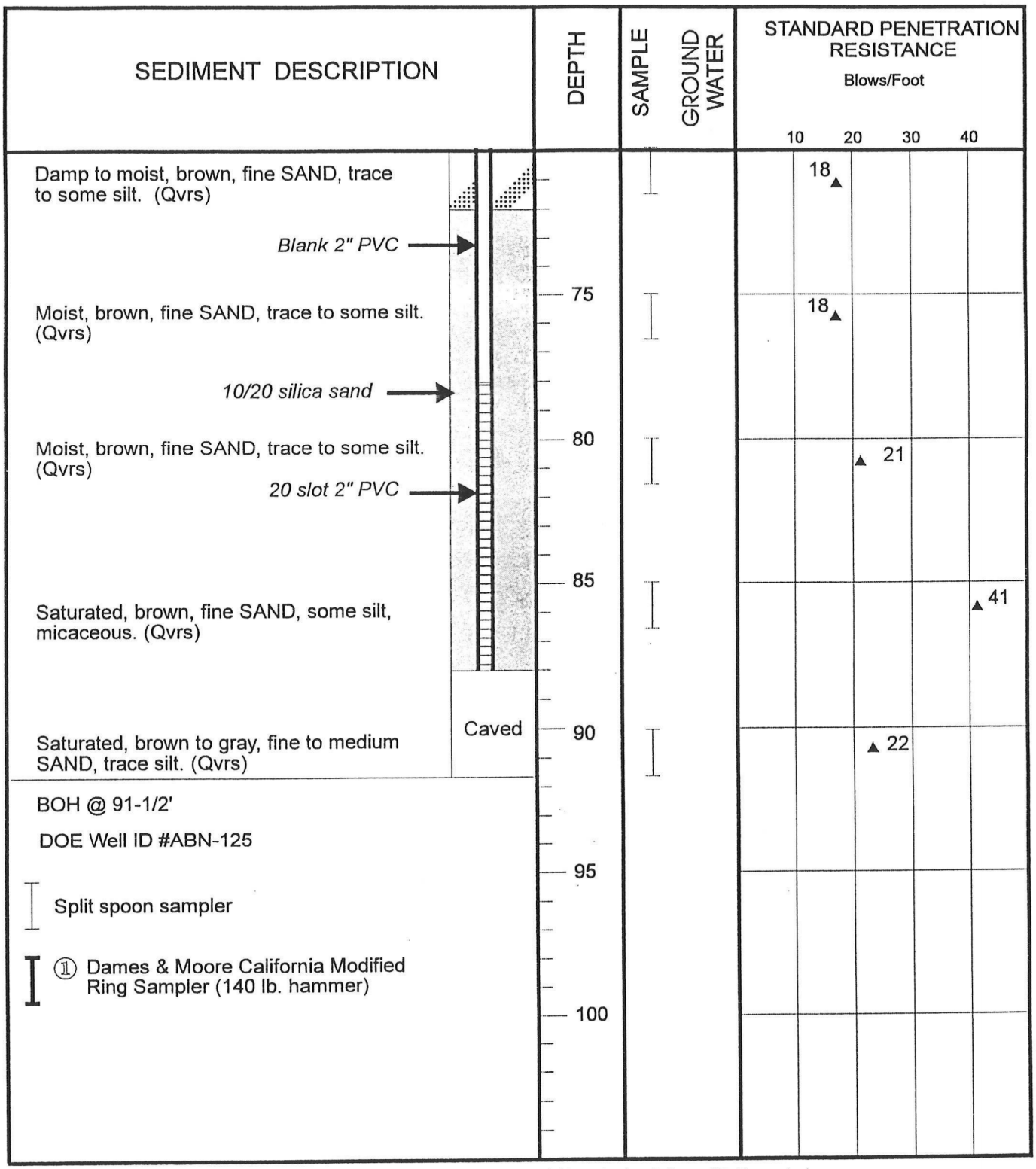
EXPLORATION BORING LOG

Number OBW-3 Page 3 of 3



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Snoqualmie Waste Water Treatment Plant
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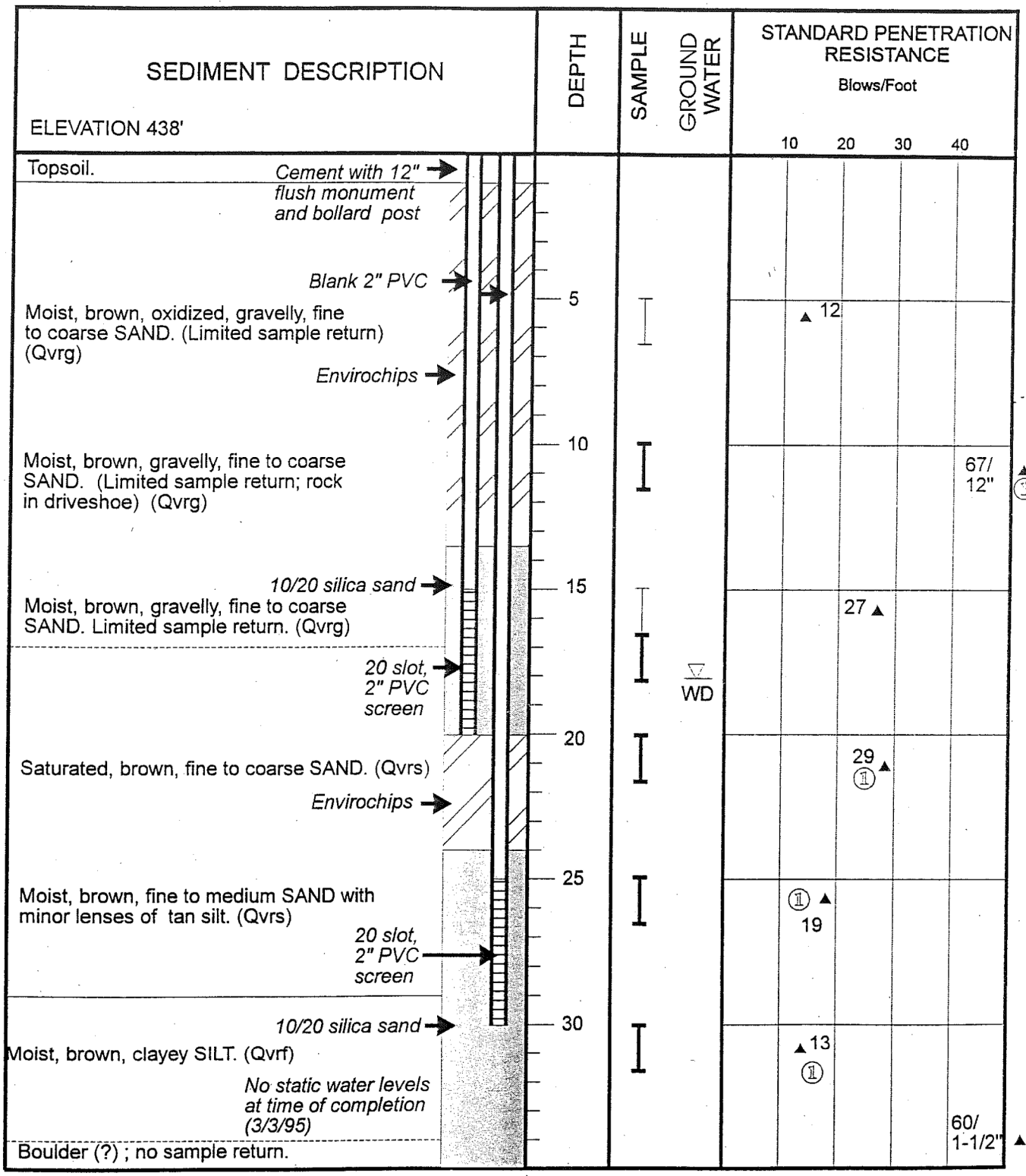
EXPLORATION BORING LOG

Number OBW-4 (BH-6) Page 1 of 2



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Snoqualmie Waste Water Treatment Plant
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Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number OBW-4 (BH-6) Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
BOH @ 35' Refusal				
Split spoon sampler	40			
① Dames & Moore California Modified Ring Sampler (140 lb. hammer)				
WD Ground water encountered while drilling	45			
DOE Well ID #ABN-114				

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number OBW-5

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	WELL COMPLETION	STANDARD PENETRATION RESISTANCE Blows/Foot (10 20 30 40)
Cement w/12" Flush Monument *Envirochips (Bentonite)* Wet, brown, mottled, clayey SILT with some fine sand. Cobbles at 6'.	5			3/21/95 ▼ 15 ▲
2" PVC Blank Moist, gray, cobbly, silty, gravelly SAND. Large cobbles at 13-1/2' at contact. (Subglacial (?) Deposits) *20 Slot 2" PVC Screen*	10			50/5"
Moist, gray, gravelly, silty SAND. (Lodgement Till?/Qvt)) *10/20 Silica Sand*	15			50/6"
No sample.	20			50/1"
BOH @ 21-1/2' Note: Bentonite chips fell back into well; screened 10' to 15'; bottom 2' plugged. DOE Well ID #ABN-109	25 30			

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94263A
March 1995

EXPLORATION BORING LOG

Number B-1 Page 1 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE (Split Spoon Sampler) Blows/Foot 10 20 30 40
Wet, brown cobbles. (Fill)				
Moist, brown, slightly silty, fine SAND with minor organics *Flood Plain Deposits*	5			4
Moist, brown, gravelly, fine to coarse SAND.	10			23
Moist to wet, brown, fine to coarse SAND with minor gravel.	15			8
Saturated, brown, highly oxidized in areas, fine to coarse SAND with gravel.	20		WD	16
8" log at 23-1/2'; near refusal. Saturated, brown, fine to coarse SAND with minor gravel.	25			21
Saturated, brown, oxidized in zones, fine to medium SAND. Containing minor pieces of wood.	30			7

Ancestral South Fork Channel (?) Deposits

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Snoqualmie Pump Station
Snoqualmie, Washington
Project No. G95125A
June 6, 1995

EXPLORATION BORING LOG

Number B-1 Page 2 of 2

SEDIMENT DESCRIPTION		DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE (Split Spoon Sampler) Blows/Foot 10 20 30 40
Saturated, brown, oxidized in zones, fine to medium SAND grading into fine to coarse SAND. Containing minor pieces of wood and organics.	*Ancestral South Fork Channel (?) Deposits*				▲ 21
Saturated, brown, fine to coarse SAND.		40			▲ 14
Saturated, brown, fine to coarse SAND.		45			▲ 21
Saturated, brown, fine to coarse SAND.		50			▲ 4
Saturated, blue-gray, silty CLAY. Containing occasional very thin beds of organics.	*Lacuatrine Deposits*				
Saturated, blue-gray, silty CLAY.		55			▲ 3
Saturated, blue-gray, silty CLAY.		60			▲ 2
Saturated, blue-gray, silty CLAY.		65			▲ 0-Pushed
BOH @ 66-1/2' Note: Water added 25' to 50' due to heaving sands. WD = water encountered while drilling					

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Snoqualmie Pump Station
Snoqualmie, Washington
Project No. G95125A
June 6, 1995

EXPLORATION BORING LOG

Number B-2 Page 1 of 2

SEDIMENT DESCRIPTION		DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE (Split Spoon Sampler) Blows/Foot 10 20 30 40
Wet, brown oxidized GRAVEL AND COBBLES. (Fill)					
Moist, brown, slightly silty, fine SAND with occasional gravel. (Limited sample return)	*Flood Plain Deposits*	5			▲ 4*
Moist, brown, slightly silty, fine SAND with occasional gravel. (Limited sample return)		10			6*▲
Moist, brown, oxidized, fine to medium SAND with occasional gravel.	*Ancestral South Fork Channel (?) Deposits*	15		▽ WD	15▲
Saturated, brown-black, locally silty, fine to medium SAND, slightly micaceous and containing minor pieces of wood.		20			▲ 3
Saturated, brown and gray in zones, locally oxidized, fine to medium SAND, slightly micaceous and containing very thin beds of organics.		25			9▲
Saturated, brown, fine to coarse SAND grading into gray, fine to medium SAND.		30			▲ 14

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Snoqualmie Pump Station
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June 6, 1995

EXPLORATION BORING LOG

Number B-2 Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE (Split Spoon Sampler) Blows/Foot 10 20 30 40
Saturated, brown, highly oxidized in zones, fine to coarse SAND. *Ancestral South Fork Channel (?) Deposits*				17 ▲
Saturated, brown, fine to coarse SAND containing minor organics.	40			18 ▲
Saturated, blue-gray, silty CLAY. *Lacustrine Deposits*	45			▲ 2
BOH @ 46-1/2' Note: Water added 25' to 45' due to heaving sands.				
WD = water encountered while drilling * = rock in driveshoe	50			
	55			
	60			
	65			

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Snoqualmie Pump Station
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Project No. G95125A
June 6, 1995

EXPLORATION BORING LOG

Number B-3 Page 1 of 2

SEDIMENT DESCRIPTION		DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE (Split Spoon Sampler) Blows/Foot 10 20 30 40
Wet, brown to black, organic, gravelly SAND. (Topsoil)					
Moist, brown, slightly silty, fine SAND with minor organics.	*Flood Plain Deposits*	5			0 - Pushed
Moist, brown, slightly silty, fine SAND with minor organics.		10			3
Moist, brown, slightly oxidized, fine to medium SAND, slightly micaceous.	*Ancestral South Fork Channel (?) Deposits*	15			0 - Pushed
Saturated, brown, slightly silty, fine to coarse SAND. Containing minor gravel and pieces of wood.		20		WD	2
Saturated, brown-gray, silty, fine to medium SAND with abundant pieces of wood and minor organics.		25			4
Saturated, gray, locally silty, fine to medium SAND.		30			5

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Project No. G95125A
June 6, 1995

EXPLORATION BORING LOG

Number B-3 Page 2 of 2

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE (Split Spoon Sampler) Blows/Foot 10 20 30 40
Saturated, gray, fine to medium SAND grading into fine to coarse SAND.				▲ 10
Saturated, gray, slightly silty, fine to medium SAND grading into brown, oxidized, fine to coarse SAND.	40			▲ 22
Saturated, brown, fine to coarse SAND (Limited in-place sample due to heaving sands)	45			▲ 16**
Ancestral South Fork Channel (?) Deposits				
Saturated, blue-gray CLAY. *Lacustrine Deposits*	50			▲ 0 - Pushed
BOH @ 51-1/2'				
WD = water encountered while drilling	55			
** = Auger plugged due to heaving sands. Blow counts may not be representative of in-place conditions.	60			
	65			

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Snoqualmie Pump Station
Snoqualmie, Washington
Project No. G95125A
June 6, 1995

EXPLORATION BORING LOG

Number ESB-1C Page 1 of 3

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
Moist, brown, fine SAND. (Extrapolated from ESB-1B and drill cuttings)	5			
Moist to wet, brown, sandy GRAVEL. (Extrapolated from ESB-1B and drill cuttings)	10			
	15			
Saturated, brown to red-brown, gravelly, medium to coarse SAND.	20		WD	1
Log encountered 21' to 24'; difficult drilling.				
Saturated, gray, fine to medium SAND with wood pieces. Limited sample return, may be heave.	25			16 (heave?)
Log encountered 28' to 30'; difficult drilling.				
Saturated, brown-gray, slightly silty, fine to coarse SAND with wood pieces.	30			20

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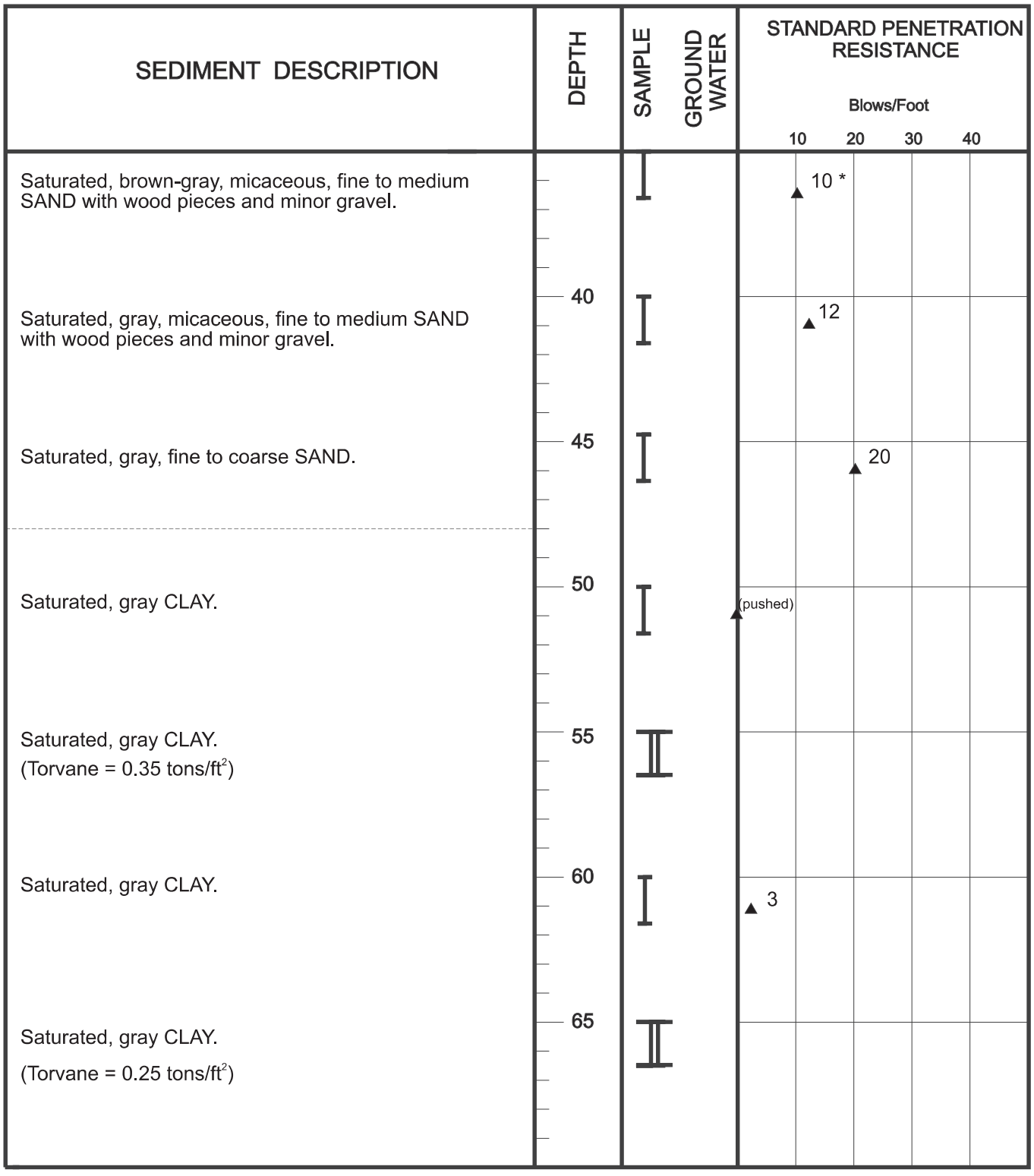
Snoqualmie Lift Station
Snoqualmie, Washington
Project No. H95125A
September 1995

EXPLORATION BORING LOG

Number ESB-1C Page 2 of 3



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Snoqualmie Lift Station
Snoqualmie, Washington
Project No. H95125A
September 1995

EXPLORATION BORING LOG

Number ESB-1C Page 3 of 3

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
Saturated, gray CLAY.				▲2
Saturated, gray, slightly sandy CLAY. (Torvane = 0.20 tons/ft²)	75			
Saturated, gray, fine to medium SAND.	80			▲1
Due to heave, unable to sample below 80'. Based on drilling action encountering gravel at 84'. At 91' drilling becomes harder (possible lodgement till).	85			
	90			
BOH @ 95'	95			
Note: Refusal. Drilled with Hollow Stem Auger. Sand heave binding up augers. 25' of heave at BOH.				
WD = water encountered while drilling. * = rock in drive shoe	100			
Split spoon sampler				
Shelby tube sampler				

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
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Snoqualmie Lift Station
Snoqualmie, Washington
Project No. H95125A
September 1995

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-1	1 of 2

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.68
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/08/02,07/08/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
5		10" diameter bentonite surface seal (bentonite pellets) 0-18'				Surface materials: Dark brown, fine SAND. **Vashon Recessional Delta Deposits** Loose gravels with cobbles. Driller notes losing air into formation
10						
15						Driller adding small amount of water. Dark brown, SANDY GRAVEL, abundant cuttings.
20		6" diameter steel casing +2'-69'				
25						Dry, brown, fine to medium SAND, trace gravel.
30						Driller notes softer, possible small amount water not noted in sample.
35						Dry, brown, fine to coarse SAND, trace gravel.
40						Damp, brown, fine to medium SAND, trace gravel.
45						Damp, brown, fine to medium SAND, little gravel, trace silt. Minor increase in silt content.
50		6" diameter steel casing +2'-69'				Moist, brown, GRAVELLY fine to medium SAND with trace to some silt.
55	▼					Color change at ~ 52' to gray. Driller adding water. Gray, SILTY, GRAVELLY, fine to medium SAND.
60						
65						
70		K-packer 66.5'-67' 6" diameter telescoping stainless steel screen 0.012" slot width 67'-72'				Becoming interbedded gray SAND/SILT with trace gravel. Gray, fine to medium SAND with trace silt. Gray SILT.
75		6" diameter telescoping stainless steel screen 0.014" slot width 72'-77'				Color change at ~74' to gray-brown, increase in gravel. Saturated, gray-brown GRAVEL with minor sand, abundant cuttings.
80		Gravel fill 77'-78' Abandoned 6" diameter steel casing backfilled with bentonite 78'-87'				Cobble at 78'. Gray GRAVEL (cuttings) with minor brown to white gravel (mainly andesite with minor intrusive volcanic [diorite?] gravels).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH
Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/29/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-1	2 of 2

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.68
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/08/02,07/08/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
90		Bentonite pellets as backfill 87'-94'				Gray GRAVEL (cuttings) with minor clasts of quartz, diorite.
						Mt. Persis Formation Gray ANDESITE.
95						Boring terminated at 94 feet on 07/08/02 Well completed on 07/09/02.
100						
105						
110						
115						
120						
125						
130						
135						
140						
145						
150						
155						
160						
165						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/29/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-2a	1 of 2

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.71
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/09/02,07/11/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Well abandoned with bentonite 0-139'				Surface material: dark brown SAND.
						Vashon Recessional Delta Deposits
5						
10						Light brown, fine to medium SAND, little gravel, little coarse sand.
						Drilling adding small amount of water.
						Dark brown, SANDY GRAVEL.
15						Dark gray and green GRAVEL with little brown sand.
20						Brown to gray GRAVEL with trace sand, abundant cuttings.
						Grades to SAND.
25						Damp, brown, fine to medium SAND.
30						
						Slower drilling - losing air into formation, driller adding water.
35						Brown, fine to medium SAND with few coarse sand, few gravel.
40						Brown, fine to coarse SAND, little gravel.
45						Brown, SANDY GRAVEL, trace silt.
50						As above.
						Increase in silt content.
55	▼					Brown, SANDY GRAVEL with some silt.
						Color change to gray, increase in silt content.
60						Color change to brownish gray.
						Gray to brown-gray, SILTY, GRAVELLY SAND.
65						Brown, SILTY fine to medium SAND with gravel.
						At 66', thin layers of gray SILT interbedded with brown, fine to medium SAND, trace gravel.
70						At 68', layer of brown-gray, medium to coarse SAND with trace gravel.
						Boulder-andesite ~72'-73'
75						Color change to green-gray.
						Gray GRAVEL with fine to coarse SAND, little silt.
						At ~77', gray-brown color, abundant orange gravel clasts.
80		Well abandoned with bentonite 0-139'				At ~79', color change to brown.
						Brown-gray, SANDY GRAVEL, trace silt.
						Color change to gray.
						Increase in silt content 82'-83'.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

▽ Water Level ()

▼ Water Level at time of drilling (ATD)

Logged by: JAH/LBK

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/29/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-2a	2 of 2

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.71
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/09/02,07/11/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray, SANDY GRAVEL with few silt.
						Mt. Persis Formation
90						At 87', driller notes edge of bedrock. Gray ANDESITE (cuttings).
95						
100						Gray to green ANDESITE.
105						Driller noted a bit softer at ~104.5'; hard again at ~105'.
110						Driller notes looser at ~111'.
115						Slower drilling, smaller cuttings at ~117'.
120		Well abandoned with bentonite 0-139'				Gray to green ANDESITE.
125						
130						
135						
140						Boring terminated at 139 feet on 07/11/02
145						
150						
155						
160						
165						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: JAH/LBK
Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/29/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-2b	1 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.71
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/18/02,07/23/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in):
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
0		10" diameter bentonite surface seal (bentonite quick grout 0-95' and bentonite chips 95'-97.5') 0-97.5'				Surface material: Dark brown, fine SAND.
						Vashon Recessional Delta Deposits
5						Driller adding water throughout. No Recovery
10		6" diameter steel casing +2'-97.5'				Brown-gray, GRAVELLY medium to coarse SAND, little cobbles.
15						Brown, GRAVELLY fine to coarse SAND. Driller notes material is softer at 16', possibly finer sand.
20						
25						Brown, GRAVELLY fine to coarse SAND, trace cuttings. Brown, fine to medium SAND, little gravel.
30						Brown, fine to medium SAND, trace gravel.
35						
40						Poor recovery - brown, fine to medium SAND, trace gravel, silt.
45						Brown, fine to medium SAND, trace silt. Brown, fine to medium SAND, trace gravel, silt.
50						Brown, fine to medium SAND with little gravel, few silt. Color change to gray, silt content increases.
55	▼					Gray, SILTY fine SAND with little gravel.
60						
65						
70						Gray, SILTY fine SAND/SANDY SILT with little gravel (clasts of gray, sandy silt in cuttings). At ~71', slow drilling - increase in gravel content.
75						Gray, SILTY, SANDY GRAVEL. At ~76', color change to gray-brown. Water discharge at casing switch - gray-brown. Slow drilling.
80		10" diameter bentonite surface seal (bentonite quick grout 0-95' and bentonite				Gray to gray-brown, SANDY GRAVEL with cobbles. At 82', becoming gray.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/RNS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.	Geologic & Monitoring Well Construction Log		
	Project Number KG99312A	Well Number MW-2b	Sheet 2 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.71
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/18/02,07/23/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in):
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		chips 95'-97.5') 0-97.5'				Gray GRAVEL with little medium to coarse sand (mainly andesite, trace conglomerate, plutonic, sandstone).
						Mt. Persis Formation
90	▽	6" diameter steel casing +2'-97.5'				Driller notes bedrock at ~88'. Gray to green ANDESITE, trace orange, white clasts.
95						
		Drilling openhole into bedrock 97.5'-310'				
100						Gray to green ANDESITE.
105						
110						
115						
120						
125						Driller notes slightly harder at ~123' for thin zone.
130						Driller notes slightly harder from ~129' to ~135'.
135						Driller notes softer from 135' to 139'.
						Driller notes slightly harder.
140	▼					At 141', driller notes fractures; small amount of water encountered (estimated <1 gpm by driller).
145						As above, but wet.
						Driller notes harder at ~148'.
150						As above, but damp.
						Driller notes soft spot - thin zone at ~152'; possible fracture.
155						
160		Drilling openhole into bedrock 97.5'-310'				Gray to green ANDESITE.
165						At ~166', driller adding water.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (3/17/03)
Water Level at time of drilling (ATD)

Logged by: JAH/RNS
Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-2b	3 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.71
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/18/02,07/23/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in):
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
175						Driller notes looser from ~173' to 180'.
180						Harder drilling from 180'-205'.
185						Greenish gray ANDESITE, minor sulfides.
190						
195						
200						As above; minor calcite.
205						Greenish gray ANDESITE.
210						
215						As above - minor pyrite (disseminated).
220						Greenish gray ANDESITE.
225						
230	▼					Moderate amount of ground water at 230'. Driller estimates a minimum of 5-7 gpm.
235						Lighter shade of greenish gray ANDESITE with minor sulfides; drills easier than above. Chlorite on microfractures, trace sulfides on occasional fractures.
240		Drilling openhole into bedrock 97.5'-310'				236'-240' - softer drilling, ground water increasing in GPM above clays. Gray to black ANDESITE; some chips are breccia fragments with minor sulfides (transition to welded tuff?)
245						At 243', alteration - clays. Greenish gray ANDESITE with clays; subrounded andesitic grains.
250						Light gray to dark gray ANDESITE - substantial decrease in clay content.

Sampler Type (ST):

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- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/RNS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-2b	4 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 625.71
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/18/02,07/23/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in):
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
260						At 255', clay content increases again; zone of alteration - volcanics altered to light gray. Clay is light gray. Unaltered greenish gray chips also present (andesite). At 260', zone of light gray CLAY with fragments of highly altered volcanics, which range in color from light bluish gray to greenish gray. Clasts subrounded.
265	▼					At 263', dark greenish gray ANDESITIC tuff - clay decreases. Driller notes small amount of water. Light to dark gray ANDESITE.
270						Dark brown (hematitic interflow [tuff?). Dark gray tuff. At 272', dark gray-brown ANDESITIC tuff.
275						Dark gray-brown ANDESITIC tuff.
280						Dark brown to gray (andesitic?) tuff with green phenocrysts.
285						Dark greenish gray ANDESITE.
290						Harder driller at 292'.
295						Dark gray (slightly greenish) ANDESITE. Harder drilling
300						Dark blackish gray ANDESITE with minor light blue, soft, friable vein fragments (talc?). Hard drilling.
305						
310						Boring terminated at 310 feet on 07/23/02
315						
320						
325						
330						
335						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/RNS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	1 of 4

Project Name: Snoqualmie Bedrock Mining
Elevation (Top of Well Casing): 565.02
Water Level Elevation:
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hammer Weight/Drop: N/A

Location: King County, WA
Surface Elevation (ft): N/A
Date Start/Finish: 07/12/02,07/17/02
Hole Diameter (in): 6

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
0		10" diameter bentonite surface seal (perma plug/bentonite pellets) 0-17.5'				Surface material: Brown SAND, GRAVEL, and COBBLES (Fill).
						Vashon Recessional Delta Deposits
5						Damp, brown, fine to medium SAND with gravel and coarse sand, trace silt. Driller adding water.
10						Brown, SANDY GRAVEL with cobbles, difficult drilling. Cobble zone from 10.5'-14'.
15						At ~11', 10" casing jammed between cobbles; cutting casing - will drill open hole with 10" drill bit to 18' for surface seal. Brown GRAVEL with cobbles, abundant cuttings.
20		6" diameter steel casing +2'-301.5'				Brown, GRAVELLY fine to coarse SAND with little cobbles.
25						Brown, fine to coarse SAND with trace gravel.
30						Slight increase in gravel content. Driller adding water. Gray-brown, medium to coarse SAND with gravel. Only occasional cobbles below 30'.
35						Brown, fine to coarse SAND with gravel (poor recovery of gravel - losing air into formation).
40						Gray-brown, medium to coarse SAND with little gravel.
45						Gray-brown, GRAVELLY medium to coarse SAND.
50						
55						
60						Brown, medium to coarse SAND with little gravel.
65						Increase in gravel from ~63'-64'.
70						
75						Brown, fine to coarse SAND with little gravel.
80						Brown, GRAVELLY fine to coarse SAND. Difficult drilling from 81'-90'.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	2 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 565.02
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/12/02,07/17/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/6"	Graphic Symbol	DESCRIPTION
						No Recovery - losing air/water into formation.
90		6" diameter steel casing +2'-301.5'				
						Gray-brown, medium to coarse SAND with little gravel.
95						Gray-brown, GRAVELLY fine to coarse SAND.
100						As above with few silt.
105						
						Rough, slow drilling - driller notes cobble zone from 108'-113'.
110						Gray-brown, SANDY GRAVEL.
						Driller noted increase in fines below 113', hole standing open better.
115						Gray-brown GRAVEL with sand.
120						Gray-brown GRAVEL with medium to coarse sand.
						Poor recovery.
125						Driller adding foam to improve recovery.
						From ~128' to ~137', no recovery.
130						
135						
						Gray-brown, SANDY GRAVEL/GRAVELLY SAND.
140						Gray-brown, SANDY GRAVEL.
145						
150						
						Increase in fine to medium sand content.
155						
160						Gray-brown, GRAVELLY medium to coarse SAND.
165						Gray-brown, GRAVELLY medium to coarse SAND.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	3 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 565.02
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/12/02,07/17/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		6" diameter steel casing +2'-301.5'				
175						Increase in fine to medium sand content from 177'-179'.
180						Poor recovery - slow drilling at ~182'.
185						
190						
195						Gray-brown, GRAVELLY fine to coarse SAND/SANDY GRAVEL.
200						Poor recovery. Continued slow drilling.
205						Better recovery and drilling speed faster.
210						Gray-brown, fine to coarse SANDY GRAVEL (few cuttings).
215						Driller noted sand from 214'-216'. Gray-brown, GRAVELLY fine to coarse SAND with few silt (some fine content lost due to added water; possible interbeds of silt). Driller noted silt from ~216'-217'.
220						Slow drilling - poor recovery. Driller noted entering clean gravel at 219'. Gray-brown, fine to coarse SANDY GRAVEL (abundant cuttings).
225						Drilling very slow from 220' - ~224'. Increased sand, drilling/recovery increase. Gray-brown, fine to coarse SAND with gravel (fewer cuttings).
230						Drilling slower. Gray-brown, fine to coarse SAND, little gravel (fewer cuttings).
235						Gray-brown, fine to coarse SAND, little gravel, little silt (possible interbeds of silt).
240						As above, but brown. Drilling very slow, increase in gravel content.
245						Gray-brown, GRAVELLY fine to coarse SAND (abundant cuttings). Thin layer of fine SAND and SILT.
250		6" diameter steel casing +2'-301.5'				Gray-brown, GRAVELLY fine to coarse SAND, little silt (fewer cuttings). Drilling faster, good recovery.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	4 of 4

Project Name: Snoqualmie Bedrock Mining
Elevation (Top of Well Casing): 565.02
Water Level Elevation:
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hammer Weight/Drop: N/A

Location: King County, WA
Surface Elevation (ft): N/A
Date Start/Finish: 07/12/02,07/17/02
Hole Diameter (in): 6

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
260	▼					Interbedding of fine SAND and SILT. Driller notes possibly (perched?) water over silt from ~250' to ~255'. Gray-brown, GRAVELLY medium to coarse SAND with interbeds of fine sand with silt. At ~259', brown silt clasts. No water at casing switch. Brown, coarse SAND with brown silt and gray-brown gravel.
265						Gray-brown, GRAVELLY medium to coarse SAND with fine sand and silt.
270						Brown, fine to medium SAND layer, trace brown silt. Brown, fine to coarse SAND with gray-brown gravel and little brown silt. Interbeds of fine SAND with some silt and GRAVEL.
275						Gray-brown, fine to coarse SAND.
280						Driller notes within water table. Blew out hole and let sit for 20 minutes. Did not detect water in hole, possibly at top of water table. Gray-brown, fine to coarse SAND, trace gravel.
285						Gray-brown, fine to coarse SAND, trace gravel, trace silt.
290	▼					Measured water depth at 291.5' below top of casing; ~289 below ground surface. Gray-brown, fine to coarse SAND with gray-brown gravel, little silt. Interbeds of fine SAND with trace silt.
295	▽					As above.
300		K-packer 299.5'-300' 6" diameter telescoping stainless steel screen 0.012" slot width 300'-305'				Drilling slow - cobble zone, very little recovery from 302' - ~307'.
305		6" diameter telescoping stainless steel screen 0.014" slot width 305'-310'				Gray-brown, GRAVELLY medium to coarse SAND/SANDY GRAVEL with some fine sand, trace gray-brown silt; discharge water more gray (abundant cuttings).
310		Hole caved 310'-318'				Gray-brown, fine to coarse SAND with gray-brown gravel, gray silt. Interbeds of fine SAND and SILT from ~310'-315'.
315						Gray-brown, fine to coarse SAND with silt, trace gravel; gray silt clasts noted. Cobble zone at 315'. At 318', stop drilling, pulled up casing to 310'.
320						Boring terminated at 318 feet on 07/17/02 Well completed on 07/18/02.
325						
330						
335						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	1 of 4

Project Name: Snoqualmie Bedrock Mining
Elevation (Top of Well Casing): 565.02
Water Level Elevation:
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hammer Weight/Drop: N/A

Location: King County, WA
Surface Elevation (ft): N/A
Date Start/Finish: 07/12/02,07/17/02
Hole Diameter (in): 6

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
0		10" diameter bentonite surface seal (perma plug/bentonite pellets) 0-17.5'				Surface material: Brown SAND, GRAVEL, and COBBLES (Fill).
						Vashon Recessional Delta Deposits
5						Damp, brown, fine to medium SAND with gravel and coarse sand, trace silt. Driller adding water.
10						Brown, SANDY GRAVEL with cobbles, difficult drilling. Cobble zone from 10.5'-14'.
15						At ~11', 10" casing jammed between cobbles; cutting casing - will drill open hole with 10" drill bit to 18' for surface seal. Brown GRAVEL with cobbles, abundant cuttings.
20		6" diameter steel casing +2'-301.5'				Brown, GRAVELLY fine to coarse SAND with little cobbles.
25						Brown, fine to coarse SAND with trace gravel.
30						Slight increase in gravel content. Driller adding water. Gray-brown, medium to coarse SAND with gravel. Only occasional cobbles below 30'.
35						Brown, fine to coarse SAND with gravel (poor recovery of gravel - losing air into formation).
40						Gray-brown, medium to coarse SAND with little gravel.
45						Gray-brown, GRAVELLY medium to coarse SAND.
50						
55						
60						Brown, medium to coarse SAND with little gravel.
65						Increase in gravel from ~63'-64'.
70						
75						Brown, fine to coarse SAND with little gravel.
80						Brown, GRAVELLY fine to coarse SAND. Difficult drilling from 81'-90'.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	2 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 565.02
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/12/02,07/17/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/6"	Graphic Symbol	DESCRIPTION
						No Recovery - losing air/water into formation.
90		6" diameter steel casing +2'-301.5'				
						Gray-brown, medium to coarse SAND with little gravel.
95						Gray-brown, GRAVELLY fine to coarse SAND.
100						As above with few silt.
105						
						Rough, slow drilling - driller notes cobble zone from 108'-113'.
110						Gray-brown, SANDY GRAVEL.
						Driller noted increase in fines below 113', hole standing open better.
115						Gray-brown GRAVEL with sand.
120						Gray-brown GRAVEL with medium to coarse sand.
						Poor recovery.
125						Driller adding foam to improve recovery.
						From ~128' to ~137', no recovery.
130						
135						
						Gray-brown, SANDY GRAVEL/GRAVELLY SAND.
140						Gray-brown, SANDY GRAVEL.
145						
150						
						Increase in fine to medium sand content.
155						
160						Gray-brown, GRAVELLY medium to coarse SAND.
165						Gray-brown, GRAVELLY medium to coarse SAND.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	3 of 4

Project Name: Snoqualmie Bedrock Mining
Location: King County, WA
Elevation (Top of Well Casing): 565.02
Surface Elevation (ft): N/A
Water Level Elevation:
Date Start/Finish: 07/12/02,07/17/02
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hole Diameter (in): 6
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		6" diameter steel casing +2'-301.5'				
175						Increase in fine to medium sand content from 177'-179'.
180						Poor recovery - slow drilling at ~182'.
185						
190						
195						Gray-brown, GRAVELLY fine to coarse SAND/SANDY GRAVEL.
200						Poor recovery. Continued slow drilling.
205						Better recovery and drilling speed faster.
210						Gray-brown, fine to coarse SANDY GRAVEL (few cuttings).
215						Driller noted sand from 214'-216'. Gray-brown, GRAVELLY fine to coarse SAND with few silt (some fine content lost due to added water; possible interbeds of silt). Driller noted silt from ~216'-217'.
220						Slow drilling - poor recovery. Driller noted entering clean gravel at 219'. Gray-brown, fine to coarse SANDY GRAVEL (abundant cuttings).
225						Drilling very slow from 220' - ~224'. Increased sand, drilling/recovery increase. Gray-brown, fine to coarse SAND with gravel (fewer cuttings).
230						Drilling slower. Gray-brown, fine to coarse SAND, little gravel (fewer cuttings).
235						Gray-brown, fine to coarse SAND, little gravel, little silt (possible interbeds of silt).
240						As above, but brown. Drilling very slow, increase in gravel content.
245						Gray-brown, GRAVELLY fine to coarse SAND (abundant cuttings). Thin layer of fine SAND and SILT.
250		6" diameter steel casing +2'-301.5'				Gray-brown, GRAVELLY fine to coarse SAND, little silt (fewer cuttings). Drilling faster, good recovery.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KG99312A	MW-3	4 of 4

Project Name: Snoqualmie Bedrock Mining
Elevation (Top of Well Casing): 565.02
Water Level Elevation:
Drilling/Equipment: Aquatech Well Drilling and Pumps / Air Rotary
Hammer Weight/Drop: N/A

Location: King County, WA
Surface Elevation (ft): N/A
Date Start/Finish: 07/12/02,07/17/02
Hole Diameter (in): 6

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
260	▼					Interbedding of fine SAND and SILT. Driller notes possibly (perched?) water over silt from ~250' to ~255'. Gray-brown, GRAVELLY medium to coarse SAND with interbeds of fine sand with silt. At ~259', brown silt clasts. No water at casing switch. Brown, coarse SAND with brown silt and gray-brown gravel.
265						Gray-brown, GRAVELLY medium to coarse SAND with fine sand and silt.
270						Brown, fine to medium SAND layer, trace brown silt. Brown, fine to coarse SAND with gray-brown gravel and little brown silt. Interbeds of fine SAND with some silt and GRAVEL.
275						Gray-brown, fine to coarse SAND.
280						Driller notes within water table. Blew out hole and let sit for 20 minutes. Did not detect water in hole, possibly at top of water table. Gray-brown, fine to coarse SAND, trace gravel.
285						Gray-brown, fine to coarse SAND, trace gravel, trace silt.
290	▼					Measured water depth at 291.5' below top of casing; ~289 below ground surface. Gray-brown, fine to coarse SAND with gray-brown gravel, little silt. Interbeds of fine SAND with trace silt.
295	▽					As above.
300		K-packer 299.5'-300' 6" diameter telescoping stainless steel screen 0.012" slot width 300'-305'				Drilling slow - cobble zone, very little recovery from 302' - ~307'.
305		6" diameter telescoping stainless steel screen 0.014" slot width 305'-310'				Gray-brown, GRAVELLY medium to coarse SAND/SANDY GRAVEL with some fine sand, trace gray-brown silt; discharge water more gray (abundant cuttings).
310		Hole caved 310'-318'				Gray-brown, fine to coarse SAND with gray-brown gravel, gray silt. Interbeds of fine SAND and SILT from ~310'-315'.
315						Gray-brown, fine to coarse SAND with silt, trace gravel; gray silt clasts noted. Cobble zone at 315'. At 318', stop drilling, pulled up casing to 310'.
320						Boring terminated at 318 feet on 07/17/02 Well completed on 07/18/02.
325						
330						
335						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (3/17/03)
- Water Level at time of drilling (ATD)

Logged by: JAH/SS

Approved by:

NWWELL 99312A-1.GPJ BORING.GDT 4/30/03

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	1 of 7

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing): 421.82'
Surface Elevation (ft): 420'
Water Level Elevation: 374'
Date Start/Finish: April 1973,April 1973
Drilling/Equipment: Cable Tool
Hole Diameter (in): Variable
Hammer Weight/Drop: Adapted from Driller's Log

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
5		16" diameter well casing 0-98'				**Recent Snoqualmie River Deposits** Brown CLAY.
10						
15						
20						**Vashon Recessional Lake Snoqualmie Deposits** Blue SAND with silt.
25						
30						
35						
40						
45	▽					
50						Blue, SILTY fine SAND.
55						
60						
65						
70						
75						

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
▽ Water Level (08/14/01)
▼ Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	2 of 7

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 421.82'
Water Level Elevation: 374'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Adapted from Driller's Log

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: April 1973,April 1973
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
85						
90		16" diameter well casing 0-98'				Blue, SILTY fine SAND.
95						
100		12" diameter well casing 98'-435'				Blue SILT.
105						
110						
115						
120						
125						
130						
135						
140						Blue, SILTY CLAY.
145						
150						
155						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	3 of 7

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 421.82'
Water Level Elevation: 374'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Adapted from Driller's Log

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: April 1973,April 1973
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
165						
170						
175						
180						Blue, SILTY CLAY.
185						
190						
195						
200		12" diameter well casing 98'-435'				
205						
210						
215						
220						
225						
230						
235						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	4 of 7

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 421.82'
Water Level Elevation: 374'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Adapted from Driller's Log

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: April 1973,April 1973
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
245						
250						
255						
260						
265						
270						Blue, SILTY fine SAND.
275						Blue CLAY.
280		12" diameter well casing 98'-435'				**Undifferentiated Olympia/pre-Olympia Lacustrine Deposits** Blue, SANDY CLAY.
285						
290						
295						
300						
305						
310						
315						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	5 of 7

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 421.82'
Water Level Elevation: 374'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Adapted from Driller's Log

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: April 1973,April 1973
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
325						
330						
335						
340						
345						
350						
355						
360		12" diameter well casing 98'-435'				
365						
370						
375						
380						**Undifferentiated Olympia/pre-Olympia Fine-Grained Fluvial Deposits** Blue, SILTY fine SAND, occasional gravel.
385						
390						
395						

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	6 of 7

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 421.82'
Water Level Elevation: 374'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Adapted from Driller's Log

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: April 1973,April 1973
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
405						
410		12" diameter well casing 98'-435'				
415						
420						
425						
430						
435		8" diameter well casing 435'-515'				
440						
445						Blue, fine to coarse SAND with gravel and silt.
450						
455						
460						
465						
470						
475						Blue, coarse SAND with gravel and silt.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 1	7 of 7

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing): 421.82'
Water Level Elevation: 374'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Adapted from Driller's Log

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: April 1973,April 1973
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
485		8" diameter well casing 435'-515'				
490						
495						
500						Blue, SILTY fine to coarse SAND with gravel (till-like).
505						
510						
515		8" diameter 60-slot well screen 515'-528'				**Undifferentiated Olympia/pre-Olympia Coarse-Grained Fluvial Deposits** Blue, fine to coarse SAND with gravel, trace silt.
520						
525						
530		8" diameter 50-slot well screen 528'-538'				
535						
540		Tailpipe 538'-545'				**Tertiary Bedrock** Light-green, gray ANDESITE.
545						Boring terminated at 545 feet on April 1973
550						
555						

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	1 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
0		12" diameter steel well casing 0-475'				**Recent Snoqualmie River Deposits** Brown to gray, SILTY SAND, occasional gravel and organics (roots).
5						
10						
15						
20		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				
25						
30						
35						**Vashon Recessional Lake Snoqualmie Deposits** Gray, SANDY SILT, occasional gravel and organics (wood).
40						
45						
50	▽					
55						
60						
65						
70						
75						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- ▽ Water Level (08/14/01)
- ▼ Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	2 of 8

Project Name: Snoqualmie Ridge North Well Field
Location: Snoqualmie, WA
Elevation (Top of Well Casing):
Surface Elevation (ft): 420'
Water Level Elevation: 350'
Date Start/Finish: June-22-1995,July-12-1995
Drilling/Equipment: Cable Tool
Hole Diameter (in): Variable
Hammer Weight/Drop: Grab

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
85						Gray, SANDY SILT, occasional gravel and organics (wood).
90						
95						Wood at 95' - C^{14} = 5,720 years bp.
100		12" diameter steel well casing 0-475'				Gray CLAY with varying amounts of silt; occasional sand, organic material (wood), and concentrations.
105						
110						
115						
120		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				
125						
130						
135						
140						
145						
150						
155						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	3 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
165						
170						
175						
180		12" diameter steel well casing 0-475'				
185						
190						
195						
200		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				Gray CLAY with varying amounts of silt; occasional sand, organic material (wood), and concentrations.
205						
210						
215						
220						
225						
230						
235						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	4 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
245						
250						
255						
260		12" diameter steel well casing 0-475'				Gray CLAY with varying amounts of silt; occasional sand, organic material (wood), and concretions.
265						
270						
275						
280		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				
285						
290						**Undifferentiated Olympia/pre-Olympia Lacustrine Deposits** Gray SILT.
295						
300						
305						
310						Gray, fine to medium SAND, trace silt.
315						Gray CLAY.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	5 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
325						
330						Gray CLAY.
335						
340		12" diameter steel well casing 0-475'				
345						
350						
355						
360		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				
365						
370						**Undifferentiated Olympia/pre-Olympia Fine-Grained Fluvial Deposits** Gray, SILTY fine SAND, occasional organics (wood).
375						
380						
385						
390						
395						Gray, fine SAND with silt, occasional gravel and organics (wood).

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level (08/14/01)
- Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	6 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
405						
410						Gray, fine SAND with silt, occasional gravel and organics (wood).
415						
420		12" diameter steel well casing 0-475'				
425						Gray, SILTY fine SAND with organics (wood).
430						
435						
440		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				
445						
450						
455						
460						
465						Gray, fine SAND with silt, occasional organics (wood).
470						
475						Wood at 474' - C^{14} > 41,940 years bp.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	7 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
485		10" diameter steel well casing 0-521' (NOTE: 10" casing extend inside 12" casing from 0-475')				
490						Gray, fine SAND with silt, occasional organics (wood).
495						
500						
505						
510						**Undifferentiated Olympia/pre-Olympia Coarse-Grained Fluvial Deposits** Gray, fine to coarse SAND with fine to coarse gravel, trace silt.
515						
520		9.5" diameter 20-slot well screen 521'-524'				
525		9.5" diameter 40-slot well screen 524'-529'				
530		9.5" diameter 60-slot well screen 529'-535'				Gray, fine to coarse GRAVEL with fine to coarse sand, occasional cobbles.
535		9.5" diameter steel well casing 535'-548'				
540						Gray, fine to medium SAND with silt, occasional gravel.
545						Gray, fine to coarse SAND and GRAVEL with cobbles.
550		9.5" diameter 100-slot well screen 548'-556'				
555		Tailpipe 556'-564'				

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level (08/14/01)
Water Level at time of drilling (ATD)

Logged by:
Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH02005C	-City of Snoqualmie No. 2	8 of 8

Project Name: Snoqualmie Ridge North Well Field
Elevation (Top of Well Casing):
Water Level Elevation: 350'
Drilling/Equipment: Cable Tool
Hammer Weight/Drop: Grab

Location: Snoqualmie, WA
Surface Elevation (ft): 420'
Date Start/Finish: June-22-1995,July-12-1995
Hole Diameter (in): Variable

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
565		Tailpipe 556'-564' Gravel backfill 564'-574'				Gray, fine to coarse SAND with silt and gravel.
570						**Tertiary Bedrock** BEDROCK
575						Boring terminated at 574 feet on July-12-1995
580						
585						
590						
595						
600						
605						
610						
615						
620						
625						
630						
635						

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

Water Level (08/14/01)

Water Level at time of drilling (ATD)

Logged by:

Approved by:

NWWELL 02005C-1.GPJ BORING.GDT 1/8/04

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	1 of 14

Project Name: Tokul Creek Water Right
Location: Snoqualmie, WA
Elevation (Top of Well Casing): ~550'
Surface Elevation (ft): ~550'
Water Level Elevation:
Date Start/Finish: 11/11/09,12/21/09
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hole Diameter (in): 6"
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
		0 to 554 1/2 feet, 6 inches stainless steel well casing 10-inch-diameter borehole 0 to 14 feet 8-inch-diameter borehole 14 to 28 feet Concrete and bentonite surface seal 0 to 18 feet				**Vashon Recessional Outwash - Tokul Creek Deltaic Deposits** Brown, silty fine to coarse GRAVEL; few organics.
						Brown, fine to coarse GRAVEL, little silt, few fine to coarse sand, occasional cobble and boulder; using drilling foam.
5						
						Brown, fine to coarse GRAVEL, few fine to coarse sand, occasional cobble and boulder; abundant cuttings.
10						
						Gray-brown, fine to coarse GRAVEL, few fine to coarse sand, occasional cobble and boulder; abundant cuttings.
15						Gray-brown, fine to coarse SAND, little fine to coarse sand; abundant cuttings.
20		18 to 28 feet native slough fills annular space between 8-inch-diameter borehole and 6-inch-diameter casing				Same as above.
25						Gray-brown, fine to coarse GRAVEL, few fine to coarse sand; abundant cuttings.
30						Gray-brown, fine to coarse SAND; abundant cuttings.
35						Gray-brown, fine to coarse SAND, little fine to coarse gravel; abundant cuttings.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	2 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray-brown, fine to coarse SAND, few gravel; abundant cuttings; continue to use drilling foam (as on previous page).
45						Same as above.
50						Gray-brown, fine to coarse SAND, little fine to coarse gravel; abundant cuttings.
55						Gray-brown, fine to coarse GRAVEL, trace sand; abundant cuttings.
60						Gray-brown, fine to coarse GRAVEL, few sand; abundant cuttings.
65						Gray-brown, fine to coarse GRAVEL, little coarse sand, trace fine to medium sand; abundant cuttings.
70						Same as above.
75						Gray-brown, fine to coarse GRAVEL, trace sand; abundant cuttings.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	3 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray-brown, fine to coarse GRAVEL, little fine to coarse sand; abundant cuttings; continue to use drilling foam (as on previous page).
85						Same as above.
90						Gray-brown, fine to coarse SAND; abundant cuttings.
95						Gray-brown, fine to coarse GRAVEL, trace sand; abundant cuttings.
100						Gray-brown, fine to coarse GRAVEL, little medium to coarse sand; abundant cuttings.
105						Same as above.
110						Gray-brown, fine to coarse SAND; abundant cuttings.
115						Same as above.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	4 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray-brown, fine to coarse GRAVEL; abundant cuttings.
125						Same as above.
130						Gray-brown, fine to coarse GRAVEL, few medium to coarse sand; abundant cuttings.
135						Gray-brown, medium to coarse SAND, few fine to coarse gravel; abundant cuttings.
140						Gray-brown, fine to coarse GRAVEL; little coarse sand; abundant cuttings.
145						Same as above.
150						Same as above.
155						Same as above.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	5 of 14

Project Name: Tokul Creek Water Right
Location: Snoqualmie, WA
Elevation (Top of Well Casing): ~550'
Surface Elevation (ft): ~550'
Water Level Elevation:
Date Start/Finish: 11/11/09,12/21/09
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hole Diameter (in): 6"
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray-brown, medium to coarse SAND, trace fine sand; abundant cuttings.
165						Same as above.
170						Gray-brown, medium to coarse SAND, few fine to coarse gravel; abundant cuttings.
175						Gray-brown, fine to coarse GRAVEL, few coarse sand; abundant cuttings.
180						Same as above.
185						Same as above.
190						Gray-brown, medium to coarse SAND, few gravel; abundant cuttings.
195						Gray-brown, fine to coarse GRAVEL, little medium to coarse sand; abundant cuttings.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	6 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray-brown, fine to coarse GRAVEL, little medium to coarse sand; abundant cuttings.
205						Same as above.
210						Same as above.
215						Gray-brown, fine to coarse GRAVEL, trace sand; abundant cuttings.
						Formation becomes saturated. Tokul Creek Delta Aquifer
220						Gray-brown, fine to coarse SAND; abundant cuttings; discontinue use of drilling foam.
225						Same as above.
230						Gray-brown, fine to coarse SAND, little fine to coarse gravel; abundant cuttings.
235						Gray-brown, fine to coarse SAND, few fine to coarse gravel; abundant cuttings.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	7 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray-brown, fine to coarse SAND, few fine to coarse gravel; abundant cuttings; formation continues to be saturated (as on previous page).
245						Gray-brown, fine to coarse SAND, little fine to coarse gravel; abundant cuttings.
250						Same as above.
255						Same as above.
260						Gray-brown, fine to coarse SAND, few gravel, few silt; silt washing out of grab samples; abundant cuttings.
265						Same as above.
270						Same as above.
275						Gray-brown, fine to coarse GRAVEL, little fine to coarse sand, few silt; silt washing out of grab samples; abundant cuttings.
						Brown, silty fine to coarse SAND.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	8 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Brown, silty fine to medium SAND; formation continues to be saturated (as on previous page).
285						Same as above.
290						Same as above.
295						Same as above.
300						**Olympia/Pre-Olympia Undifferentiated Fluvial/Lacustrine Deposits** Gray, silty fine to coarse SAND; trace organics.
305						Same as above.
310						Same as above.
315						Same as above.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	9 of 14

Project Name: Tokul Creek Water Right
Location: Snoqualmie, WA
Elevation (Top of Well Casing): ~550'
Surface Elevation (ft): ~550'
Water Level Elevation:
Date Start/Finish: 11/11/09,12/21/09
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hole Diameter (in): 6"
Hammer Weight/Drop: N/A

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray, fine to medium SAND, few silt; formation continues to be saturated (as on previous page).
325						Same as above.
330						Same as above.
335						Same as above.
340						Gray, fine to coarse SAND, few silt; trace organics.
345						Gray, silty fine SAND to fine sandy SILT.
350						Gray, fine sandy SILT; trace organics.
355						Same as above.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	10 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray, silty fine SAND; trace organics; formation continues to be saturated (as on previous page).
365						Gray, fine sandy SILT.
370						Same as above.
375						Same as above.
380						Gray, fine to coarse SAND, little silt; trace organics; abundant cuttings.
385						Gray, silty fine to medium SAND; trace organics.
390						Gray, silty fine SAND.
395						Same as above.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	11 of 14

Project Name	Tokul Creek Water Right	Location	Snoqualmie, WA
Elevation (Top of Well Casing)	~550'	Surface Elevation (ft)	~550'
Water Level Elevation		Date Start/Finish	11/11/09,12/21/09
Drilling/Equipment	Hayes Drilling/Air & Mud Rotary	Hole Diameter (in)	6"
Hammer Weight/Drop	N/A		

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray, silty fine SAND; formation continues to be saturated (as on previous page).
405						Same as above.
						Gray, SILT/CLAY.
410						Same as above.
415						Same as above.
420						Same as above; becoming harder with depth.
425						Same as above.
430						Gray, SILT/CLAY, trace gravel; trace cuttings.
435						Same as above.
						Saturated, gray, fine SAND.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: LBK/FSM

Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	12 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	ST	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Gray, SILT/CLAY.
445						Saturated, gray, fine to coarse SAND, little silt.
450						Saturated, gray, fine sandy SILT/CLAY; abundant organics.
455						Same as above.
460						Saturated, gray, silty fine SAND; abundant organics.
465						Same as above; most of sample is woody debris.
470						Same as above.
475						Saturated, gray, very fine to fine SAND, few silt; abundant organics.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	13 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
						Sample is primarily woody fragments; discharge includes gray, silty fine sand.
485						Saturated, gray, very fine to fine SAND, few silt; trace organics.
490						Same as above.
495						Saturated, gray, very fine to fine SAND, few silt.
500						Saturated, gray, fine SAND, few silt.
505						Same as above.
510						Same as above.
515						Saturated, gray, fine to medium SAND, few silt.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

Associated Earth Sciences, Inc.

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
KH070569A	OBW-4	14 of 14

Project Name: Tokul Creek Water Right
Elevation (Top of Well Casing): ~550'
Water Level Elevation:
Drilling/Equipment: Hayes Drilling/Air & Mud Rotary
Hammer Weight/Drop: N/A

Location: Snoqualmie, WA
Surface Elevation (ft): ~550'
Date Start/Finish: 11/11/09,12/21/09
Hole Diameter (in): 6"

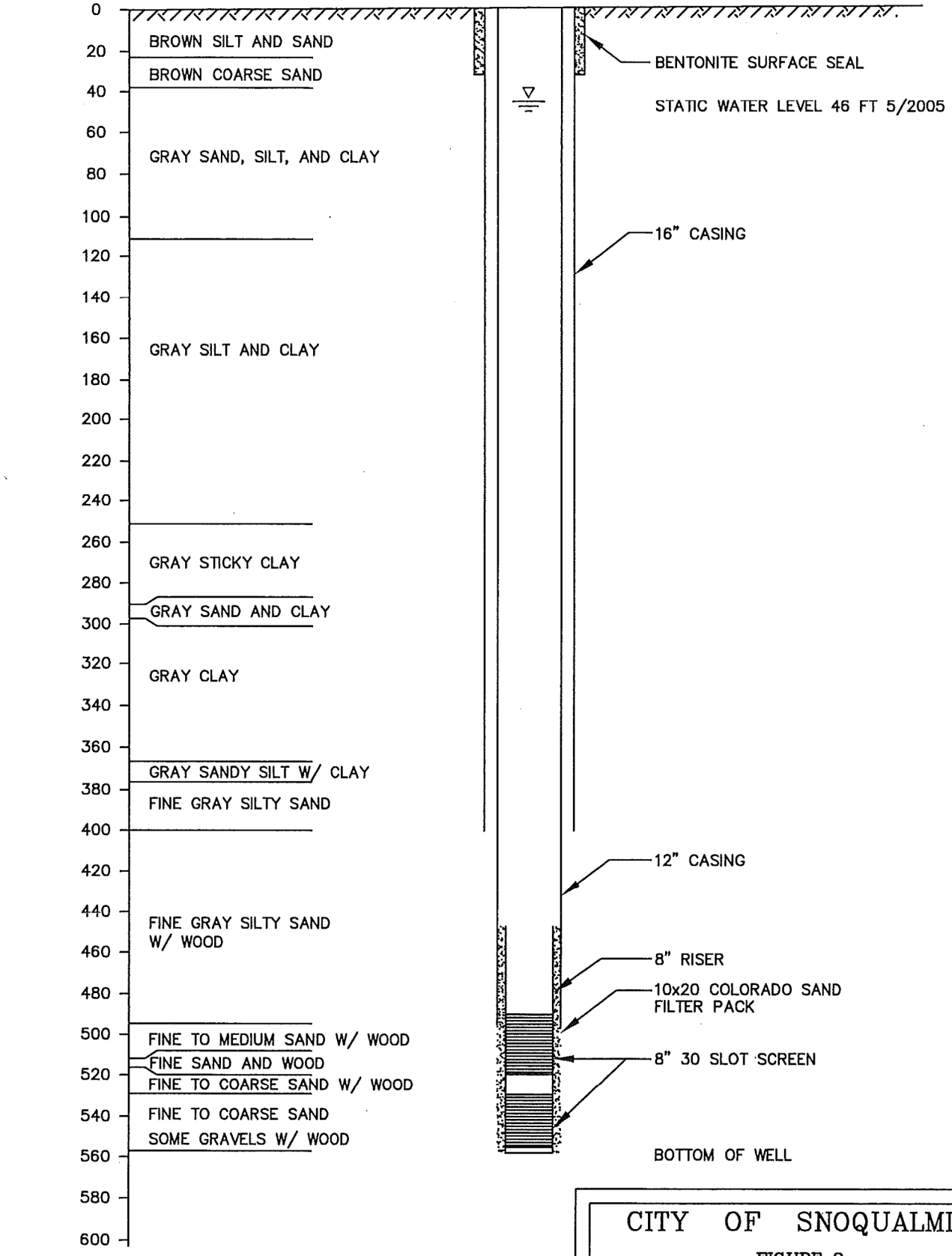
Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
		0 to 554 1/2 feet, 6-inch stainless steel well casing				Saturated, gray, fine to medium SAND, few silt.
525						Same as above.
530						Same as above.
535						Same as above.
540						Wet, medium gray to greenish gray, medium SAND, trace to few silt.
545		Screen assembly 546 1/2 to 557 1/2 feet. 9 1/2 inches - K-packer, 5-inch inner diameter (I.D.), 6 1/4-inch outer diameter (O.D.) at rubber gaskets. 60 inches - stainless steel screen, 0.040-inch machine slot size, 5-inch I.D., 5 1/2-inch O.D. 2 1/2 inches - stainless steel casing, 5-inch I.D., 5 1/2-inch O.D.				Wet, medium gray to greenish gray, fine to very fine SAND, few to trace silt.
550						Same as above.
555		60 inches - stainless steel screen, 0.040-inch machine slot size, 5-inch I.D., 5 1/2-inch O.D. 1 1/2 inches - stainless steel casing, 5-inch I.D., 5 1/2-inch O.D., stainless steel plate welded to bottom of screen assembly.				Same as above.
						Boring terminated at 558 feet. Well completed at feet on 12/21/09.

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: LBK/FSM
Approved by:

NWWELL- B 070569A.GPJ BORING.GDT 8/27/13

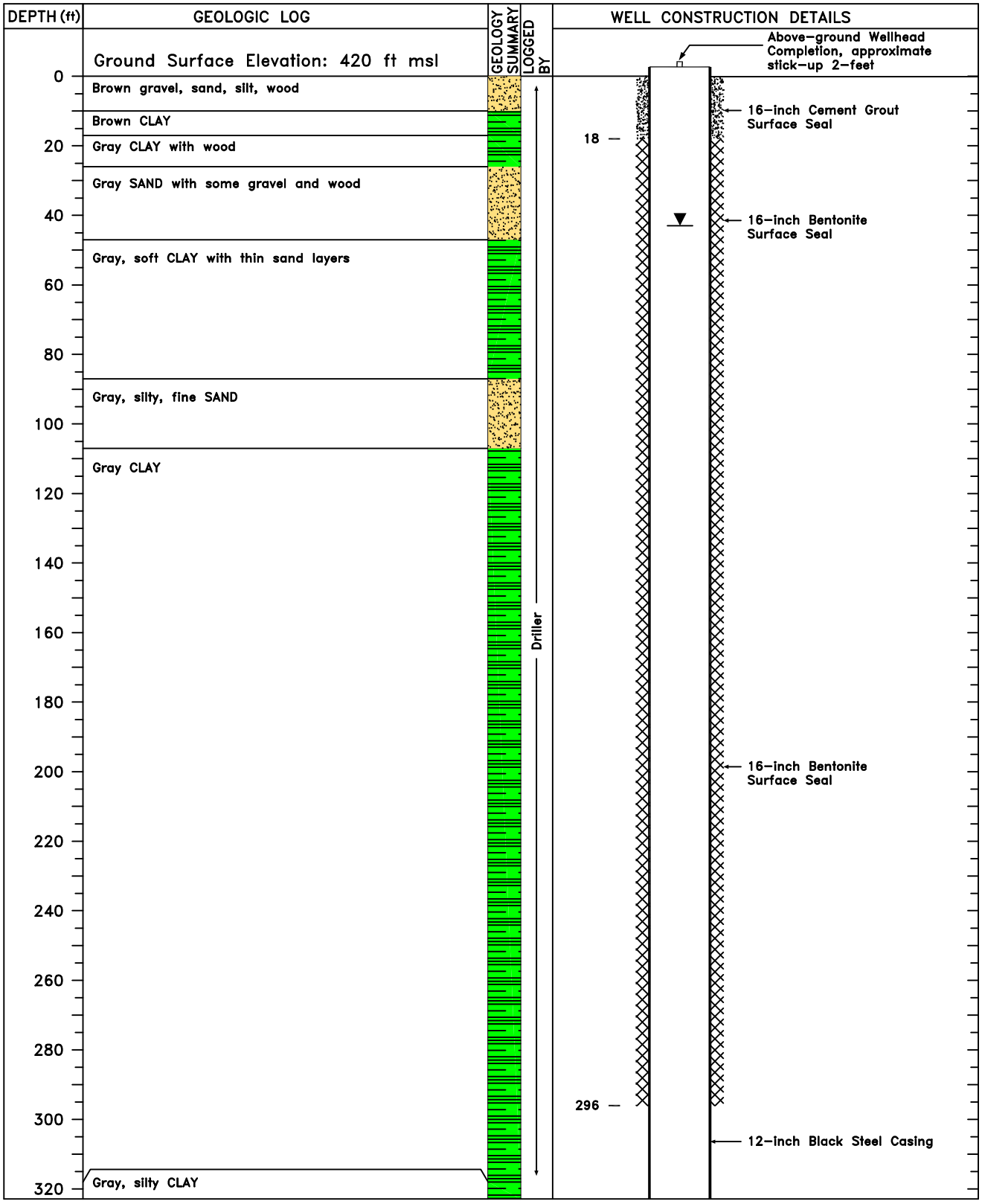


CITY OF SNOQUALMIE

FIGURE 2
WELL NO. 1-R

Gray & Osborne, Inc.
CONSULTING ENGINEERS

Figure 2. Well Log and As-Built for EW1

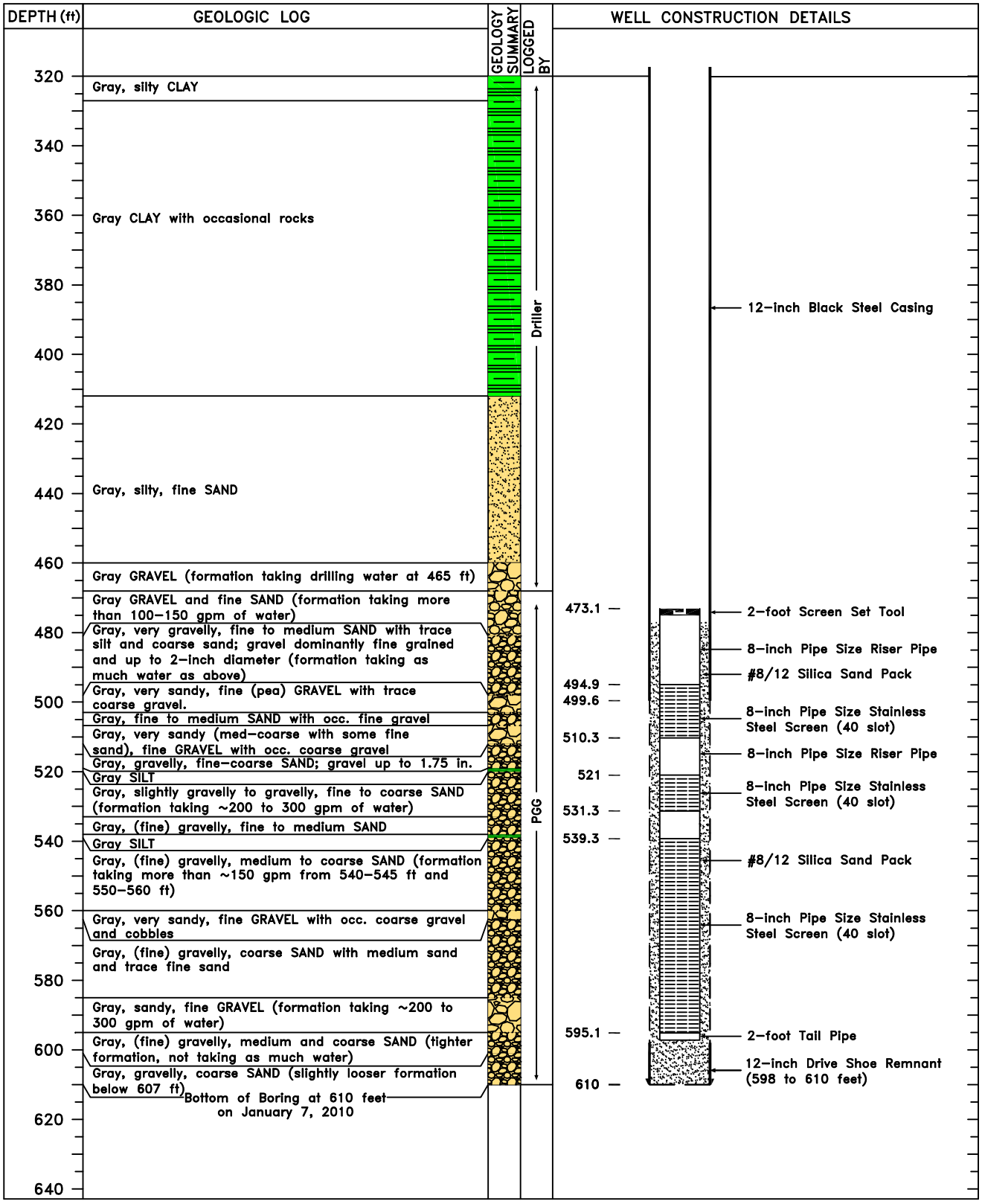


PROJECT NAME: Richert/Mt Si High School Geothermal Heat Pump
WELL IDENTIFICATION NAME: EW1
LOCATION: NW¼ SE¼ Sec. 32, T.24N., R.8E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Inger Jackson
ECOLOGY UWID: BAL 870

WATER LEVEL ELEVATION: Wellhead Not Surveyed
WATER LEVEL: 3/17/2010
START CARD NO.: GE00106
DRILLING METHOD: Reverse Circulation Rotary
DRILLER: Mark Wiese
FIRM: Tacoma Pump & Drilling Co. Inc.

PgG

Figure 2. Well Log and As-Built for EW1

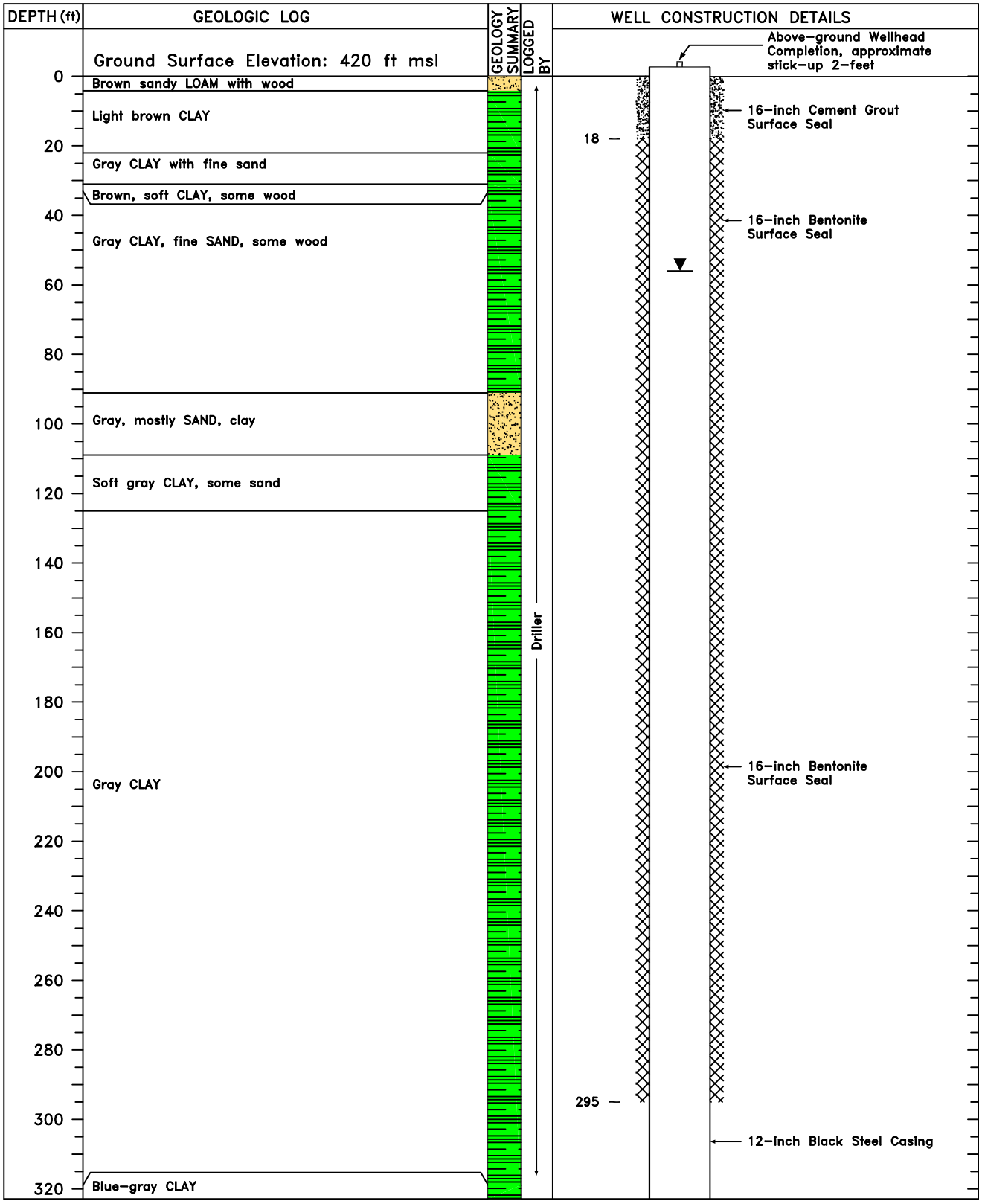


PROJECT NAME: Richert/Mt Si High School Geothermal Heat Pump
WELL IDENTIFICATION NAME: EW1
LOCATION: NW¼ SE¼ Sec. 32, T.24N., R.8E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Linton Wildrick
ECOLOGY UWID: BAL 871

WATER LEVEL ELEVATION: Wellhead Not Surveyed
WATER LEVEL DATE: 3/17/2010
START CARD NO.: GE00106
DRILLING METHOD: Reverse Circulation Rotary
DRILLER: Mark Wiese
FIRM: Tacoma Pump & Drilling Co. Inc.

PgG

Figure 6. Well Log and As-Built for IW1

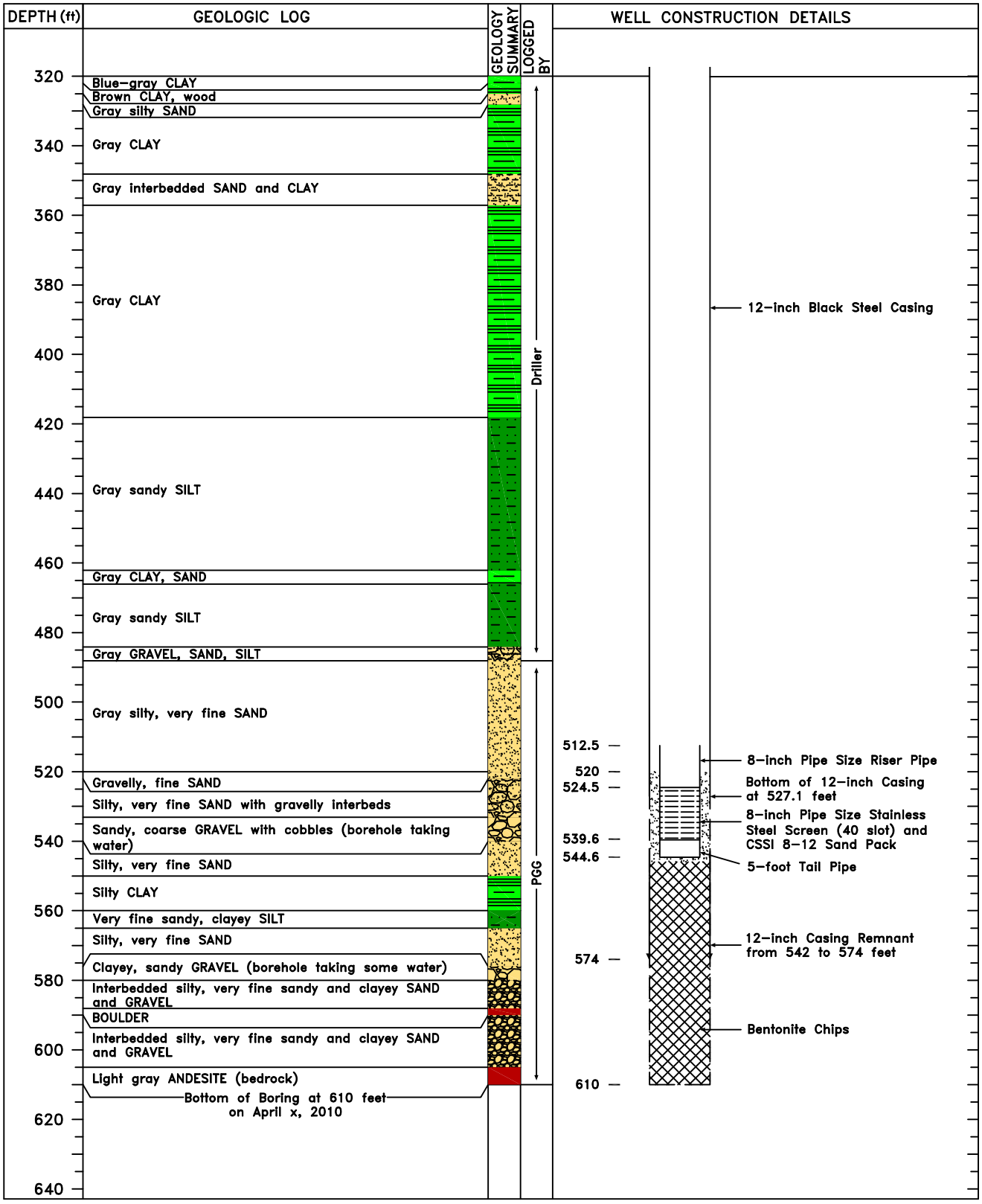


PROJECT NAME: Richert/Mt Si High School Geothermal Heat Pump
WELL IDENTIFICATION NAME: IW1
LOCATION: NW¼ SE¼ Sec. 32, T.24N., R.8E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Linton Wildrick
ECOLOGY UWID: BAL 871

WATER LEVEL ELEVATION: Wellhead Not Surveyed
WATER LEVEL DATE: 4/16/2010
START CARD NO.: GE00106
DRILLING METHOD: Reverse Circulation Rotary
DRILLER: Mark Wiese
FIRM: Tacoma Pump & Drilling Co. Inc.

PgG

Figure 6. Well Log and As-Built for IW1



PROJECT NAME: Richert/Mt Si High School Geothermal Heat Pump
WELL IDENTIFICATION NAME: IW1
LOCATION: NW¼ SE¼ Sec. 32, T.24N., R.8E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Linton Wildrick
ECOLOGY UWID: BAL 871

WATER LEVEL ELEVATION: Wellhead Not Surveyed
WATER LEVEL DATE: 4/16/2010
START CARD NO.: GE00106
DRILLING METHOD: Reverse Circulation Rotary
DRILLER: Mark Wiese
FIRM: Tacoma Pump & Drilling Co. Inc.

PgG

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

475347

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 _____

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

TYPE OF WORK: Owner's number of well (if more than one) I-W2

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

DIMENSIONS: Diameter of well 12 inches, drilled 669 ft. Depth of completed well 669 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 16" Diam. from 0 ft. to 32.3 ft. ☐ Liner installed 12" Diam. from 0 ft. to 669 ft. ☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used Mills Knife

SIZE of perfs 7/8 in. by 3 in. and no. of perfs 6/ft from 643 ft. to 665 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? 305 ft.

Material used in seal Bentonite Grout

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 420 ft.

Static level 80.6 ft. below top of well Date 10/3/12

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? TP & D

Yield: 510 gal./min. with 10.5 ft. drawdown after 0.75 hrs.

Yield: 506 gal./min. with 11.7 ft. drawdown after 3 hrs.

Yield: 505 gal./min. with 12.6 ft. drawdown after 6 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 10/3/12

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

CURRENT

Notice of Intent No. WE14716

Unique Ecology Well ID Tag No. BIB 504

Water Right Permit No. _____

Property Owner Name Snoqualmie School District

Well Street Address 38300 Epsilon Street

City Snoqualmie County King

Location SE 1/4-1/4 NW 1/4 Sec 32 Twn 24 R 8 EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg 47 Lat Min/Sec 31/18 Long Deg -122 Long Min/Sec 49/1

Tax Parcel No. (Required) N/A

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
Brown gravel, silt, wood	0	10
Brown clay	10	16
Gray clay and wood	16	25
Gray sand, gravel, wood	25	47
Gray, soft clay/sand	47	85
Gray silty, fine sand	85	105
Gray clay	105	335
Gray clay, silty	335	450
Clay w/thin sand lense	450	507
Silty sand	507	525
Silty sand, some gravel	525	527
Interbedded fine sand/clay	527	552
sand, gravel interbeds	552	630
Coarse gravel, sand	630	668

RECEIVED FEB 04 2013 DEPT OF ECOLOGY NWRO - WR

RECEIVED JAN 30 2013 DEPT OF ECOLOGY NWRO - WR

Job #: 12-1678-05

Start Date 6/26/2012 Completed Date 10/24/2012 MW

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) Wiese, Mark

Driller/Engineer/Trainee Signature

Driller or trainee License No. 2432

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company Tacoma Pump & Drilling Co., Inc.

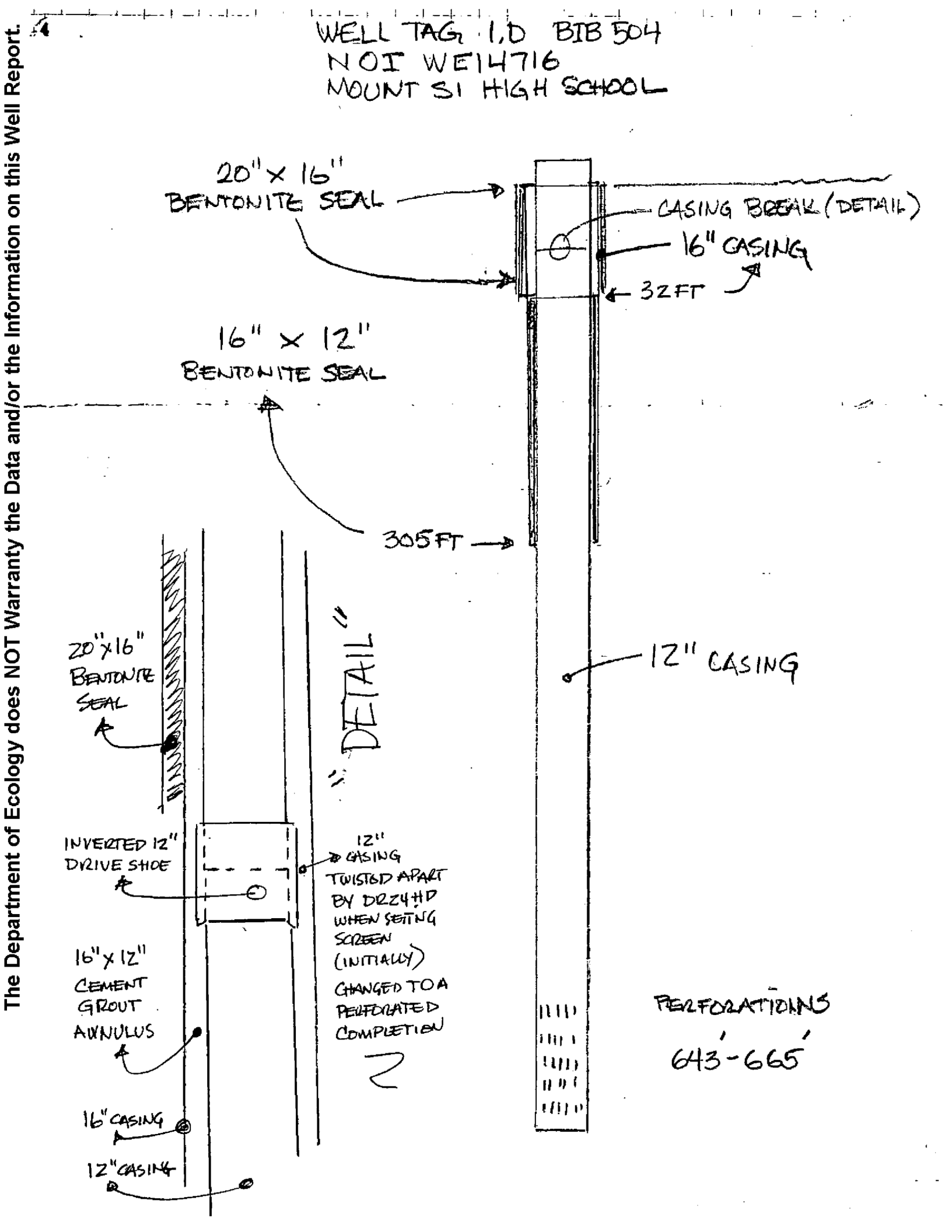
Address 30316 Mountain Highway

City, State, Zip Graham , WA. 98338

Contractor's Registration No. TACOMPD203PS Date 1/24/2013

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

WELL TAG I.D BIB 504
NOI WE14716
MOUNT SI HIGH SCHOOL



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 _____

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

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

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

DIMENSIONS: Diameter of well 12 inches, drilled 668 ft.
Depth of completed well 668 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 Allloy Machine

Type Stainless Model No. _____

Diam. 8 Slot size .050 from 631 ft. to 668 ft.

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

Gravel/Filter packed: ☒ Yes ☐ No Size of gravel/sand 6-9

Materials placed from 584 ft. to 668 ft.

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

Material used in seal N/A

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 _____ ft. below top of well Date _____

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
Specific	capacity		@ appprox. 15 gal/ft.		

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

CURRENT

Notice of Intent No. WE22034

Unique Ecology Well ID Tag No. BIB 504

Water Right Permit No. _____

Property Owner Name Snoqualmie Valley School District

Well Street Address 38300 Epsilon Street

City Snoqualmie County King

Location SE1/4-1/4 NW1/4 Sec 32 Twn 24 R 8 EWM ☒ Or WWM ☐
(s, t, r Still REQUIRED)

Lat/Long Lat Deg 47 Lat Min/Sec 31' 18"
Long Deg -122 Long Min/Sec 49.1"

Tax Parcel No. (Required) _____

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
Well Refurbishment		
4" PVC SAND FILL TUBE WAS INSTALLED		
	579.5'	
584.6 SAND PACK 09/01/2015		
	8 INCH X .250 STEEL CASING	
6-9 SILICA SAND		
	631'	
CENTRALIZERS		
OCT 09 2015 DEPT OF ECOL NWRO - WR	8 INCH P.S. .050 S.S. SCREEN	
	668'	
Job #15-1773-06		

Start Date 9/8/2015 Completed Date 10/1/2015

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) Jon Hansen

Driller/Engineer/Trainee Signature Helen Hilbert 2320 for Jon Hansen

Driller or trainee License No. 0193

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company Tacoma Pump and Drilling Co., Inc.

Address 30316 Mountain Highway East

City, State, Zip Graham , WA, 98338

Contractor's Registration No. TACOMPD203PF Date 10/5/2015

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.*

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

WELL DESIGNATIONS AND LOG LOCATIONS

On-site borings are included in Appendix A. Ecology and AESI water well logs are shown under Appendix D. When possible, both Ecology and AESI well logs have been included, and multiple logs are presented for some wells in this report. For clarification, the following lists the AESI designation and the well log number for selected wells. The source aquifer for each well is also shown.

AESI Well Designation	Well log Number	Aquifer
SS&G#1	31	Olympia Aquifer
SS&G#2	49	Olympia Aquifer
SS&G#3	58	Tokul Creek Delta Aquifer
EB-B4W	59	Seasonal perched ground water zone within Tokul Creek Delta deposits
EB-C1W	16	Tokul Creek Delta Aquifer
North Valley Well Field (NVWF) Wells:		
TW-5	50	Olympia Aquifer
TW-6	15	Olympia Aquifer
TW-7	51	Olympia Aquifer
OBW-1	13	Tokul Creek Delta Aquifer
OBW-2	14	Tokul Creek Delta Aquifer
Snoqualmie Waste Water Treatment Plant (WWTP) Wells:		
OBW-1B (abandoned)	52	Advance Outwash Aquifer
OBW-2 (abandoned)	53	Tokul Creek Delta Aquifer
OBW-2A	54	Tokul Creek Delta Aquifer
OBW-3	55	Tokul Creek Delta Aquifer
OBW-4 (abandoned)	56	Tokul Creek Delta Aquifer
OBW-5	57	Tokul Creek Delta Aquifer

JAW/ld
KG99312A22
D:\WP\ld\2-01 - WP8

Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Permit No 1

(1) OWNER: Name Rocky Ridge Water Assn. Address 13721 408th Ave. S.E. North Benr, Wa.

(2) LOCATION OF WELL: County King — NW ¼ SW ¼ Sec. 16 T. 24N. R 8E WM

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 8 inches.
Drilled 100 ft. Depth of completed well 100 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from 0 ft. to 66 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? ____ ft.
Material used in seal
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.... ____ ft.
Static level dry hole ft. below top of well Date
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.
" " " "
" " " "

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 0 gal./min. with 0 ft. drawdown after 0 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
Topsoil	0	3
Brn. Glacial Till & Boulders	3	21
Blue Glacial Till & Boulders	21	54
Brn. Glacial Till & Boulders	54	65
Gray Sandstone	65	100
CASING BENT OFF DUE TO BOULDERS		
UNABLE TO CONTINUE WITH HOLE IN		
PRESENT CONDITION		
CASING PULLED AND HOLE ABONDONED		
ACCORDING TO STATE CODES		

RECEIVED
JUL 31 1986
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 4-15-86 19 Completed 4-16-86 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 NW Pump & Drilling Co. (Person, firm, or corporation) (Type or print)

Address 3245 Auburn Way South

[Signed] R. B. Dettman (Well Driller)

License No. 0097 Date 4-30-86, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

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

24/08/16M
Application No

Permit No 2

(1) OWNER: Name Rocky Ridge Water Assn. Address 13721 408th Ave. S.E. North Bend

(2) LOCATION OF WELL: County King — NW ¼ SW ¼ Sec. 16 T. 24 N. R 8E W

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 750 ft. Depth of completed well 750 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 750 ft.
Threaded ☐ 8 " Diam. from 0 ft. to 66 ft.
Welded ☒ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Torch
SIZE of perforations 3/16 in. by 4 in.
60 perforations from 710 ft. to 730 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 & Cement
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.... _____ ft.
Static level 97 ft. below top of well Date 5-1-86
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.
" " " "
" " " "

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 7 gal./min. with 550 ft. drawdown after 12 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
Topsoil	0	3
Brn. Glacial Till	3	21
Blue Glacial Till	21	54
Brn. Glacial Till	54	65
Gray Sandstone w/ Shale Layers	65	145
Gray Shale	145	160
Gray Sandstone w/ Shale Layers	160	545
Gray to Black Shale	545	620
Light Gray Basalt	620	750

RECEIVED
JUL 31 1986
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 4-17-86, 19__ Completed 5-1-86, 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 NW Pump & Drilling Co.
(Person, firm, or corporation) (Type or print)

Address 3245 Auburn Way South

[Signed] _____ (Well Driller)

License No. 0097 Date 5-4-86, 19__

USE ADDITIONAL SHEETS IF NECESSARY

(1) OWNER: Name Laura G McCune Address 38410 SE 47 ST Snoqualmie Wash 98065

(2) LOCATION OF WELL: County King Lot 18-24-08 AK 9064 SW ¼ SE ¼ Sec 18 T 24 N R 8E W M

Bearing and distance from section or subdivision corner Cadl 6540 Corner not 18-24-18

3

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

(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 8 inches.
Drilled 361 ft. Depth of completed well 361 ft.

(6) CONSTRUCTION DETAILS: Pulled Back to

Casing installed: 8" Diam. from +1 ft. to 352 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 ☐ with 2 Ft Riser Seal packer
Manufacturer's Name Johnson
Type Model No.
Diam. 8 Slot size from 252 ft. to 261 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? 30 ft.
Material used in seal Bentonite & Dial cuttings
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Will Be a Sub measure
Type: Sub. Will Be HP 5

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ~565 ft.
Static level 317 ft. below top of well Date
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.
" " " "
" " " "

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 26 gal./min. with 2 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: 16 = 8 → = 7 = 15

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
Boulders up to 3 Ft in diameter		
to 16 Ft - It was Necessary to		
take Back ~~Hoe~~ Hoe & dig down	1	16
to 16 Ft - 120 Blurs take out		
14" Steel Pipe to 18 Ft		
Large Excavation Back filled		
with clean sand & Bentonite		
Bentonite seal goes to 26 Ft		
Mixed with drill cuttings		
total Bentonite 15 sacks	0	26
Coarse dry gravel - Very little		
till 4 inches at a time	26	180
occasional layers of till		
Fine sand & gr.	180	220
Water at head 10 Ft in Layers	330	345
clay & fine sand most of which had		
to Be drill		
Coarse sand & some clay	345	348
Fine sand. Bailed down	350	362
Sand is Medium Size up to 30 thread		
Yellow clay	362	364
Now there is a 13 Ft Artesian		
head		
It is possible that there is more aquifer under		
this		
It was Necessary to use Pipe		
in 6 & 7 Ft lengths Because we		
Could not drill more than 3 to 4" Below		
Pipe had to Be driven - Some days we		
only got 7 Ft.		

Work started APRIL 1988 Completed May 1988

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 H.O. Meyer Drlg Co (Person, firm, or corporation) (Type or print)

Address 6424 Lake Wn Blvd NE - Kirkland, Wash

[Signed] H.O. Meyer (Well Driller)

License No. 0308 Date June 15, 1988

USE ADDITIONAL SHEETS IF NECESSARY

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy 24/SE/18/Q

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 7/00-10 Q
Permit No. ....

(1) OWNER: Name Don Carlson & Al. Beutel Address SE 46th St. Snoqualmie

(2) LOCATION OF WELL: County King — SW ¼ SE ¼ Sec 18 T 24 N., R 8 E W.M.
Bearing and distance from section or subdivision corner 70' from No. property Line & 100' from End-Line

4

(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 ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Bored ☐ Cable ☒ Driven ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" inches.
Drilled 185 ft. Depth of completed well 185 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +1 ft. to 185 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 Johnson
Type SS Model No. ___
Diam. 6" Slot size 14 from 185 ft. to 180 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 Neatonite
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.... ~~350~~ ~565' ft.
Static level 157' ft. below top of well Date April 22/75
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.
" " " "
" " " "

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 20 gal./min. with 14 ft. drawdown after 1 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
Brown Top Soil	0'	6'
Rock Gravel Cemented w/clay	6'	8'
Rocks Gravel (water)	8'	10'
Light Brown Cemented Gravel Sand Clay	10'	179'
Sand Gravel (water)	179'	185'

Work started March 31, 1975. Completed April 23, 1975

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 B & J Drilling Co (Person, firm, or corporation) (Type or print)
Address 9026 38th Ave SW Seattle 9[illegible]
[Signed] [signature] (Well Driller)
License No. 0071 Date May 12, 19[illegible]

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)

(1) OWNER Name Cecilia Todd Address [illegible] 5

(2) LOCATION OF WELL: County KING NW ¼ SE ¼ Sec 18 T 24 N. R 8E W.M

(2a) STREET ADDRESS OF WELL (or nearest address) SAME AS Above

(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 [X] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 191 feet Depth of completed well 190 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 191 ft.
Welded [ ] " Diam. from ____ ft. to ____ ft.
Liner installed [ ] " Diam. from ____ ft. to ____ ft.
Threaded [ ]

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 Goulds
Type: Sub. H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level ~~400~~ 600 ft.
Static level 156 ft. below top of well Date Feb 15 1991
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 [X] If yes, by whom? ____
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 10 gal. min with 0 ft drawdown after 1 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 [X]

(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
Brown Top Soil	0	2
Brown Sand Clay gravel	2	9
Brown gravel Rock cobbles sand	9	11
Brown gravel cobbles Rocks	11	21
Brown Clay gravel Cobbles	21	25
Brown Clay gravel Cobbles	25	30
Brown Clay gravel Boulders	30'	40'
Brown Clay gravel sand Loose	40'	85'
gray Clay Sand gravel	85'	94'
gray Silty Clay sand gravel	94'	105'
Brown Clay gravel sand Loose	105	120'
Brown Clay gravel sand Trace H2O	120'	121'
Brown Clay Sand gravel	121	125
gray Clay Sand.	125	133
Blue gray clay gravel Sand	133	142
Brown gravel Clay Lite gray	142	145
Brown Gravel Clay	145	148
Lite gray gravel streaks sand	148	158
Brown gray sand gravel clay	158	160
Light. gray Clay sand gravel	160	170
Light gray Sand Trace H2O	170	175
Brown Clay gravel Sand	175	178
gravel Lite gray sand clr water	178	185
Light. gray clay gravel sand water	185	190
gray Clay Sand.	191	
This well Open hole		
No screen		

RECEIVED SEP 11 DEPT OF ECOLOGY

Work started Dec 27 1990 Completed Feb 15 1991

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 B & J Drilling Co 392-3826
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 9026 38TH AV S.W. Seattle

(Signed) [signature] License No. 0071
(WELL DRILLER)

Contractor's Registration No. 302 KK Date March 4 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

6

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. 24-08-18P

Water Right Permit No.

(1) OWNER: Name Ed. A Florek Address 4431 178th Lane SE. Bellevue 98

(2) LOCATION OF WELL: County King SE ¼ SW ¼ Sec 18 T 24 N., R 8E W M

(2a) STREET ADDDRESS OF WELL (or nearest address) Aprox 38817 SE 47th Snoqualmie, Wa. (12) =20

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

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

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

(5) DIMENSIONS: Diameter of well 8 inches. Drilled 388 feet. Depth of completed well 384 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from +1 ft. to 384 ft.
Welded [X] Liner installed [ ] Threaded [ ]
" Diam. from ft. to ft.
" 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 [X] No [ ]
Manufacturer's Name Cook
Type SS. Model No.
Diam. 8 Slot size 16 from 374 ft. to 369 ft.
Diam. 8 Slot size 14 from 369 ft. to 364 ft.

Gravel packed: Yes [ ] No [X] Size of gravel 1
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? N/A Depth of strata N/A
Method of sealing strata off N/A.

(7) PUMP: Manufacturer's Name Cadds
Type: Sub. H.P. 1½

(8) WATER LEVELS: Land-surface elevation above mean sea level 510'±550 ft.
Static level 316 ft. below top of well Date
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 [X] If yes, by whom? N/A
Yield: gal./min. with ft. drawdown after hrs.
" N/A " N/A " N/A "
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
	N/A		N/A		N/A

Date of test
Bailer test 10 gal./min. with 20 ft. drawdown after 4 hrs.
Airtest N/A gal./min. with stem set at N/A ft. for N/A hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(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
Dark Brown Sand.	0	8
Brown Color Boulders 4' Dia & Smaller	8	13
Brown Clay gravel & Boulders	13	18
Brown Clay Sand Boulders Cobbles	18	30
Brown gravel sand Dry [illegible] Boulders	30	40
Light Brown sand clay gravel	40	60
Light Brown sand gravel Cobble st.	60	100
Light Brown Clay sl. sandy gravel Loose	100	120
Light Brown Pit Run gravel Cobbles	120	170
Large Boulders Rocks Loose	170	185
Brown Clay sand streak of Boulders	185	220
Brown Clay sand gravel Some cobbles	220	232
Reddish Brown clay sand cobbles	232	241
Brown clay sand streak gravel	241	334
Brown Clay streaks Sand Trace H2O	334	336
Brown Clay Sand no water	336'	340'
Brown sand Clay H2O bearing	340'	376'
Brown Sand Hearing (water)	376	388'

JAN 26 1989

DEPARTMENT OF ECOLOGY
NORTHWEST SECTION

Work started June 29 88, 19. Completed JAN 17, 19 89

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 B & J Drilling Co 392-3826
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 9026 38th Ave SW Sea

(Signed) [signature] License No. 0071
(WELL DRILLER)

Contractor's Registration No. BOZ KK Date Jan 19, 1989

(USE ADDITIONAL SHEETS IF NECESSARY)

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

Permit No. 7

(1) OWNER: Name Frank Pace Address 8814 S 54th Mercer Island

(2) LOCATION OF WELL: County King SE ¼ SE ¼ Sec 18 T 24 N. R 5E 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 217 ft. Depth of completed well 217 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 212 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 ☐ JOHNSON
Manufacturer's Name
Type STAINLESS Model No.
Diam. 6 Slot size .014 from 212 ft. to 217 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 ~570 ft.
Static level 140 ft. below top of well Date 1/6/79
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.
" " " "
" " " "

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 8 gal./min. with 22 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: (11) = 19

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	4
Brown Gravelly till	4	155
Blue till	155	194
Brown Sandy Hardpan	194	214
Blue Sand & Gravel	214	217

Work started ___, 19___ Completed ___, 19___

WELL DRILLER'S STATEMENT:

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

NAME STATEWIDE DRILLING CO. (Person, firm, or corporation) (Type or print)
Address 1333 Beacon Way S. Renton, WA 98055 772-5771

[Signed] (Well Driller)

License No. 0220 Date 1/9, 197

USE ADDITIONAL SHEETS IF NECESSARY!

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

24/08-18K
Application No. 8
Permit No. ....

(1) OWNER: Name Jerry C. Parker Address P.O. Box 341 Fall City, WA. 98024

(2) LOCATION OF WELL: County King — SE ¼ SE ¼ Sec. 18 T. 24 N. R. 8E 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 8 Inches. Drilled 224 ft. Depth of completed well 224 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8 " Diam. from +1-6" ft. to 145 ft.
Threaded ☐ 5 " Diam. from 140 ft. to 224 ft.
Welded ☐ ____ " Diam. from ____ ft. to ____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Torch
SIZE of perforations 1/8 in. by 4 in.
30 perforations from 200 ft. to 224 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.... ~570 ft.
Static level Appx. 200 ft. below top of well Date
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.
" " " "
" " " "

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
	Air Test				

Date of test 4-21-81
Bailer test 10 gal./min. with 20 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: 10 = 18

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'
Gravel & Cobble Stone	1'	18'
Gravel & Boulders	18'	42'
Sand & Gravel	42'	96'
Hard Pan	96'	110'
Sand & Gravel	110'	161'
Hard Pan	161'	186'
Coarse Sand, some water	186'	188'
Hard Pan	188'	200'
Black Sand Water	200	224'

RECEIVED
MAY 7 1981
DEPARTMENT OF ECOLOGY
WATER RESOURCES

Work started April 10, 1981 Completed April 21, 1981

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 Berg Drilling & Pump Service
(Person, firm, or corporation) (Type or print)

Address P.O. Box 569, Fall City, WA. 98024

[Signed] James Dawson
(Well Driller)

License No. 1003 Date 4/22, 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

Third Copy — Driller's Copy

STATE OF WASHINGTON

(1) OWNER: Name Kenneth R. Wiltse Address 38429 S.E. 47th, Snoqualmie, WA, 98065

(2) LOCATION OF WELL: County King — SE ¼ SE ¼ Sec 18 T. 24 N. R. 8E W.M.

Bearing and distance from section or subdivision corner

9 (9) = 17

(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 ____ inches. Drilled ____ ft. Depth of completed well ____ ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1'6" ft. to 138' 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.... ~570 ft.
Static level 78' ft. below top of well Date 5-8-81
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.
" " " "
" " " "

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
Air Test					

Date of test ____
Bailer test 15 gal./min. with 30 ft. drawdown after 1 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
Topsoil	0	1'
Gravel & Cobble Stone	1'	6'
Gravel & Boulders	6'	28'
Hard Pan & Gravel Mix	28'	31'
Gravel & Boulders	31'	42'
Hard Pan & Gravel Mix	42'	63'
Sand - Brown	63'	66'
Gravel	66'	108'
Hard Pan Gravel	108'	130'
Gravel Brown Clay	130'	136'
Gravel Water Bearing	136'	138'
Air Test About 15 Gallons per Minute		

RECEIVED JUN 8 1981 DEPARTMENT OF ECOLOGY NORTHWEST REGION

Work started 5/4 19 81 Completed 5/7 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 Berg Drilling & Pump Service (Person, firm, or corporation) (Type or print)

Address P.O. Box 569 Fall City, WA. 98024

[Signed] James Davis (Well Driller)

License No. 1003 Date May 12, 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

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

ENTERED

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 20133 **10**

UNIQUE WELL I.D. # _____

Water Right Permit No. 24/SE/18 Q

(1) OWNER: Name Ron Sather Address 4525 378 Pl. SE, SNOQ.

(2) LOCATION OF WELL: County King SE 1/4 SE 1/4 Sec. 18 T. 24 N. R 8E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) SAME AS Above (14) = 22

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

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

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

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 430 feet. Depth of completed well 378' ft.

(6) CONSTRUCTION DETAILS:

Casing Installed: 6" Diam. from +1 ft. to 398 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Mills Knife
SIZE of perforations ¼ in. by 2 in.
236 perforations from 300' ft. to 359 ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☐
Manufacturer's Name Houston
Type SS. Model No. _____
Diam. 6 Slot size 14 from 345' ft. to 360' 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 300' to 359'
Method of sealing strata off not sealed used.

(7) PUMP: Manufacturer's Name Goulds
Type: SUB. 10EJ15412 H.P. 1½

(8) WATER LEVELS: Land-surface elevation above mean sea level 400' ~ 580' ft.
Static level 310' ft. below top of well Date April 13 1994
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.
" " " "
" " " "

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 10 gal./min. with 5 ft. drawdown after 1 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
SEE org. Log For Formation March 30 1977	6" CASING	6" CASING
5" Liner pipe to surface		
FEB 08 1995		
		345'
15' of 14 slot, SS, Screen Houston		
		360'
21' 1½" Tail pipe 5"	5" X 21' Tail Pipe	

Work Started March 29 1994 Completed April 13 1994

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 B & J Drilling Co INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 9026 38th Av. S.W. Sea.

(Signed) D L Cannon (WELL DRILLER) License No. 0071

Contractor's Registration No. BJ Dric 088 DT Date May 1 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

24/8E/19 6

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 [redacted] 11

c/o BILL LANGUS Water Right Permit No

(1) OWNER: Name WA,ST.FISHERIES-BONIN HOMES INC Address 713 SE EVERETT MALL WAY SUITE A

(2) LOCATION OF WELL: County KING PARCEL #1924089007 SW. NE ¼ Sec 19 T 24 N. R 8E W M

(2a) STREET ADDRESS OF WELL (or nearest address) 37405 SE FALL CITY SNOQUALMIE RD. (24)

(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 178 feet. Depth of completed well 178 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 168 ft.
Welded [X] Liner installed [ ] Threaded [ ] " Diam. from ft. to ft.
" 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 [X] No [ ]
Manufacturer's Name COOK
Type .016 Model No
Diam. 6 Slot size .030 from 168 ft. to 178 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? 20 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 32 ft. below top of well Date 4-19-91
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 [X] No [ ] If yes, by whom? S-K
Yield: 107 gal./min. with 68.5 ft. drawdown after 3 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
3:31	55'	3:35	41.0'	3:45	31.0'
3:32	48.5'	3:36	38.5		
3:34	43.5'	3:40	33.5'		

Date of test
Bailer test 40 gal./min. with 38 ft. drawdown after 1 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 [X] 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
brown sand & gravel	0'	7'
wood	7'	10'
brown sand, gravel & wood	10'	17'
gray sand,gravel & clay	17'	28'
gray sandy clay	28'	36'
silty gray sand,gravel & clay,silty water 15-20 gpm	36'	52'
gray sand-some clay	52'	156'
heaving gray sand	156'	164'
coarse gray sand & large gravels water 40+gpm	164'	178'
2'6'' riser & packer		
12'6'' total screen assembly		

RECEIVED
APR 30 1991
DEPT OF ECOLOGY

Work started 4-16-91 19. Completed 4-19-91 19

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 S-K PUMP & DRILLING (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 32519 MT.HWY.EATONVILLE,WA.98328

(Signed) Richard Braun (WELL DRILLER) License No 1065

Contractor's Registration No S-K Pumd*136N1 Date 8-21 19 91

(USE ADDITIONAL SHEETS IF NECESSARY)

ENTERED

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 11
Unique Well I.D. #
Water Right Permit No.

12

(1) OWNER: Name PHILLIPS, GARY Address P O BOX 813 FALL CITY, WA 98024- 24-8E-19B

(2) LOCATION OF WELL: County KING - NW 1/4 NE 1/4 Sec 19 T 24 N., R 8 WM

(2a) STREET ADDRESS OF WELL (or nearest address) 5XXX SE FISH HATCHERY RD, FALL CITY

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 60 ft. Depth of completed well 60 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 55 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: 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
Manufacturer's Name
Type STAINLESS STEEL Model No. TELESCOPING
Diam. 6 slot size 10 from 55 ft. to 60 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... 210 ft.
Static level 21 ft. below top of well Date 10/12/95
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. 30 ft. drawdown after hrs.
Air test 7 gal/min. w/ stem set at ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made?

(10) WELL LOG (23)

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 in formation.

MATERIAL	FROM	TO
BROWN CLAY & GRAVEL	0	23
BLUE CLAY	23	56
WATER & SAND	56	60
BLUE CLAY	60	

RECEIVED
JAN 11 1996
DEPT. OF ECOLOGY

Work started 10/12/95 Completed 10/12/95

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 DAHLMAN PUMP & WELL DRILL
(Person, firm, or corporation) (Type or print)

ADDRESS PO BOX 422,BURLINGTON, WA

[SIGNED] Ralph W. Rush License No. 2043

Contractor's
Registration No. DAHLMPW123LC Date 01/03/96

STATE OF WASHINGTON Water Right Permit no.

(1) OWNER: Name ASSOCIATED EARTH SCIENCES Address 903 5 AVE KIRKLAND, WA 98033-

13

(2) LOCATION OF WELL: County KING - NE 1/4 SE 1/4 Sec 19 T 24 N., R 6 W

(2a) STREET ADDRESS OF WELL (or nearest address) NO ADDRESS ASSIGNED

(3) PROPOSED USE: TEST WELL

(4) TYPE OF WORK: Owner's Number of well (If more than one) 1

NEW WELL Method: ROTARY

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

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 195 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: 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
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No.
Diam. 6 slot size .030 from 195 ft. to 200 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 164 ft. below top of well Date 09/06/89
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test ? gal/min. w/ stem set at 190 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
BROWN SAND & GRAVEL	0	160
BROWN CEMENTED SAND & GRAVEL	160	200

Work started 09/05/89 Completed 09/06/89

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS 3245 AUBURN WAY SOUTH

[SIGNED] [signature] License No. 0097

Contractor's
Registration No. NORTHPD137PQ Date 10/18/89

RECEIVED
OCT 23 1989
DEPARTMENT OF ECOLOGY

24/08-19J

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 035211
Water Right Permit No.

14

(1) OWNER: Name ASSOCIATED EARTH SCIENCE Address 903 5 AVE KIRKLAND, WA 98033-

(2) LOCATION OF WELL: County KING - NE 1/4 SE 1/4 Sec 19 T 24 N., R 8 WM
(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: TEST WELL

(4) TYPE OF WORK: Owner's Number of well (If more than one) OBW-2
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 160 ft. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 155 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: 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
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No.
Diam. 6 slot size .020 from 155 ft. to 160 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 135 ft. below top of well Date 09/08/89
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 7 gal/min. w/ stem set at 150 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG (26) OBW-2

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 in formation.

MATERIAL	FROM	TO
BROWN SAND & GRAVEL	0	9
BROWN CEMENTED SAND & GRAVEL	9	22
BROWN SAND & GRAVEL	22	140
BROWN CEMENTED SAND & GRAVEL	140	154
WATER BEARING SAND & GRAVEL	154	160

Work started 09/07/89 Completed 09/08/89

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS 3245 AUBURN WAY SOUTH

[SIGNED] R B [signature] License No. 0097

Contractor's Registration No. NORTHPD137PQ Date 10/18/89

RECEIVE
OCT 23 1989
DEPARTMENT OF ECOL
NORTHWEST REGIC

Second Copy—Owner's Copy
Third Copy—Driller's Copy

STATE OF WASHINGTON

Water Right Permit No [redacted]

15

(1) OWNER: Name Weyhaeuser Real Estate Co Address Snoqualmie Ridge

(2) LOCATION OF WELL: County King NE ¼ SE ¼ Sec 11 T 99 N, R 8 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Tokul Road. TW-6 (25)

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

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

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

(5) DIMENSIONS: Diameter of well 20"X16" inches. Drilled 589 feet. Depth of completed well 589 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 20" Diam. from +2 ft. to 399 ft.
Welded ☒ Liner installed ☐ Threaded ☐ 16" Diam. from +2 ft. to 589 ft.
_____" 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 Johnson Filtration (UOP)

Type Stainless Model No 804

Diam 14" Slot size 60-40 from 586 ft. to 567 ft.

Diam 8" Slot size 90 from 586 ft. to 535 ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10-20 Colorado Sand

Gravel placed from 586 ft. to 490 ft.

Surface seal: Yes ☒ No ☐ To what depth? 20+ ft.

Material used in seal Cement Grout

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 428 ft.

Static level 161 ft. below top of well Date 11-7-89

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? Driller

Yield: 500 gal./min. with 212 ft. drawdown after 8 hrs.

500 " 220 " 20 "
500 " 250 " 40 "

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
0	346	1hr	180		
15	185	4	173		
30	183	8	170		

Date of test 11-7-89

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
Top soil & Gray bound Gravel and cobbles	0	11
Brown gravel-Gravel-cobbles silt binder	11	200
Sand-Gravel water Drive & soil	200	205
Brown To Gray silt bound sand-Gravel	205	237
Blue-Gray silt bound sand-Gravel & Cobbles	237	271
Blue silt bound Sand-Gravel Cobbles	271	311
Gray silt bound sand-Gravel	311	354
Gray silt bound Sand-Gravel Loose silty sand	354	368
Silty Sand some Gravel	368	413
Layer Blue silt & silty Gravel	413	480
Brown silt bound Gravel	480	509
Changing To Loose Gravel H20 Tighter silty Fine Sand	509	540
Sand-Gravel Water bearing	540	550
Gray silty Sand some Gravel	550	556
Gray silty Sand & Gravel small layer of Silty Clay.	556	573
Sand-Gravel Water bearing	573	583
Silt bound gravel & Cobbles	583	587
Bedrock	587	589

Work started 6-20, 19[illegible] Completed 11-18-, 1989

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 Armstrong Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 10715 66 Ave East

(Signed) [signature] (WELL DRILLER) License No 0012

Contractor's Registration No ARMSTDI136NC Date 12-7-, 1989

(USE ADDITIONAL SHEETS IF NECESSARY)

RECEIVED
APR 03 1991

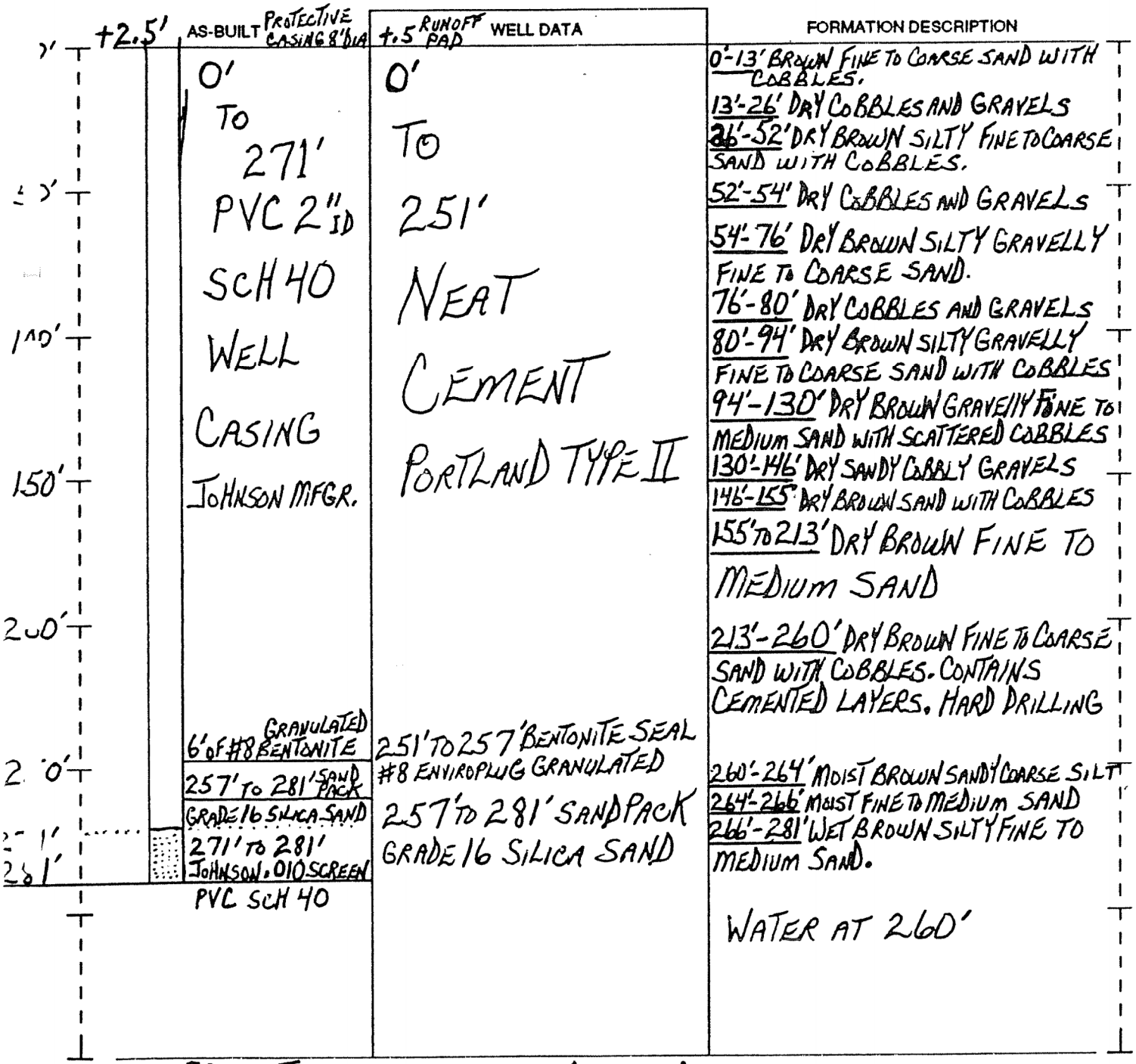
16

RESOURCE PROTECTION WELL REPORT

START CARD NO. 048641

PROJECT NAME: LONE STAR JOB #574
WELL IDENTIFICATION NO. EB-C1W
DRILLING METHOD: 180 BECKER HAMMER REVERSE CIRCULATION
DRILLER: GLENN FELTON
FIRM: BECKER DRILLS INC.
SIGNATURE: William A. Jeskey
CONSULTING FIRM: ASSOCIATED EARTH SCIENCES INC.
REPRESENTATIVE: JILL WHEELER

COUNTY: KING
LOCATION: SW¼ SE¼ Sec 19 Twn 24N R 8E
STREET ADDRESS OF WELL: TOKUL CREEK ROAD SNOQUALMIE WASHINGTON
WATER LEVEL ELEVATION: 259'
GROUND SURFACE ELEVATION: +520 FT.
INSTALLED: MARCH 28 1991
DEVELOPED: OBSERVATION



SCALE: 1" = 50 FEET

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	Initiated 2/7/91 DESCRIPTION	WATER TABLE(S)
	10	Brown, dry to moist, oxidized, gravelly, silty, fine to coarse sand with cobbles.	
	20	Cobbles with gravels 13'-22'.	
	30	Cobbles 24'-26'.	
	40		
	50	Brown, moist, medium to coarse sand with scattered cobbles.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 1 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Brown, moist, slightly oxidized, silty to slightly silty, gravelly, fine to coarse sand with scattered cobbles. Cobble zone 52'-54'.	
	70	Becoming gravellier below 64' with silt/clay on gravels. Containing scattered lenses of silt. Cobble zone at 68'.	
		Brown, moist, gravelly, medium to coarse sand.	
	80	Moist, sandy, cobbly gravels.	
	90	Brown, dry to moist, slightly oxidized, gravelly, silty to slightly silty, fine to coarse sand with cobbles.	
		Gravelly cobbles 90'-94'.	
	100	Brown, dry becoming moist, gravelly, fine to medium sand with occasional cobbles. Slightly silty in areas. Silt/clay on gravels.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 2 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110	As above.	
	120		
	130		
	140	Brown, dry to moist, sandy, cobbly gravels.	
		Grading into cobbly, gravelly, fine to coarse	sand.
	150	Grading into cobbly, sandy gravel.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 3 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, dry, cobbly, sandy gravels.	
	160	Brown, moist, slightly silty, fine to medium sand. Containing scattered gravels and less silt with depth. Cobble zone 158'-159'.	
	170		
	180		
	190		
	200	Increase gravel content 194'-195'. Cobbles and boulders 195'-197'.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 4 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	210	As above. Slightly silty 206'-208'.	
	220	Brown, dry, cemented (?), gravelly, fine to coarse sand with cobbles. Brown, dry, sandy, gravelly cobbles 220'-224'	
		Brown, dry, sandy, cobbly gravels with some boulders.	
	230	Brown, moist, fine to medium sand with occasional gravels and silt lenses.	
	240	Brown, moist, cemented (?), silty, fine to coarse sand with well sorted gravels. Containing silt lenses. Sandy, gravelly cobbles and boulders 233'-235'.	
	250	Grading into brown, moist, silty, fine to medium sand with gravels.	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 5 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	260	As above.	
	270	Brown, moist, sandy, coarse silt with inter-bedded, fine sand lenses.	259.3' 3/28/91
	280	Becomes wet at 274'. Grading into silty, fine sand below 278'. Predominant amount of fines lost due to addition of water.	266' While drilling 2/8/91 Water added while drilling at 281
	290		
	300	TD @ 291' 3/28/91	

NOTES:

PROJECT NO. 9006-18E
BORING NO. EB-C1W
ELEVATION 520
PAGE 6 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

24/8-19J

17

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 Jim Parkerson Address 37089 SE Fish Hatchery Rd Fall City

(2) LOCATION OF WELL: County King, Gov Lot 1 (see attach) ¼ Sec 19 T 24 N. R 6 W

Bearing and distance from section or subdivision corner

(28)

(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 8 inches.
Drilled 100 ft. Depth of completed well 100 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 100 ft.
Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.
Welded ☒ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used torch
SIZE of perforations 1/8 in. by 3 in.
30 perforations from 65 ft. to 95 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 Cement, 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.... _____ ft.
Static level 40 ft. below top of well Date 12/7/82
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.
" " " " "
" " " " "
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 15 gal./min. with 20 ft. drawdown after 3 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
Surface	0	3
Brown sandy clay	3	9
Gray solid rock	9	100

Work started 12/2 19 82 Completed 12/7 19 82

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 Johnson Drilling Co, Inc (Type or print)
(Person, firm, or corporation)
Address 19415 108th Ave SE Renton

[Signed] _____ (Well Driller)

License No. C 233 Date 12/17 19 82

USE ADDITIONAL SHEETS IF NECESSARY

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. **18**

(1) **OWNER:** Name Earl Requa Address 37540 Fish Hatchery Rd., Fall City

(2) **LOCATION OF WELL:** County ~~XX~~ King NW ¼ SW ¼ Sec 19 T 24 N. R 8E W.M.
Bearing and distance from section or subdivision corner same address

(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 234 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 Johnson
Type Stainless steel Model No.
Diam. 2 Slot size 016 from 235 ft. to 240 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? ~~XX~~ 39 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 Berkeley
Type Submersible HP 3/4

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 125 ft. below top of well Date 4/8/87
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? Driller
Yield ~~XX~~ 15 gal./min. with ft. drawdown after hrs.
" " " "
" " " "
with air

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:** (29)

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
Fill dirt	0	2
Brn topsoil & wood	2	8
Clean coarse sand & grav/water	8	25
Brn silty fine sand	25	30
Gray blue clay w/silty zones	30	155
Fine brn sand, wet silt	155	180
Dry brn fine silty sand	180	220
Brn fine wet sand	220	234
Clean brn med sand/water	234	240
8-25 ft was 100 gpm		

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NOV 5 1987
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 4/2 19 87 Completed 4/8 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 Uelke Drilling & Pump Co.
(Person, firm, or corporation) (Type or print)

Address 10807-32nd Street E, Puyallup 9837

[Signed] (Well Driller)

License No. 0379 Date 6/22 19 87

USE ADDITIONAL SHEETS IF NECESSARY

NW

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. 24/08—20A
Permit No. 19

(1) OWNER: Name GOHLKE, DANIEL Address P.O. BOX 546 A SE 1/4

(2) LOCATION OF WELL: County King E 1/4 NE 1/4 NE 1/4 Sec 20 T 24 N. R 08 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 224 ft. Depth of completed well 220 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 215 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 Johnson
Type Stainless Model No
Diam. 5in Slot size 10 from 215 ft. to 220 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? 190 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.... ft.
Static level 180 ft. below top of well Date
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.
" " " "
" " " "

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 12 gal./min. with 100 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: (31)
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
Brn soil	2	8
cemented river rock & Boulders	8	125
Sandstone Black	125	179
Brown sand, W.B.	180	220

Work started 1/13, 19 29 Completed 2/4/29, 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 B+B Well Drilling (Person, firm, or corporation) (Type or print)
Address RT 7 Box 600A Yakima
[Signed] Harvey Blackman (Well Driller)
License No. 37 Date 2/9, 19 29

(USE ADDITIONAL SHEETS IF NECESSARY)

(1) OWNER: Name OSBORN, RON & MARILYN Address 40312 SE 53 ST SNOQUALMIE, WA 98065

(2) LOCATION OF WELL: County KING - NE 1/4 NE 1/4 Sec 10 T 24 N., R 8 WM

(2a) STREET ADDRESS OF WELL (or nearest address) 40312 SE 53 ST

20

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 216 ft. Depth of completed well 216 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 210 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: 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
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No.
Dian. 6 slot size .025 from 211 ft. to 216 ft.
Dian. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 20 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 161 ft. below top of well Date 08/27/93
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 12 gal/min. w/ stem set at 200 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
TOPSOIL	0	2
BROWN CEMENTED SAND & GRAVEL	2	8
BLUE GLACIAL TILL	8	37
BLUE CEMENTED SAND & GRAVEL	37	63
BLUE SILT	63	78
BROWN CEMENTED SAND & GRAVEL	78	95
BLUE GLACIAL TILL	95	144
BROWN SILTY SAND & GRAVEL	144	157
BROWN CEMENTED SAND & GRAVEL	157	170
WATER BEARING SAND W/OCC GRAVEL	170	216

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SEP 02 1993
DEPT. OF ECOLOGY

Work started 08/23/93 Completed 08/27/93

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS ~~1245 AUBURN WAY SOUTH~~

[SIGNED] [signature] License No. 0097

Contractor's
Registration No. NORTHPD137PQ Date 08/31/93

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. 47105 -- 21

Permit No. Unassigned

24/8E/20/H

(1) OWNER: Name Burglund Coal Address Rt 1 Box 186 Snoqualmie Or Issaquah

(2) LOCATION OF WELL: County King Block 9060 Plat 4456 Sec 20 T 24 N. R 8 W.m.

Bearing and distance from section or subdivision corner: By 1/4 Cor. of Sec Ths S 55-37 W 4471 ft

(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 242 ft. Depth of completed well 222 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 10 " Diam. from 0 ft. to 18 ft.
Threaded ☐ 6 " Diam. from 0 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 Plastic Ch Model No
Diam. 6 Slot size 40 from 204 ft. to 222 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 - In 11" hole
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.... ft.
Static level 172 ft. below top of well Date
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.
" " " "
" " " "

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
		Should Reduce to 9 Ft or More			

Date of test
Baller test 6 gal./min. with 26 ft. drawdown after 3 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: SE¼ NE¼ Sec 20, T24N, R8E

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 & gr	0	4
Rocks - Hardpan	4	10
Hard pan & fill	10	19
Bonded gr & some H2O	19	21
Grey Rocky hardpan	21	55
Grey hardpan	55	85
Grey fill - Very tight	85	98
Broken fills	98	135
" "	135	160
Bonded grs.	160	178
Red Brown Sand	178	190
Grey Sand - Sm. H2O at 190	190	215
Grey Sand With Lenses of Water	215	222
Bonded gr - Sm water	222	223
" "	223	233
Bonded gr & Sm H2O	233	238
Top of Bed Rock Very Light Colore	238	248
Having drilled in this area before I knew that it was best to Bedrock the well could go 400 ft. We never had a defined free aquifer Each foot of the 242 ft had to be drilled		
After discussing Procedures as to how to complete it seemed advisable to Back fill to 223 ft & set 20 Ft of Screen. Used Plastic Screen Made By Soil Sampling Service of Puyallup, Wn		

Work started 11-1 19 73 Completed 11-26 19 73

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. T. J. Murphy DR. #1

NAME H.O. Meyer Drilling Co. (Person, firm, or corporation) (Type or print)

Address 6424 Lake Wash. Blvd. NE Kirkland, Wn 98033

[Signed] H.O. Meyer (Well Driller)

License No. 0308 Date 11-21 19 73

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 2356—C.S.—Rev. 4-71

(1) OWNER: Name Herman Schlaht

(2) LOCATION OF WELL: County King SE ¼ NE ¼ Sec 20 T 24N. R 4 W.M. H

Bearing and distance from section or subdivision corner

22

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

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

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 275 ft. Depth of completed well 275 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ____" Diam. from ____ ft. to ____ ft.
Threaded [ ] ____" Diam. from ____ ft. to ____ ft.
Welded [X] 6" Diam. from 0 ft. to 275 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
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.... ft.
Static level 145 ft. below top of well Date 2-23-78
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 [X] If yes, by whom?
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 2-23-78
Bailer test 15 gal./min. with 20 ft. drawdown after 2 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
SAND + SILT	2	20
Clay + Rock	20	42
SAND + SILT	42	48
Hard pan	48	80
Clay + SAND	80	158
SAND	158	160
Clay	160	170
SAND	170	270
SAND & Gravel	270	295

Work started ____, 19____. Completed ____, 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 Jerry Gaines (Person, firm, or corporation) (Type or print)

Address 2540 - 367TH AVE. S.E. P.O. Box 111

[Signed] Jerry M Gaines (Well Driller)

License No. 0149 Date 2-23, 19 78

(USE ADDITIONAL SHEETS IF NECESSARY)

Third Copy — Driller's Copy

STATE OF WASHINGTON

Form No. ... H

23

(1) OWNER: Name Paul A Nelson Address 5431 40th Ave SE. Sea

(2) LOCATION OF WELL: County King ~~NE 1/4 NE~~ 1/4 Sec 20 T. 24 N. R. 08 E W.M.

Bearing and distance from section or subdivision corner SE 1/4, NE 1/4

(3) PROPOSED USE: Domestic [X] 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 [X] Cable [X] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 90 ft. Depth of completed well 90 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ..." Diam. from ... ft. to ... ft.
Threaded [ ] ..." Diam. from ... ft. to ... ft.
Welded [X] 6" Diam. from 20 ft. to 90 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 [ ] No [X] To what depth? ... ft.
Material used in seal
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 .... ft.
Static level 65 ft. below top of well Date 2-27-78
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.
" " " "
" " " "

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 2-27-78
Bailer test 5 gal./min. with 8 ft. drawdown after 2 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
CASING	0	22
CLAY	22	47
HARDPAN	47	60
CLAY	60	87
SAND & ROCKS	87	90

Work started ..., 19... Completed ..., 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 Jerry Gaines (Person, firm, or corporation) (Type or print)

Address P. O. Box 111

[Signed] Jerry M Gaines (Well Driller)

License No. 0149 Date 2 - 27, 1978

(USE ADDITIONAL SHEETS IF NECESSARY)

24/08 – 20ff

24

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 Eldon Mills Address 40206 SE 53rd Snoqualmie, Wa.

(2) LOCATION OF WELL: County King SE ¼ NE ¼ Sec 20 T 24 N., R 08 W M

Bearing and distance from section or subdivision corner 100 FT

(53)

(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 168 ft. Depth of completed well 168 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +2 ft. to 163 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 Johnson
Type Stainless Steel Model No. ____
Diam. 5 Slot size .020 from 163 ft. to 168 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? Surface Depth of strata 16'
Method of sealing strata off Bentonite

(7) PUMP: Manufacturer's Name Flint & Walling
Type: Submersible HP 1

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level 143 ft. below top of well Date 5/24/85
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 10" ft. drawdown after 2 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 5/24/85
Bailer test 15 gal./min. with 1 ft. drawdown after 2 hrs.
Artesian flow ____ g.p.m. Date 5/22/85
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 & Gravel: brown	0	5
Clay & Gravel: brown	5	12
Clay: brown, large rocks	12	25
Clay: gray	25	60
Clay: gray/ brown, gravelly	60	90
Till: gray	90	105
Sand & gravel: gray, dry	105	125
Clay: brown, sandy	125	135
Sand: brown, dry	135	150
Sand: brown, coarse, with water.	150	168

RECEIVED
JUL 25 1985

Work started May 16 19 85 Completed May 24 19 85

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 Cable Tool Well Drilling Co.
(Person, firm, or corporation) (Type or print)

Address 5716 17th Ave NE Seattle Wa. 9810[illegible]

[Signed] ____ (Well Driller)

License No. 0852 Date May 26 19 85

USE ADDITIONAL SHEETS IF NECESSARY

ENTERED

25

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. W 107761
UNIQUE WELL I.D. # AEP 174
Water Right Permit No. 24-8E-20H

(1) OWNER: Name Terry Schlaht Address 5431 404th Ave SE Snoqualmie 98065

(2) LOCATION OF WELL: County King SE 1/4 NE 1/4 Sec 20 T. 24 N. R 08 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Same

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

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

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 185 feet. Depth of completed well 185 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6" Diam. from +2 ft. to 180 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.
_____" 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 Cook
Type Stainless Steel Model No. _____
Diam. 5 Slot size .016 from 180 ft. to 185 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 Chips
Did any strata contain unusable water? Yes ☒ No ☐
Type of water? Silty Depth of strata 60
Method of sealing strata off Cased by it.

(7) PUMP: Manufacturer's Name Flint & Walling
Type: Submersible H.P. 1

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 160 ft. below top of well Date 2-1-99
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: 14 gal./min. with 18 ft. drawdown after 2 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
Steady recovery to static in 4-5 minutes.					

Date of test _____
Bailer test 10 gal./min. with 15 ft. drawdown after 1 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
Sandy clay: brown, dry.	0	20
Gravel: brown, pit run.	20	65
Till: gray.	65	70
Clay: gray, wood chips.	70	90
Till: gray, boulder at 92'.	90	95
Sand & gravel: gray.	95	100
Sandy clay: gray/green.	100	115
Sand: brown, coarse, dry.	115	150
Clay: brown, gravelly.	150	170
Sand: brown, water.	170	185

RECEIVED
MAR 15 1999
DEPT OF ECOLOGY

Work Started Nov. 1, 98 Completed Feb. 1, 99 19

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 Cable Tool Well Drilling Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 11723 194th Ave NE Redmond Wa. 98C

(Signed) _____ (WELL DRILLER) License No. 0852

Contractor's Registration No. CABLETW 13203 Date Feb. 3 19 99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * f

Mike Moore 20J

(1) OWNER: Name [illegible] Address [illegible]

(2) LOCATION OF WELL: County King NE ¼ SE ¼ Sec. 24 T. 24 N., R. 18 W.M.

Bearing and distance from section or subdivision corner SE corner / SE ¼ / NE ¼ / SE ¼ / Sec. 20 / T24 / 18E

(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 186' ft. Depth of completed well 186' ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 176 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 Johnson
Type Stainless Steel Model No. ____
Diam. 6 Slot size #8 from 175 ft. to 186 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 Flint + Walling
Type: Submersible H.P. 3/4

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 161 ft. below top of well Date 10/13/80
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? C.T.W.D.
Yield: 12 gal./min. with 20 ft. drawdown after 1 hrs.
" ~~[illegible]~~ " ~~[illegible]~~ " "
" " " "

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
	X		X		X

Date of test Oct 13 - 1980
Bailer test 5 gal./min. with 5 ft. drawdown after 2 hrs.
Artesian flow — g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: 26

Formation: Describe by color, character, size of material a[illegible]re, 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
Dirt - Brown	0	3
Till - Brown	3	30
Gravel - Brown	30	35
Till - Gray	35	70
Till - Gray - Large Rocks	70	83
Clay - Gray	83	115
Till - Gray	115	138
Clay - Brown, Sandy	138	173
Sand/Gravel Brown, water bearing	173	183
~~[illegible]~~ Clay - Gray	183	183.6
Sand, Gray - lenses of clay	183	190
(186-190: Sand is muddier with wood chips)		

Work started Sept. 23, 1980. Completed Oct 10, 1980

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 Cable Tool Well Drilling Co. (Person, firm, or corporation) (Type or print)

Address 5716 - 17th Ave N.E. Seattle

[Signed] [signature] (Well Driller)

License No. 0852 Date Oct 13, 1980

(USE ADDITIONAL SHEETS IF NECESSARY)

27

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

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent ...34034

UNIQUE WELL I.D.# ACG-805

Water Right Permit No. 24-8E-20R 9802

(1) OWNER: Name Judith Lamson Address 1441 217th Ave SE, Issaquah, c

(2) LOCATION OF WELL: County King SE 1/4 SE 1/4 Sec 20 T 24 N.R. SE WM

(2a) STREET ADDRESS OF WELL: (or nearest address) 5613 402nd Ave SE, Snoqualmie

TAX PARCEL NO.: 202408-9023

(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) ____ X New Well ☐ Deepened ☐ Reconditioned ☐ Decommission Method: ☐ Dug ☐ Bored ☐ Cable ☐ Driven X Rotary ☐ Jetted

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 180 feet. Depth of completed well 180 ft.

(6) CONSTRUCTION DETAILS

Casing Installed: X Welded 6" Diam. from 0 ft. to 180 ft. ☐ Liner installed ____ Diam. from ____ ft. to ____ ft. ☐ Threaded ____ Diam. from ____ ft. to ____ ft.

Perforations: ☐ Yes X No

Type of perforator used ____

SIZE of perforations ____ in. by ____ in.

____ perforations from ____ ft. to ____ ft.

Screens: ☐ Yes X 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 X No ☐ Size of gravel/sand ____

Material placed from ____ ft. to ____ ft.

Surface seal: X Yes ☐ No To what depth? 18 ft.

Material used in seal bentonite

Did any strata contain unusable water? ☐ Yes X 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 ____ ft.

Static level 140 ft. below top of well Date 3-16-99

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 X 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 8 gal./min. with 20 ft. drawdown after 2 1/2 min.

Artesian flow ____ g.p.m. Date ____

Temperature of water ____ Was a chemical analysis made? ☐ Yes X No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION

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. Indicate all water encountered.

MATERIAL	FROM	TO
Brown gravel-clay	0	4
Tan clay gravel	4	12
Gray gravel clay	12	80
Gray clay	80	87
Gray Sand clay	87	135
Tan clay gravel	135	157
Gray water Sand Fine	157	175
Tan gravel clay	175	180

RECEIVED

MAR 22 1999

DEPT OF ECOLOGY

Work Started 3-10 Completed 3-16-99

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.

Type or Print Name Brad Johnson License No. 0233 (Licensed Driller/Engineer)

Trainee Name ____ License No. ____

Drilling Company Johnson Drilling Co., Inc.

(Signed) Brad Johnson License No. 0233 (Licensed Driller/Engineer)

Address 19415 108th Ave SE, Renton, WA 980

Contractor's Registration No. JOHNSDC207QM Date 3-16-99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

ECY 050-1-20 (11/98)

24/08-20 N

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. 28
Permit No ....

(1) OWNER: Name LeRoy GAMAZEL Address 539 NE 67th Seattle, WA, 98115

(2) LOCATION OF WELL: County ATTACHED KING NW ¼ SW ¼ Sec 20 T. 24 N., R. 8E W.

Bearing and distance from section or subdivision corner

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

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

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 276 ft. Depth of completed well 276 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8 " Diam. from +1' ft. to 266' ft.
Threaded [ ] " Diam. from ... ft. to ... ft.
Welded [X] " 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 [X] No [ ]
Manufacturer's Name JOHNSON
Type STAINLESS Model No
Diam. 8 Slot size 20 from 266 ft. to 276 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 FLINT + WALLING
Type: Submersible H.P. 5.

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ~ ? ft.
Static level 255 ft. below top of well Date 3-25-80
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 [X] No [ ] If yes, by whom? BURAS
Yield: 40 gal./min. with 5 ft. drawdown after 4 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
2:40	255'				
2:41	250'				

Date of test 6-10-80
Bailer test 15 gal./min. with 0 ft. drawdown after 4 hrs.
Artesian flow ... g.p.m. Date
Temperature of water ... Was a chemical analysis made? Yes [X] No [ ]

(10) WELL LOG: (41)

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
Brown dry sand	0	5
Brown dry gravel with large cobbles	5	52
Brown dry gravel with occ sand layers	52	231
Brown dry semi-conglomerated GvL	231	259
Gray medium to coarse washed sand	259	276

Work started 3-3-80, 19... Completed 3-26, 1980

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 BURAS Drilling Company
(Person, firm, or corporation) (Type or print)

Address 1519 DAYTON CT. NE. RENTON

[Signed] Jan Buras
(Well Driller)

License No. 0690 Date 6-10, 1980

USE ADDITIONAL SHEETS IF NECESSARY

Second Copy — Driller's Copy
Third Copy — Driller's Copy

STATE OF WASHINGTON

Permit No. 29

(1) OWNER: Name Robert E. Vezzoni Address P.O. Box 97 Snoqualmie

(2) LOCATION OF WELL: County King NW ¼ SW ¼ Sec. 20 T. 24 N., R. 8E W.M.

Bearing and distance from section or subdivision corner

RECEIVED JUL 1986 DEPARTMENT OF ECOLOGY NORTHWEST REGION

(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 ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 281 ft. Depth of completed well 281 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 276 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 Johnson
Type Stainless Steel Model No.
Diam. 6 Slot size 14 from 276 ft. to 281 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 Berkeley
Type: Submersible H.P. 1½

(8) WATER LEVELS: Land-surface elevation above mean sea level.... +06 ft.
Static level 263 ft. below top of well Date 6-25-86
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.
" " " "
" " " "

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 15 gal./min. with 0 ft. drawdown after 1½ hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: (40)

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
Brown Sandy Loam	0	3
Brown Semi-Conglomerated Gravel with Boulders	3	25
Brown Semi-Conglomerated Gravel	25	230
Brown Dense Gravel with Boulders	230	263
Gray washed Sand	263	281
Clay	281	→

Work started 5-29-86, 19 Completed 6-28-86, 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 Burgas Drilling Co. (Person, firm, or corporation) (Type or print)

Address 1519 Dayton Ct. N.E. Renton

[Signed] Jan Burgas (Well Driller)

License No. 0690 Date 7-1-86, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

STATE OF WASHINGTON

Water Right Permit No. ____

M 30

(1) OWNER: Name Steve Parsons Address PO Box 1944, Snoqualmie 98065

LOCATION OF WELL: County King SW¼ SW¼ Sec. 20 T. 24 N., R. 8 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) 5820 390th Ave SE, Snoqualmie

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

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

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 265 feet. Depth of completed well 265 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 0 ft. to 265 ft.
Welded ☒ Liner installed ☐ Threaded ☐
____" Diam. from ____ ft. to ____ ft.
____" 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 puddling 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 ____ ft.
Static level 225 ft. below top of well Date 1-16-92
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.

"	"	"	"
"	"	"	"

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 8 gal. min. with stem set at 261 ft. for 2 1/2 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
Surface	0	3
Brown sand-gravel-hardpan	3	19
Tan sand-gravel	19	47
Brown sand-gravel	47	55
Tan sand-gravel	55	160
Brown gravel-sand	160	255
Brown water sand-gravel	255	265
Brown gravel sand	265	~

RECEIVED
FEB 6 1992
DEPT. OF ECOLOGY

Work started 1-4 19. Completed 1-16 1992

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 Johnson Drilling Co, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 19415 105th Ave SE Renton 98055

(Signed) Bud Johnson (WELL DRILLER) License No. 0233

Contractor's Registration No. JOHNSDC207BM Date 1-16 19 92

(USE ADDITIONAL SHEETS IF NECESSARY)

WATER WELL REPORT 24/08/201

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. 31
Permit No.

(1) OWNER: Name Kenmore Pre-Mix Address P.O. Box 224, Kenmore, Washington

(2) LOCATION OF WELL: County King SE ¼ SW ¼ Sec 20 T 24 N, R 8 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) EB-2
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled ft. Depth of completed well 370 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 360 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. 5-3/4 Slot size 0.50 from 360 ft. to 370 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 No permanent pump installed
Type: at this time H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level 505 ft.
Static level 160 ft. below top of well Date
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? AESI
Yield: 66 gal./min. with 49 ft. drawdown after 4 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 7/86
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: SSG#1 (43)

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
Sandy gravel to gravelly sand	0	153
Sand	153	182
Silty sand	182	196
Sand	196	228
Silty sand	228	234
Silt/clay	234	262
Sandy Gravel	262	275
Silty sand with gravel	275	295
Silt/clay	295	300
Clayey, silty, fine sand with scattered gravel	300	359
Gravelly sand	359	370

RECEIVED
OCT 9 1986
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started June 19 86 Completed August 19 86

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 Associated Earth Sciences, Inc. (Person, firm, or corporation) (Type or print)
Address 903 - 5th Avenue, Kirkland, Wa 98033

[Signed] drilled by N.W. Pump and Drill (Well Driller)
Dekmer

License No. Date 19

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL	161.0		161.0	
DATE	11-1-85		10-29-85	
TIME	12:45pm		10:25	am

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Topsoil	
	5	Grey, GRAVEL with Cobbles --Qvdg	
	10	Grey, brown sandy GRAVEL --Qvdg	
	15	With COBBLES	
	20	Brown, sandy GRAVEL --Qvdg	
	25		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 1 OF 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above with Cobbles	
	30	Brown, slightly silty, GRAVEL --Qvdg	
	35	Brown, sandy GRAVEL interbedded with brown, medium SAND--Qvdg	
	40		
	45		
	50	With COBBLES	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 2 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	55	Brown, gravelly SAND--Qvdg	
	60		
	65	Brown, medium-coarse, sandy GRAVEL--Qvdg	
	70		
	75	With COBBLES	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 3 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
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LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	80	Brown, medium to coarse, sandy GRAVEL --Qvdg	
	85		
	90		
	95		
	100	With COBBLES	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

COBBLES AND GRAVEL
SANDY GRAVEL
GRAVELLY SAND
SAND
DIAMICTON
SILT - CLAY
PEAT
BEDROCK
SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	105	Brown, medium to coarse, sandy GRAVEL --Qvdg	
	110		
	115	With COBBLES	
	120		
	125	Brown, slightly sandy GRAVEL --Qvdg	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	130	Brown, medium to coarse sandy GRAVEL--Qvdg	
	135		
	140		
	145		
	150	Brown, gravelly SAND --Qvdg	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 6 OF 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	155	Brown, medium to coarse SAND--Qvds	
	160		
	165		
	170		
	175		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
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DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	180	As Above	
	185	Grey, silty SAND with some clay--Qvds	
	190		
	195		
	200	Brown, medium SAND --Qvds	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 8 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	205	As Above	
	210		
	215		
	220		
	225		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 9 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As Above	
	230	Grey, silty very fine SAND--Qvds	
	235	Grey, silty CLAY with scattered GRAVEL --Qvds	
	240		
	245	Interbedded grey SILT and SAND --Qpvu	
	250		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 10 OF 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	255	As Above	
	260		
	265	Grey to brown GRAVEL with Cobbles --Qpvu	
	270		
	275		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 11 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	280	Grey, silty, very fine SAND--Qpvu	
	285	Interbedded, grey, silty SAND with brown sandy GRAVEL--Qpvu	
	290		
	295		
	300	Grey SILT--Qpvu	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 12 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	305 310 315 320 325	Silty, fine SAND with scattered GRAVEL and abundant wood chips	

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 13 OF 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
137½ PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	330	As Above	
	335		
	340		
	345	Dry, very silty, gravelly, fine SAND to SANDY GRAVEL	
	350		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1
ELEVATION 505'
PAGE 14 **OF** 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
137½ PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- COBBLES AND GRAVEL
- SANDY GRAVEL
- GRAVELLY SAND
- SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	355	As Above	
	360		
	365	Gravelly, medium to coarse SAND	
	370		
TD	375		

NOTES:

PROJECT NO. 8412-06
BORING NO. SS&G#1 SS46#1
ELEVATION 505'
PAGE 15 OF 15

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
13717 PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy 24/8E/20/R

WATER WELL REPORT 888-0987

STATE OF WASHINGTON

Application No. 24/08-20R

Permit No. ....

32

(1) OWNER: Name Richard AukerMAN Address SNOQUALMIE WA.

(2) LOCATION OF WELL: County King — SE ¼ SE ¼ Sec. 20 T. 24 N., R. 8E 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 8 inches. Drilled 400 ft. Depth of completed well 400 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from +1 ft. to 402' ft.
Threaded ☐ " Diam. from ... ft. to ... ft.
Welded ☒ " Diam. from ... ft. to ... ft.

Perforations: Yes ☒ No ☐
Type of perforator used Mill KNife
SIZE of perforations 3" in. by ¼ in.
[redacted] perforations from ... ft. to ... ft.
14 perforations from 60' ft. to 49 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 Benotite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? — Depth of strata —
Method of sealing strata off Not.

(7) PUMP: Manufacturer's Name Goulds
Type: ... H.P ⅓

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 650 ft.
Static level 28 ft. below top of well Date 12-9-75
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? B&J Drilling
Yield: 5 gal./min. with 0 ft. drawdown after 1 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 12-12-75
Bailer test 3 gal./min. with 0 ft. drawdown after 1 hrs.
Artesian flow ... g.p.m. Date 12-12-75
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
Light Brown Clay SAND Loose	0	49
Dark Gray clay SAND Loose (water)	49	52
Light. Gray clay SAND (water) silty		
(Some Gravel streeks) silty		
Light. Gray Clay SAND Gravel (water)	52	63
Dark & Light. streeks of Cemented.	63	75
Clay Gravel SAND (NO WATER)		
Redish Brown Cemented Clay Gravel	75	[redacted]
(Bolders)		128
Light. Brown Clay SAND Loose	128	136
BLUE Gray clay SAND Gravel streeks	136	184
SOME Heaving in spots		
Gray Clay Sand - Gray BLUE SAND	184'	400'
ALSO SOME Layer Clay All with		
Silt, SAND and SMALL AMOUNTS of		
WATER!		
CUSTOMER STOPPED DRILLING		
At 400' OK'D DRILLER		
TO Perforate pipe		

Work started 9-5- 19 75 Completed 12-9 19 75

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 B&J DRILLING CO
(Person, firm, or corporation) (Type or print)

Address 9026 38TH AVE SW. SEA. 98126

[Signed] [illegible] Cannon
(Well Driller)

License No. 0071 Date JAN 3 19 76

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

3

24/08-20R

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 33

(1) OWNER: Name Marjorie Edmonds Address 40203 SE 60th Snoqualmie, Wa. 98065

(2) LOCATION OF WELL: County King — SE ¼ SE ¼ Sec 20 T 24 N, R 8E W.

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) 1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 40 ft. Depth of completed well 34 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 29 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 Johnson Well
Type Stainless steel Model No
Diam. 6 Slot size 20 from 29 ft. to 34 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 Pioneer
Type: A1810C H.P. ½

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 20 ft. below top of well Date 1-4-84
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.
" " " "
" " " "

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 10 gal./min. with 12 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date 1-4-84
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: (36)

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 & gravel	0	2
Gravel & clay	2	8
Hardpan & boulders	8	16
Seepage & hardpan	16	18
Hardpan	18	30
Water & coarse sand	30	34
Clay & gravel	34	40

RECEIVED
FEB 21 1984
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 12-30 19 83 Completed 1-4 19 84

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 Richardson Well Drilling Co.
(Person, firm, or corporation) (Type or print)

Address P.O. Box 44427 Tacoma, Wa. 98444

[Signed] (Well Driller)

License No. 0419 Date 2-10 , 19 8-

(USE ADDITIONAL SHEETS IF NECESSARY)

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 073830
Water Right Permit No.

(1) OWNER: Name REYNOLDS, HARDELL Address 40014 SE 60 SNOQUALMIE, WA 98065-

34

(2) LOCATION OF WELL: County KING - SE 1/4 SE 1/4 Sec 20 T 24 N., R 8 WM
(2a) STREET ADDRESS OF WELL (or nearest address) 40014 SE 60 ST

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 300 ft. Depth of completed well 300 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 132 ft.
WELDED/LINER IN 4 " Dia. from 124 ft. to 300 ft.
" Dia. from ft. to ft.

Perforations: YES
Type of perforator used SAW CUT
SIZE of perforations 1/8 in. by 3 in.
40 perforations from 280 ft. to 300 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 19 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 225 ft. below top of well Date 03/08/91
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 20 gal/min. w/ stem set at 300 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
TOPSOIL	0	3
BROWN GLACIAL TILL	3	15
BLUE GLACIAL TILL	15	21
BROWN GLACIAL TILL	21	25
BLUE GLACIAL TILL	25	31
BROWN CEMENTED SAND & GRAVEL	31	49
BLUE SILT W/OCC GRAVEL	49	81
BLUE GLACIAL TILL	81	97
BROWN SILTY SAND & GRAVEL	97	130
GRAY SANDSTONE W/ LAYERS OF	130	300
BROWN SANDSTONE	130	300

RECEIVED
APR 09 1991
DEPT. OF ECOLOGY

Work started 03/02/91 Completed 03/08/91

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS 3245 AUBURN WAY SOUTH

[SIGNED] R B DeLeau License No. 0097

Contractor's Registration No. NORTHPD137PQ Date 03/21/91

24/08/20K

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. ____ **35**

(1) OWNER: Name Donald F. & Neva Brown Address 40127 SE 60th Snoqualmie

(2) LOCATION OF WELL: County King S1/2, W1/2, SE ¼ SE ¼ Sec 20 T 24 N., R 8E W.M.

Bearing and distance from section or subdivision corner

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

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

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 356 ft. Depth of completed well 356 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 356 ft.
Threaded [ ] ____ " Diam. from ____ ft. to ____ ft.
Welded [X] ____ " 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 puddling clay
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 260 ft. below top of well Date 3-10-86
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: 8 gal./min. with 50 ft. drawdown after 2 1/2 hrs.
" " " " AIR JET "

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: (45)

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
Surface	0	5
Gray brown sand	5	18
Gray sand-silt	18	35
Gray clay-gravel	35	41
Brown sand	41	75
Brown sand-gravel	75	78
Gray hardpan	78	83
Brown sand & gravel	83	90
Gray hardpan	90	96
Brown hardpan	96	101
Brown sand-silt	101	130
Gray silt	130	150
Gray clay	150	165
Gray hardpan	165	170
Gray silty sand	170	185
Gray hardpan	185	193
Gray sand	193	223
Gray silt-sand	223	240
Gray silt	240	265
Gray silty clay	265	270
Gray hardpan-gravel	270	280
Gray silt-clay	280	304
Gray clay-gravel	304	315
Gray clay	315	328
Gray silt	328	335
Gray clay	335	348
Gray sand	348	350
Gray water sand & gravel	350	355
Gray hardpack	355	356

RECEIVED
APR 11 1986
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 3-3 19 86 Completed 3-10 19 86

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 Johnson Drilling Co., Inc. (Person, firm, or corporation) (Type or print)

Address 19415 108th Ave SE Renton 98055

[Signed] Brad Johnson (Well Driller)

License No. 0233 Date 3-10 19 86

USE ADDITIONAL SHEETS IF NECESSARY

24/08-21E

Application No. 36

Permit No.

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

(1) OWNER: Name Geneveine P. Mc Cuein Address 38410 S. E. 47th, Snoqualmie, WA 98065

(2) LOCATION OF WELL: County King SW ¼ NW ¼ Sec. 21 T. 24 N., R. 8 W.M.

Bearing and distance from section or subdivision corner 5704 404th S. E. Snqualmie, WA.

(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 460' ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from ft. to 260 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? ft.
Material used in seal
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.... ft.
Static level ft. below top of well Date
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.
" " " "
" " " "

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: (47)

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
Over Burden Sandy Loam	0	15'
Boulders & Clay	15'	25'
Brown Clay	12'	40'
Hard Pan Gray	40'	72'
Gravel with Clay	72	80'
Loose Gravel	80	87
Gravel Clay	87'	96'
Boulders Hard Pan Clay	96	107'
Boulders and Sand	107'	139'
Yellow Sand Some Gravel	139'	160'
Sand Black Some White	160'	460'
Hole #1		
Casing Pulled		
Sealed with Puddling		
Clay and Tailings		

Work started 1/22, 19 81 Completed 1/30, 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 Berg Drilling & Pump Service
(Person, firm, or corporation) (Type or print)

Address P.O. Box 569 Fall City, WA. 98024

[Signed] James Darrow
(Well Driller)

License No. 1003 Date Mar. 6, 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

STATE OF WASHINGTON

E Permit No **37**

(1) OWNER: Name Geneveine P. Mc Cuen Address 38410 S.E. 47th, Snoqualmie, WA 98065

(2) LOCATION OF WELL: County King — SW ¼ NW ¼ Sec. 21 T. 24 N. R 8 W.M.

Bearing and distance from section or subdivision corner 5704 404th S.E. Snoqualmie, WA.

(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 487 ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1'6" ft. to 280 ft.
Threaded ☐ 5 " Diam. from ft. to 161 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? Surface Depth of strata 12'
Method of sealing strata off Cased off

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

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level No Water ft. below top of well Date
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.
" " " "
" " " "

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
Over Burden Sandy Loam	0	15'
Boulders & Clay	15'	25'
Brown Clay	12'	40'
Hard Pan Gray	40'	72'
Gravel with Clay	72'	80'
Loose Gravel	80'	87'
Gravel Clay	87'	96'
Boulders, Hard Pan Clay	96'	107'
Boulders and Sand	107'	139'
Yellow Sand, Some Gravel	139'	160'
Sand Black, some white	160'	487'
No Water		

Work started 2/2 19 81 Completed 2/21 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 Berg Drilling & Pump Service
(Person, firm, or corporation) (Type or print)

Address P.O. Box 569 Fall City, WA. 98024

[Signed] James Dawson
(Well Driller)

License No. 1003 Date Mar. 6, 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

Third Copy — Driller's Copy

STATE OF WASHINGTON

(1) OWNER: Name Donald S. CASE Address P.O. Box 125 SNOQ WA

(2) LOCATION OF WELL: County KING NW¼ SW¼ Sec 21 T 24 N. R 8E W.M.

Bearing and distance from section or subdivision corner Approx 450 ft

38

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

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

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 96 ft. Depth of completed well 96 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 96 ft.
Threaded [ ] ____ " Diam. from ____ ft. to ____ ft.
Welded [X] ____ " 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
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.... ft.
Static level 30 ft. below top of well Date 3-7-78
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 [X] If yes, by whom?
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 3-7-78
Bailer test 15 gal./min. with 15 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date 3-7-78
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	4
Rock + Hardpan	4	18
SILT	18	27
Hardpan	27	35
SILT	35	92
Coarse Sand + Gravel and Water	92	96

Work started ____, 19____ Completed ____, 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 Jerry Gaines (Person, firm, or corporation) (Type or print)

Address 367 7th AVE S.E. P.O. 111

[Signed] Jerry M Gaines (Well Driller)

License No. 0149 Date 3-7, 1978

(USE ADDITIONAL SHEETS IF NECESSARY)

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. 39
Permit No. ....

(1) OWNER: Name Ken Schneider Address 4027 SE 60th Snoqualmie 98065

(2) LOCATION OF WELL: County King SW¼ SW¼ Sec 21 T 24 N., R 8 W M
Bearing and distance from section or subdivision corner 100 Feet From South Line 130 Feet From SE 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 6 ft. Depth of completed well 211 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 212 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 ☐ Johnson
Manufacturer's Name
Type Stainless Model No.
Diam. 5-5/8 Slot size 12 from 105 ft. to 210 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? ... ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ... Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Sears
Type: Sub H.P. 1

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 189 ft. below top of well Date
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.
" " " "
" " " "

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 9 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: (55)

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 & loam	0	19
Sticky gray clay	19	38
Blue Dky-Grey Sticky	38	54
Hard gravel & Bldrs	54	85
Bonded gravel & Bldrs gray	85	102
" " " "	102	114
Shot Bldr at	114	116
Bonded gravel & Rocks	116	128
gray Clay	128	156
gray Till	156	175
gray sand	175	178
Sandy Brown clay	178	190
Sandy clay	190	200
Saturated Clay layers with Water	200	205
Shale at	203	204
Fine Sand & Water	204	212
Bailing down		
Silty Sand & Some Wood	212	215
The formation from 54 ft to 128 ft was all a very tought Formation.		
Some time we were down as 1 ft per day		
It took 12 days		
It took 6 days to drill 72 ft.		

RECEIVED JAN 05 1981 DEPT OF ECOLOGY

Work started 6-23, 19 80. Completed 6-29, 19 80.

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. 192 H.C.M.

NAME H.A. Meyer Drlg Co (Person, firm, or corporation) (Type or print)
Address 6424 Lake Wm Blvd NE Kirkland, Wash 98033

[Signed] H.A. Meyer (Well Driller)
License No. 0308 Date May 25, 1980.

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)

00777

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

40 Start Card No. W063672

UNIQUE WELL I.D. # ACG819

Water Right Permit No 24-8E-21 N

(1) OWNER: Name Allen Penhallegon Address 4603 S. 164th St., SeaTac, LA 98188

(2) LOCATION OF WELL: County King SW 1/4 SW 1/4 Sec 21 T 24 N, R 8 E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) 6210 404th LN SE, Snoqualmie 50

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

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

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

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 260 feet. Depth of completed well 253 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 253 ft.
Welded ☒ _____" Diam. from _____ ft. to _____ ft.
Liner installed ☐ _____" Diam. from _____ ft. to _____ ft.
Threaded ☐

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 _____
Static level 213 ft. below top of well Date 7-17-97
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.
" " " "
" " " "
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 21 1/2 gal./min. with stem set at 252 ft. for 2 1/2 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
Surface	0	3
Brown clay-gravel	3	12
Gray clay	12	30
Gray sand-gravel	30	36
Gray silty clay	36	60
Gray silt	60	65
Gray clay	65	123
Tan rocks-gravel	123	145
Brown sand gravel	145	180
Brown sandy clay	180	190
Tan sand-gravel	190	205
Brown clay	205	218
Brown sand-gravel	218	249
Brown water sand-gravel	249	253
Gray hardpan	253	260

RECEIVED
AUG 07 1997
Department of Ecology

Work Started 7-2 19 Completed 7-17 19 97

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 Johnson Drilling Co., Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT) 98055

Address 19415 108th Ave SE, Renton

(Signed) Brad Johnson (WELL DRILLER) License No. 0233

Contractor's Registration No JOHNSDC207AM Date 7-17 19 97

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006

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Corrected Copy

WATER WELL REPORT 41

STATE OF WASHINGTON

Ist Card No. 67257

Water Right Permit No. 24/8E/21N

(51) = 52

(1) OWNER: Name Tim Welborn Address

(2) LOCATION OF WELL: County King SW¼ SW¼ Sec 21 T 24 N. R 8E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) 3805 Snoq Falls, LOR Co Rd

(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 320 feet. Depth of completed well 320 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 18 ft.
Welded [ ] 4½" Diam. from 0 ft. to 320 ft.
Liner installed [X]
Threaded [ ] Diam. from ft. to ft.

Perforations: Yes [X] No [ ]
Type of perforator used Cyclone Saw
SIZE of perforations 4" O" in. by 3 in.
280 perforations from 280 ft. to 320 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 + Cement grout
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 220 ft. below top of well Date
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 [X] If yes, by whom?
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 25 gal./min. with stem set at 315 ft. for 1 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
Brown Dirt	0	5
Gray Sand Stone	5	105
Reddish Shale	105	155
Blue Gray Shale	155	250
Reddish Shale	250	260
Blue Gray Shale	260	285
Reddish Shale	285	290
Blue Gray Shale/Water	290	320

RECEIVED
SEP 11 1991
DEPT. OF ECOLOGY

Work started 8/26, 19 9 Completed 8/30, 19 9

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 KING DRILLING COMPANY INC (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address PO Box 817 MILTON WA 9835

(Signed) Tom Fulghum (WELL DRILLER) License No 1913

Contractor's Registration No. CCEKINGDC160XE Date 8-30, 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

27/08-21N

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. 014606

42

Water Right Permit No. _____

(1) OWNER: Name David L Brown Address C136 402nd Ave SE Snoqualmie

(2) LOCATION OF WELL: County King SW¼ SW¼ Sec 21 T 24 N. R 8 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) 406XX SE 60th Snoqualmie (53)

(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 420 feet Depth of completed well 420 ft.

(6) CONSTRUCTION DETAILS:

Casing Installed: 6 " Diam. from 0 ft. to 235 ft.
Welded [X] PVC4 " Diam. from -1 ft. to 420 ft.
Liner installed [ ]
Threaded [ ] _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes [X] No [ ]
Type of perforator used saw
SIZE of perforations 1/8 in. by 3 in.
100 perforations from 270 ft. to 410 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 puddling clay
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 ~730 ft.
Static level 270 ft. below top of well Date 3-10-88
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 [X] If yes, by whom? _____
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 1+ gal./min. with stem set at 410 ft. for 2 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes [ ] No [X]

(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
Surface	0	2
Brown sand & gravel	2	7
Brown clay sand & gravel	7	12
Gray clay	12	140
Tan clay gravel	140	145
Tan gravel clay	145	150
Tan gravel sand	150	154
Tan gravel clay	154	161
Brown clay	161	166
Tan gravel clay	166	175
Gray gravel clay	175	189
Brown clay gravel	189	194
Tan clay gravel	194	212
Tan hardpan	212	216
Gray clay gravel	216	222
Tan clay gravel	222	228
Gray gravel - clay	228	235
Gray solid rock	235	290
Tan rock (basalt)	290	300
Gray rock	300	311
Tan rock	311	335
Gray rock seepage	335	350
Tan rock	350	363
Gray rock	363	380
Tan rock seepage	380	391
Gray rock	391	420

RECEIVED MAR 10 1988

Work started 2-24 19. Completed 3-10 19 88

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 Johnson Drilling Co. Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 19415 105th Ave SE Renton 98055

(Signed) Brad Johnson (WELL DRILLER) License No. 0233

Contractor's Registration No. JOHNSDC207BM Date 3-10 19 88

(USE ADDITIONAL SHEETS IF NECESSARY)

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 [redacted]

43

Water Right Permit No _____

1) OWNER: Name Ken Schneider Address 40427 - S.E. 60th. Snoqualmie, Wa. 98065

(2) LOCATION OF WELL: County King East½ of North½ SW ¼ SW ¼ Sec 21 T 24N N., R 8E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) 40609- S.E. 60th. Snoqualnie, Wa. 98065 (54)

(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 [X] Driven [ ] Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 47 feet. Depth of completed well 47 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 47 ft.

Welded [X] Liner installed [ ] Threaded [ ] " Diam. from _____ ft. to _____ ft.

" 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 Flint & Walling

Type: Submersible H.P ½

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

Static level 20 ft. below top of well Date 10/2/92

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 [X] If yes, by whom? _____

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 10 gal./min. with 9 ft. drawdown after 1 hrs.

Artest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? Yes [X] 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
Brown sandy topsoil.	0	1
Brown till & boulders.	1	17
Grey till.	17	31
Bonded gravel some water.	31	39
Grey till. Open hole drilling. Water shut off.	39	45
Coarse sand & gravel. Water	45	47

RECEIVED

OCT 08 1992

DEPT. OF ECOLOGY

Work started 9/19/92 19. Completed 10/2 19 92

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 Morris Drilling Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 7215-122Ave. S.E. Renton, Wa. 98056

(Signed) Tom Morris (WELL DRILLER) License No. 0327

Contractor's Registration No. MORRIDC181P5 Date 10/6 19 92

(USE ADDITIONAL SHEETS IF NECESSARY)

Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

STATE OF WASHINGTON

Permit No. .....

44

(1) **OWNER:** Name DEWEY ROGERS Address 13014 - 7th Ave S, Seattle 98168

(2) **LOCATION OF WELL:** County [redacted] King — NE ¼ NW ¼ Sec 28 T 24 N, R [redacted] 8 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 98½ ft. Depth of completed well 98½ ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 6 " Diam. from 0 ft. to 98½ 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? 18ft ft.
Material used in seal puddling 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.... ft.
Static level 32 ft. below top of well Date 3/18/80
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? DRILLER with AIR
Yield: 60 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.
Artesian flow g.p.m. Date
Temperature of water 48 Was a chemical analysis made? Yes ☒ No ☐

IRON 25

(10) **WELL LOG:** (75)

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
Brn Silty Topsoil w/ Rocks	0	5
Gray Till	5	11
Blue Gray Silty Sand, some gravel	11	87
Clean Sand	87	95
Clean Sand & Gravel	95	98½

RECEIVED 1980 MAY 9 1980 WATER RESOURCES

Work started 3/17 , 1980 Completed 3/18 , 1980

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 DELKE DRILLING Co.
(Person, firm, or corporation) (Type or print)

Address 701 - 41 Ave NE, Puyallup 98371

[Signed] Roger Delke
(Well Driller)

License No. 0379 Date 4/2 , 1980

USE ADDITIONAL SHEETS IF NECESSARY

24/08-28D

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. 45
Permit No. ....

(1) OWNER: Name DAVID R.B. SWENSON Address 14416 S.E. 18TH Bellevue, WN. 98007

(2) LOCATION OF WELL: County KING ~~NE~~ NW¼ NW¼ Sec. 28 T. 24 N. R. 8E W.

Bearing and distance from section or subdivision corner

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

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

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 230 ft. Depth of completed well 230. ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +1 ft. to 210 ft.
Threaded [ ] 5" Diam. from 215 ft. to 230 ft.
Welded [X] ____" 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 [X] No [ ]
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No.
Diam. 6 Slot size 14 from 210 ft. to 215 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 FLINT & WALLING
Type: SUBMERSIBLE H.P. 3/4

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level 210. ft. below top of well Date 2/13/82
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 [X] If yes, by whom?
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
Baller test 4-5 gal./min. with 0 ft. drawdown after 4 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG: (16)

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
BROWN SANDY CLAY.	0	3
BROWN TILL (Light Brown)	3	37
BROWN SILTY SAND WITH CLAY	37	41
GRAY SILT WITH ACC CLAY LAYERS	41	102
BLUE CLAY	102	129
BROWN Conglomerated GRAVEL WITH Boulders	129	164
DARK BROWN DRY Conglomerated SAND.	164	210
BROWN medium to course WASHED SAND	210	215
BLUE CLAY	215	217
BROWN SANDY CLAY.	217	230

RECEIVED
APR 1 1982
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 12-28 19 81 Completed 2-16 19 82

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 BURGAS DRILLING COMPANY
(Person, firm, or corporation) (Type or print)

Address 1519 DAYTON CT. N.E. RENTON

[Signed] Jan Burgas
(Well Driller)

License No. 0690 Date 3/12 19 82

USE ADDITIONAL SHEETS IF NECESSARY

RECEIVED

NOV 30 1992

DEPT. OF ECOLOGY

28D

46

WATER WELL REPORT
STATE OF WASHINGTON

Grant Camp No. [redacted]
Water Right Permit No.

(1) OWNER: Name JOHNSON, ALAN Address 44326 SE 142ND PLACE NORTH BEND, WA 98045-

(2) LOCATION OF WELL: County KING - NW 1/4 NW 1/4 Sec 28 T 24 N, R 9
Dir. STREET ADDRESS OF WELL (or nearest address) SE 70TH, NORTH BEND

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of Well (if more than one)
NEW WELL Method ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 250 ft. Depth of completed well 250 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 Dia. from 0 ft. to 250 ft.
WELDED Dia. from ft. to ft.
Dia. from ft. to ft.

Perforations: 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: NO
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
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 227 ft. below top of well Date 11/06/92
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? If yes, by whom?
Yield: gal. min with ft. drawdown after hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal. min. 18 ft. drawdown after hrs.
Air test 9 gal. min. w/ stem set at ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made?

(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 in formation.

MATERIAL	FROM	TO
TOPSOIL	0	2
DIRTY SAND & GRAVEL	2	10
SAND & BROWN CLAY	10	30
BLUE CLAY	30	114
BROWN CLAY GRAVEL ROCK	114	200
BLUE CLAY	200	230
BROWN CLAY & GRAVEL	230	240
WATER SAND & GRAVEL	240	250

Work started 11/02/92 Completed 11/06/92

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 DAHLMAN PUMP & WELL DRILL
(Person, firm, or corporation) Type or print

ADDRESS PO BOX 422, BURLINGTON, WA

DESIGNED: [signature] License No. 0623

Contractor's Registration No. DAHLMPW123LC Date 11/9/92

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. 47
Permit No.

(1) OWNER: Name DAVID BATTEY Address 40404 S.E. 70th DR. SNOQUALMIE WN

(2) LOCATION OF WELL: County KING — W½ NW¼ Sec 28 T. 24N. R. 8E 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 212 ft. Depth of completed well 212 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 212 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? 21 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 Pioneer
Type: Submersible H.P. 3/4

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 185 ft. below top of well Date 9-8-82
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.
" " " "
" " " "

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 6 gal./min. with 14 ft. drawdown after 4 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: 24-8E-28DE (59)
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
Fill	0	2
Loam	2	5
Brown Sandy Clay	5	19
Gray Silty Clay	19	26
Gray Sandy Clay	26	32
Gray Silty Clay	32	41
Gray Clay	41	56
Brown Till	56	59
Brown Fine Sand	59	61
Brown Dry Gravel	61	82
Brown Gravely Till with occ Boulders	82	96
Brown Dry Gravel	96	126
Brown Dry Sand	126	159
Gray Till	159	171
Brown Dry Sand	171	178
Gray Sandy Clay	178	208
Gray Course Sandy Gravel	208	212

RECEIVED
OCT 1 21982
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 8-26 19 82 Completed 9-9 19 82

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 BURAAS DRILLING COMPANY
(Person, firm, or corporation) (Type or print)

Address 1519 DAYTON CT. N.E. RENTON

[Signed] Jan Buraas
(Well Driller)

License No. 0690 Date 10-5 19 82

USE ADDITIONAL SHEETS IF NECESSARY

24/00 — 261

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 **48**

(1) OWNER: Name DAVID R.B. SWENSON Address 14416 S.E. 18TH Bellevue, WN 98007

(2) LOCATION OF WELL: County KING W 1/2 - NW 1/4 1/4 Sec 28 T 24 N. R 8 E W

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic [X] 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 [X] Cable [X] 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 230 ft. to 260 ft.
Threaded [ ] " Diam. from ft. to ft.
Welded [X] " 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 [ ] No [ ] To what depth? N/A ft.
Material used in seal
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 ft.
Static level 245 ft. below top of well Date 3-4-83
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 [X] If yes, by whom?
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 7-8 gal./min. with 2-3 ft. drawdown after 3 hrs.
Artesian flow N/A g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG: (60)

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
BROWN CONGLOMERATED SAND & GRAVEL	230	249
BROWN LAYERED, WASHED SAND & GRAVEL	249	260

Work started 3-2 19 83 Completed 3-5 19 83

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 BURRAS DRILLING COMPANY
(Person, firm, or corporation) (Type or print)

Address 1519 DAYTON CT N.E RENTON 98

[Signed] Jan Burras
(Well Driller)

License No. 0690 Date 3-15 19 83

(USE ADDITIONAL SHEETS IF NECESSARY)

Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

SS+G #2

Water Right Permit No. G1-24839P

49

(1) OWNER: Name Snoqualmie Sand & Gravel Address P.O. Box 492 Snoqualmie, 98065

(2) LOCATION OF WELL: County King NW ¼ NW ¼ Sec 20 T. 24 N. R 8 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) SS+G2

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

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

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 354 feet. Depth of completed well 354 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8 " Diam. from 0 ft. to 334 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.
_____ " 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 Johnson
Type Stainless Model No. _____
Diam. 8" Slot size .100 from 334 ft. to 344 ft.
Diam. 8" Slot size .080 from 344 ft. to 354 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 _____ ft.
Static level 157 ft. below top of well Date 4-7-88
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.
" " " "
" " " "

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 300+ gal./min. with stem set at 330 ft. for 6 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
Brown Sand & Gravel	0	167
Brown Silty Sand & Occ. Gravel	167	221
Blue Silty Sand & Occ. Gravel	221	307
Water Bearing Sand & Gravel	307	354

RECEIVED
MAY 5 1988
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 3-30-88 19. Completed 4-7-88 19

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 Northwest Pump and Drilling Co.
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 3245 Auburn Way South

(Signed) _____ License No. 0097
(WELL DRILLER)

Contractor's Registration No. North P D 137 P 9 Date 4-8-88 19

(USE ADDITIONAL SHEETS IF NECESSARY)

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air-Rotary

SAMPLING METHOD: Grab Samples
5' intervals

WATER LEVEL	139'	167'	139'	181'
DATE	9/27	9/30	10/3	11/6
TIME	3:00	8:30	9:00	8:30

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	0	Brown/grey, silty, sandy gravel. Fast, smooth drilling.	
	50	Brown, silty sand with some gravel (dirty sand). Fast, smooth drilling.	
	100	Slight increase in gravel.	
	150	Grey, coarse, sandy gravel with some silt and scattered cobbles. Medium, rough drilling.	▽ WD
	200		100gpm ▽ WD
	250	Grey, coarse, sandy gravel with trace silt. Slow, rough drilling. Heaving sands and gravels.	

NOTES:

WD = While Drilling.

PROJECT NO. 8607-14
BORING NO. TW-5
ELEVATION 450'
PAGE 1 **OF** __

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
13714 PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air-Rotary to 445'

SAMPLING METHOD: Grab Samples 5' intervals

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	250	Grey, silty sand with some gravel. Slow to medium, rough drilling. Some clasts of blue silt/clay. Heaving conditions.	
	300	No gravel. Fast, smooth drilling.	▽ WD
	350		
		Organics with trace clay clasts.	▽ WD
	400		
			75gpm ▽ WD
	450	Grey, gravelly, silty, fine to coarse sand with some silt/clay clasts. No hammer needed to drive casing.	
	500		

NOTES:

WD = While Drilling.

PROJECT NO. 8607-14
BORING NO. TW-5
ELEVATION 450'
PAGE 2 **OF** __

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
13714 PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Cable Tool
445' to 538.5'
Mud Rotary
538.5' to 583'

SAMPLING METHOD: Grab Samples
5' intervals

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	500	Grey, silty, fine sand with trace gravel.	
		Grey, gravelly sand with some silt. Alternating hard and easy drilling.	
	550	Grey, gravel with some silt.	
		Bedrock, black basalt and purple andesite.	
		BOH	
	600		

NOTES:

PROJECT NO. 8607-14
BORING NO. TW-5
ELEVATION 450'
PAGE ___ **OF** ___

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
13717 PARK LANE • KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 1 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Yellow-brown, gravelly SAND with trace silt and some cobbles.	
		Yellow-brown, gravelly SAND with cobbles and some silt.	
	10	Yellow-brown, gravelly SAND with some cobbles and some silt.	Surface Seal
	20	Yellow-brown, gravelly SAND with some silt and trace cobbles.	20" Steel Casing
	30	Yellow-brown, fine to coarse SAND with gravel and some silt.	
	40		
		Yellow-brown, gravelly SAND with trace of silt.	
	50		

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 2 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Yellow-brown, fine to coarse SAND with gravel and silt.	20" Steel Casing
	60	Yellow-brown, gravelly SAND with some silt.	
		Yellow-brown, gravelly SAND with some silt and some cobbles.	
	70	Yellow-brown, gravelly SAND with some cobbles and some silt.	
	80	Yellow-brown, sandy GRAVEL with cobbles and some silt.	
	90		
		Yellow-brown, sandy GRAVEL with some cobbles and trace silt.	
	100		

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701
Fax: 206-827-5424

Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 3 of 12
Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	110	Yellow-brown, sandy GRAVEL with some cobbles and trace silt.	20" Steel Casing
		Yellow-brown, sandy GRAVEL with some silt and some cobbles.	
	120	Gray-brown, gravelly SAND.	
		Gray, gravelly SAND with trace silt and some cobbles.	
	130	Yellow-brown and gray, gravelly SAND with some cobbles and some silt.	
	140	Gray-brown, gravelly SAND with some silt and a few cobbles.	
	150		

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 4 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	160	Gray-brown, gravelly SAND with some silt.	20" Steel Casing
	170	Gravelly SAND with some cobbles grading into sandy GRAVEL with cobbles.	
	180	Dark gray, sandy GRAVEL with cobbles.	
	190	Gray-brown, gravelly SAND with some silt and trace cobbles.	
	200	Dark gray, gravelly SAND with some silt and trace cobbles.	
		Dark gray, gravelly SAND with some cobbles.	

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Drilling Log

LEGEND

- Sandy gravel with cobbles
- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Bailer Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 5 of 12
Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Gray-brown, gravelly SAND with some silt.	20" Steel Casing
		Siltier lenses present.	
	210		
	220		
	230		
	240	Gray-brown, gravelly, silty SAND.	
		Brown, sandy GRAVEL to silty SAND with gravel.	
	250		

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LEGEND

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- Sandy gravel
- Poorly sorted sand
- Well sorted sand
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- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 6 of 12 . Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Brown, sandy GRAVEL with cobbles and trace silt..	20" Steel Casing
	260	Some heaving 260'-270'.	
	270		
		Gray, cobbly, gravelly, very silty SAND (till-like); hard drilling.	
	280		
		Gray, gravelly SAND with silt. Able to drive and bail without drilling.	
	290		
	300		

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- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
- Diamicton
- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 7 of 12 · Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	310	Gray, gravelly SAND with silt. Able to drive and ball without drilling.	20" Steel Casing
	320		
	330	Gray, cobbly, sandy, silty GRAVEL. Very dense, hard drilling. "Till-like."	Top 16" Casing 328'-4"
	340		Top Cement Grout 16" to 20" @ 340'
	350		16" Steel Casing

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LEGEND

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- Sandy gravel
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- Peat
- Silt-clay
- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 8 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	360	Gray, cobbly, sandy, silty GRAVEL. Very dense, hard drilling. "Till-like."	16" Steel Casing
	370		
		Gray, very silty SAND.	
	380	Gray, cobbly, sandy, silty GRAVEL. Very dense, hard drilling.	
	390		
		@ 394' large cobbles/boulders	
	400		

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- Sandy gravel
- Poorly sorted sand
- Well sorted sand
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- Peat
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 9 of 12
Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl.
	410	Gray, silty, fine SAND. @ 405'-409' large cobbles.	
	420	Gray, sandy SILT.	Bottom 20" Casing @ 415'
	430	Gray, clay-rich, sandy SILT with lenses of fine sand.	16" Steel Casing
	440		
	450		

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- Sandy gravel
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Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 10 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	460	Gray, clay-rich, sandy SILT with lenses of fine sand.	16" Steel Casing
	470		
	480	Gray, clayey SILT with scattered lenses of fine sand, trace peat, local gravelly zones.	
	490		
	500		

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- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
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- Silt

Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
Sampling Method: Baller Grab and Split
Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 11 of 12 Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
	510	Gray, clayey SILT with scattered lenses of fine sand, trace peat, local gravelly zones.	Top 10" Riser Flanged to 12"
	520	Gray, cobbly GRAVEL with silt/clay matrix.	Top Screen 516'-7"
	530	Gray, gravelly, fine SAND with silt; coarsens with depth.	Bottom 16" Casing @ 527'-7"
	540	Gray, cobbly, sandy GRAVEL with thin lenses of silty, fine sand.	10" Riser; 10" Pipe Size, 50 Slot, Stainless Steel Screen; 8-12 Colorado Sand
	550		

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- Sandy gravel
- Poorly sorted sand
- Well sorted sand
- Bedrock
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Project Name: Snoqualmie North Well Field
Project Number: W93199K
Drilling Method: Cable Tool
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Elevation: 436.55'
Boring Diameter: 20" 0'-415'; 16" 415'-564'
Drilling Contractor: Armstrong Drilling, Inc.
Page 12 of 12
Boring No. TW-7

Water Level	150.11	149.60	149.63		
Date	5/13/94	5/26/94	6/7/94		
Time	7:10 AM	11:30 AM	1:13 PM		

Strata	Depth	Description	Well Compl..
		Gray, cobbly, sandy GRAVEL with thin lenses of silty, fine sand.	
		"Till-like", gravelly, silty SAND (hard silt matrix).	
	560	Very hard, gravelly SAND with large cobbles.	Top Tailpipe 556'-5" / Cement Plug 558'-564'
		Maroon, gray-green, and black, basaltic flows/flow breccia BEDROCK.	
		BOH @ 564'	
	570		
	580		
	590		
	600		

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Drilling Log

EXPLORATION BORING LOG

Number OBW-1

52

SEDIMENT DESCRIPTION ELEVATION 423.6'	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
Moist, brown, silty, fine SAND. (Fill?) Rocks in tip affected blow counts.	5			50/ 5-1/2"
No recovery. Rocks in tip. Driller reported change at approximately 7-1/2' to 8' to silty material.				
No recovery. Rocks in tip.	10		▽ WD	
Damp, gray SILT with sand, gravel. (Lodgement Till) Approximate 3" recovery.				50/ 3" ①
Damp, gray, sandy SILT to silty SAND with gravel. (Lodgement Till) Approximate 6" recovery.	15			50/ 6" ①
Damp, gray, silty SAND with gravel. (Lodgement Till) Approximate 6" recovery.				50/ 5" ①
Qvt				
Saturated, brown SAND AND GRAVEL with silt. (Qva)	20			50/ 4" ①
BOH @ 23' Note: Probable bedrock at approximately 23'. Twisted off auger in hole. Hole abandoned.	25			
WD = while drilling				
Split spoon sampler	30			
① Dames & Moore California Modified Ring Sampler (140 lb. hammer)				

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By GJK

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Snoqualmie Waste Water Treatment Plant
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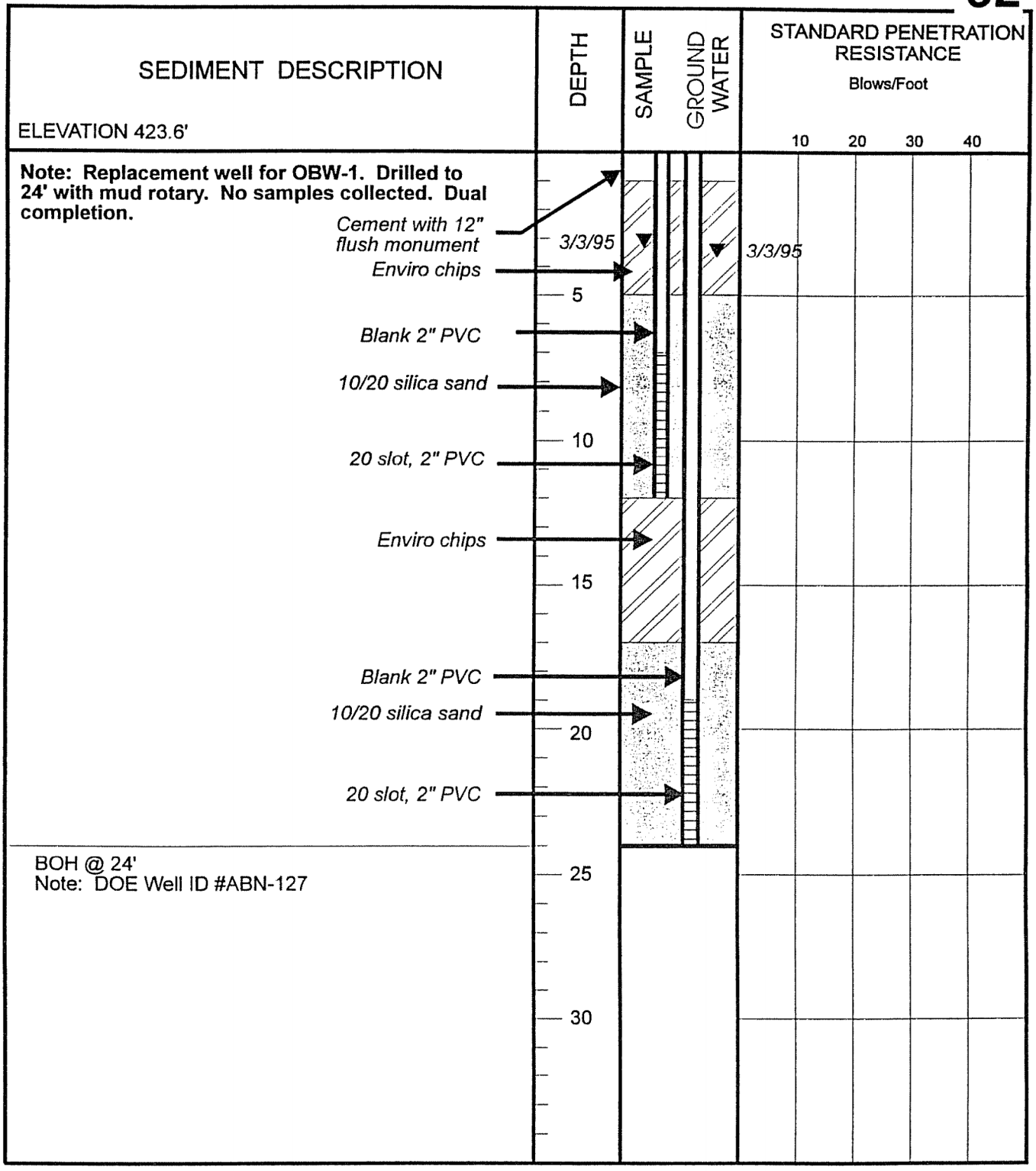
Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-1B

52



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Reviewed By CJK

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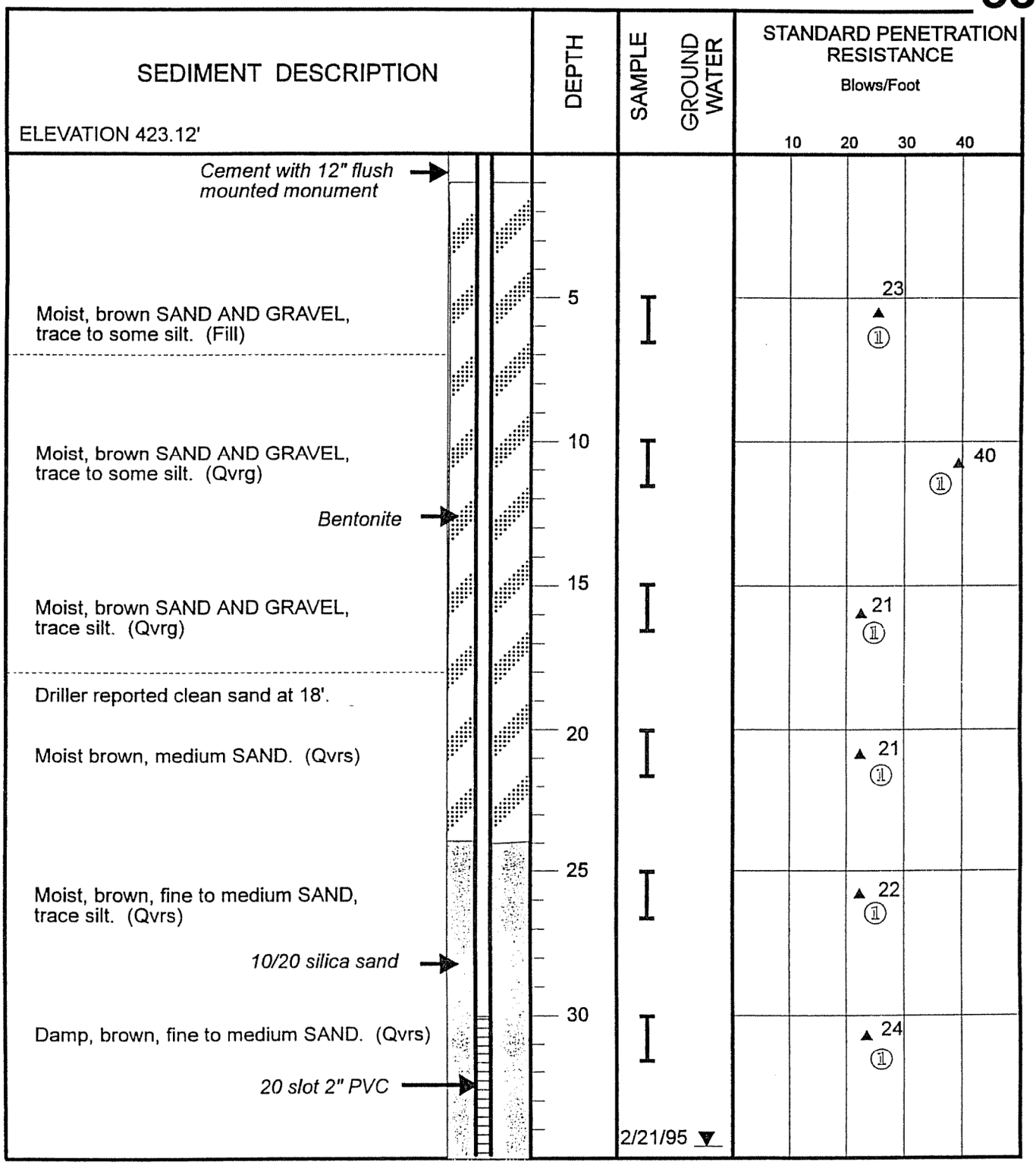
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-2 Page 1 of 2

53



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Reviewed By CSK

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

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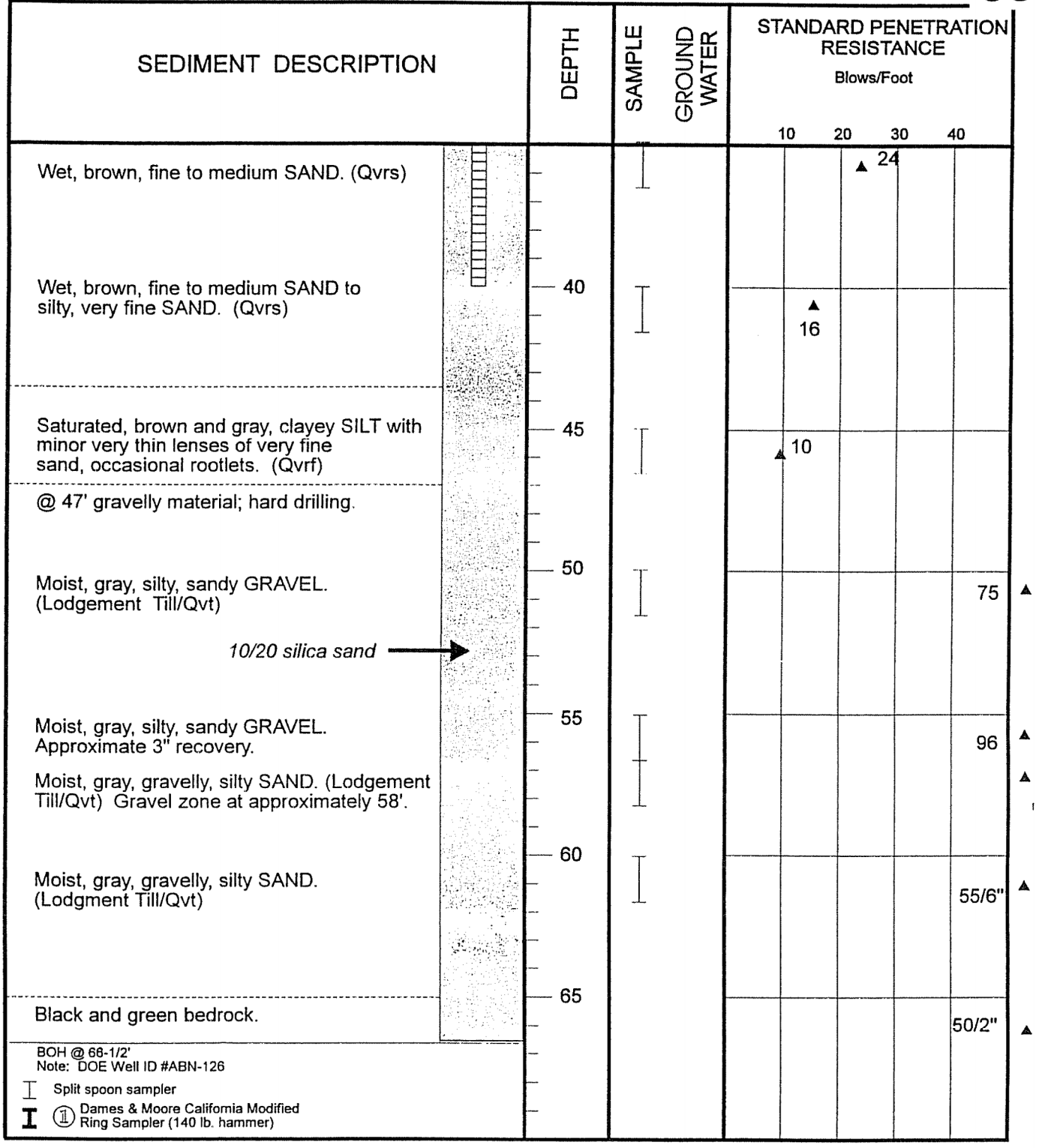
53



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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-2A Page 1 of 2

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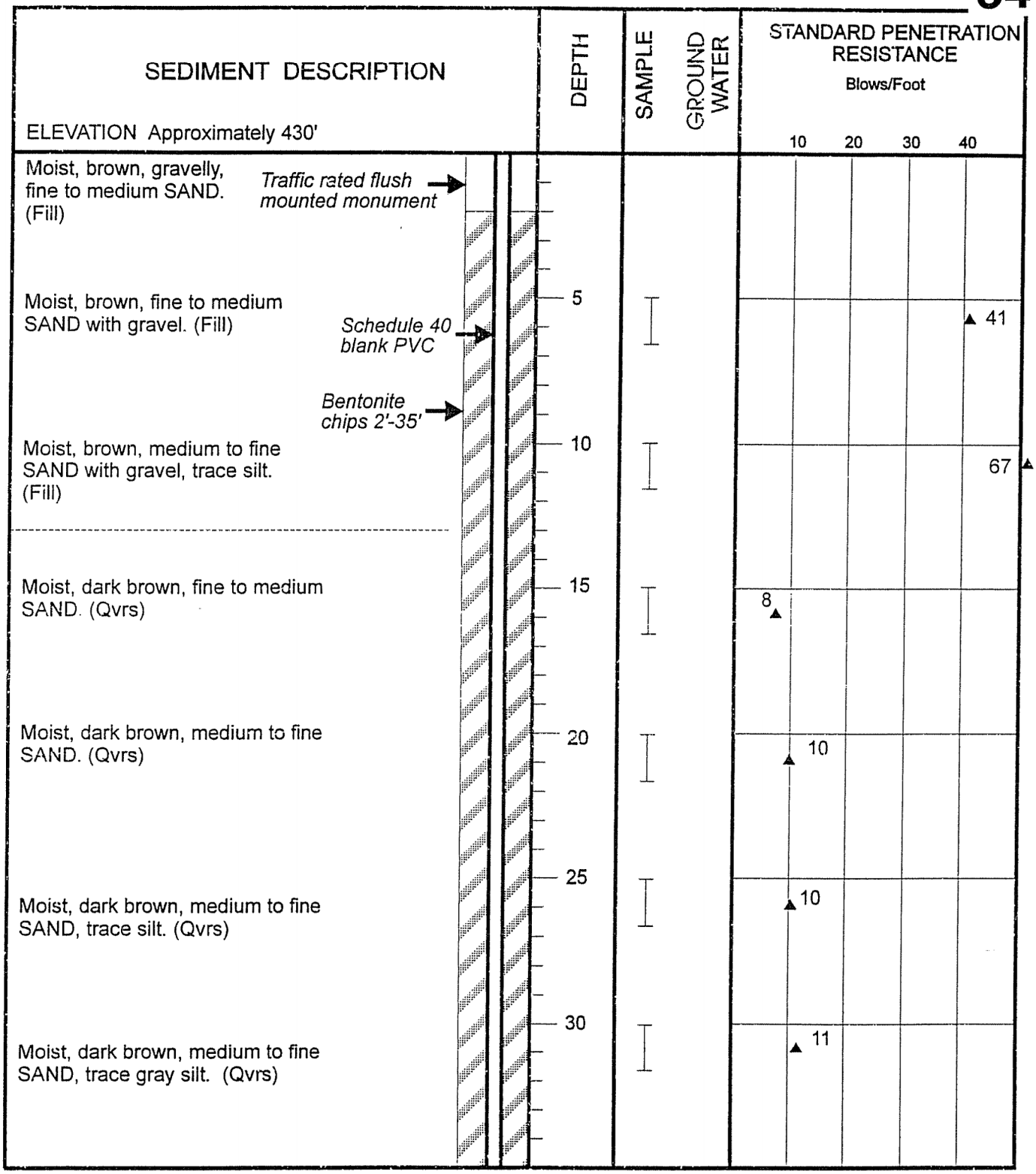

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94263C
July 1996

EXPLORATION BORING LOG

Number OBW-2A Page 2 of 2

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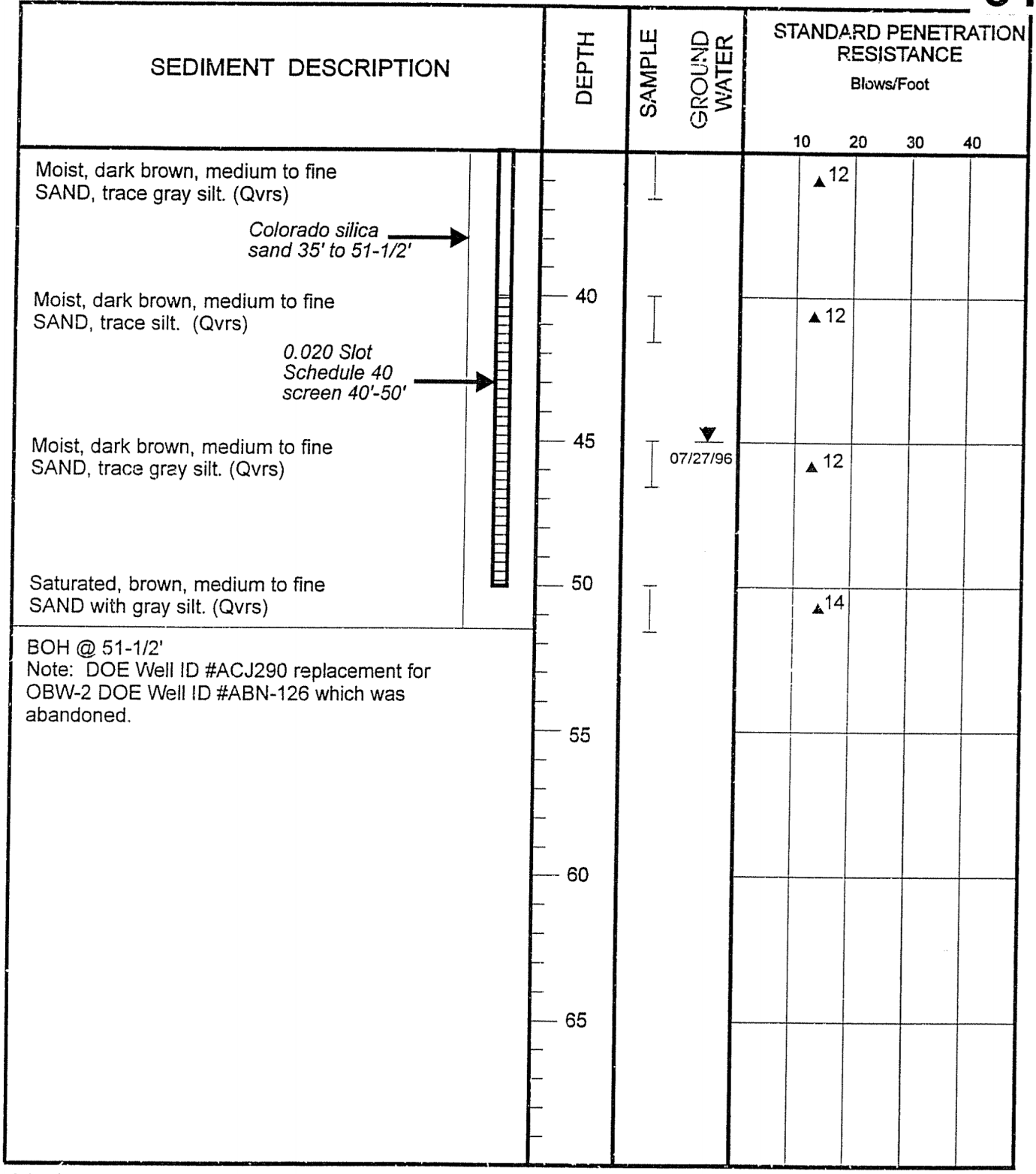

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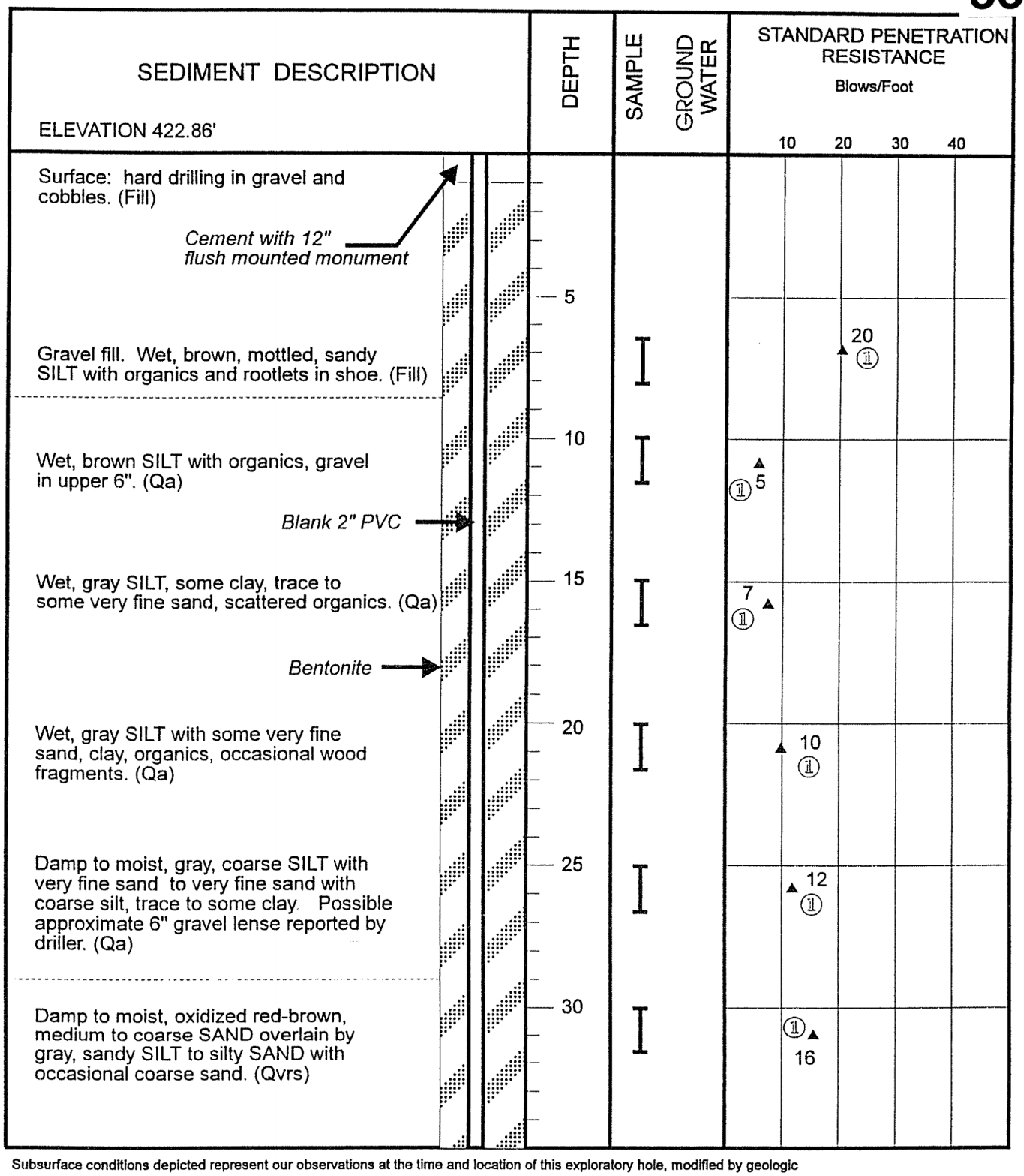
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94263C
July 1996

EXPLORATION BORING LOG

Number OBW-3 Page 1 of 3

55



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Reviewed By CJK

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

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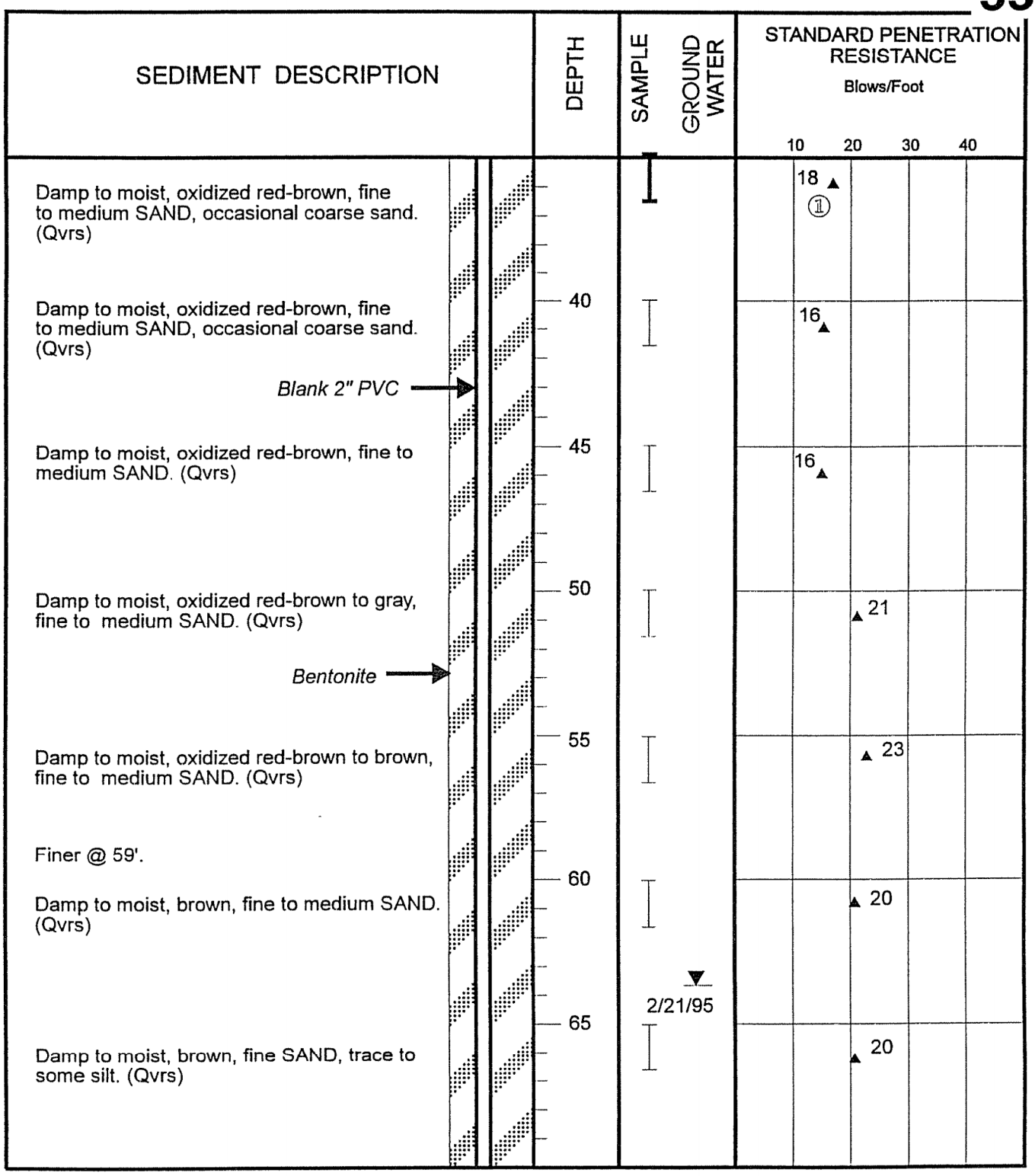
55



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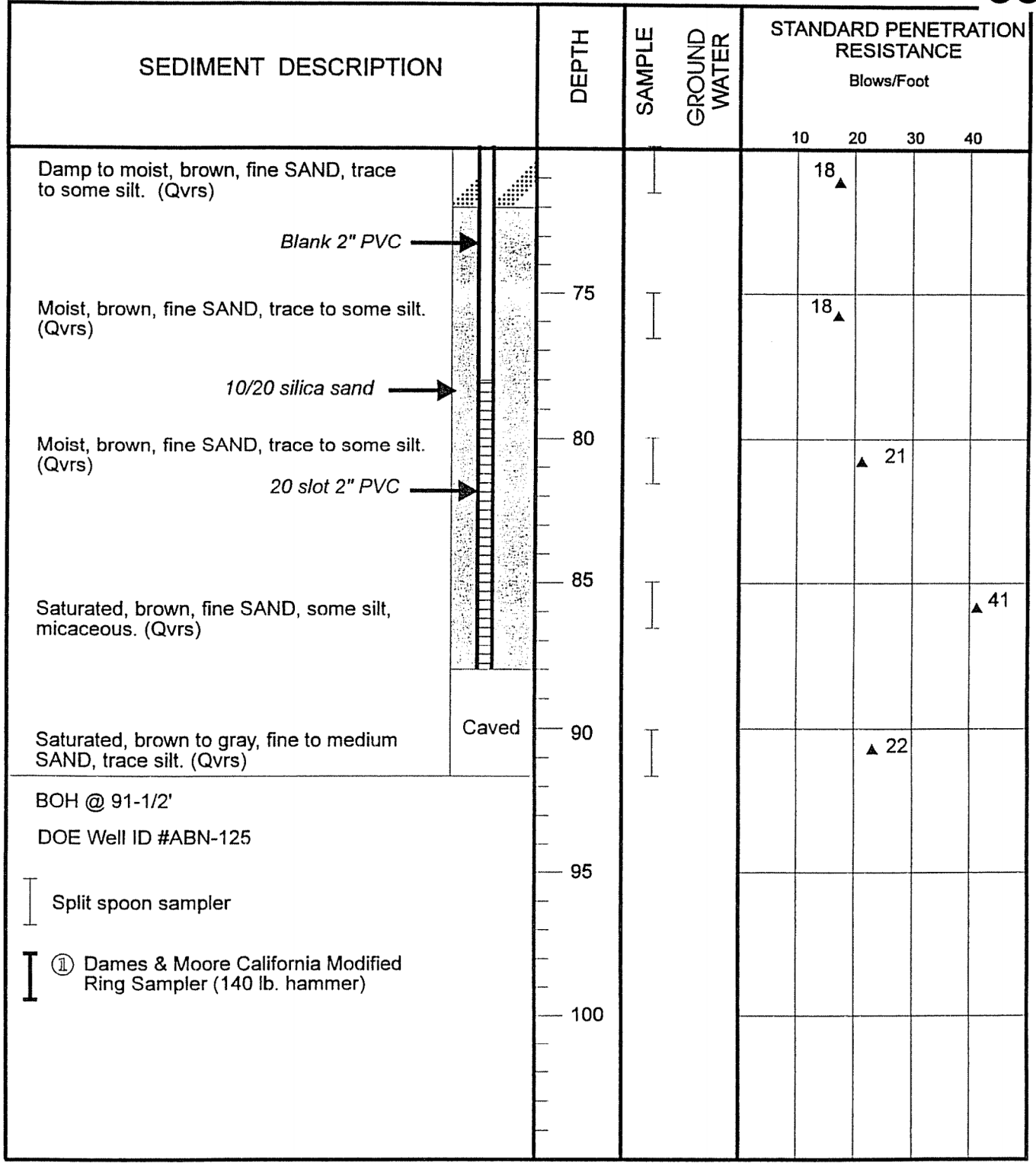
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-3 Page 3 of 3

55



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Snoqualmie Waste Water Treatment Plant
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Project No. W94236A
February 1995

EXPLORATION BORING LOG

Number OBW-4 (BH-6) Page 1 of 2

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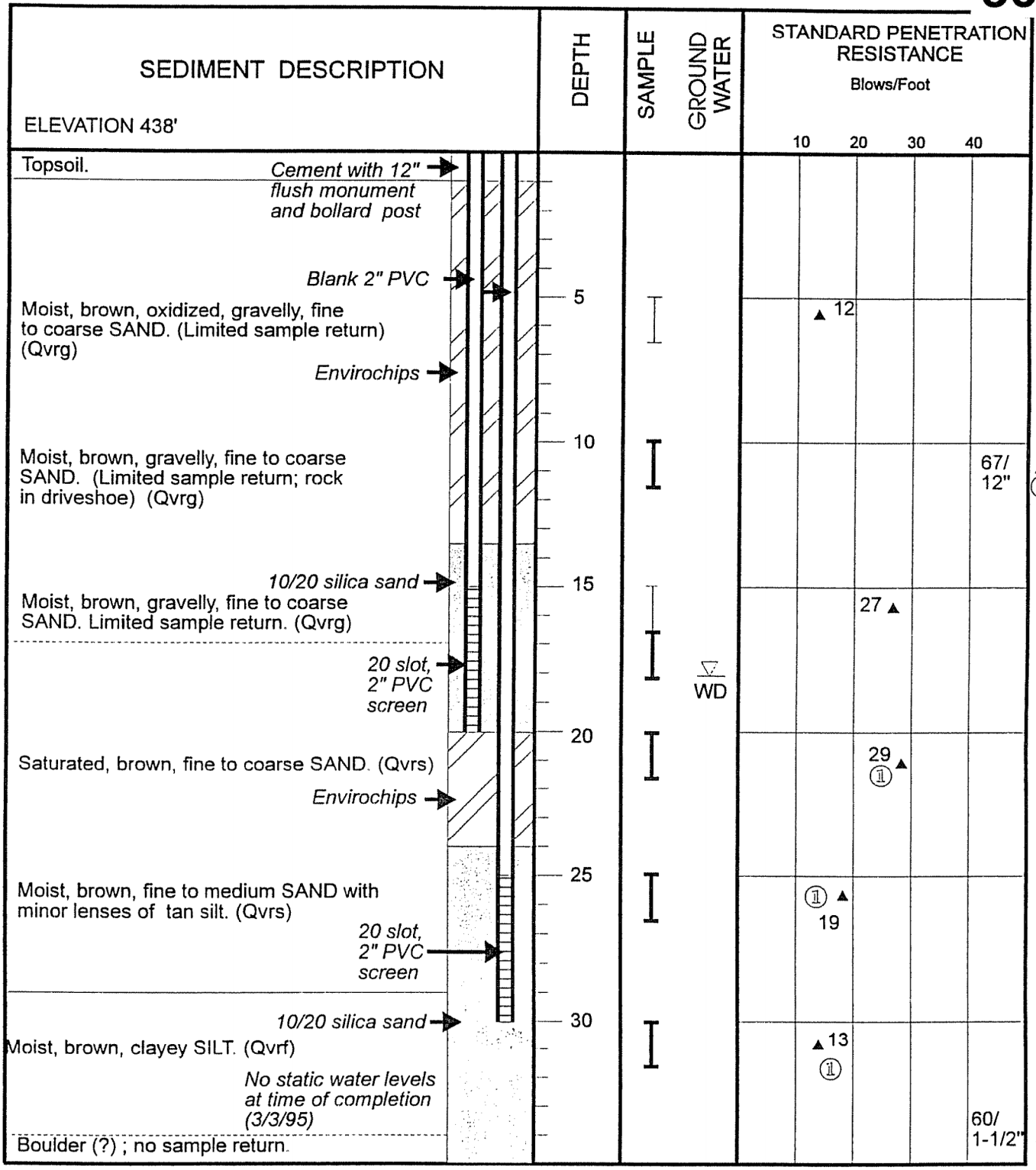

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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number OBW-4 (BH-6) Page 2 of 2

56

SEDIMENT DESCRIPTION	DEPTH	SAMPLE	GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot 10 20 30 40
BOH @ 35' Refusal				
I Split spoon sampler				
I ① Dames & Moore California Modified Ring Sampler (140 lb. hammer)	40			
WD Ground water encountered while drilling				
DOE Well ID #ABN-114	45			

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Reviewed By CJK

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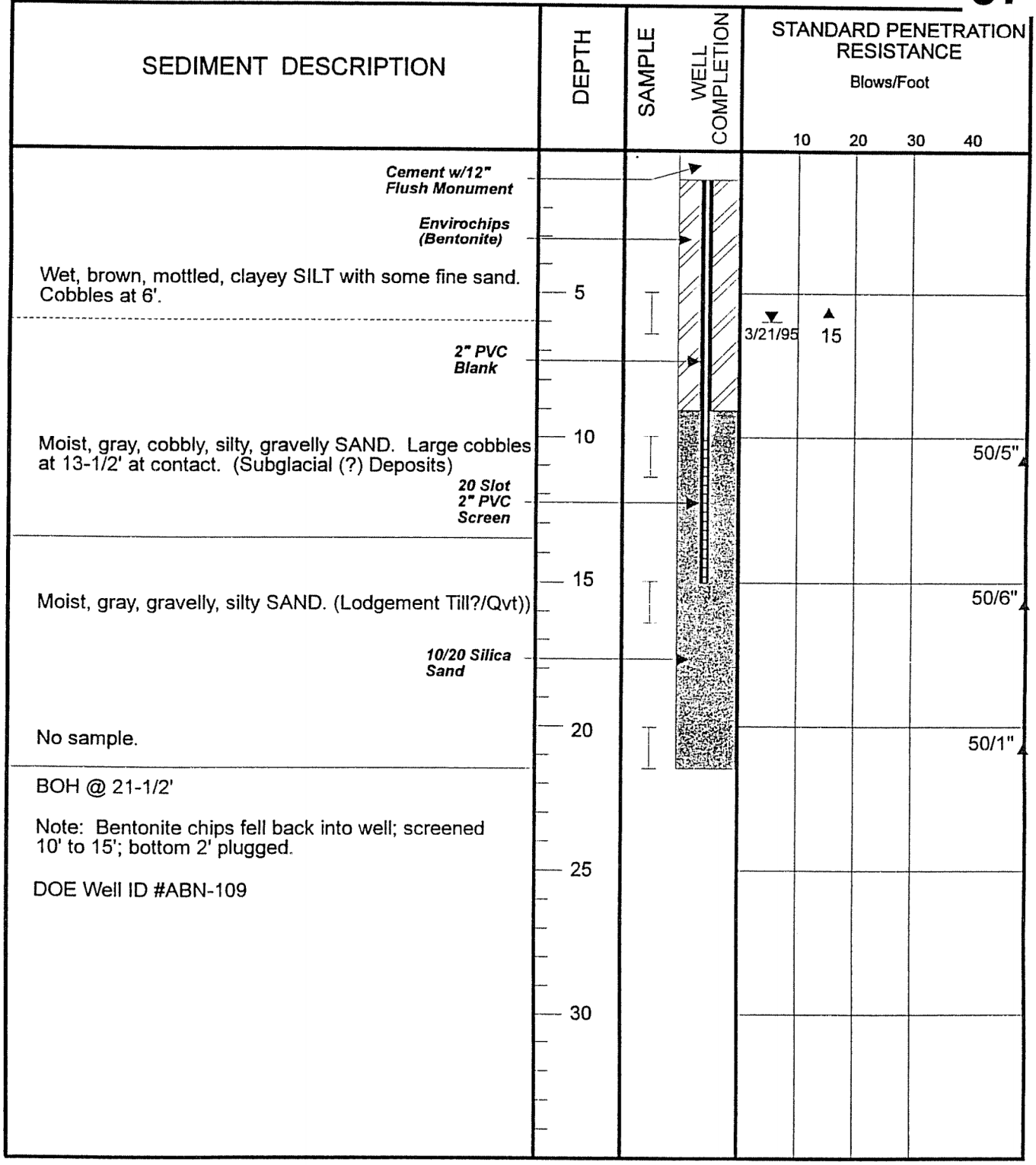
Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. G94236A
March 1995

EXPLORATION BORING LOG

Number OBW-5

57



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Snoqualmie Waste Water Treatment Plant
Snoqualmie, Washington
Project No. W94263A
March 1995

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	Initiated 4/8/91 DESCRIPTION	WATER TABLE(S)
	10	Brown, wet, sandy gravelly cobbles.	
	20	Becoming dry with some silt content below 10'.	
	30		
	40	Brown, wet, gravelly, fine to coarse sand with scattered cobbles. Cobble zone at 38-40'	
		Brown, moist, sandy, well sorted sand with scattered cobbles.	
	50	Brown, moist, gravelly, fine to coarse sand with cobbles. Containing less cobbles below 48'.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 1 **OF** 6

DRILLING LOG

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ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		As above. Well sorted ½"-1" gravels at 50'-56½'.	
	60	Grading interbeds of brown, moist, sandy gravel and gravelly, fine to coarse sand.	
		Well sorted 1" gravels 60'-63'.	
	70		
	80		
	90		
	100		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 2 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	110 120	As above.	
	130 140 150	Interbedded zones of brown, cemented, dry, silty, fine to coarse sand (hard drilling) and brown, moist, fine to coarse sand with varying gravel content.	

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 3 OF 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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LEGEND


SANDY GRAVEL WITH COBBLES


SANDY GRAVEL


POORLY SORTED SAND


WELL SORTED SAND


DIAMICTON


SILT - CLAY


PEAT


BEDROCK


SILTY

DRILLING METHOD : Reverse air circulation

SAMPLING METHOD : Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	160	As above.	Water added 152'-180'
	170	Becoming brown-grey 156'-177'. Losing fines content between 152'-180' due to adding water.	
	180	Cobble zone 166'-170'.	
	190		
	200		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 4 **OF** 6

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	210	As above	Water added 205'-208'
	220		
	230	Brown, dry, sandy, well sorted 1" gravels at 222'-224'. Limited sample return 224'-232'.	
		Brown, wet, sandy, well sorted 3/4"-1" gravels with minor cobbles.	▽ Trace while drilling
		Brown, wet to saturated, unsorted, clayey, sandy silt.	
	240	Brown, dry, silty, fine to coarse sand with minor cobbles and gravels. Becoming wet below 246' where water added. (Hard drilling)	Water added 246'-248'
	250		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 5 **OF** 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Reverse air circulation

SAMPLING METHOD: Continuous

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		Brown, dry becoming wet where water added, subangular medium to coarse sand	Water added 251'-260'
	260	Brown, wet to saturated, unsorted, sandy silt. (Hard drilling) Losing some fines content due to adding water.	
	270	TD 260' 4/13/91 Refusal	
	280		
	290		
	300		

NOTES:

PROJECT NO. E93013A
BORING NO. EB-B4W
ELEVATION 545
PAGE 6 **OF** 6

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
ECONOMIC GEOLOGISTS / ENGINEERING GEOLOGISTS
• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD : Air Rotary

SAMPLING METHOD : Grab

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	10		
	20	Brown gravel and coarse sand.	
	30	Brown gravel with sand, high % of fractured rock chips.	
	40	Brown gravel with coarse sand.	
	50	Brown gravel/cobbles with coarse sand, rock fragments.	

NOTES: 8" surface casing to 20'; 6" casing surface to TD; 8" casing later pulled. Surface seal from 0-20'.

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 1 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND



SANDY GRAVEL WITH COBBLES



SANDY GRAVEL



POORLY SORTED SAND



WELL SORTED SAND



DIAMICTON



SILT - CLAY



PEAT



BEDROCK



SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

WATER LEVEL					
DATE					
TIME					

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	60	Brown sandy gravel with cobbles, rock fragments	
	70	Brown gravel with cobbles with interbedded coarse sand, rock fragments.	
	80	Gray-brown gravel with coarse sand, rock fragments.	
	90	Gray gravel with rock fragments with trace sand.	
	100	Gray gravel with rock fragments with trace sand.	

NOTES:

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 2 **OF** 4

DRILLING LOG

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LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

WATER LEVEL				
DATE				
TIME				

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
	100	Gray gravel with rock fragments with trace sand.	
	110	Brown coarse sand and gravel with some rock fragments.	
	120	Brown coarse sand with some gravel and rock fragments.	
	130	Brown coarse sand with rock fragments and some gravel.	
	140	Grayish-brown gravel with rock fragments and trace sand.	
	150	Gray gravel with sand and rock fragments and some silt	

NOTES:

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 3 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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• KIRKLAND, WASHINGTON 98033 • 206-827-7701

LEGEND

- SANDY GRAVEL WITH COBBLES
- SANDY GRAVEL
- POORLY SORTED SAND
- WELL SORTED SAND
- DIAMICTON
- SILT - CLAY
- PEAT
- BEDROCK
- SILTY

DRILLING METHOD: Air Rotary

SAMPLING METHOD: Grab

		while drilling	
WATER LEVEL	~70		163.2
DATE	6/25/92		6/26/92
TIME	12:10		1:30pm

STRATA	DEPTH	DESCRIPTION	WATER TABLE(S)
		@155 dark brown fine to medium sand with some scattered gravel.	
	160	Dark brown medium sand and thin layers of silt inter-bedded in gray gravel with coarse sand.	
		@165 dark brown medium sand.	▼
	170	Dark brown medium sand, wet.	▽ WD
		@175 brown fine to medium sand and silt, saturated.	
	180	Brown fine to medium sand, silt, and clay, woody fragments, saturated.	
		@185 brown fine sand and silt, saturated.	
	190	Gray-brown fine to coarse sand with some silt.	
		@195 brown fine to coarse sand and silt.	
	200	Brown fine to medium sand.	

NOTES: 10' of No 12 screen installed from 188'-198'.

PROJECT NO. 9206-15W
BORING NO. SS&G #3
ELEVATION ~476
PAGE 4 **OF** 4

DRILLING LOG

ASSOCIATED EARTH SCIENCES, INC.
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• KIRKLAND, WASHINGTON 98033 • 206-827-7701

Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

24/8E/32/F

60

Application No. ——
Permit No. G120316P

(1) OWNER: Name TOWN of SNOQUALMIE Address TOWN Hall SNOQUALMIE WA 98065

(2) LOCATION OF WELL: County KING — SE ¼ NW ¼ Sec. 32 T. 24 N., R. 8E W.M.

Bearing and distance from section or subdivision corner 840' W & 1290' N of ¢ Sec. 32

(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 16 inches.
Drilled 544 ft. Depth of completed well 544 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16" Diam. from 0 ft. to 98.8 ft.
Threaded ☐ 12" Diam. from 98.8 ft. to 434.7 ft.
Welded ☐ 8" Diam. from 434.7 ft. to 544 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. 8 Slot size 60 from 516 ft. to 527 ft.
Diam. 8 Slot size 50 from 527 ft. to 539 ft.

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

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

(7) PUMP: Manufacturer's Name Line Shaft TURBINES
Type: GMC DEISEL H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 410 ft.
Static level 46 ft. below top of well Date 5-11-73
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? Story Armstrong
Yield: 600 gal./min. with 179 ft. drawdown after 11:50 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
Water 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	
Brn clay	0	20	20
Blue Sand - Silt	20	50	30
Blue Silty Sand	50	100	50
Blue Silt	100	140	40
Blue Silty clay	140	190	50
Blue Silty clay	190	240	50
Blue silty clay	240	245	5
fine silty Sand / Little H2O	245	255	10
Sticky Blue clay	255	265	10
Sandy Blue clay	265	340	75
Silty Sandy Blue clay	340	375	35
Fine Silty Sand Little H2O	375	430	10
Silty Sand Some water	430	445	15
Sand & Some Gravel	445	470	25
Sand & Gravel w clay Binder	470	480	10
Coarse Gravel & Sand	480	500	20
Glacial Till	500	515	15
Sand & Gravel	515	530	15
Sand & Gravel	530	544	14

Specific Composity = 3.35 gal/ft.

Potential = $1500 gal

106' below Sea Level

Work started 4-4, 1973 Completed 4-26, 1973

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 STORY ARMSTRONG (Person, firm, or corporation) (Type or print)

Address

[Signed] ____ (Well Driller)

License No. ____ Date ____, 19__

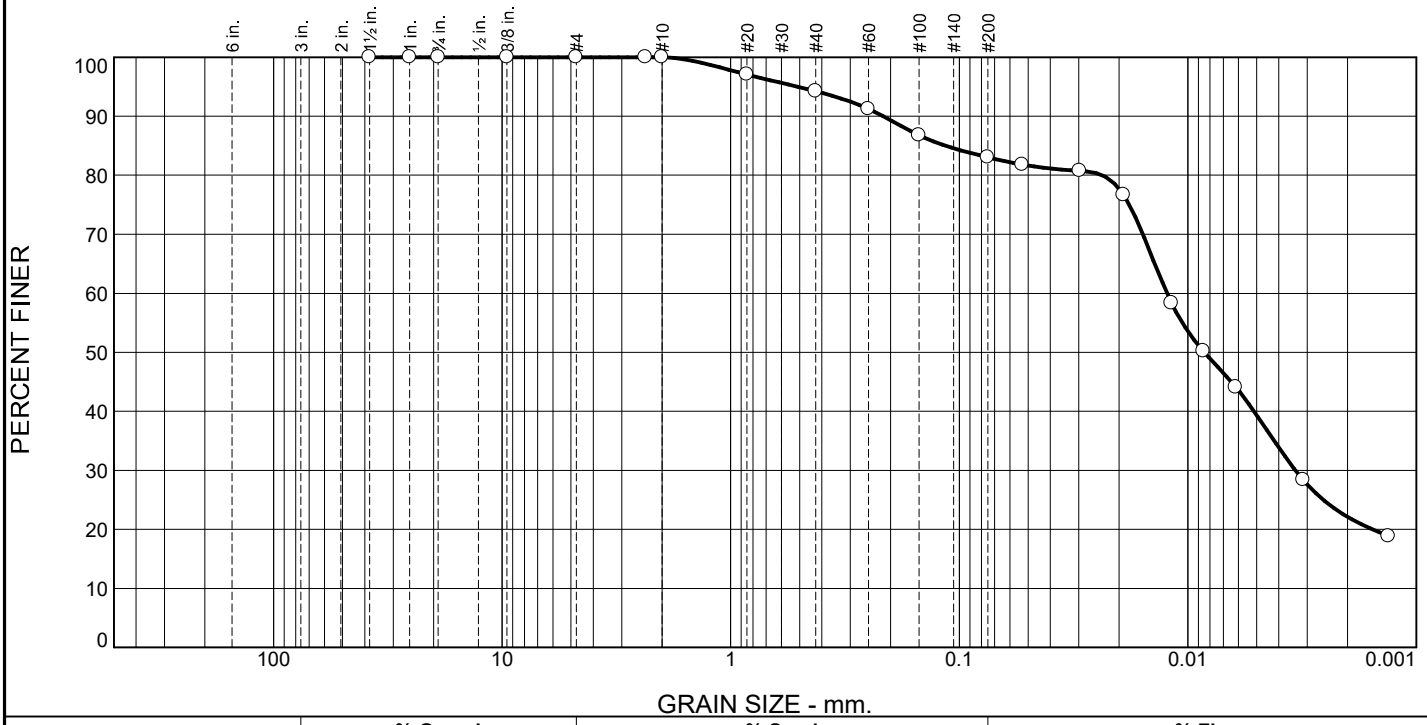
(USE ADDITIONAL SHEETS IF NECESSARY)

F. No. 7356—OS—(Rev. 4-71).

APPENDIX C

Laboratory Testing

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	5.8	11.2	43.6	39.4

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#20	97.1		
#40	94.2		
#60	91.2		
#100	86.8		
#200	83.0		
#270	81.8		
0.0297 mm.	80.7		
0.0191 mm.	76.7		
0.0118 mm.	58.3		
0.0086 mm.	50.2		
0.0062 mm.	44.1		
0.0031 mm.	28.4		
0.0013 mm.	18.9		

* (no specification provided)

Material Description

sandy SILT

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.2156 D_{85}= 0.1149 D_{60}= 0.0123
D_{50}= 0.0085 D_{30}= 0.0034 D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected by: LDM

Date Received: 02/15/2018 **Date Tested:** 02/20/2018

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: EB-1 **Depth:** 10'

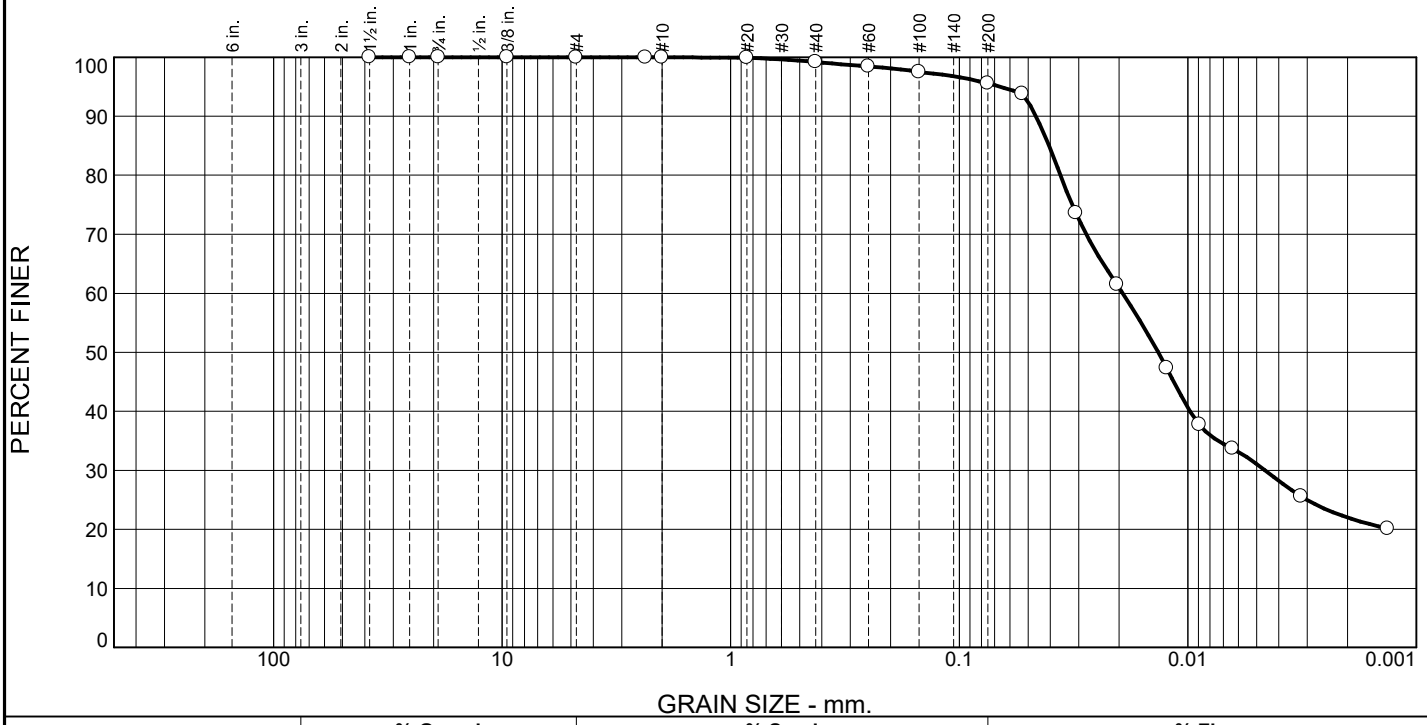
Date Sampled: 12/19/2017

associated earth sciences incorporated

Client: Snoqualmie Mill Ventures
Project: Snoqualmie Mill Site

Project No: 120126 H012 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.8	3.6	64.6	31.0

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#20	99.9		
#40	99.2		
#60	98.4		
#100	97.5		
#200	95.6		
#270	93.8		
0.0309 mm.	73.6		
0.0204 mm.	61.5		
0.0124 mm.	47.3		
0.0089 mm.	37.7		
0.0064 mm.	33.7		
0.0032 mm.	25.6		
0.0013 mm.	20.1		

* (no specification provided)

Material Description

SILT, trace sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** 29 **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(1)

Coefficients

D_{90}= 0.0461 D_{85}= 0.0405 D_{60}= 0.0193
D_{50}= 0.0135 D_{30}= 0.0046 D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected By: LDM

Date Received: 02/15/2018 **Date Tested:** 02/20/2018

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: EB-1 **Depth:** 25'

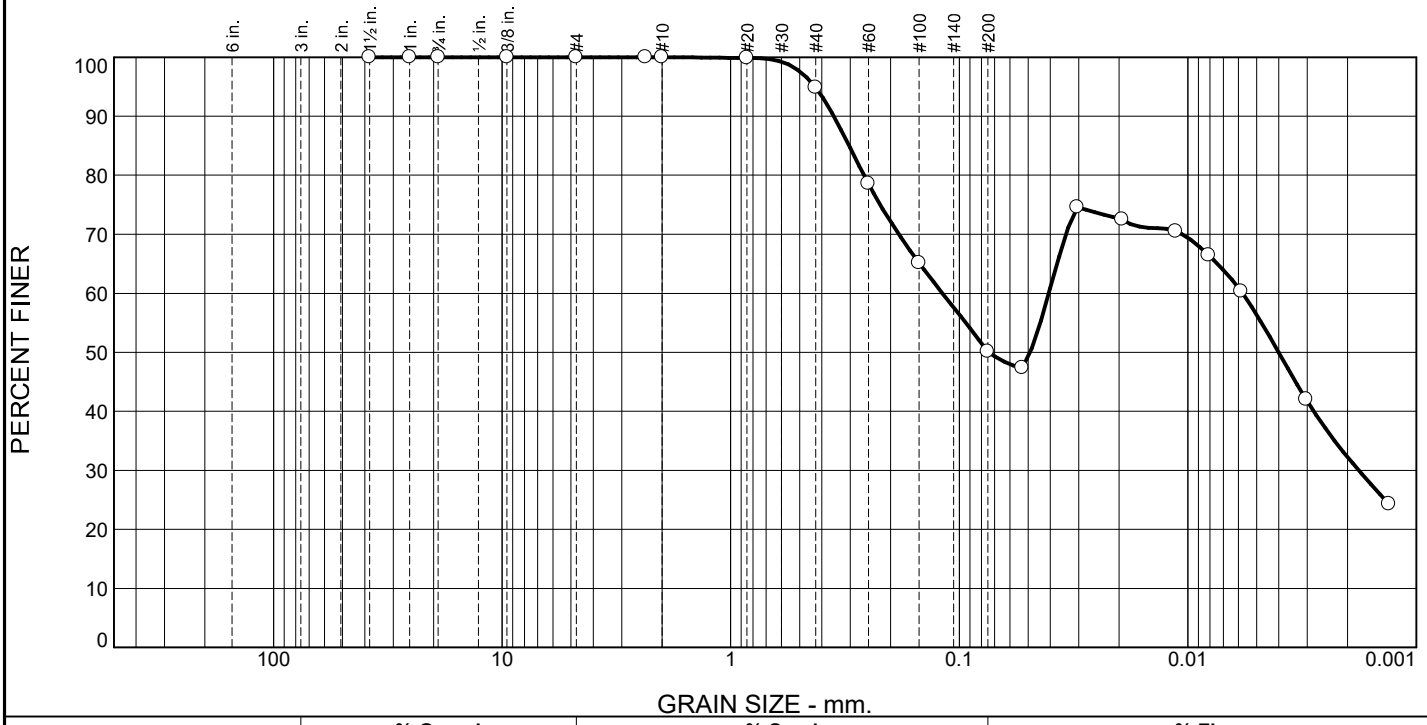
Date Sampled: 12/19/2017

associated earth sciences incorporated

Client: Snoqualmie Mill Ventures
Project: Snoqualmie Mill Site

Project No: 120126 H012 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	5.1	44.8	50.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#20	99.9		
#40	94.9		
#60	78.6		
#100	65.2		
#200	50.1		
#270	47.4		
0.0305 mm.	74.6		
0.0194 mm.	72.5		
0.0113 mm.	70.5		
0.0081 mm.	66.4		
0.0058 mm.	60.3		
0.0030 mm.	42.0		
0.0013 mm.	24.3		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= 32 **LL=** 42 **PI=** 10

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-5(3)

Coefficients

D_{90}= 0.3542 D_{85}= 0.3034 D_{60}= 0.0058
D_{50}= 0.0040 D_{30}= 0.0018 D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected by: LDM

Date Received: 02/16/2018 **Date Tested:** 02/20/2018

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: EB-1 **Depth:** 30'

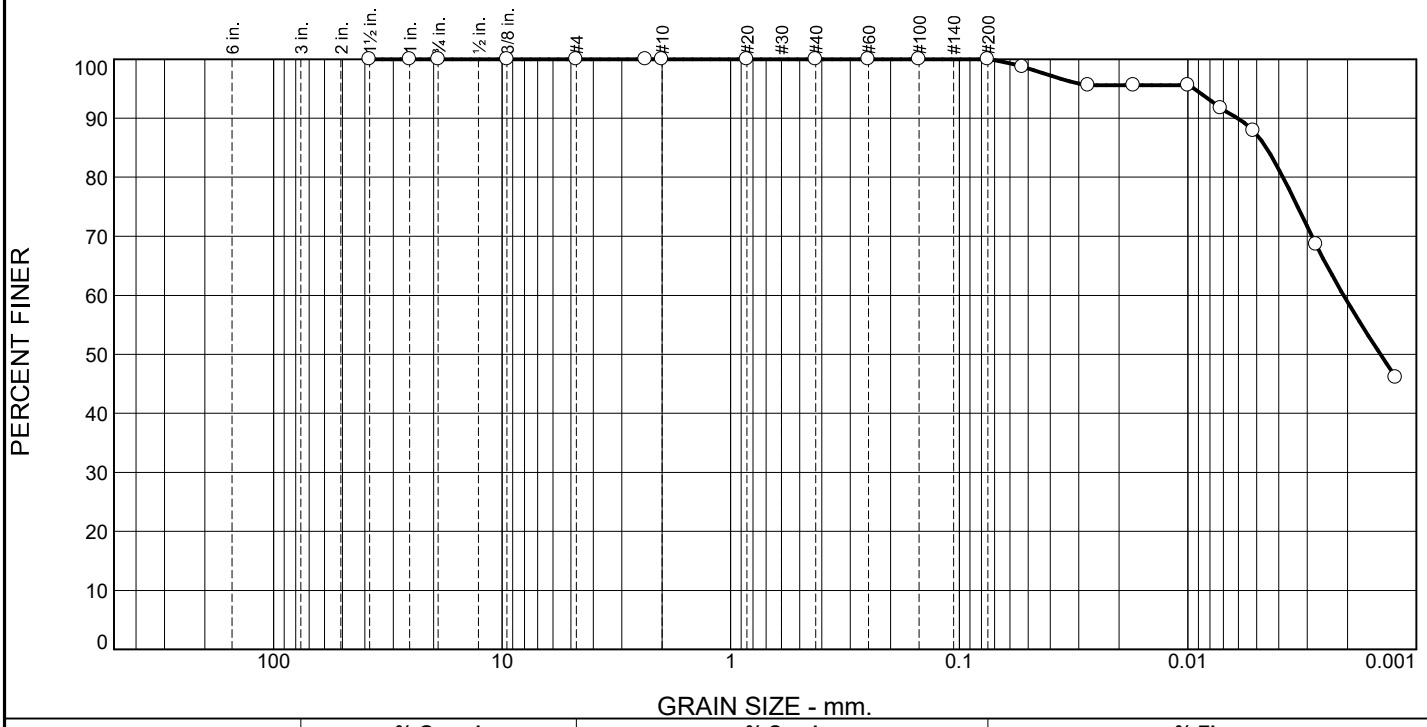
Date Sampled: 12/19/2017

associated earth sciences incorporated

Client: Snoqualmie Mill Ventures
Project: Snoqualmie Mill Site

Project No: 120126 H012 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.0	12.8	87.2

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#20	100.0		
#40	100.0		
#60	100.0		
#100	100.0		
#200	100.0		
#270	98.7		
0.0273 mm.	95.6		
0.0173 mm.	95.6		
0.0100 mm.	95.6		
0.0072 mm.	91.7		
0.0052 mm.	87.9		
0.0028 mm.	68.6		
0.0012 mm.	46.1		

* (no specification provided)

Material Description

fat clay

Atterberg Limits (ASTM D 4318)

PL= 29 **LL=** 57 **PI=** 28

Classification

USCS (D 2487)= CH **AASHTO (M 145)=** A-7-6(34)

Coefficients

D_{90}= 0.0061 D_{85}= 0.0045 D_{60}= 0.0021
D_{50}= 0.0014 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Collected by: LDM

Date Received: 02/15/2018 **Date Tested:** 02/20/2018

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: EB-1 **Depth:** 45'

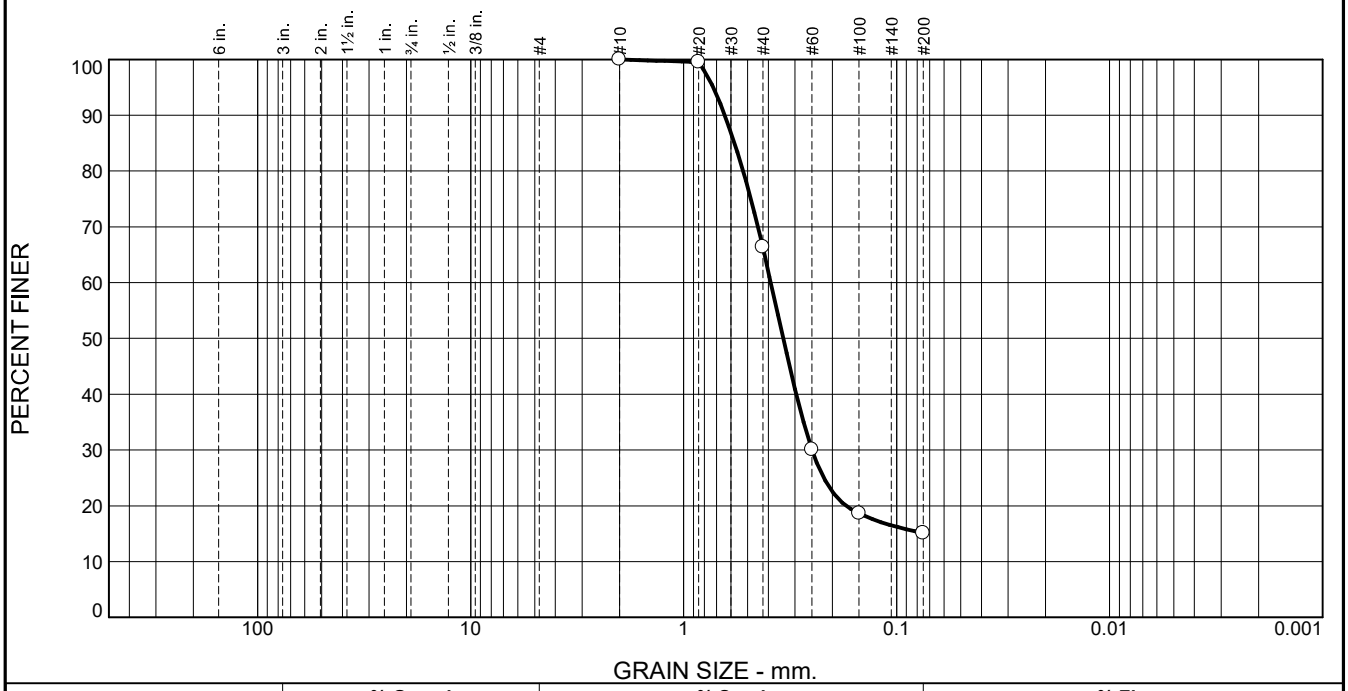
Date Sampled: 12/19/2017

associated earth sciences incorporated

Client: Snoqualmie Mill Ventures
Project: Snoqualmie Mill Site

Project No: 120126 H012 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	33.6	51.3	15.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.5		
#40	66.4		
#60	30.1		
#100	18.6		
#200	15.1		

* (no specification provided)

Material Description

Silty SAND

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.6401 D_{85}= 0.5764 D_{60}= 0.3895
D_{50}= 0.3408 D_{30}= 0.2497 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 2-8-18 **Date Tested:** 2-8-18

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: EB-1 **Depth:** 65'

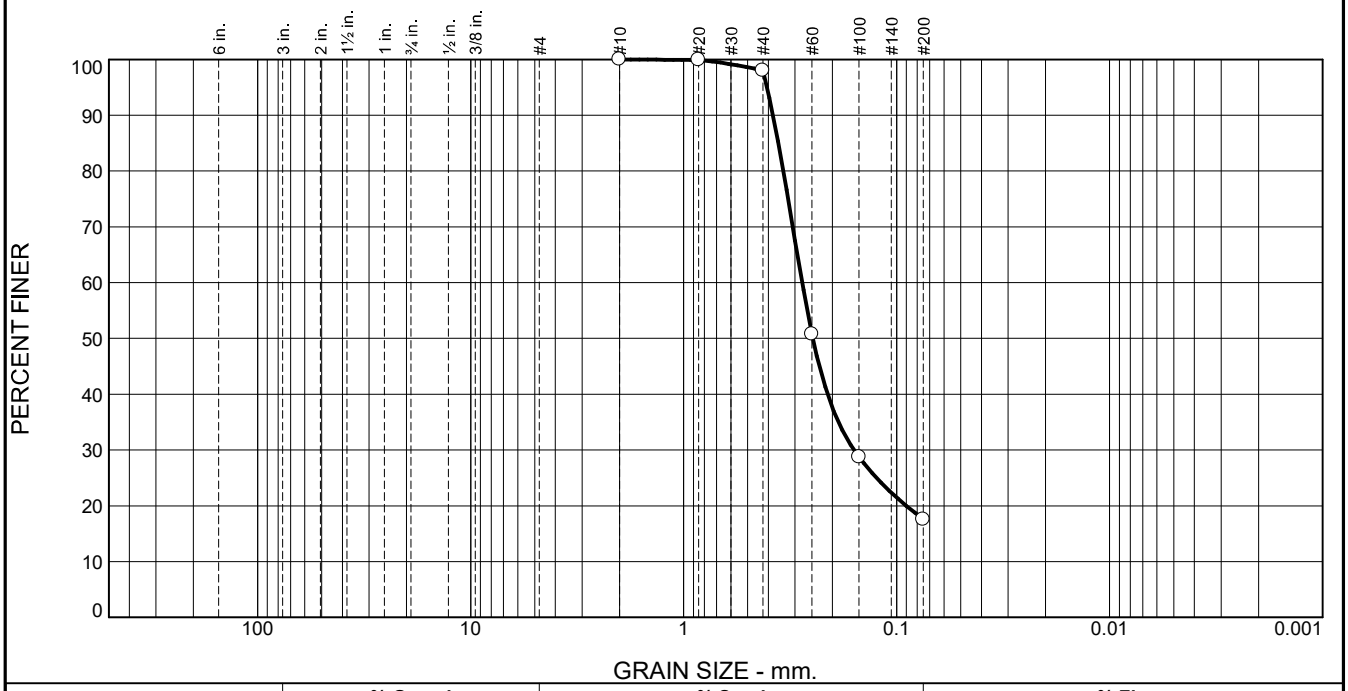
Date Sampled: 2-8-18

associated earth sciences incorporated

Client: Snoqualmie Mill Ventures
Project: Snoqualmie Mill Site

Project No: 120126 H012 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.0	80.5	17.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	98.0		
#60	50.8		
#100	28.7		
#200	17.5		

* (no specification provided)

Material Description

Silty SAND

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.3801 D_{85}= 0.3590 D_{60}= 0.2779
D_{50}= 0.2475 D_{30}= 0.1584 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 2-8-18 **Date Tested:** 2-8-18

Tested By: BN

Checked By: CJK

Title:

Location: Onsite
Sample Number: EB-1 **Depth:** 95'

Date Sampled: 2-8-18

associated earth sciences incorporated

Client: Snoqualmie Mill Ventures
Project: Snoqualmie Mill Site

Project No: 120126 H012 **Figure**

associated earth sciences incorporated

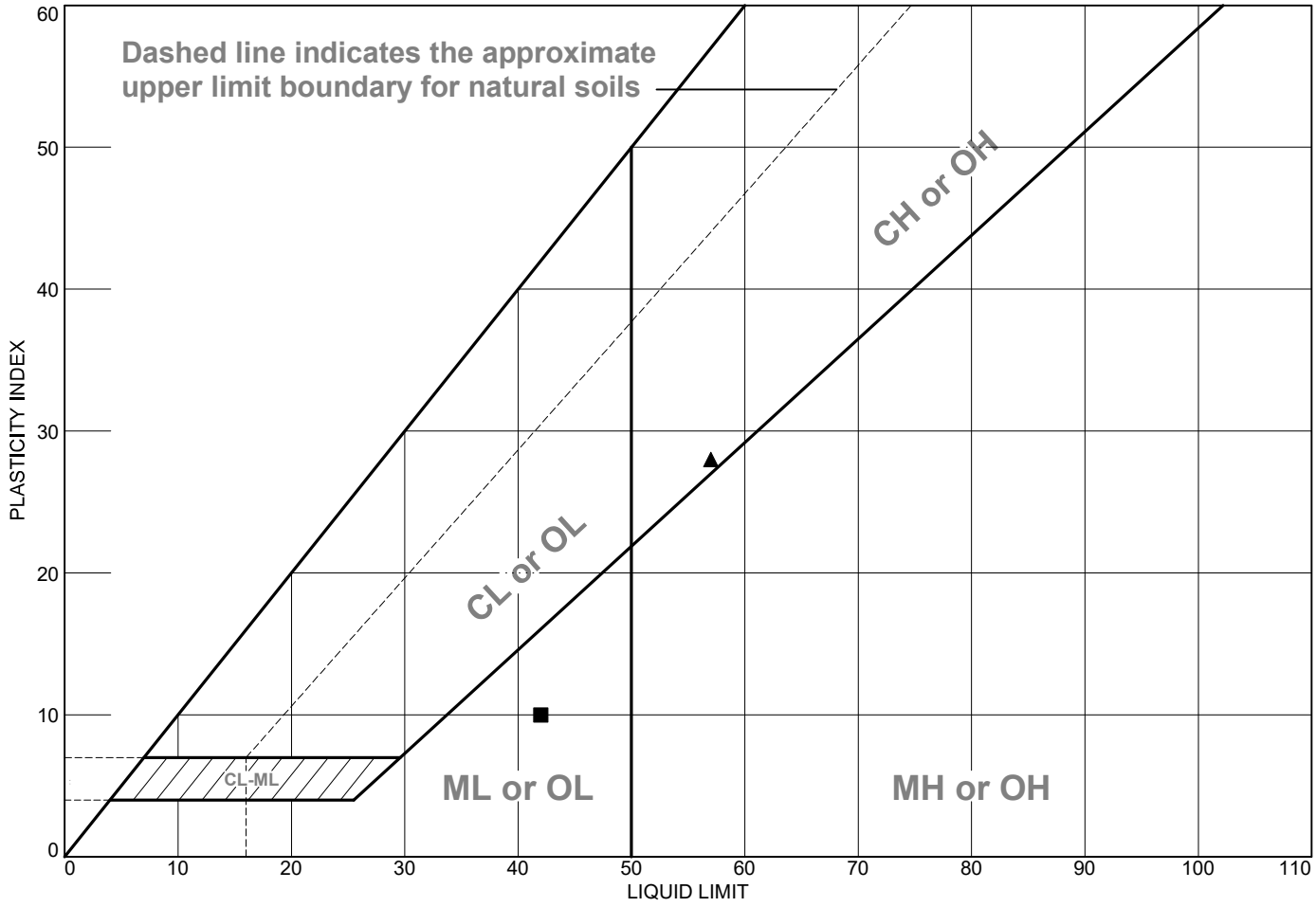
Percent Passing #200
ASTM - D1140

Date Samp	Project	Project No.		Soil Description
12/19/17	Snoqualmie Mill Site	120126 H012		
Tested By	**Location**	**EB/EP No.**	**Depth**	Various
BN	Onsite			

Sample I.D.	EB1-55'	EB1-65'	EB1-75'
Wet Weight	1059.4	1057.5	1104.1
Dry Weight	931.2	931.2	954.2
Water Weight	128.3	126.3	149.9
Pan	425.1	453.0	424.5
Actual Dry Weight	506.0	478.2	529.7
Percent of Water Weight	**25.3**	**26.4**	**28.3**
After Wash Weight	851.5	854.9	842.6
Percent Passing #200	**15.7**	**16.0**	**21.1**

Sample I.D.	EB1-85'	EB1-95'
Wet Weight	1323.4	1181.5
Dry Weight	1158.5	1045.9
Water Weight	164.9	135.6
Pan	507.0	530.6
Actual Dry Weight	651.6	515.3
Percent of Water Weight	**25.3**	**26.3**
After Wash Weight	1064.6	958.8
Percent Passing #200	**14.4**	**16.9**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILT, trace sand	29	NP	NP	99.2	95.6	ML
■	SILT, trace sand	42	32	10	94.9	50.1	ML
▲	fat clay	57	29	28	100.0	100.0	CH

Project No. 120126 H012 **Client:** Snoqualmie Mill Ventures

Project: Snoqualmie Mill Site

●**Location:** Onsite **Depth:** 25' **Sample Number:** EB-1

■**Location:** Onsite **Depth:** 30' **Sample Number:** EB-1

▲**Location:** Onsite **Depth:** 45' **Sample Number:** EB-1

associated earth sciences incorporated

Remarks:

●Collected by: LDM

■Collected by: LDM

▲Collected by: LDM

Figure

Tested By: BN **Checked By:** CJK

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GEOTECHNICAL LABORATORY TESTING REPORT

Project:
Snoqualmie Mill

Performed at the Request of:
Associated Earth Sciences, Inc.

Reviewed By:
Joe Laprade, C.E.T.
Shannon & Wilson, Inc. Lab Manager

February 23, 2018

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GEOTECHNICAL LABORATORY TESTING

We performed geotechnical laboratory testing on selected soil samples retrieved from one boring completed for Associated Earth Sciences, Inc.'s Snoqualmie Mill Project. The laboratory testing program included tests to classify the soil and provide data for engineering studies. We visually described all tested samples. Our laboratory testing program included water content determinations, grain size distribution analyses, Atterberg limits determinations, one-dimensional consolidation, and consolidated-undrained triaxial testing.

The following sections describe the laboratory test procedures.

VISUAL CLASSIFICATION

We classified or described soil samples using ASTM International (ASTM) D2487-17, Standard Test Method for Classification of Soil for Engineering Purposes, or ASTM D2488-17, Standard Recommended Practice for Description of Soils (Visual-Manual Procedure). For samples which we did not perform index testing, we assigned a Unified Soil Classification System (USCS) group name and symbol, based on visual-manual description. We revised visual classifications using results of the index tests discussed below.

WATER CONTENT DETERMINATION

We tested the water content of selected samples in accordance with ASTM D2216-10, Standard Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures. Comparison of the water content of a soil with its index properties can be useful in characterizing soil unit weight, consistency, compressibility, and strength. We present water content test results in the Laboratory Test Summary table in this lab report.

GRAIN SIZE DISTRIBUTION ANALYSIS

Grain size distribution analyses separate soil particles through mechanical or sedimentation processes. We present grain size distribution analysis results in the Lab Summary Table and on plots in this lab report. Grain size distribution plots provide tabular information about each specimen, including: USCS group symbol and group name; water content; constituent (i.e., cobble, gravel, sand, and fines) percentages; coefficients of uniformity and curvature, if applicable; personnel initials; ASTM standard designation; and testing remarks. Constituent percentages are also presented in the Lab Summary Table in this lab report.

We performed combined analyses (mechanical and sedimentation) on selected soil specimens to determine the grain size distribution of coarse- and fine-grained soil particles, in accordance with ASTM D422-63 (2007)e2, Standard Test Method for Particle-Size Analysis of Soils. We typically assume a specific gravity of 2.7 for hydrometer calculations, unless otherwise indicated on grain size distribution plots. We assumed a different specific gravity for one tested specimen, as noted on the associated plot.

ATTERBERG LIMITS DETERMINATION

We determined soil plasticity by performing Atterberg Limits tests on selected samples in accordance with ASTM D4318-17, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, Method A (Multi-Point Liquid Limit). The Atterberg Limits include liquid limit (LL), plastic limit (PL), and plasticity index (PI=LL-PL).

We present soil plasticity test results in the Lab Summary Table and on plasticity charts in this lab report. Plasticity charts provide the liquid limit, plastic limit, plasticity index, USCS group symbol, the sample description, water content, and percent passing the No. 200 sieve (if a grain size distribution analysis was performed).

ONE-DIMENSIONAL CONSOLIDATION TESTING

We performed one-dimensional consolidation tests in a fixed-ring consolidometer on relatively undisturbed samples in accordance with ASTM D2435/D2435M-11, Standard Test Methods for One Dimensional Consolidation Properties of Soils Using Incremental Loading, Test Method B (loaded to 100% primary consolidation with time-deformation readings on all load increments). We used the Casagrande construction method (log of time) to determine the end of primary consolidation. One-dimensional consolidation results presented in this lab report include a test summary, settlement plots, summarized incremental plots, and incremental plots at requested load increments.

CONSOLIDATED UNDRAINED (CU) TRIAXIAL COMPRESSION TESTING

We performed consolidated, undrained, triaxial compression tests (CU) with pore pressure measurements on requested, relatively undisturbed tube samples in accordance with ASTM D4767-11, Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils. We saturated each sample using back pressure, then determined the degree of specimen saturation by measuring pore pressure coefficient B. Sample side drains consisting of thin strips of filter paper were used to facilitate consolidation. We sheared the specimens with a

displacement-controlled testing machine. CU test results presented in this lab report include test summary tables, and plots of principal stress difference versus axial strain, pore pressure versus axial strain, principal effective stress ratio versus axial strain, and Mohr diagrams for failure conditions.

CONSIDERATIONS

Drilling, sampling, and handling methodologies may affect the outcome of prescribed geotechnical laboratory tests. We cannot quantify or qualify sample disturbance imparted during the sampling process, or from handling procedures prior to our receipt of the samples. Sample disturbance may impact one-dimensional consolidation and triaxial testing results. As-received moisture content may affect test results; we cannot account for the effects of moisture change between sampling and testing. Instances of limited recovery may have resulted in test samples not meeting specified minimum mass requirements, per ASTM standards. Test plots show which samples do not meet ASTM specified minimum mass requirements.

REFERENCES

ASTM International, 2007, Standard test method for particle-size analysis of soils, D422-63(2007)e2: West Conshohocken, Pa., ASTM International, Annual book of standards, v. 04.08, soil and rock (I): D420 - D5876, 8 p., available: www.astm.org.

ASTM International, 2010, Standard test methods for laboratory determination of water (moisture) content of soil and rock by mass, D2216-10: West Conshohocken, Pa., ASTM International, Annual book of standards, v. 04.08, soil and rock (I): D420 - D5876, 7 p., available: www.astm.org.

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ASTM International, 2017, Standard test methods for liquid limit, plastic limit, and plasticity index of soils, D4318-17: West Conshohocken, Pa., ASTM International, Annual book of standards, v. 04.08, soil and rock (I): D420 - D5876, 16 p., available: www.astm.org.

LABORATORY TERMS

Abbreviations, Symbols, and Terms	Descriptions
%	Percent
*	Sample specimen weight did not meet required minimum mass for the test method
"	Inch
#	Test not performed by Shannon & Wilson, Inc. laboratory
ASTM Std.	ASTM International Standard
C_c	Coefficient of curvature
Clay-size	Soil particles finer than 0.002 mm
cm	Centimeter
cm^2	Square centimeter
Coarse-grained	Soil particles coarser than 0.075 mm (cobble-, gravel- and sand-sized particles)
Cobbles	Soil particles finer than 305 mm and coarser than 76.2 mm
C_u	Coefficient of uniformity
CU	Consolidated-Undrained
ε	Axial strain
Fine-grained	Soil particles finer than 0.075 mm (silt- and clay-sized particles)
ft	Feet
γm	Wet unit weight
Gravel	Soil particles finer than 76.2 mm and coarser than 4.75 mm
G_s	Specific gravity of soil solids
H_o	Initial height
ΔH	Change in height
ΔH_{load}	End of load increment deformation
in	Inch
in^3	Cubic inch
LL	Liquid Limit
min	Minute
mm	Millimeter
μ_m	Micrometer
MC	Moisture content
MPa	Mega-Pascal
NP	Non-plastic
OC	Organic content
p	Total stress
p'	Effective stress
Pa	Pascal
pcf	Pounds per cubic foot
PI	Plasticity Index
PL	Plastic Limit
psf	Pounds per square foot
psi	Pounds per square inch
q	Deviatoric stress
Sand	Soil particles finer than 4.75 mm and coarser than 0.075 mm
sec	Second
Silt	Soil particles finer than 0.075 mm and coarser than 0.002 mm
t_n	Time to n% primary consolidation
t_{load}	Duration of load increment
tsf	Short tons per square foot
USCS	Unified Soil Classification System
UU	Unconsolidated-Undrained
WC	Water content

LABORATORY INDEX TEST SUMMARY

Boring	Top Depth (ft)	USCS	WC (%)	% Sand	% Fines	% Clay-size	LL	PL	Soil Description
EB-1	22	ML	34.9	5	95	12	28	27	Silt
EB-1	37	ML	46.3	1	99	45	42	27	Silt

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GRAIN SIZE DISTRIBUTION PLOT

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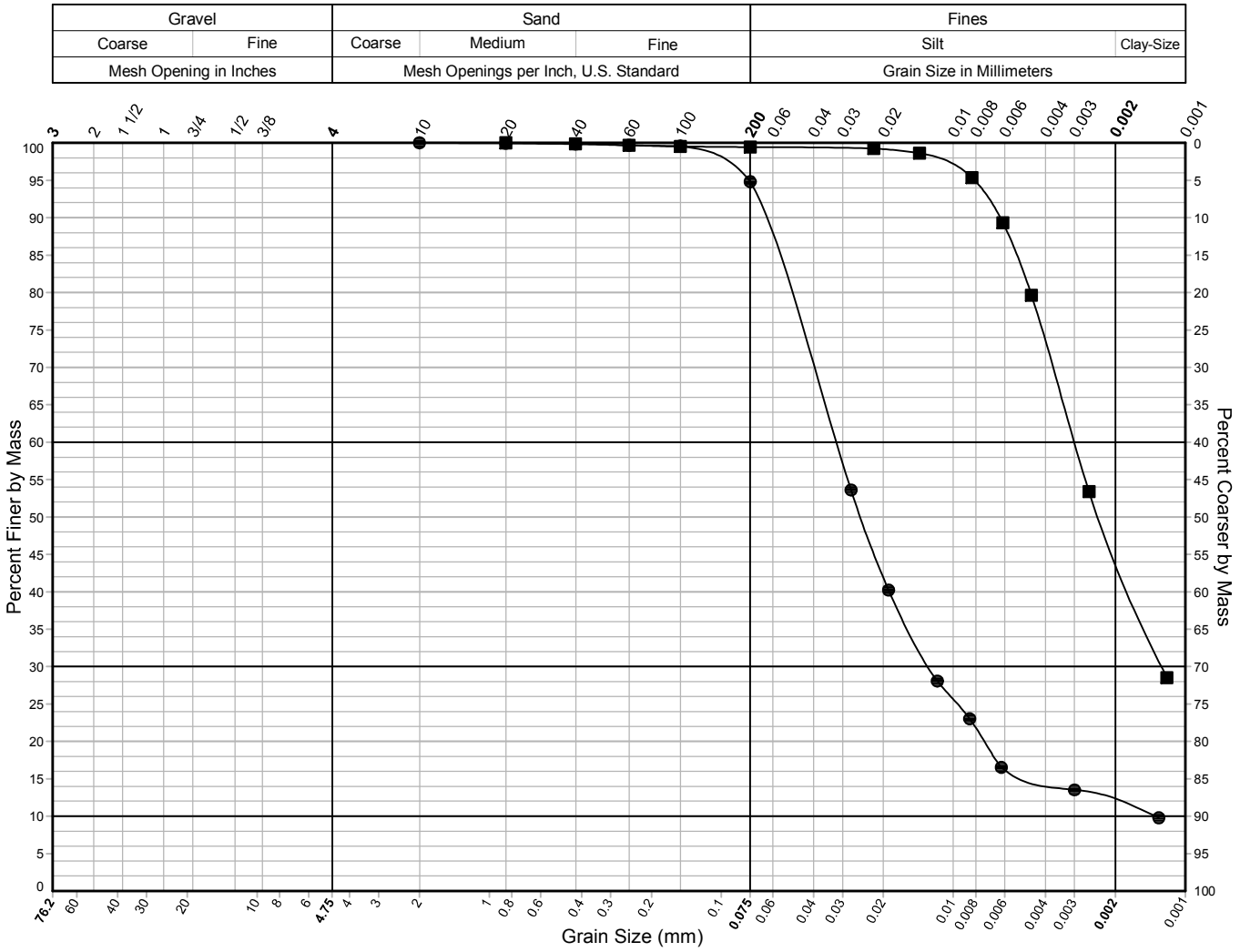
King County, Washington

BORING EB-1



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	Gravel %	Sand %	Fines %	< 20µm %	< 2µm %	WC %	Tested By	Review By	ASTM Std.
● EB-1	22.0	ML	Silt		5	95	42	12	34.9	AKV	JFL	D422
■ EB-1	37.0	ML	Silt		1	99	99	45	46.3	AKV	JFL	D422

Testing Remarks: Hydrometer tests require specific gravity data for calculation of the percent finer. In the absence of specific-gravity testing, we typically assume a specific gravity of 2.7, unless the mechanical and settling curves do not match. The hydrometer curve at 37 ft required a specific-gravity-approximation adjustment to 2.78 to align with the mechanical curve. The actual specific gravity of this specimen may vary.

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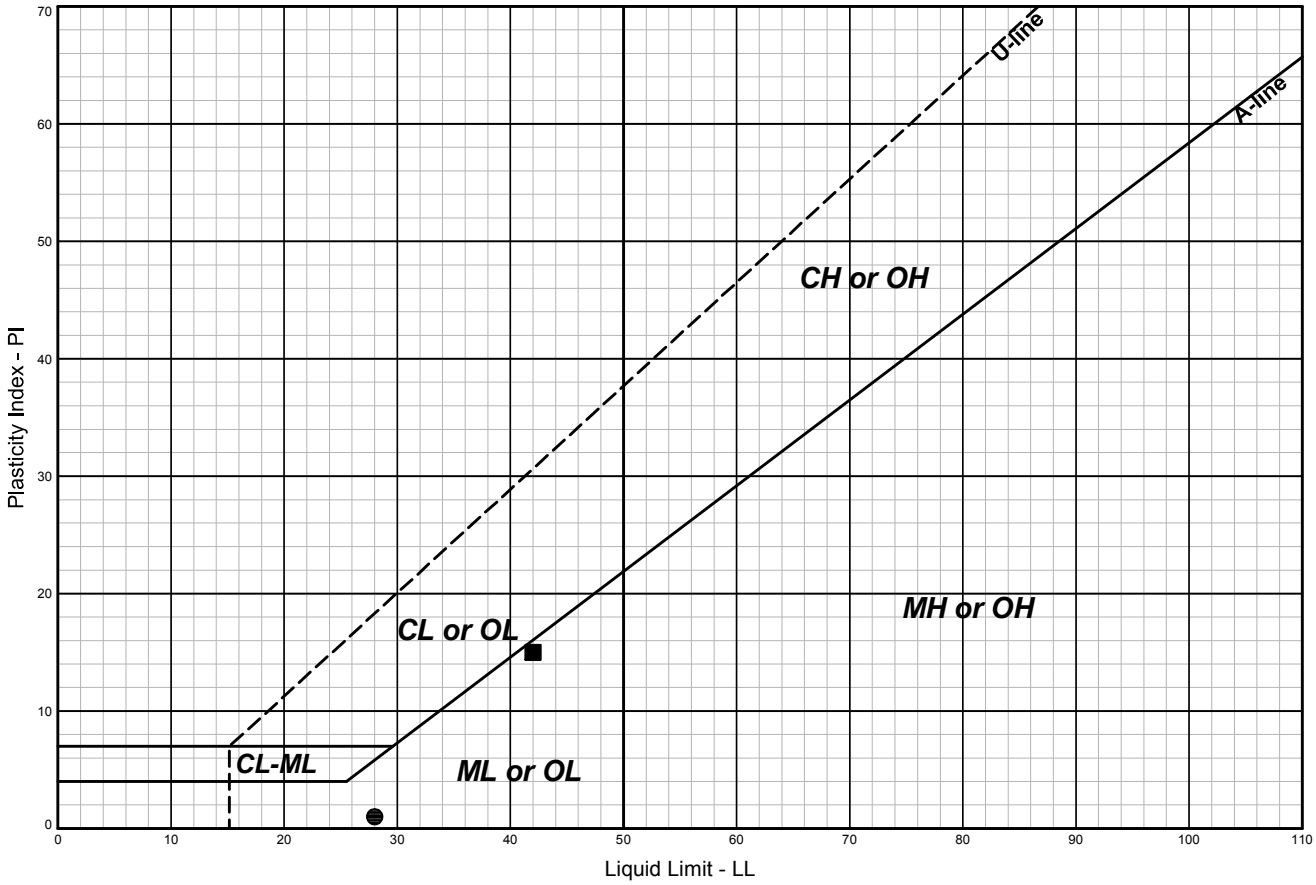
PLASTICITY CHART

Snoqualmie Mill
King County, Washington

BORING EB-1



Sample Identification	Depth (ft)	USCS Group Symbol	USCS Group Name	LL	PL	PI	WC %	Gravel %	Sand %	Fines %	< 2µm %	Tested By	Review By	ASTM Std.
● EB-1	22.0	ML	Silt	28	27	1	34.9		5	95	12	AKV	JFL	D4318
■ EB-1	37.0	ML	Silt	42	27	15	46.3		1	99	45	AKV	JFL	D4318

ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

TEST SUMMARY
Boring EB-1, Sample , 22.6 ft

SPECIMEN DATA AND TEST RESULTS

Sample Classification:
Silt (ML)

Specific Gravity, G_s (Assumed)	2.7
Liquid Limit, LL	---
Plastic Limit, PL	---
Plasticity Index, PI (LL - PL)	---
Fines Content	---
Organic Content	---
Initial Seating Load, g	50
Final Seating Load, g	50
ASTM Test Method	Method B
Coefficient of Consolidation Interpretation	Procedure 1

	Pre-Inundation	Final Load
Height, in	0.787	0.609
Diameter, in	1.972	1.972
Specimen Volume, in^3	2.404	1.861
Wet Unit Weight, pcf	116.7	134.2
Dry Unit Weight, pcf	84.4	109.1
Water Content	38%	23%
Void Ratio	1.00	0.55
Degree of Saturation	100%	100%

Load Increment Number	Applied Stress, tsf	t_{load}, min	t_{50}, min	ΔH_{load}, in	ΔH at t_{100}, in	$\Delta H/H_o$	Void Ratio	a_v, Mpa^{-1}	c_v, cm^2/s	k, cm/s
Seating										
1	0.05	1410	0.7	0.002	0.002	0.2%	0.992	8.85E-01	4.43E-03	1.92E-07
2	0.10	510	0.4	0.008	0.005	0.6%	0.983	1.71E+00	7.26E-03	6.12E-07
3	0.26	525	0.3	0.025	0.019	2.4%	0.947	2.41E+00	1.11E-02	1.32E-06
4	0.52	885	0.3	0.038	0.029	3.6%	0.924	9.53E-01	8.93E-03	4.29E-07
5	1.04	315	0.1	0.052	0.041	5.2%	0.893	6.11E-01	2.10E-02	6.55E-07
6	2.07	1080	0.1	0.072	0.055	7%	0.857	3.70E-01	2.48E-02	4.75E-07
7	4.15	300	0.1	0.091	0.072	9.2%	0.813	2.18E-01	2.69E-02	3.09E-07
8	8.30	230	0.1	0.115	0.093	11.8%	0.761	1.32E-01	3.13E-02	2.24E-07
9	16.60	900	0.1	0.144	0.116	14.8%	0.701	7.55E-02	3.47E-02	1.46E-07
10	33.19	285	0.1	0.173	0.143	18.1%	0.635	4.17E-02	3.52E-02	8.45E-08
11	66.38	1110	0.1	0.208	0.171	21.7%	0.562	2.28E-02	3.66E-02	5.00E-08
12	95.42	185	0.1	0.225	0.189	24%	0.516	1.64E-02	2.57E-02	2.66E-08
13	23.86	1455	0.7	0.216	0.194	24.6%	0.504	-1.73E-03	2.57E-03	2.88E-10
14	6.22	2715	0.2	0.207	0.190	24.1%	0.514	5.91E-03	9.37E-03	3.61E-09
15	1.56	465	0.2	0.199	0.186	23.6%	0.524	2.23E-02	9.20E-03	1.33E-08
16	0.39	975	0.2	0.188	0.180	22.9%	0.539	1.32E-01	1.29E-02	1.10E-07
17	0.10	8851	167.0	0.178	0.167	21.2%	0.573	1.25E+00	1.20E-05	9.58E-10

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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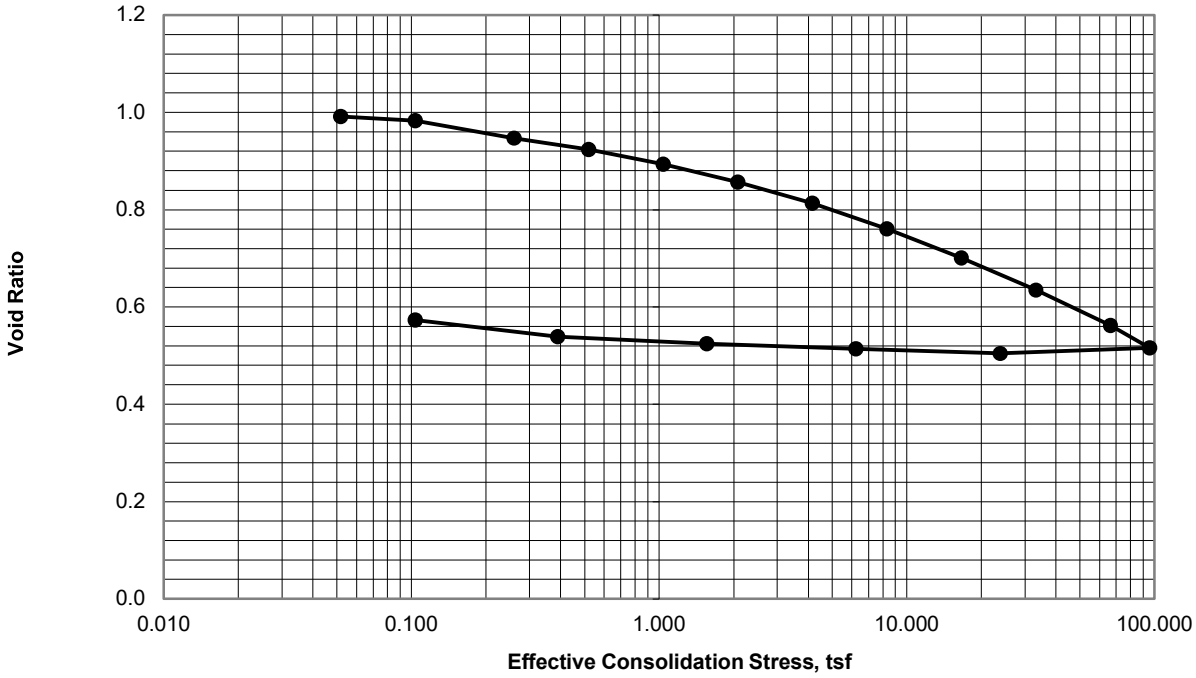
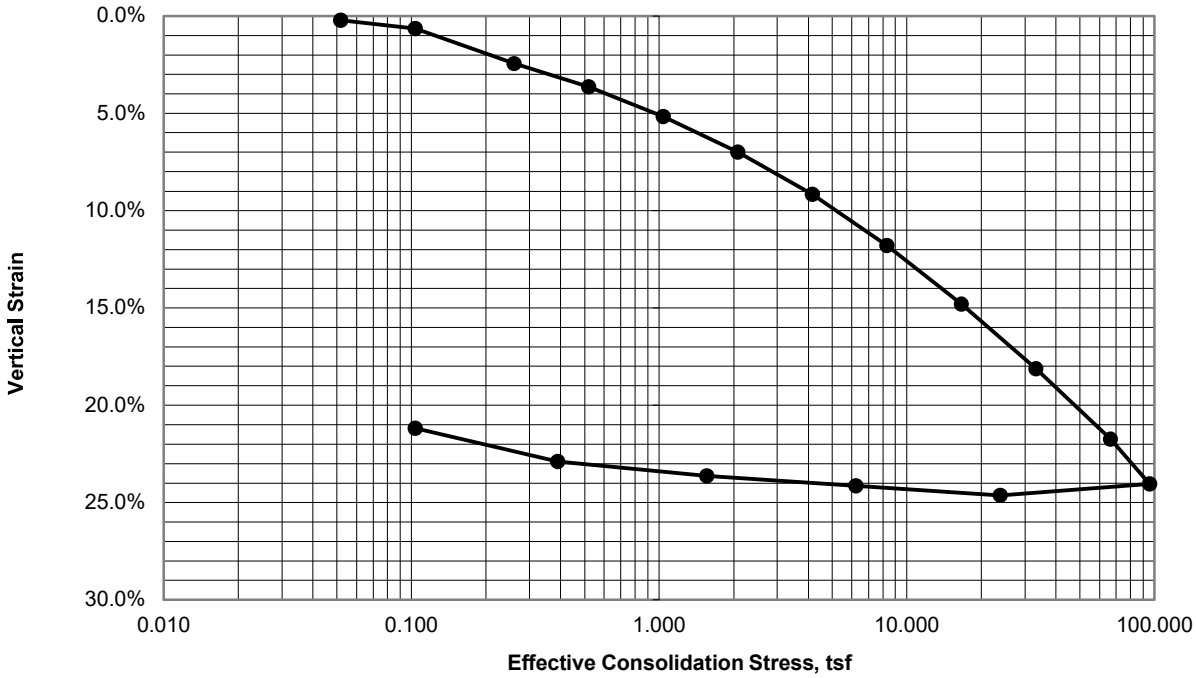
ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

CONSOLIDATION CURVES
Boring EB-1, Sample , 22.6 ft





Maximum Applied Effective Consolidation Stress, tsf = 95.42

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

CONSOL_v3.0_NOTB_snoqualmie mill_EB-1_22.6.xlsm 02/22/18

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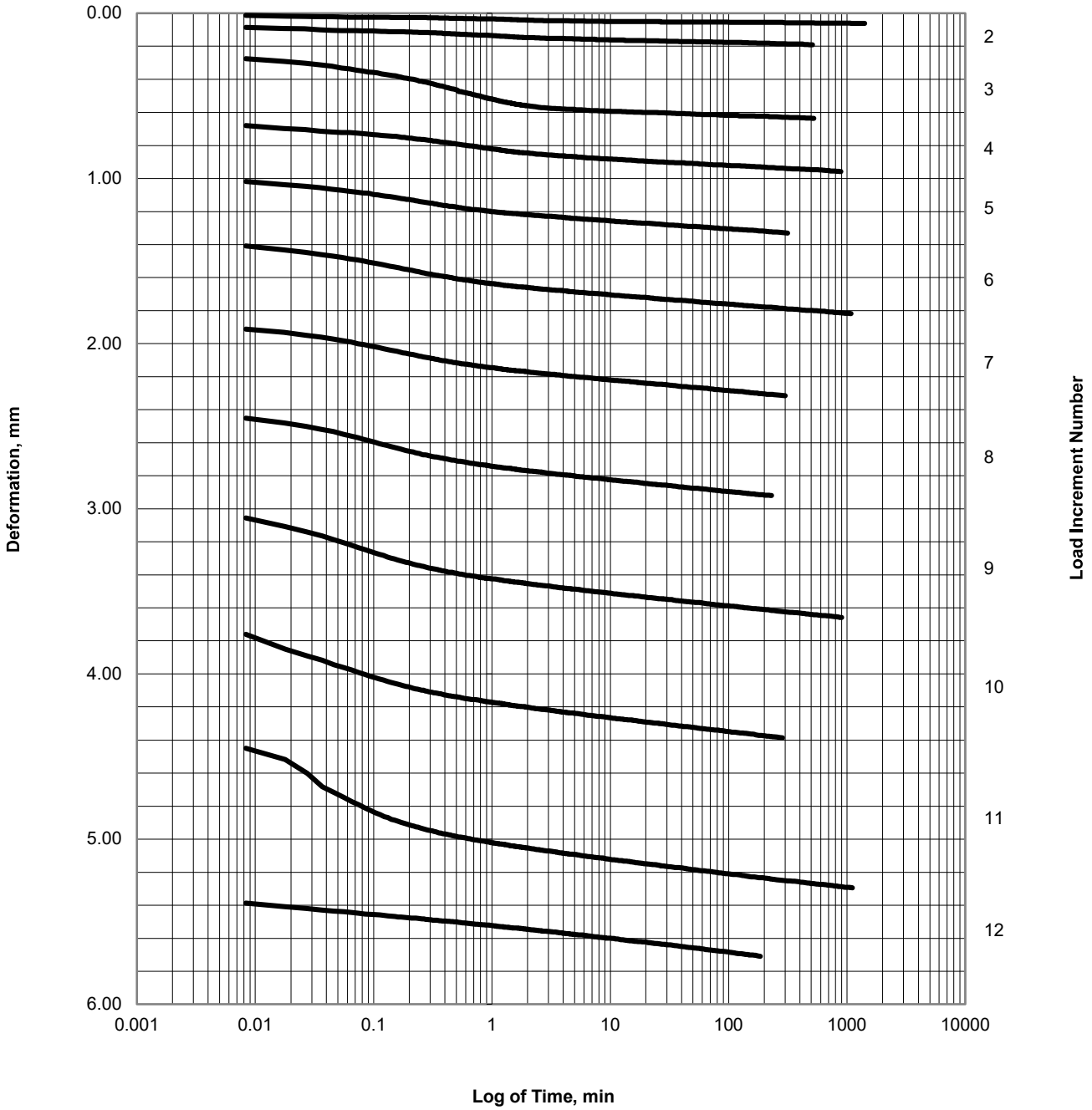
ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

LOAD INCREMENT TIME-DEFORMATION CURVES
Boring EB-1, Sample , 22.6 ft



Load Sequence, tsf = 0.1, 0.26, 0.52, 1.04, 2.07, 4.15, 8.3, 16.6, 33.19, 66.38, 95.42

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

CONSOL_v3.0_NOTB_snoqualmie mill_EB-1_22.6.xlsm 02/22/18

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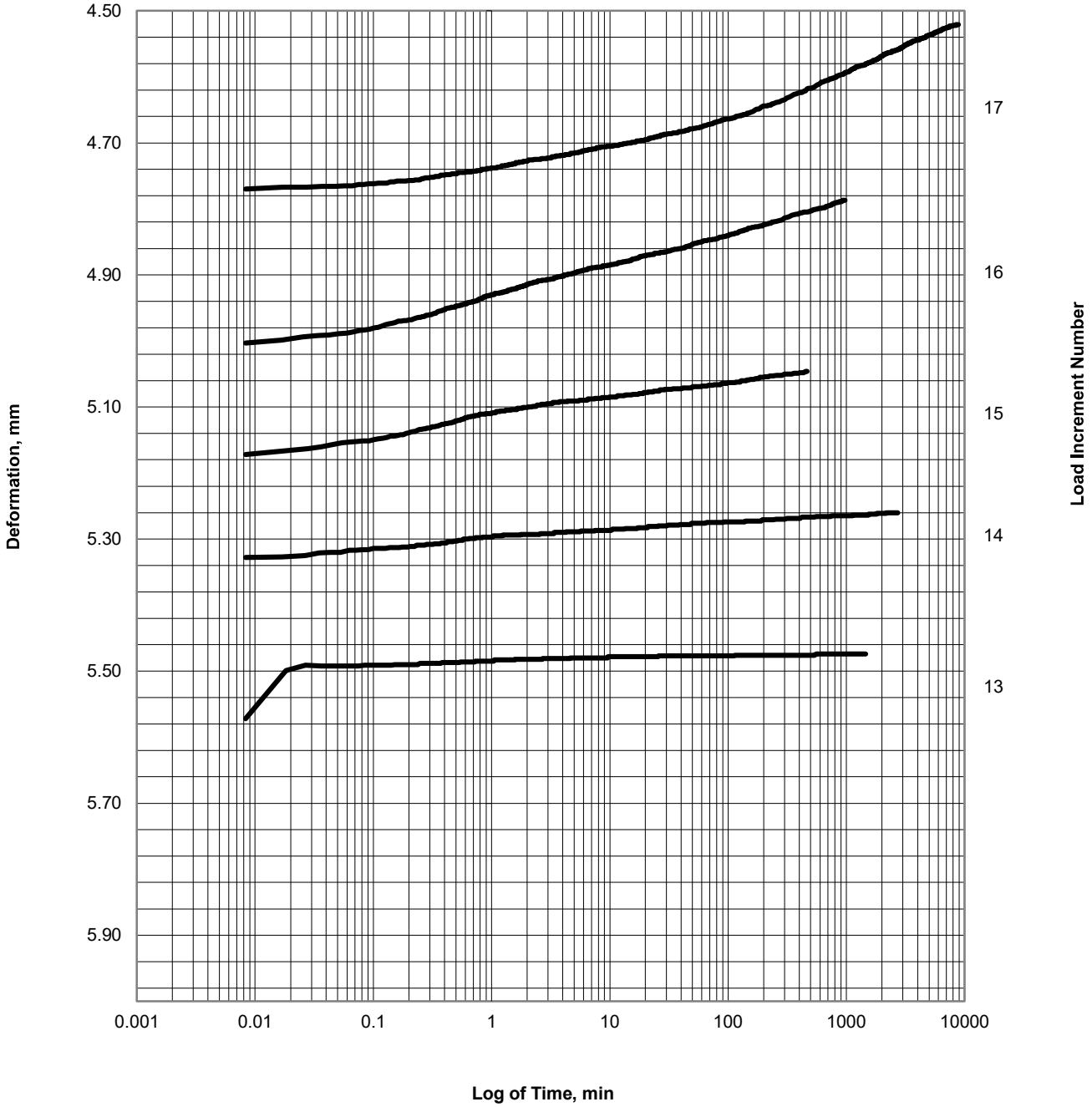
ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

UNLOAD INCREMENT TIME-DEFORMATION CURVES
Boring EB-1, Sample , 22.6 ft



Load Sequence, tsf = 23.86, 6.22, 1.56, 0.39, 0.1

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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ONE-DIMENSIONAL CONSOLIDATION

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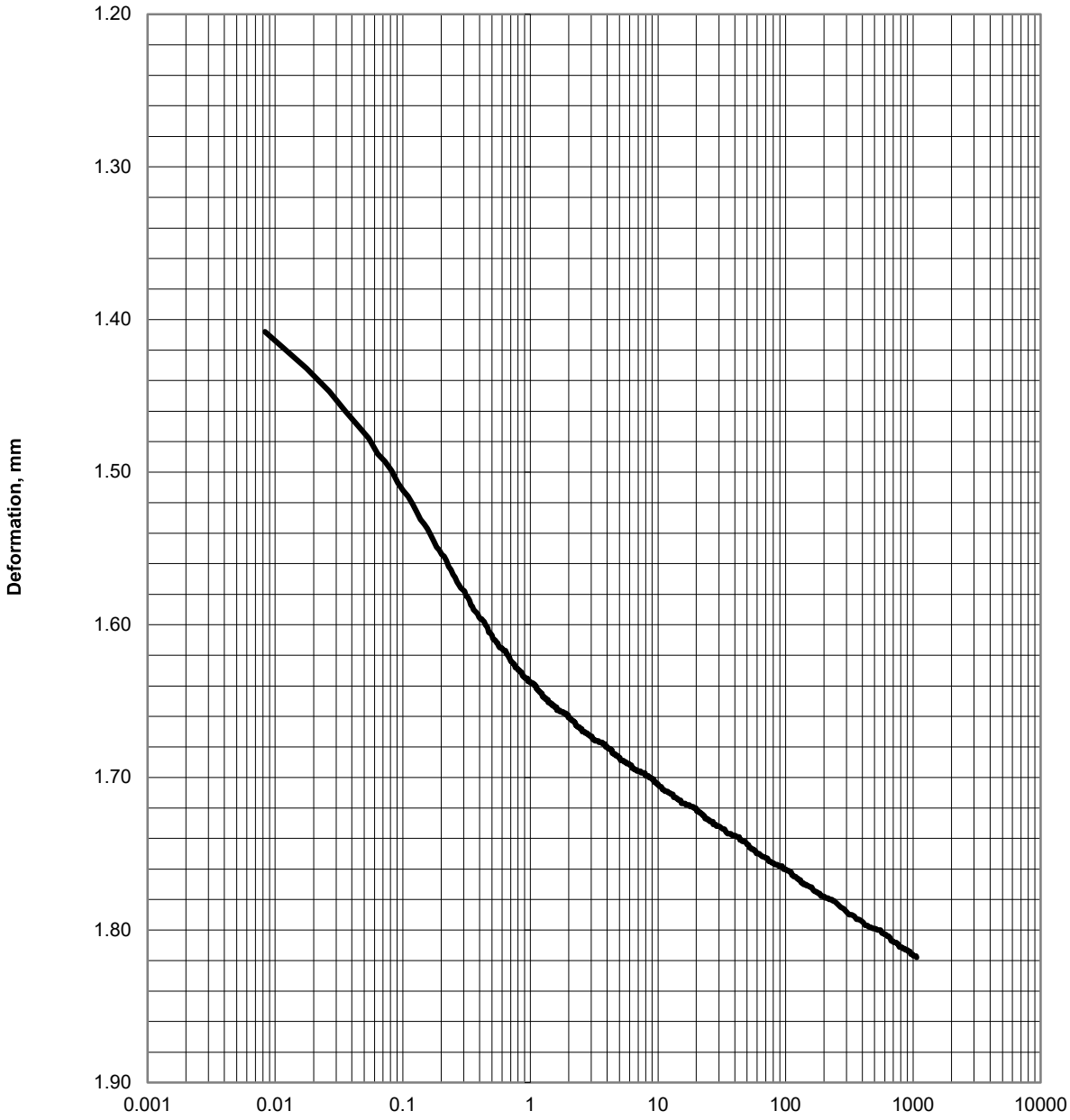
PLOT OF LOAD INCREMENT 6 (LOG TIME)
BORING EB-1, SAMPLE , 22.6 ft



Applied Stress, tsf = 2.07

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

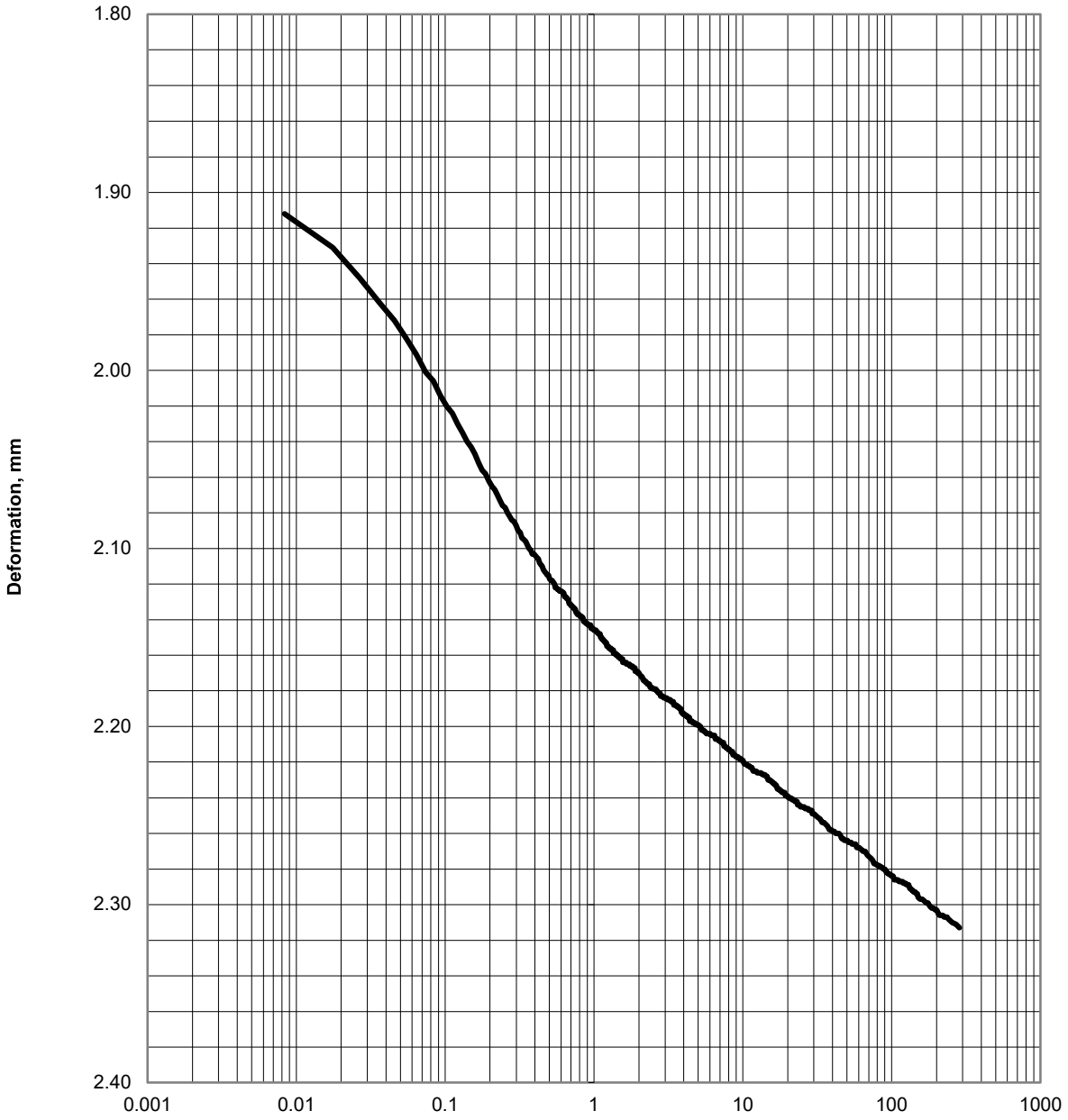
CONSOL_v3.0_NOTB_snoqualmie mill_EB-1_22.6.xlsm 02/22/18

0

ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

PLOT OF LOAD INCREMENT 7 (LOG TIME)
BORING EB-1, SAMPLE , 22.6 ft



Applied Stress, tsf = 4.15

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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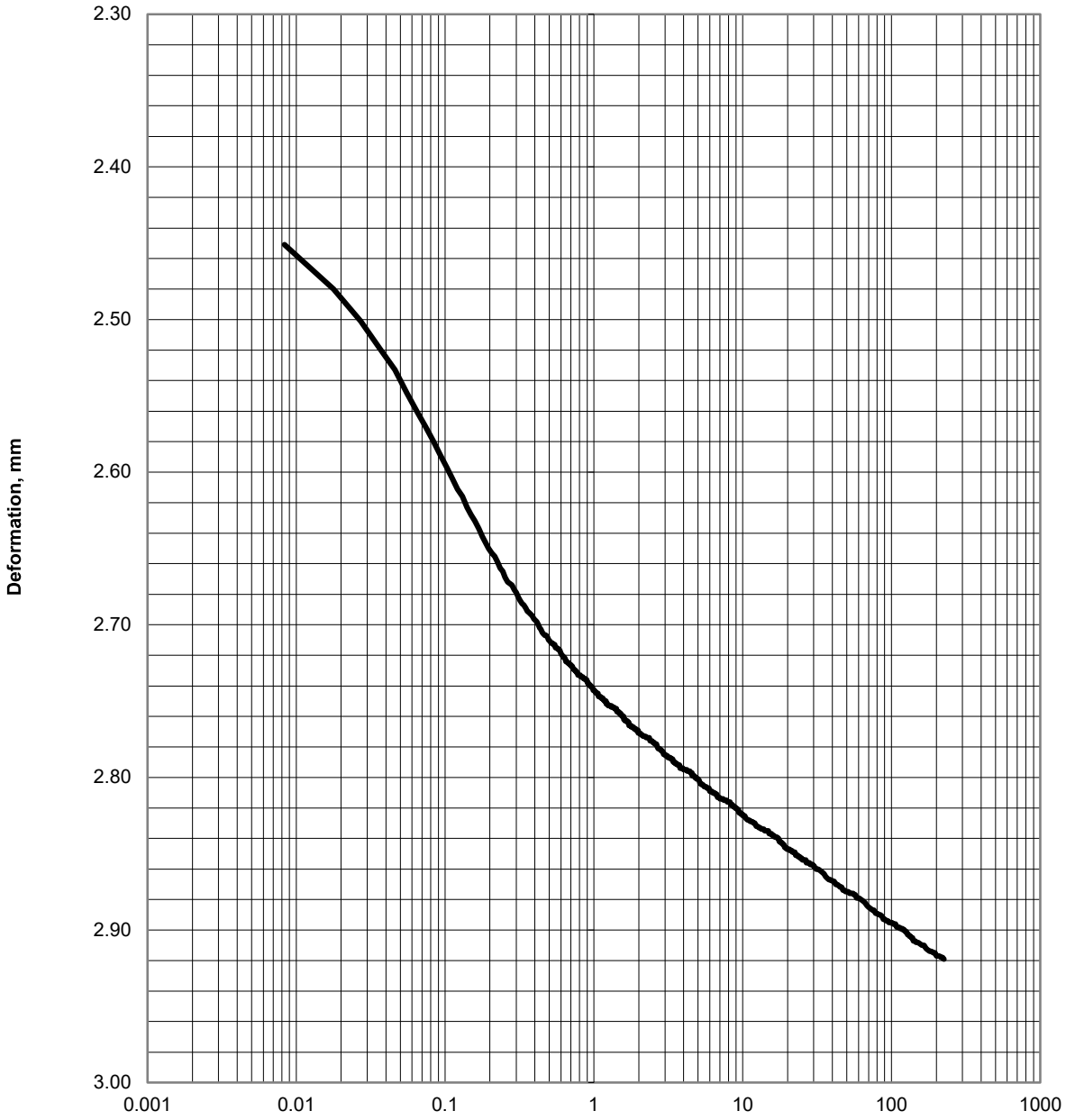
ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

PLOT OF LOAD INCREMENT 8 (LOG TIME)
BORING EB-1, SAMPLE , 22.6 ft



Applied Stress, tsf = 8.3

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

TEST SUMMARY
Boring EB-1, Sample , 22.8 ft

SPECIMEN DATA AND TEST RESULTS

Sample Classification:
Silt (ML)

Specific Gravity, G_s (Assumed)	2.7
Liquid Limit, LL	---
Plastic Limit, PL	---
Plasticity Index, PI (LL - PL)	---
Fines Content	---
Organic Content	---
Initial Seating Load, g	50
Final Seating Load, g	50
ASTM Test Method	Method B
Coefficient of Consolidation Interpretation	Procedure 1

	Pre-Inundation	Final Load
Height, in	0.786	0.631
Diameter, in	1.992	1.992
Specimen Volume, in^3	2.450	1.969
Wet Unit Weight, pcf	115.1	129.7
Dry Unit Weight, pcf	85.7	106.7
Water Content	34%	22%
Void Ratio	0.97	0.58
Degree of Saturation	96%	100%

Load Increment Number	Applied Stress, tsf	t_{load}, min	t_{50}, min	ΔH_{load}, in	ΔH at t_{100}, in	$\Delta H/H_o$	Void Ratio	a_v, Mpa^{-1}	c_v, cm^2/s	k, cm/s
Seating										
1	0.05	1410	0.1	0.003	0.002	0.2%	0.962	8.30E-01	4.73E-02	1.96E-06
2	0.10	510	0.1	0.009	0.006	0.8%	0.950	2.41E+00	2.99E-02	3.60E-06
3	0.25	525	0.1	0.019	0.014	1.8%	0.931	1.31E+00	4.35E-02	2.86E-06
4	0.51	885	0.1	0.028	0.023	2.9%	0.910	8.91E-01	3.69E-02	1.67E-06
5	1.02	315	0.1	0.039	0.031	3.9%	0.890	4.09E-01	5.95E-02	1.25E-06
6	2.03	1080	0.1	0.055	0.043	5.5%	0.858	3.25E-01	5.88E-02	9.93E-07
7	4.06	300	0.1	0.071	0.058	7.3%	0.822	1.84E-01	5.54E-02	5.38E-07
8	8.13	230	0.0	0.091	0.074	9.5%	0.780	1.09E-01	5.50E-02	3.23E-07
9	16.26	900	0.1	0.116	0.097	12.3%	0.724	7.17E-02	4.99E-02	1.97E-07
10	32.52	285	0.0	0.142	0.118	15%	0.672	3.37E-02	1.08E-01	2.07E-07
11	65.03	1110	0.0	0.175	0.144	18.4%	0.605	2.13E-02	5.29E-02	6.62E-08
12	93.48	1455	0.1	0.193	0.163	20.7%	0.558	1.71E-02	2.75E-02	2.88E-08
13	23.37	2715	0.5	0.185	0.171	21.8%	0.538	-3.04E-03	4.19E-03	8.00E-10
14	6.10	465	0.1	0.178	0.167	21.3%	0.547	5.60E-03	3.82E-02	1.36E-08
15	1.52	975	0.1	0.171	0.164	20.9%	0.556	1.91E-02	3.35E-02	4.06E-08
16	0.38	1395	10.1	0.163	0.156	19.8%	0.577	1.94E-01	2.06E-04	2.53E-09
17	0.10	7441	254.8	0.155	0.148	18.8%	0.597	7.32E-01	8.36E-06	3.81E-10

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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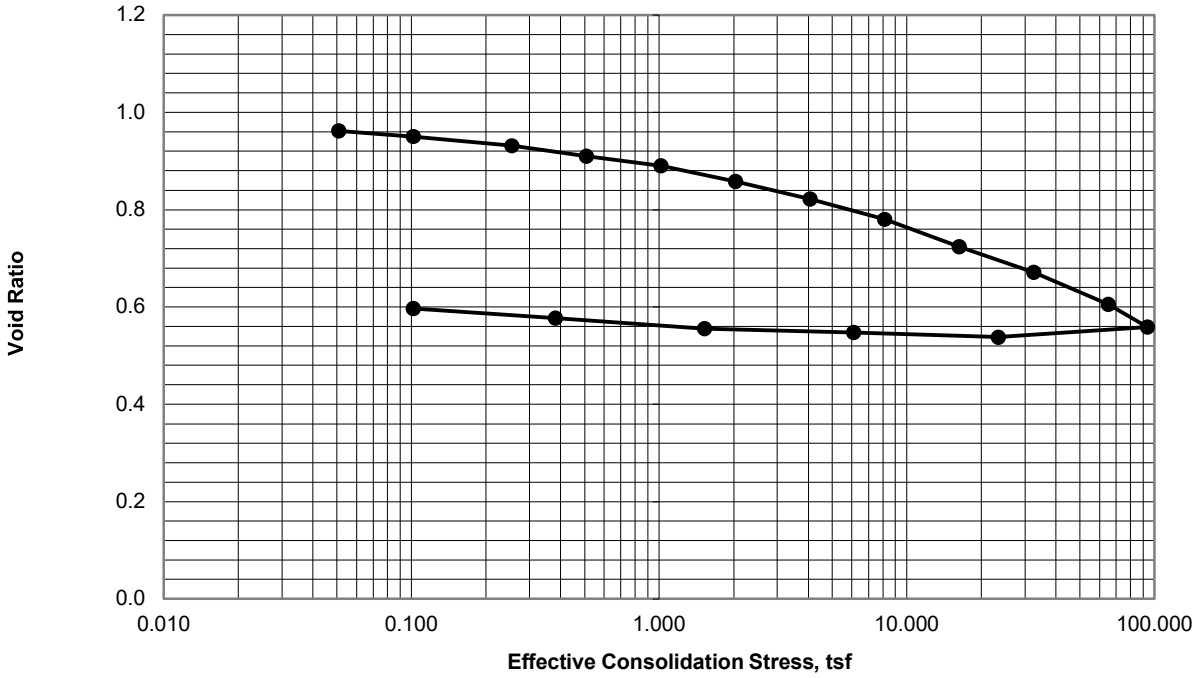
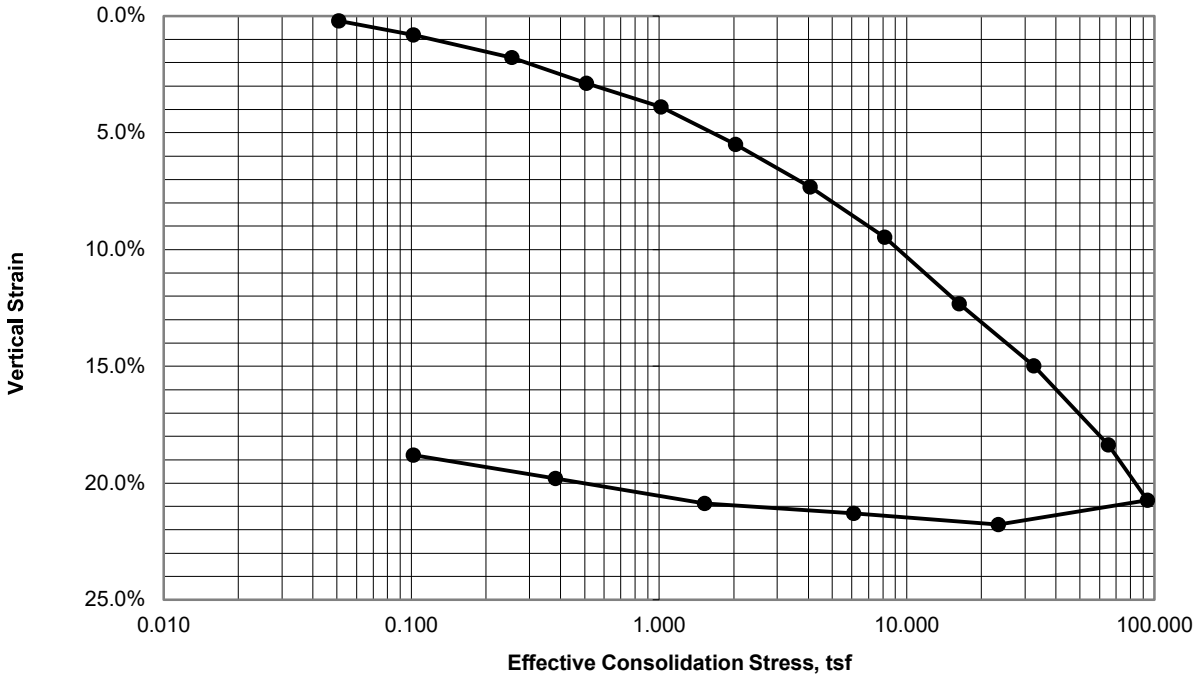
ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

CONSOLIDATION CURVES
Boring EB-1, Sample , 22.8 ft





Maximum Applied Effective Consolidation Stress, tsf = 93.48

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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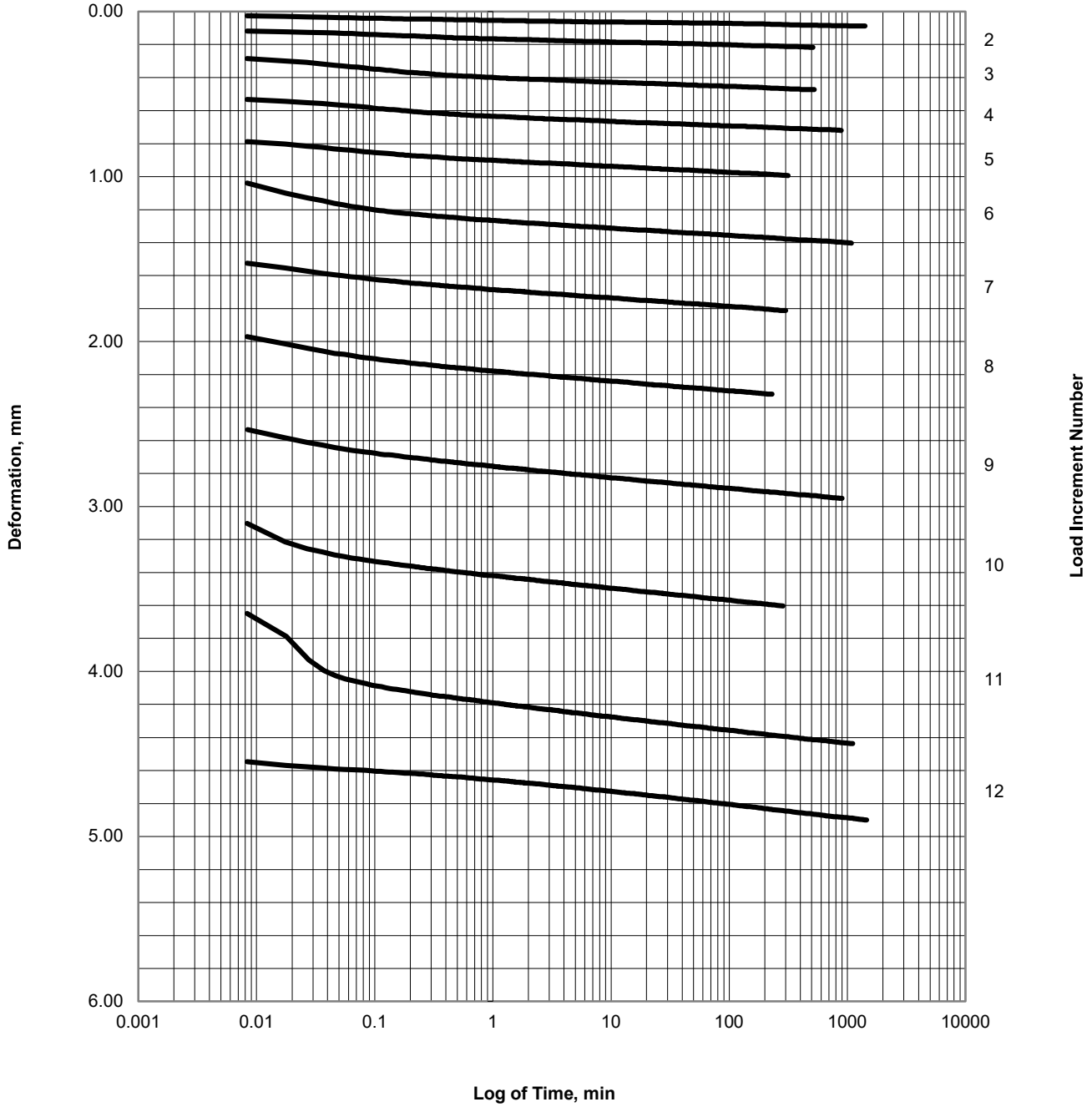
ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

LOAD INCREMENT TIME-DEFORMATION CURVES
Boring EB-1, Sample , 22.8 ft



Load Sequence, tsf = 0.1, 0.25, 0.51, 1.02, 2.03, 4.06, 8.13, 16.26, 32.52, 65.03, 93.48

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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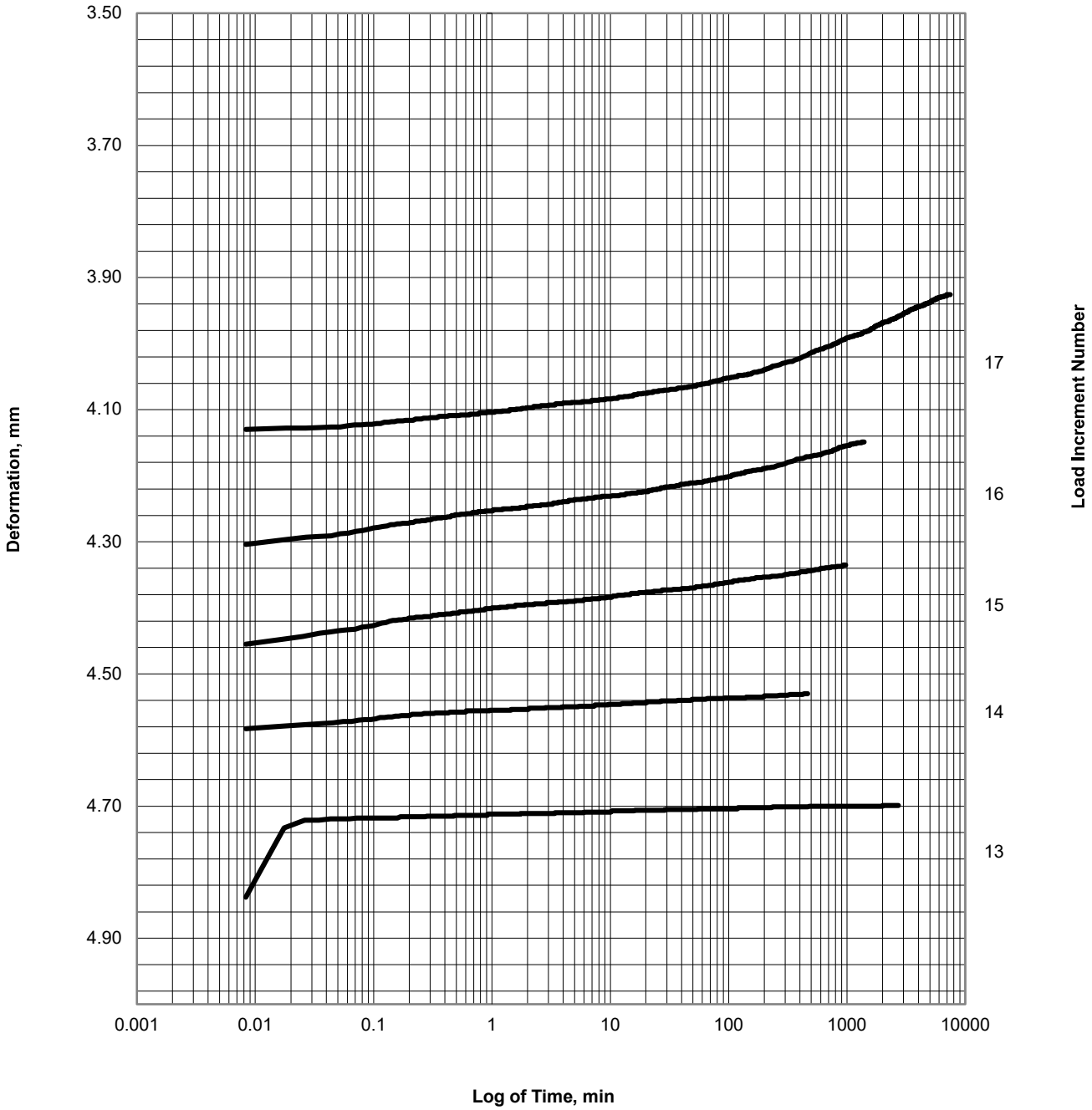
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

UNLOAD INCREMENT TIME-DEFORMATION CURVES
Boring EB-1, Sample , 22.8 ft



Load Sequence, tsf = 23.37, 6.1, 1.52, 0.38, 0.1

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

CONSOL_v3.0_NOTB_snoqualmie mill_EB-1_22.8.xlsm 02/22/18

0

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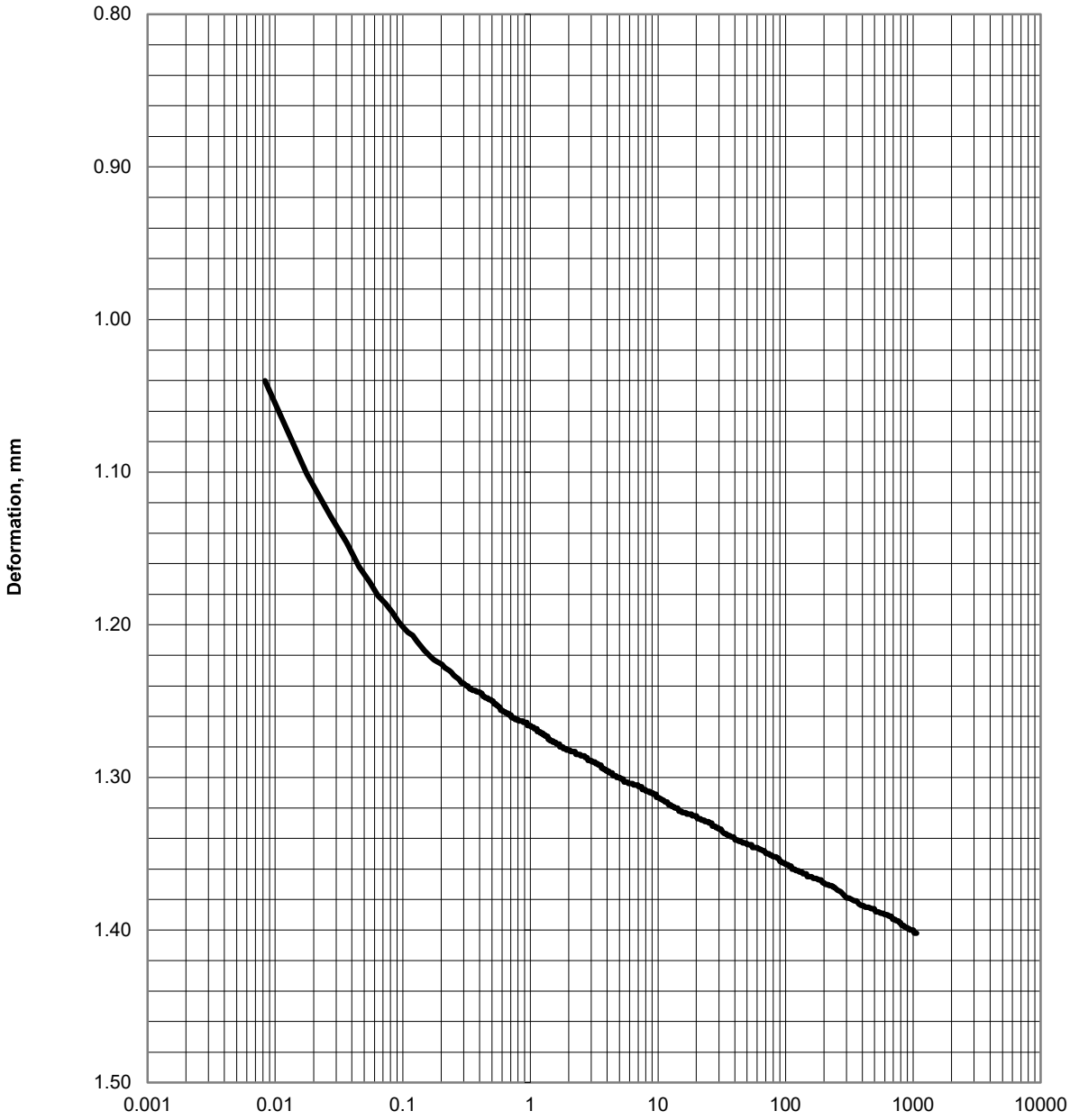
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

PLOT OF LOAD INCREMENT 6 (LOG TIME)
BORING EB-1, SAMPLE , 22.8 ft



Applied Stress, tsf = 2.03

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

CONSOL_v3.0_NOTB_snoqualmie mill_EB-1_22.8.xlsm 02/22/18

0

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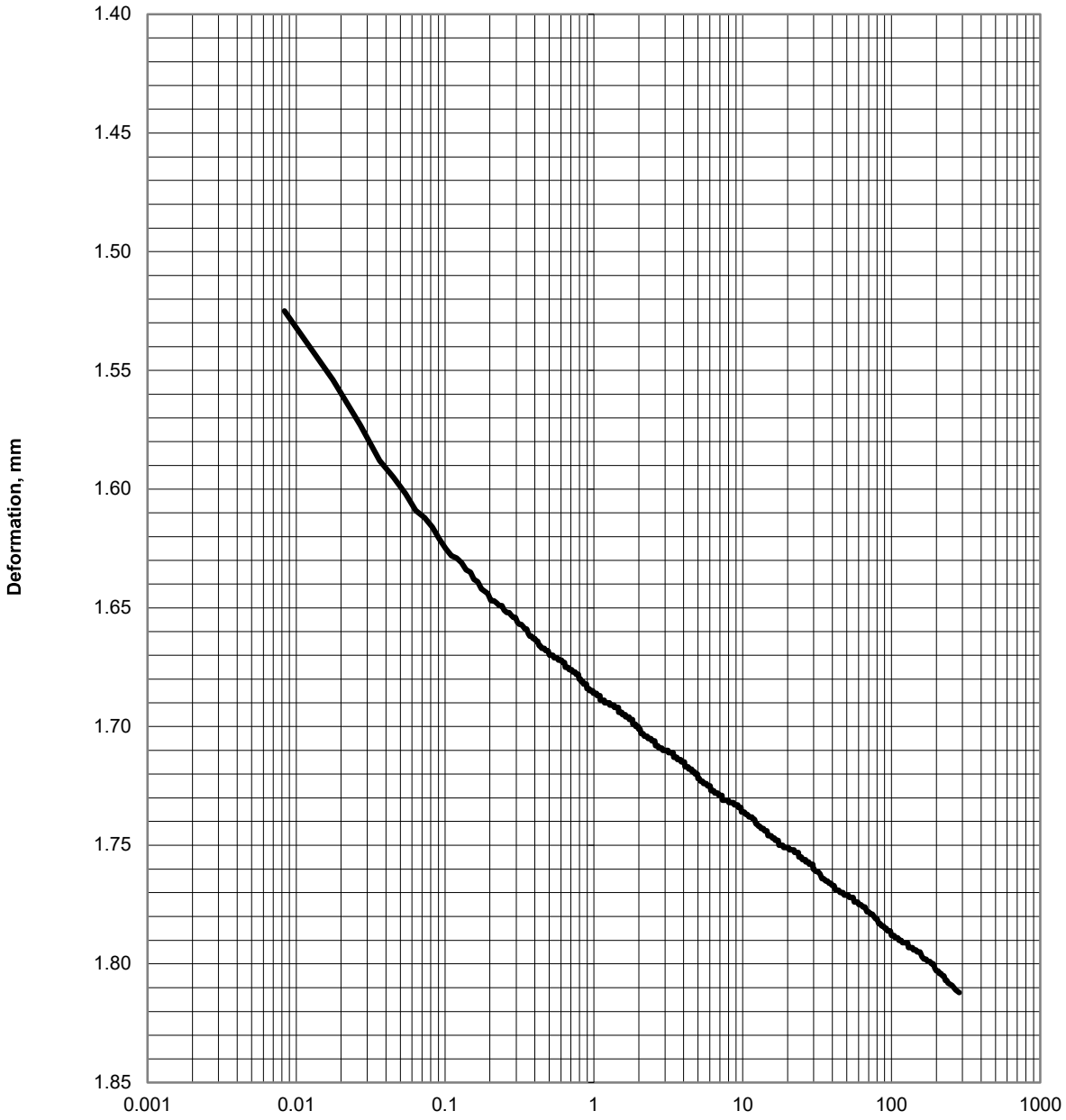
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

PLOT OF LOAD INCREMENT 7 (LOG TIME)
BORING EB-1, SAMPLE , 22.8 ft



Applied Stress, tsf = 4.06

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

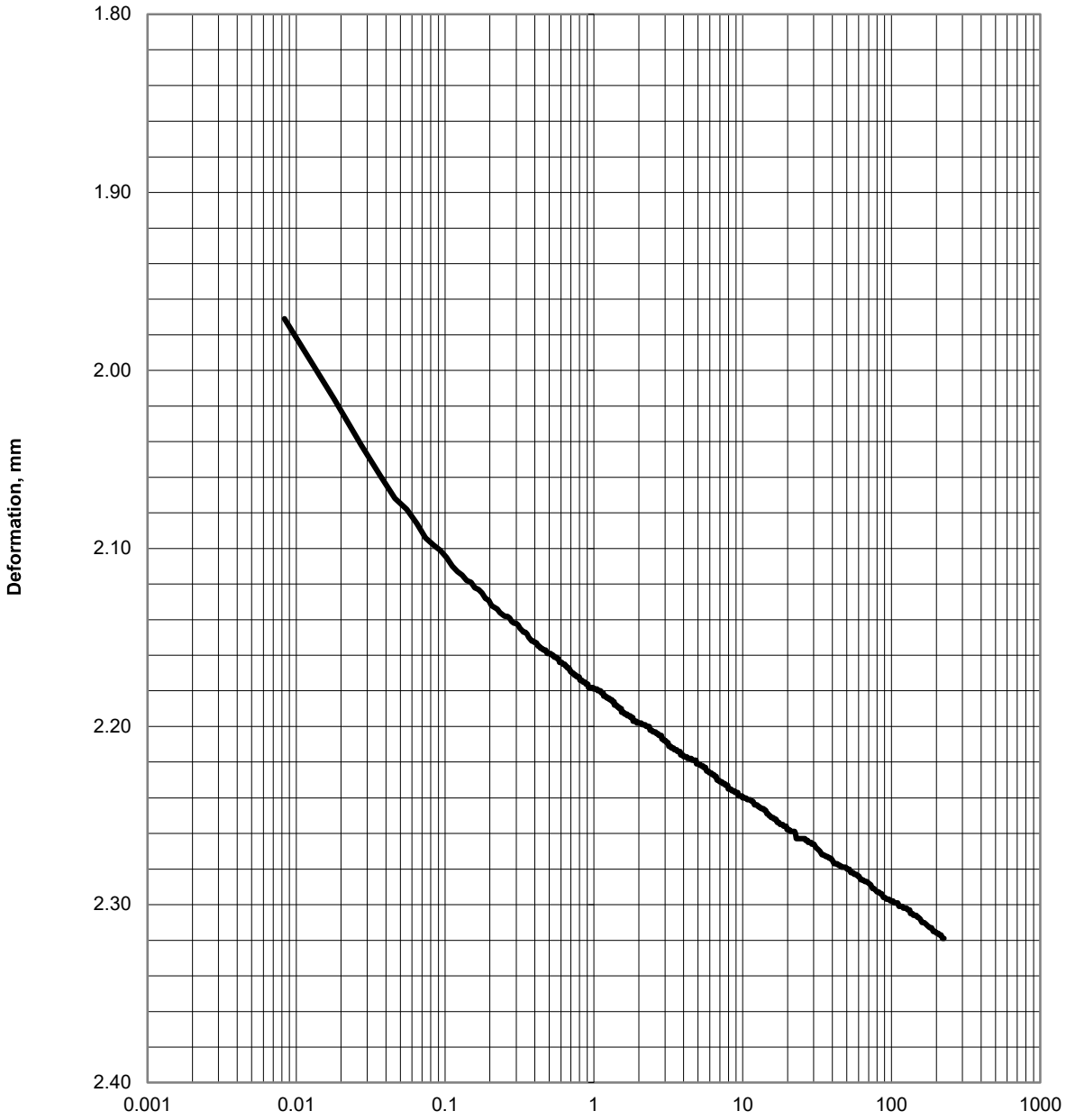
CONSOL_v3.0_NOTB_snoqualmie mill_EB-1_22.8.xlsm 02/22/18

0

ONE-DIMENSIONAL CONSOLIDATION

Snoqualmie Mill
King County, Washington

PLOT OF LOAD INCREMENT 8 (LOG TIME)
BORING EB-1, SAMPLE , 22.8 ft



Applied Stress, tsf = 8.13

Specimen trimmed using a trimming turntable and indundated with distilled water.
Tested by AKV in accordance with ASTM D2435-11. Finalized by JFL.

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CU TRIAXIAL COMPRESSION

Snoqualmie Mill
King County, Washington

BORING EB-1, SAMPLE , 22 ft
EFFECTIVE CONFINING PRESSURE = 14 psi

SPECIMEN DATA AND TEST RESULTS

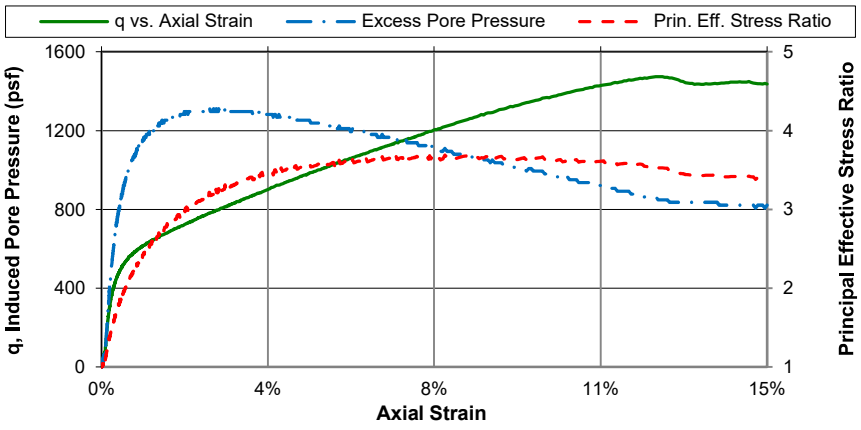
Sample Classification:
Silt; ML; LL =28; PL =27

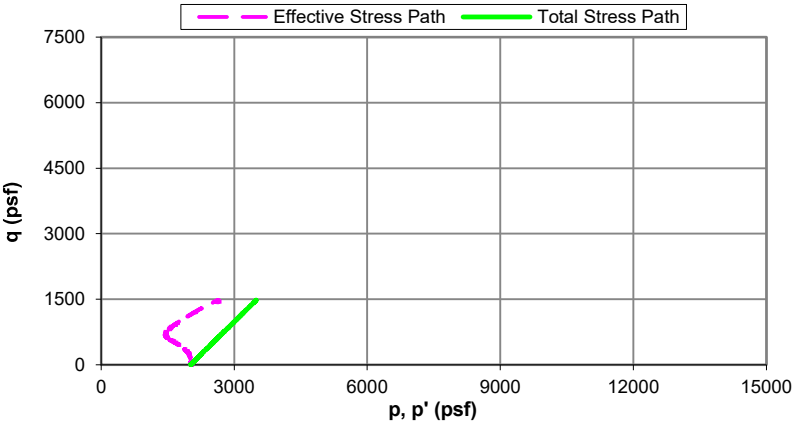
			Initial	Post-Consolidation	Post-Shear
Specific Gravity, G_s (Assumed)	2.7	Height, in	5.197	5.165	4.488
Initial Specimen State	Intact	Diameter, in	2.575	2.546	---
Specimen Saturation Method	Wet	Aspect Ratio	2.02	2.03	---
B-value at End of Saturation	0.99	Wet Mass, grams	696.4	669.9	669.9
Specimen Height Post-Saturation, in	5.196	Water Content	34.9%	29.8%	29.8%
Effective Confining Pressure, psf	2016	Wet Unit Weight, pcf	98.0	97.0	97.0
Time to 50% Primary Consolidation, min	6	Dry Unit Weight, pcf	72.7	74.8	74.8
Post Consolidation Area Calculation	Method A	Void Ratio	1.32	1.25	---
Shear Rate, in/min	0.0004	Percent Saturation	71.7%	64.4%	---
Shear Rate, %/min	0.0085	Area, in^2	5.207	5.091	---

CONSOLIDATED UNDRAINED COMPRESSIVE STRENGTH FAILURE CRITERION SUMMARY

Peak Principal Effective Stress Difference Criterion	
Principal Effective Stress Difference	2950 psf
Effective Major Principal Stress	4110 psf
Effective Minor Principal Stress	1160 psf
Axial Strain at Peak	12.54%
Axial Strain at 50% Peak	1.99%

Peak Principal Effective Stress Ratio Criterion	
Principal Effective Stress Ratio	3.69
Effective Major Principal Stress	3350 psf
Effective Minor Principal Stress	910 psf
Axial Strain at Peak	7.74%
Axial Strain at 50% Peak	0.43%





Pre-Shear Specimen Photo



Post-Shear Specimen Photo



Principal Stress Difference adjusted for filter-paper and membrane effects.
Water content derived from entire specimen.
Test procedures and calculations were performed in accordance with ASTM D4767-11. Original document produced in color.
Tested by AKV. Finalized by JFL.

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CU TRIAXIAL COMPRESSION

Snoqualmie Mill
King County, Washington

BORING EB-1, SAMPLE , 37 ft
EFFECTIVE CONFINING PRESSURE = 28 psi

SPECIMEN DATA AND TEST RESULTS

Sample Classification:
Silt; ML; LL =42; PL =27

Specific Gravity, G_s (Assumed)	2.78
Initial Specimen State	Intact
Specimen Saturation Method	Wet
B-value at End of Saturation	0.96
Specimen Height Post-Saturation, in	4.432
Effective Confining Pressure, psf	4032
Time to 50% Primary Consolidation, min	23
Post Consolidation Area Calculation	Method A
Shear Rate, in/min	0.0004
Shear Rate, %/min	0.0102

	Initial	Post-Consolidation	Post-Shear
Height, in	4.479	4.323	3.675
Diameter, in	2.390	2.274	---
Aspect Ratio	1.87	1.90	---
Wet Mass, grams	680.1	639.6	639.6
Water Content	46.3%	37.6%	37.6%
Wet Unit Weight, pcf	129.0	138.7	138.7
Dry Unit Weight, pcf	88.1	100.8	100.8
Void Ratio	0.97	0.72	---
Percent Saturation	100.0%	100.0%	---
Area, in^2	4.485	4.061	---

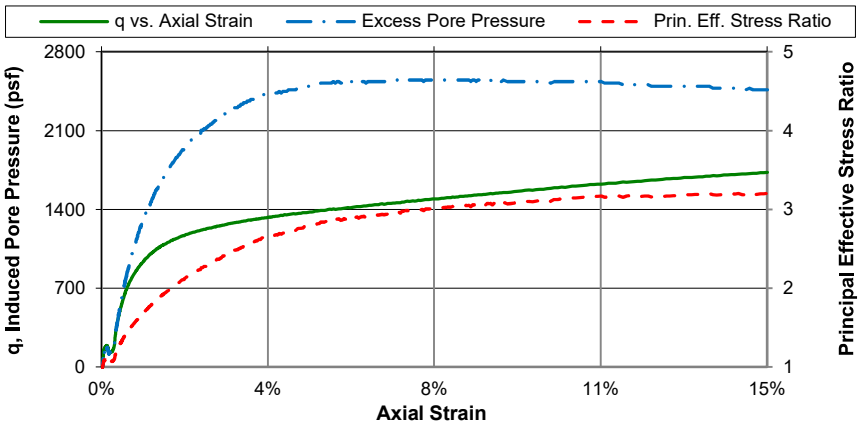
CONSOLIDATED UNDRAINED COMPRESSIVE STRENGTH FAILURE CRITERION SUMMARY

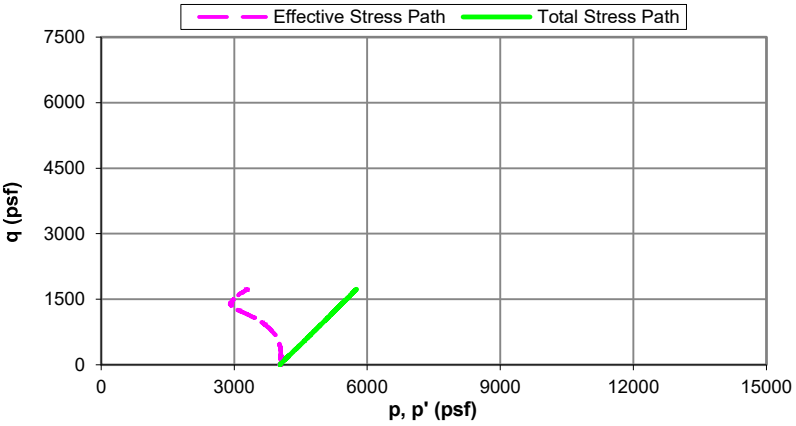
Peak Principal Effective Stress Difference Criterion

Principal Effective Stress Difference	3460 psf
Effective Major Principal Stress	5030 psf
Effective Minor Principal Stress	1570 psf
Axial Strain at Peak	15.01%
Axial Strain at 50% Peak	0.80%

Peak Principal Effective Stress Ratio Criterion

Principal Effective Stress Ratio	3.21
Effective Major Principal Stress	4990 psf
Effective Minor Principal Stress	1560 psf
Axial Strain at Peak	14.60%
Axial Strain at 50% Peak	0.81%





Pre-Shear Specimen Photo



Post-Shear Specimen Photo



Principal Stress Difference adjusted for filter-paper and membrane effects.
Water content derived from entire specimen. Specific Gravity estimated by hydrometer data; actual specific gravity may vary.
Test procedures and calculations were performed in accordance with ASTM D4767-11. Original document produced in color.
Tested by AKV. Finalized by JFL.

SHANNON & WILSON, INC.
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CU TRIAXIAL COMPRESSION

Snoqualmie Mill
King County, Washington

BORING EB-1, SAMPLE , 37.5 ft
EFFECTIVE CONFINING PRESSURE = 42 psi

SPECIMEN DATA AND TEST RESULTS

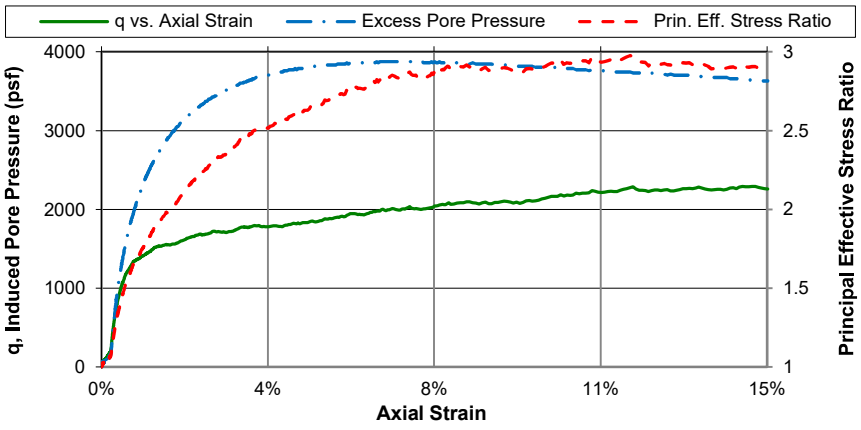
Sample Classification:
Silt; ML

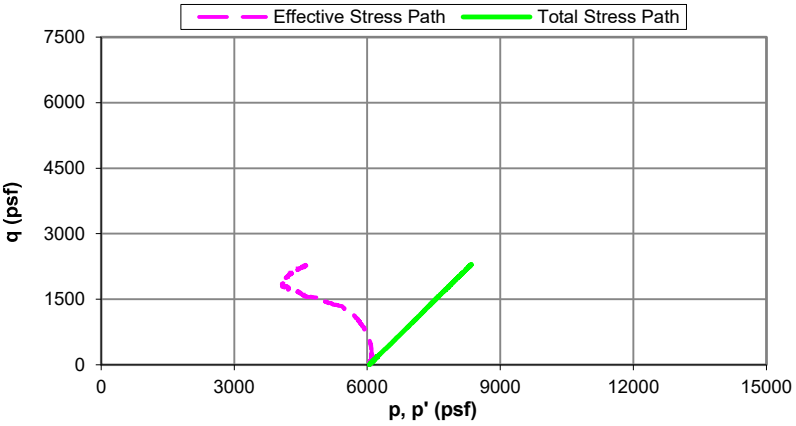
			Initial	Post-Consolidation	Post-Shear
Specific Gravity, G_s (Assumed)	2.78	Height, in	5.175	4.978	4.231
Initial Specimen State	Intact	Diameter, in	2.442	2.327	---
Specimen Saturation Method	Wet	Aspect Ratio	2.12	2.14	---
B-value at End of Saturation	0.96	Wet Mass, grams	665.7	612.0	612.0
Specimen Height Post-Saturation, in	5.135	Water Content	47.4%	35.5%	35.5%
Effective Confining Pressure, psf	6048	Wet Unit Weight, pcf	104.6	110.1	110.1
Time to 50% Primary Consolidation, min	27	Dry Unit Weight, pcf	71.0	81.2	81.2
Post Consolidation Area Calculation	Method A	Void Ratio	1.44	1.13	---
Shear Rate, in/min	0.0004	Percent Saturation	91.5%	87.2%	---
Shear Rate, %/min	0.0088	Area, in^2	4.685	4.253	---

CONSOLIDATED UNDRAINED COMPRESSIVE STRENGTH FAILURE CRITERION SUMMARY

Peak Principal Effective Stress Difference Criterion	
Principal Effective Stress Difference	4580 psf
Effective Major Principal Stress	6990 psf
Effective Minor Principal Stress	2410 psf
Axial Strain at Peak	14.73%
Axial Strain at 50% Peak	0.52%

Peak Principal Effective Stress Ratio Criterion	
Principal Effective Stress Ratio	2.97
Effective Major Principal Stress	6900 psf
Effective Minor Principal Stress	2320 psf
Axial Strain at Peak	11.97%
Axial Strain at 50% Peak	0.50%





Pre-Shear Specimen Photo



Post-Shear Specimen Photo



Principal Stress Difference adjusted for filter-paper and membrane effects.
Water content derived from entire specimen. Specific Gravity estimated by hydrometer data; actual specific gravity may vary.
Test procedures and calculations were performed in accordance with ASTM D4767-11. Original document produced in color.
Tested by AKV. Finalized by JFL.

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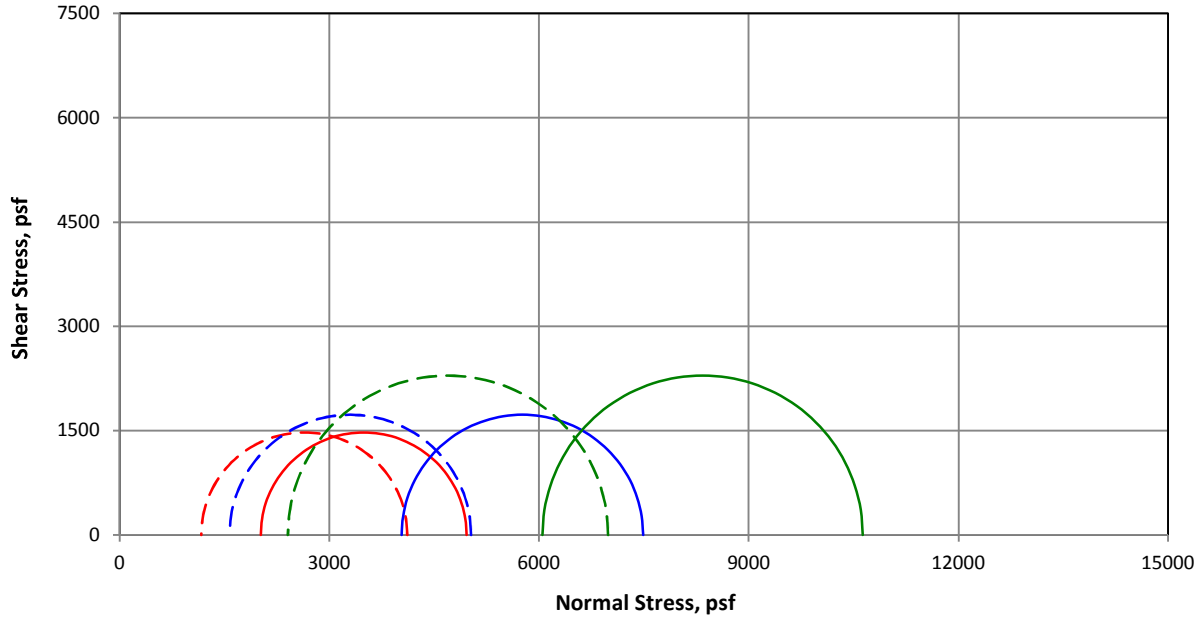
Snoqualmie Mill
King County, Washington

MOHR'S CIRCLE PLOTS
BORING EB-1, SAMPLE

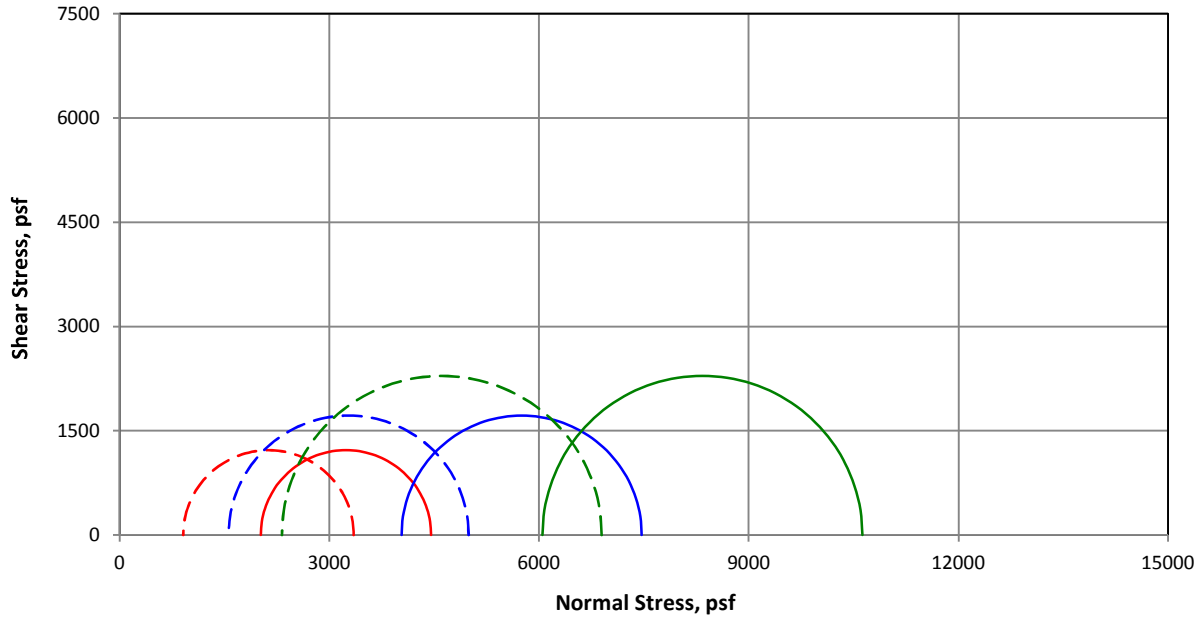
SPECIMEN SUMMARY

TS EB-1, , 22ft
TS EB-1, , 37ft
TS EB-1, , 37.5ft
EFF EB-1, , 22ft
EFF EB-1, , 37ft
EFF EB-1, , 37.5ft

MOHR'S CIRCLE PLOT BASED ON MAXIMUM PRINCIPAL EFFECTIVE STRESS DIFFERENCE



MOHR'S CIRCLE PLOT BASED ON MAXIMUM PRINCIPAL EFFECTIVE STRESS RATIO



Test procedures and calculations were performed in accordance with ASTM D4767-11.
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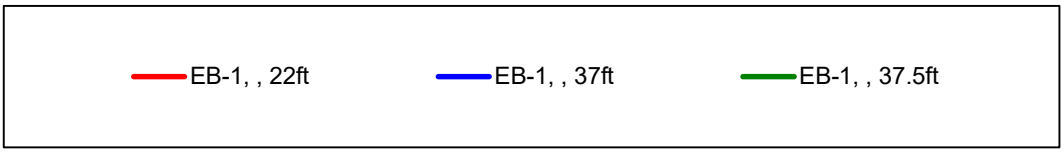
CU TRIAXIAL COMPRESSION

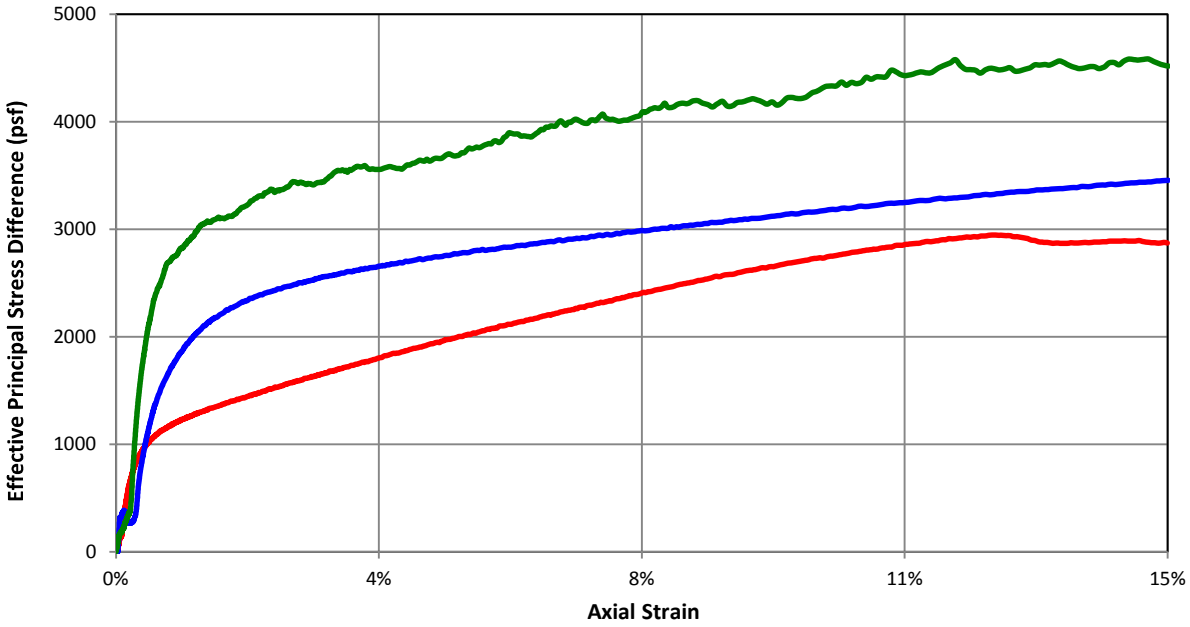
Snoqualmie Mill
King County, Washington

STRESS BEHAVIOR PLOTS
BORING EB-1, SAMPLE

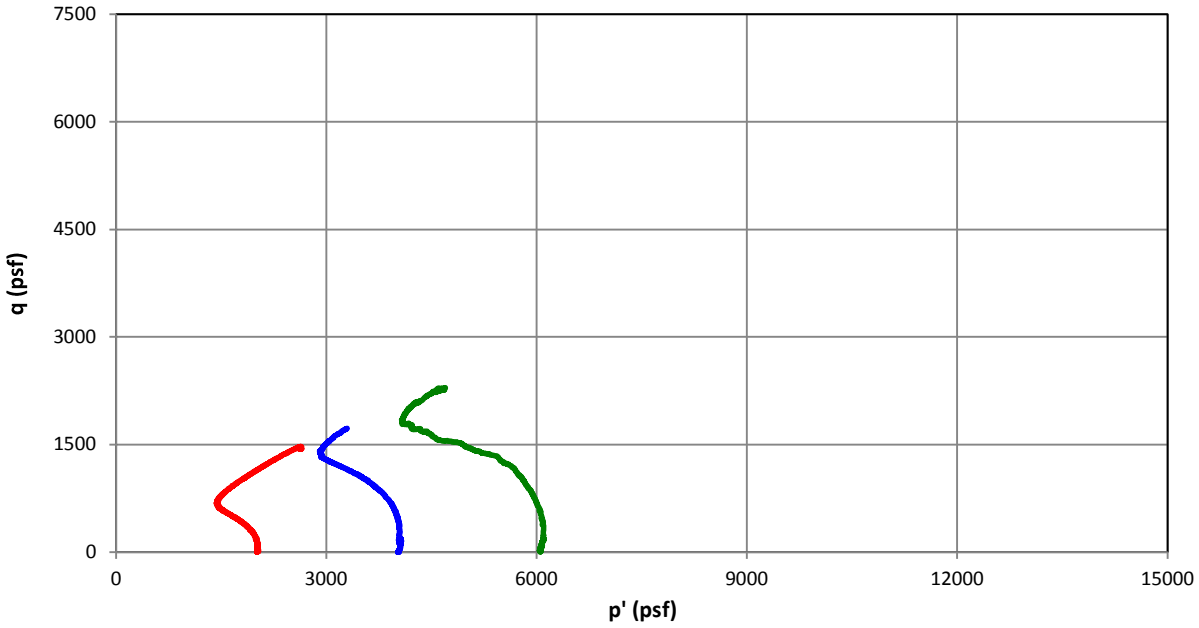
SPECIMEN SUMMARY



STRESS-STRAIN PLOT



STRESS PATH PLOT



Test procedures and calculations were performed in accordance with ASTM D4767-11.
Original document produced in color.
Tested by AKV. Finalized by JFL.

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Curtis J. Koger

Report Date: 5/21/2012

Associated Earth Sciences, Incorporated

Material Received: 5/14/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 322015	5510 +/- 30 BP	-25.8 o/oo	5500 +/- 30 BP
SAMPLE : KH120126MW1@37.5			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 4360 to 4330 (Cal BP 6310 to 6280)			
Beta - 322016	7960 +/- 40 BP	-25.0 o/oo	7960 +/- 40 BP
SAMPLE : KH120126MW1@194			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 7050 to 6690 (Cal BP 9000 to 8640)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Consistent Accuracy . . .
. . . Delivered On-time

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

May 21, 2012

Mr. Curtis J. Koger
Associated Earth Sciences, Incorporated
911 Fifth Avenue
Suite 100
Kirkland, WA 98033
USA

RE: Radiocarbon Dating Results For Samples KH120126MW1@37.5, KH120126MW1@194

Dear Mr. Koger:

Enclosed are the radiocarbon dating results for two samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the MASTERCARD card provided. A receipt is enclosed. with the mailed report copy Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-322016**

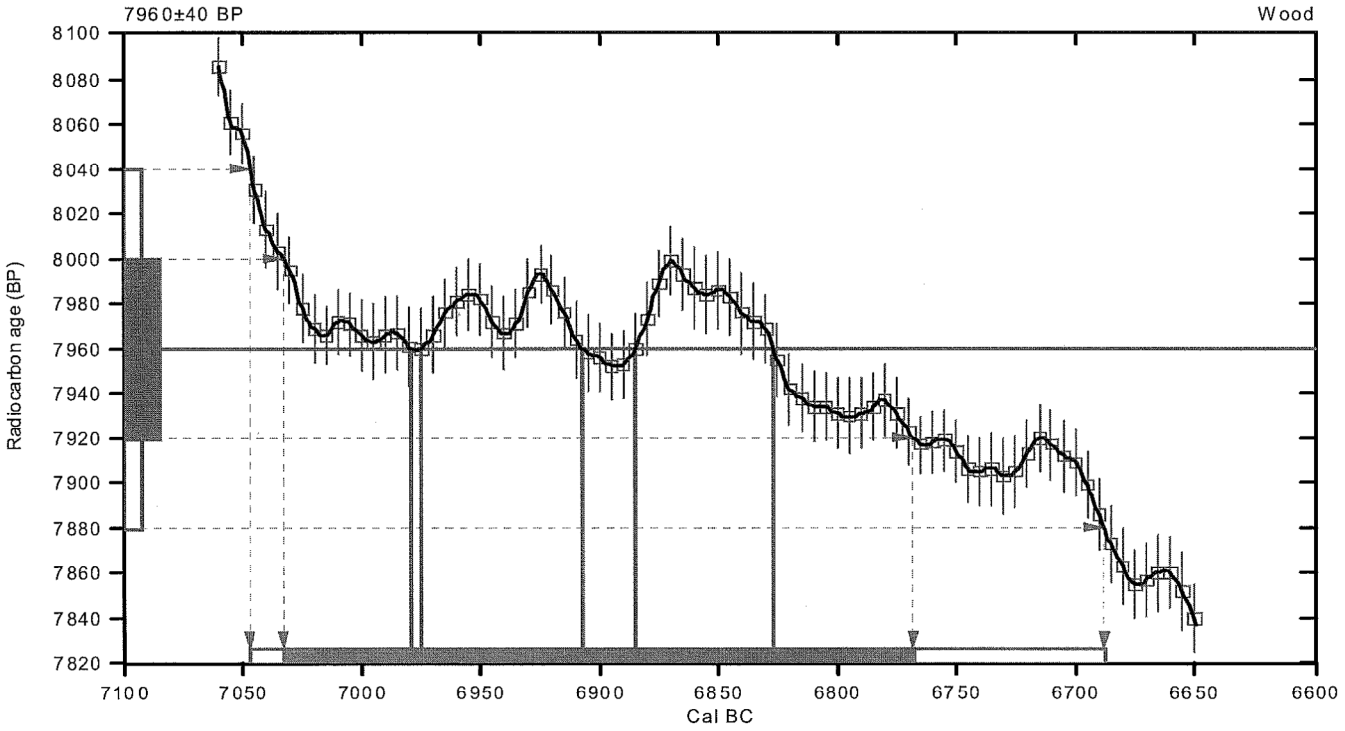
Conventional radiocarbon age: **7960±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 7050 to 6690 (Cal BP 9000 to 8640)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 6980 (Cal BP 8930) and
Cal BC 6980 (Cal BP 8920) and
Cal BC 6910 (Cal BP 8860) and
Cal BC 6880 (Cal BP 8840) and
Cal BC 6830 (Cal BP 8780)

1 Sigma calibrated result: (68% probability) Cal BC 7030 to 6770 (Cal BP 8980 to 8720)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.8:lab. mult=1)

Laboratory number: **Beta-322015**

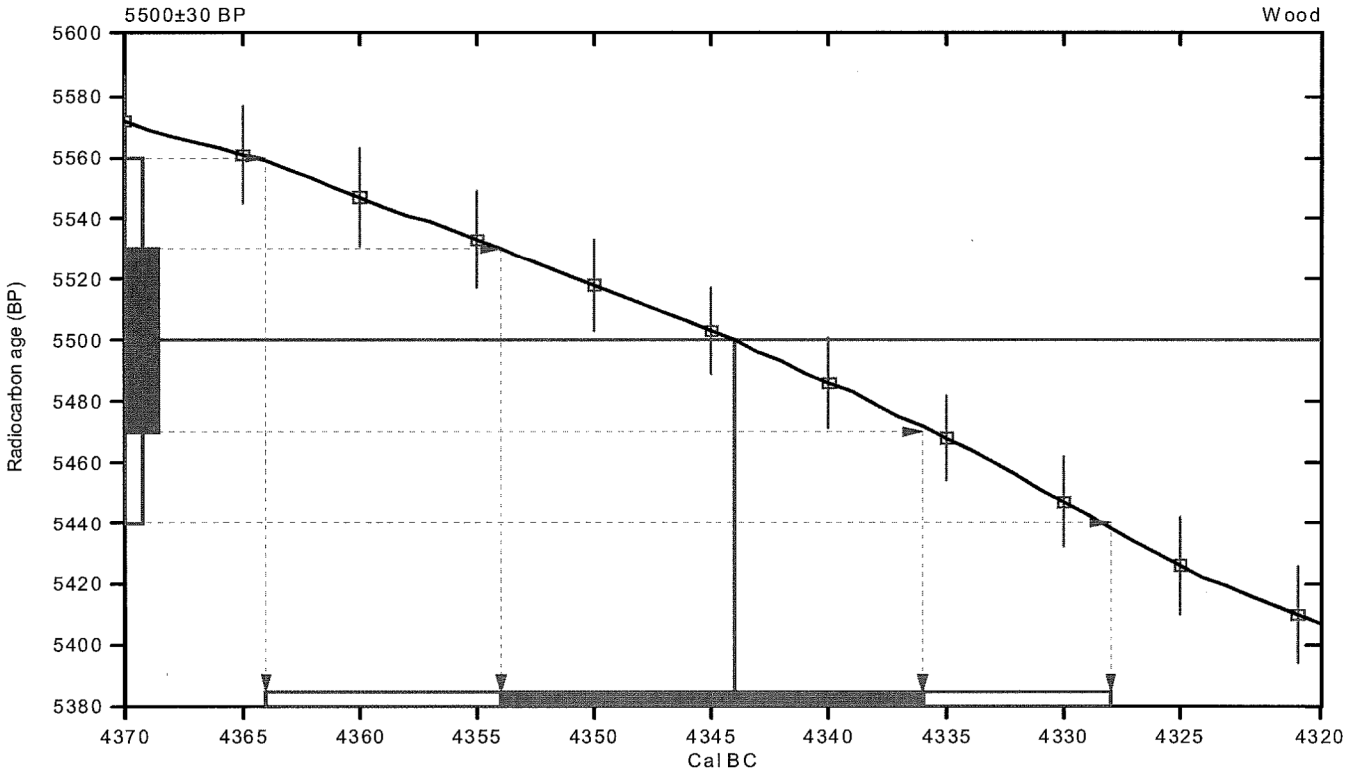
Conventional radiocarbon age: **5500±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 4360 to 4330 (Cal BP 6310 to 6280)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 4340 (Cal BP 6290)

1 Sigma calibrated result: (68% probability) Cal BC 4350 to 4340 (Cal BP 6300 to 6290)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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BETA ANALYTIC INC.

RADIOCARBON DATING SERVICES

Dr. JERRY J. STIPP
Dr. MURRY A. TAMERS
CO-DIRECTORS

DARDEN G. HOOD, P.G.
Laboratory Head

RONALD E. HATFIELD
Laboratory Manager

CHRISTOPHER PATRICK
TERESA A. ZILKO-MILLER
Associate Managers

July 21, 1995

Mr. Curtis J. Koger
Associated Earth Sciences, Inc.
911 5th Avenue
Suite 100
Kirkland, Washington 98033

Dear Mr. Koger:

Please find enclosed the radiocarbon dating results on one wood sample recently submitted for analysis. It provided plenty of carbon for a precise measurement after full pretreatments. In addition to the results, please review the enclosed discussions on applied methodology, pretreatments and calendar calibration. The reported "Conventional C14 Age" is the radiocarbon date of interest and was the value used to calculate the calendar equivalent age.

Our invoice is enclosed. Thank you in advance, for your prompt attention to its payment. As always, if you have any specific questions, please do not hesitate to fax, e-mail, or call us.

Sincerely,

Darden Hood

P.S. Please note the two new services for 1996; SEM analysis of carbon dated materials and the ADVANCE AMS analysis service with 14 day delivery (literature enclosed).

4985 S.W. 74 COURT, MIAMI, FL 33155 U.S.A.
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WWW HOME PAGE: http://www.win.net/~analytic

BETA ANALYTIC INC.

DR. J.J. STIPP and DR. M.A. TAMERS

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MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-mail: beta@analytic.win.net

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Mr. Curtis J. Koger
Associated Earth Sciences, Inc.

DATE RECEIVED: June 29, 1995
DATE REPORTED: July 20, 1995

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-83433	3050 +/- 80 BP	-25.0* o/oo	3050 +/- 80* BP

SAMPLE #: EB-1 23½ - 25
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(wood): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-83433	3050 +/- 80 BP	-25.0* o/oo	3050 +/- 80* BP

SAMPLE #: B-1 23½ - 25
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT: (wood): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present"= 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards. Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 Age.

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Tel. 305-667-5167
FAX 305-663-0964
E-mail beta@analytic.win.net

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

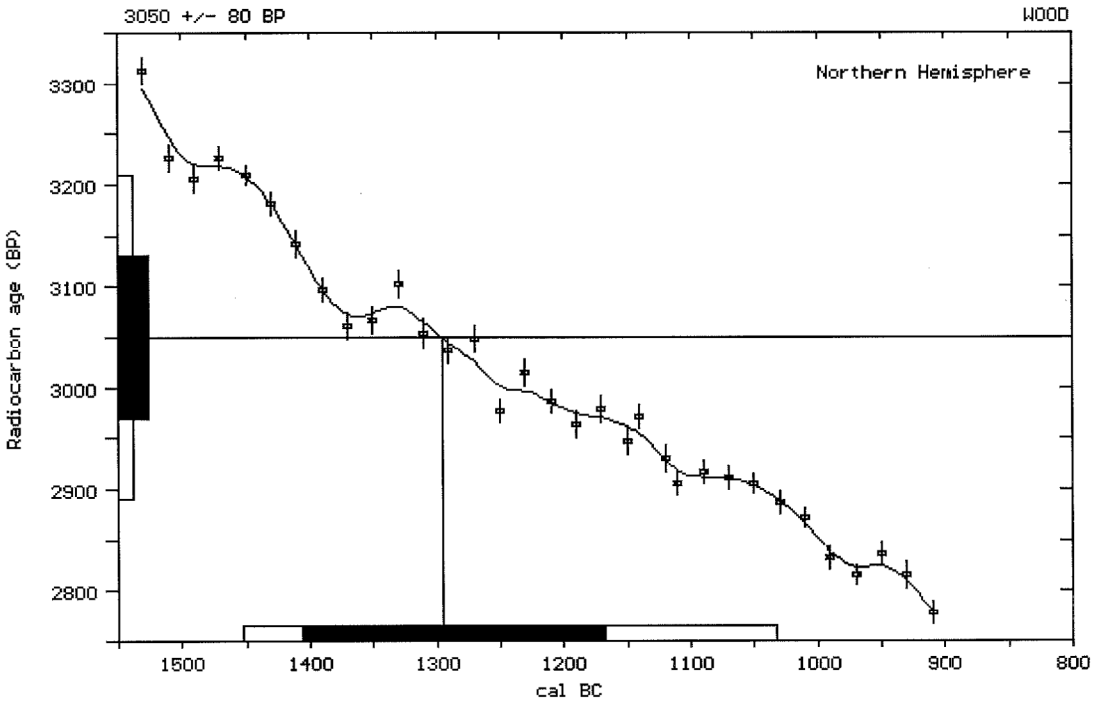
(Variables:estimated C13/C12=-25:lab mult.=1)

Laboratory Number:	Beta-83433
Conventional radiocarbon age*:	**3050 +/- 80 BP**
Calibrated results: (2 sigma, 95% probability)	**cal BC 1450 to 1030**

* C13/C12 ratio estimated

Intercept data:

Intercept of radiocarbon age with calibration curve:	cal BC 1295
1 sigma calibrated results: (68% probability)	cal BC 1405 to 1170



References:

Pretoria Calibration Curve for Short Lived Samples
Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86

A Simplified Approach to Calibrating C14 Dates
Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Calibration - 1993
Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Beta Analytic Radiocarbon Dating Laboratory

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Curtis J. Koger/Jenny Hilden — Report Date: 2/23/01

Associated Earth Sciences, Inc. — Material Received: 1/15/01

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 151591	> 41240 BP	-25.0* o/oo	> 41240 BP

SAMPLE : KH00005C-TW8-248FEET
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : (result is outside of the calibration range)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
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PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Curtis J. Koger/Jenny Hilden

Report Date: 2/23/01

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 151592	> 40380 BP	-25.0* o/oo	> 40380 BP
SAMPLE : KH00005C-TW8-395FEET			
ANALYSIS : Radiometric-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : (result is outside of the calibration range)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

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Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

July 31, 2015

Mr. Curtis J. Koger
Associated Earth Sciences, Incorporated
911 Fifth Avenue, Suite 100
Kirkland, WA 98033
USA

RE: Radiocarbon Dating Results For Samples KE150249EB2@45- Organic Sediment, KE150249EB2@65, KE150249EB2@45- Plant

Dear Mr. Koger:

Enclosed are the radiocarbon dating results for three samples recently sent to us. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable. The Conventional Radiocarbon Ages have all been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

Reported results are accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all chemistry was performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analyses.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result.

When interpreting the results, please consider any communications you may have had with us regarding the samples. As always, your inquiries are most welcome. If you have any questions or would like further details of the analyses, please do not hesitate to contact us.

The cost of the analysis was charged to the VISA card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Curtis J. Koger

Report Date: 7/31/2015

Associated Earth Sciences, Incorporated

Material Received: 7/23/2015

Sample Data	Measured Radiocarbon Age	d13C	Conventional Radiocarbon Age(*)
Beta - 415738	6040 +/- 30 BP	-28.5 o/oo	5980 +/- 30 BP
SAMPLE : KE150249EB2@45- Organic Sediment			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 4940 to 4790 (Cal BP 6890 to 6740)			
Beta - 415739	5920 +/- 30 BP	-26.8 o/oo	5890 +/- 30 BP
SAMPLE : KE150249EB2@65			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 4830 to 4815 (Cal BP 6780 to 6765) and Cal BC 4805 to 4705 (Cal BP 6755 to 6655)			
Beta - 415972	5890 +/- 30 BP	-25.1 o/oo	5890 +/- 30 BP
SAMPLE : KE150249EB2@45- Plant			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 4830 to 4815 (Cal BP 6780 to 6765) and Cal BC 4805 to 4705 (Cal BP 6755 to 6655)			

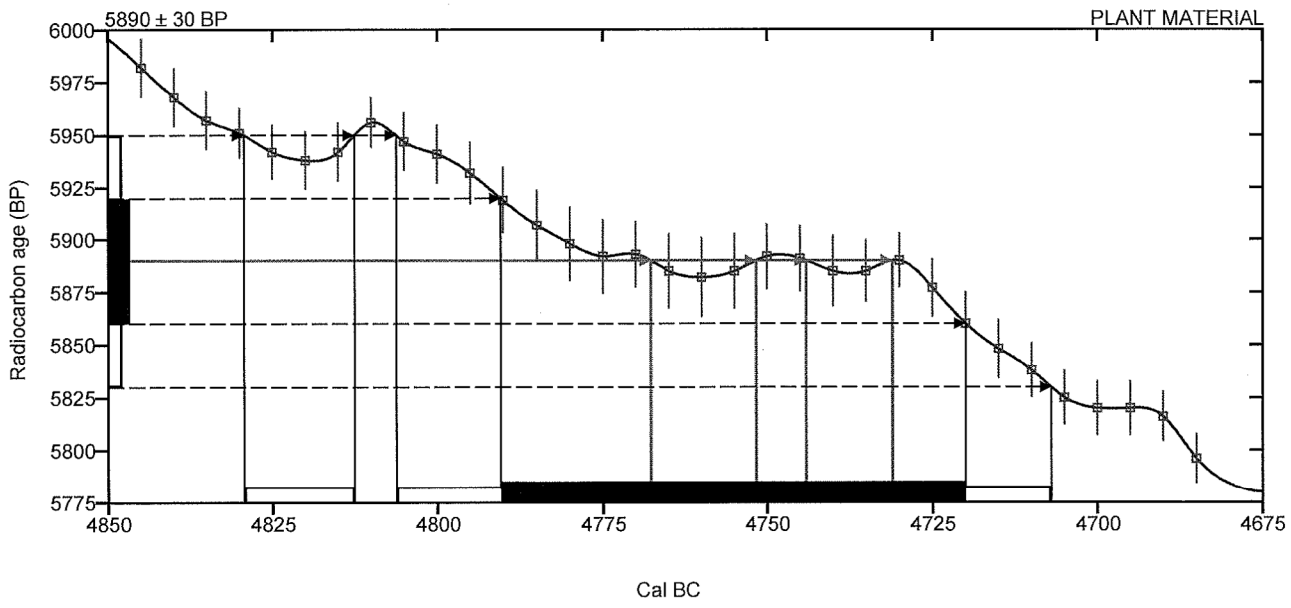
Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -25.1 o/oo : lab. mult = 1)

Laboratory number	**Beta-415972**
Conventional radiocarbon age	**5890 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 4830 to 4815 (Cal BP 6780 to 6765)** **Cal BC 4805 to 4705 (Cal BP 6755 to 6655)**
Intercept of radiocarbon age with calibration curve	Cal BC 4770 (Cal BP 6720) Cal BC 4750 (Cal BP 6700) Cal BC 4745 (Cal BP 6695) Cal BC 4730 (Cal BP 6680)
Calibrated Result (68% Probability)	Cal BC 4790 to 4720 (Cal BP 6740 to 6670)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

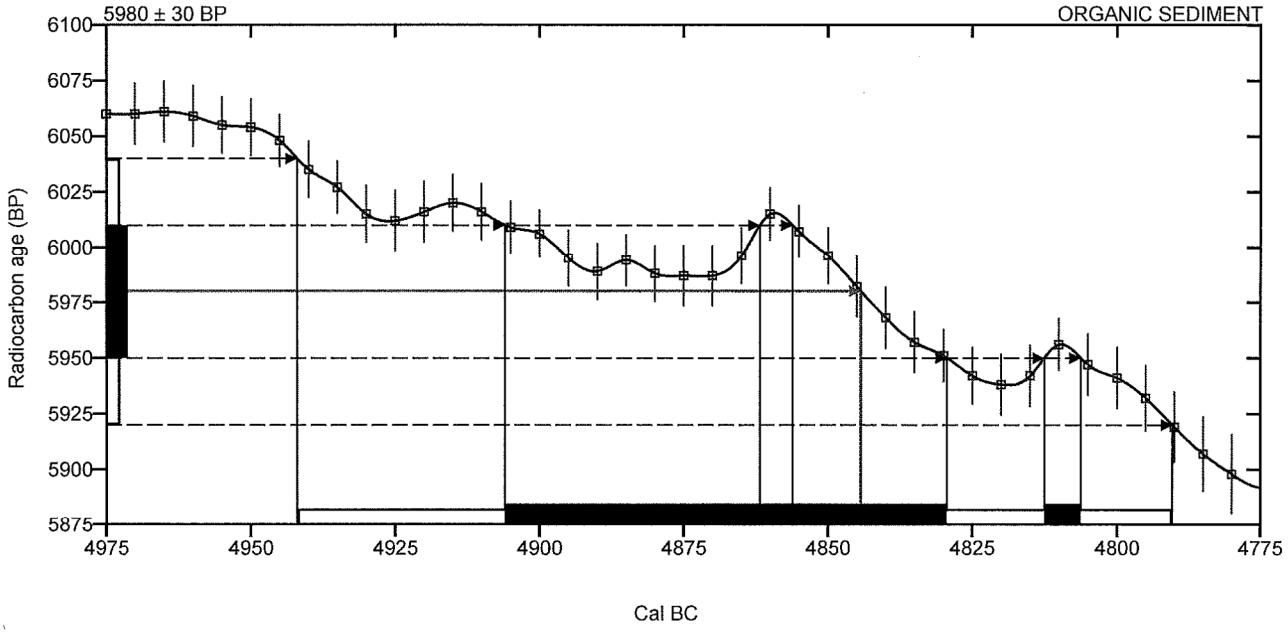
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -28.5 o/oo : lab. mult = 1)

Laboratory number	**Beta-415738**
Conventional radiocarbon age	**5980 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 4940 to 4790 (Cal BP 6890 to 6740)**
Intercept of radiocarbon age with calibration curve	Cal BC 4845 (Cal BP 6795)
Calibrated Result (68% Probability)	Cal BC 4905 to 4830 (Cal BP 6855 to 6780) Cal BC 4815 to 4805 (Cal BP 6765 to 6755)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

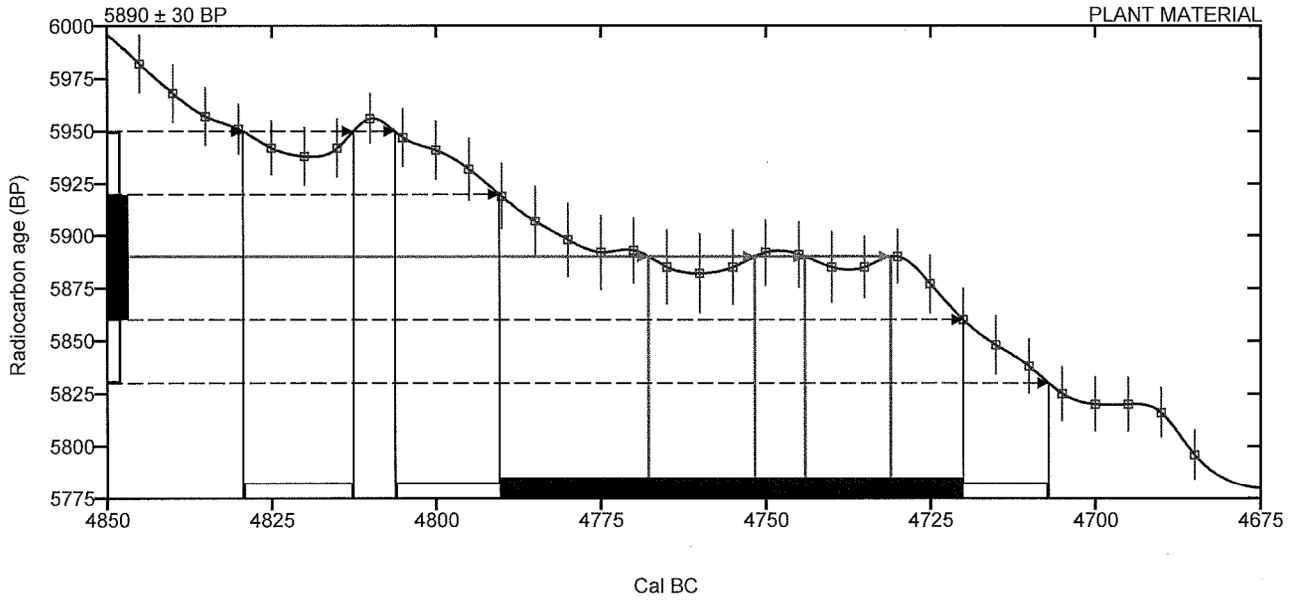
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -26.8 o/oo : lab. mult = 1)

Laboratory number	**Beta-415739**
Conventional radiocarbon age	**5890 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 4830 to 4815 (Cal BP 6780 to 6765)** **Cal BC 4805 to 4705 (Cal BP 6755 to 6655)**
Intercept of radiocarbon age with calibration curve	Cal BC 4770 (Cal BP 6720) Cal BC 4750 (Cal BP 6700) Cal BC 4745 (Cal BP 6695) Cal BC 4730 (Cal BP 6680)
Calibrated Result (68% Probability)	Cal BC 4790 to 4720 (Cal BP 6740 to 6670)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

BETA ANALYTIC INC.

RADIOCARBON DATING SERVICES

Dr. JERRY J. STIPP
Dr. MURRY A. TAMERS
CO-DIRECTORS

DARDEN G. HOOD, P.G.
Laboratory Head

RONALD E. HATFIELD
Laboratory Manager

CHRISTOPHER PATRICK
TERESA A. ZILKO-MILLER
Associate Managers

August 16, 1995

Mr. Curtis J. Koger
Associated Earth Sciences, Inc.
911 5th Avenue
Suite 100
Kirkland, Washington 98033

South Well Field
Well #2
474'

Dear Mr. Koger:

Please find enclosed the radiocarbon dating results on one wood sample (W94036A-474) recently submitted for analysis. Reliable measurements were made on the suitable carbon remaining after pretreatments. The applied pretreatment is listed next to the sample on the report sheet and described in the "PRETREATMENT GLOSSARY". In addition to the results, please review the enclosed discussions on applied methodology, pretreatments and calendar calibration. The reported "Conventional C14 Age" is the radiocarbon date of interest and would have been the value used to calculate the calendar equivalent age if the material was less than 10,000 BP.

Our invoice is enclosed. Thank you in advance, for your prompt attention to its payment. As always, if you have any specific questions, please do not hesitate to fax, e-mail, or call us.

Sincerely,

Darden Hood

P.S. Please note the two new services for 1996; SEM analysis of carbon dated materials and the ADVANCE AMS analysis service with 14 day delivery (literature enclosed).

4985 S.W. 74 COURT, MIAMI, FL 33155 U.S.A.
TELEPHONE: 305-667-5167 / FAX: 305-663-0964 / INTERNET: beta@analytic.win.net
WWW HOME PAGE: http://www.win.net/~analytic

BETA ANALYTIC INC.

DR. J.J. STIPP and DR. M.A. TAMERS

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4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-mail: beta@analytic.win.net

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Mr. Curtis J. Koger
Associated Earth Sciences, Inc.

DATE RECEIVED: July 18, 1995
DATE REPORTED: August 15, 1995

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-83811	> 41940 years BP	-25.0* o/oo	> 41940 years* BP

SAMPLE #: W94036A-474 → City of Snoq. Well #2 @ 474'
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(wood): acid/alkali/acid

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA ANALYTIC INC.

RADIOCARBON DATING SERVICES

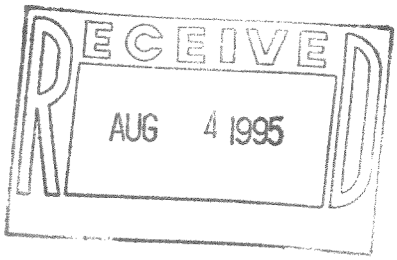
Dr. JERRY J. STIPP
Dr. MURRY A. TAMERS
CO-DIRECTORS

DARDEN G. HOOD, P.G.
Laboratory Head

RONALD E. HATFIELD
Laboratory Manager

CHRISTOPHER PATRICK
TERESA A. ZILKO-MILLER
Associate Managers

July 31, 1995



Mr. Curtis J. Koger
Associated Earth Sciences, Inc.
911 5th Avenue
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Dear Mr. Koger:

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As always, if you have any specific questions, please do not hesitate to fax, e-mail, or call us.

Sincerely,

Chris Patrick

P.S. Please note the two new services for 1996; SEM analysis of carbon dated materials and the ADVANCE AMS analysis service with 14 day delivery (literature enclosed).

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BETA ANALYTIC INC.

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REPORT OF RADIOCARBON DATING ANALYSES

FOR: Mr. Curtis J. Koger
Associated Earth Sciences, Inc.

DATE RECEIVED: June 30, 1995
DATE REPORTED: July 31, 1995

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-83465	5720 +/- 70 BP	-25.0* o/oo	5720 +/- 70* BP

SAMPLE #: W94036B
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

THIS IS A COPY OF THE REPORT MAILED TO YOU TODAY. CALENDAR CALIBRATIONS ARE NOT INCLUDED.

BETA ANALYTIC INC.

DR. MURRY TAMERS
DR. JERRY STIPP

4985 SW 74 COURT
MIAMI, FL 33155, U.S.A

July 31, 1995

Mr. Curtis J. Koger
Associated Earth Sciences, Inc.
911 5th Avenue
Suite 100
Kirkland, Washington 98033

Dear Mr. Koger:

Please find enclosed the radiocarbon dating results on a wood sample recently submitted for analysis. Reliable measurements were made on the suitable carbon remaining after pretreatments. In addition to the results, please review the enclosed discussions on applied methodology, pretreatments and calendar calibration. The reported "Conventional C14 Age" is the radiocarbon date of interest and was the value used to calculate the calendar equivalent age.

As always, if you have any specific questions, please do not hesitate to fax, e-mail, or call us.

Sincerely,

P.S. Please note the two new services for 1996; SEM analysis of carbon dated materials and the ADVANCE AMS analysis service with 14 day delivery (literature enclosed).

DATING RESULTS

Mr. Curtis J. Koger — June 30, 1995

Associated Earth Sciences, Inc. — July 31, 1995

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)

South Well Field TW-2
Drld by Holt - GeoEngineers onsite to supervise drlg.

Beta-83465 / 5720 +/- 70 BP -25.0* o/oo 5720 +/- 70* BP

SAMPLE #: W94036B -95'
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT: (charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

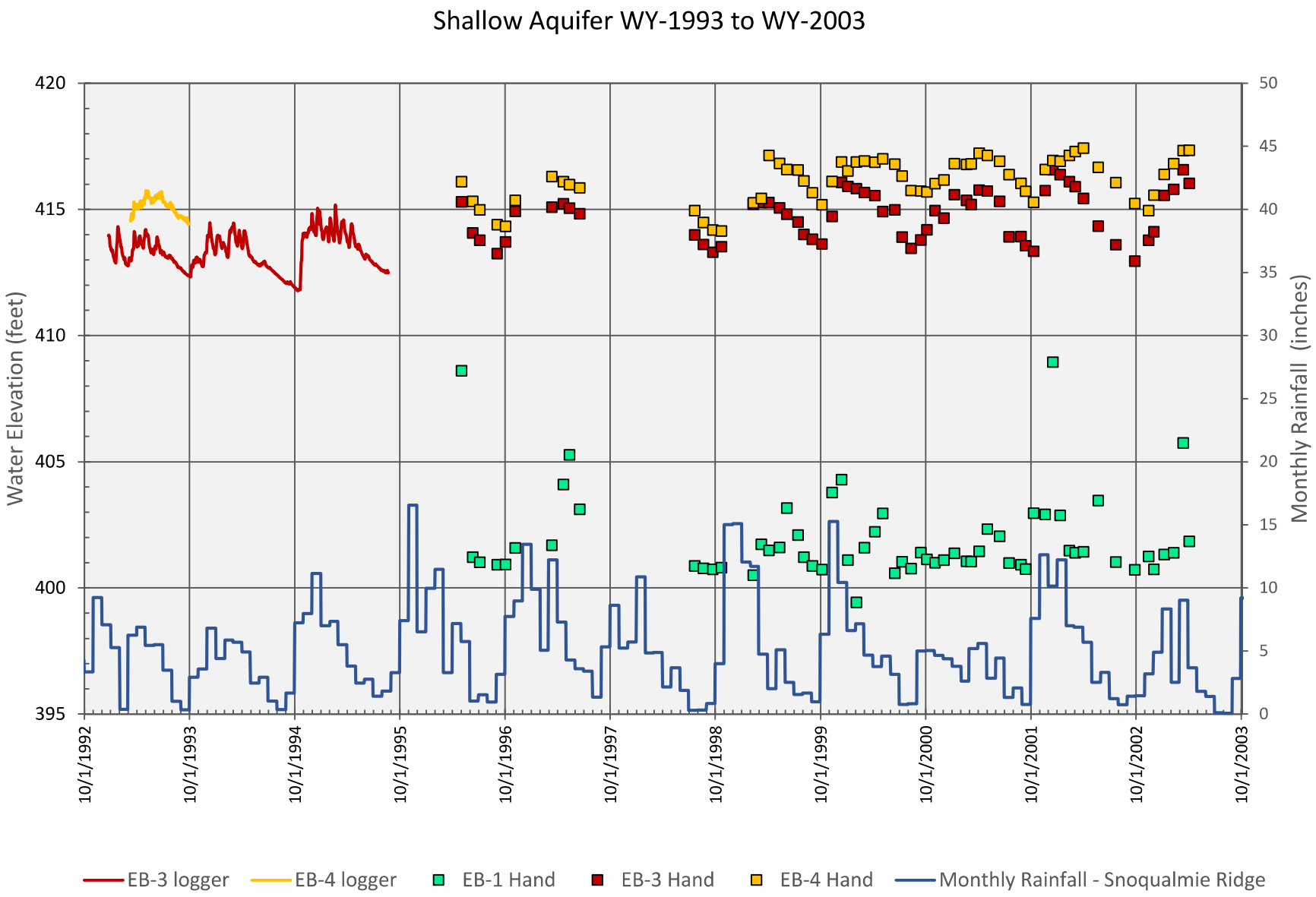
Dates are reported as RCYBP (radiocarbon years before present, "present"= 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards. Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 Age.

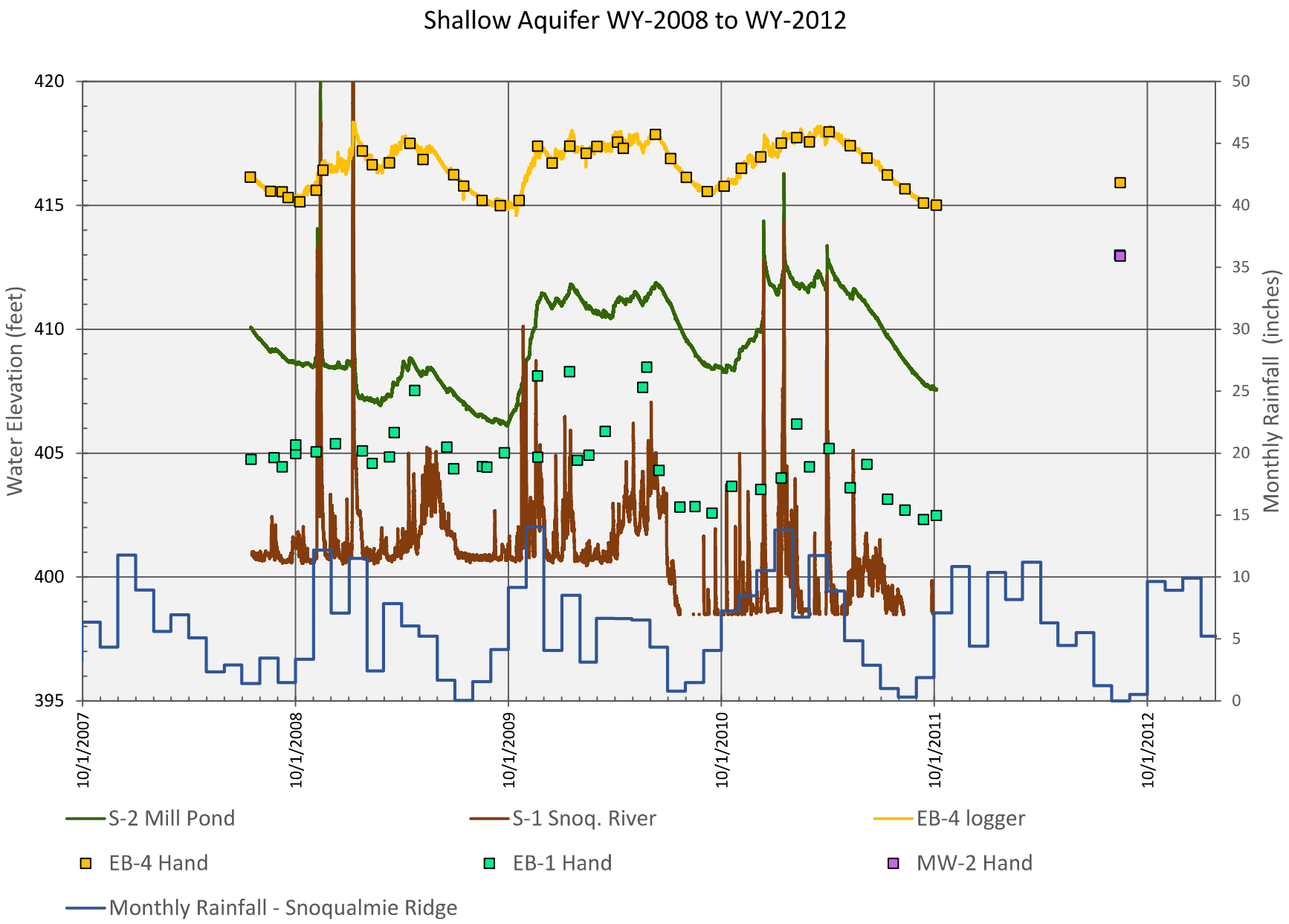
BETA ANALYTIC, INC
4985 SW 74TH COURT
MIAMI, FL 33155
Tel. 305-667-5167
FAX 305-663-0964
E-mail beta@analytic.win.net

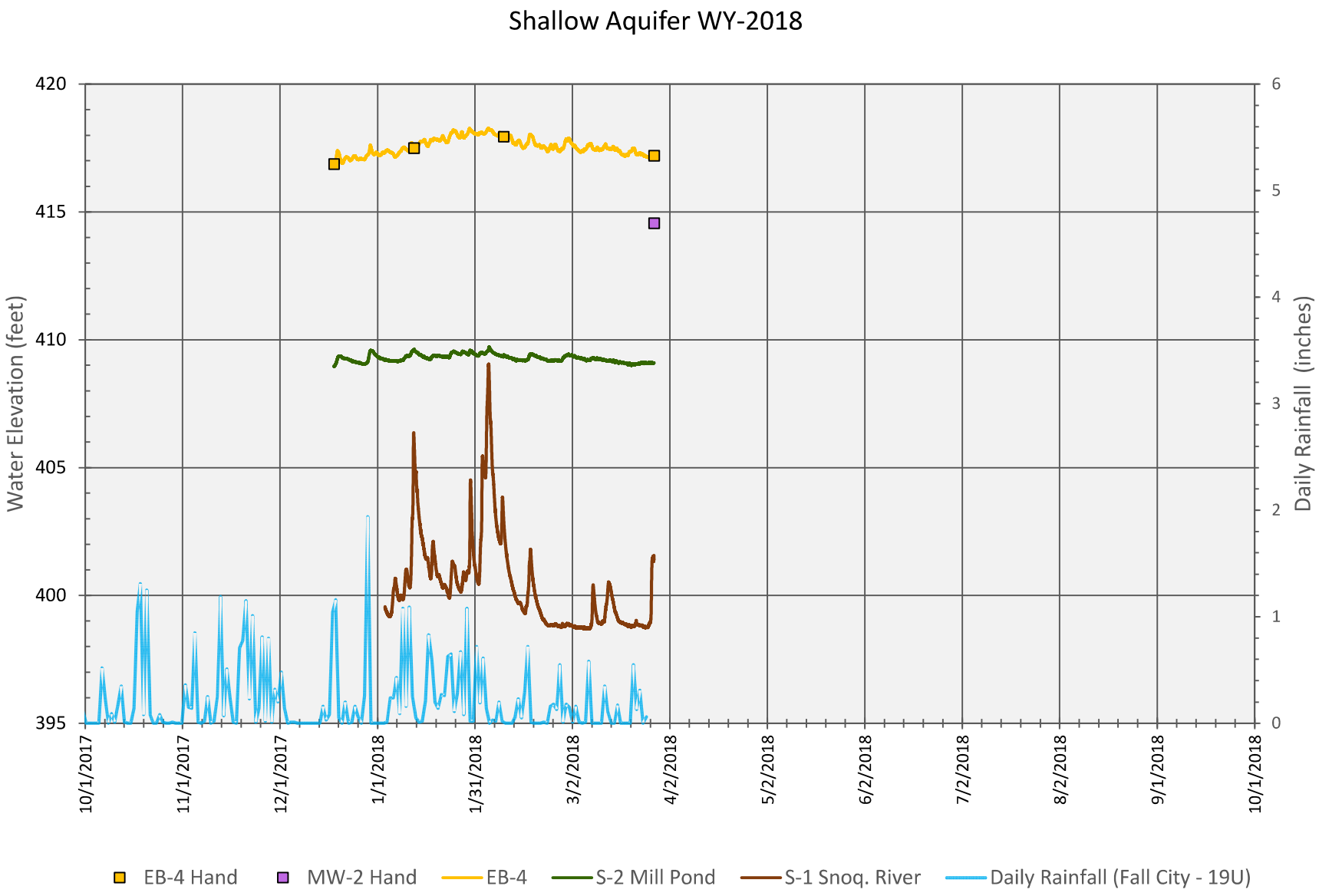
APPENDIX D

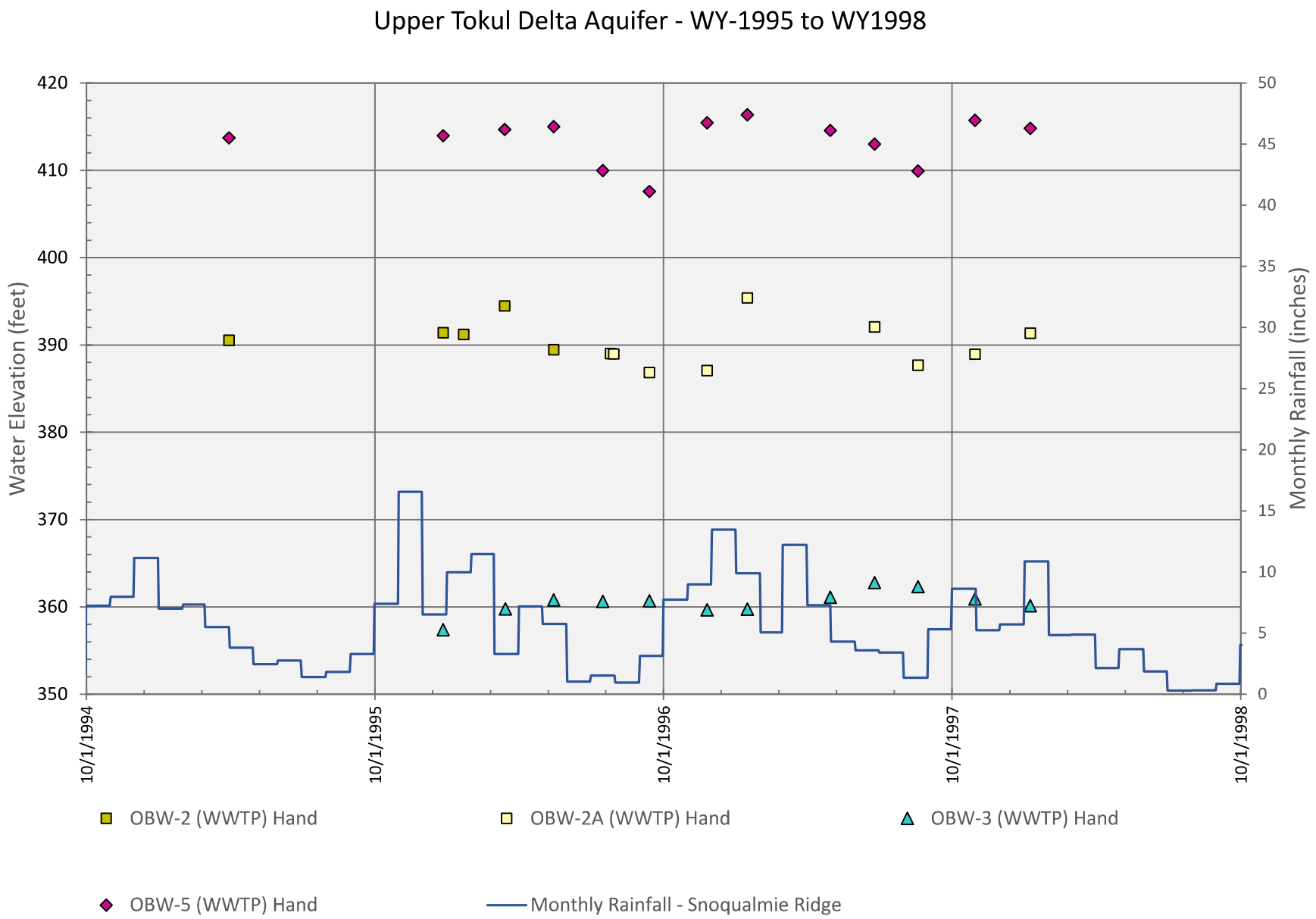
Water Level Monitoring Data

Well ID	Aquifer or Surface Water Body	Monitoring Start	Monitoring End	High Groundwater Elevation (ft)	High Groundwater Elevation Date
EB-1	Snoqualmie Shallow Aquifer	May-96 July-08	Apr-04 Oct-11	409.0	May-96
EB-2	Snoqualmie Shallow Aquifer	Mar-93	Apr-04	408.4	Jan-97
EB-3	Snoqualmie Shallow Aquifer	Mar-93	Apr-04	416.4	Jan-02
EB-4	Snoqualmie Shallow Aquifer	Mar-93 July-08 Dec-17	Apr-04 Oct-11 Current	418.0	Apr-11
MW-2	Snoqualmie Shallow Aquifer	Limited	Limited	414.6	Mar-18
EB-C1W	Tokul Creek Delta Aquifer	Feb-94	Current	268.0	Jul-97
OBW-1	Tokul Creek Delta Aquifer	July-91 Jan-94 June-02	Oct-92 Jan-95 Nov-11	305.0	May-11
OBW-2	Tokul Creek Delta Aquifer	Jul-91	Current	311.3	Mar-97
OBW-2 (WWTP)	Tokul Creek Delta Aquifer	Feb-95	May-96	394.5	Mar-96
OBW-2A (WWTP)	Tokul Creek Delta Aquifer	Jul-96	Jan-98	395.4	Jan-97
OBW-3 (WWTP)	Tokul Creek Delta Aquifer	Feb-95	Jan-98	362.8	Jun-97
OBW-5 (WWTP)	Tokul Creek Delta Aquifer	Feb-95	Jan-98	416.4	Jan-97
MW-3	Tokul Creek Delta Aquifer	Jul-02	Current	278.6	Jun-11
SS&G #3	Tokul Creek Delta Aquifer	Jan-94	Current	330.0	Feb-97
CITY	Deep Aquifer	Aug-91	Jun-05	385.6	Apr-96
CITY #2	Deep Aquifer	Apr-08	Mar-09	379.0	Feb-09
OBW-4	Deep Aquifer	Jan-10	Current	259.5	Mar-17
TW-5	Deep Aquifer	July-91 Jan-94 June-02	Oct-92 Jan-95 Nov-11	294.7	May-97
TW-6	Deep Aquifer	July-91 Jan-94 Jan-05	Jan-93 Aug-95 Feb-09	290.9	Feb-97
TW-7	Deep Aquifer	Sept-94 Jan-05	Aug-95 Feb-09	298.7	Mar-96
TW-8	Deep Aquifer	Oct-01 Jan-05	May-02 Feb-09	290.0	Mar-07
SG-1	Snoqualmie River	Jul-91	Oct-11	405.7	Jan-09
SG-2	Mill Pond	Jul-91	Oct-11	412.6	Apr-11

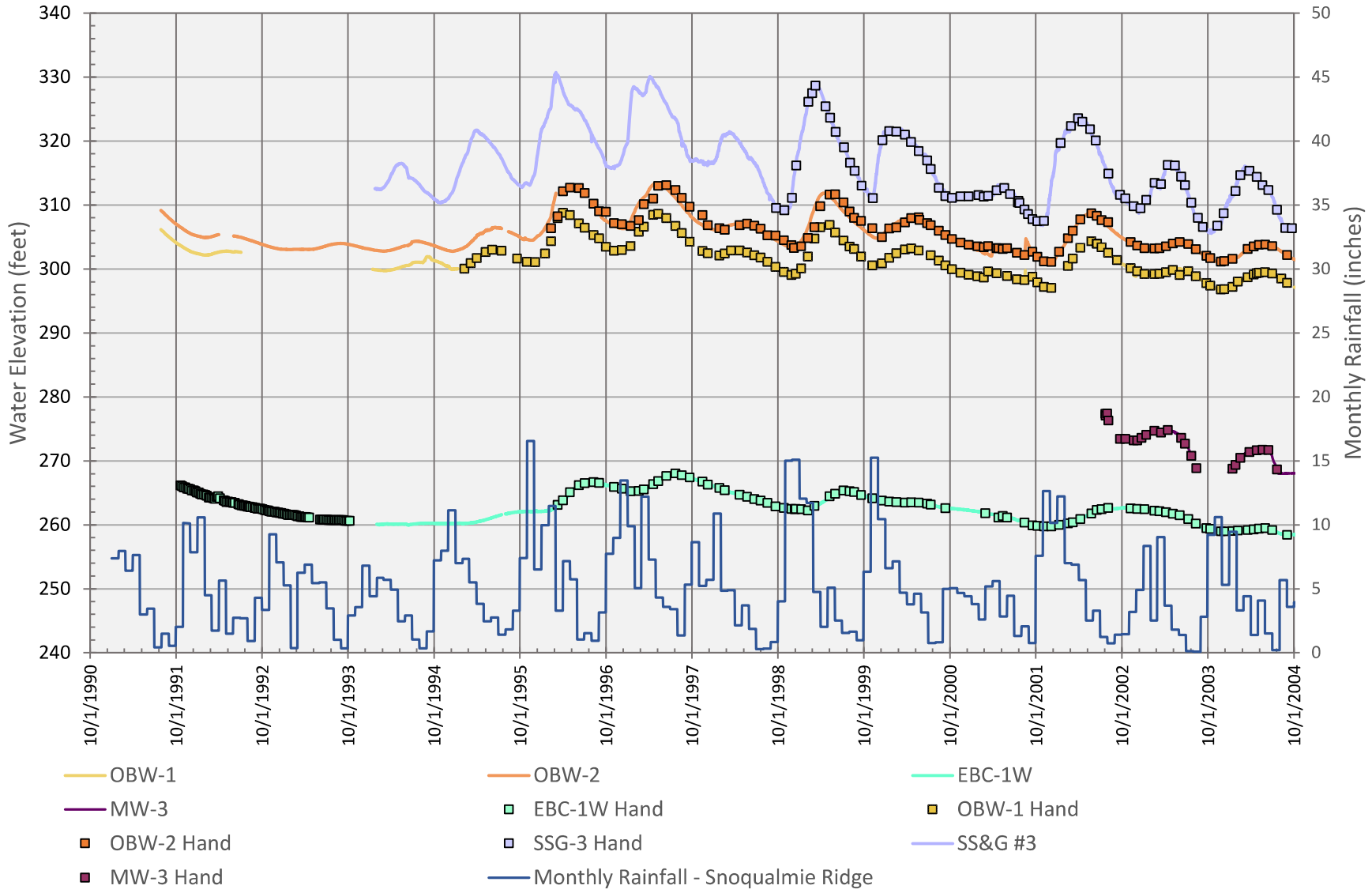

Shallow Aquifer WY-1993 to WY-2003
Water Elevation (feet)
Monthly Rainfall (inches)
420
415
410
405
400
395
50
45
40
35
30
25
20
15
10
5
0
10/1/1992
10/1/1993
10/1/1994
10/1/1995
10/1/1996
10/1/1997
10/1/1998
10/1/1999
10/1/2000
10/1/2001
10/1/2002
10/1/2003
EB-3 logger
EB-4 logger
EB-1 Hand
EB-3 Hand
EB-4 Hand
Monthly Rainfall - Snoqualmie Ridge


Shallow Aquifer WY-2008 to WY-2012
Water Elevation (feet)
Monthly Rainfall (inches)
420
415
410
405
400
395
50
45
40
35
30
25
20
15
10
5
0
10/1/2007
10/1/2008
10/1/2009
10/1/2010
10/1/2011
10/1/2012
S-2 Mill Pond
S-1 Snoq. River
EB-4 logger
EB-4 Hand
EB-1 Hand
MW-2 Hand
Monthly Rainfall - Snoqualmie Ridge

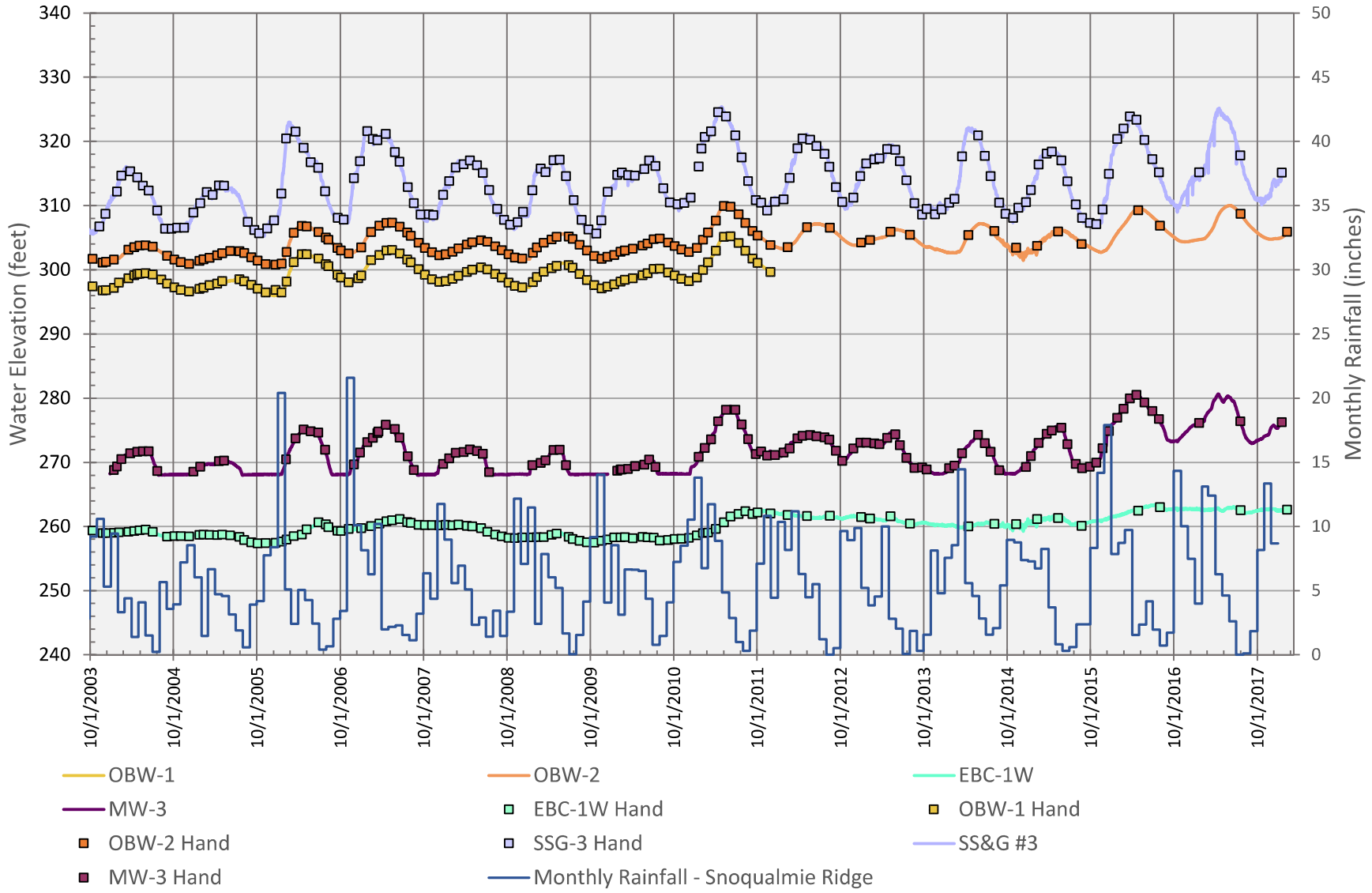

Shallow Aquifer WY-2018
Water Elevation (feet)
Daily Rainfall (inches)
420
415
410
405
400
395
6
5
4
3
2
1
0
10/1/2017
11/1/2017
12/1/2017
1/1/2018
1/31/2018
3/2/2018
4/2/2018
5/2/2018
6/2/2018
7/2/2018
8/2/2018
9/1/2018
10/1/2018
EB-4 Hand
MW-2 Hand
EB-4
S-2 Mill Pond
S-1 Snoq. River
Daily Rainfall (Fall City - 19U)

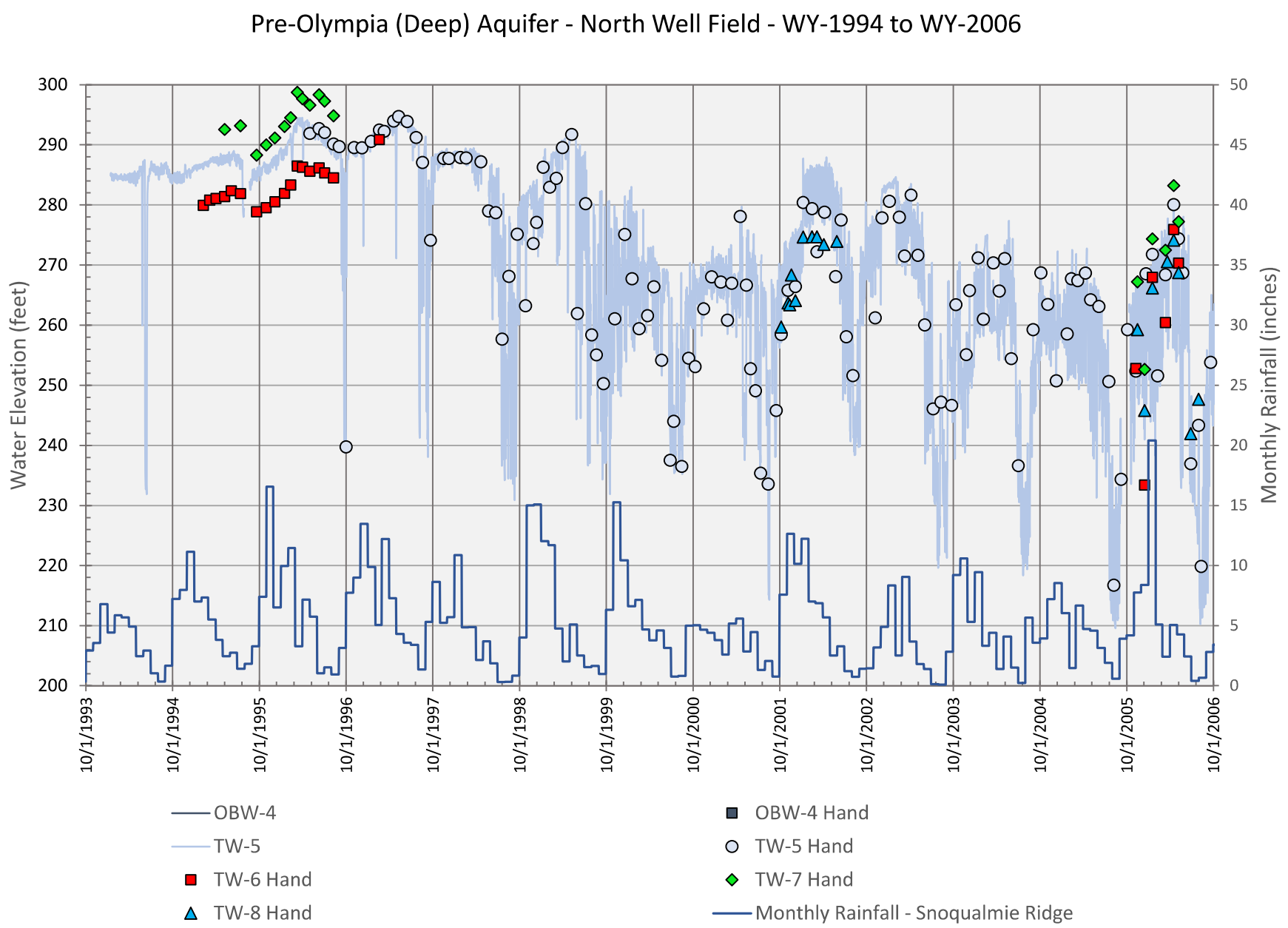

Upper Tokul Delta Aquifer - WY-1995 to WY1998
Water Elevation (feet)
Monthly Rainfall (inches)
420
410
400
390
380
370
360
350
50
45
40
35
30
25
20
15
10
5
0
10/1/1994
10/1/1995
10/1/1996
10/1/1997
10/1/1998
OBW-2 (WWTP) Hand
OBW-2A (WWTP) Hand
OBW-3 (WWTP) Hand
OBW-5 (WWTP) Hand
Monthly Rainfall - Snoqualmie Ridge

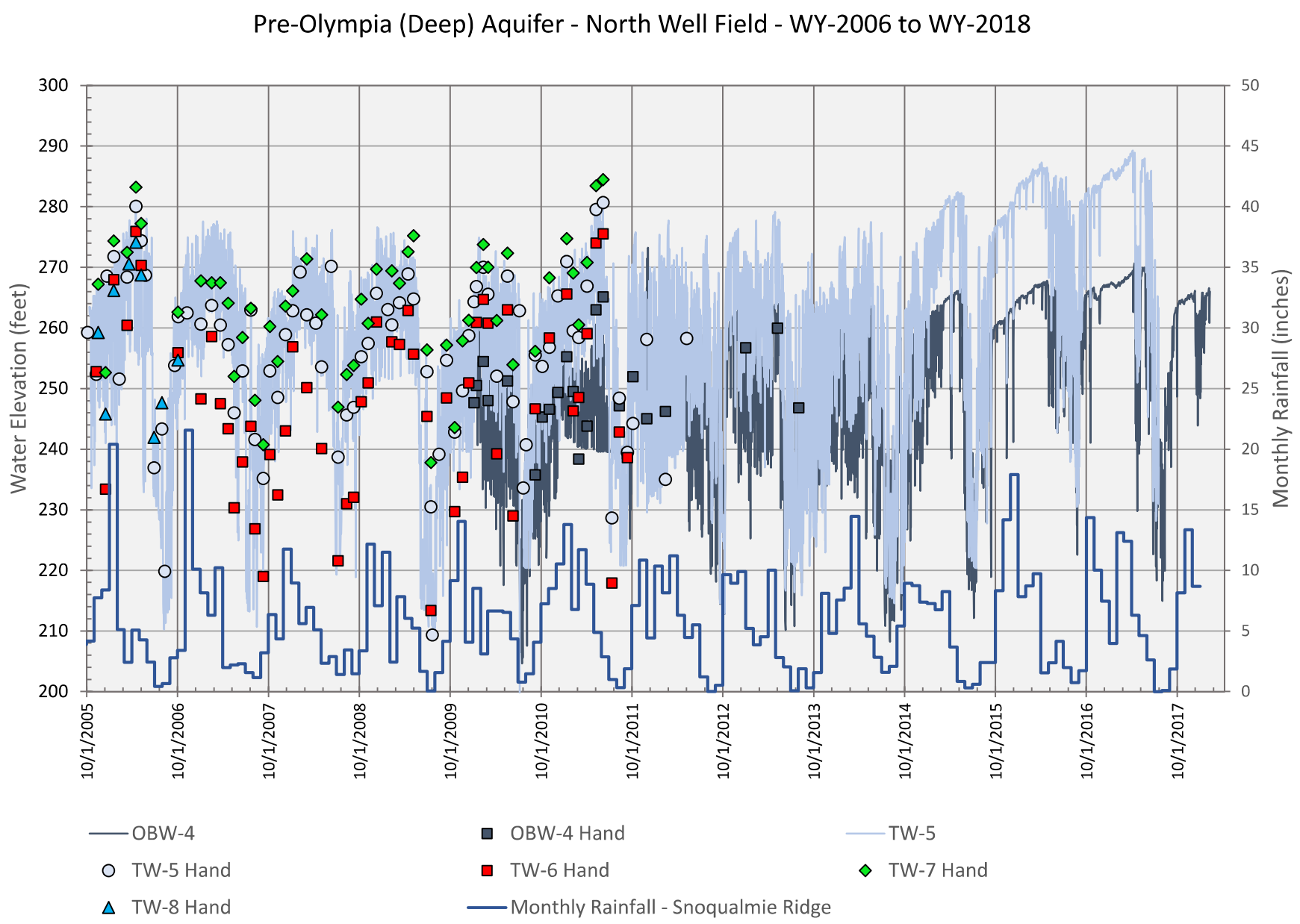
Lower Tokul Delta Aquifer - WY-1991 to WY-2004

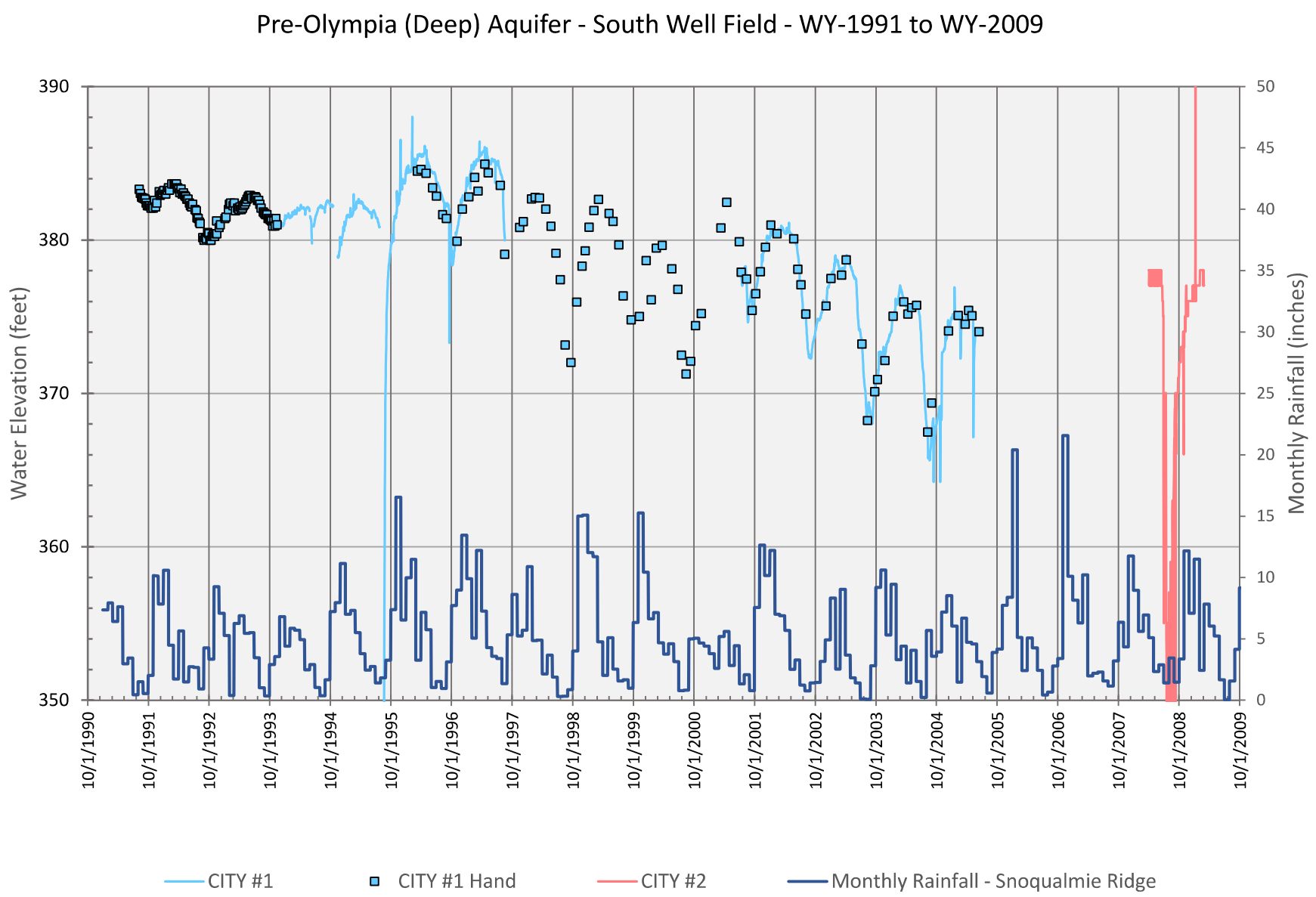


Lower Tokul Delta Aquifer - WY-2004 to WY-2018




Pre-Olympia (Deep) Aquifer - North Well Field - WY-1994 to WY-2006
Water Elevation (feet)
Monthly Rainfall (inches)
300
290
280
270
260
250
240
230
220
210
200
50
45
40
35
30
25
20
15
10
5
0
10/1/1993
10/1/1994
10/1/1995
10/1/1996
10/1/1997
10/1/1998
10/1/1999
10/1/2000
10/1/2001
10/1/2002
10/1/2003
10/1/2004
10/1/2005
10/1/2006
OBW-4
TW-5
TW-6 Hand
TW-8 Hand
OBW-4 Hand
TW-5 Hand
TW-7 Hand
Monthly Rainfall - Snoqualmie Ridge


Pre-Olympia (Deep) Aquifer - North Well Field - WY-2006 to WY-2018
Water Elevation (feet)
Monthly Rainfall (inches)
300
290
280
270
260
250
240
230
220
210
200
50
45
40
35
30
25
20
15
10
5
0
10/1/2005
10/1/2006
10/1/2007
10/1/2008
10/1/2009
10/1/2010
10/1/2011
10/1/2012
10/1/2013
10/1/2014
10/1/2015
10/1/2016
10/1/2017
OBW-4
OBW-4 Hand
TW-5
TW-5 Hand
TW-6 Hand
TW-7 Hand
TW-8 Hand
Monthly Rainfall - Snoqualmie Ridge

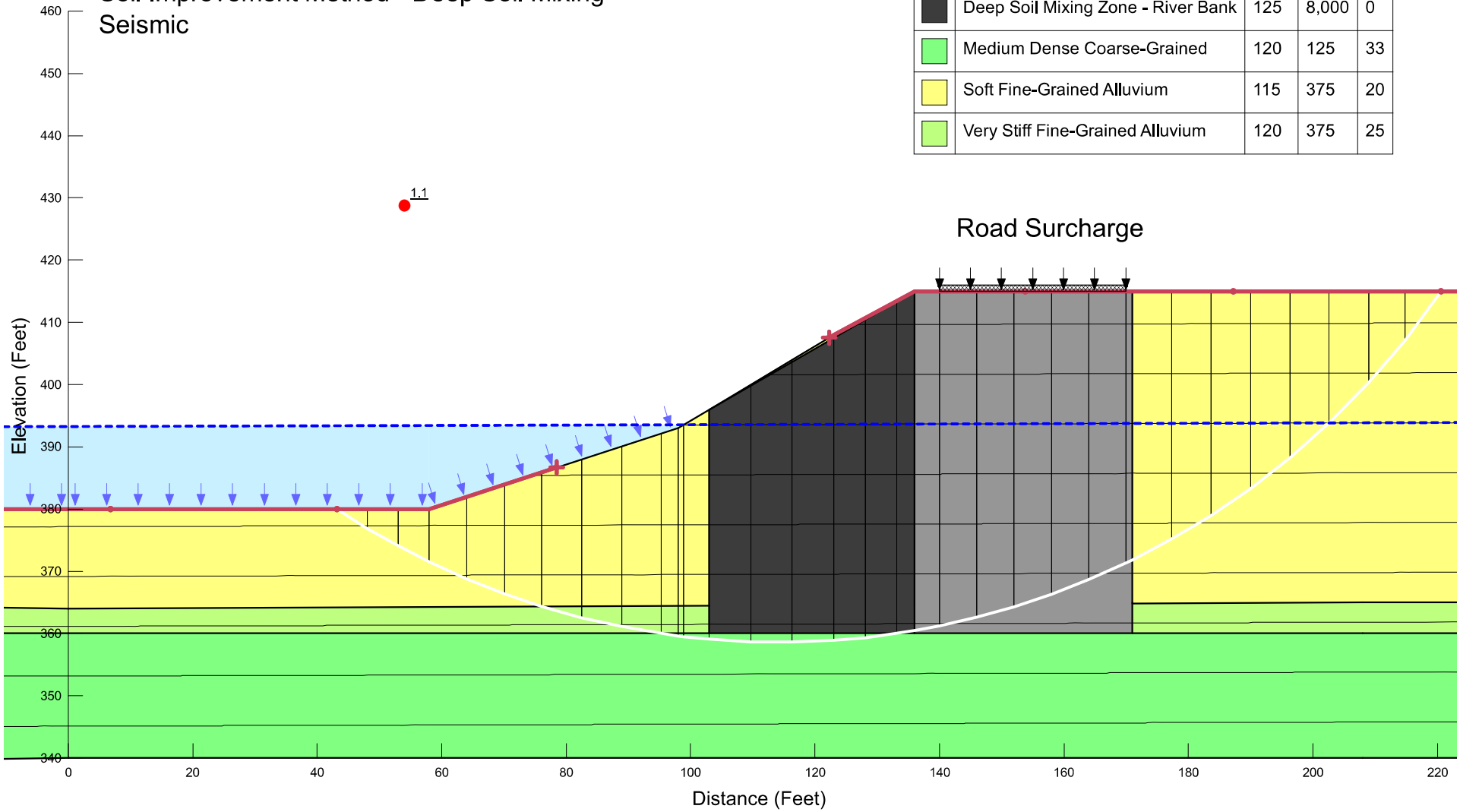

Pre-Olympia (Deep) Aquifer - South Well Field - WY-1991 to WY-2009
Water Elevation (feet)
Monthly Rainfall (inches)
390
380
370
360
350
50
45
40
35
30
25
20
15
10
5
0
10/1/1990
10/1/1991
10/1/1992
10/1/1993
10/1/1994
10/1/1995
10/1/1996
10/1/1997
10/1/1998
10/1/1999
10/1/2000
10/1/2001
10/1/2002
10/1/2003
10/1/2004
10/1/2005
10/1/2006
10/1/2007
10/1/2008
10/1/2009
CITY #1
CITY #1 Hand
CITY #2
Monthly Rainfall - Snoqualmie Ridge

APPENDIX E

Slope Stability Analysis

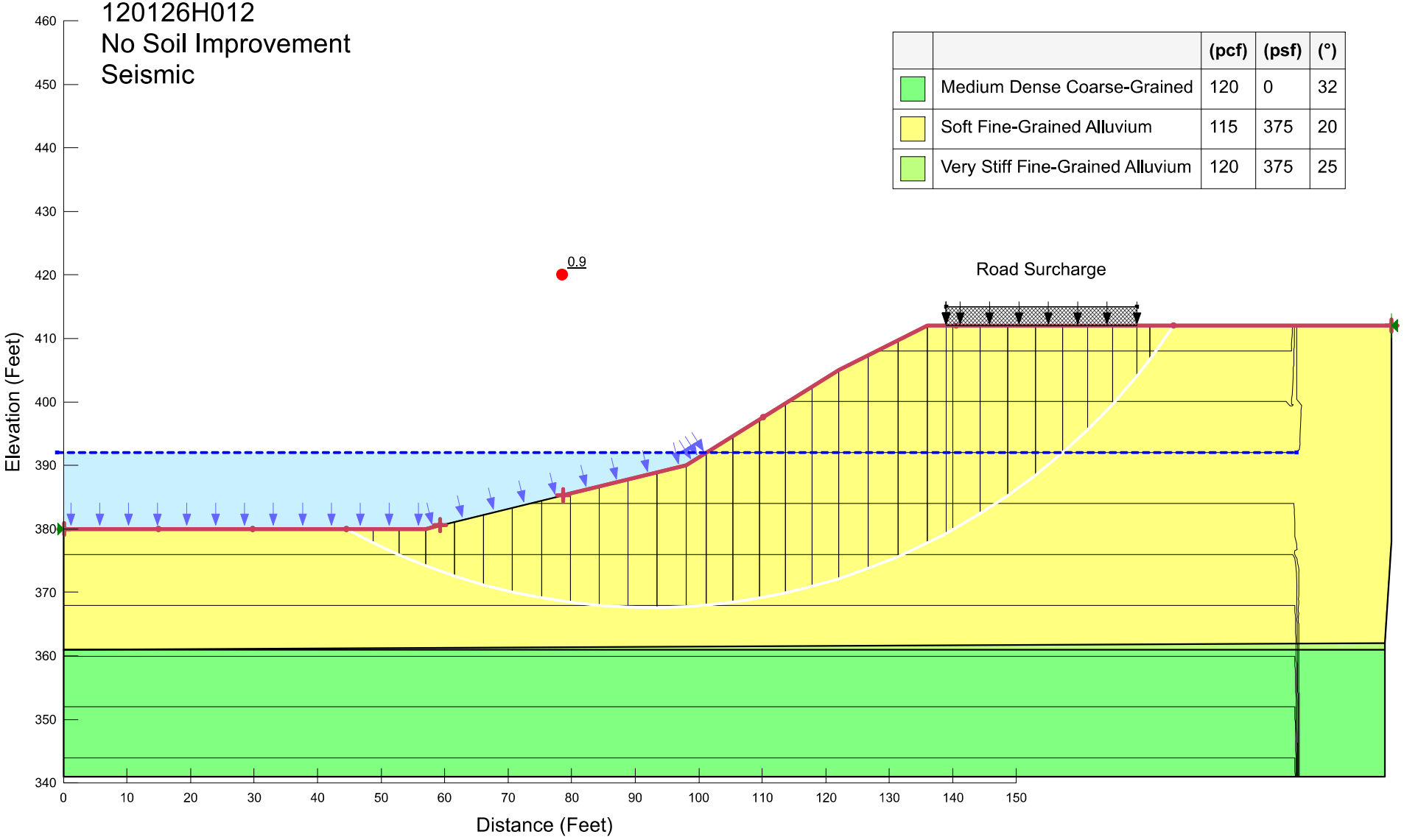
Snoqualmie Mill Site
120126H012
Soil Improvement Method - Deep Soil Mixing
Seismic

		(pcf)	(psf)	(°)
	Deep Soil Mixing Zone	125	800	0
	Deep Soil Mixing Zone - River Bank	125	8,000	0
	Medium Dense Coarse-Grained	120	125	33
	Soft Fine-Grained Alluvium	115	375	20
	Very Stiff Fine-Grained Alluvium	120	375	25



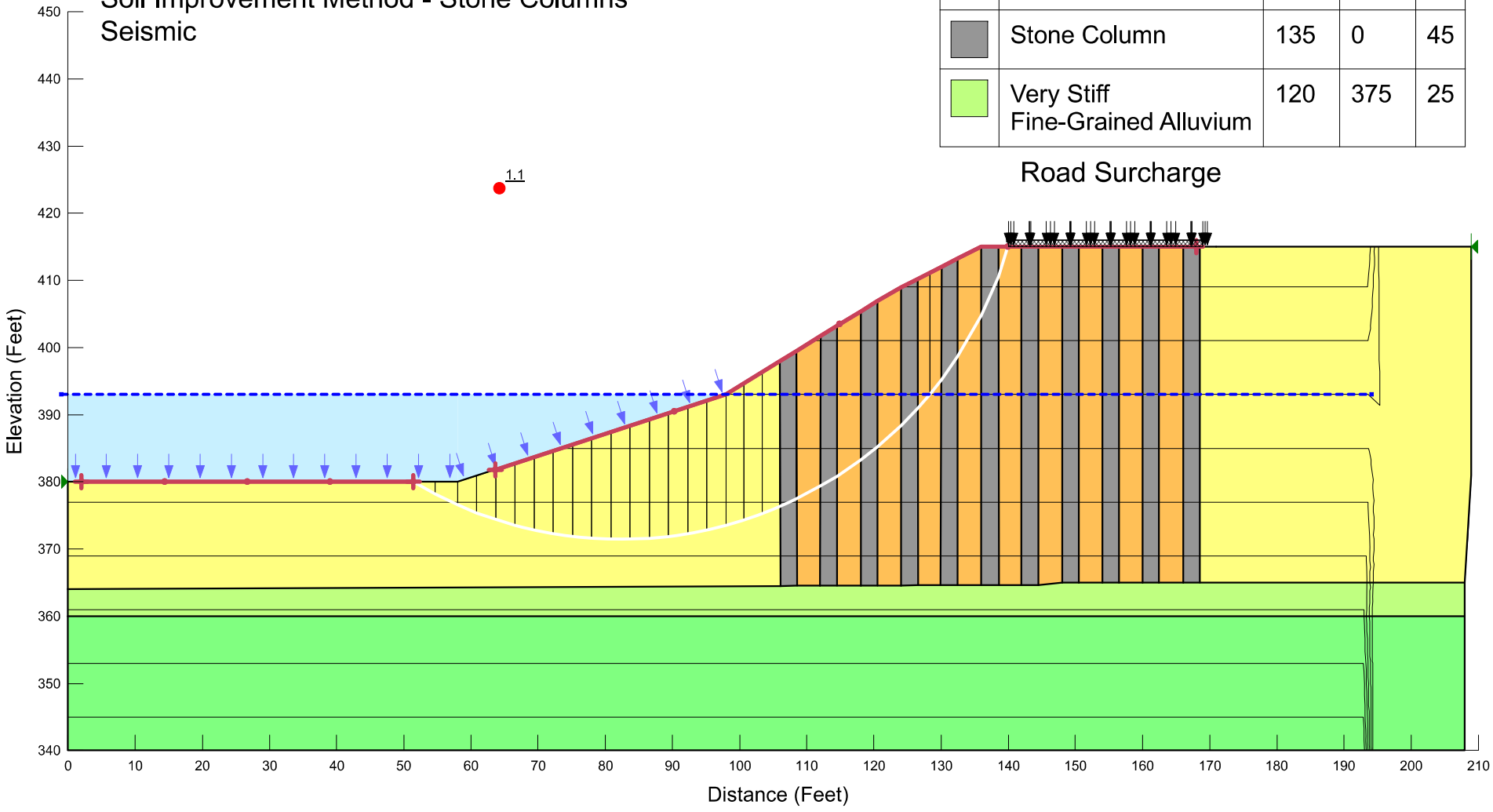
Snoqualmie Mill Site
120126H012
No Soil Improvement
Seismic

		(pcf)	(psf)	(°)
	Medium Dense Coarse-Grained	120	0	32
	Soft Fine-Grained Alluvium	115	375	20
	Very Stiff Fine-Grained Alluvium	120	375	25



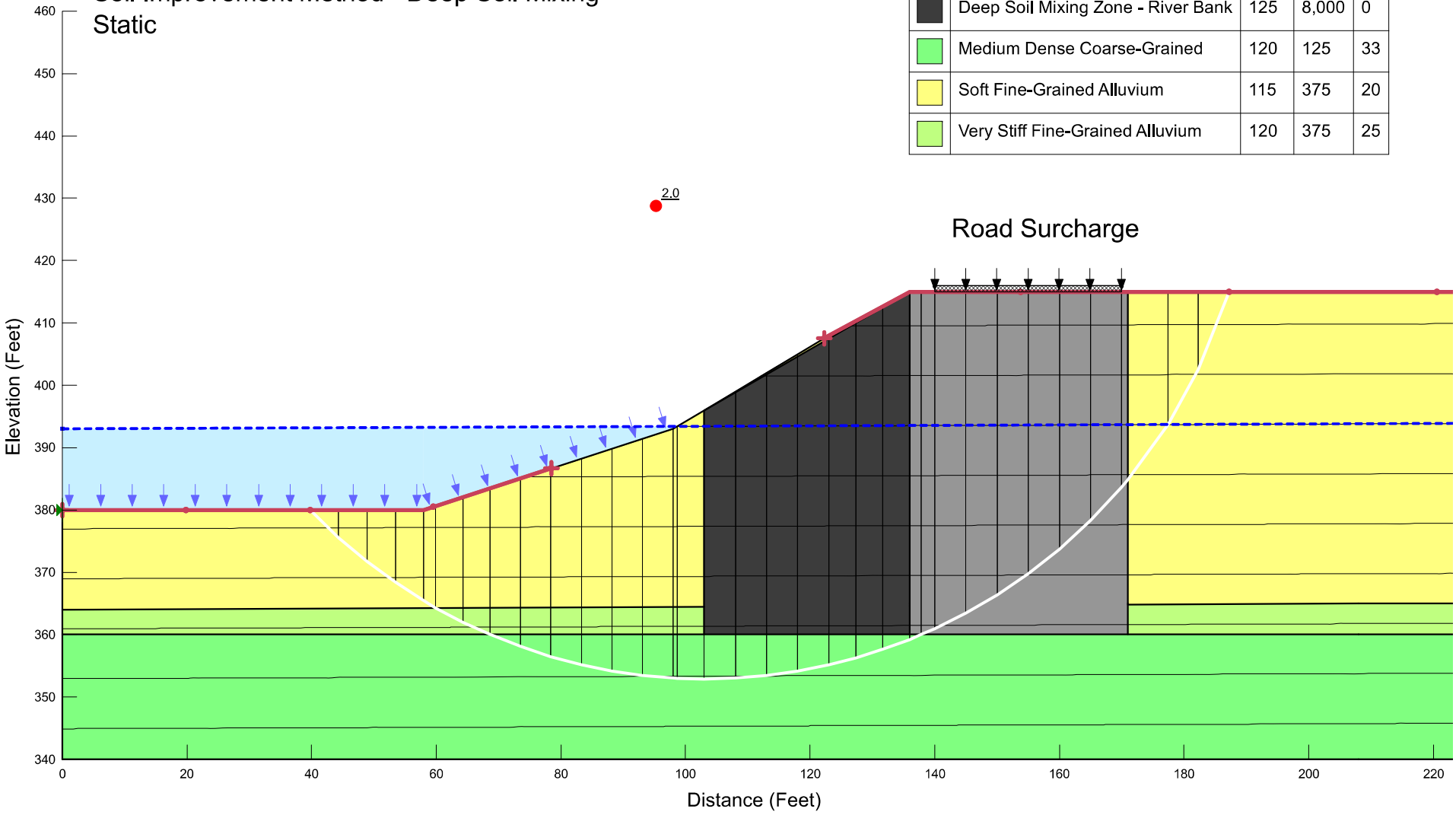
Snoqualmie Mill Site
120126H012
Soil Improvement Method - Stone Columns
Seismic

		(pcf)	(psf)	(°)
	Improved Alluvium	120	150	32
	Medium Dense Coarse-Grained	120	0	32
	Soft Fine-Grained Alluvium	115	375	20
	Stone Column	135	0	45
	Very Stiff Fine-Grained Alluvium	120	375	25



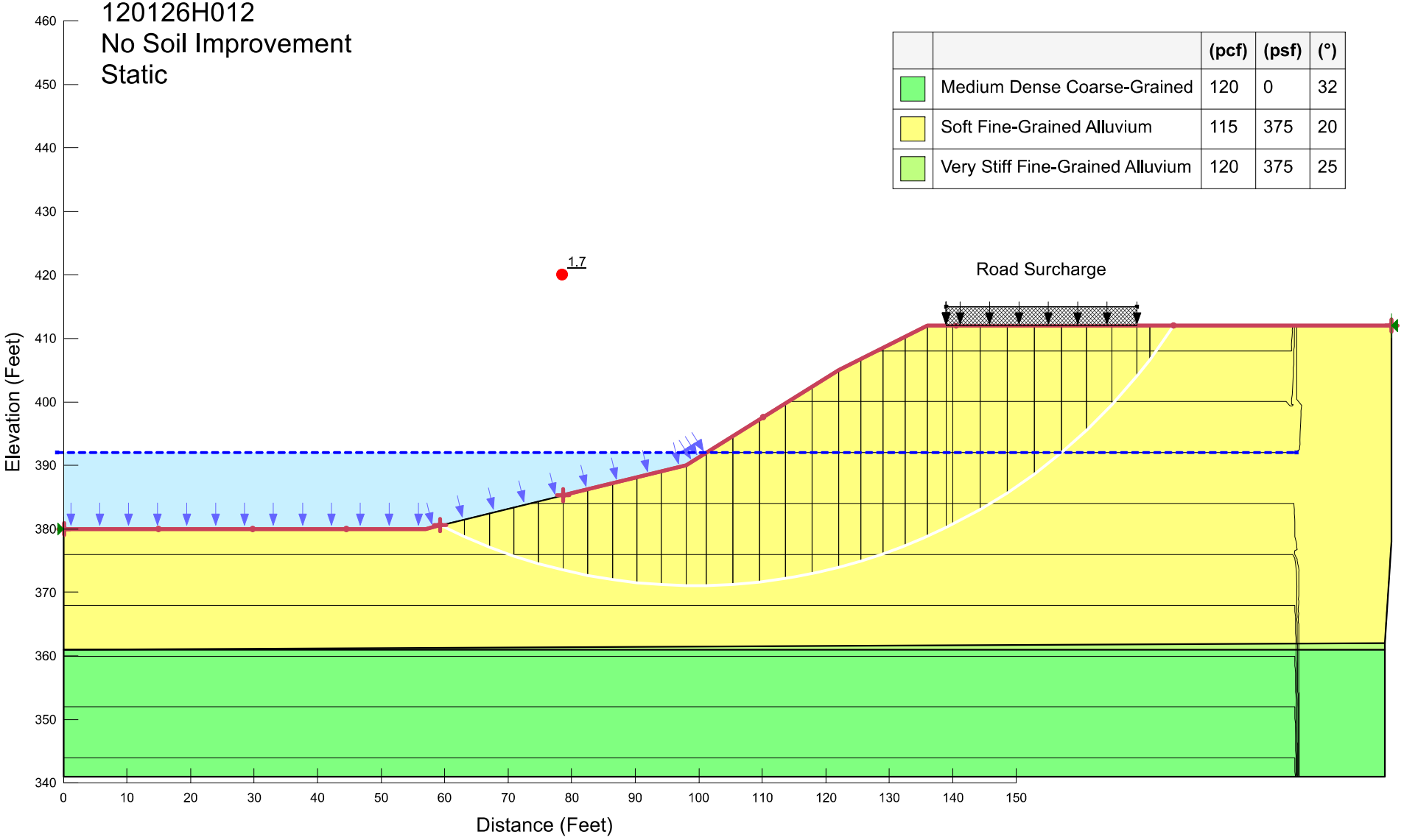
Snoqualmie Mill Site
120126H012
Soil Improvement Method - Deep Soil Mixing
Static

		(pcf)	(psf)	(°)
	Deep Soil Mixing Zone	125	800	0
	Deep Soil Mixing Zone - River Bank	125	8,000	0
	Medium Dense Coarse-Grained	120	125	33
	Soft Fine-Grained Alluvium	115	375	20
	Very Stiff Fine-Grained Alluvium	120	375	25



Snoqualmie Mill Site
120126H012
No Soil Improvement
Static

		(pcf)	(psf)	(°)
	Medium Dense Coarse-Grained	120	0	32
	Soft Fine-Grained Alluvium	115	375	20
	Very Stiff Fine-Grained Alluvium	120	375	25



Snoqualmie Mill Site
120126H012
Soil Improvement Method - Stone Columns
Static

		(pcf)	(psf)	(°)
	Improved Alluvium	120	150	32
	Medium Dense Coarse-Grained	120	0	32
	Soft Fine-Grained Alluvium	115	375	20
	Stone Column	135	0	45
	Very Stiff Fine-Grained Alluvium	120	375	25

