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April 11, 2022
Updated May 18, 2023

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Preliminary Geotechnical Engineering Report
Proposed Residential Plat
Summit Pointe Plat
Gig Harbor, Washington
PN: 0122253072, 0122253074, & 0122254092
Doc ID: Rush.SummitPointePlat.RG

INTRODUCTION

This *Geotechnical Engineer Report* summarizes our site observations, subsurface explorations, and provides geotechnical conclusions and recommendations for the proposed Summit Pointe residential plat to be located at 6302 – 112th Street in Gig Harbor, Washington. The general location of the site is shown on the attached Site Location Map, Figure 1. ***This updated report addresses comments by the City dated May 16, 2023 seeking clarification regarding grain size analyses interpolations and stormwater infiltration rates.***

Our understanding of the project is based on our email correspondences, review of the *Preliminary Site Plan* Prepared by Larson and Associates dated October 6, 2021, our November 10, 2021 and January 17, 2022 site visits and subsurface explorations, our experience in the area, and our understanding of the City of Gig Harbor critical areas and site development ordinances. We understand the site is a reclaimed aggregate quarry that is currently undeveloped. We further understand that you propose to develop the site with a 56-lot residential plat with a stormwater pond and a private road providing access from 112th Street South. We anticipate that the new residences will be wood framed, one to two story structures, founded on conventional shallow foundations. The proposed development is shown on the Site & Exploration Plan, Figure 2.

Because of the height and inclination of slopes across and/or adjacent to the site, we anticipate that the City of Gig Harbor will require a Critical Areas assessment in accordance with the Gig Harbor Municipal Code (GHMC) Title 18 Section 18.08.190. The City of Gig Harbor also requires a soils report to address the feasibility of infiltration of stormwater for the proposed development. According to the current plan, the proposed site development will include a stormwater infiltration pond or vault in the northeast corner of the plat. The pond will be within the original limits of the

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former Sunrise Pit and within 50 feet of the slope down toward McCormick Creek to the east. This report addresses the critical areas code, the stormwater code, and provides geotechnical design recommendations, including the feasibility for the site soils to support infiltration and stability for placing the pond within 300 feet of a potential erosion hazard area.

SCOPE

The scope of our services was to evaluate the surface and subsurface conditions across the site as a basis for developing geotechnical recommendations and conclusions. Specifically, the scope of services included the following.

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring subsurface conditions across the site by excavating a 14 test pits at selected locations across the site;
3. Monitoring the drilling of three borings to depths of 31½ to 41½ feet below existing grades at the site using a track mounted drill rig, operated by a licensed driller and completing two of the borings as groundwater observation wells;
4. Describing surface and subsurface conditions, including soil type, depth to groundwater, and an estimate of seasonal high groundwater levels;
5. Monitoring groundwater levels within the wells through the remainder of the wet season on a twice per month basis, if infiltration is feasible;
6. Performing slope stability analyses using the computer program Slide2 by RocScience to assess the global stability of the existing and proposed conditions at the site, including the proposed stormwater pond and embankment;
7. Addressing the Gig Harbor Municipal Code (GHMC) Title 18 Section 18.08.190 for Hillside, Ravine Sidewalls, and Bluffs, as well as potential landslide and erosion hazards;
8. Providing geotechnical conclusions and recommendations regarding site grading activities, including site preparation, subgrade preparation, fill placement criteria, suitability of on-site soils for use as structural fill, temporary and permanent cut slopes and drainage and erosion control measures;
9. Providing recommendations for shallow foundations and floor slab support and design criteria, including bearing capacity and subgrade modulus as appropriate;
10. Providing geotechnical conclusions regarding the use of subgrade walls, including lateral earth pressures and applicable seismic surcharges;
11. Providing our opinion about the feasibility onsite infiltration in accordance with the City of Gig Harbor Stormwater Management and Site Development Manual (GHSWMSDM), including preliminary design infiltration rate based on grain size data;
12. Performing in-situ infiltration testing using the Small-Scale PIT method, once the preliminary storm drainage system has been designed;
13. Providing geotechnical conclusions and recommendations regarding site preparation, subgrade preparation, fill placement criteria, suitability of on-site soils for use as structural fill, temporary and permanent slopes, and drainage and erosion control measures;

14. Preparing this written *Geotechnical Engineering Report* summarizing our site observations and conclusions, and our geotechnical recommendations and design criteria, along with the supporting data.

Our work was completed in general accordance with our *Proposal for Geotechnical Engineering Report* dated November 2, 2021. We received written authorization to proceed on November 10, 2021. Items in italics have not been completed the time of preparing this primary report.

SITE CONDITIONS

Surface Conditions

The site consists of three tax parcels located along 112th Street in Gig Harbor, Washington: one parcel north of the street and two contiguous parcels south of the street. The site is partially located in the former Sunrise Pit sand and gravel mine that has been reclaimed. When combined, the parcels encompass 16.71 acres. The northern parcel measures about 740 feet wide (east to west) by 700 to 940 feet long (north to south). The two southern parcels, when combined, measure about 400 to 720 feet wide (east to west) by about 140 feet long (north to south). The site is bounded by existing residential development to the south and west, a stormwater tract to the north, and undeveloped land to the east.

The site is located on the eastern margin of a glacial upland area that slopes down to the east towards the McCormick Creek drainage and Highway 16. The ground surface in the northern parcel site slopes down from approximately the western property boundary to the east at about 40 percent and vertical relief of up to about 50 feet. We understand the western slope is a cut slope associated with previous mining activity at the site. The ground surface flattens to less than 5 percent and horizontal distance of about 615 feet across most of the northern parcel. The ground surface in the northeastern portion of the parcel slopes up at 30 to 40 percent and vertical relief of about 6 to 15 feet towards the eastern property boundary. Offsite and to the northeast, the ground surface slopes down to the east at 22 to 42 percent and vertical relief of approximately 150 feet towards McCormick Creek. The offsite slope to the northeast appears to be a natural slope. Offsite and to the southeast, the ground surface slopes down to the east at 30 to 40 percent and vertical relief of approximately 60 feet. The offsite slope to the southeast appears to be a cut slope associated with mining activity.

The ground surface in the southern parcel slopes down to the east at about 20 to 30 percent and vertical relief of approximately 30 feet, then flattens to less than 5 percent for a horizontal distance of 300 to 350 feet. The eastern portion of the southern parcel slopes down to the northeast at 28 to 60 percent and vertical relief of 25 to 35 feet towards 112th Street. The total topographic relief across the southern portion of the site is on the order of 80 feet. Existing topography is shown on the Site & Exploration Plan, Figure 2. The site conditions prior to final reclamation are shown on the Site Vicinity Map, Figure 3.

Vegetation across the site generally consists of unmaintained grass and scotch broom. The offsite slope to the northeast is vegetated with mixed forest and a moderate understory of salal, ferns, and other low growing plants. Standing water was observed in a stormwater pond in the northeast portion of the site and scattered shallow puddles in the flat portion of the site. No seepage was

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observed along the face of the slopes at the time of our site reconnaissance. A portion of the western slope about 20 feet wide was surfaced with quarry spalls. No evidence of active or ongoing erosion or landslide activity was observed at the time of our site visit.

Site Soils

The USDA Natural Resource Conservation Service (NRCS) Web Soil Survey maps most of the site as being underlain by Harstine gravelly ashy sandy loam (16B and 16C) and Indianola loamy sand (18C) soils. The eastern portion of the southern parcel is mapped as underlain by Kitsap/Indianola complex (21F) soils. An excerpt of the NRCS map for the site vicinity is attached as Figure 4.

- *Harstine gravelly ashy sandy loam (16B and 16C)*: The Harstine soils are derived from sandy glacial till and are included in hydrologic soils group "C". The Harstine 16B soils form on slopes of 0 to 6 percent and are considered to have a "slight" erosion hazard. The Harstine 16C soils form on slopes of 6 to 15 percent and are considered to have a "moderate" erosion hazard when exposed. Table 4 of the Soil Conservation Service *Soil Survey for Pierce County* lists the Harstine 16B soils as having a "slight" hazard for wetness, while the Harstine 16C soils as having a "moderate" hazard for slopes and wetness for residences without basements,
- *Indianola loamy sand (18C)*: The Indianola (18C) soils are derived from sandy glacial outwash, form on slopes of 6 to 15 percent, are listed as having a "moderate" erosion hazard and are included in hydrologic soils group "A". Table 4 of the Soil Conservation Service *Soil Survey for Pierce County* lists the Indianola loamy sand 18C soils as having a "moderate" hazard for slopes,
- *Kitsap/Indianola complex (21F)*: The Kitsap/Indianola complex (21F) is derived from glacial lake deposits, forms on slopes of 45 to 70 percent, are considered to have a "severe" erosion hazard and are included in hydrologic soils group "C/D". Table 4 of the Soil Conservation Service *Soil Survey for Pierce County* lists the Kitsap/Indianola complex 21F soils as having a "severe" hazard for slopes and wetness for residences without basements. No development is proposed in the area underlain by these soils.

Site Geology

The draft *Geological Map of the Gig Harbor 7.5-minute Quadrangle, Washington* (*Troost, K.G., Booth, D.B., and Wells, R.E.*) maps the site as being underlain by glacial till (Qgt) and advance outwash (Qva). Recessional outwash (Qvr) is mapped nearby to the east. These glacial soils were deposited during the Vashon Stade of the Fraser Glaciation approximately 12,000 to 15,000 years ago. An excerpt of the above referenced map is included as Figure 5. Detailed descriptions of the mapped geologic units are included below.

- *Recessional Outwash (Qvr):* The recessional outwash typically consists of poorly sorted, lightly stratified mixture of sand and gravel that may contain localized deposits of clay and silt that were deposited by meltwater streams emanating from the retreating ice mass. The recessional outwash is considered normally consolidated and exhibits moderate strength and compressibility characteristics where undisturbed. The infiltration potential of recessional outwash is generally favorable.

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- *Glacial Till (Qgt):* The glacial till typically consists of a heterogeneous mixture of clay, silt, sand and gravel that was deposited and overridden by the continental ice mass. As such, the glacial till is considered over-consolidated and exhibits high strength and low compressibility characteristics where undisturbed. The infiltration potential of glacial till is generally limited.
- *Advance Outwash (Qva):* Advance outwash typically consists of poorly stratified mixtures of sand and gravel that were deposited by meltwaters emanating from the advancing continental ice mass and was subsequently over-ridden. Advance outwash is considered over-consolidated and exhibits high strength and low compressibility characteristics where undisturbed. The infiltration potential of advance outwash soils is generally moderate to favorable, depending on grain size distribution.

The referenced map does identify a large landslide south and east of the site. Given the size and location of the mapped landslide, it appears to be typical of a prehistoric failure associated with the glacial retreat and "unloading" at the end of the Vashon Stade of the Fraser Glaciation. No other mass-wasting deposits or alluvial fans are identified on the map within the vicinity of the site.

The Washington Department of Natural Resources Landslide Inventory map indicates that local portions of the onsite slopes and offsite slopes to the east have a "moderate" to "high" susceptibility for shallow landslides. Portions of the slope offsite to the east are mapped having a "moderate" susceptibility for deep landslides. No areas of active or historic landslides are mapped on or within 300 feet of the site from the DNR susceptibility map. A copy of the Washington DNR Landslide Inventory Map is included as Figure 6.

Subsurface Explorations

On November 10, 2021, we visited the site and monitored the drilling of three borings, two of which were completed as groundwater observation wells. We returned on January 17, 2022 and monitored the excavation of 14 test pits.

The subsurface explorations performed as part of this preliminary evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun. The approximate locations and numbers of our explorations are shown on the attached Site & Exploration Plan, Figure 2. The indicated locations were determined by taping or pacing from existing site features and reference points; as such, the locations should only be considered as accurate as implied by the measurement method. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our test pits and borings are included as Figures A-2 through A-4.

Test Pit Explorations:

The test pits were excavated by a medium sized track-mounted excavator, operated by a licensed earthwork contractor working for GeoResources. The specific number, locations, and depths of our explorations was based on the configuration of the proposed development and stormwater system and was adjusted in the field based on consideration for underground utilities, existing site conditions, site access limitations and encountered stratigraphy. Representative soil samples obtained from the explorations were placed in sealed plastic bags and then taken to our laboratory for further examination and testing as deemed necessary. Soil densities presented on the logs were based on the difficulty of excavation and our experience. We also correlated density stated on the test pit logs to the SPT values obtained in our borings. After completion, the test pits were backfilled with the excavated soils and bucket tamped but were not otherwise compacted.

Hollow Stem Auger Borings:

Our three borings were drilled by a licensed drilling contractor working for GeoResources. Two of the borings were completed as groundwater monitoring wells. During drilling, soil samples were obtained at 2½ and 5-foot depth intervals in accordance with Standard Penetration Test (SPT) as per the test method outlined by ASTM D1586. The SPT method consists of driving a standard 2 inch-diameter split-spoon sampler 18 inches into the soil with a 140-pound hammer. The number of blows required to drive the sampler through each - inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or “SPT blow count”. If a total of 50 blows for any 6-inch interval is reached, refusal is called and the blow counts are recorded as 50 for the actual distance driven. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils. Table 1 below summarizes the approximate functional locations, surface elevations, and termination depths of our explorations.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS AND DEPTHS OF EXPLORATIONS

Exploration Number	Functional Location	Surface Elevation[1] (feet)	Termination Depth (feet)	Termination Elevation[1] (feet)
B-1/MW-1	West of existing pond	235	31½	203½
B-2/MW-2	East of existing pond	240	41	199
B-3	Center of proposed "Tract B"	238	31½	206½
TP-1	East of lot 29	240	16	224
TP-2	Front of lot 30	242	16	226
TP-3	Front of lot 23	239	16	223
TP-4	Corner of lots 50, 51, 52	244	15	229
TP-5	Front of lot 34	248	15	233
TP-6	Border of lots 37 and 38	254	15	239
TP-7	SW corner of lot 55	250	15	235
TP-8	Border of 46 and 47	246	15	231
TP-9	Border of lots 18 and 19	242	15	227
TP-10	Eastern edge of lot 15	247	15	232
TP-11	Front of lot 12	252	15	237
TP-12	Center of lot 2	254	11	243
TP-13	Border of lots 4 and 5	262	12	250
TP-14	Border of lots 7 and 8	272	14	258

Notes:
1 = Elevations interpolated from contours on the *Preliminary Site Plan* by Larson and Associates (datum NAVD 88) dated January 26, 2021

Subsurface Conditions

At the locations of our borings and test pits, we encountered uniform subsurface conditions that, in our opinion, confirmed the mapped stratigraphy. In our borings and test pits we encountered 0 to ½ foot of topsoil/duff that mantled about 5 to 16 feet of previously placed fill. The fill consisted of structural fill placed as part of the mine reclamation. GeoResources monitored placement of the fill, which was required to be compacted to at least 90 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D 1557).

Underlying the fill, our borings encountered a medium dense to dense sand and gravel with varying amounts of silt that we interpret to be advance outwash, consistent with the material mined from the former Sunrise Pit. The outwash was encountered to the full depth explored in all three of our borings. Encountered thickness, depths, and elevations of various soil types encountered across the site are summarized below in Table 2.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF ENCOUNTERED SOIL TYPES

Exploration Number	Thickness of Topsoil (feet)	Thickness of Fill (feet)	Thickness of Recessional Outwash (feet)	Depth to Advance Outwash (feet)	Elevation of Advance Outwash
MW-1/B-1	0	13	0	13	223
MW-2/B-2	0	5	13	18	222
B-3	½	12	0	12	226
TP-1	0	12	0	12	228
TP-2	¼	9¾	0	10	232
TP-3	¼	>15	NE	NE	NE
TP-4	0	>15	NE	NE	NE
TP-5	0	>15	NE	NE	NE
TP-6	0	10	0	10	244
TP-7	0	11	>4	NE	NE
TP-8	0	10	0	10	236
TP-9	0	12	0	12	230
TP-10	0	14	>1	NE	NE
TP-11	0	9	>6	NE	NE
TP-12	0	9	0	10	244
TP-13	0	8	0	8	252
TP-14	0	8	0	8	264

Notes:
[1] = Surface elevations estimated from Site Plan prepared by *Contour Engineering* dated May 4, 2021

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the test pits to estimate soil index engineering properties of the soils encountered. Laboratory testing included visual soil classification, moisture content determinations, grain size analysis. Laboratory testing included visual soil classification per ASTM D2488 and ASTM D2487, moisture content determination per ASTM D2216, and grain size analysis per ASTM D6913 standard procedures. The results of the laboratory tests are included in Appendix B. The results of the laboratory tests are included in Appendix B and summarized below in Table 3.

TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Soil Type	Sample	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	D10 Ratio (mm)
Gravelly silty SAND (SM)	B-1, S-3, 7.5’	12.6	58.4	29.0	<0.075
Gravelly silty SAND (SM)	B-1, S-5, 15’	20.0	46.0	34.0	<0.075
Silty SAND with trace gravel (SM)	B-1, S-8, 30’	2.2	82.2	15.6	<0.075
Poorly graded SAND with silt (SP-SM)	B-2, S-3, 7.5’	0.0	89.0	11.0	<0.075
Gravelly silty SAND (SM)	B-2, S-9, 35’	22.4	50.9	26.7	<0.075
Silty SAND with some gravel (SM)	B-3, S-2, 5’	10.9	46.4	45.7	<0.075
Gravelly silty SAND (SM)	TP-2, S-1, 2’	28.2	51.5	20.3	<0.075
Poorly graded SAND with silt (SP-SM)	TP-5, S-1, 4’	0.0	92.7	7.3	.0878
Silty sandy GRAVEL (GM)	TP-9, S-1, 12’	59.6	26.6	13.9	<0.075
Gravelly Silty SAND (SM)	TP-14, S-2, 10’	39.9	43.2	16.9	<0.075

Groundwater Conditions

Groundwater seepage was observed in borings B-1 and B-3 at the time of drilling and test pits TP-4, TP-5, TP-11, TP-12, TP-13, and TP-14 at the time of digging. No groundwater was observed in boring B-2, closest to the top of the eastern slope. We interpret the groundwater encountered in our test pit explorations to be indicative of perched groundwater that develops atop finer grained/more dense layers within the shallow reclamation fill. In contrast, we interpret the groundwater encountered in our borings/groundwater monitoring wells to be indicative of the regional groundwater table, most likely founded on the deeper denser glacially consolidated advanced outwash deposits. The test pits where shallow groundwater was encountered were not in or near the proposed stormwater pond. These test pits were in the central and eastern portions of the reclaimed gravel pit and on the lots located south of 12th Street Ct.

There is an existing stormwater pond for the Horizon West neighborhood to the north of the proposed pond area. No seepage has been observed from the permanent slope separating the Horizon West retention pond. No evidence of groundwater or seepage that would correspond to lateral infiltration from the Horizon West retention pond was observed in Borings B-1 or B-3. Accordingly, It is our opinion that infiltration of retained stormwater from the Horizon west pond is likely vertical for a sufficient depth to preclude impact potential impact to the proposed infiltration pond.

Table 4, below, summarizes the depths and elevation of groundwater encountered in our explorations. Perched groundwater typically develops when the vertical infiltration of precipitation through a more permeable soil is slowed at depth by a deeper, less permeable soil type. We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off-site construction activities, and site utilization.

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TABLE 4:
APPROXIMATE DEPTHS AND ELEVATIONS OF GROUNDWATER ENCOUNTERED IN EXPLORATIONS

Well Number	Depth to Groundwater (feet)	Elevation of Groundwater (feet)[1]	Date Observed
B-1/MW-1	25	210	November 10, 2021 (ATD)
B-2/MW-2	NE	NE	November 10, 2021 (ATD)
B-3	28	210	November 10, 2021 (ATD)
TP-4	3	41	January 17, 2022 (ATD)
TP-5	7	241	January 17, 2022 (ATD)
TP-11	4	248	January 17, 2022 (ATD)
TP-12	8	246	January 17, 2022 (ATD)
TP-13	8	254	January 17, 2022 (ATD)
TP-14	7	265	January 17, 2022 (ATD)

Notes:
[1] Surface elevations interpolated from contours provided by Pierce County GIS (NAVD 88).
ATE = At time of digging/drilling

Two of our borings at the site were completed as groundwater monitoring wells and which were monitored twice a month for the duration of the wet season. Based on our wet season monitoring, seasonal high groundwater occurs at Elevation 203.6 to 216.6 feet (NAVD 88) at the locations monitored, approximately 18.4 to 37.4 feet below the ground surface. These levels were last measured on May 4, 2022. Figure 1, below, summarizes the groundwater levels recorded as part of our groundwater monitoring program during our monitoring period.

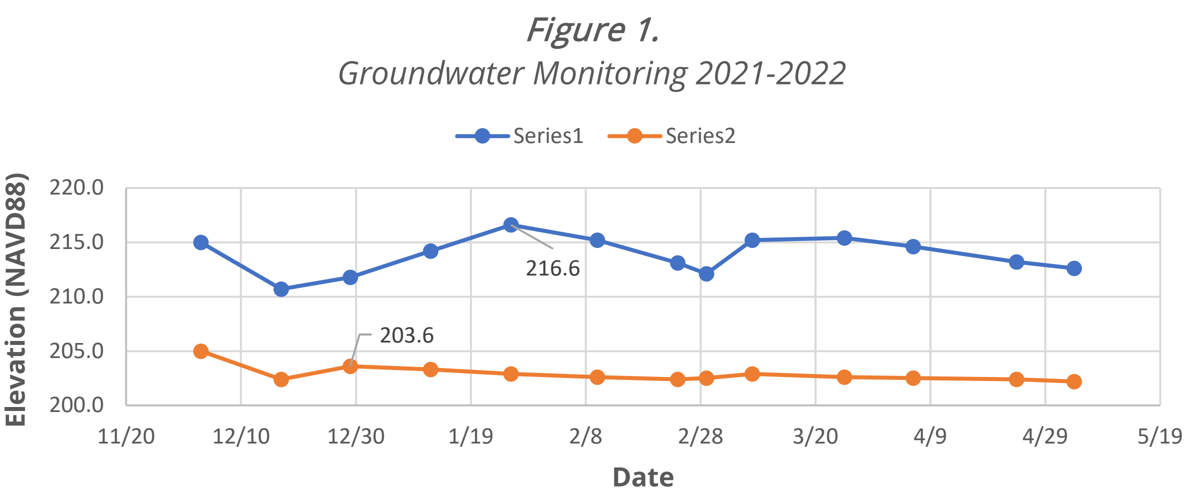
Figure 1.
Groundwater Monitoring 2021-2022

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Based on review of the 2021-2022 groundwater monitoring data, we interpret the observed standing water and shallow groundwater encountered in our test pit explorations to be indicative perched groundwater that develops atop finer grained/more dense layers within the shallow reclamation fill and the groundwater encountered in our borings/groundwater monitoring wells to be indicative of the regional groundwater table, most likely founded on the deeper denser glacially consolidated advanced outwash deposits. This is further confirmed by the lack of seepage on the native eastern slope.

We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off site construction activities, and site utilization. As such, water level observations made at the time of our field investigation may vary from those encountered during the construction phase. Analysis or modeling of anticipated groundwater levels during construction is beyond the scope of this report.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our data review, site reconnaissance, subsurface explorations, and our experience in the area, it is our opinion that the construction of the proposed residential plat is feasible from a geotechnical engineering standpoint.

As described above, most of the site consists of a reclaimed sand and gravel pit. As part of the reclamation, 16 or more feet of fill placement and compaction was placed in the former pit and compacted to 90 percent of the maximum dry density (ASTM D1557). The placement and compaction of the reclaimed fill was monitored on a periodic basis. The use of conventional spread footings and slab-on-grade floors does appear feasible with proper subgrade preparation. The use of the onsite soils for structural fill should be feasible during periods of extended dry weather. Given the moderate to high fines content of the upper fill and weathered native soils, the site soils will be highly sensitive to moisture. The potential for infiltration does appear feasible provided the bottom of the proposed pond extends through the existing structural fill and into the underlying native soils.

Pertinent conclusions and geotechnical recommendations regarding the design and construction of the proposed development are presented below.

Hillsides, Ravine Sidewalls and Bluffs per Gig Harbor Municipal Code 18.08.190

The City of Gig Harbor Chapter 18, Section 18.08.190 requires an undisturbed buffer of natural vegetation equal to the height of the ravine, sidewall, or bluff, as measured on a horizontal plane. A buffer may be reduced upon verification by a qualified professional that the proposed construction method will: i) not adversely impact the stability of the ravine sidewalls; ii) use construction techniques which minimize disruption of existing topography and vegetation; iii) include measures to overcome any geological, soils, and hydrologic constraints of the site. If the minimum rear setback established in the zoning district, pursuant to GHMC Title 17.

A. Disturbance Limitations. If a hillside, ravine sidewall or bluff is located on or adjacent to a development site, all activities on the site shall be in compliance with the following requirements:
    1. Ravine Sidewalls and Bluffs

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   a. Buffers. An undisturbed buffer of natural vegetation equal to the height of the ravine sidewall or bluff shall be established and maintained from the top, toe and sides of all ravine sidewalls and bluffs. All buffers shall be measured on a horizontal plane.
   b. Buffer Delineation. The edge of a buffer shall be clearly staked, flagged, and fenced prior to any site clearing or construction. Markers shall be clearly visible and weather resistant. Site clearing shall not commence until such time that the project proponent or authorized agent for the project proponent has submitted written notice to the city that the buffer requirements of this section have been met. Field marking of the buffer shall remain in place until all phases of construction have been complete and an occupancy permit has been issued by the city.
   c. Buffer Reduction. A buffer may be reduced upon verification by a qualified professional and supporting environmental information to the satisfaction of the city that the proposed construction method will:
      i. Not adversely impact the stability of ravine sidewalls;
      ii. Not increase erosion and mass movement potential of ravine sidewalls;
      iii. Use construction techniques which minimize disruption of existing topography and vegetation;
      iv. Includes measures to overcome any geological, soils and hydrologic constraints of the site. The buffer may be reduced to no less than the minimum rear yard setback established in the respective zoning district, pursuant to GHMC Title 17.
   d. Building Setback Lines. A building setback line of 10 feet is required from the edge of any buffer or a ravine wall or bluff.

2. Hillsides of 15 Percent Slope and Greater – Studies Required. Developments on hillsides shall comply with the following requirements:
   a. Site Analysis Reports Required. The following chart sets forth the level of site analysis report required to be developed based upon the range of the slope of the site and adjacent properties:

There are no slopes on or in the immediate vicinity of the site that meet the definition of a ravine or bluff. However, the reclaimed western (original working face of the Sunrise Pit) portion of the parcel and the slope that extends down from the northwest corner of the site both meet the definition of a hillside. All graded or disturbed areas should be protected from erosion by temporary and permanent erosion control measures. A site with a hillside does <u>not</u> require a prescriptive buffer per the Critical Areas Ordinance like a ravine sidewall or bluff. However, we recommend that any structure be setback from the top and toe of the slopes steeper than 33 percent in accordance with the requirements of the 2018 International Building Code (IBC).

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Landslide Hazard Areas per Gig Harbor Municipal Code Chapter 18.08.192

The GHMC defines a landslide hazard area as those areas which are susceptible to risk of mass movement due to a combination of geologic, topographic, and hydrologic factors.

The referenced maps identify one landslide d south of the site by several hundred feet, but no landslides, mass wasting deposits, or alluvial fans are mapped on the subject property. No adverse geologic contacts were observed in our explorations or are mapped at the site. No evidence of jackstrawed or toppled trees, landslide activity, or significant erosion was observed at the site at the time of our site visit. No sloughing or surface erosion was observed at the time of our site visit. Slopes steeper than 40 percent were observed along the western and eastern extent of the site. However, the slopes on the western portion of site we attribute to the construction of Burnham Drive. No planes of weakness or rockfall hazards were observed at the site. No groundwater seepage was observed on the face of the hillside or within our subsurface explorations at the time of our site visit. In our opinion, the site does not constitute a landslide or erosion hazard area.

Because no evidence of landslide activity or landslide hazards was observed on the site, no prescriptive buffer or setbacks should be imposed by the City. Further discussion on the overall stability of the slopes below the site is discussed below in the “**Slope Stability**” section of this report.

Erosion Hazard Areas per Gig Harbor Municipal Code Chapter 18.08.192

Erosion Hazard Areas are defined as “those areas which are vulnerable to erosion due to natural characteristics including vegetative cover, soil texture, slope, gradient or which have been induced by human activity. Those areas which are rated “severe” or “very severe” for building site development on slopes or cut banks, per Table 4 of the Soil Conservation Service *Soil Survey for Pierce County Area* (February 1979). As described above, none of the soils in the areas of the proposed development are classified as having “severe” or “very severe” for building site development. Based on the above, the 16C soils do not meet the technical criteria for an erosion hazard. It is our opinion that the building areas should pose no greater risk of erosion during, and post construction provided Best Management Practices (BMPs) outlined in the City of Gig Harbor Stormwater Manual are utilized during construction.

Because no evidence of erosion or erosion hazards were observed at the site, no prescriptive buffer or setbacks should be imposed by the City.

Seismic Hazard Areas per Gig Harbor Municipal Code Chapter 18.08.194

The GHMC defines a seismic hazard area as those areas which are susceptible to severe damage from earthquakes because of ground shaking, slope failure, settlement or soil liquefaction. Based on our subsurface explorations, the site is generally underlain by dense advanced outwash.

Based on our observations and the subsurface units mapped at the site, we interpret site to correspond to a seismic Site Class “C” in accordance with the 2018 IBC documents and the American Society of Civil Engineers (ASCE) standard 7-16 Chapter 20 Table 20.3-1. This is based on the range of SPT (Standard Penetration Test) blow counts for the soil types observed in the borings. These conditions were assumed to be representative for the subsurface conditions for the site in general based on our experience in the vicinity of the site.

Based on the density of the soils and variable depth to groundwater encountered in our explorations, it is our opinion that the risk for liquefaction to occur at this site during an earthquake is negligible. Provided the design criteria listed below are followed, the proposed residences should have no greater risk damage from seismically induced liquefaction than other appropriately designed structures in the Puget Sound area.

Seismic Design

The site is in the Puget Sound region of western Washington, which is seismically active. Seismicity in this region is attributed primarily to the interaction between the Pacific, Juan de Fuca, and North American plates. The Juan de Fuca plate is subducting beneath the North American plate at the Cascadia Subduction Zone (CSZ). This produces both intercrustal (between plates) and intracrustal (within a plate) earthquakes. In the following sections we discuss the design criteria and potential hazards associated with regional seismicity.

Seismic Site Class

Based on our explorations and the subsurface units mapped at the site, we interpret the structural site conditions to correspond to a seismic Site Class "C" in accordance with the 2018 IBC documents and American Society of Civil Engineers (ASCE) standard 7-16 Chapter 20 Table 20.3-1. This is based on the SPT blow counts recorded during our borings. These conditions are assumed to be representative for the subsurface across the site.

Design parameters

The U.S. Geological Survey (USGS) completed probabilistic seismic hazard analyses (PSHA) for the entire country in November 1996, which were updated and republished in 2002 and 2008. We used the *ATC Hazard by Location* website to estimate seismic design parameters at the site. Table 5 below, summarizes the recommended design parameters.

TABLE 5:
2018 IBC PARAMETERS FOR DESIGN OF SEISMIC STRUCTURES

Spectral Response Acceleration (SRA) and Site Coefficients for Existing Conditions	Short Period
Mapped SRA	$S_s = 1.538g$
Site Coefficients (Site Class C)	$F_a = 1.200$
Maximum Considered Earthquake SRA	$S_{MS} = 1.846g$
Design SRA	$S_{DS} = 1.230g$

Peak Ground Acceleration

The mapped peak ground acceleration (PGA) for this site is 0.654g. To account for site class, the PGA is multiplied by a site amplification factor (F_{PGA}) of 1.2. The resulting site modified peak ground acceleration (PGA_M) is 0.785g. In general, estimating seismic earth pressures (k_h) by the Mononobe-Okabe method are taken as 1/3 to 1/2 of the PGA_M, or 0.262g to 0.392g.

Liquefaction and Lateral Spreading

Earthquake-induced geologic hazards may include liquefaction, lateral spreading, slope instability, and ground surface fault rupture. Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in pore water pressure in soils. The increase in pore water pressure is induced by seismic vibrations. Liquefaction primarily affects geologically recent deposits of loose, uniformly graded, fine-grained sands and granular silts that are below the groundwater table. In our opinion, the potential for liquefaction and lateral spreading is not significant because of the dense nature of the on-site soils. The soils encountered below groundwater in our borings were in a dense to very condition. Because of the relatively low susceptibility of site soils to liquefaction, it is our opinion that the likelihood of lateral spreading is also relatively low.

Based on our review of the Department of Natural Resources Geologic Hazards Map (Geologic Information Portal), the site is located about 0.3 miles south and 0.6 miles north of strands of the Tacoma Fault Zone (Figure 7). No evidence of ground fault rupture was observed in the subsurface explorations or our site reconnaissance. Therefore, in our opinion, the proposed structure should have no greater risk for ground fault rupture than other structures located in the area.

Slope Stability

We used the computer program SLIDE 2, from RocScience to perform the slope stability analyses. The computer program SLIDE uses several methods to estimate the factor of safety (FS) of the stability of a slope by analyzing the shear and normal forces acting on a series of vertical “slices” that comprise a failure surface. Each vertical slice is treated as a rigid body; therefore, the forces and/or moments acting on each slice are assumed to satisfy static equilibrium (i.e., a limit equilibrium analysis). The FS is defined as the ratio of the forces available to resist movement to the forces of the driving mass. An FS of 1.0 means that the driving and resisting forces are equal; an FS less than 1.0 indicates that the driving forces are greater than the resisting forces (indicating failure). We used the Generalized Limit Equilibrium method using the Morgenstern-Price analysis, which satisfies both moment and force equilibrium, to search for the location of the most critical failure surfaces and their corresponding FS. The most critical surfaces are those with the lowest FS for a given loading condition and are therefore the most likely to move.

Table 6, below, summarizes index properties for various native soil types encountered in the Puget Sound based on “*Geotechnical Properties of Geologic Materials*”, by Koloski, Schwarz, and Tubbs and as presented in the ENGINEERING GEOLOGY IN WASHINGTON, VOLUME 1 (Washington Division of Geology and Earth Resources Bulletin 78).

TABLE 6:

SOIL PROPERTIES FOR VARIOUS NATIVE SOIL TYPES ENCOUNTERED IN THE PUGET SOUND

Geologic Unit	Soil Type	Dry Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)
Glacial Till	SM, ML	120 - 140	1,000 – 4,000	35 – 45
Outwash	GW, GP, SW, SP, SM	115 - 130	0 – 1,000	30 - 40

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Based on our site observations, the encountered subsurface conditions, relative densities, the existing site topography, and our laboratory results, we assumed dry unit weights, friction angles (Phi), and cohesion values for the soils encountered in our explorations. Soil unit weight and strength parameters were assigned based on our experience and our laboratory testing of representative soil samples.

TABLE 7:
PROPERTIES OF ON-SITE SOILS FOR STABILITY ANALYSIS

Soil Type	Soil Type	Dry Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)
Fill	SM	125	0	33
Recessional Outwash	SP-SM	125	25	34
Sandy Advance Outwash	SP-SM	130	75	36
Gravelly Advance Outwash	GW, GP	132	100	40

To analyze the global and internal stability of the site and surrounding slopes, we performed our analysis based on cross sections A-A' which runs north to south and captures the steeper slope in the southern portion of the site. The interpretation of the stratigraphy of the slope modeled in cross section A-A' are based on our subsurface explorations and the draft *Geological Map of the Gig Harbor 7.5-minute Quadrangle, Washington* (*Troost, K.G., Booth, D.B., and Wells, R.E.*). Topographic information utilized in the stability analysis was obtained from the provided site survey and the Pierce County GIS website for the onsite and offsite portions of the model, respectively. The cross-section location is shown on the Figure 2.

We used the Generalized Limit Equilibrium method using the Morgenstern-Price analysis, which satisfies both moment and force equilibrium, to search for the location of the most critical failure surfaces and their corresponding FS. The most critical surfaces are those with the lowest FS for a given loading condition and are therefore the most likely to move.

The site seismic stability conditions were analyzed by applying a horizontal acceleration equal to one-half of the peak ground acceleration obtained from the ATC Hazards by Location Map using ASCE 7-16, Risk Category III, Seismic Site Class C, as described below. We used a design peak ground acceleration of 0.262g for our analysis.

Based on our analyses, the proposed development does not appear to negatively impact the site and does not decrease the factors of safety. The cross sections and slope stability results using both static and seismic conditions for the existing and proposed structures are included in Appendix C. Slope Stability Analysis results are shown in Table 8, below.

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TABLE 8:
STABILITY ANALYSIS RESULTS

Conditions	Factor of Safety	
	Static	Seismic
Existing Conditions	2.517	1.365
Proposed Conditions	2.521	1.237

Recommended Setback

While no prescriptive buffer or setback should be required by the City of Gig Harbor, a setback from slopes steeper than 3H:1V (Horizontal:Vertical) in accordance with the 2018 IBC will be required. The 2018 IBC Section 1808.7 requires a building setback from slopes that are steeper than 3H:1V unless evaluated and reduced and/or a structural setback is provided by a licensed geotechnical engineer. The setback distance is calculated based on the vertical height of the slope. The typical 2018 IBC setback from the top of the slope equals one third the height of the slope or 40 feet, whichever is less, while a setback from the toe of the slope equals one half the height of the slope or 15 feet, whichever is less.

As stated, the western portion of the site has slopes steeper than 33 percent with more than 30 feet of relief. The setback from this steep slope area would be 15 feet from the toe of the slope, which is less than the typical rear yard setback of 30 feet. The reclaimed slope to the east is also steeper than 33 percent with more than 50 feet of relief. The setbacks from this steep slope would need to be at least 17 feet, which is also less than the typical rear yard setback of 30 feet. Lot locations are shown on the Site & Exploration Plan, Figure 2.

Foundation Support

Shallow foundations may be used where they will be setback far enough from the top of the slope to meet the IBC structural setback. We recommend that spread footings for the proposed residence be founded on reclaimed mine fill, the medium dense to dense advance outwash soils observed in our test pits, or on structural fill that extends to suitable native soils.

The soil at the base of the excavations should be disturbed as little as possible. All loose, soft or unsuitable material should be removed or compacted, as appropriate. A representative from our firm should observe the foundation excavations to determine if suitable bearing surfaces have been prepared, particularly if any areas of the foundation will be situated in fill material.

All footing elements should be embedded at least 18 inches below grade for frost protection. Footings founded on the advance outwash can be designed using an allowable soil bearing capacity of 2,000 psf (pounds per square foot) for combined dead and long-term live loads. The weight of the footing and any overlying backfill may be neglected. The allowable bearing value may be increased by one-third for transient loads such as those induced by seismic events or wind loads.

Lateral loads may be resisted by friction on the base of footings and floor slabs and as passive pressure on the sides of footings. We recommend that an allowable coefficient of friction of 0.35 be used to calculate friction between the concrete and the underlying soil. Passive pressure may be determined using an allowable equivalent fluid density of 300 pcf (pounds per cubic foot). Factors of safety have been applied to these values.

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We estimate that settlements of footings designed and constructed as recommended will be less than 1 inch, for the anticipated load conditions, with differential settlements between comparably loaded footings approaching total settlements. Most of the settlements should occur essentially as loads are being applied. However, disturbance of the foundation bearing surfaces during construction could result in larger settlements than predicted. We recommend that all foundations be provided with footing drains.

Floor Slab Support

Slab-on-grade floors, where constructed, should be supported on the native advance outwash or on structural fill bearing on suitable native soils. We recommend that all floor slabs be directly underlain by a minimum 4-inch-thick capillary break that consists of clean, granular material, such as pea gravel or clean crushed rock and should contain less than 2 percent fines. The capillary break should be placed in a single lift and compacted to an unyielding condition. A synthetic vapor retarder is recommended to control moisture migration through the slabs. This is of particular importance where moisture migration through the slab is an issue, such as where adhesives are used to anchor carpet or tile to the slab or where slabs are present below heated, enclosed spaces.

A subgrade modulus of 200 pci (pounds per cubic inch) may be used for floor slab design. We estimate that settlement of the floor slabs designed and constructed as recommended, will be ½-inch or less over a span of 50 feet.

Retaining Walls

The lateral pressures acting on cast-in-place retaining walls (such as basement or grade separation walls) will depend upon the nature and density of the soil behind the wall as well as the presence or absence of hydrostatic pressure. Below we provide recommended design values and drainage recommendations for retaining walls.

Design Values

For walls backfilled with granular well-drained soil and with a level backslope, the design active pressure may be taken as 35 pcf (equivalent fluid density). For walls that are braced or otherwise restrained, the design at-rest pressure may be taken as 55 pcf. For the condition of an inclined back slope, higher lateral pressures would act on the walls. For a 3H:1V (Horizontal to Vertical) slope above the wall, the active pressure may be taken as 48 pcf; for a 2H:1V back slope condition, a wall design pressures of 55 pcf may be assumed. If walls taller than 6 feet are required, a seismic surcharge of 20H (for walls backfilled with the native soils or washed gravel) and 15H for walls backfilled with "*Ballast*" per WSDOT Standard Specification 9-03.9(1), should be included where required by the code. If walls will be constructed with a backslope and will be braced or otherwise restrained against movement, we should be notified so that we can evaluate the anticipated conditions and recommend an appropriate at-rest earth pressure.

Lateral loads may be resisted by friction on the base of footings and as passive pressure on the sides of footings and the buried portion of the wall, as described in the "**Foundation Support**" section of this report.

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Wall Drainage

Adequate drainage behind retaining structures is imperative. Positive drainage which controls the development of hydrostatic pressure can be accomplished by placing a zone of drainage behind the walls. Granular drainage material should contain less than 2 percent fines and at least 30 percent retained on the US No. 4 sieve.

A minimum 4-inch diameter perforated or slotted PVC pipe should be placed in the drainage zone along the base and behind the wall to provide an outlet for accumulated water and direct accumulated water to an appropriate discharge location. We recommend that a nonwoven geotextile filter fabric be placed between the soil drainage material and the remaining wall backfill to reduce silt migration into the drainage zone. The infiltration of silt into the drainage zone can, with time, reduce the permeability of the granular material. The filter fabric should be placed such that it fully separates the drainage material and the backfill and should be extended over the top of the drainage zone. Typical wall drainage and backfilling details are shown on Figure 8.

A soil drainage zone should extend horizontally at least 18 inches from the back of the wall. The drainage zone should also extend from the base of the wall to within 1 foot of the top of the wall. The soil drainage zone should be compacted to approximately 90 percent of the MDD, as determined in accordance with ASTM D1557. Over-compaction should be avoided as this can lead to excessive lateral pressures on the wall. A geocomposite drain mat may also be used instead of free draining soils, provided it is installed in accordance with the manufacturer's instructions.

Site Drainage

All ground surfaces, pavements and sidewalks at the site should be sloped to direct surface water away from the structures, slopes, and property lines. Surface water runoff should be controlled by a system of curbs, berms, drainage swales, and or catch basins, and conveyed to an appropriate discharge point.

We recommend that footing drains are installed for each residence per the 2018 IBC, Section 1805.4.2, and basement walls (if utilized) have a wall drain as describe above. The roof drain should not be connected to the footing drain. We recommend material used for footing drains be of approximately the same quality as "*Gravel Backfill for Drains*" (WSDOT Standard Specifications Section 9-03.12(4)). A geotextile separation fabric should be placed between the drainage material and native/structural fill soils. Recommendations for a footing or wall drain system are presented in Figure 8 For permanent drainage of below-grade walls, the groundwater level should be maintained 2 feet below the basement finished floor.

Stormwater Infiltration

Based on our site evaluation, it is our opinion that the infiltration of stormwater at the site is feasible in the deeper outwash sands provided minimum setbacks from the slope can be maintained, but not in the upper, shallow, structural fill placed during reclamation of the former gravel pit.

Feasibility

The following sections discuss the feasibility of each BMP associated with Minimum requirement #5.

1. <u>Soil Preservation and Amendment (Ecology BMP T5.13)</u>: Soil perseveration/retention and protection of the undisturbed soils is not feasible given the shallow soils consist of structural fill placed during reclamation of the former surface mine. The fill was not engineered and constructed with the design to support future infiltration. Topsoil was only encountered within Test pits TP-2 and TP-3, and Boring B-3. Where the stormwater plan requires, topsoil will need to be imported to meet BMP T5.13

2. <u>Downspout Infiltration Systems (Ecology BMP T5.10A)</u>: The *2016 City of Gig Harbor Stormwater Management and Site Development Manual* (SWMSDM), Volume III, Section 2.5.2, Step 2 states that "the base of all infiltration basin or trench systems shall be a minimum of 3 feet above seasonal high groundwater levels, bedrock (or hardpan), or other low permeability layer." Based on our subsurface explorations and observations, downspout infiltration would need to extend through the shallow fill (up to 16 feet deep). This depths makes individual down spouts system infeasible. However, expanded the existing pond to continue to function as an infiltration similar to the pond for the adjacent neighbor does appear feasible as the depth to groundwater was about 20 feet below the top of the of deeper advance sand.

3. <u>Downspout Dispersion Systems (Ecology BMP T5.10B)</u>: Based on the existing site topography, downspout dispersion does not appear feasible as the lots will not deep enough to provide adequate vegetated flow path lengths.

4. <u>Concentrated Flow Dispersion (Ecology BMP T5.11)</u>: Based on the existing site conditions, concentrated dispersion does not appear feasible given the site dimensions, proposed development, and the minimum lengths of required vegetated flow paths.

5. <u>Sheet Flow Dispersion (Ecology BMP T5.12)</u>: Based on the existing site conditions, sheet flow dispersion does not appear feasible given the site dimensions, existing and proposed development, and the minimum lengths of required vegetated flow paths.

<u>Test Method</u>

The 2016 SWMMWW, Volume III, Section 3.3.6 provides three approved methods to estimate the long term design infiltration rate of site soils: 1) Large-Scale Pilot Infiltration Test (PIT), 2) Small-Scale PIT, and 3) soil grain size analysis method. Restrictions do apply to the various methods based on soil conditions and type of infiltration facility. While large or small scale PITs are the preferred option of determining the design infiltration, given the relatively deep depth to the advance sand and presence of both surface water and shallow perched water within the reclamation structural fill, performing the small scale PITs at depth was not feasible at this time. ***We highly recommend that confirmation infiltration testing consisting of at least 2 small-scale PITs, and supplemented with several other EPA falling test tests, be performed at the time of construction to verify the rates provided below. We anticipate that the City will make confirmation testing a condition of permit approval.***

Design Infiltration Rate

The design infiltration rate is determined based on Method 3 in Volume III, Appendix III-A of the 2016 GHSWSDM. As stated, this method was used because performing either a large or small-scale PIT below the fill soils is not feasible at this time. A large-scale verification test will need to be completed with enough lead time for the pond size to be re-designed if necessary. Three correction factors are applied to the measured infiltration rate to account for test method ($F_{testing}$), long term reduction in infiltration capability ($F_{plugging}$), and facility shape ($F_{geometry}$). In no case may the design infiltration rate exceed 30 inches per hour. The design infiltration rate is determined as follows:

$$I_{design} = I_{measured} * F_{testing} * F_{plugging} * F_{geometry}$$

Where:

I_{design} = Infiltration rate to be used for design of infiltration facility
$I_{measured}$ = Infiltration rate measured in the field or estimated by grain size analysis
$F_{testing}$ = Accounts for test method used
$F_{plugging}$ = accounts for reduction in infiltration rates based on soil type
$F_{geometry}$ = accounts for facility geometry and depth to groundwater = 4*D/W+0.05

As shown in Table 9, below, we used correction factor values of 0.4 for $F_{testing}$, and a value of 0.8 for $F_{plugging}$, and a value of 1.0 for $F_{geometry}$.

TABLE 9
CORRECTION FACTORS

	Correction Factor^3	
Large Scale PIT	$F_{testing}$	0.75
Small Scale PIT		0.5
Double-Ring Infiltrometer		0.4
Grainsize analysis		**0.4**
Loam and Sandy Loam	$F_{plugging}$	0.7
Fine Sand and Loamy Sand		**0.8**
Medium Sand		0.9
Course Sand or Cobbles		1.0
Geometry (4*D/W+0.05), Where: D = depth to water table or other impermeable layer W = width of facility $F_{geometry}$ must be between 0.25 and 1.0	$F_{geometry}$	**1.0**^{2}

NOTES:

[1] Correction factors from 2016 Gig Harbor SWDM, Volume III, Appendix III-A

[2] Assumed correction factor.

Bold type indicates correction value used in design infiltration rate.

Per Volume III, Appendix III-A 2016 GH-SWMSDM the design infiltration rate shall not exceed 30 inches per hour. Applying the factors of safety listed above to the measured infiltration rates, results in (design) infiltration rates.

TABLE 10
DESIGN INFILTRATION RATES

Sample	Sample Depth (feet)	USCS Soil Type at Test Surface	Geologic Unit	Recommended Design Infiltration Rate[1] (in/hr)
B-1	15	SM	*Advance Outwash*	*1.75*
B-1	30	SP-SM	*Advance Outwash*	7.50
B-2	7.5	SM	*Advance Outwash*	9.70
B-2	*35*	*SM*	*Advance Outwash*	*2.40*
*TH-1**	*25-30*	*SP-SM*	*Advance Outwash*	*11.07*

Note: 1 Design infiltration rate estimated per *2016 Gig Harbor – SWMSDM, Vol. III, App III-A*
*Taken from Robinson Noble Hydrogeologic Report for the Sunrise Mine dated June 2006

As discussed above in the SITE CONDITONS section of the report, the infiltration pond will extend through the upper reclamation fill and into the deeper advance outwash sand and gravel. We reviewed a previous Hydrogeologic Report for the Sunrise Mine that was prepared by Robinson and Noble in June 2006. The Robinson and Noble report, a copy of which is attached in Appendix E, confirmed the stratigraphy and interpretation of groundwater conditions described previously in this report.

GeoResources has also recently completed several reports on the undeveloped land below (east) and north of the proposed stormwater pond for the Henderson-Burnham Partners. The most recent report was our March 2020 Geotechnical Engineering and Hydrogeologic Report that provided design infiltration rates of 4 inches per hour in the upper sandy soils and 12 inches per hour for the lower gravel areas. This rate was based grain size analyses and on GeoResources's monitoring of the performance of the Horizon West and Sunrise Pit stormwater facilities since the 1990's.

The rates recommended above in Table 10 are lower than the rates in the Henderson-Burnham Partners report, but this is most likely due to method and volume of sample collected. The grain size analyses on the samples from the lower portion of the pit had a cleaner sand and gravel mixture with fines generally less than 5 percent by weight. The finer grain size depicted in the laboratory testing in our more recent borings can be attributed to the method of sample collection. The SPT samples collected in our borings consist of a smaller overall sample size than in test pit explorations and do not account for coarse gravel. Therefore, the infiltration rates listed from our more recent boring locations should be considered conservative. We also derived an infiltration rate based on a sample that was obtained from the Robinson Noble Hydrologic Report for the Sunrise Mine (2006) taken from the approximate location of the proposed infiltration facility.

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Based on our sieve analyses and infiltration calculations, the infiltration rate of 4.5 inches per hour used by Larson & Associates in sizing the proposed pond was based on an average of rates provided by GeoResources based on the grain size method. Averaging the rates from our recent samples summarized above in Table 10, we recommend a design infiltration rate of 5.35 inches per hour, which exceeds the value used by Larson & Associates. The results of the infiltration calculations are included in Appendix D. These rates were obtained for various soil layers that correspond to the stratigraphically equivalent layers at corresponding elevations in boring B-3, in the area of the proposed pond. Stratigraphic equivalence is based on visual classification of soils completed in accordance with ASTM D2487 and our experience. D_{10} values in our calculations were derived from interpolation of grain size analysis.

Infiltration is not permitted in the previously placed structural fill which was encountered in our test pit explorations in the area of the proposed pond. As proposed, the existing fill will be removed in the area of the proposed pond down to native soils. If fill material will be imported to raise the grade within the pond area, the old fill material should be replaced with free draining soils that can provide a minimum infiltration rate of 8 in/hr "*Gravel Backfill for Drains or Gravel Backfill for Drywells*" as defined by WSDOT 9-03.12(4) and WSDOT 9-03.12(5) are typically suitable, but the sizing of the system would still require using the values presented in Table 10 for the underlying native soils. We should verify submittals for free draining soils and complete infiltration testing as necessary at the time of construction.

All minimum setback requirements and infeasibility criteria per Appendix III-D of the 2016 GHSWMSDM should be considered prior to the selection of any stormwater facility for the proposed development.

Construction Considerations

We recommend that a representative from our firm be onsite at the time of excavation of the proposed infiltration facilities to verify that the soils encountered during construction are consistent with the soils observed in our subsurface explorations. In-situ infiltration testing should be performed at the time of construction to verify the recommended infiltration rate and to determine if a different site specific infiltration rate would be more appropriate for the site.

It should be noted that special care is required during the grading and construction periods to avoid fine sediment contamination. This may be accomplished using an alternative stormwater management location during construction. All contractors, builders, and subcontractors working on the site should be advised to avoid allowing "dirty" stormwater or excess sediment to enter the proposed pervious pavement area during construction and landscaping activities. No concrete trucks should be washed or cleaned onsite.

Suspended solids could clog the underlying soil and reduce the infiltration rate of the facilities. To reduce potential clogging of the infiltration systems, the infiltration system should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved or otherwise protected. Temporary systems may be utilized throughout construction. Periodic sweeping of paved areas will help extend the life of the infiltration system.

Temporary Excavations

All job site safety issues and precautions are the responsibility of the contractor providing services/work. The following cut/fill slope guidelines are provided for planning purposes only. Temporary cut slopes will likely be necessary during grading operations or utility installation.

All excavations at the site associated with confined spaces, such as utility trenches and retaining walls, must be completed in accordance with local, state, or federal requirements. Based on current Washington Industrial Safety and Health Act (WISHA, WAC 296-155-66401) regulations, we classify the fill as Type C and the dense advance outwash deposits as Type B.

According to WISHA, for temporary excavations of less than 20 feet in depth, the side slopes in Type B soils should be laid back at an inclination of 1H:1V or flatter and side slopes in Type C soils should be laid back at an inclination of 1.5H:1V or flatter. It should be recognized that slopes of this nature do ravel and require occasional maintenance. All exposed slope faces should be covered with a durable reinforced plastic membrane, jute matting, or other erosion control mats during construction to prevent slope raveling and rutting during periods of precipitation. These guidelines assume that all surface loads are kept at a minimum distance of at least one half the depth of the cut away from the top of the slope and that significant seepage is not present on the slope face. Flatter cut slopes will be necessary where significant raveling or seepage occurs, or if construction materials will be stockpiled along the top of the slope.

Where it is not feasible to slope the site soils back at these inclinations, a retaining structure, such as temporary shoring, should be considered. Where retaining structures are greater than 4-feet in height (bottom of footing to top of structure) or have slopes of greater than 15 percent above them, they should be engineered per Washington Administrative Code (WAC 51-16-080 item 5). This information is provided solely for the benefit of the owner and other design consultants, and should not be construed to imply that GeoResources assumes responsibility for job site safety. It is understood that job site safety is the sole responsibility of the project contractor.

Permanent Cut and Fill Slopes

Permanent slopes in soil should be no steeper than 2H:1V. Fill slopes constructed on grades that are steeper than 5H:1V should be constructed in accordance with Appendix J, Section J107 of the 2018 IBC and should utilize proper keying and benching methods, as shown on Figure 9. Fill should be "keyed" into the undisturbed native soils by cutting a series of horizontal benches. The benches should be 1½ times the width of the equipment used for grading and be a maximum of 3 feet in height. Subsurface drainage may be required in areas where significant seepage is encountered during grading. Collected drainage should be directed to an appropriate discharge point. Surface drainage should be directed away from all slope faces.

All slopes should be protected from erosion. Typical erosion control BMPs as adopted by the City of Gig Harbor Stormwater Management and Site Development Manual should be sufficient for proposed site grading activities. Additionally, permanent slopes should be planted with a mulch, hardy vegetative groundcover or armored with quarry spalls as soon as feasible after grading is completed.

EARTHWORK RECOMMENDATIONS

Site Preparation

All structural areas on the site to be graded should be stripped of vegetation, organic surface soils, and other deleterious materials including existing structures, foundations or abandoned utility lines. Organic topsoil is not suitable for use as structural fill but may be used for limited depths in non-structural areas. Based on our subsurface exploration, stripping depths ranging from 3 to 9 inches should be expected to remove topsoil. Areas of thicker topsoil may be encountered in areas of heavy vegetation or depressions.

Where placement of structural fill material is required, the stripped/exposed subgrade areas should be compacted to a firm and unyielding surface prior to placement of new fill. Excavations for debris removal should be backfilled with structural fill compacted to the densities described in the "**Structural Fill**" section of this report.

We recommend that a member of our staff evaluate the exposed subgrade conditions after removal of vegetation and topsoil stripping is completed and prior to placement of structural fill. The exposed subgrade soil should be proof-rolled with heavy rubber-tired equipment during dry weather or probed with a ½-inch diameter steel T-probe during wet weather conditions.

Soft, loose, or otherwise unsuitable areas delineated during proof-rolling or probing should be recompacted, if practical, or over-excavated and replaced with structural fill. The depth and extent of over-excavation should be evaluated by our field representative at the time of construction. The areas of old fill material should be evaluated during grading operations to determine if they need mitigation, recompaction, or removal.

Structural Fill

All material placed as fill associated with mass grading, as utility trench backfill, under building areas, or under roadways should be placed as structural fill. The structural fill should be placed in horizontal lifts of appropriate thickness to allow adequate and uniform compaction of each lift. Structural fill should be compacted to at least 95 percent of MDD as determined in accordance with ASTM D1557.

The appropriate lift thickness will depend on the structural fill characteristics and compaction equipment used, but it is typically limited to 4 to 6 inches for hand operated equipment; thicker lifts may be appropriate for larger equipment. For planning purposes, we recommend a maximum loose-lift thickness of 12 inches. We recommend that the appropriate lift thickness be evaluated by our field representative during construction. We recommend that our representative be present during site grading activities to observe the work and perform field density tests.

The suitability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines (material passing US No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more difficult to achieve. During wet weather, we recommend a material such as well-graded sand and gravel with less than 5 percent (by weight) passing the US No. 200 sieve based on that fraction passing the ¾-inch sieve, such as "*Gravel Backfill for Walls*" (WSDOT 9-03.12(2)). If prolonged dry weather prevails during the earthwork and foundation installation phase of construction, higher fines content (up to 10 to 12 percent) may be acceptable.

Material placed for structural fill should be free of debris, organic matter, trash, and cobbles greater than 6 inches in diameter. The moisture content of the fill material should be adjusted as necessary for proper compaction.

Suitability of On-Site Materials as Fill

During dry weather construction, the non-organic onsite soil may be considered for use as structural fill, provided it meets the criteria described above in the "**Structural Fill"** section and can be compacted as recommended. If the soil material is over optimum moisture at the time of excavation, it will be necessary to aerate or dry the soil prior to placement as structural fill. We generally did not observe the shallow site soils to be excessively moist at the time of our subsurface explorations.

The existing fill encountered in our boring is generally comparable to "*Common Borrow"* (WSDOT Standard Specification 9-03.14(3)). These soils should be suitable for use as structural fill provided the moisture content is maintained within 2 percent of the optimum moisture level. These soils can contain pockets of significant fines which can be difficult or impossible to properly compact when wet or during periods of precipitation. The contractor should plan accordingly if earthwork will be performed during the wet season.

We recommend that completed graded-areas be restricted from traffic or protected prior to wet weather conditions. The graded areas may be protected by paving, placing asphalt-treated base, a layer of free-draining material such as pit run sand and gravel or clean crushed rock material containing less than 5 percent fines, or some combination of the above.

Erosion Control

Weathering, erosion and the resulting surficial sloughing and shallow land sliding are natural processes. To manage and reduce the potential for these natural processes, we recommend erosion hazards be mitigated by applying Best Management Practices (BMPs), as outlined in the City of Gig Harbor Stormwater Management and Site Development Manual. Temporary erosion control BMPs should be installed at the site prior to the beginning of clearing, grading, or other construction activities, and should be updated and maintained throughout construction until final site stabilization is established. Temporary erosion control BMPs may include, but are not limited to:

- Silt fencing and appropriate soil stockpiling techniques to prevent silty stormwater from leaving the site,
- Jute matting, hydroseeding, or plastic covering to protect exposed soils,
- Straw wattles, quarry spall armoring, check dams, or other energy attenuation BMPs to slow the flow of stormwater over slopes and within drainage channels, and,
- Swales and berms to convey construction stormwater away from the slope.

Where native vegetated is removed because of clearing and grading activities, a dense vegetative groundcover, grass lawn, or native vegetation should be reestablished as soon as feasible. Permanent erosion control, such as mulched landscaping areas, groundcovers, hardscaping, or grass lawns, should be established as soon as feasible once final grades have been completed. All permanent erosion control methods should be maintained after construction activities have been completed.

We recommend earthwork activities be completed during the dry season (May 1 through September 30), and that any exposed soil areas be stabilized during the wet season (October 1 through April 30).

LIMITATIONS

We have prepared this report for use by Rush Construction and other members of the design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,
GeoResources, LLC

Engineering Geologist
925
KEITH SCOTT SCHEMBS
5/18/2023

KYLE EUGENE BILLINGSLEY
56931
5/18/2023

Keith S. Schembs, LEG
Principal

Kyle E. Billingsley, PE
Senior Geotechnical Engineer

KSS:KEB/cjb
DocID: Rush.SummitPointe.RG.Rev03
Attachments:
Figure 1: Site Location Map
Figure 2: Site & Exploration Plan
Figure 3: Site Vicinity Map
Figure 4: NRCS Soils Map
Figure 5: Geologic Map
Figure 6: WA DNR Landslide Inventory
Figure 7: Fault Hazard Map
Figure 8: Typical Wall Drainage and Backfilling Detail
Figure 9: IBC Appendix J Detail
Appendix A - Subsurface Explorations
Appendix B - Laboratory Test Results
Appendix C – Slope Stability Analysis
Appendix D – Infiltration Analysis
Appendix E – Hydrogeologic Report for the Sunrise Mine (Robinson and Noble, June 2006)

Summit Pointe Preliminary Plat
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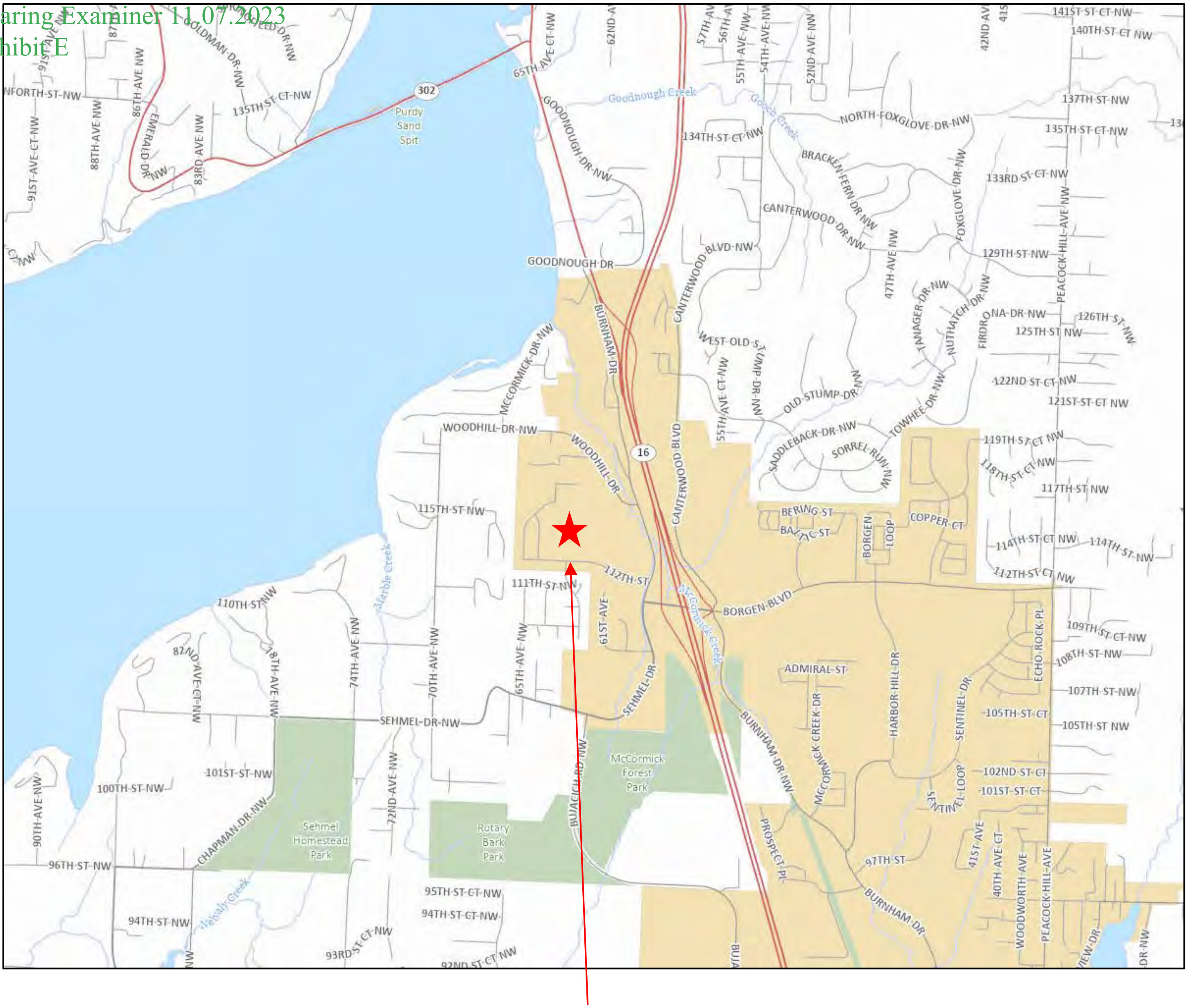

Approximate Site Location

Map created from Pierce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

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Not to Scale

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Site Location Map

Proposed Residential Plat
6302 – 112th Street
Gig Harbor, Washington
PN: 0122253072, 0122253074, & 0122254092

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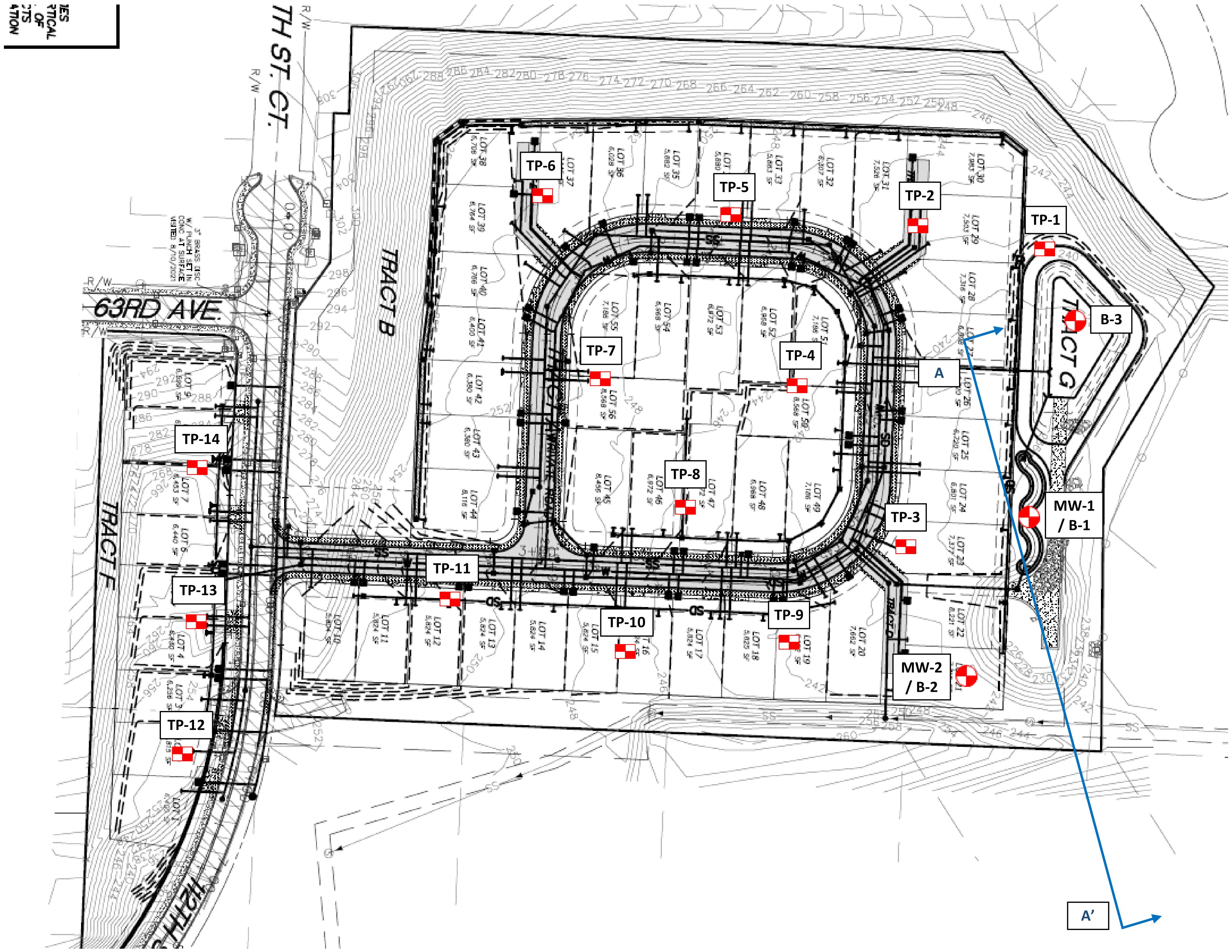

Notes:
Preliminary Plat prepared by Larson & Associates dated August 12, 2022

B-1 ◐	Boring number and approximate location (GeoResources, 2021)
TP-1 🟥	Test pit number and approximate location (GeoResources, 2022)

Scale: 1" =

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Site & Exploration Plan

Proposed Residential Plat
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Gig Harbor, Washington
PN: 0122253072, 0122253074, & 0122254092

Doc ID: Rush.SummitPointe.F	***August*** 2022	Figure 2

Approximate Site Location

Map created from Pierce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

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Site Vicinity Map

Proposed Residential Plat
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Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
16B	Harstine gravelly ashy sandy loam	Sandy glacial till on broad uplands	0 to 6	Slight	C
16C			6 to 15	Moderate	C
18C	Indianola loamy sand	Sandy glacial outwash	6 to 15	Moderate	A
21F	Kitsap/Indianola Complex	Glacial lake deposits	45 to 70	Severe	C/D

Not to Scale

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NRCS Soils Map

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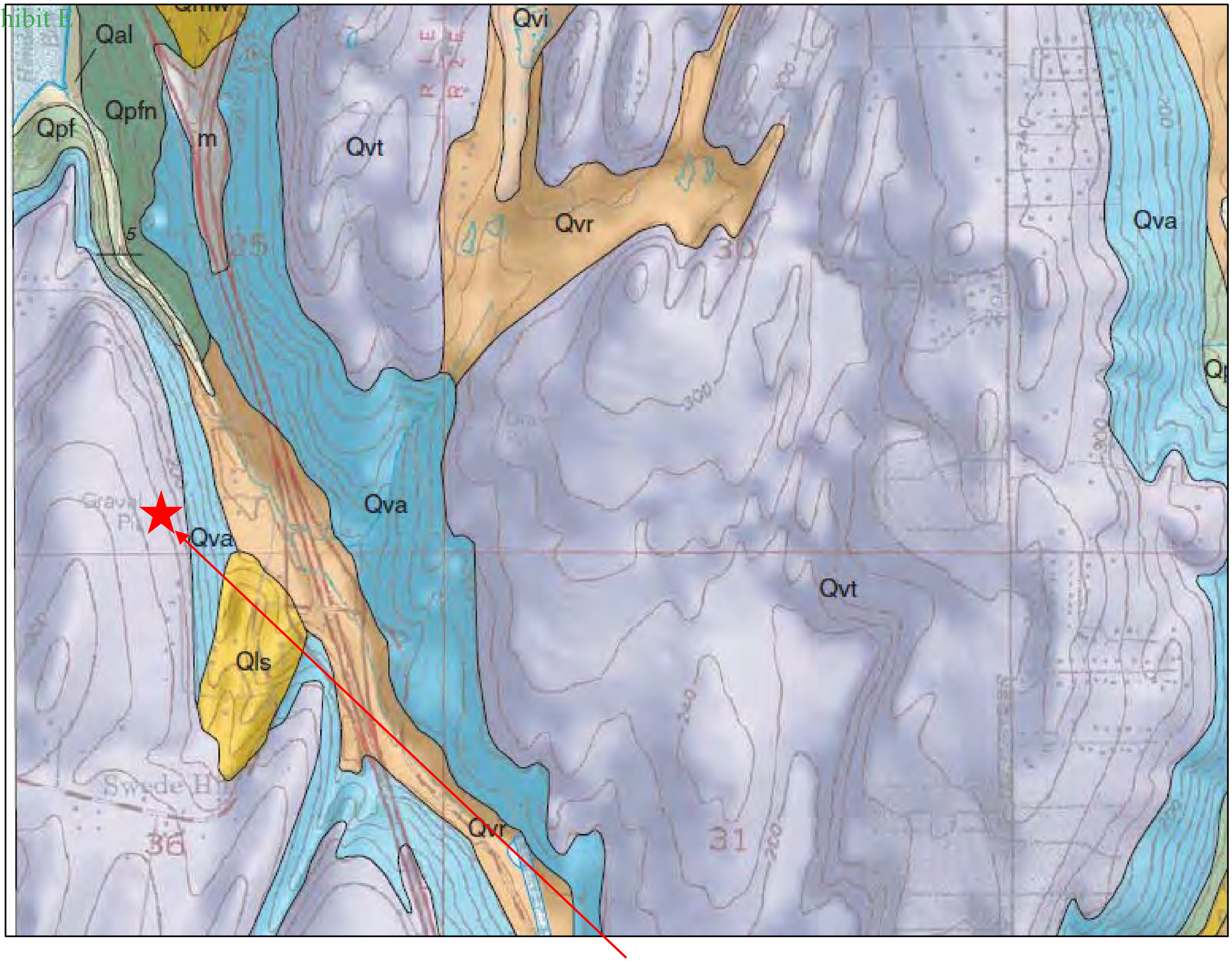

Approximate Site Location

An excerpt from the draft *Geologic Map of the Gig Harbor 7.5-minute Quadrangle, Washington* by K.G. Troost, D.B. Booth, and R.E. Wells (in review)

Qls	Landslide deposits
Qvr	Recessional outwash
Qvt	Glacial till
Qva	Advance outwash

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Geologic Map

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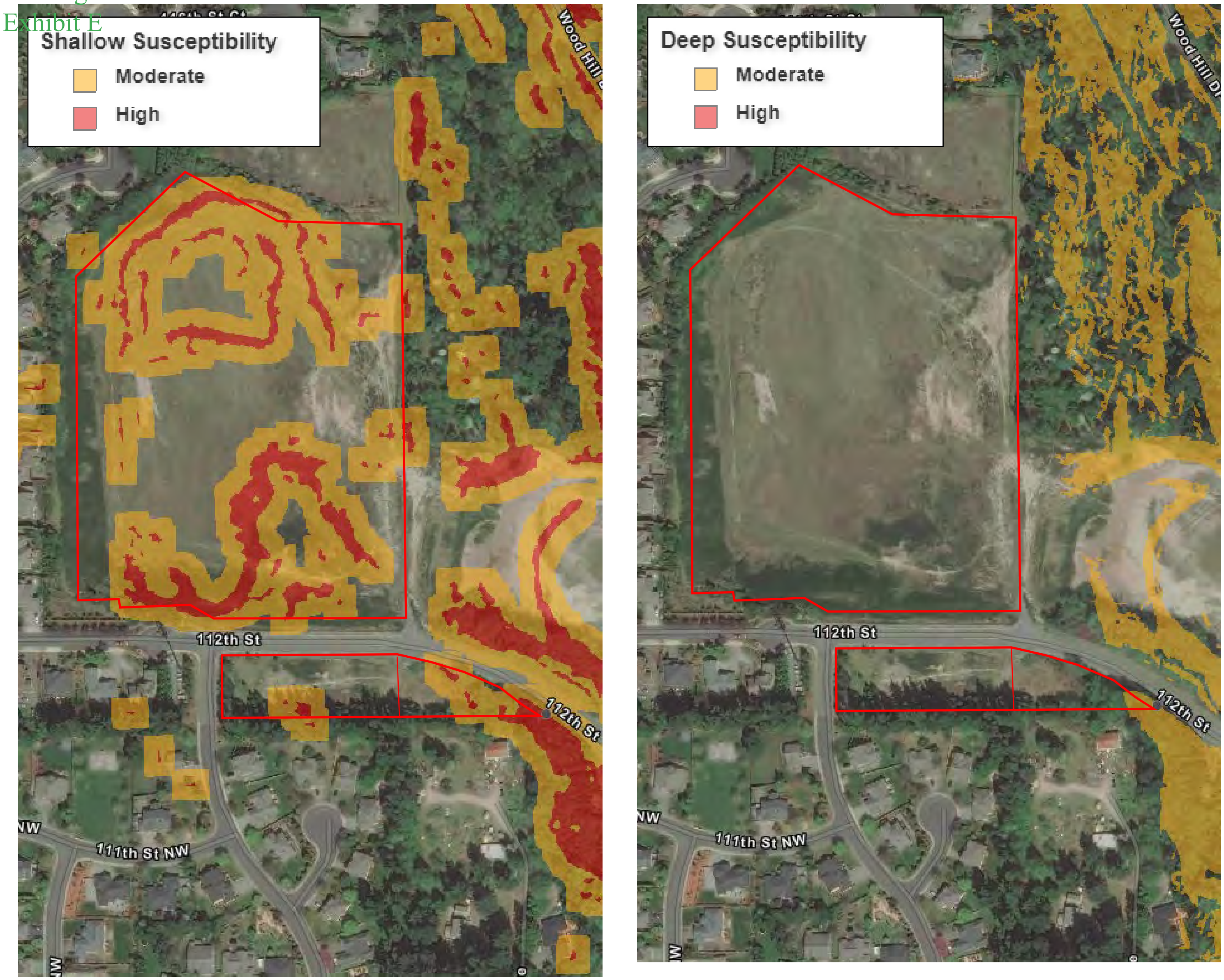

Approximate Site Location

Map obtained from Washington Interactive Geologic Information Portal Map (https://geologyportal.dnr.wa.gov/)

Not to Scale

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WA DNR Landslide Inventory

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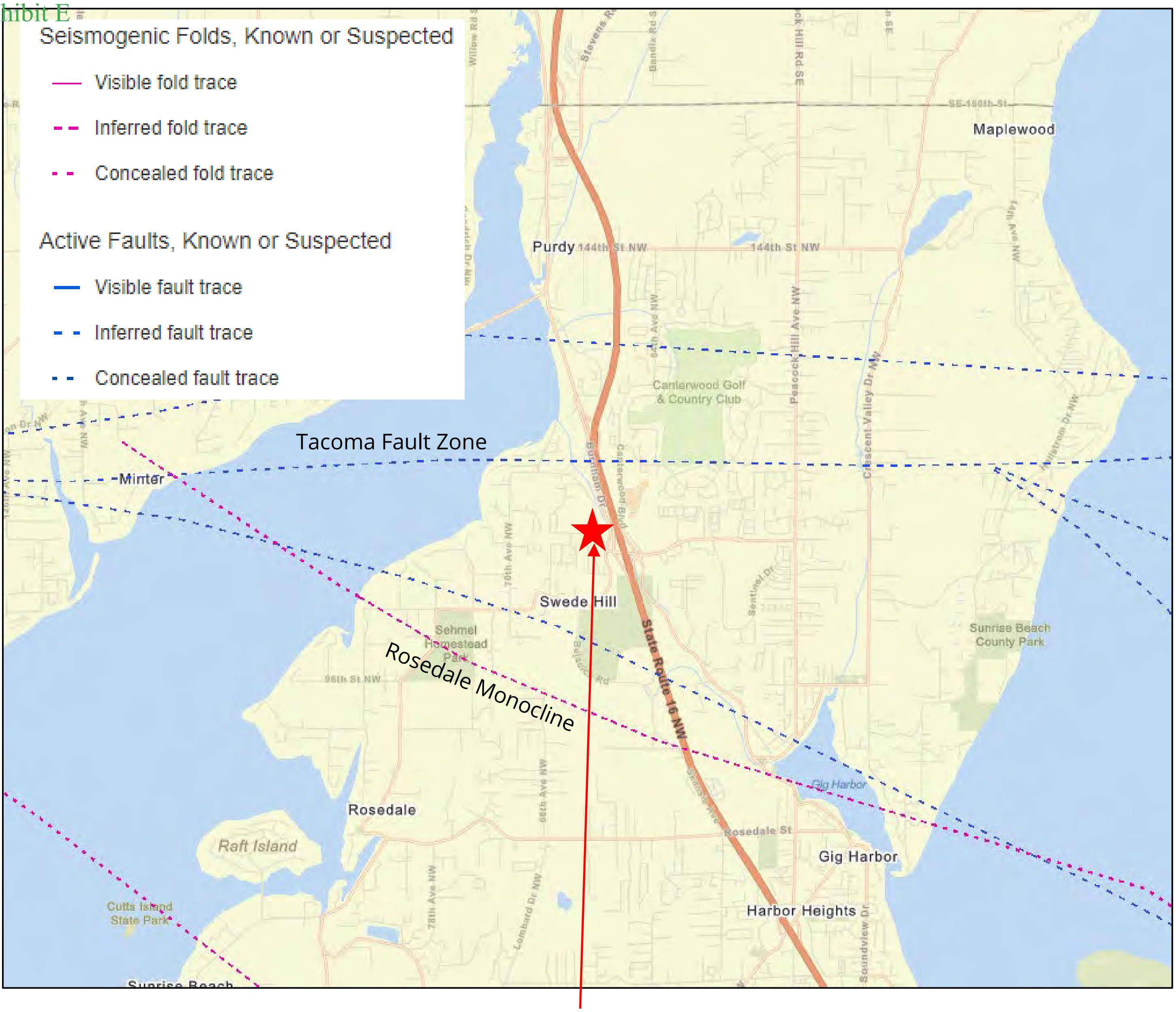

Approximate Site Location

Map created from the Washington Geologic Information Portal (geologyportal.dnr.wa.gov/)

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Fault Hazard Map

Proposed Residential Plat
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Gig Harbor, Washington
PN: 0122253072, 0122253074, & 0122254092

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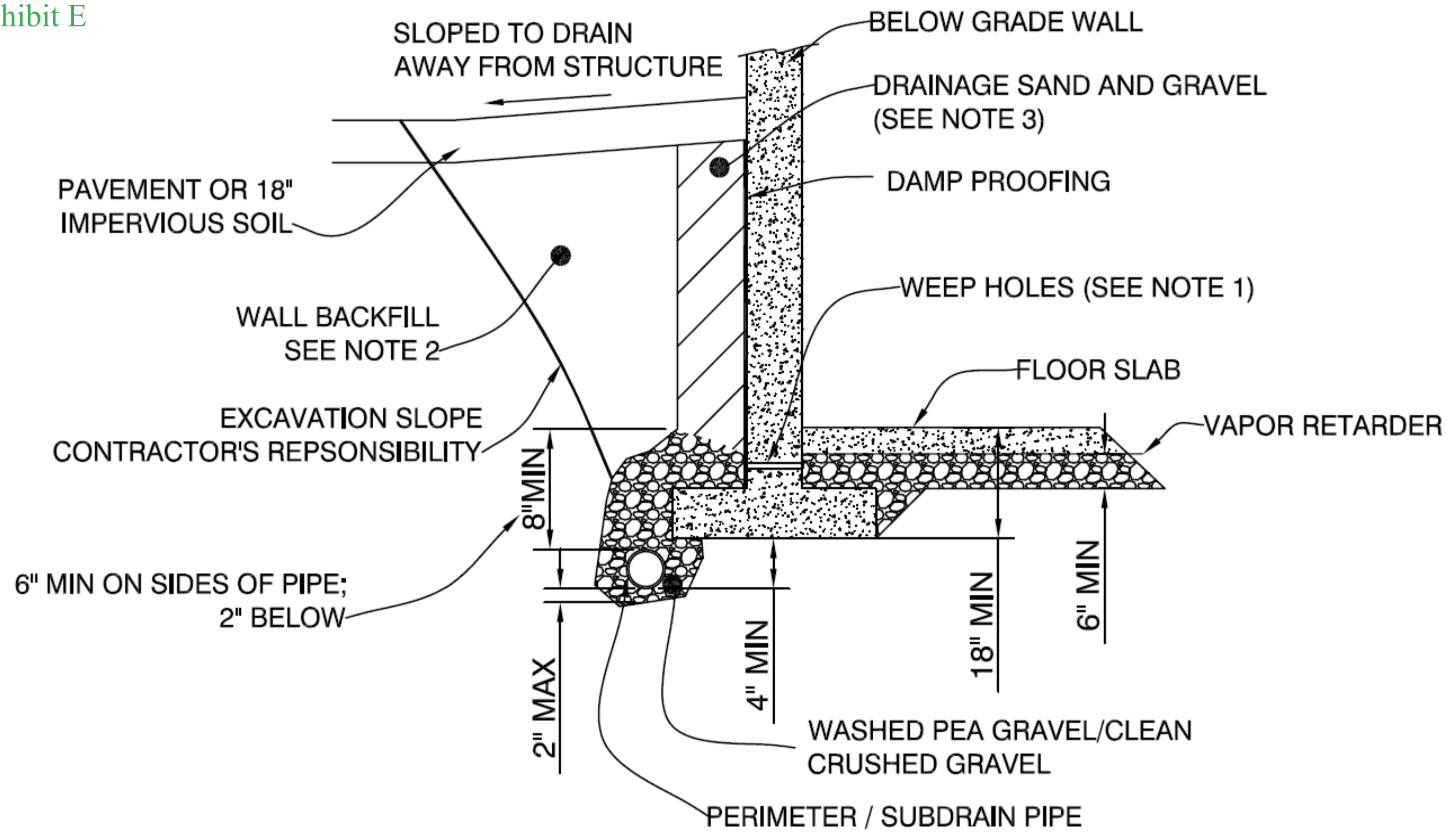

Notes

1. Washed pea gravel/crushed rock beneath floor slab could be hydraulically connected to perimeter/subdrain pipe. Use of 1" diameter weep holes as shown is one applicable method. Crushed gravel should consist of 3/4" minus. Washed pea gravel should consist of 3/8" to No. 8 standard sieve.

2. Wall backfill should meet WSDOT Gravel Backfill for walls Specification 9-03-12(2).

3. Drainage sand and gravel backfill within 18" of wall should be compacted with hand-operated equipment. Heavy equipment should not be used for backfill, as such equipment operated near the wall could increase lateral earth pressures and possibly damage the wall. The table below presents the drainage sand and gravel gradation.

4. All wall back fill should be placed in layers not exceeding 4" loose thickness for light equipment and 8" for heavy equipment and should be densely compacted. Beneath paved or sidewalk areas, compact to at least 95% Modified Proctor maximum density (ASTM: 01557-70 Method C). In landscaping areas, compact to 90% minimum.

5. Drainage sand and gravel may be replaced with a geocomposite core sheet drain placed against the wall and connected to the subdrain pipe. The geocomposite core sheet should have a minimum transmissivity of 3.0 gallons/minute/foot when tested under a gradient of 1.0 according to ASTM 04716.

6. The subdrain should consist of 4" diameter (minimum), slotted or perforated plastic pipe meeting the requirements of AASHTO M 304; 1/8-inch maximum slot width; 3/16- to 3/8-inch perforated pipe holes in the lower half of pipe, with lower third segment unperforated for water flow; tight joints; sloped at a minimum of 6"/100' to drain; cleanouts to be provided at regular intervals.

7. Surround subdrain pipe with 8 inches (minimum) of washed pea gravel (2" below pipe" or 5/8" minus clean crushed gravel. Washed pea gravel to be graded from 3/8-inch to No.8 standard sieve.

8. See text for floor slab subgrade preparation.

Materials

Drainage Sand and Gravel

Sieve Size	% Passing by Weight
¾"	100
No 4	28 – 56
No 8	20 – 50
No 50	3 – 12
No 100	0 – 2

¾" Minus Crushed Gravel

Sieve Size	% Passing by Weight
¾"	100
½"	75 – 100
¼"	0 – 25
No 100	0 – 2
(by wet sieving)	(non-plastic)

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Typical Wall Drainage & Backfill Detail

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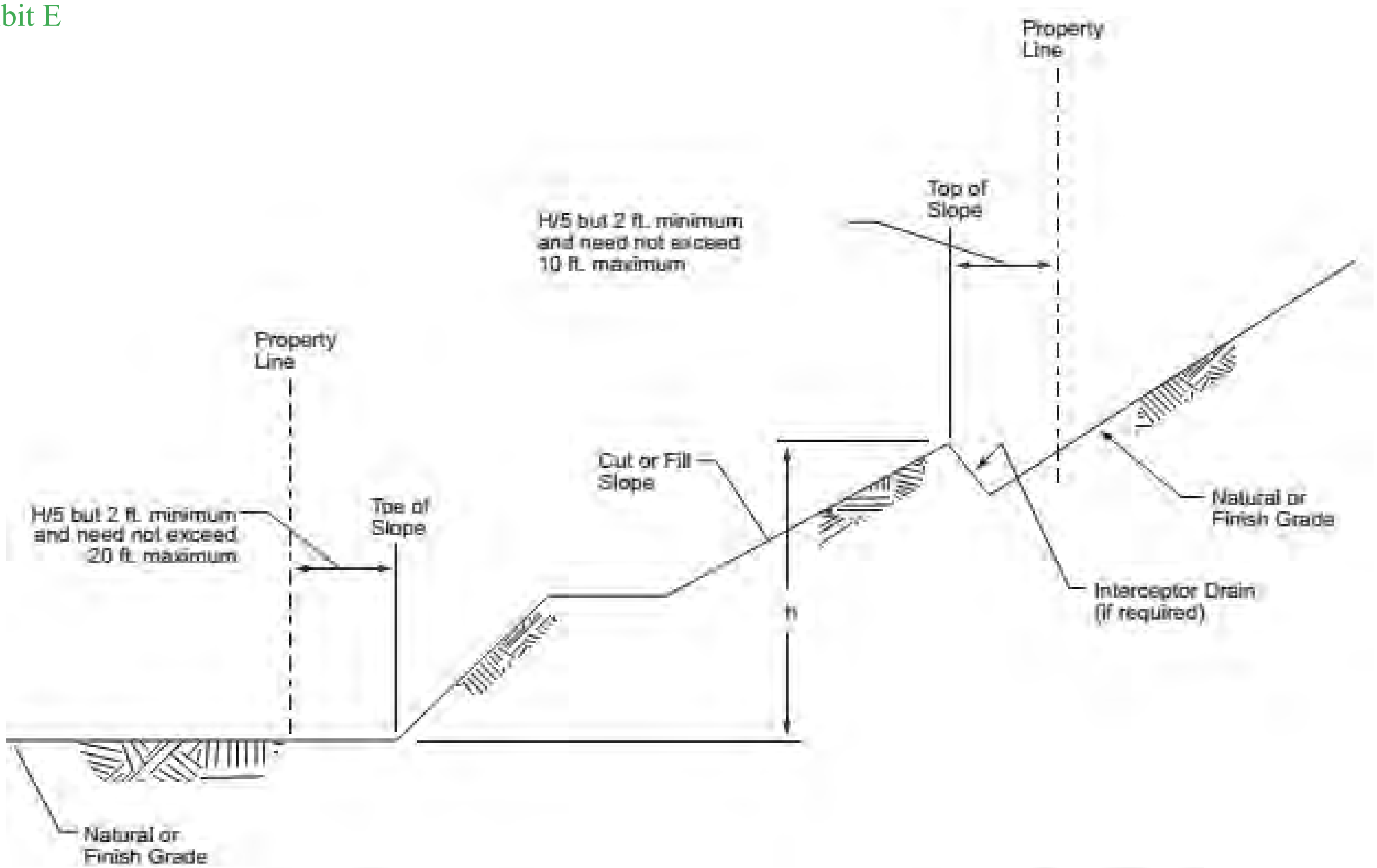

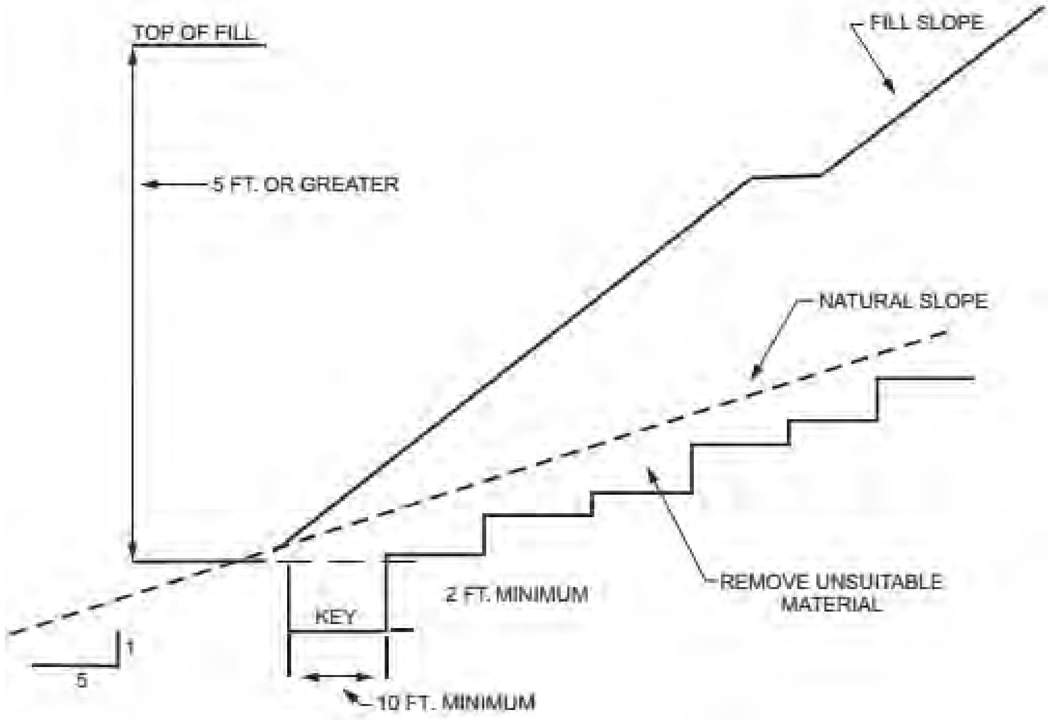

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IBC Appendix J Detail

Proposed Residential Plat
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Appendix A

Subsurface Explorations

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Exhibit E

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.

2. Soil classification using laboratory tests is based on ASTM D2487-90.

3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry-	Absence of moisture, dry to the touch
Moist-	Damp, but no visible water
Wet-	Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

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6302 – 112th Street
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PN: 0122253072, 0122253074, & 0122254092

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LOG OF BORING B-1

Proposed Residental Plat

Gig Harbor, Wa

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling

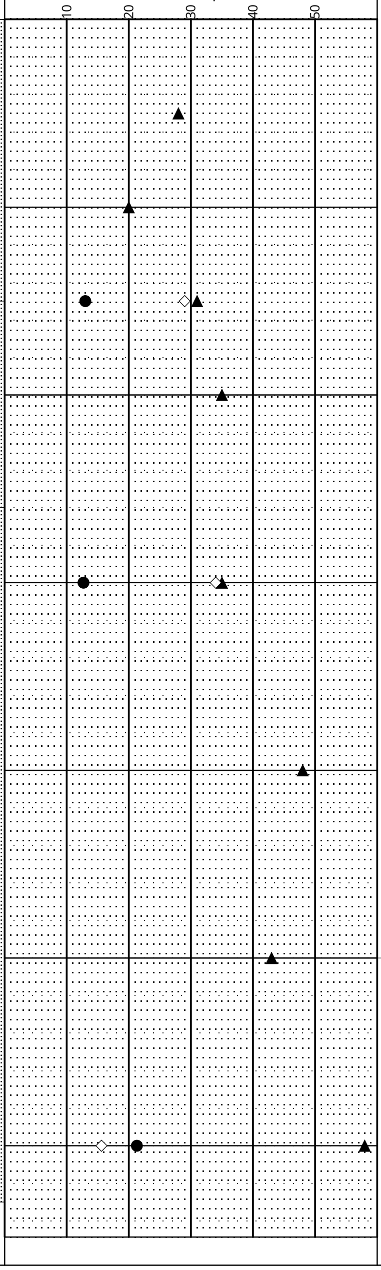
Drilling Company: Boretec
Drilling Method: Hollow-stem auger
Drilling Rig: EC95
Sampler Type: Split-spoon
Hammer Type: Cathead
Hammer Weight: 140 lb
Logged By: NAF
Drilling Date: 11/10/21
Datum: NAVD 88
Elevation: 235
Termination Depth: 31.5
Latitude:
Longitude:

Notes:

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	SPT Blowcounts	Groundwater
0	235		Brown silty SAND with gravel (SM) (medium dense, moist) (fill)		
				5 7 11	
5	230			2 5 15	
			Brown to gray gravelly silty fine SAND and scattered wood fragments less 1/4" diameter (SM)(dense, moist) (fill)	14 15 16	
10	225			13 16 19	
			Grayish brown gravelly silty SAND, grades to trace gravel with depth, varved at upper contact, becomes siltier with depth (SM) (dense to very dense, moist becomes wet at 25') (advance outwash)		
15	220			9 15 20	
20	215			14 22 26	
25	210			17 20 23	▼ ATD
30	205	No Gravel		22 31 27	
			(Termination Depth - 11/10/21)		

Test Results
Plastic Limit ├──┤ Liquid Limit
% Fines (<0.075mm) ◇
% Water Content ●

Penetration - ▲ (blows per foot)



▥ Silty sand

Sheet 1 of 1

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FIG.

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Exhibit E

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LOG OF BORING B-2

Proposed Residental Plat

Gig Harbor, Wa

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling

Drilling Company: Boretec
Drilling Method: Hollow-stem auger
Drilling Rig: EC95
Sampler Type: Split-spoon
Hammer Type: Cathead
Hammer Weight: 140 lb

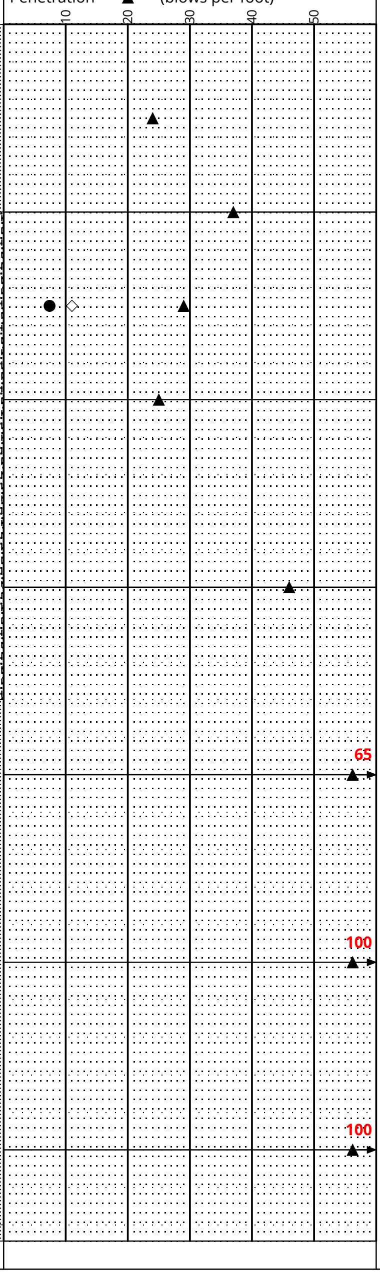
Logged By: NAF
Drilling Date: 11/10/21
Datum: NAVD 88
Elevation: 240
Termination Depth: 41.5
Latitude:
Longitude:

Notes:

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	SPT Blowcounts
0	240		Brown silty fine SAND with interbedded sandy silt, mottled bands about 2" thick (SM) (medium dense, moist) (fill)	
				7 10 14
5	235		Brown poorly graded fine to medium SAND with some silt (SM) (medium dense to dense, moist) (advance outwash)	11 16 21
				10 13 16
10	230			7 10 15
15	225			12 21 25
		chatter	Brown to gray gravelly silty SAND, becomes more gravelly at 40 feet (very dense, moist) (advance outwash)	
20	220			15 31 34
25	215			32 50/6"
30	210			38 50/5"

Test Results
Plastic Limit ├──┤ Liquid Limit
% Fines (<0.075mm) ◇
% Water Content ●

Penetration - ▲ (blows per foot)



Groundwater

▥ Silty sand
▦ Poorly graded sand with silt

Sheet 1 of 2
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FIG.

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LOG OF BORING B-2

Proposed Residental Plat

Gig Harbor, Wa

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling

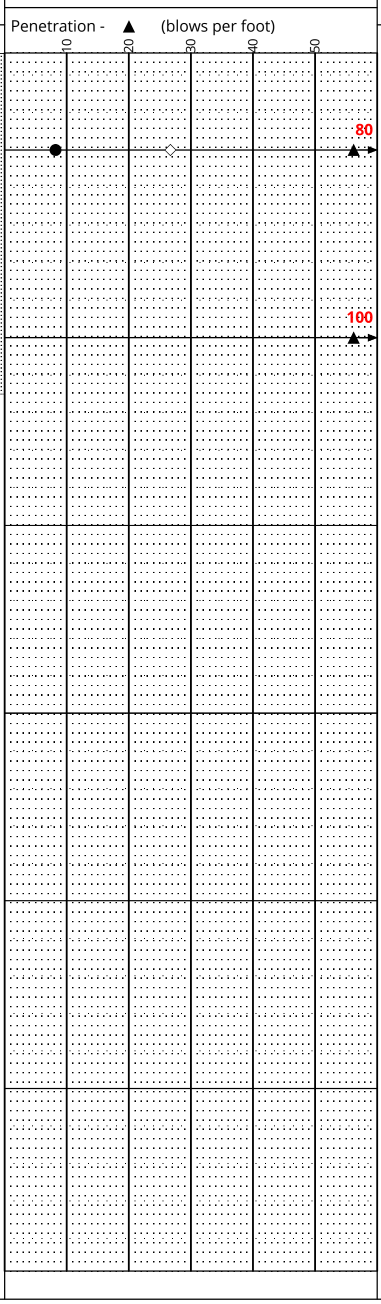
Notes:

Drilling Company: Boretec
Drilling Method: Hollow-stem auger
Drilling Rig: EC95
Sampler Type: Split-spoon
Hammer Type: Cathead
Hammer Weight: 140 lb

Logged By: NAF
Drilling Date: 11/10/21
Datum: NAVD 88
Elevation: 240
Termination Depth: 41.5
Latitude:
Longitude:

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	SPT Blowcounts	Sampler	Symbol	Groundwater
			As above				
35	205			22 36 44			
40	200			42 50/5"			
			(Termination Depth - 11/10/21)				
45	195						
50	190						
55	185						
60	180						

Test Results
Plastic Limit ├──┤ Liquid Limit
% Fines (<0.075mm) ◇
% Water Content ●



▥ Silty sand
▩ Poorly graded sand with silt

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LOG OF BORING B-3

Proposed Residental Plat

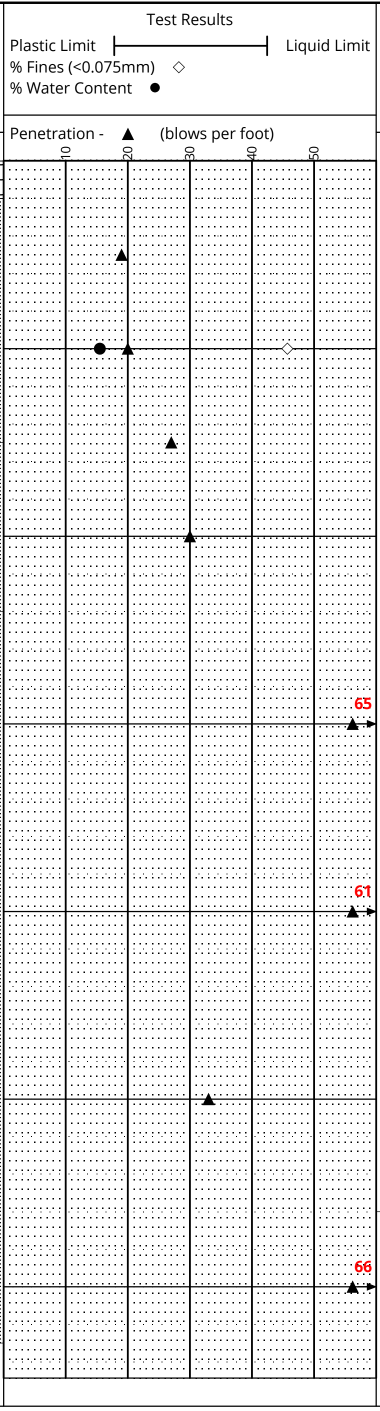
Gig Harbor, Wa

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling

Drilling Company:	Boretec	**Logged By:**	NAF
Drilling Method:	Hollow-stem auger	**Drilling Date:**	11/10/21
Drilling Rig:	EC95	**Datum:**	NAVD 88
Sampler Type:	Split-spoon	**Elevation:**	238
Hammer Type:	Cathead	**Termination Depth:**	31.5
Hammer Weight:	140 lb	**Latitude:**	
		Longitude:	

Notes:

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	SPT Blowcounts
0			Brown topsoil (loose, moist to wet) (topsoil)	
	235		Grayish brown silty SAND with some gravel, trace mottling, occasional silt layers about 1/2" thick (SM) (medium dense, moist) (fill)	7 9 10
5				5 11 9
	230		Dark gray to purple silty SAND with gravel, more gravelly at bottom contact (SM) (medium dense to dense, moist) (fill)	7 13 14
10				11 15 15
	225		Gray silty SAND with some gravel (SM) (very dense, moist becomes wet at 28 feet) (advance outwash)	
15				13 22 43
	220			
20				18 28 33
	215			
25				12 14 19
	210			
30				14 26 40
			(Termination Depth - 11/10/21)	



Groundwater
▼ ATD

▨ Low plasticity organic silts
▥ Silty sand

Sheet 1 of 1

JOB: Rush.SummitPointe

FIG.

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Test Pit TP-1

Location: East of lot 29
Approximate Elevation: 240’

Depth (ft)	Soil Type	Soil Description
0 - 6	--	Tan to brown silty SAND (loose to med dense, moist) (Fill)
6 - 12	--	Grey silty SAND (med dense, moist to damp) (Fill)
12 - 16	SM	Tan to grey silty SAND (med dense, moist) (outwash)

Terminated at 16 feet below ground surface (BGS).
No mottling observed at the time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Test Pit TP-2

Location: Front of lot 30
Approximate Elevation: 242’

Depth (ft)	Soil Type	Soil Description
0 - ¼	-	Topsoil/rootzone
¼ - 10	SM	Brown silty gravelly SAND with roots/organics and some cobbles (loose to med dense, moist) (Fill)
10 - 16	SM	Brown silty gravelly SAND with some cobbles (med dense to dense, moist) (outwash)

Terminated at 16 feet BGS.
No mottling observed at the time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Test Pit TP-3

Location: Front of lot 23
Approximate Elevation: 239’

Depth (ft)	Soil Type	Soil Description
0 - ¼	--	Topsoil/rootzone
¼ - 3	SM	Tan to grey silty gravelly SAND (loose to med dense, moist to wet) (Fill)
3 - 6	SM	Grey silty gravelly silty SAND (moist to wet) (Fill)
6 - 10	GM	Brown silty sandy GRAVEL some cobbles (med dense to dense, moist) (Fill)
10 - 15	SM	Bluish grey silty SAND (med dense, moist) (Fill)

Terminated at 16 feet BGS.
No mottling observed at the time of excavation.
Major caving observed in lower 12 feet at the time of excavation.
No groundwater seepage observed at the time of excavation.

Logged by: CJB

Excavated on: January 17, 2022

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Test Pit Logs

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Test Pit TP-4

Location: Corner of lots 50, 51, 52
Approximate Elevation: 244'

Depth (ft)	Soil Type	Soil Description
0 - 2	SM	Tan to bluish grey silty SAND (loose, moist) (fill)
2 - 15	GM	Brown silty sandy GRAVEL some organics (med dense, moist to wet) (fill)

Terminated at 15 feet (BGS).
No mottling observed at the time of excavation.
No caving observed at the time of excavation.
Groundwater seepage observed at approximately 3 feet BGS at the time of excavation.

Test Pit TP-5

Location: Front of lot 34
Approximate Elevation: 248'

Depth (ft)	Soil Type	Soil Description
0 - 15	SM	Tan silty SAND (loose, moist) (recessional outwash)

Terminated at 15 feet BGS.
Iron oxide staining observed at approximately 4 feet BGS.
No caving observed at the time of excavation.
Groundwater seepage observed at approximately 7 feet BGS at the time of excavation.

Test Pit TP-6

Location: Border of lots 37 and 38
Approximate Elevation: 254'

Depth (ft)	Soil Type	Soil Description
0 - 1	GM	Brown silty sandy GRAVEL (med dense, moist) (Fill)
1 - 6	GP	Bluish grey silty sandy GRAVEL (dense, moist) (Fill)
6 - 10	SM	Tan silty SAND (med dense, moist) (Fill)
10 - 15	GP	Bluish grey silty sandy GRAVEL (dense, moist) (advance outwash)

Terminated at 15 feet BGS.
No mottling observed at the time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Logged by: CJB

Excavated on: January 17, 2022

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Test Pit TP-7

Location: SW corner of lot 55
Approximate Elevation: 250’

Depth (ft)	Soil Type	Soil Description
0 - 3	GP	Brown silty sandy GRAVEL some roots and cobbles (med dense, moist) (Fill)
3 - 6	SM	Tan silty SAND (med dense, moist) (Fill)
6 - 11	SM	Bluish grey silty SAND (med dense, moist) (Fill)
11 - 15	SM	Tan silty SAND (med dense, moist) (outwash)

Terminated at 15 feet BGS.
No mottling observed at the time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Test Pit TP-8

Location: Border of 46 and 47
Approximate Elevation: 246’

Depth (ft)	Soil Type	Soil Description
0 - 4	SM	Tan silty SAND (loose, moist) (Fill)
4 - 10	ML	Tan sandy SILT (med stiff, moist) (Fill)
10 - 15	SM	Tan silty SAND (med dense, moist) (recessional outwash)

Terminated at 15 feet BGS.
Iron oxide staining observed at approximately 4 feet BGS
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Test Pit TP-9

Location: Border of lots 18 and 19
Approximate Elevation: 242’

Depth (ft)	Soil Type	Soil Description
0 - 8	SM	Tan silty SAND (med dense, moist) (Fill)
8 - 10	ML	Tan sandy SILT (med dense, moist) (Fill)
10 - 12	SM	Tan silty SAND (med dense, moist) (Fill)
12 - 15	GM	Brown silty sandy GRAVEL (very dense, moist to damp)(advance outwash)

Terminated at 15 feet below ground surface (BGS).
No mottling observed at the time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Logged by: CJB

Excavated on: January 17, 2022

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Test Pit TP-10

Location: Eastern edge of lot 15
Approximate Elevation: 247’

Depth (ft)	Soil Type	Soil Description
0 - 1	GM	Brown silty sandy GRAVEL (med dense, moist) (Fill)
1 - 2	GM	Grey silty sandy GRAVEL (med dense, moist) (Fill)
2 - 14	SM	Brown to tan silty SAND (med dense, moist) (Fill)
14 - 15	ML	Orangish tan sandy SILT (med dense, moist) (recessional outwash)

Terminated at 15 feet below ground surface (BGS).
Iron oxide staining observed at approximately 14 feet BGS.
No caving observed at the time of excavation.
No groundwater seepage observed at the time of excavation.

Test Pit TP-11

Location: Front of lot 12
Approximate Elevation: 252’

Depth (ft)	Soil Type	Soil Description
0 - 5	GM	Brown silty sandy GRAVEL (med dense, moist) (Fill)
5 - 8	SM	Bluish grey silty SAND (med dense, moist) (Fill)
8 - 9	ML	Tan sandy SILT (med dense, moist) (Fill)
9 - 15	SM	Tan silty SAND (med dense, moist) (recessional outwash)

Terminated at 15 feet BGS.
No mottling observed at the time of excavation.
Caving observed in the lower 6 feet at the time of excavation.
Groundwater seepage observed at 4 and 7 feet BGS at the time of excavation.

Test Pit TP-12

Location: Center of lot 2
Approximate Elevation: 254’

Depth (ft)	Soil Type	Soil Description
0 - 5	GM	Grey silty sandy GRAVEL (med dense, moist) (Fill)
5 - 9	SM	Tan to grey silty SAND (med dense, moist) (Fill)
9 - 10	--	Dark brown sandy SILT (med dense, moist)((Fill)
10 - 11	GP	Tan to grey silty gravelly SAND/sandy GRAVEL (dense, moist) (advance outwash)

Terminated at 11 feet BGS.
No mottling observed at the time of excavation.
Caving observed in the lower 5 feet at the time of excavation.
Groundwater seepage observed at 8 feet BGS at the time of excavation.

Logged by: CJB

Excavated on: January 17, 2022

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Test Pit TP-13

Location: Border of lots 4 and 5
Approximate Elevation: 262’

Depth (ft)	Soil Type	Soil Description
0 - 8	GP	Tan to grey silty sandy GRAVEL (med dense, moist to wet) (Fill)
8 - 10	GP	Grey silty sandy GRAVEL (dense, moist to wet) (advance outwash)
10 - 12	SM	Tan silty gravelly SAND/sandy GRAVEL (dense, moist) (advance outwash)

Terminated at 12 feet below ground surface (BGS).
Iron oxide staining observed at approximately 7 feet BGS.
Minor caving in the lower 4 feet observed at the time of excavation.
Groundwater seepage observed at 8 feet BGS at the time of excavation.

Test Pit TP-14

Location: Border of lots 7 and 8
Approximate Elevation: 272’

Depth (ft)	Soil Type	Soil Description
0 - 8	SM	Grey to tan silty gravelly SAND (med dense, moist to damp) (Fill)
8 - 9	SM	Bluish grey silty SAND (med dense, moist) (advance outwash)
9 - 14	SM	Bluish grey silty gravelly SAND/sandy GRAVEL (dense, moist) (advance outwash)

Terminated at 14 feet below ground surface (BGS).
Iron oxide staining observed at approximately 8 feet BGS.
No caving observed at the time of excavation.
Groundwater seepage observed at 7 feet BGS at the time of excavation.

Logged by: CJB

Excavated on: January 17, 2022

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Appendix B

Laboratory Test Results

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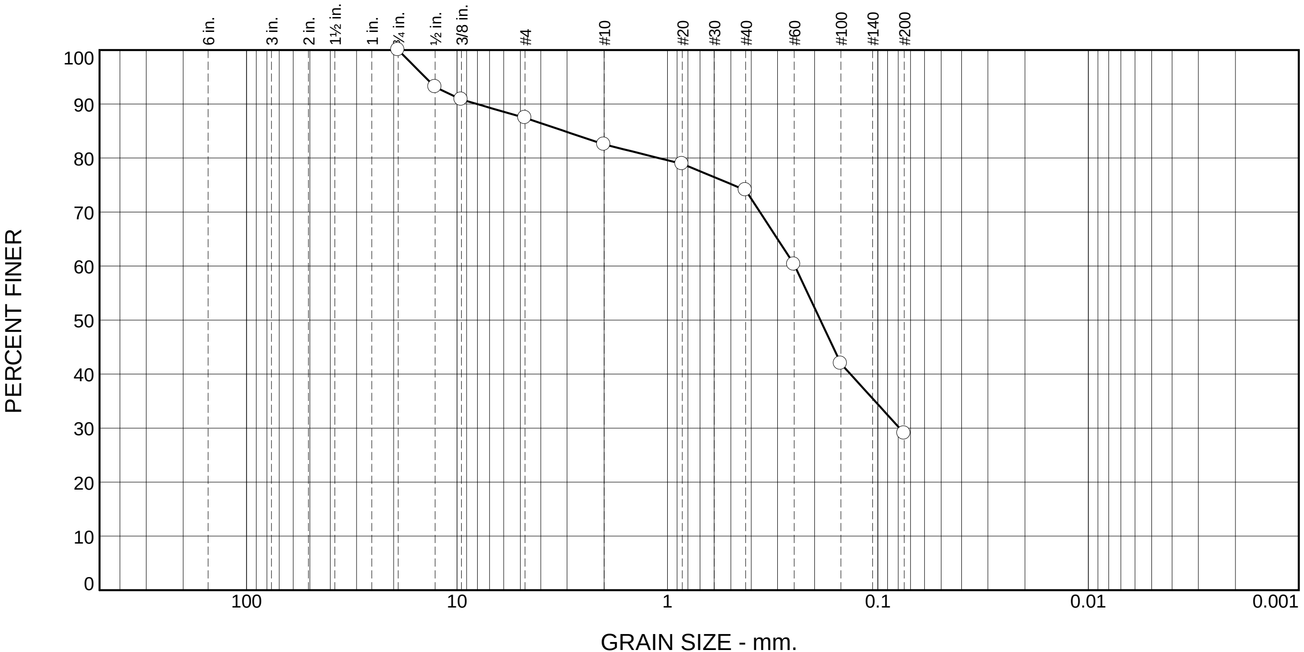
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.6	4.9	8.4	45.1	29.0	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	93.1		
0.375	90.8		
#4	87.4		
#10	82.5		
#20	78.9		
#40	74.1		
#60	60.3		
#100	42.0		
#200	29.0		

* (no specification provided)

Material Description

Brown to gray gravelly silty SAND and scattered wood fragments less 1/4" diameter (SM)(dense, moist) (fill)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

$D_{90}=$ 8.0455 $D_{85}=$ 3.0926 $D_{60}=$ 0.2480
$D_{50}=$ 0.1877 $D_{30}=$ 0.0790 $D_{15}=$
$D_{10}=$ $C_u=$ $C_c=$

Remarks

Natural Moisture: 13%

Date Received: 11/10/21 **Date Tested:** 11/11/21
Tested By: MAW
Checked By: KSS
Title: PM

Source of Sample: B-1 **Depth:** 7.5 **Date Sampled:** 11/10/21
Sample Number: 3

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-1

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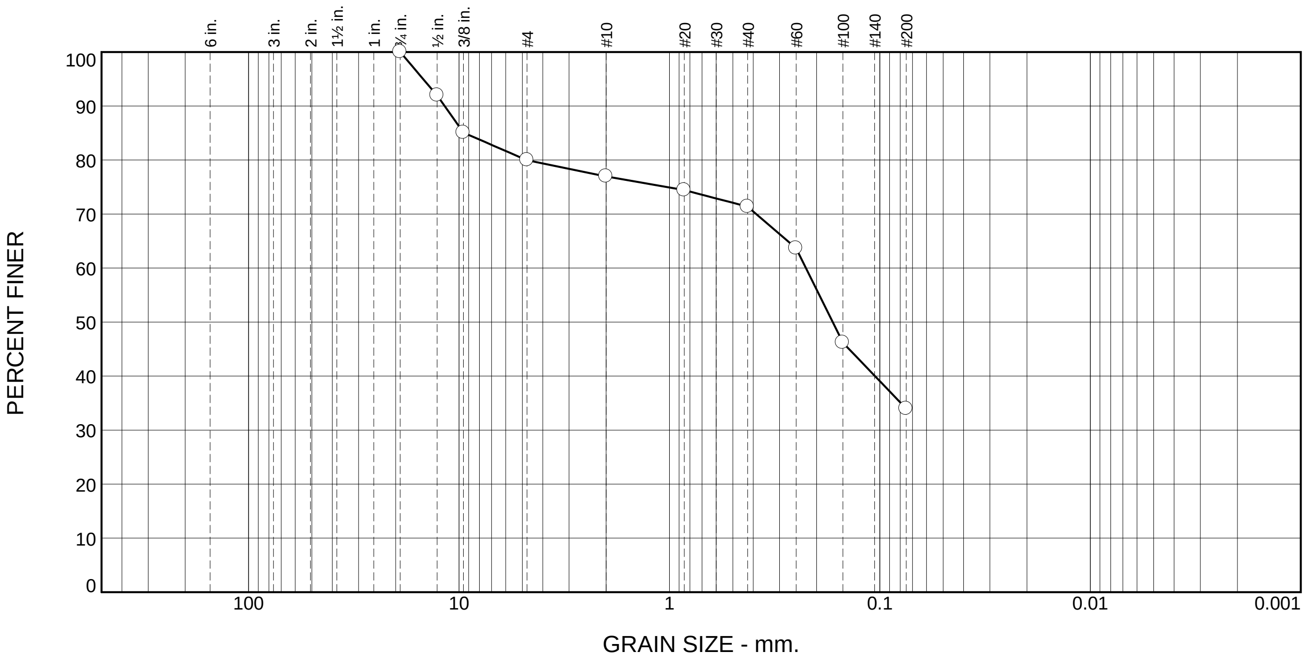
Tested By: ______________________ **Checked By:** ______________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	20.0	3.0	5.6	37.4	34.0	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	92.0		
0.375	85.1		
#4	80.0		
#10	77.0		
#20	74.4		
#40	71.4		
#60	63.6		
#100	46.2		
#200	34.0		

* (no specification provided)

Material Description

Gravelly silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 11.7027 D_{85}= 9.4332 D_{60}= 0.2247
D_{50}= 0.1676 D_{30}= D_{15}=
D_{10}= **~0.01**

Remarks

Natural Moisture: 12.9%

Date Received: 11/10/21 **Date Tested:** 11/11/21
Tested By: MAW
Checked By: KSS
Title: PM

Source of Sample: B-1 **Depth:** 15 **Date Sampled:** 11/10/21
Sample Number: 5

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-2

Tested By: ______________________ **Checked By:** ______________________

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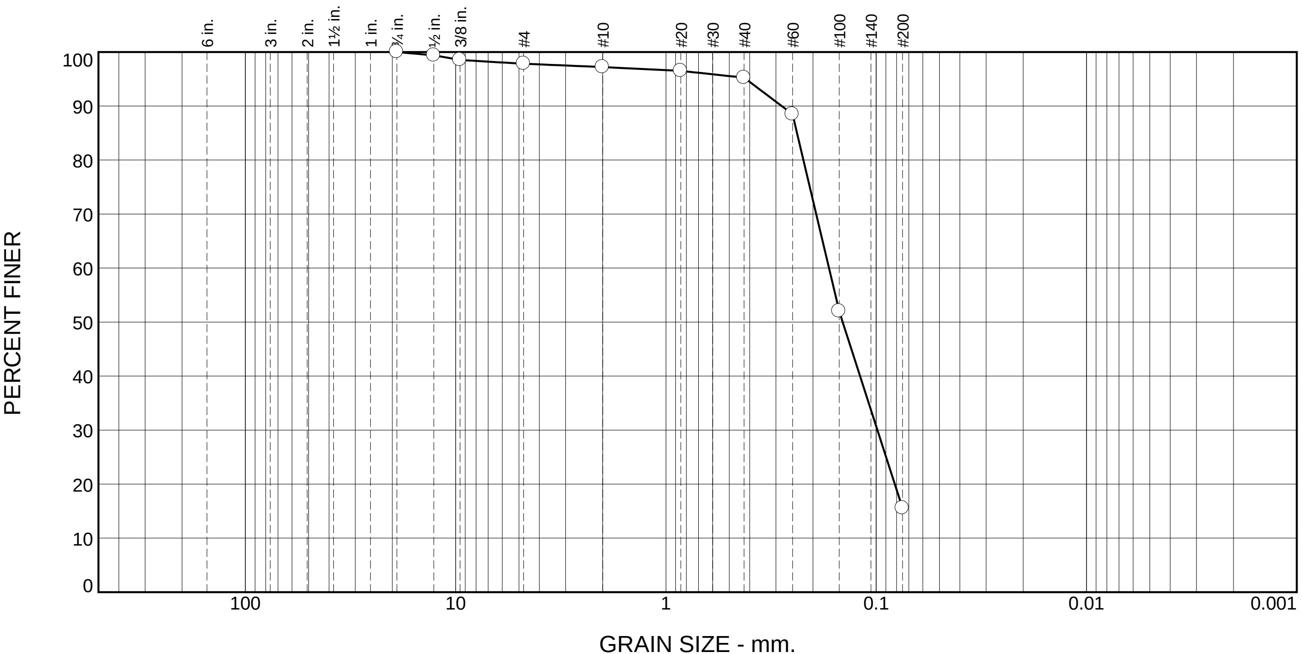


% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.2	0.6	1.9	79.7	15.6	

Test Results (ASTM D 6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	99.4		
0.375	98.5		
#4	97.8		
#10	97.2		
#20	96.5		
#40	95.3		
#60	88.5		
#100	52.0		
#200	15.6		

* (no specification provided)

Material Description

Silty SAND with trace gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.2815 D_{85}= 0.2381 D_{60}= 0.1678
D_{50}= 0.1444 D_{30}= 0.0987 D_{15}=
D_{10}= **~0.06**

Remarks

Natural Moisture: 21.3%

Date Received: 11/10/21 **Date Tested:** 11/11/21
Tested By: MAW
Checked By: KSS
Title: PM

Source of Sample: B-1 **Depth:** 30 **Date Sampled:** 11/10/21
Sample Number: 8

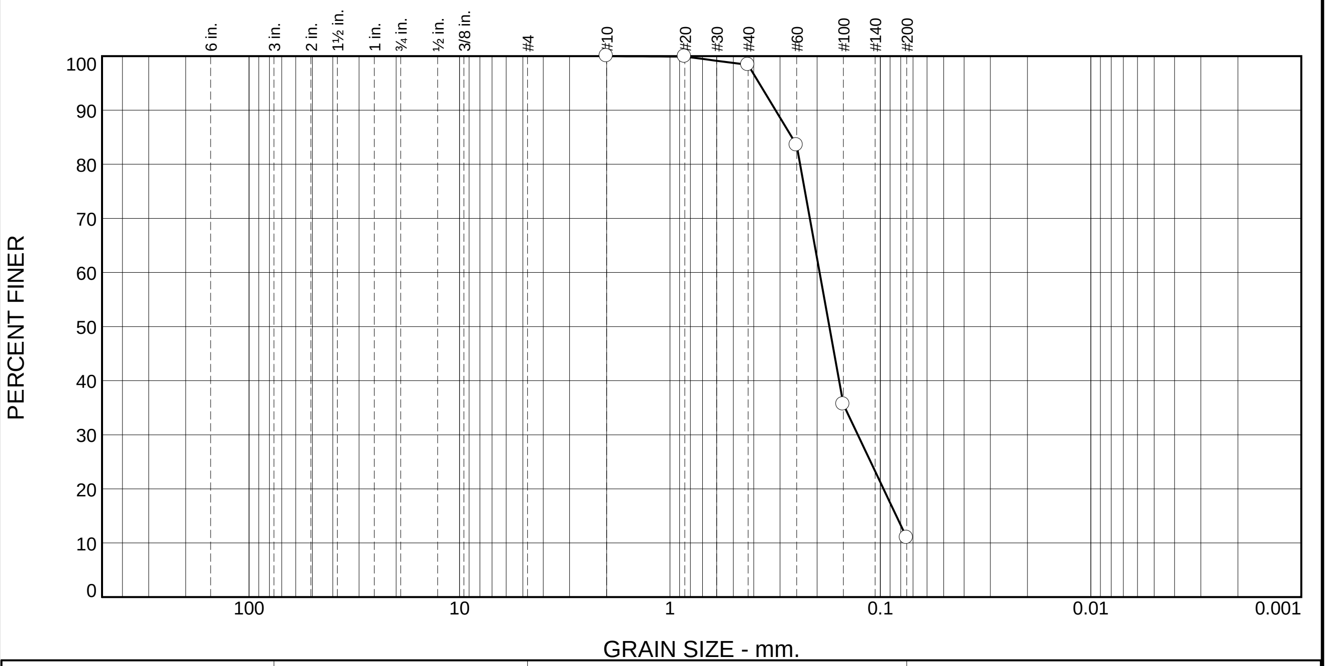
GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-3

Tested By: ____________________ **Checked By:** ____________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.6	87.4	11.0	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	98.4		
#60	83.5		
#100	35.6		
#200	11.0		

* (no specification provided)

Material Description

Poorly graded SAND with some silt (SP-SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}=	0.3151	D_{85}=	0.2635	D_{60}=	0.1945
D_{50}=	0.1748	D_{30}=	0.1280	D_{15}=	0.0840
D_{10}=	**~0.07**				

Remarks

Natural Moisture: 7.4%

Date Received: 11/10/21 **Date Tested:** 11/11/21

Tested By: MAW

Checked By: KSS

Title: PM

Source of Sample: B-2 **Depth:** 7.5 **Date Sampled:** 11/10/21
Sample Number: 3

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Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-4

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Tested By: ______________________ **Checked By:** ______________________

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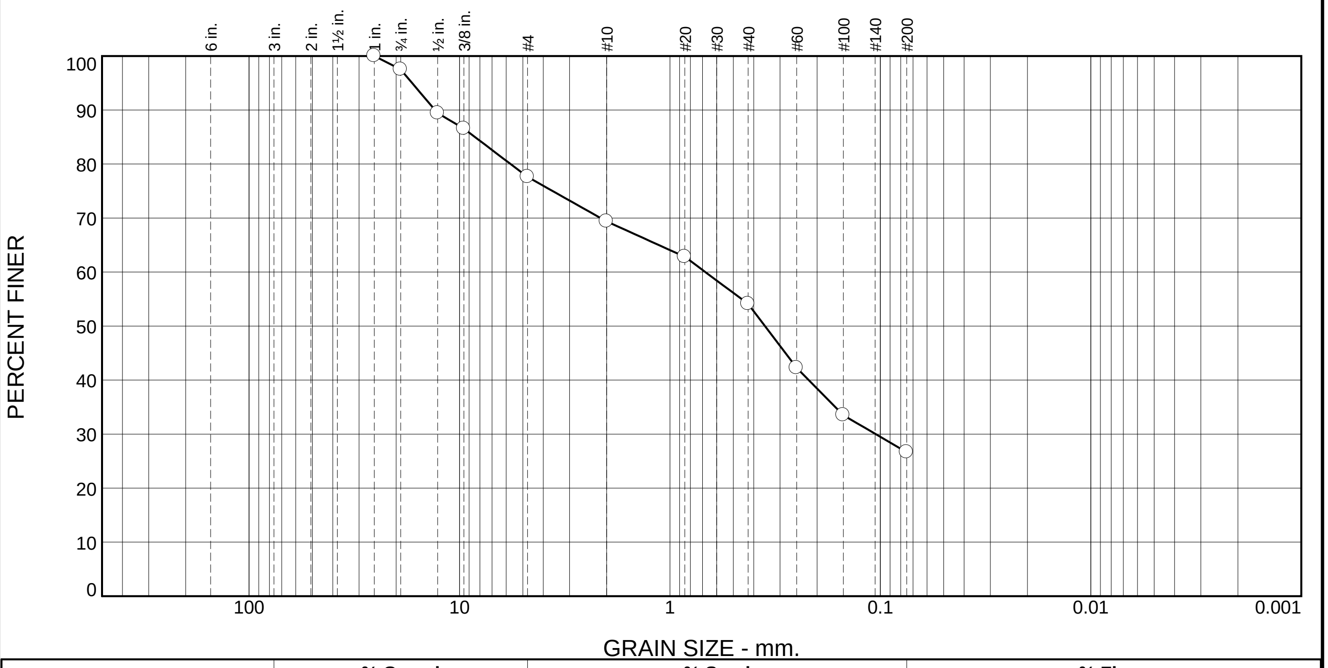
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.5	19.9	8.2	15.3	27.4	26.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	97.5		
.5	89.4		
0.375	86.5		
#4	77.6		
#10	69.4		
#20	62.8		
#40	54.1		
#60	42.3		
#100	33.5		
#200	26.7		

* (no specification provided)

Material Description

Gravelly silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 13.0709	D_{85}= 8.4500	D_{60}= 0.6788
D_{50}= 0.3535	D_{30}= 0.1053	D_{15}=
D_{10}= ~0.01	C_u=	C_c=

Remarks

Natural Moisture: 8.2%

Date Received: 11/10/21 **Date Tested:** 11/11/21

Tested By: MAW

Checked By: KSS

Title: PM

Source of Sample: B-2 **Depth:** 35 **Date Sampled:** 11/10/21
Sample Number: 9

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-5

Tested By: ______________ **Checked By:** ______________

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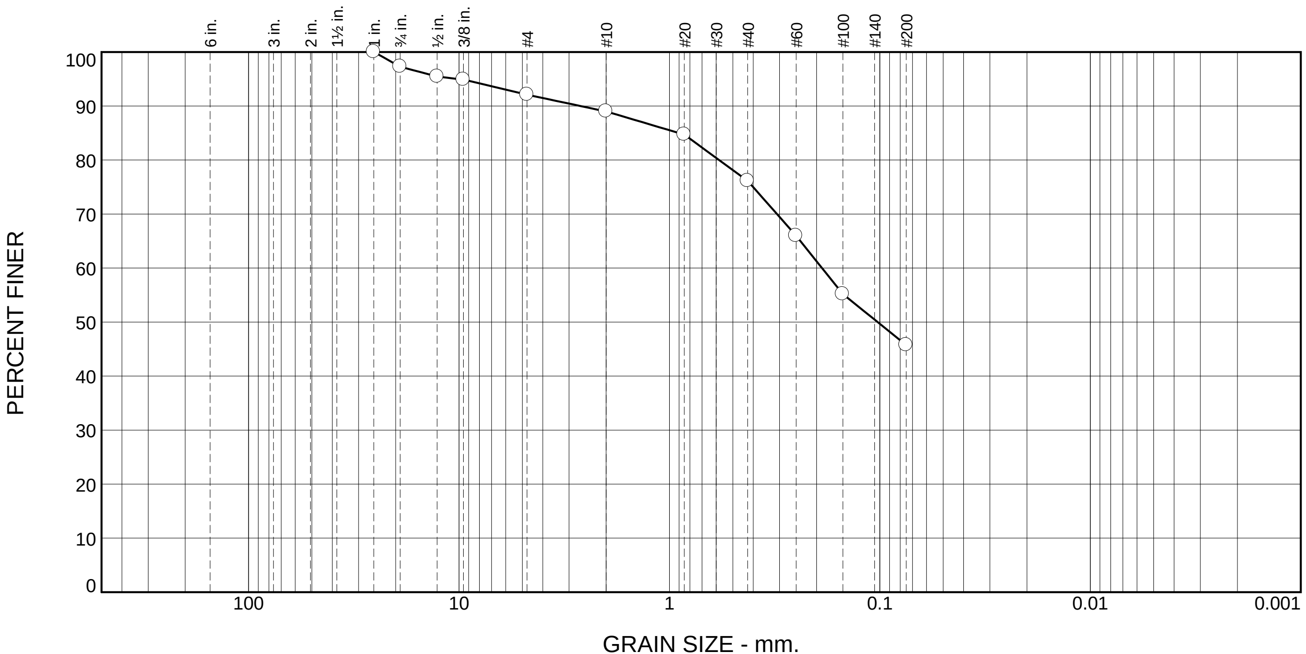
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.7	5.2	3.1	12.9	30.4	45.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	97.3		
.5	95.5		
0.375	94.9		
#4	92.1		
#10	89.0		
#20	84.7		
#40	76.1		
#60	66.0		
#100	55.2		
#200	45.7		

* (no specification provided)

Material Description

Silty SAND with some gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 2.6479 D_{85}= 0.9005 D_{60}= 0.1884
D_{50}= 0.1025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 15.5%

Date Received: 11/10/21 **Date Tested:** 11/11/21
Tested By: MAW
Checked By: KSS
Title: PM

Source of Sample: B-3 **Depth:** 5 **Date Sampled:** 11/10/21
Sample Number: 2

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-6

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Tested By: ____________ **Checked By:** ____________

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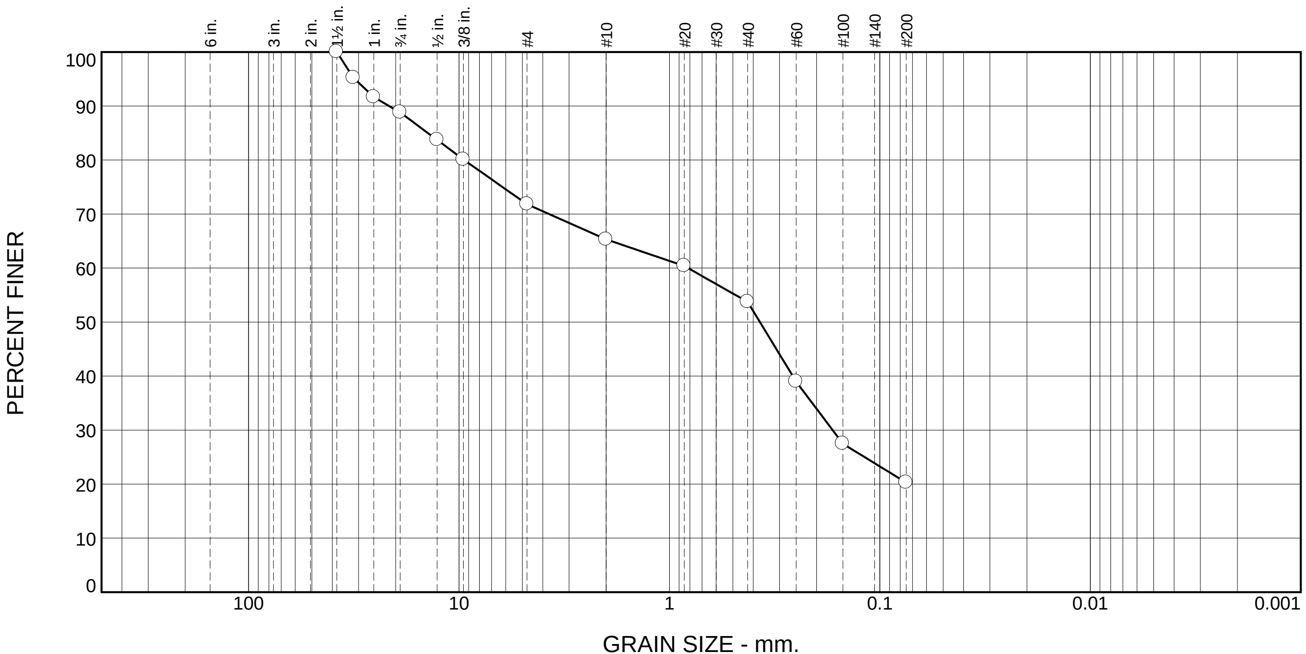

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.2	17.0	6.5	11.6	33.4	20.3	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1.25	95.2		
1	91.7		
.75	88.8		
.5	83.7		
0.375	80.1		
#4	71.8		
#10	65.3		
#20	60.4		
#40	53.7		
#60	39.0		
#100	27.5		
#200	20.3		

* (no specification provided)

Material Description

Silty gravelly SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}=	21.4926	D_{85}=	14.0529	D_{60}=	0.8162
D_{50}=	0.3715	D_{30}=	0.1678	D_{15}=	
D_{10}=		C_u=		C_c=	

Remarks

Natural Moisture: 6.5%

Date Received: 1/17/22 **Date Tested:** 1/7/22

Tested By: MAW

Checked By: KSS

Title: PM

Location: TP-2, S-1

Sample Number: 102890 **Depth:** 2'

Date Sampled: 1/17/22

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)

Project: Proposed Residental Plat

Project No: Rush.SummitPointe **Figure** AppB-7

Tested By: ____________________ **Checked By:** ____________________

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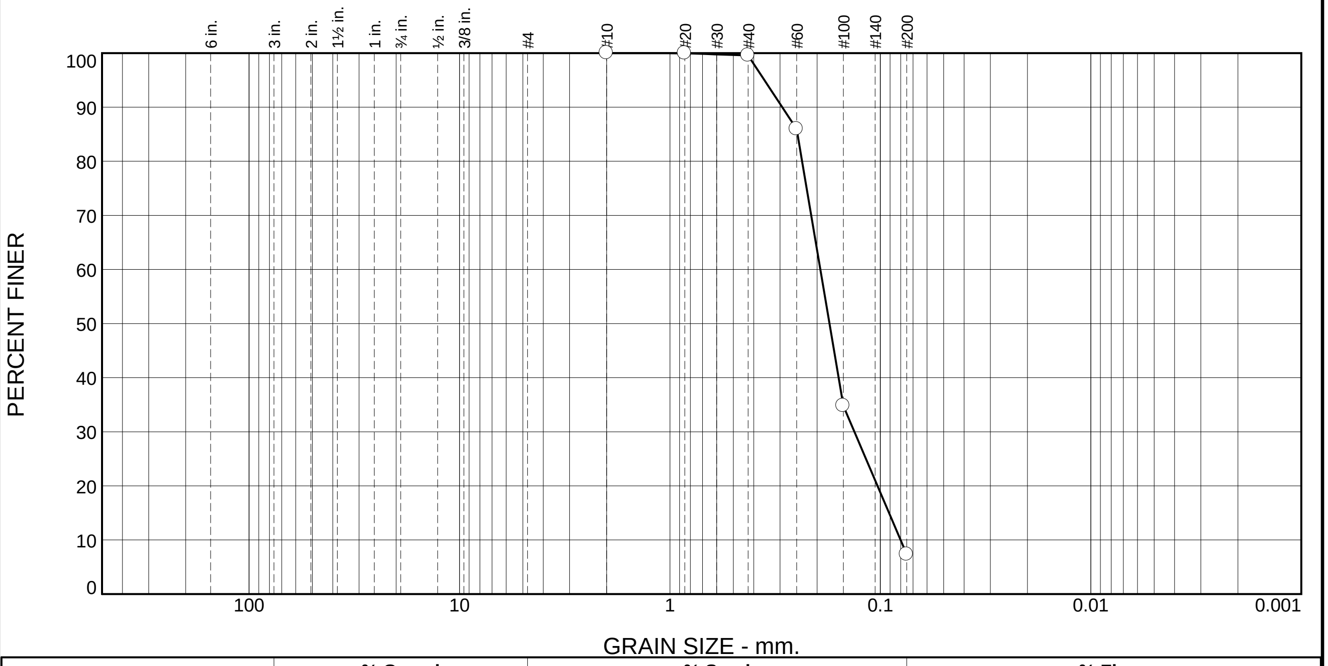
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	92.3	7.3	

Test Results (ASTM D 6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.6		
#60	86.0		
#100	34.8		
#200	7.3		

* (no specification provided)

Material Description

Poorly graded SAND with some silt (SP-SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.2928	D_{85}= 0.2476	D_{60}= 0.1929
D_{50}= 0.1746	D_{30}= 0.1329	D_{15}= 0.0910
D_{10}= 0.0802	C_u= 2.41	C_c= 1.14

Remarks

Natural Moisture: 18.3%

Date Received: 1/17/22 **Date Tested:** 2/7/22
Tested By: MAW
Checked By: KSS
Title: PM

Location: TP-5, S-1
Sample Number: 102895 **Depth:** 4'
Date Sampled: 1/17/22

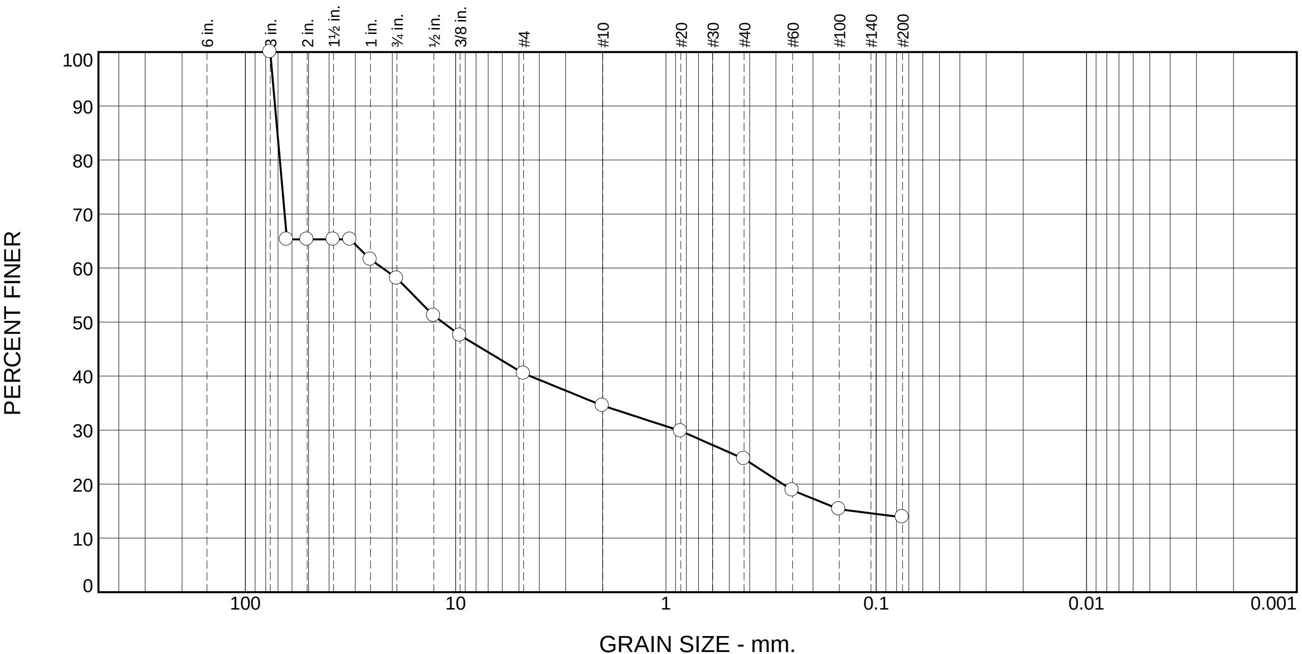
GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-8

Tested By: ______________________ **Checked By:** ______________________

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	41.9	17.6	6.0	9.8	10.8	13.9	

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3.0	100.0		
2.5	65.3		
2.0	65.3		
1.5	65.3		
1.25	65.3		
1	61.6		
.75	58.1		
.5	51.2		
0.375	47.5		
#4	40.5		
#10	34.5		
#20	29.8		
#40	24.7		
#60	18.8		
#100	15.3		
#200	13.9		

* (no specification provided)

Material Description

Silty sandy GRAVEL (GM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 72.2998	D_{85}= 70.4252	D_{60}= 22.2829
D_{50}= 11.5717	D_{30}= 0.8763	D_{15}= 0.1276
D_{10}=	C_u=	C_c=

Remarks

Natural Moisture: 2.8%

Date Received: 1/17/22 **Date Tested:** MAW

Tested By: 2/7/22

Checked By: KSS

Title: PM

Location: TP-9, S-1 **Date Sampled:** 1/17/22
Sample Number: 120902 **Depth:** 12'

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-9

Tested By: ______________________ **Checked By:** ______________________

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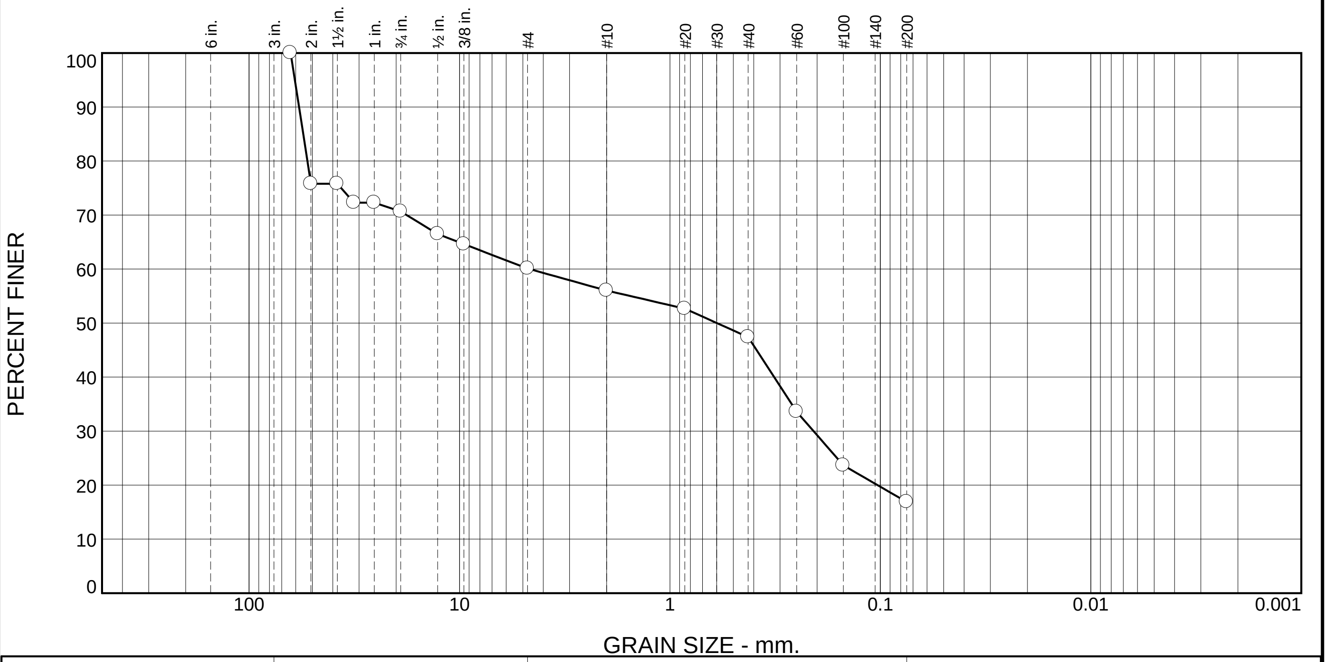
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	29.3	10.6	4.1	8.6	30.5	16.9	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2.5	100.0		
2.0	75.8		
1.5	75.8		
1.25	72.3		
1	72.3		
.75	70.7		
.5	66.5		
0.375	64.6		
#4	60.1		
#10	56.0		
#20	52.7		
#40	47.4		
#60	33.6		
#100	23.7		
#200	16.9		

* (no specification provided)

Material Description

Silty gravell SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 57.9077 D_{85}= 55.2990 D_{60}= 4.6457
D_{50}= 0.5977 D_{30}= 0.2078 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 5.2%

Date Received: 1/17/22 **Date Tested:** 2/7/22
Tested By: MAW
Checked By: KSS
Title: PM

Location: TP-14, S-2
Sample Number: 102910 **Depth:** 10'
Date Sampled: 1/17/22

GeoResources, LLC

Fife, WA

Client: Rush Development Company, INC (Joe Flansberg)
Project: Proposed Residental Plat
Project No: Rush.SummitPointe **Figure** AppB-10

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Appendix C

Slope Stability Analyses

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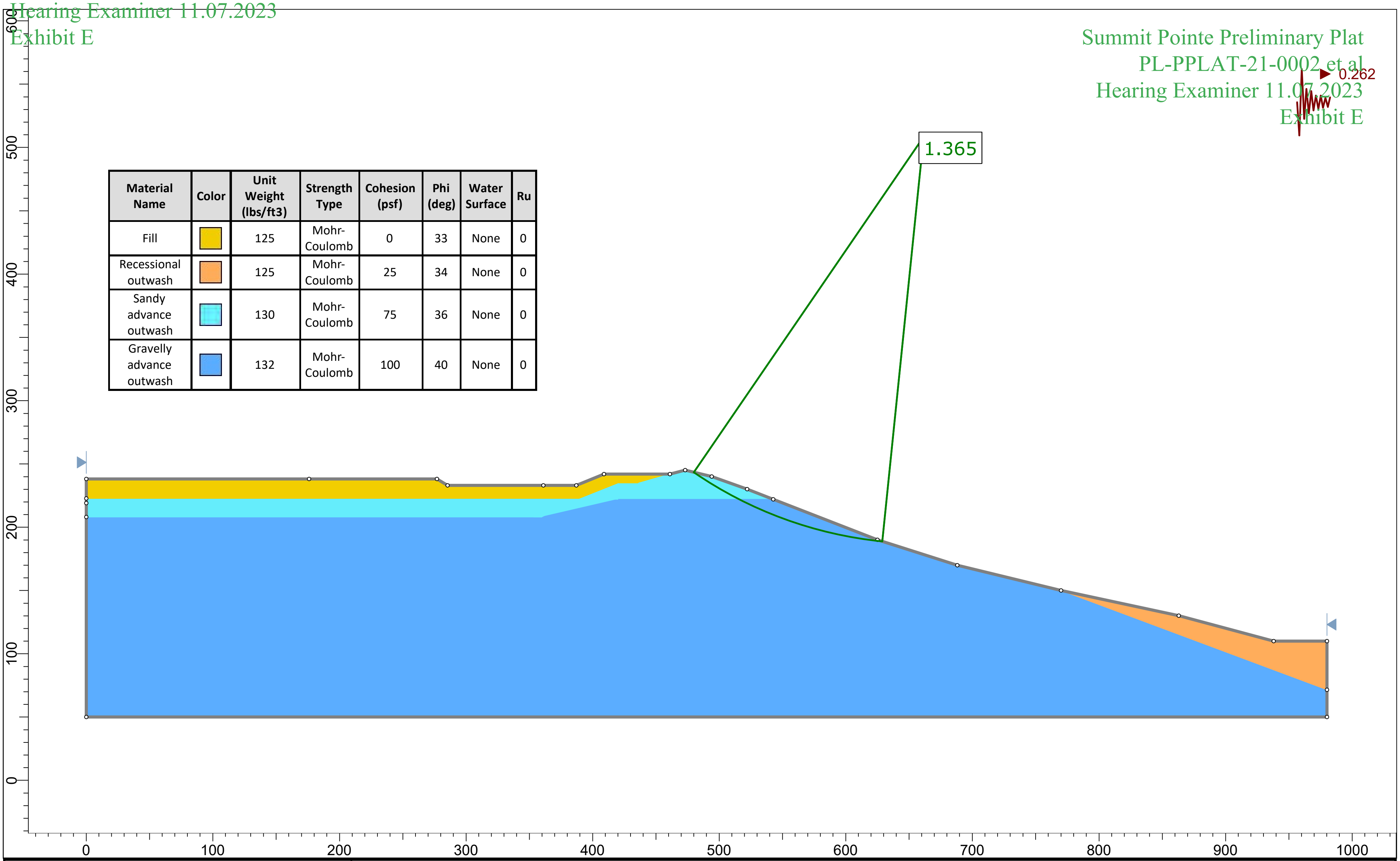

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fill	🟨	125	Mohr-Coulomb	0	33	None	0
Recessional outwash	🟧	125	Mohr-Coulomb	25	34	None	0
Sandy advance outwash	🟦	130	Mohr-Coulomb	75	36	None	0
Gravelly advance outwash	🟦	132	Mohr-Coulomb	100	40	None	0

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SLIDEINTERPRET 9.005

Project	Rush.SummitPoint		
Group	Existing	*Scenario*	Seismic
Drawn By	DWC	*Company*	GeoResources
Date	12/8/2021	*File Name*	Slope Stability

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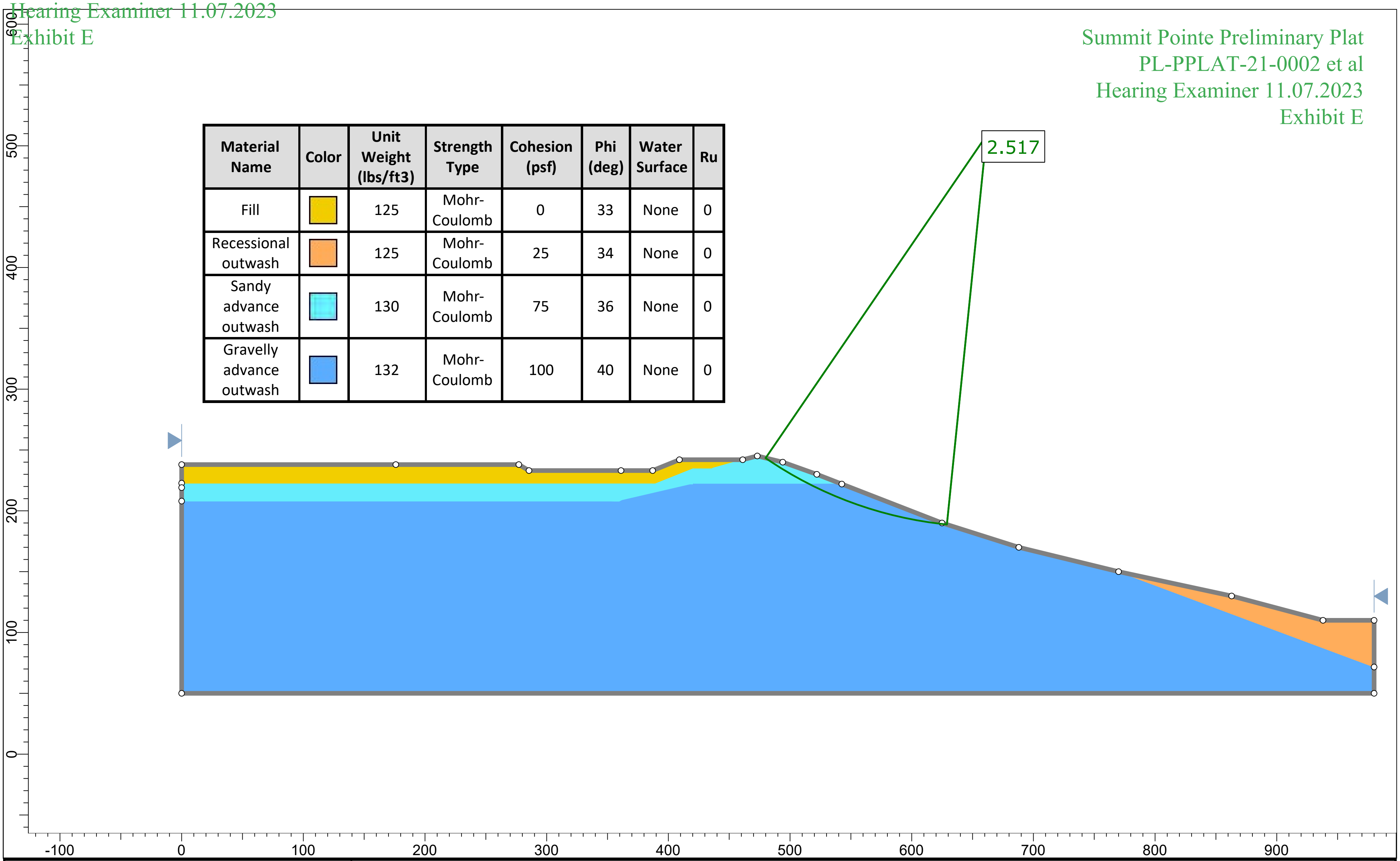

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fill	🟨	125	Mohr-Coulomb	0	33	None	0
Recessional outwash	🟧	125	Mohr-Coulomb	25	34	None	0
Sandy advance outwash	🟦	130	Mohr-Coulomb	75	36	None	0
Gravelly advance outwash	🟦	132	Mohr-Coulomb	100	40	None	0

rocscience

SLIDEINTERPRET 9.005

Project	Rush.SummitPoint		
Group	Existing	*Scenario*	Static
Drawn By	DWC	*Company*	GeoResources
Date	12/8/2021	*File Name*	Slope Stability

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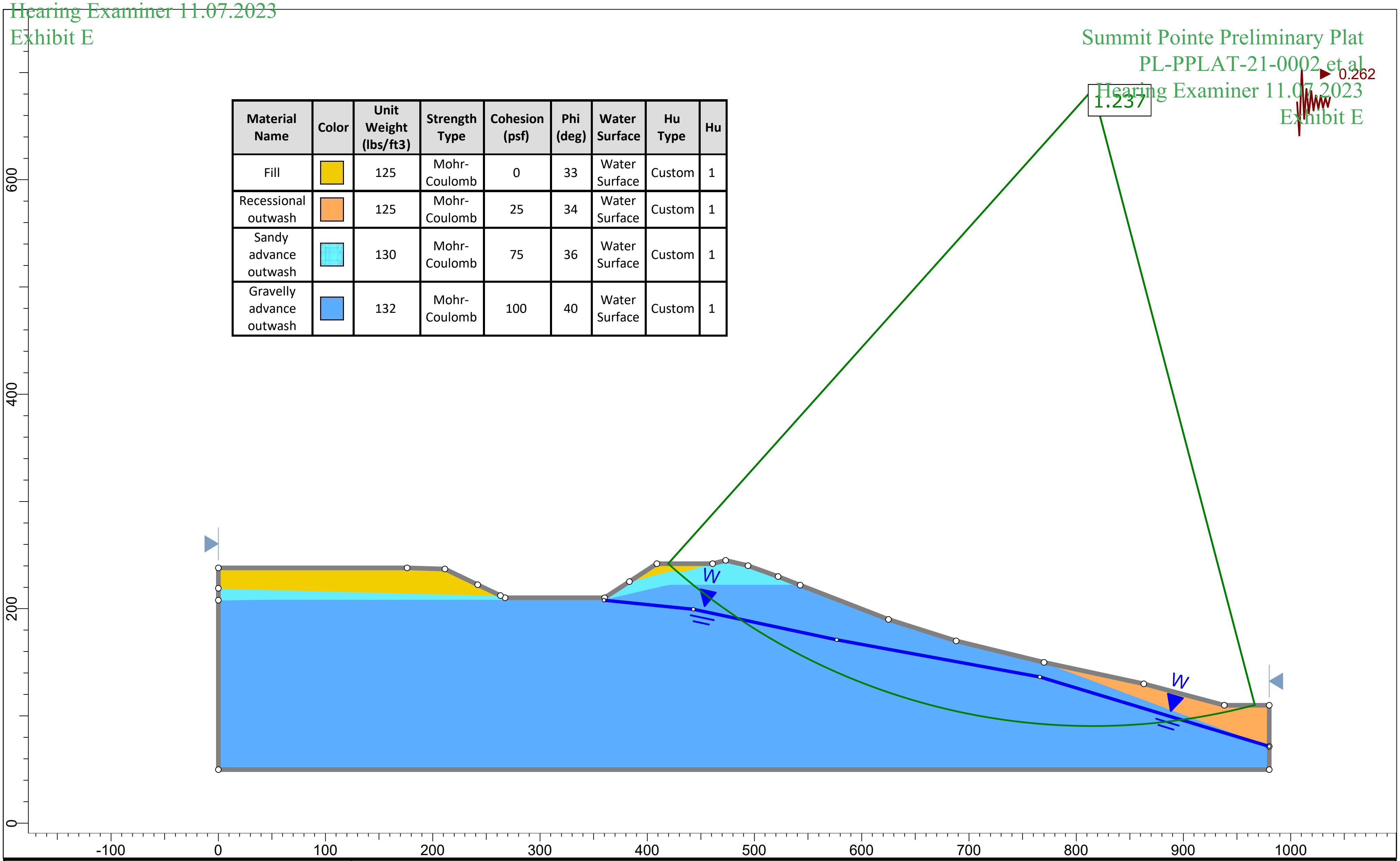

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Fill	🟨	125	Mohr-Coulomb	0	33	Water Surface	Custom	1
Recessional outwash	🟧	125	Mohr-Coulomb	25	34	Water Surface	Custom	1
Sandy advance outwash	🟦	130	Mohr-Coulomb	75	36	Water Surface	Custom	1
Gravelly advance outwash	🟦	132	Mohr-Coulomb	100	40	Water Surface	Custom	1

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SLIDEINTERPRET 9.005

Project	Rush.SummitPoint		
Group	Proposed Pond	*Scenario*	Seismic
Drawn By	DWC	*Company*	GeoResources
Date	12/8/2021	*File Name*	Slope Stability

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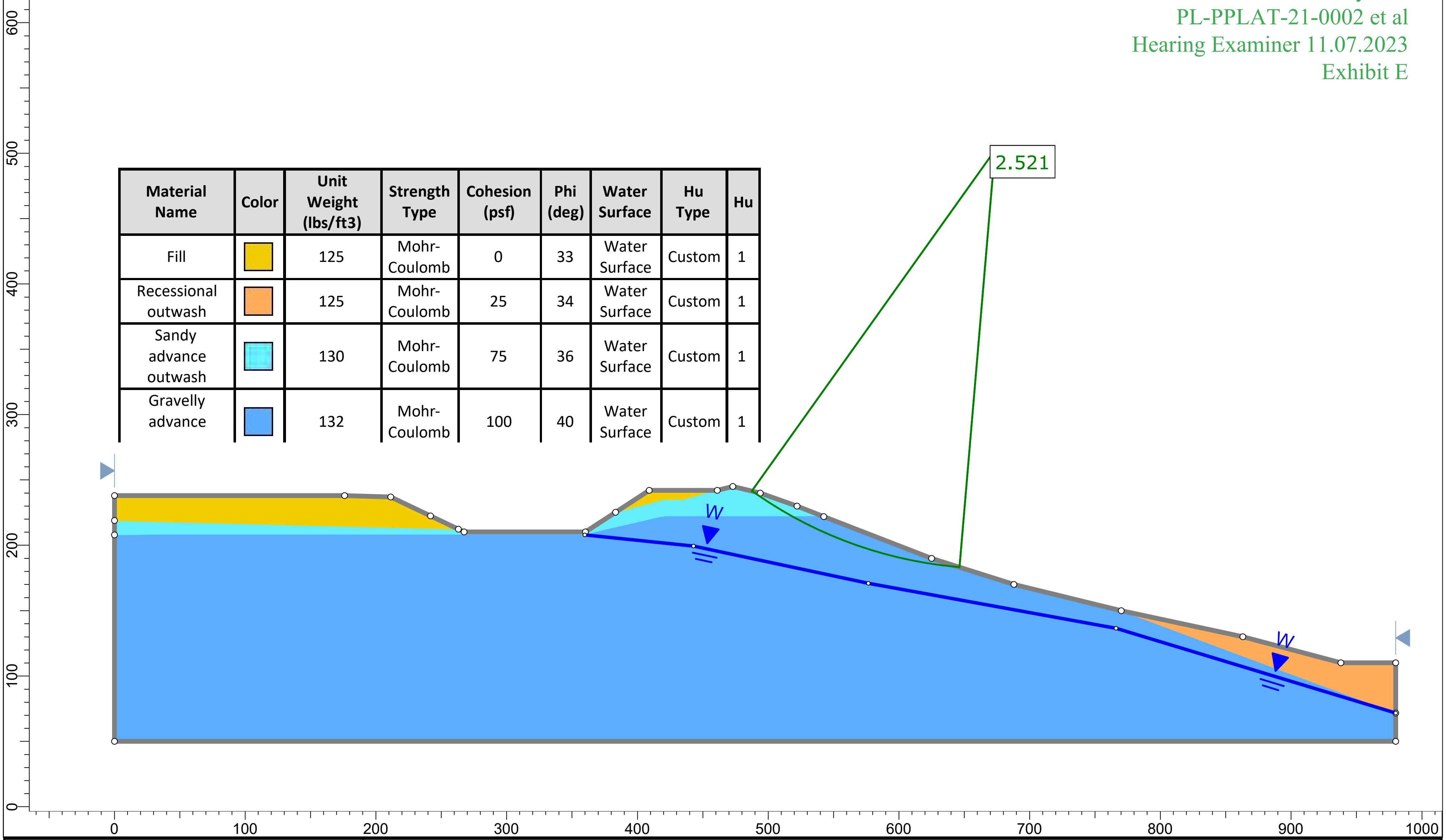

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Fill	🟨	125	Mohr-Coulomb	0	33	Water Surface	Custom	1
Recessional outwash	🟧	125	Mohr-Coulomb	25	34	Water Surface	Custom	1
Sandy advance outwash	🟦	130	Mohr-Coulomb	75	36	Water Surface	Custom	1
Gravelly advance	🟦	132	Mohr-Coulomb	100	40	Water Surface	Custom	1

SLIDEINTERPRET 9.005

Project	Rush.SummitPoint		
Group	Proposed Pond	*Scenario*	Static
Drawn By	DWC	*Company*	GeoResources
Date	12/8/2021	*File Name*	Slope Stability

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Appendix D

Infiltration Analysis

2016 SWMMWW

Rush.SummitPointePlat.RG

Gig Harbor, WA

Method 3 Calculation Sheet

METHOD 3 - Soil Grain Size Analysis Method

Procudure based on 2021 PCSWMSDM, Appendix III-A

$K_{sat} = 10\text{^}(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})$ (provides Ksat in cm/s)

$K_{sat} = [10\text{^}(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})]*1417$ (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
	B-1	15'	18.5'+	0.01	0.2221	11.7321	0.34	0.004	5.546

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	5.546	Average
	5.546	Lowest
	5.546	To Use

Testing Method ($F_{testing}$)

Grain Size Analysis (Method 3)	0.4

Factor to use for calculations 0.4

Potential for Plugging ($F_{plugging}$)

Based on USDA Soil Type	0.8

Loams and Sandy Loams	0.7
Fine Sands and Loamy Sands	0.8
Medium Sands	0.9
Coarse Sands or Cobbles	1

Factor to use for calculations 0.8

Facility Geometry ($F_{geometry}$)

between 0.25 and 1.0 using equation: $F_{geometry} = 4\ D/W + 0.05$	1.00

Estimated D: -

Estimated W: -

Factor to use for calculations 1

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$ **1.77** in/hr

Design Value **1.75** in/hr

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Gig Harbor, WA
PN: 0122253072, 0122253074, & 0122254092

2016 SWMMWW

Rush.SummitPointePlat.RG

Gig Harbor, WA

Method 3 Calculation Sheet

METHOD 3 - Soil Grain Size Analysis Method

Procudure based on 2021 PCSWMSDM, Appendix III-A

$K_{sat} = 10\text{^}(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})$ (provides Ksat in cm/s)

$K_{sat} = [10\text{^}(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})]*1417$ (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
	B-1	30'	18.5+	0.06	0.1665	0.2793	0.156	0.017	23.429

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	23.429	Average
	23.429	Lowest
	23.429	To Use

Testing Method ($F_{testing}$)

Grain Size Analysis (Method 3)	0.4

Factor to use for calculations 0.4

Potential for Plugging ($F_{plugging}$)

Based on USDA Soil Type	0.8

Loams and Sandy Loams	0.7
Fine Sands and Loamy Sands	0.8
Medium Sands	0.9
Coarse Sands or Cobbles	1

Factor to use for calculations 0.8

Facility Geometry ($F_{geometry}$)

between 0.25 and 1.0 using equation: $F_{geometry} = 4\ D/W + 0.05$	1.00

Estimated D: -

Estimated W: -

Factor to use for calculations 1

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$ **7.50** in/hr

Design Value **7.50** in/hr

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2016 SWMMWW

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Gig Harbor, WA

Method 3 Calculation Sheet

METHOD 3 - Soil Grain Size Analysis Method

Procudure based on 2021 PCSWMSDM, Appendix III-A

K_{sat} = 10^(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines}) (provides Ksat in cm/s)

K_{sat} = [10^(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})]*1417 (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
	B-2	7.5'		0.07	0.19	0.2793	0.11	0.022	30.534

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	30.534	Average
	30.534	Lowest
	30.534	To Use

Testing Method ($F_{testing}$)

Grain Size Analysis (Method 3)	0.4

Factor to use for calculations 0.4

Potential for Plugging ($F_{plugging}$)

Based on USDA Soil Type	0.8
Loams and Sandy Loams	0.7
Fine Sands and Loamy Sands	0.8
Medium Sands	0.9
Coarse Sands or Cobbles	1

Factor to use for calculations 0.8

Facility Geometry ($F_{geometry}$)

between 0.25 and 1.0 using equation: $F_{geometry}$ = 4 D/W + 0.05	1.00

Estimated D: -

Estimated W: -

Factor to use for calculations 1

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$ **9.77** in/hr

Design Value **9.70** in/hr

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2016 SWMMWW

Rush.SummitPointePlat.RG

Gig Harbor, WA

Method 3 Calculation Sheet

METHOD 3 - Soil Grain Size Analysis Method

Procudure based on 2021 PCSWMSDM, Appendix III-A

$K_{sat} = 10^{(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})}$ (provides Ksat in cm/s)

$K_{sat} = [10^{(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})}]*1417$ (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
	B-2	35'	18.5'+	0.01	0.6335	13.1478	0.267	0.005	7.649

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	7.649	Average
	7.649	Lowest
	7.6	To Use

Testing Method ($F_{testing}$)

Grain Size Analysis (Method 3)	0.4

Factor to use for calculations 0.4

Potential for Plugging ($F_{plugging}$)

Based on USDA Soil Type	0.8

Loams and Sandy Loams	0.7
Fine Sands and Loamy Sands	0.8
Medium Sands	0.9
Coarse Sands or Cobbles	1

Factor to use for calculations 0.8

Facility Geometry ($F_{geometry}$)

between 0.25 and 1.0 using equation: $F_{geometry} = 4\ D/W + 0.05$	1.00

Estimated D: -
Estimated W: -

Factor to use for calculations 1

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$ **2.43** in/hr

Design Value **2.40** in/hr

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2016 SWMMWW

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Gig Harbor, WA

Method 3 Calculation Sheet

METHOD 3 - Soil Grain Size Analysis Method

Procudure based on 2021 PCSWMSDM, Appendix III-A

K_{sat} = 10^(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines}) (provides Ksat in cm/s)

K_{sat} = [10^(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})]*1417 (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
	TH-1*	25-30	18	0.077	0.178	0.483	0.089	0.024	34.589

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	34.589	Average
	34.589	Lowest
	34.589	To Use

Testing Method ($F_{testing}$)

Grain Size Analysis (Method 3)	0.4

Factor to use for calculations 0.4

Potential for Plugging ($F_{plugging}$)

Based on USDA Soil Type	0.8
Loams and Sandy Loams	0.7
Fine Sands and Loamy Sands	0.8
Medium Sands	0.9
Coarse Sands or Cobbles	1

Factor to use for calculations 0.8

Facility Geometry ($F_{geometry}$)

between 0.25 and 1.0 using equation: $F_{geometry}$ = 4 D/W + 0.05	1.00

Estimated D: -
Estimated W: -

Factor to use for calculations 1

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$ **11.07** in/hr

Design Value **11.07** in/hr

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Appendix E

Hydrogeologic Report for the Sunrise Mine
(Robinson Noble, June 2006)

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SUNRISE ENTERPRISES
HYDROGEOLOGIC CHARACTERIZATION OF SUNRISE MINE

JUNE 2006

By

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HYDROGEOLOGIC CHARACTERIZATION OF SUNRISE MINE
June 2006

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HYDROGEOLOGIC CHARACTERIZATION OF SUNRISE MINE
June 2006

Introduction

At the request of McLucas & Associates, Robinson, Noble & Saltbush accomplished the characterization of the groundwater regimes that exist beneath the Sunrise Mine site near Purdy, Washington. The location of the mine site is shown on Figure 1. An initial hydrogeologic investigation was accomplished using existing data and reconnaissance-level field observations. This initial study identified a need for test drilling and installation of a water level monitoring network. The drilling/monitoring program was accomplished in February and March, 2006 with the intention of defining the groundwater conditions beneath the site. Specifically, the work was intended to define the shallowest meaningful groundwater occurrence that will dictate the lower limit of mining at the site.

Robinson, Noble & Saltbush having been the primary investigators of the groundwater aspects of a regional study performed for the Gig Harbor Peninsula and for prior project studies near the mine site itself, is well suited to define the groundwater conditions beneath the Sunrise Mine. In addition to applying specific experience in the area, we acquired well log information from the Department of Ecology files, performed a reconnaissance level field investigation to provide the appropriate regional context for our analyses, and established site-specific water-level monitoring capability that explicitly defines the groundwater regime that dictates the base of mining operations.

Previous Studies

Though several regional studies have addressed the geology and the hydrogeology of the Gig Harbor/Purdy region, no site specific hydrogeologic characterization had been accomplished prior to this study. A hydrogeologic study of the Pierce County area west of the Narrows was performed by Sweet-Edwards/EMCON in 1992 as part of Pierce County's Ground Water Management Planning Program. Robinson & Noble provided the hydrogeologic expertise to that program as part of the study team. In addition, Robinson & Noble prepared a Geotechnical Map of the Gig Harbor Peninsula in 1980. The findings of these studies were used in developing the regional context within which site-specific interpretations were made.

Glennda McLucas of McLucas and Associates defined reserves as part of a mining plan that defines the mine floor at an elevation of approximately 235 feet. She subsequently (August/September 2005) accomplished a drilling program that placed five resource exploration holes to depths of as much as 110 feet (approximately 135 feet above mean sea level). The drilling identified a substantial amount of material between the current mine floor (approximate elevation 240) and the deepest point penetrated. The drilling consistently identified a clay rich unit, often described by McLucas to be a glacial till of varying thickness, from as high as elevation 210 to as low as elevation 170 above mean sea level . This unit is described as both extremely clay rich and as sandy with lower interstitial clay content and varies in its characteristics both laterally and vertically.

5 borings

The hydrostratigraphy of the region is established in the EMCON report and the nomenclature of that report is maintained herein. The near-surface material is Vashon glacial till which is a low permeability unit laid down directly by the ice of the Vashon glaciation. The underlying sand (currently being mined) is Vashon Advance sediments (Aa) laid down in front of the advancing ice. An underlying sand and gravel unit commonly lies directly underneath the advance sands in the region. This unit, designated as A2 constitutes a lower facies of the same Upper Aquifer system described in the EMCON report. Occasionally, intervening till or lacustrine clay is found between the sediments of the Aa unit and the A2 unit. This is remnant of a prior glaciation that is described by Noble as the Narrows Glacial Unit (Noble, 1990). The underlying sand and gravel would, then be outwash deposits of the same penultimate glacial episode. The till and the outwash sand and gravel are both units within the A2 stratigraphic unit of EMCON. The A2 unit is underlain by the non-glacial fine grained sediments of the Olympia Beds (formally the Kitsap Formation) which is Unit B in the EMCON nomenclature. The Olympia Beds constitute the hydrogeologic base for the upper aquifer system and is indicated to occur from as high as 100 feet above sea level to slightly below sea level in the Purdy area (EMCON, 1992 and Noble, 1990). Stratigraphy deeper than the Olympia Beds is not relevant to the mine or this characterization and is, therefore, not discussed as part of this report.

Hydrogeology

The resource exploration drilling program accomplished by McLucas and Associates in the summer of 2005 provided insights into the geology and the hydrogeology to an elevation of approximately 140 feet which is above the regional water table of the site. Because the proposed vertical expansion of mining was expected to extend below this elevation, it was necessary to perform additional drilling and to establish a set of three piezometers that allowed the definition and monitoring of the first significant groundwater beneath the site. Collectively, the available information provides a solid basis for description of the hydrogeologic setting associated with the mine site. Information gained through the installation and monitoring of the piezometer network in conjunction with the information available from previous studies, water well reports and topographic/geologic maps of the area provide a sound basis for description of the local hydrogeologic setting.

The drilling associated with the placement of the monitor well network in February 2006 provided additional insights to the geologic and hydrogeologic conditions beneath the site. Two monitor holes (TH-1 and TH-2) were drilled on the upland bench that is the western portion of the active mine site, one at the northern edge of the mine area and the other at the southern edge near the entrance to the site. Both of these holes encountered the perching, till-like material noted by McLucas at approximately 200 feet above sea level and both observed non-saturated materials below it. The observance of a few feet of saturated sand above the unit verified that there is no significant groundwater regime above the till-like materials. (The geologic logs of TH-1 and TH-2 are presented as part of the monitor well construction report which is provided as an appendix to this report.)

A third Monitor well (TH-3), placed at the base of the hill at the eastern edge of the property did not encounter the till-like perching unit since the local land surface was below the elevation of the base of that unit. The sands that occur beneath the till-like unit are saturated below elevation 114.5 and 140 in monitor wells TH-1 (the northern well) and TH-2 (the southern well) respectively. Well TH-3 is a shallower well placed at the base of the slope on the eastern edge of the property. This well encountered saturated material within 11 feet of land surface (elevation 114.6 on March 7, 2006). All three holes encountered a compact silt and clay unit at the base of the sand. TH-1 encountered the basal clay at an elevation of 75 feet above sea level, TH-2 encountered it at 129 feet above sea level and TH-3 encountered it at 105 foot elevation (17 feet below land surface). This clay layer is regionally present and serves as the base of the groundwater regime pertinent to the mining operation and is correlative with the Unit B noted in the EMCON report.

Hydrogeologically, the till-like unit serves as a local lower-permeability perching layer that impedes the downward percolation of rain water to the point where a thin layer of saturated material was observed above it. Since the McLucas drilling program observed water at the top of this unit in late August/Early September of 2005, it is reasonable to assume that the thin layer of saturated material above the low-permeability layer is present most of the year. The observation of only a few feet of saturated material above the unit in February, 2006 suggests that the perched water is fairly consistent seasonally. This saturated material is comprised of fine sand and is sufficiently thin that it does not represent a significant groundwater resource. The saturated regime is not capable of supporting sustained production to a well (even a domestic well) and cannot be considered an aquifer. Though there could be some local hydrologic function with ecological implications at those points where (or if) this unit discharges to wetlands or along the hillside as seeps, no wetland functions, seeps or springs were observed in proximity to the mine property. It is equally likely that the perched water merely leaks over buried edges or through holes in the perching layer and continues its downward flow to the regional water table within the geologic sequence observed and never discharges directly to surface features.

Groundwater Conditions

The data from the two drilling programs was used in conjunction with existing regional hydrogeologic interpretations to define the groundwater beneath the site. The site is situated over a ridge that falls off abruptly to the east and less abruptly to the north and west. This situation results in a sharp gradient on the water table as the groundwater system drains to the base line of McCormick Creek on the eastern and northern boundaries of the mine site. The highest water level exists at the southwest corner of the property with water levels falling to the east and north and likely to the west at some small distance west of the mine. The configuration of the water table in proximity to the mine is a direct response to the topographic and hydrologic conditions imposed by the valley of McCormick Creek. Conceptual cross sections oriented east-west and north-south across the property are presented as Figures 2 and 3 respectively. The locations of these cross sections are shown on Figure 1. Time-synchronous water level data for the three monitor wells are presented in Table 1 and a hydrograph tracking the water level in TH-2 Through a 15-day period between March 23 and April 7, 2006 is presented as Figure 4.

Table 1: Manual Water Level Measurements

Well ID	Well Elevation	2/27/06		3/7/06		3/23/06	
		DTW	Elev	DTW	Elev	DTW	Elev
TH-1	242.71	128.17	114.54	128.22	114.49	127.73	114.98
TH-2	260.25	121.21	139.04	120.16	140.09	120.2	140.05
TH-3	121.46	7.05	114.41	6.87	114.59	6.28	115.18

The regional reports, particularly the EMCON 1992 report for the GWMP study indicate the shallowest regional aquifer has a water table that drains to the north and to the west with the expression of McCormick being reflected as a local northeastward gradient near the mine site. The elevation of the water table beneath the southern portion of the mine (TH-2) was measured at 140 feet above mean sea level on March 7, 2006. The water level to the north and to the east were measured at 114.5 feet (TH-1) and 114.6 feet (TH-3), respectively on the same day. It is clear that the water table falls off to both the north and to the east below the mine site. This is consistent with the regional interpretations presented by EMCON in their 1992 report. The few well logs available near the mine site are consistent with these findings as well. A local potentiometric map of the upper aquifer was modified from the EMCON regional map using the site-specific data generated with the monitoring network. The resultant water table map for the area in proximity to the mine site is presented as Figure 5.

Conclusions

Based on the documents provided and discussions with Glennda McLucas, it is our understanding that the current mining plan is restricted to an elevation of no lower than 235 feet above seal level and that an application for deeper mining has been submitted. The substantial depth to the nearest groundwater allows for deeper mining than is defined in the current mine plan. It appears that the constraining groundwater presence beneath the site is the regional water table (Figure 5). The conceptual cross sections (Figures 2 and 3) provide a vertical context for the discussion of the mining implications of the hydrogeologic setting. The southern boundary of the site is the controlling factor by virtue of its significantly higher water table elevation. The indicated average water level elevation at the southern boundary of the mine is approximately 140 feet above sea level. The March 7, 2006 water level measurements followed a near-record three-month period of high precipitation. As such, it is reasonable to presume that the water levels observed are near the seasonal maximum. Allowing for the fact that seasonal fluctuation might cause as much as five feet higher water levels during an extremely high precipitation period and presuming an intent to remain 10 feet above the high water table, an elevation of 155 feet is implied to be the lower limit of mining in the southwest corner of the mine site, as defined by the groundwater conditions.

Since the water table elevations falls to 115 feet above sea level to the north, similar considerations for the seasonality and relationship to mining the lowest practical mine floor elevation at the northern edge of the actively mined area is indicated to be 130 feet. Likewise, the mine floor elevation along the eastern boundary is indicated to be 130 feet above sea level. However, on parts of the eastern portion of the property, the existing grade is already within ten feet of the possible high water table. Mining in these areas may or may not be appropriate depending on the somewhat arbitrary definition of remaining ten feet above the predicted high groundwater condition.

A contoured map of the mine site showing a hypothetical groundwater-dictated lowest practical mine floor elevation is presented as Figure 6. The analysis presumes that the high water table will be 5 feet higher than observed. This is conservative in that the water level observations made during our investigation occurred immediately after near record recharge conditions. The map is also based on the arbitrary assumption that mining will stay 10 feet above the estimated high groundwater elevation. This is not a requirement of law and is merely a condition set for this analysis. If the mine plan were to be written to accommodate mining within a closer proximity, the floor elevation could be lowered accordingly at any given point on the site. The groundwater conditions along the northern boundary are clearly more suitable to deeper mining. The presence of the storm retention ponds immediately north of the mine boundary is a complicating factor that will require an engineering solution if the deeper mining is to be accomplished on that portion of the site. The presence of a sewer line through the eastern portion of the property is also a complicating factor that will likely require substantial engineering. Further, the reclamation slope requirements will dictate mining depths around the perimeter of the mine that are higher than is

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dictated by the groundwater aspects. These issues are beyond the scope of the hydrogeologic characterization presented here and the lower limit of mining presented in Figure 6 only addresses the groundwater constraints for the site.

The statements, conclusions, and recommendations provided in this report are to be exclusively used within the context of this document. They are based upon generally accepted hydrogeologic practices and are the result of analysis by Robinson, Noble, & Saltbush staff. This report, and any attachments to it, is for the exclusive use of Sunrise Enterprises. Unless specifically stated in the document, no warranty, expressed or implied, is made.

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FIGURES

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Note: Basemap taken from USGS Gig Harbor / Fox Island / Ollala Quads.

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Figure 1
Vicinity Map
Sunrise Enterprises: Hydrogeologic Characterization

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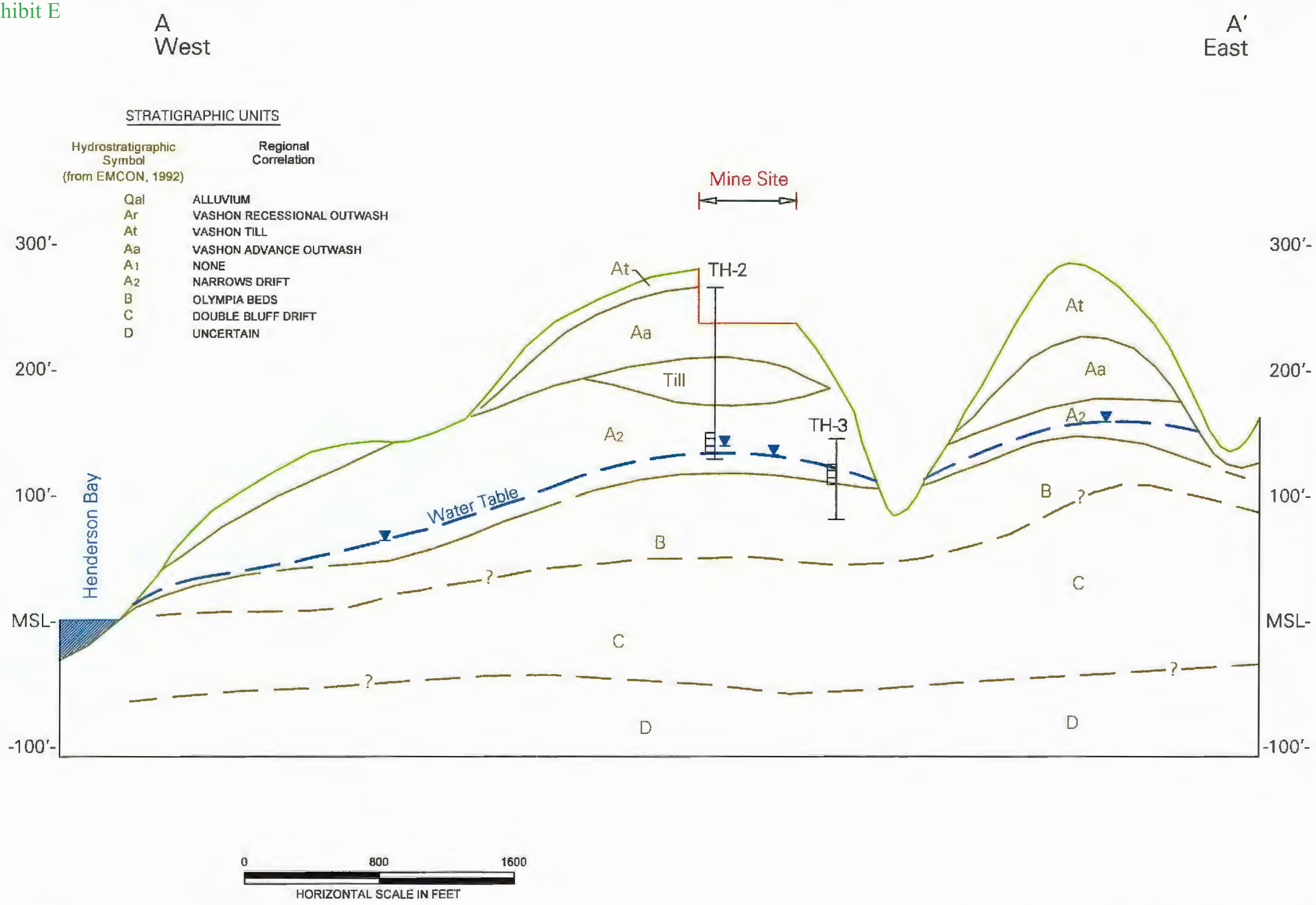

STRATIGRAPHIC UNITS

Hydrostratigraphic Symbol (from EMCON, 1992)	Regional Correlation
Qal	ALLUVIUM
Ar	VASHON RECESSIONAL OUTWASH
At	VASHON TILL
Aa	VASHON ADVANCE OUTWASH
A_1	NONE
A_2	NARROWS DRIFT
B	OLYMPIA BEDS
C	DOUBLE BLUFF DRIFT
D	UNCERTAIN

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Figure 2
Conceptual Hydrogeologic Cross Section A-A'
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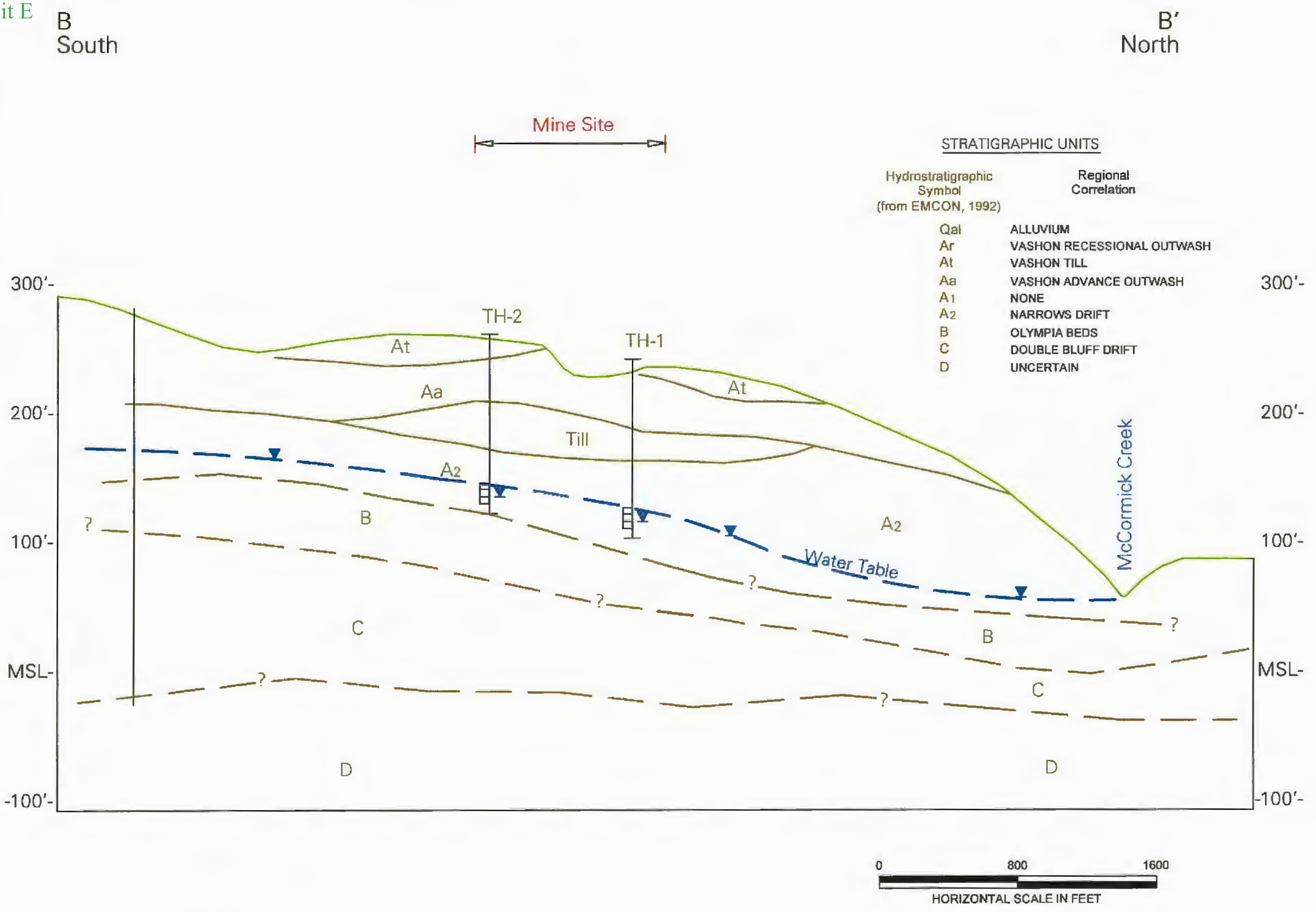

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Figure 3
Conceptual Hydrogeologic Cross Section B-B'
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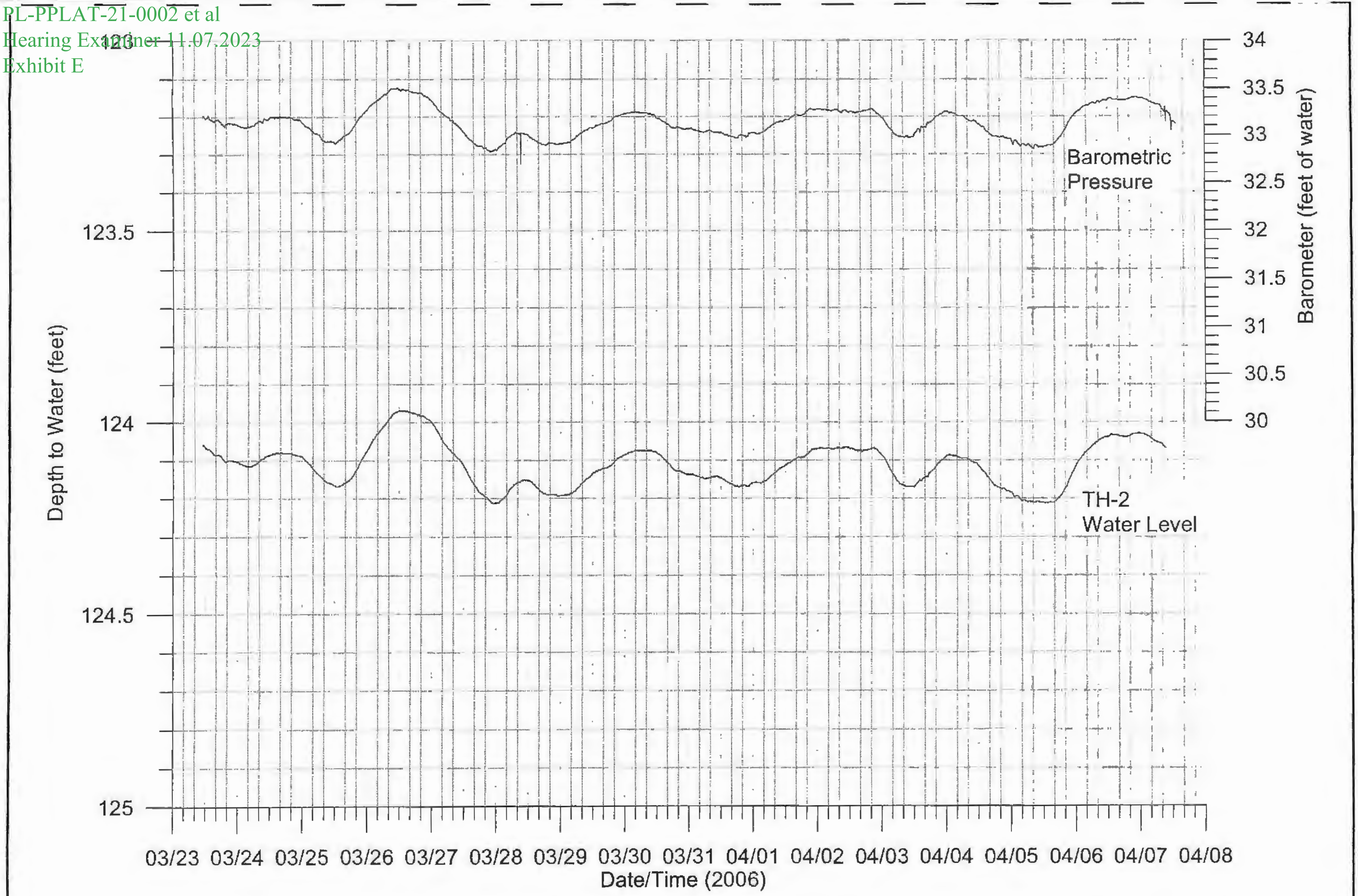

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Figure 4

Hydrograph Sunrise Mine TH-2 with Barometric Pressure

Sunrise Enterprise:Hydrogeologic Charaterization

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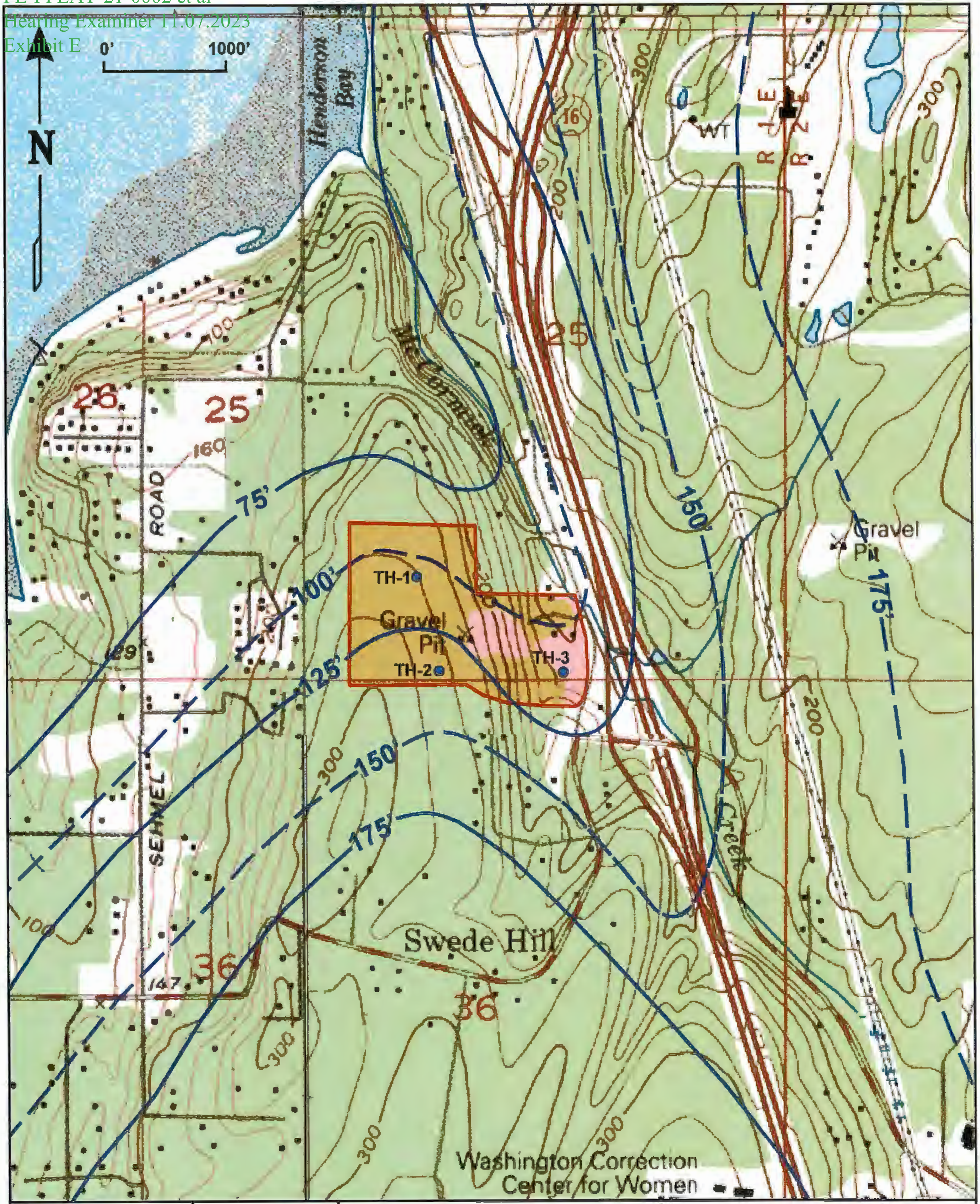

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Note: Potentiometric Contours Modified from EMCON, 1992

Figure 5
Potentiometric Surface Contour Map for the Upper Aquifer
Sunrise Enterprises: Hydrogeologic Characterization

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SUNRISE ENTERPRISES
MONITOR NETWORK CONSTRUCTION REPORT
SUNRISE MINE
April 2006

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Introduction

As a part of the hydrogeologic characterization of the Sunrise Mine property, Robinson, Noble & Saltbush was asked to provide hydrogeologic consulting services in support of the drilling and construction of three monitoring wells. The project site is located in the Purdy area North of Gig Harbor, Washington (Figure 1). Three monitor wells were drilled to the water table aquifer beneath the site. Robinson, Noble & Saltbush personnel provided oversight to the drilling and well construction process. The monitoring wells provided for a definition of the water table and the short-term fluctuations of the groundwater levels as part of a broader characterization of the groundwater regime pertinent to the mining operation.

Monitor Well Construction

Three monitoring wells were drilled for the project. The purpose of the wells is to monitor water levels of the shallow water table aquifer. Drilling was completed by Prosonic Corporation of Portland, OR using sonic drilling techniques. The drilling yielded 6-inch boreholes which were completed as 2-inch PVC monitor wells.

Prior to the start of drilling, no specific target zone for the wells had been selected other than to complete the wells in the local water-table aquifer presumed to exist beneath the site. A review of Department of Ecology Water Well Reports suggested a thick dense grey clay layer was present at a depth of approximately 150 feet. A water-table condition aquifer was expected to exist above this clay layer.

Sonic drilling was chosen for its speed and its ability to provide nearly continuous core-barrel samples of soils and geologic materials penetrated. The wells were drilled with 4.5-inch (outside diameter) casing, resulting in 4-inch core samples. Samples were extruded into clear plastic sleeves at land surface for inspection by the geologist. A 6-inch casing was advanced over the inner core barrel to case the bore hole. Drilling was accomplished between February 20 and February 27, 2006.

The 6-inch boreholes were completed as monitor wells by the placement of 2-inch diameter schedule 40 PVC casing. Two-inch diameter, 0.020-inch slot size PVC well screens were placed on the bottoms of each PVC casing. The 2- to 6-inch annular space was filled with a 10 x 20 Colorado silica sand filter pack from several feet below to several feet above the screens. The remainder of the annular space, above the filter pack to three feet below land surface was filled with bentonite chips. In all the wells, the remaining three feet of annular space was filled with Portland cement.

Each wellhead was completed with a six-foot long, 6-inch diameter monument placed with approximately three feet extending above ground. Surrounding the monuments is a cement collar placed at land surface and three steel bollards to protect the well from damage. The elevation and location of each monitor well was surveyed following well completion.

Drilling Results

Test Hole 1 (TH-1) was drilled to a total depth of 187 feet on February 20, 2006 and was completed as a 2-inch PVC monitoring well the following day. TH-1 is located near the northeast corner of the active gravel mine (Figure 1). The surveyed elevation is 242.71 feet. Drilling of TH-1 encountered a series of sand and gravel deposits with varying amounts of silt matrix from land

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surface to 57 feet. From 57 to 71 feet, the materials were a compact grey silty clayey sand and gravel presumed to be a till. Below 71 feet, a dry silty sand and sandy silt was encountered. At a depth of 120 feet a 2-foot thick grey clay-bound, pea sized gravel was encountered. Below 122 the boring was advanced through a thick layered sequence of medium- to fine-grained sand and silty & clayey fine-grained sand. The test hole was bottomed in a dense grey clay first observed at 168 feet continuing to the bottom of the hole at 187 feet. The well screen was placed from 158 to 168 feet. The geologic log and construction details from TH-1 are shown on Figure 2.

Test Hole 2 (TH-2) was drilled and completed on February 22. It is located along the southern boundary of the mine property near the main pit entrance (Figure 1) at an elevation of 260.25 feet. Similar to TH-1, drilling at TH-2 encountered a series of sand and gravel deposits with varying amounts of silt from land surface to a depth of 37 feet. Below 37 feet the material became slightly more compact with an increase in the occurrence of gravel. The drilling encountered a thin (2-foot thick), clay-bound gravel from 67 to 69 feet. A mix of brown silty sand and gravel was observed below 69 feet continued to 98 feet. Below 98 feet, material was observed as a mix of grey, silty medium-grained sand with occasional gravel to 111 feet. A compact grey clay-bound sand and gravel (till-like) was encountered from 111 to 117 feet. Material below the till was a mix of silty sand and gravel, saturated below 128 feet. Dense, grey clay was observed at 131 feet And continued to the total borehole depth of 147 feet. The sand and gravel deposits were mostly dry above 67 feet and mostly wet, but not saturated, from 117 to approximately 128 feet at the time of drilling. The materials were saturated from 128 to 131 feet. The TH-2 screen was placed in this zone, from 120 to 130 feet. The geologic log and well construction details are presented in Figure 3.

The third well, Test Hole 3 (TH-3), was located at the base of the slope on the eastern side of the mines property (Figure 1). It was drilled to a depth of 27 feet from a surface elevation of 121.46 feet above sea level. The geology observed during the drilling of this well was similar to that observed at equivalent elevations in TH-1 and TH-2. The upper 17 feet consisted of sand and occasional gravel with varying amount of silt and clay which was generally damp. The deposits appeared to be saturated from 15 to 17 feet. Below this depth is the compact gray clay. The well screen was placed from 8 to 18 feet. Figure 4 documents the construction details and geologic log.

Water Table Definition

Water level measurements were taken following the completion of each of the wells, below is a table of the manual measurements made (Table1). Subsequent water level measurements were made in the monitor network on February 27th, March 7th and March 23rd, 2006. Measurements were made using a 300-foot electric sounder. All measurements were referenced to the north side of the top of the 6-inch casing of the subject well. To monitor short-term water level fluctuations an electronic pressure transducer and data logger system was installed in TH-2 on March 23. Data collected during the week-long deployment indicates the water levels to be relatively constant.

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Table 1: Manual Water Level Measurements

Well ID	Well Elevation	2/27/06		3/7/06		3/23/06	
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TH-3	121.46	7.05	114.41	6.87	114.59	6.28	115.18

The drilling program was successful in defining the hydrogeologic conditions beneath the mine site and in providing the needed water level data to define the water table as it pertains to constraints on the mining operation. The interpretation of the information generated during the drilling program and presented above is provided in the report of findings for the Hydrogeologic Characterization Report.

The statements, conclusions, and recommendations provided in this report are to be exclusively used within the context of this document. They are based upon generally accepted hydrogeologic practices and are the result of analysis by Robinson, Noble, & Saltbush staff. This report, and any attachments to it, is for the exclusive use of Sunrise Enterprises. Unless specifically stated in the document, no warranty, expressed or implied, is made.

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FIGURES

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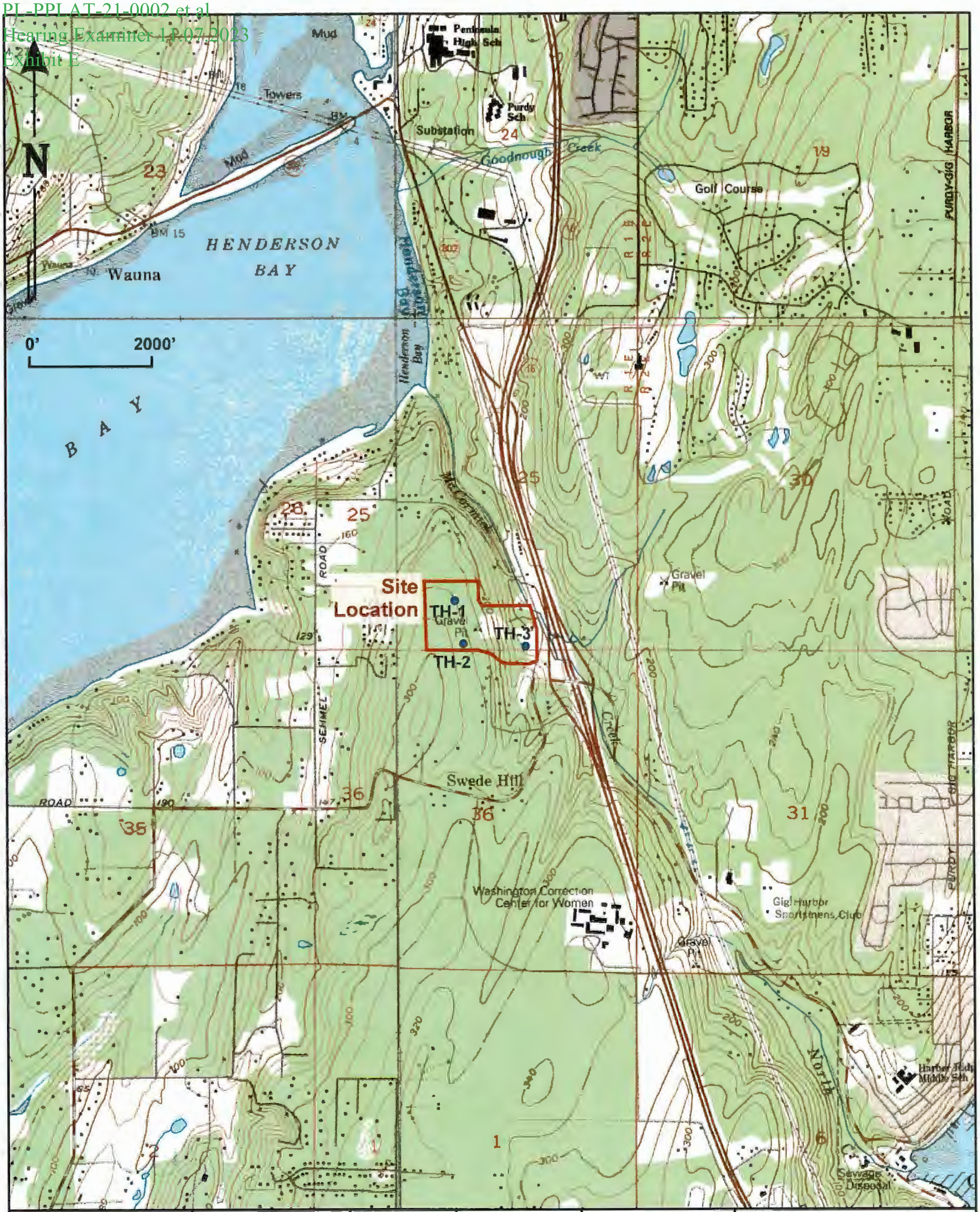

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Note: Basemap taken from USGS Gig Harbor / Fox Island / Ollala Quads.

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Figure 1
Vicinity Map

Sunrise Enterprises: Monitor Network Construction Report

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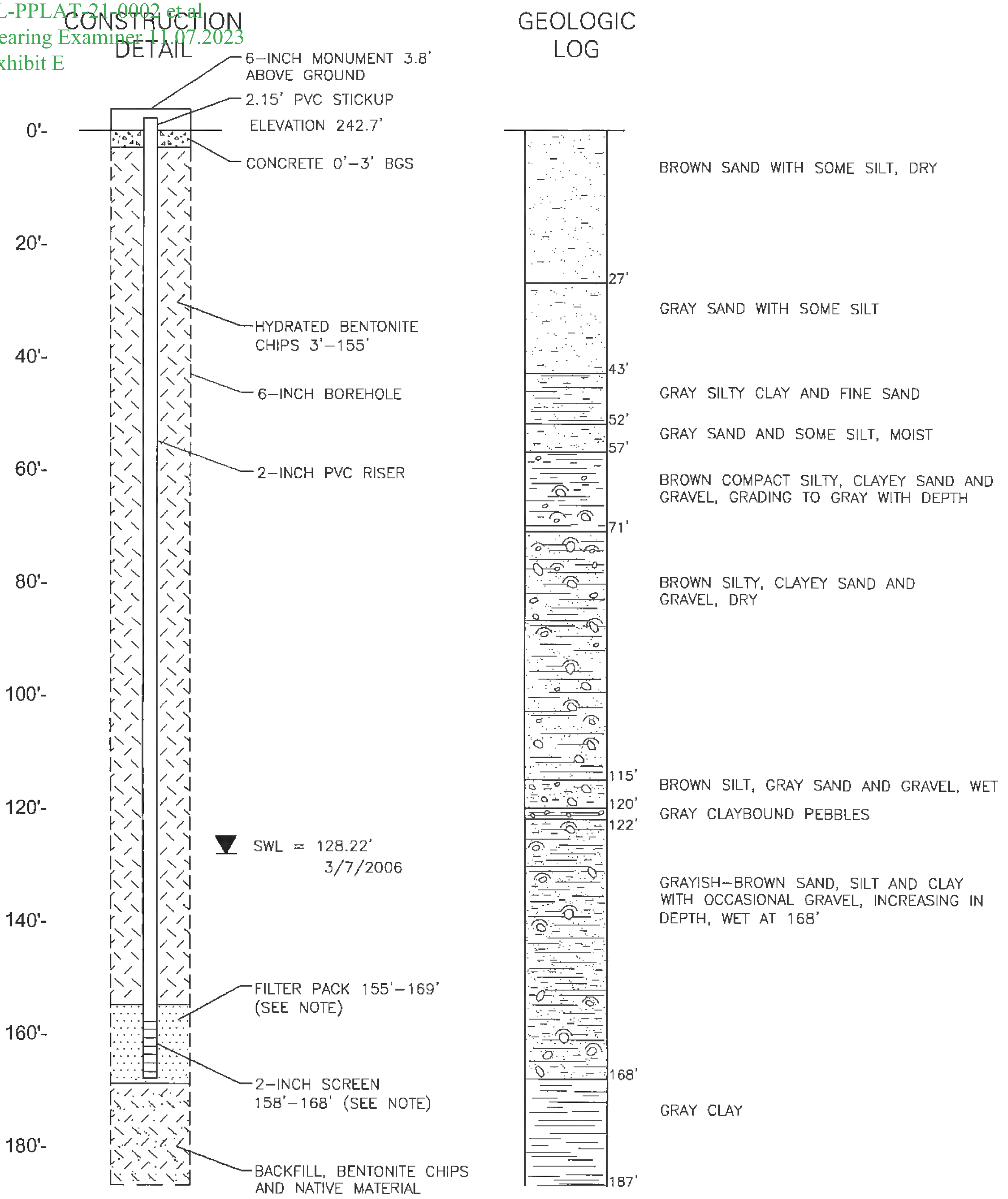

NOTES:
WELL SCREEN IS 2-INCH PVC, 20-SLOT (0.020-INCH OPENING) SCHEDULE 40.

FILTER PACK IS 10x20 COLORADO SILICA SAND PRODUCT.

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Figure 2
Construction Detail and Geologic Log for Test Hole 1
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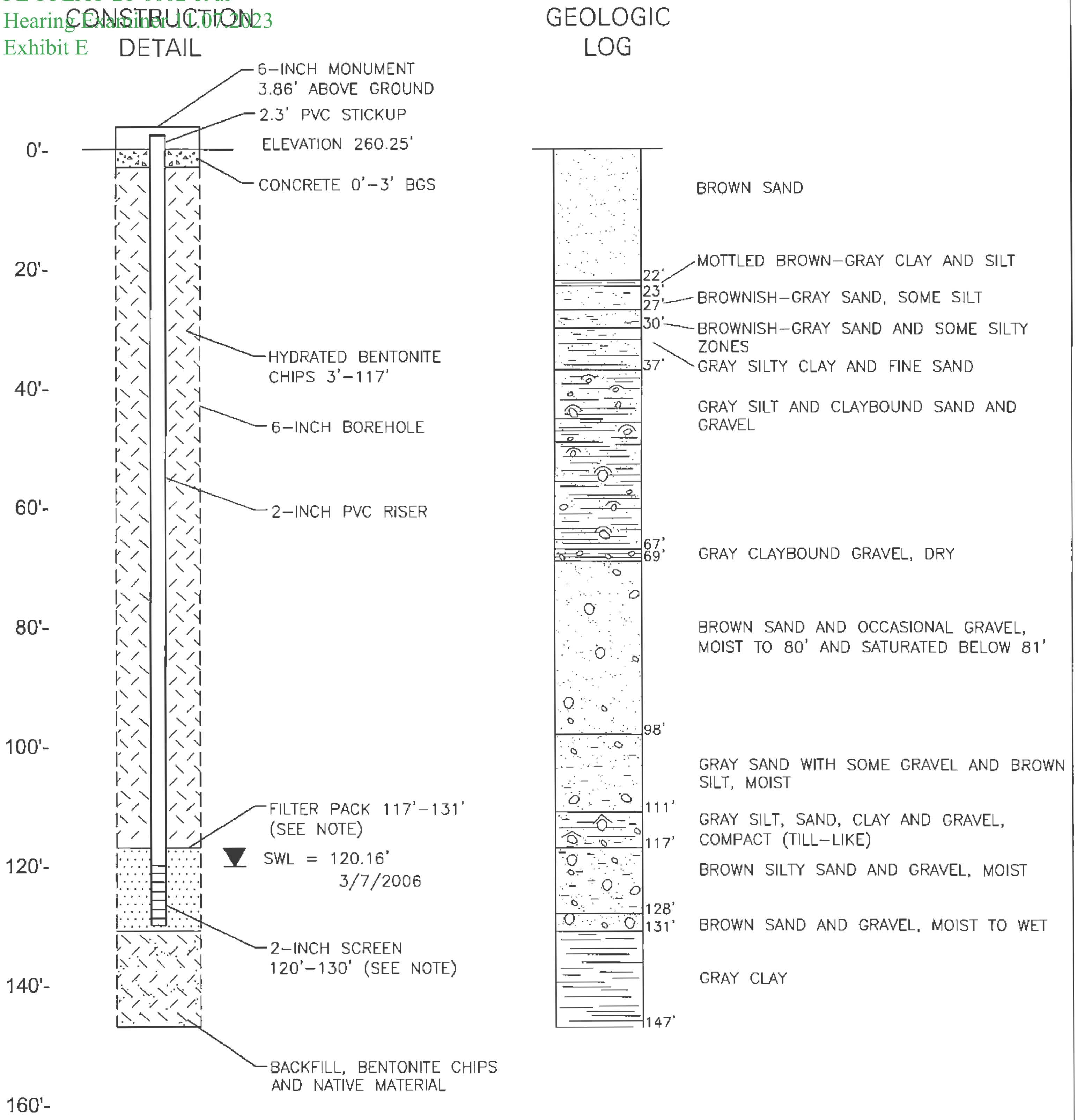

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Figure 3
Construction Detail and Geologic Log for Test Hole 2
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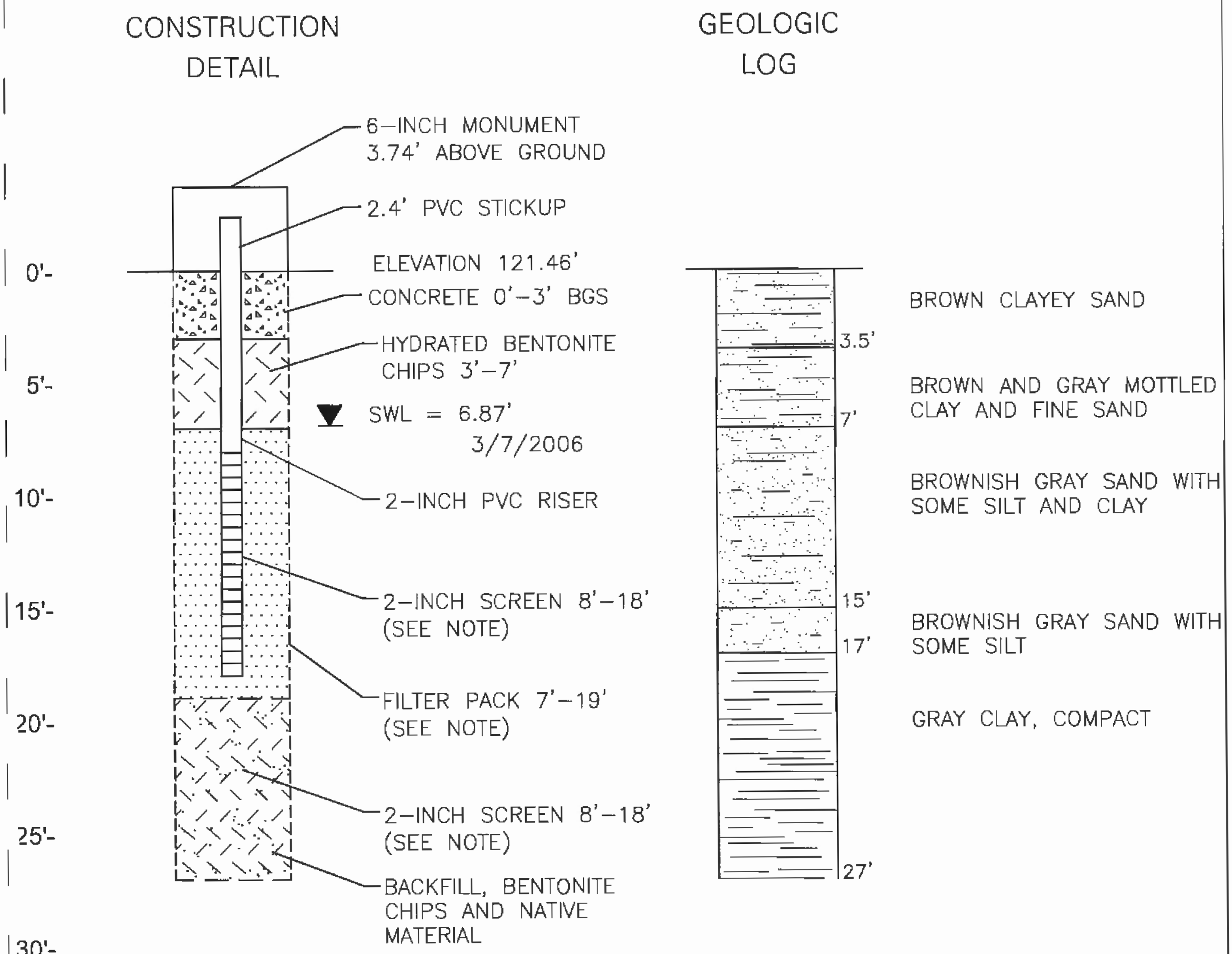

NOTES:
WELL SCREEN IS 2-INCH PVC, 20-SLOT (0.020-INCH OPENING)
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Figure 4
Construction Detail and Geologic Log for Test Hole 3
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Appendix B

Laboratory Test Results, by others

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PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 1 @ 10' - 15 '
Sample#: C-05-218

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 19-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
ML, Sandy Silt

Specifications
No Specs
Sample Meets Specs ? NA

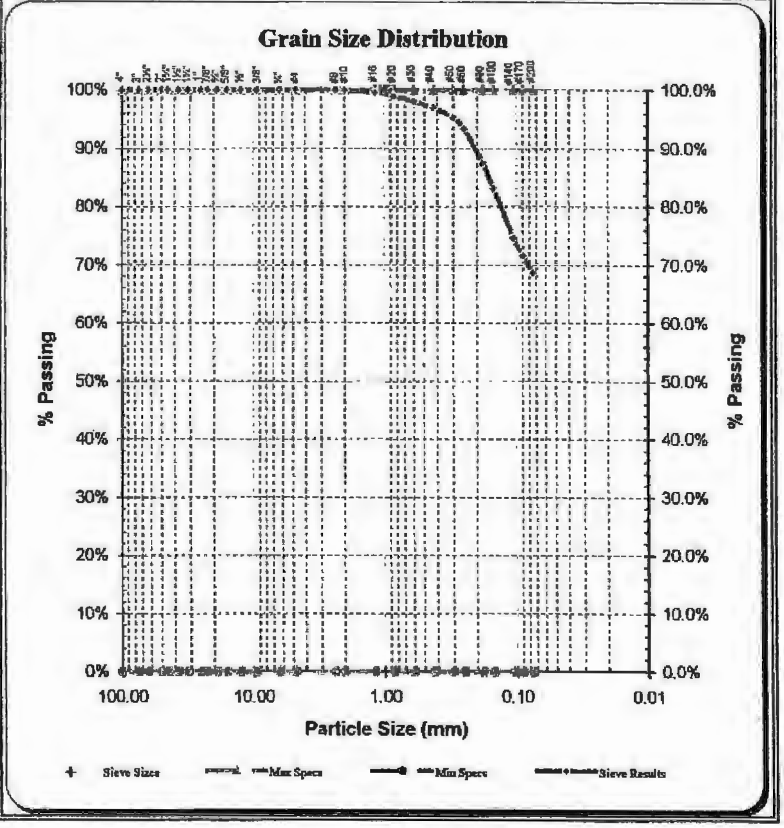
$D_{(5)}$ = 0.005 mm
$D_{(10)}$ = 0.011 mm
$D_{(30)}$ = 0.033 mm
$D_{(50)}$ = 0.055 mm
$D_{(60)}$ = 0.066 mm
$D_{(90)}$ = 0.491 mm

% Gravel = 0.0%
% Sand = 31.4%
% Silt & Clay = 68.6%
Fracture % = n/a
Moisture %, as sampled = 20.1%

Coeff. of Curvature, C_C = 1.50
Coeff. of Uniformity, C_U = 6.00
Fineness Modulus = 0.21
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	100%	100%	100.0%	0.0%
#16	1.180	100%	100%	100.0%	0.0%
#20	0.850	99%	99%	100.0%	0.0%
#30	0.600	98%	98%	100.0%	0.0%
#40	0.425	97%	97%	100.0%	0.0%
#50	0.300	95%	95%	100.0%	0.0%
#60	0.250	93%	93%	100.0%	0.0%
#80	0.180	87%	87%	100.0%	0.0%
#100	0.150	83%	83%	100.0%	0.0%
#140	0.106		75%	100.0%	0.0%
#170	0.090		72%	100.0%	0.0%
#200	0.075	68.6%	68.6%	100.0%	0.0%



Comments: Trace amount of clay, but essentially non-plastic.

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 1 @ 25' - 30 '
Sample#: C-05-219

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 19-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt

Specifications
No Specs
Sample Meets Specs ? NA

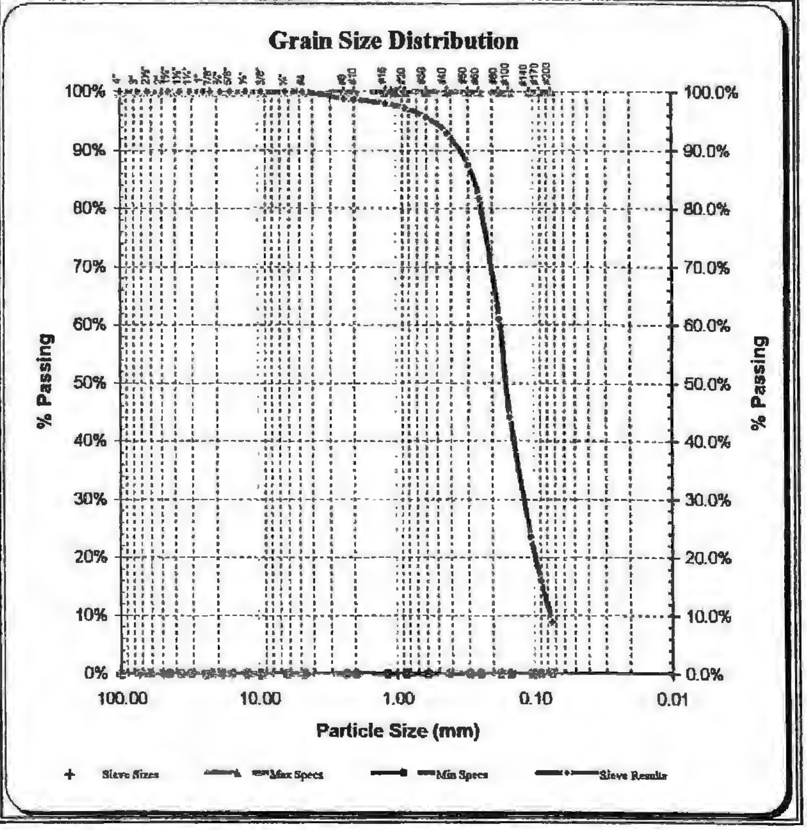
$D_{(5)}$ = mm
$D_{(10)}$ = 0.077 mm
$D_{(30)}$ = 0.120 mm
$D_{(50)}$ = 0.160 mm
$D_{(60)}$ = 0.178 mm
$D_{(90)}$ = 0.483 mm

% Gravel = 0.0%
% Sand = 91.1%
% Silt & Clay = 8.9%
Fracture % = n/a
Moisture %, as sampled = 6.7%

Coeff. of Curvature, C_C = 1.04
Coeff. of Uniformity, C_U = 2.30
Fineness Modulus = 0.76
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	99%	99%	100.0%	0.0%
#10	2.000	99%	99%	100.0%	0.0%
#16	1.180	98%	98%	100.0%	0.0%
#20	0.850	97%	97%	100.0%	0.0%
#30	0.600	96%	96%	100.0%	0.0%
#40	0.425	93%	93%	100.0%	0.0%
#50	0.300	87%	87%	100.0%	0.0%
#60	0.250	82%	82%	100.0%	0.0%
#80	0.180	61%	61%	100.0%	0.0%
#100	0.150	44%	44%	100.0%	0.0%
#140	0.106		23%	100.0%	0.0%
#170	0.090		16%	100.0%	0.0%
#200	0.075	8.9%	8.9%	100.0%	0.0%



Comments:

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 1 @ 65' - 70 '
Sample#: C-05-220

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 19-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

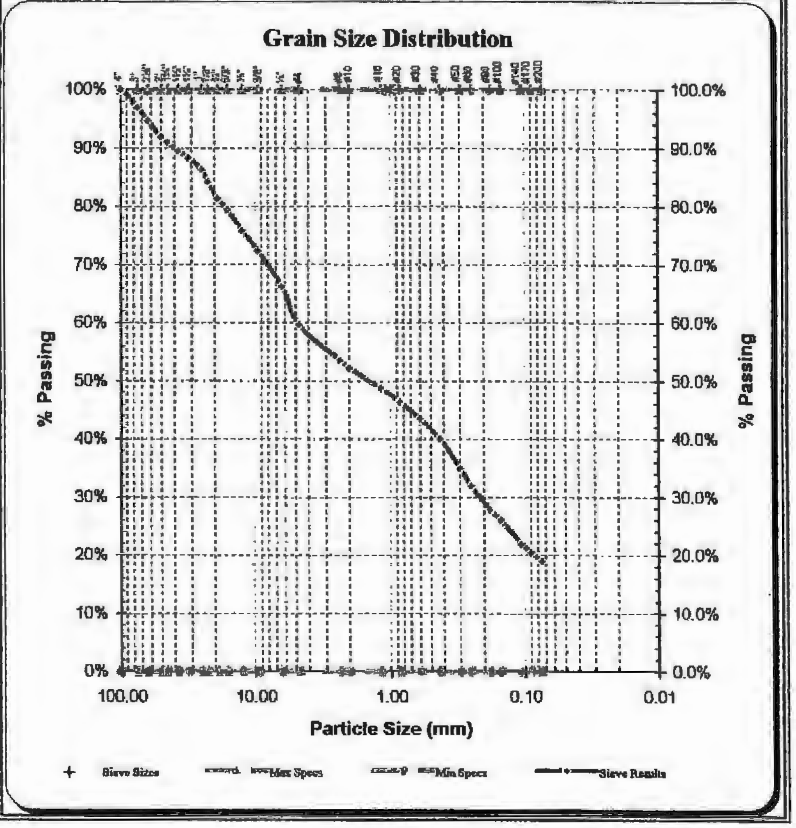
$D_{(5)}$ = 0.020 mm
$D_{(10)}$ = 0.040 mm
$D_{(30)}$ = 0.219 mm
$D_{(50)}$ = 1.493 mm
$D_{(60)}$ = 4.832 mm
$D_{(90)}$ = 47.503 mm

% Gravel = 40.4%
% Sand = 40.7%
% Silt & Clay = 19.0%
Fracture % = n/a
Moisture %, as sampled = 4.9%

Coeff. of Curvature, C_C = 0.25
Coeff. of Uniformity, C_U = 122.22
Fineness Modulus = 3.94
Liquid Limit = 19.0%
Plastic Limit = 13.0%
Plasticity Index = 6.0%

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00	100%	100%	100.0%	0.0%
3.00"	75.00	97%	97%	100.0%	0.0%
2.50"	63.00	95%	95%	100.0%	0.0%
2.00"	50.00	92%	92%	100.0%	0.0%
1.75"	45.00	91%	91%	100.0%	0.0%
1.50"	37.50	90%	90%	100.0%	0.0%
1.25"	31.50	88%	88%	100.0%	0.0%
1.00"	25.00	86%	86%	100.0%	0.0%
7/8"	22.40		84%	100.0%	0.0%
3/4"	19.00	81%	81%	100.0%	0.0%
5/8"	16.00	79%	79%	100.0%	0.0%
1/2"	12.50	76%	76%	100.0%	0.0%
3/8"	9.50	72%	72%	100.0%	0.0%
1/4"	6.30	66%	66%	100.0%	0.0%
#4	4.75	60%	60%	100.0%	0.0%
#8	2.360	54%	54%	100.0%	0.0%
#10	2.000	52%	52%	100.0%	0.0%
#16	1.180	49%	49%	100.0%	0.0%
#20	0.850	46%	46%	100.0%	0.0%
#30	0.600	43%	43%	100.0%	0.0%
#40	0.425	40%	40%	100.0%	0.0%
#50	0.300	35%	35%	100.0%	0.0%
#60	0.250	32%	32%	100.0%	0.0%
#80	0.180	28%	28%	100.0%	0.0%
#100	0.150	26%	26%	100.0%	0.0%
#140	0.106		22%	100.0%	0.0%
#170	0.090		20%	100.0%	0.0%
#200	0.075	19.0%	19.0%	100.0%	0.0%



Comments:

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 1 @ 85' - 90 '
Sample#: C-05-221

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 20-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
GP, Poorly graded Gravel with Sand

Specifications
No Specs
Sample Meets Specs ? NA

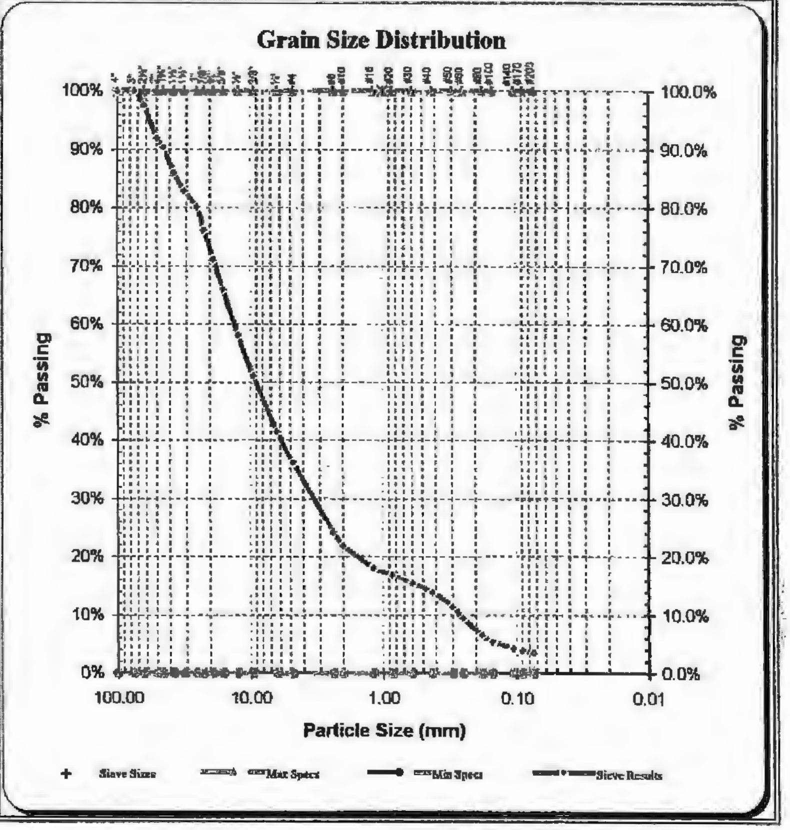
$D_{(5)}$ = 0.134 mm
$D_{(10)}$ = 0.264 mm
$D_{(30)}$ = 3.517 mm
$D_{(50)}$ = 9.127 mm
$D_{(60)}$ = 13.334 mm
$D_{(90)}$ = 51.903 mm

% Gravel = 63.8%
% Sand = 32.7%
% Silt & Clay = 3.5%
Fracture % = n/a
Moisture %, as sampled - 4.7%

Coeff. of Curvature, C_C = 3.51
Coeff. of Uniformity, C_U = 50.53
Fineness Modulus = 5.81
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	98%	98%	100.0%	0.0%
2.00"	50.00	92%	92%	100.0%	0.0%
1.75"	45.00	90%	90%	100.0%	0.0%
1.50"	37.50	86%	86%	100.0%	0.0%
1.25"	31.50	83%	83%	100.0%	0.0%
1.00"	25.00	80%	80%	100.0%	0.0%
7/8"	22.40		76%	100.0%	0.0%
3/4"	19.00	71%	71%	100.0%	0.0%
5/8"	16.00	66%	66%	100.0%	0.0%
1/2"	12.50	58%	58%	100.0%	0.0%
3/8"	9.50	51%	51%	100.0%	0.0%
1/4"	6.30	42%	42%	100.0%	0.0%
#4	4.75	36%	36%	100.0%	0.0%
#8	2.360	24%	24%	100.0%	0.0%
#10	2.000	22%	22%	100.0%	0.0%
#16	1.180	18%	18%	100.0%	0.0%
#20	0.850	17%	17%	100.0%	0.0%
#30	0.600	15%	15%	100.0%	0.0%
#40	0.425	14%	14%	100.0%	0.0%
#50	0.300	11%	11%	100.0%	0.0%
#60	0.250	9%	9%	100.0%	0.0%
#80	0.180	7%	7%	100.0%	0.0%
#100	0.150	5%	5%	100.0%	0.0%
#140	0.106		4%	100.0%	0.0%
#170	0.090		4%	100.0%	0.0%
#200	0.075	3.5%	3.5%	100.0%	0.0%



Comments: Trace amount of clay, but essentially non-plastic.

Reviewed by:

Summit Pointe Preliminary Plat
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Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 2 @ 10' - 15 '
Sample#: C-05-222

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 20-Sep-05
Tested By: L. Saylor / T. Nelson

ASTM D-2487 Unified Soils Classification System
SC-SM, Silty, Clayey Sand

Specifications
No Specs
Sample Meets Specs ? NA

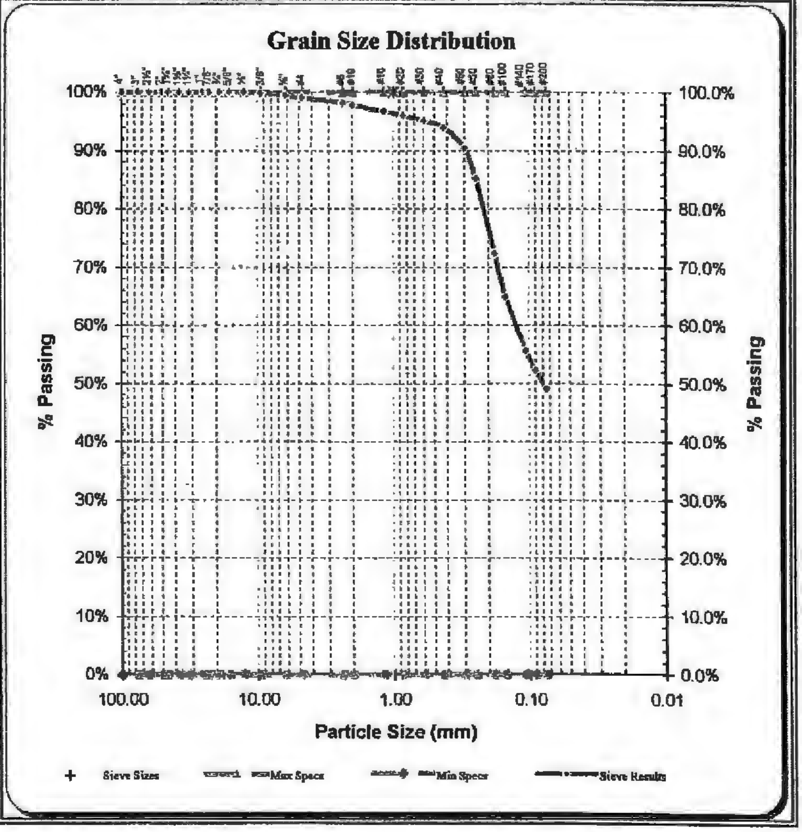
$D_{(5)}$ = 0.008 mm
$D_{(10)}$ = 0.015 mm
$D_{(30)}$ = 0.046 mm
$D_{(50)}$ = 0.079 mm
$D_{(60)}$ = 0.127 mm
$D_{(90)}$ = 0.346 mm

% Gravel = 0.9%
% Sand = 49.9%
% Silt & Clay = 49.1%
Fracture % = n/a
Moisture %, as sampled = 19.9%

Coeff. of Curvature, C_C = 1.08
Coeff. of Uniformity, C_U = 8.31
Fineness Modulus = 0.56
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00	100%	100%	100.0%	0.0%
1/2"	12.50	100%	100%	100.0%	0.0%
3/8"	9.50	100%	100%	100.0%	0.0%
1/4"	6.30	99%	99%	100.0%	0.0%
#4	4.75	99%	99%	100.0%	0.0%
#8	2.360	98%	98%	100.0%	0.0%
#10	2.000	98%	98%	100.0%	0.0%
#16	1.180	97%	97%	100.0%	0.0%
#20	0.850	96%	96%	100.0%	0.0%
#30	0.600	95%	95%	100.0%	0.0%
#40	0.425	94%	94%	100.0%	0.0%
#50	0.300	90%	90%	100.0%	0.0%
#60	0.250	85%	85%	100.0%	0.0%
#80	0.180	72%	72%	100.0%	0.0%
#100	0.150	65%	65%	100.0%	0.0%
#140	0.106		56%	100.0%	0.0%
#170	0.090		52%	100.0%	0.0%
#200	0.075	49.1%	49.1%	100.0%	0.0%



Comments: Trace amount of clay, but essentially non-plastic.

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 2 @ 15' - 20 '
Sample#: C-05-223

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 20-Sep-05
Tested By: L. Sayler / T. Nelson

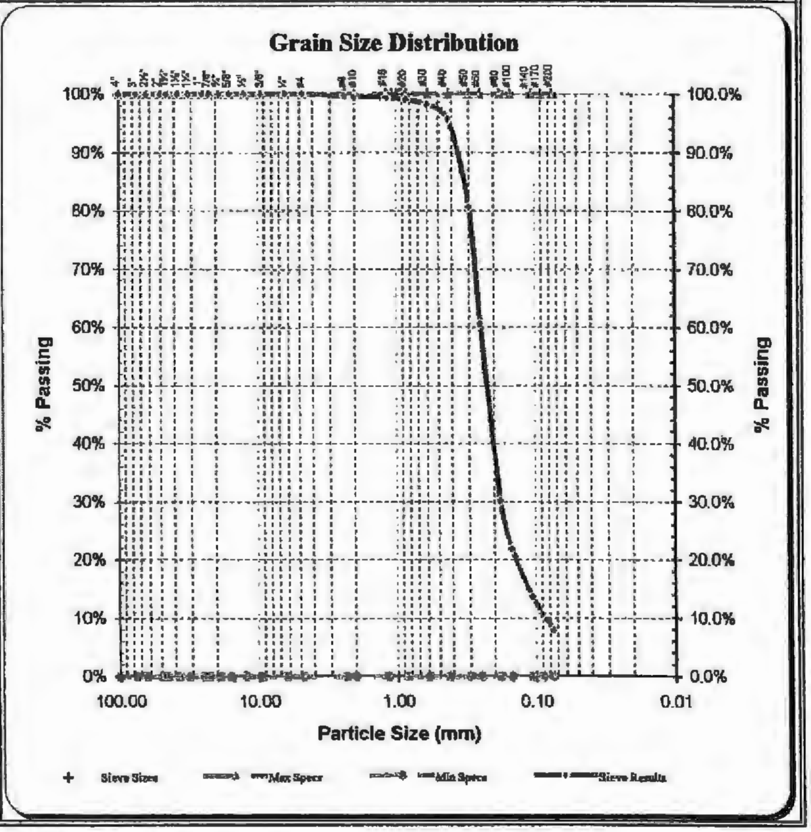
ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt

Specifications
No Specs
Sample Meets Specs ? NA

$D_{(5)}$ =		mm	% Gravel = 0.0%		Coeff. of Curvature, C_C = 1.50
$D_{(10)}$ = 0.086		mm	% Sand = 92.1%		Coeff. of Uniformity, C_U = 2.88
$D_{(30)}$ = 0.179		mm	% Silt & Clay = 7.9%		Fineness Modulus = 1.00
$D_{(50)}$ = 0.226		mm	Fracture % = n/a		Liquid Limit = NA
$D_{(60)}$ = 0.249		mm	Moisture %, as sampled =	9.1%	Plastic Limit = NP
$D_{(90)}$ = 0.503		mm			Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	99%	99%	100.0%	0.0%
#16	1.180	99%	99%	100.0%	0.0%
#20	0.850	99%	99%	100.0%	0.0%
#30	0.600	98%	98%	100.0%	0.0%
#40	0.425	96%	96%	100.0%	0.0%
#50	0.300	81%	81%	100.0%	0.0%
#60	0.250	61%	61%	100.0%	0.0%
#80	0.180	30%	30%	100.0%	0.0%
#100	0.150	22%	22%	100.0%	0.0%
#140	0.106		14%	100.0%	0.0%
#170	0.090		11%	100.0%	0.0%
#200	0.075	7.9%	7.9%	100.0%	0.0%



Comments:

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 2 @ 35' - 40'
Sample#: C-05-224

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 23-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt

Specifications
No Specs
Sample Meets Specs ? NA

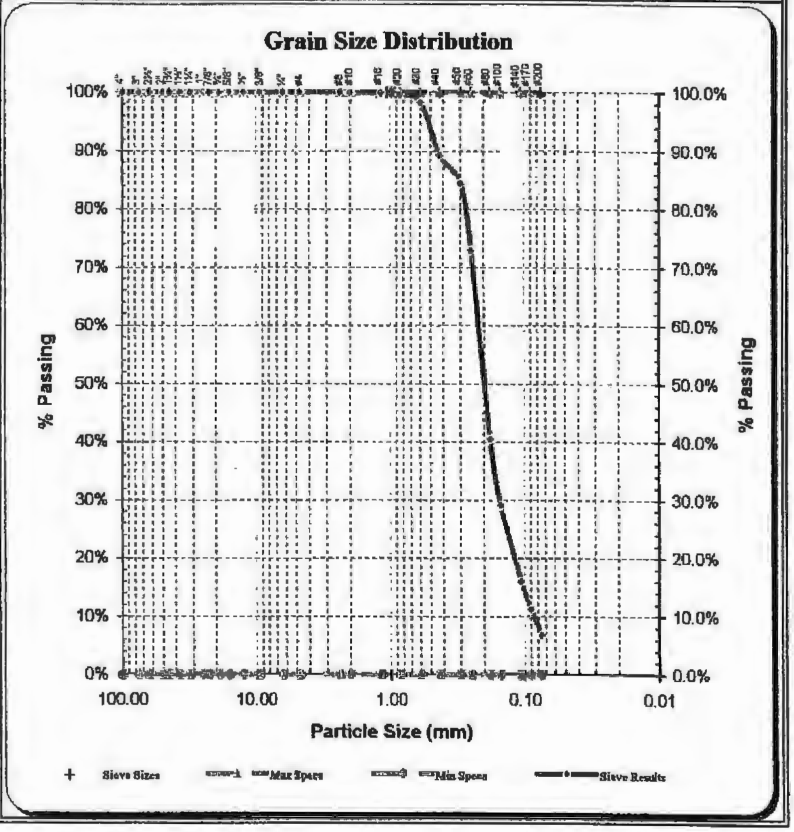
$D_{(5)}$ = mm
$D_{(10)}$ = 0.086 mm
$D_{(30)}$ = 0.152 mm
$D_{(50)}$ = 0.200 mm
$D_{(60)}$ = 0.222 mm
$D_{(90)}$ = 0.615 mm

% Gravel = 0.0%
% Sand = 93.2%
% Silt & Clay = 6.8%
Fracture % = n/a
Moisture %, as sampled = 8.5%

Coeff. of Curvature, C_C = 1.22
Coeff. of Uniformity, C_U = 2.59
Fineness Modulus = 0.88
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	100%	100%	100.0%	0.0%
#16	1.180	100%	100%	100.0%	0.0%
#20	0.850	100%	100%	100.0%	0.0%
#30	0.600	98%	98%	100.0%	0.0%
#40	0.425	89%	89%	100.0%	0.0%
#50	0.300	84%	84%	100.0%	0.0%
#60	0.250	73%	73%	100.0%	0.0%
#80	0.180	41%	41%	100.0%	0.0%
#100	0.150	29%	29%	100.0%	0.0%
#140	0.106		16%	100.0%	0.0%
#170	0.090		11%	100.0%	0.0%
#200	0.075	6.8%	6.8%	100.0%	0.0%



Comments:

Reviewed by:

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Website Address: www.mtc-inc.net

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 2 @ 55' - 60"
Sample#: C-05-225

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 23-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
SC-SM, Silty,Clayey Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

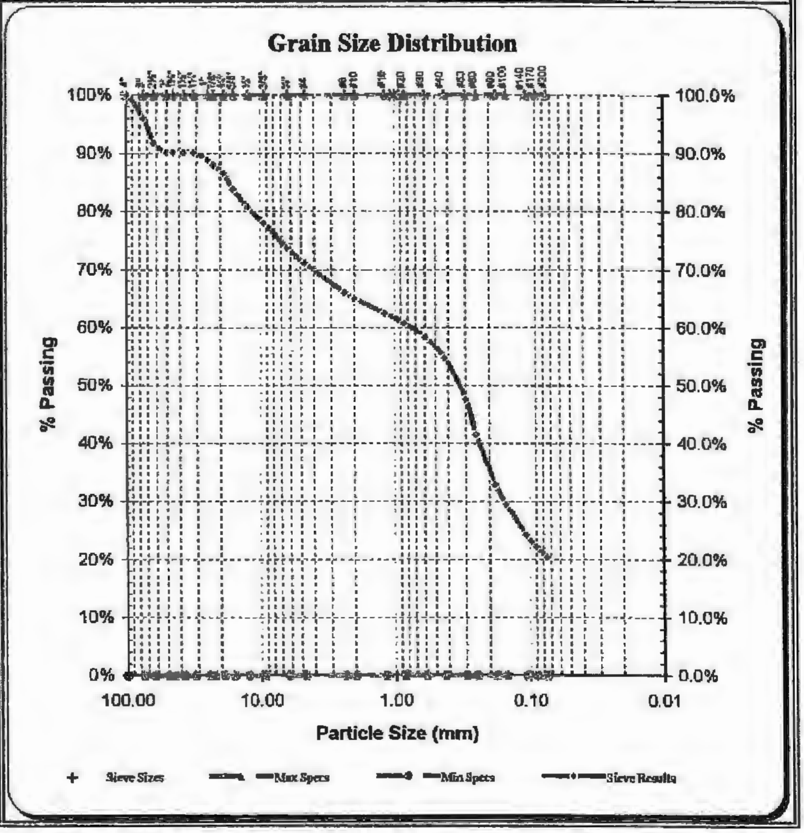
$D_{(5)}$ = 0.018 mm
$D_{(10)}$ = 0.037 mm
$D_{(30)}$ = 0.154 mm
$D_{(50)}$ = 0.343 mm
$D_{(60)}$ = 0.780 mm
$D_{(90)}$ = 37.337 mm

% Gravel = 28.9%
% Sand = 50.8%
% Silt & Clay = 20.4%
Fracture % = n/a
Moisture %, as sampled = 10.7%

Coeff. of Curvature, C_C = 0.83
Coeff. of Uniformity, C_U = 21.18
Fineness Modulus = 3.14
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00	100%	100%	100.0%	0.0%
3.00"	75.00	96%	96%	100.0%	0.0%
2.50"	63.00	92%	92%	100.0%	0.0%
2.00"	50.00	90%	90%	100.0%	0.0%
1.75"	45.00		90%	100.0%	0.0%
1.50"	37.50	90%	90%	100.0%	0.0%
1.25"	31.50	90%	90%	100.0%	0.0%
1.00"	25.00	89%	89%	100.0%	0.0%
7/8"	22.40		88%	100.0%	0.0%
3/4"	19.00	87%	87%	100.0%	0.0%
5/8"	16.00	84%	84%	100.0%	0.0%
1/2"	12.50	81%	81%	100.0%	0.0%
3/8"	9.50	78%	78%	100.0%	0.0%
1/4"	6.30	74%	74%	100.0%	0.0%
#4	4.75	71%	71%	100.0%	0.0%
#8	2.360	66%	66%	100.0%	0.0%
#10	2.000	65%	65%	100.0%	0.0%
#16	1.180	62%	62%	100.0%	0.0%
#20	0.850	61%	61%	100.0%	0.0%
#30	0.600	58%	58%	100.0%	0.0%
#40	0.425	55%	55%	100.0%	0.0%
#50	0.300	48%	48%	100.0%	0.0%
#60	0.250	42%	42%	100.0%	0.0%
#80	0.180	33%	33%	100.0%	0.0%
#100	0.150	30%	30%	100.0%	0.0%
#140	0.106		24%	100.0%	0.0%
#170	0.090		22%	100.0%	0.0%
#200	0.075	20.4%	20.4%	100.0%	0.0%



Comments: Trace amount of clay, but essentially non-plastic.

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 2 @ 80' - 85'
Sample#: C-05-226

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 26-Sep-05
Tested By: L. Sayler / T. Nelson

ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt and Gravel

Specifications
No Specs
Sample Meets Specs ? NA

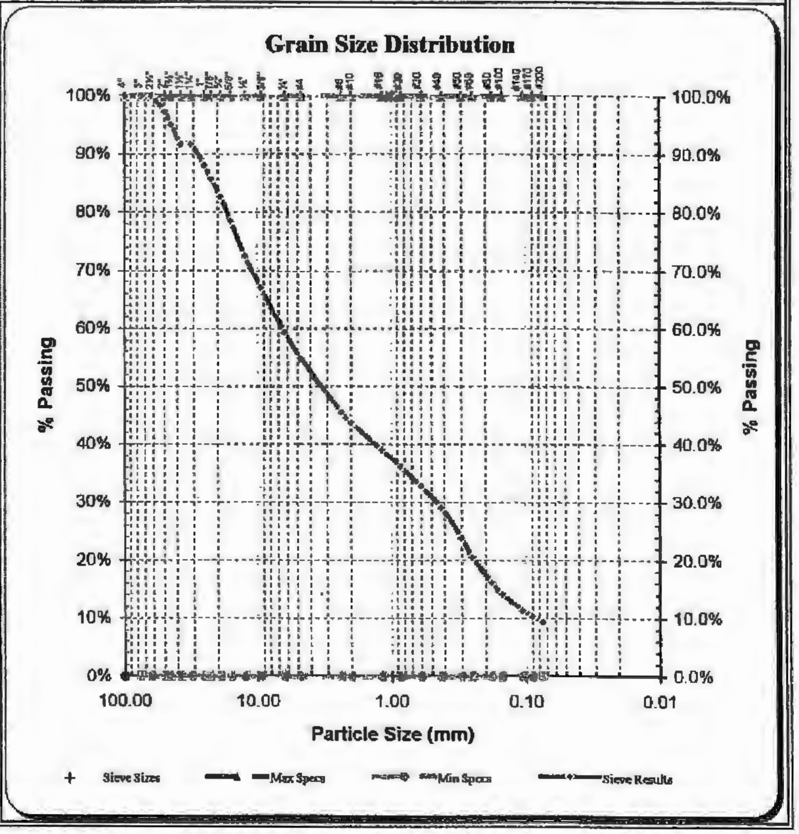
$D_{(5)}$ = mm
$D_{(10)}$ = 0.085 mm
$D_{(30)}$ = 0.466 mm
$D_{(50)}$ = 3.495 mm
$D_{(60)}$ = 6.591 mm
$D_{(90)}$ = 34.834 mm

% Gravel = 45.1%
% Sand = 45.5%
% Silt & Clay = 9.4%
Fracture % = n/a
Moisture %, as sampled = 8.3%

Coeff. of Curvature, C_C = 0.39
Coeff. of Uniformity, C_U = 77.80
Fineness Modulus = 4.48
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00	100%	100%	100.0%	0.0%
2.00"	50.00	97%	97%	100.0%	0.0%
1.75"	45.00		95%	100.0%	0.0%
1.50"	37.50	92%	92%	100.0%	0.0%
1.25"	31.50	92%	92%	100.0%	0.0%
1.00"	25.00	88%	88%	100.0%	0.0%
7/8"	22.40		86%	100.0%	0.0%
3/4"	19.00	83%	83%	100.0%	0.0%
5/8"	16.00	79%	79%	100.0%	0.0%
1/2"	12.50	73%	73%	100.0%	0.0%
3/8"	9.50	67%	67%	100.0%	0.0%
1/4"	6.30	59%	59%	100.0%	0.0%
#4	4.75	55%	55%	100.0%	0.0%
#8	2.360	46%	46%	100.0%	0.0%
#10	2.000	44%	44%	100.0%	0.0%
#16	1.180	39%	39%	100.0%	0.0%
#20	0.850	36%	36%	100.0%	0.0%
#30	0.600	33%	33%	100.0%	0.0%
#40	0.425	29%	29%	100.0%	0.0%
#50	0.300	24%	24%	100.0%	0.0%
#60	0.250	20%	20%	100.0%	0.0%
#80	0.180	16%	16%	100.0%	0.0%
#100	0.150	14%	14%	100.0%	0.0%
#140	0.106		11%	100.0%	0.0%
#170	0.090		10%	100.0%	0.0%
#200	0.075	9.4%	9.4%	100.0%	0.0%



Comments:

Reviewed by:

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 2 @ 95' - 100'
Sample#: C-05-227

Date Received: 10-Sep-05
Sampled By: Client / MTC
Date Tested: 26-Sep-05
Tested By: L. Sayler / T. Nelson

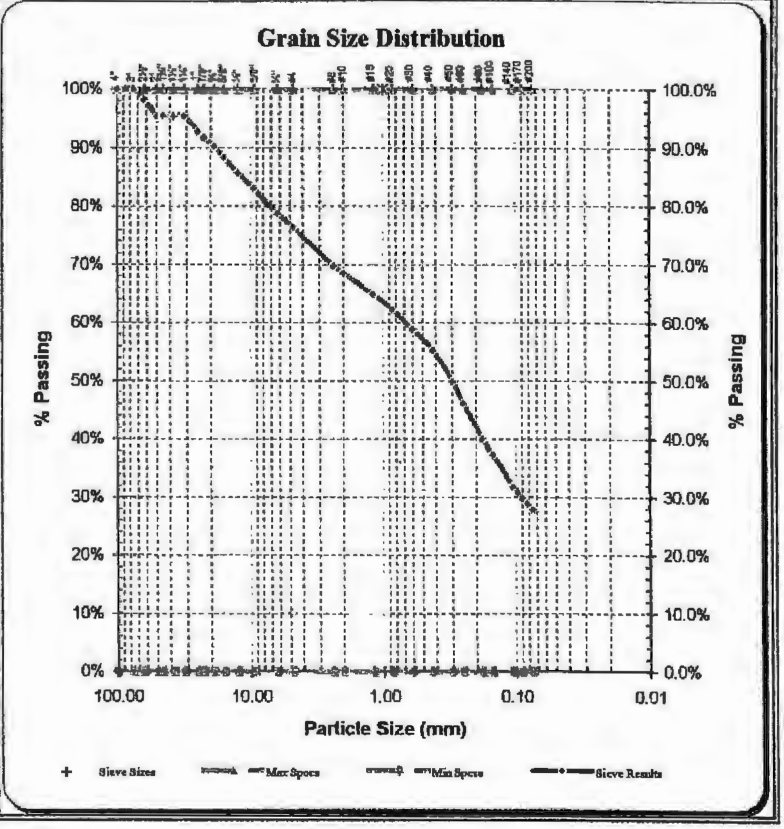
ASTM D-2487 Unified Soils Classification System
SC-SM, Silty,Clayey Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

$D_{(5)}$ = 0.013 mm	% Gravel = 23.6%	Coeff. of Curvature, C_C = 0.46
$D_{(10)}$ = 0.027 mm	% Sand = 48.5%	Coeff. of Uniformity, C_U = 25.52
$D_{(30)}$ = 0.092 mm	% Silt & Clay = 27.9%	Fineness Modulus = 2.74
$D_{(50)}$ = 0.303 mm	Fracture % = n/a	Liquid Limit = 16.0%
$D_{(60)}$ = 0.687 mm	Moisture %, as sampled = 9.3%	Plastic Limit = 14.0%
$D_{(90)}$ = 21.529 mm		Plasticity Index = 2.0%

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	98%	98%	100.0%	0.0%
2.00"	50.00	95%	95%	100.0%	0.0%
1.75"	45.00		95%	100.0%	0.0%
1.50"	37.50	95%	95%	100.0%	0.0%
1.25"	31.50	95%	95%	100.0%	0.0%
1.00"	25.00	93%	93%	100.0%	0.0%
7/8"	22.40		92%	100.0%	0.0%
3/4"	19.00	90%	90%	100.0%	0.0%
5/8"	16.00	88%	88%	100.0%	0.0%
1/2"	12.50	86%	86%	100.0%	0.0%
3/8"	9.50	83%	83%	100.0%	0.0%
1/4"	6.30	79%	79%	100.0%	0.0%
#4	4.75	76%	76%	100.0%	0.0%
#8	2.360	70%	70%	100.0%	0.0%
#10	2.000	68%	68%	100.0%	0.0%
#16	1.180	65%	65%	100.0%	0.0%
#20	0.850	62%	62%	100.0%	0.0%
#30	0.600	59%	59%	100.0%	0.0%
#40	0.425	55%	55%	100.0%	0.0%
#50	0.300	50%	50%	100.0%	0.0%
#60	0.250	46%	46%	100.0%	0.0%
#80	0.180	40%	40%	100.0%	0.0%
#100	0.150	37%	37%	100.0%	0.0%
#140	0.106		32%	100.0%	0.0%
#170	0.090		30%	100.0%	0.0%
#200	0.075	27.9%	27.9%	100.0%	0.0%



Comments:

Reviewed by:

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 3 10' - 15'
Sample#: C-05-228

Date Received: 5-Sep-05
Sampled By: Client / MTC
Date Tested: 26-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt

Specifications
No Specs
Sample Meets Specs ? NA

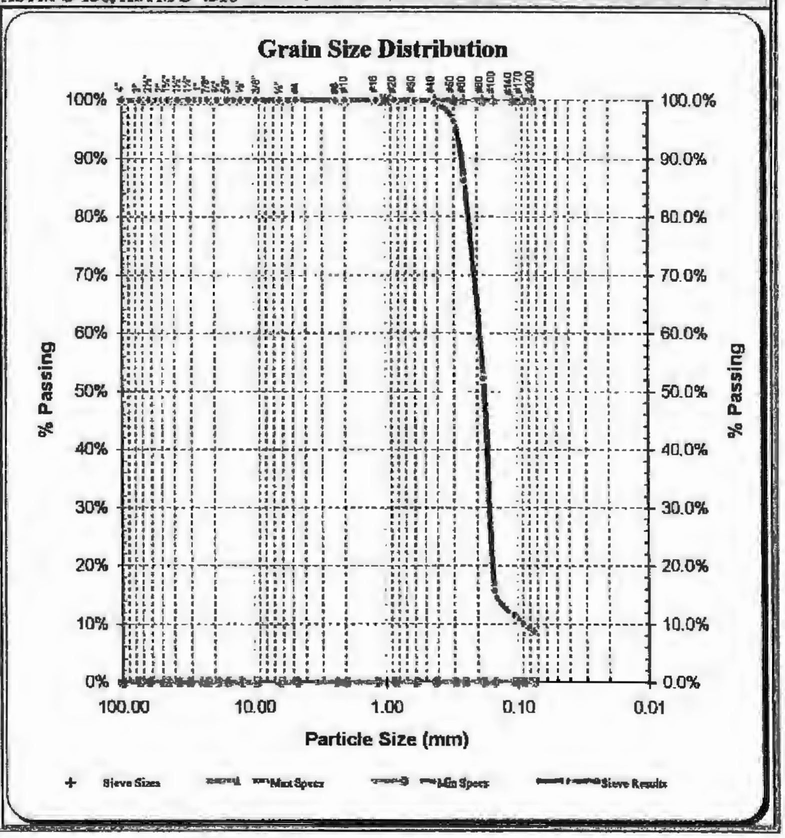
$D_{(5)}$ = mm
$D_{(10)}$ = 0.090 mm
$D_{(30)}$ = 0.162 mm
$D_{(50)}$ = 0.178 mm
$D_{(60)}$ = 0.196 mm
$D_{(90)}$ = 0.319 mm

% Gravel = 0.0%
% Sand = 91.4%
% Silt & Clay = 8.6%
Fracture % = n/a
Moisture %, as sampled = 1.6%

Coeff. of Curvature, C_C = 1.49
Coeff. of Uniformity, C_U = 2.19
Fineness Modulus = 0.88
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	100%	100%	100.0%	0.0%
#16	1.180	100%	100%	100.0%	0.0%
#20	0.850	100%	100%	100.0%	0.0%
#30	0.600	100%	100%	100.0%	0.0%
#40	0.425	99%	99%	100.0%	0.0%
#50	0.300	96%	96%	100.0%	0.0%
#60	0.250	86%	86%	100.0%	0.0%
#80	0.180	52%	52%	100.0%	0.0%
#100	0.150	16%	16%	100.0%	0.0%
#140	0.106		12%	100.0%	0.0%
#170	0.090		10%	100.0%	0.0%
#200	0.075	8.6%	8.6%	100.0%	0.0%



Comments:

Reviewed by:

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 3 25' - 30'
Sample#: C-05-229

Date Received: 5-Sep-05
Sampled By: Client / MTC
Date Tested: 28-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand w/ Cementious Clusters

Specifications
No Specs
Sample Meets Specs ? NA

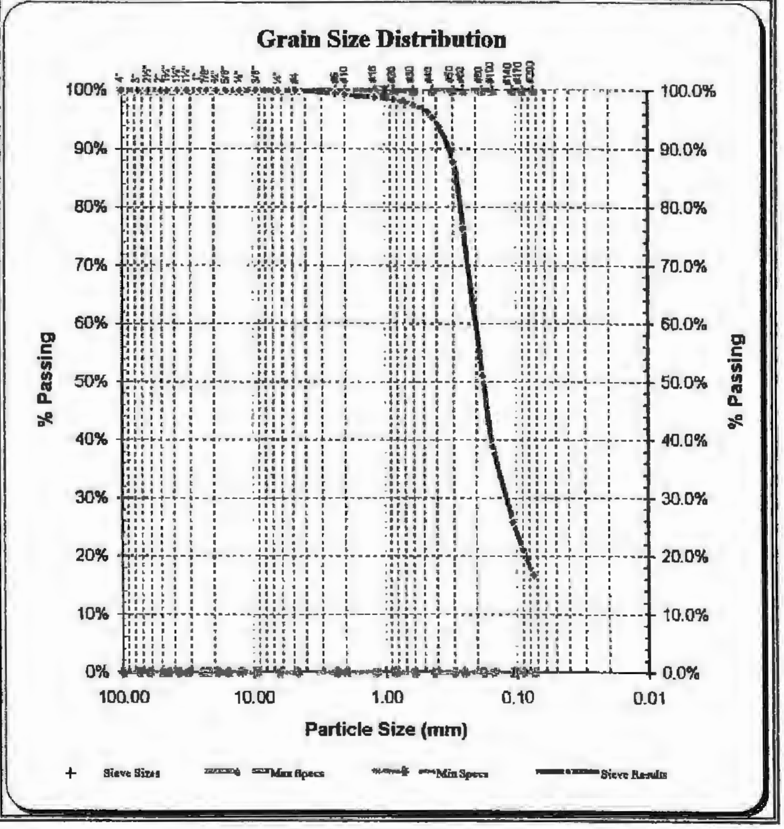
$D_{(5)}$ = 0.022 mm
$D_{(10)}$ = 0.045 mm
$D_{(30)}$ = 0.120 mm
$D_{(50)}$ = 0.178 mm
$D_{(60)}$ = 0.205 mm
$D_{(90)}$ = 0.463 mm

% Gravel = 0.0%
% Sand = 83.3%
% Silt & Clay = 16.7%
Fracture % = n/a
Moisture %, as sampled = 2.8%

Coeff. of Curvature, C_C = 1.57
Coeff. of Uniformity, C_U = 4.56
Fineness Modulus = 0.78
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	99%	99%	100.0%	0.0%
#10	2.000	99%	99%	100.0%	0.0%
#16	1.180	99%	99%	100.0%	0.0%
#20	0.850	98%	98%	100.0%	0.0%
#30	0.600	97%	97%	100.0%	0.0%
#40	0.425	95%	95%	100.0%	0.0%
#50	0.300	88%	88%	100.0%	0.0%
#60	0.250	76%	76%	100.0%	0.0%
#80	0.180	51%	51%	100.0%	0.0%
#100	0.150	39%	39%	100.0%	0.0%
#140	0.106		26%	100.0%	0.0%
#170	0.090		21%	100.0%	0.0%
#200	0.075	16.7%	16.7%	100.0%	0.0%



Comments:

Reviewed by:

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 3 35' - 40'
Sample#: C-05-230

Date Received: 5-Sep-05
Sampled By: Client / MTC
Date Tested: 28-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand

Specifications
No Specs
Sample Meets Specs ? NA

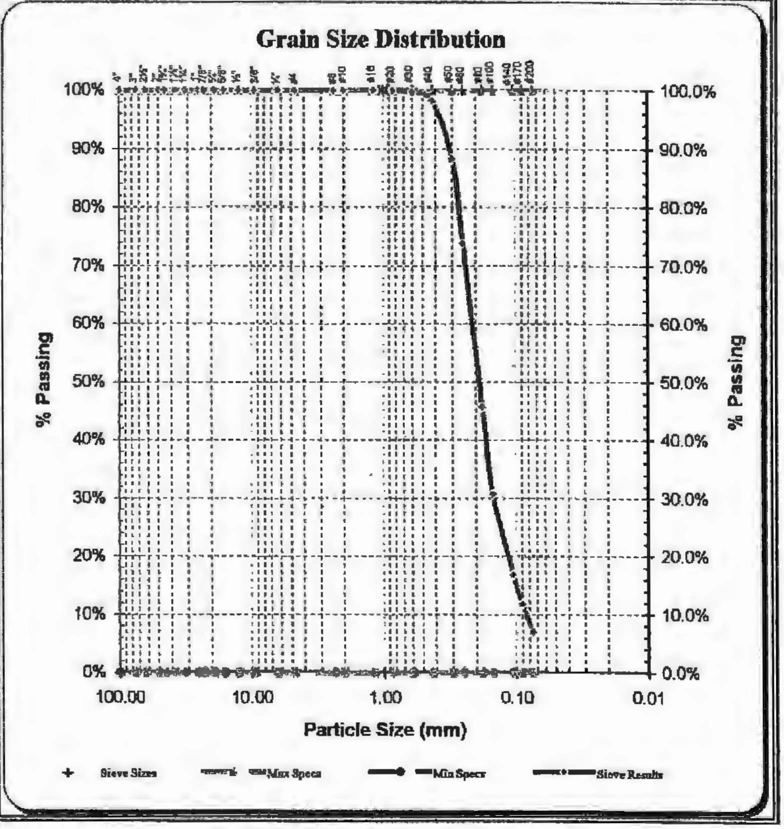
$D_{(5)}$ = mm
$D_{(10)}$ = 0.084 mm
$D_{(20)}$ = 0.148 mm
$D_{(30)}$ = 0.191 mm
$D_{(60)}$ = 0.216 mm
$D_{(90)}$ = 0.446 mm

% Gravel = 0.0%
% Sand = 93.0%
% Silt & Clay = 7.0%
Fracture % = n/a
Moisture %, as sampled = 5.7%

Coeff. of Curvature, C_C = 1.20
Coeff. of Uniformity, C_U = 2.55
Fineness Modulus = 0.81
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	100%	100%	100.0%	0.0%
#16	1.180	100%	100%	100.0%	0.0%
#20	0.850	100%	100%	100.0%	0.0%
#30	0.600	100%	100%	100.0%	0.0%
#40	0.425	98%	98%	100.0%	0.0%
#50	0.300	88%	88%	100.0%	0.0%
#60	0.250	74%	74%	100.0%	0.0%
#80	0.180	46%	46%	100.0%	0.0%
#100	0.150	31%	31%	100.0%	0.0%
#140	0.106		17%	100.0%	0.0%
#170	0.090		12%	100.0%	0.0%
#200	0.075	7.0%	7.0%	100.0%	0.0%



Comments:

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 3 55' - 60'
Sample#: C-05-231

Date Received: 5-Sep-05
Sampled By: Client Rep / MTC
Date Tested: 27-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SC-SM, Silty,Clayey Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

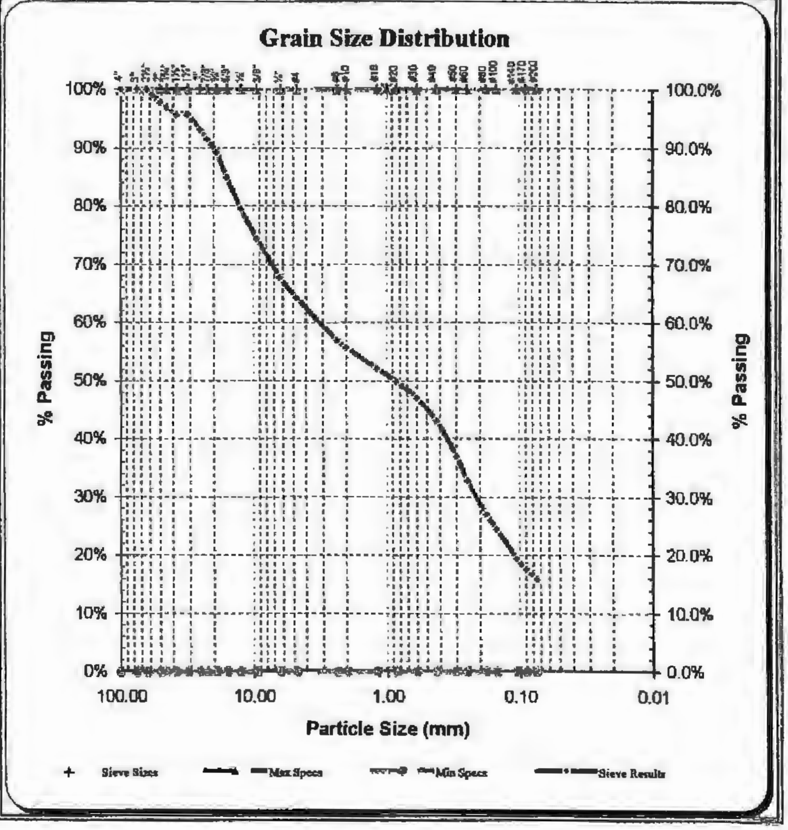
$D_{(5)}$ = 0.024 mm
$D_{(10)}$ = 0.047 mm
$D_{(30)}$ = 0.216 mm
$D_{(50)}$ = 0.877 mm
$D_{(60)}$ = 3.370 mm
$D_{(90)}$ = 23.665 mm

% Gravel = 35.8%
% Sand = 48.4%
% Silt & Clay = 15.8%
Fracture % = n/a
Moisture %, as sampled = 7.7%

Coeff. of Curvature, C_C = 0.29
Coeff. of Uniformity, C_U = 71.16
Fineness Modulus = 3.59
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00	100%	100%	100.0%	0.0%
2.00"	50.00	98%	98%	100.0%	0.0%
1.75"	45.00		97%	100.0%	0.0%
1.50"	37.50	96%	96%	100.0%	0.0%
1.25"	31.50	96%	96%	100.0%	0.0%
1.00"	25.00	93%	93%	100.0%	0.0%
7/8"	22.40		91%	100.0%	0.0%
3/4"	19.00	89%	89%	100.0%	0.0%
5/8"	16.00	85%	85%	100.0%	0.0%
1/2"	12.50	79%	79%	100.0%	0.0%
3/8"	9.50	74%	74%	100.0%	0.0%
1/4"	6.30	68%	68%	100.0%	0.0%
#4	4.75	64%	64%	100.0%	0.0%
#8	2.360	57%	57%	100.0%	0.0%
#10	2.000	56%	56%	100.0%	0.0%
#16	1.180	52%	52%	100.0%	0.0%
#20	0.850	50%	50%	100.0%	0.0%
#30	0.600	47%	47%	100.0%	0.0%
#40	0.425	43%	43%	100.0%	0.0%
#50	0.300	37%	37%	100.0%	0.0%
#60	0.250	33%	33%	100.0%	0.0%
#80	0.180	27%	27%	100.0%	0.0%
#100	0.150	24%	24%	100.0%	0.0%
#140	0.106		19%	100.0%	0.0%
#170	0.090		18%	100.0%	0.0%
#200	0.075	15.8%	15.8%	100.0%	0.0%



Comments: Trace amount of clay, but essentially non-plastic.

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 3 70'- 75'
Sample#: C-05-232

Date Received: 5-Sep-05
Sampled By: Client Rep / MTC
Date Tested: 27-Sep-05
Tested By: T. Nelson / L. Sayler

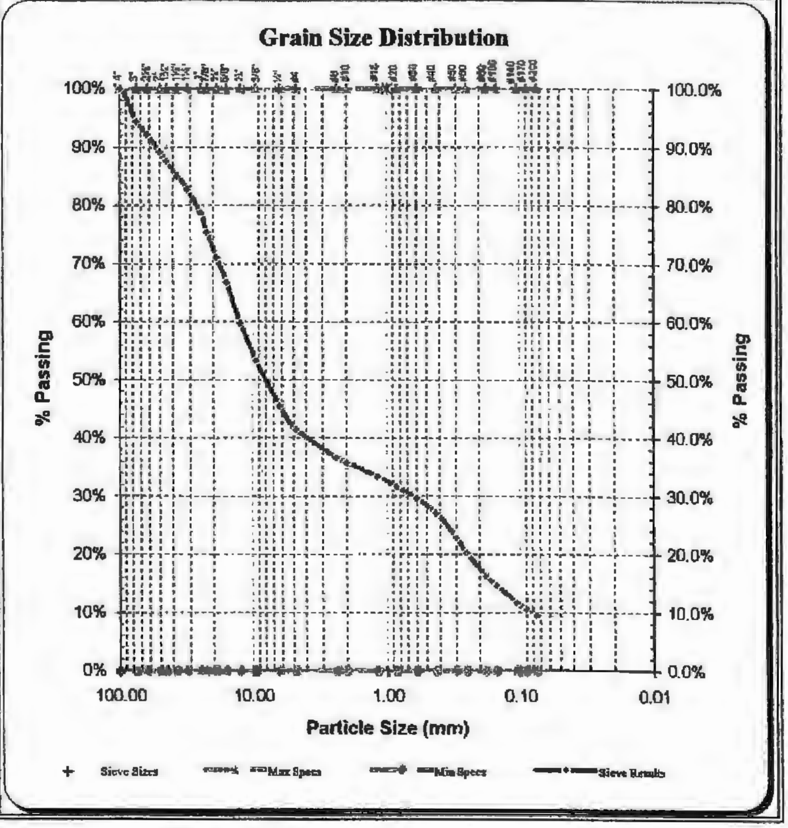
ASTM D-2487 Unified Soils Classification System
GP-GM, Poorly graded Gravel with Silt and Sand

Specifications
No Specs
Sample Meets Specs ? NA

$D_{(5)}$ = mm	% Gravel = 58.5%	Coeff. of Curvature, C_C = 0.40
$D_{(10)}$ = 0.082 mm	% Sand = 31.9%	Coeff. of Uniformity, C_U = 153.90
$D_{(30)}$ = 0.645 mm	% Silt & Clay = 9.5%	Fineness Modulus = 5.17
$D_{(50)}$ = 8.138 mm	Fracture % = n/a	Liquid Limit = NA
$D_{(60)}$ = 12.598 mm	Moisture %, as sampled = 1.2%	Plastic Limit = NP
$D_{(90)}$ = 66.489 mm		Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00	100%	100%	100.0%	0.0%
3.00"	75.00	94%	94%	100.0%	0.0%
2.50"	63.00	92%	92%	100.0%	0.0%
2.00"	50.00	89%	89%	100.0%	0.0%
1.75"	45.00		88%	100.0%	0.0%
1.50"	37.50	85%	85%	100.0%	0.0%
1.25"	31.50	83%	83%	100.0%	0.0%
1.00"	25.00	79%	79%	100.0%	0.0%
7/8"	22.40		75%	100.0%	0.0%
3/4"	19.00	71%	71%	100.0%	0.0%
5/8"	16.00	67%	67%	100.0%	0.0%
1/2"	12.50	60%	60%	100.0%	0.0%
3/8"	9.50	53%	53%	100.0%	0.0%
1/4"	6.30	45%	45%	100.0%	0.0%
#4	4.75	41%	41%	100.0%	0.0%
#8	2.360	37%	37%	100.0%	0.0%
#10	2.000	36%	36%	100.0%	0.0%
#16	1.180	33%	33%	100.0%	0.0%
#20	0.850	32%	32%	100.0%	0.0%
#30	0.600	30%	30%	100.0%	0.0%
#40	0.425	27%	27%	100.0%	0.0%
#50	0.300	23%	23%	100.0%	0.0%
#60	0.250	20%	20%	100.0%	0.0%
#80	0.180	16%	16%	100.0%	0.0%
#100	0.150	15%	15%	100.0%	0.0%
#140	0.106		12%	100.0%	0.0%
#170	0.090		11%	100.0%	0.0%
#200	0.075	9.5%	9.5%	100.0%	0.0%



Comments:

Reviewed by:

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 4 30' - 35'
Sample#: C-05-248

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt

Specifications
No Specs
Sample Meets Specs ? NA

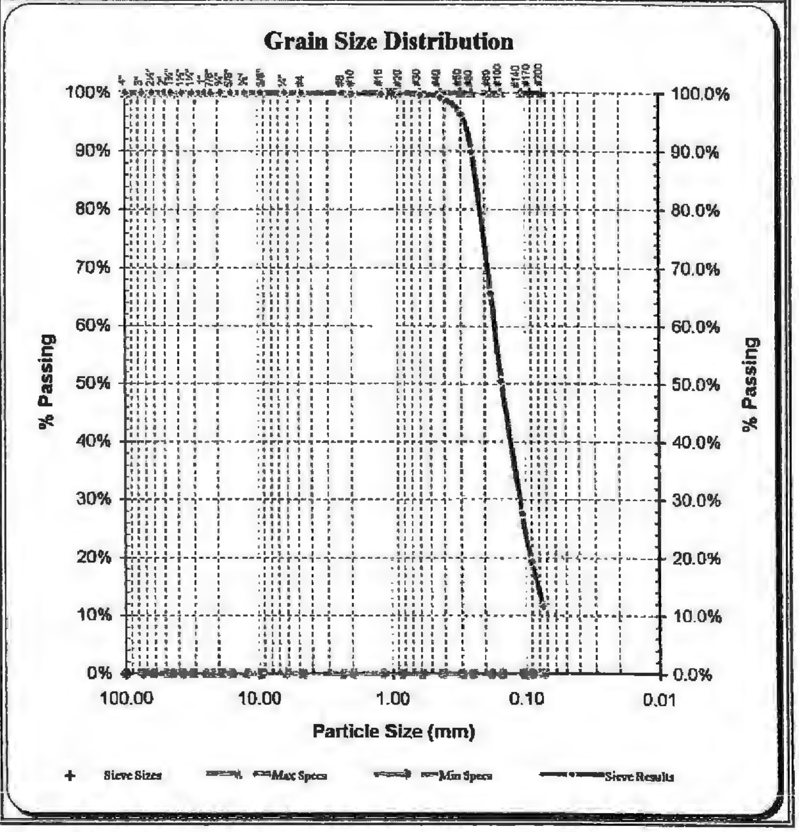
$D_{(5)}$ = 0.032 mm
$D_{(10)}$ = 0.065 mm
$D_{(30)}$ = 0.111 mm
$D_{(50)}$ = 0.149 mm
$D_{(60)}$ = 0.169 mm
$D_{(90)}$ = 0.301 mm

% Gravel = 0.0%
% Sand = 88.4%
% Silt & Clay = 11.6%
Fracture % = n/a
Moisture %, as sampled = 6.9%

Coeff. of Curvature, C_C = 1.12
Coeff. of Uniformity, C_u = 2.60
Fineness Modulus = 0.54
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	100%	100%	100.0%	0.0%
#16	1.180	100%	100%	100.0%	0.0%
#20	0.850	100%	100%	100.0%	0.0%
#30	0.600	100%	100%	100.0%	0.0%
#40	0.425	99%	99%	100.0%	0.0%
#50	0.300	96%	96%	100.0%	0.0%
#60	0.250	90%	90%	100.0%	0.0%
#80	0.180	66%	66%	100.0%	0.0%
#100	0.150	50%	50%	100.0%	0.0%
#140	0.106		28%	100.0%	0.0%
#170	0.090		19%	100.0%	0.0%
#200	0.075	11.6%	11.6%	100.0%	0.0%



Comments:

Reviewed by:

777 Chrysler Drive * Burlington, WA 98233 * Phone (360) 755-1990 * Fax (360) 755-1980
1710 Midway Court * Centralia, WA 98531 * Phone (360) 330-7926 * Fax (360) 330-7946
Website Address: www.mtc-inc.net

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 4 40' - 45'
Sample#: C-05-249

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

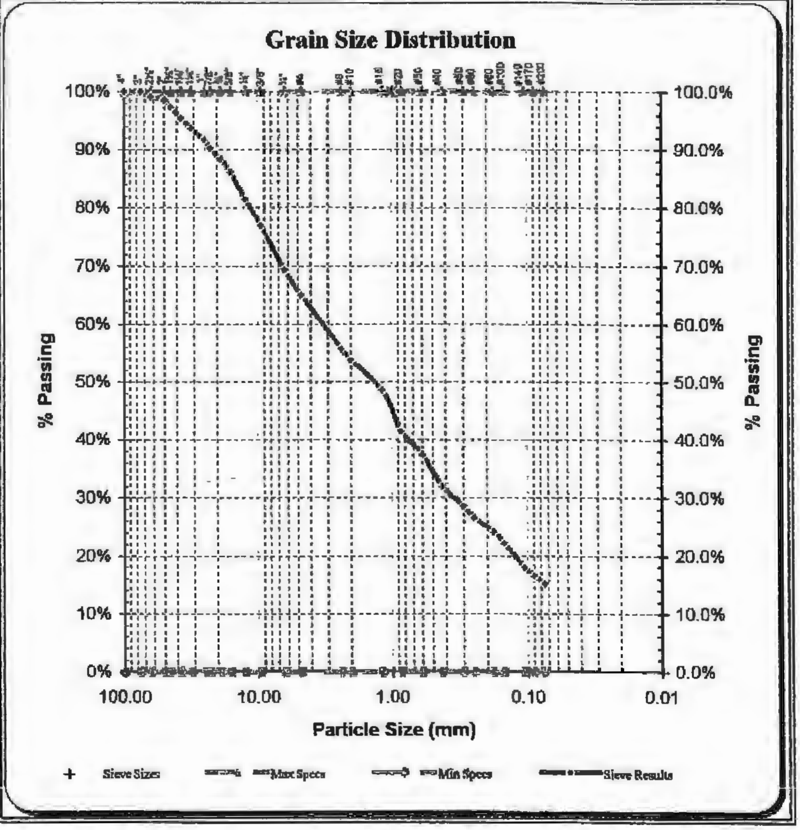
$D_{(5)}$ = 0.025 mm
$D_{(10)}$ = 0.049 mm
$D_{(30)}$ = 0.354 mm
$D_{(50)}$ = 1.403 mm
$D_{(60)}$ = 3.461 mm
$D_{(90)}$ = 25.297 mm

% Gravel = 35.0%
% Sand = 49.8%
% Silt & Clay = 15.2%
Fracture % = n/a
Moisture %, as sampled = 3.3%

Coeff. of Curvature, C_C = 0.73
Coeff. of Uniformity, C_U = 70.06
Fineness Modulus = 3.82
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	99%	99%	100.0%	0.0%
2.00"	50.00	99%	99%	100.0%	0.0%
1.75"	45.00		97%	100.0%	0.0%
1.50"	37.50	95%	95%	100.0%	0.0%
1.25"	31.50	94%	94%	100.0%	0.0%
1.00"	25.00	92%	92%	100.0%	0.0%
7/8"	22.40		90%	100.0%	0.0%
3/4"	19.00	88%	88%	100.0%	0.0%
5/8"	16.00	86%	86%	100.0%	0.0%
1/2"	12.50	82%	82%	100.0%	0.0%
3/8"	9.50	77%	77%	100.0%	0.0%
1/4"	6.30	69%	69%	100.0%	0.0%
#4	4.75	65%	65%	100.0%	0.0%
#8	2.360	56%	56%	100.0%	0.0%
#10	2.000	54%	54%	100.0%	0.0%
#16	1.180	49%	49%	100.0%	0.0%
#20	0.850	42%	42%	100.0%	0.0%
#30	0.600	37%	37%	100.0%	0.0%
#40	0.425	32%	32%	100.0%	0.0%
#50	0.300	29%	29%	100.0%	0.0%
#60	0.250	27%	27%	100.0%	0.0%
#80	0.180	24%	24%	100.0%	0.0%
#100	0.150	22%	22%	100.0%	0.0%
#140	0.106		18%	100.0%	0.0%
#170	0.090		17%	100.0%	0.0%
#200	0.075	15.2%	15.2%	100.0%	0.0%



Comments:

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 4 55' - 60'
Sample#: C-05-250

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

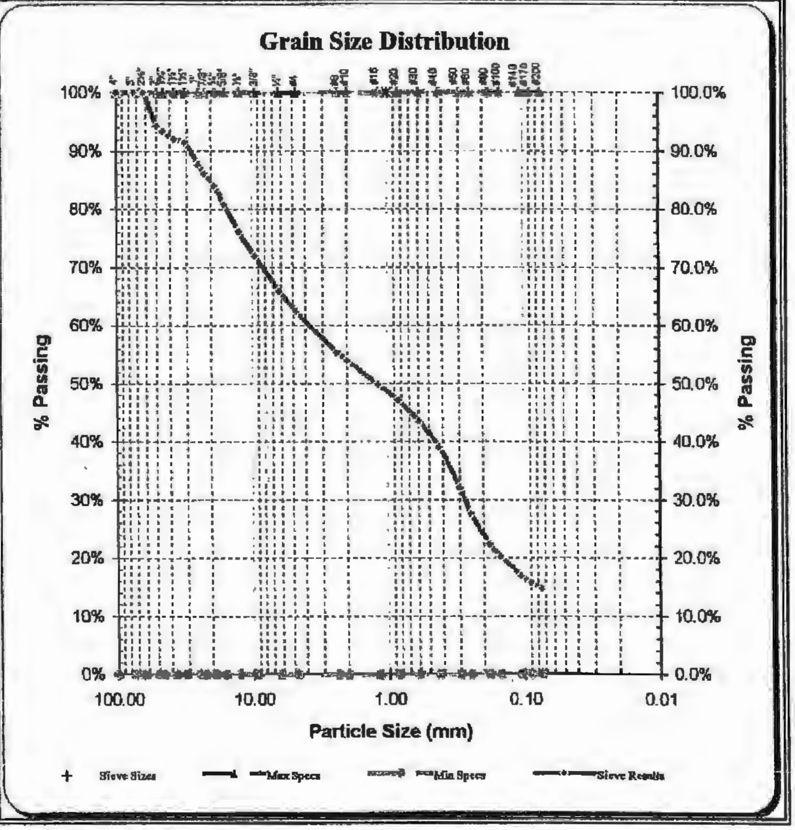
$D_{(5)}$ = 0.026 mm
$D_{(10)}$ = 0.051 mm
$D_{(30)}$ = 0.277 mm
$D_{(50)}$ = 1.208 mm
$D_{(60)}$ = 3.921 mm
$D_{(90)}$ = 35.392 mm

% Gravel = 37.6%
% Sand = 47.8%
% Silt & Clay = 14.7%
Fracture % = n/a
Moisture %, as sampled = 7.1%

Coeff. of Curvature, C_C = 0.38
Coeff. of Uniformity, C_U = 76.74
Fineness Modulus = 3.89
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00	100%	100%	100.0%	0.0%
2.00"	50.00	94%	94%	100.0%	0.0%
1.75"	45.00		93%	100.0%	0.0%
1.50"	37.50	92%	92%	100.0%	0.0%
1.25"	31.50	91%	91%	100.0%	0.0%
1.00"	25.00	88%	88%	100.0%	0.0%
7/8"	22.40		86%	100.0%	0.0%
3/4"	19.00	84%	84%	100.0%	0.0%
5/8"	16.00	81%	81%	100.0%	0.0%
1/2"	12.50	76%	76%	100.0%	0.0%
3/8"	9.50	72%	72%	100.0%	0.0%
1/4"	6.30	66%	66%	100.0%	0.0%
#4	4.75	62%	62%	100.0%	0.0%
#8	2.360	55%	55%	100.0%	0.0%
#10	2.000	54%	54%	100.0%	0.0%
#16	1.180	50%	50%	100.0%	0.0%
#20	0.850	47%	47%	100.0%	0.0%
#30	0.600	43%	43%	100.0%	0.0%
#40	0.425	39%	39%	100.0%	0.0%
#50	0.300	32%	32%	100.0%	0.0%
#60	0.250	28%	28%	100.0%	0.0%
#80	0.180	22%	22%	100.0%	0.0%
#100	0.150	20%	20%	100.0%	0.0%
#140	0.106		17%	100.0%	0.0%
#170	0.090		16%	100.0%	0.0%
#200	0.075	14.7%	14.7%	100.0%	0.0%



Comments:

Reviewed by:

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Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 4 70' - 75"
Sample#: C-05-251

Date Received: 5-Sep-05
Sampled By: Client Rep/ / MTC
Date Tested: 28-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
GP-GM, Poorly graded Gravel with Silt and Sand

Specifications
No Specs
Sample Meets Specs ? Yes

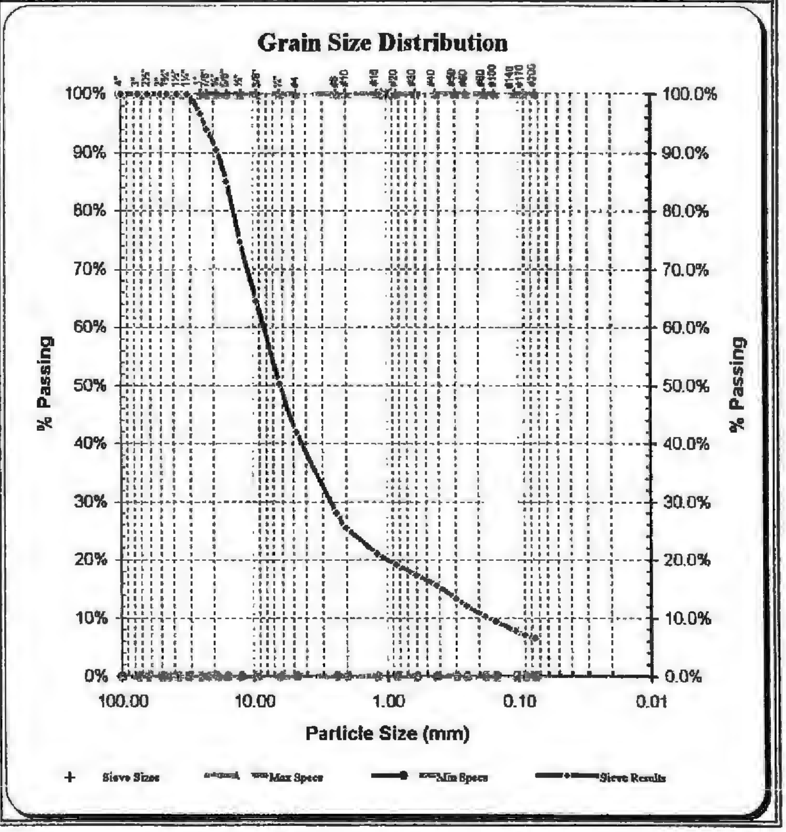
$D_{(5)}$ = mm
$D_{(10)}$ = 0.170 mm
$D_{(30)}$ = 2.694 mm
$D_{(50)}$ = 6.257 mm
$D_{(60)}$ = 8.490 mm
$D_{(90)}$ = 21.752 mm

% Gravel = 57.9%
% Sand = 35.5%
% Silt & Clay = 6.5%
Fracture % = n/a
Moisture %, as sampled = 5.9%

Coeff. of Curvature, C_C = 5.03
Coeff. of Uniformity, C_U = 49.90
Fineness Modulus = 5.14
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	97%	97%	100.0%	0.0%
7/8"	22.40		94%	100.0%	0.0%
3/4"	19.00	90%	90%	100.0%	0.0%
5/8"	16.00	85%	85%	100.0%	0.0%
1/2"	12.50	75%	75%	100.0%	0.0%
3/8"	9.50	65%	65%	100.0%	0.0%
1/4"	6.30	50%	50%	100.0%	0.0%
#4	4.75	42%	42%	100.0%	0.0%
#8	2.360	28%	28%	100.0%	0.0%
#10	2.000	25%	25%	100.0%	0.0%
#16	1.180	21%	21%	100.0%	0.0%
#20	0.850	19%	19%	100.0%	0.0%
#30	0.600	17%	17%	100.0%	0.0%
#40	0.425	16%	16%	100.0%	0.0%
#50	0.300	13%	13%	100.0%	0.0%
#60	0.250	12%	12%	100.0%	0.0%
#80	0.180	10%	10%	100.0%	0.0%
#100	0.150	9%	9%	100.0%	0.0%
#140	0.106		8%	100.0%	0.0%
#170	0.090		7%	100.0%	0.0%
#200	0.075	6.5%	6.5%	100.0%	0.0%



Comments:

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 5 10' - 15'
Sample#: C-05-252

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand

Specifications
No Specs
Sample Meets Specs ? NA

$D_{(5)}$ = 0.008 mm
$D_{(10)}$ = 0.017 mm
$D_{(30)}$ = 0.050 mm
$D_{(50)}$ = 0.106 mm
$D_{(60)}$ = 0.165 mm
$D_{(90)}$ = 0.762 mm

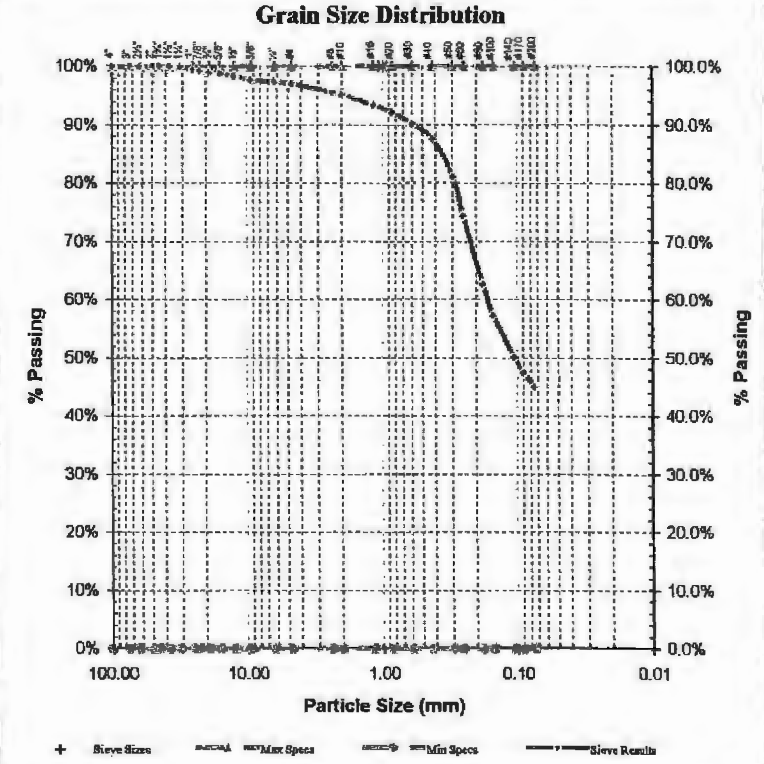
% Gravel = 3.0%
% Sand = 52.1%
% Silt & Clay = 45.0%
Fracture % = n/a
Moisture %, as sampled = 9.3%

Coeff. of Curvature, C_C = 0.91
Coeff. of Uniformity, C_U = 9.91
Fineness Modulus = 0.89
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50	100%	100%	100.0%	0.0%
1.00"	25.00	99%	99%	100.0%	0.0%
7/8"	22.40		99%	100.0%	0.0%
3/4"	19.00	99%	99%	100.0%	0.0%
5/8"	16.00	99%	99%	100.0%	0.0%
1/2"	12.50	98%	98%	100.0%	0.0%
3/8"	9.50	98%	98%	100.0%	0.0%
1/4"	6.30	97%	97%	100.0%	0.0%
#4	4.75	97%	97%	100.0%	0.0%
#8	2.360	96%	96%	100.0%	0.0%
#10	2.000	95%	95%	100.0%	0.0%
#16	1.180	93%	93%	100.0%	0.0%
#20	0.850	92%	92%	100.0%	0.0%
#30	0.600	90%	90%	100.0%	0.0%
#40	0.425	87%	87%	100.0%	0.0%
#50	0.300	81%	81%	100.0%	0.0%
#60	0.250	74%	74%	100.0%	0.0%
#80	0.180	63%	63%	100.0%	0.0%
#100	0.150	57%	57%	100.0%	0.0%
#140	0.106		50%	100.0%	0.0%
#170	0.090		47%	100.0%	0.0%
#200	0.075	45.0%	45.0%	100.0%	0.0%

Grain Size Distribution



Comments:

Reviewed by:

Summit Pointe Preliminary Plat
PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 5 20' - 25'
Sample#: C-05-253

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SP, Poorly graded Sand

Specifications
No Specs
Sample Meets Specs ? NA

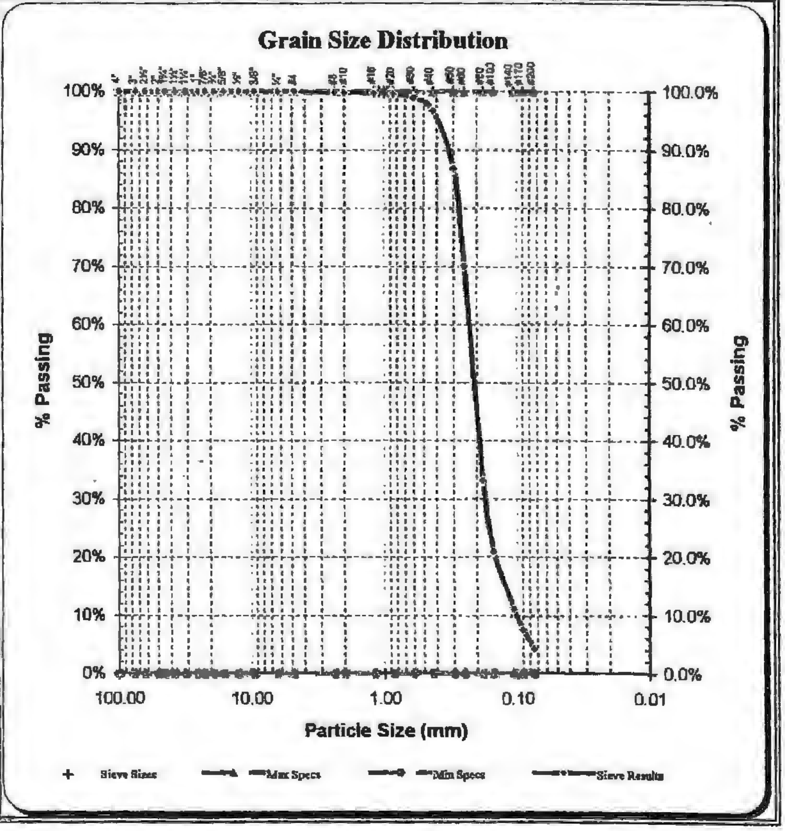
$D_{(5)}$ = 0.079 mm
$D_{(10)}$ = 0.101 mm
$D_{(30)}$ = 0.172 mm
$D_{(50)}$ = 0.212 mm
$D_{(60)}$ = 0.231 mm
$D_{(90)}$ = 0.466 mm

% Gravel = 0.0%
% Sand = 95.8%
% Silt & Clay = 4.2%
Fracture % = n/a
Moisture %, as sampled = 4.2%

Coeff. of Curvature, C_C = 1.27
Coeff. of Uniformity, C_U = 2.29
Fineness Modulus = 0.94
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
7/8"	22.40		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50		100%	100.0%	0.0%
3/8"	9.50		100%	100.0%	0.0%
1/4"	6.30		100%	100.0%	0.0%
#4	4.75	100%	100%	100.0%	0.0%
#8	2.360	100%	100%	100.0%	0.0%
#10	2.000	100%	100%	100.0%	0.0%
#16	1.180	100%	100%	100.0%	0.0%
#20	0.850	100%	100%	100.0%	0.0%
#30	0.600	99%	99%	100.0%	0.0%
#40	0.425	97%	97%	100.0%	0.0%
#50	0.300	87%	87%	100.0%	0.0%
#60	0.250	70%	70%	100.0%	0.0%
#80	0.180	33%	33%	100.0%	0.0%
#100	0.150	21%	21%	100.0%	0.0%
#140	0.106		11%	100.0%	0.0%
#170	0.090		8%	100.0%	0.0%
#200	0.075	4.2%	4.2%	100.0%	0.0%



Comments:

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Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 5 35' - 40'
Sample#: C-05-254

Date Received: 5-Sep-05
Sampled By: Client Rep/ / MTC
Date Tested: 28-Sep-05
Tested By: T. Nelson / L. Sayler

ASTM D-2487 Unified Soils Classification System
SC-SM, Silty,Clayey Sand with Gravel

Specifications
No Specs
Sample Meets Specs ? NA

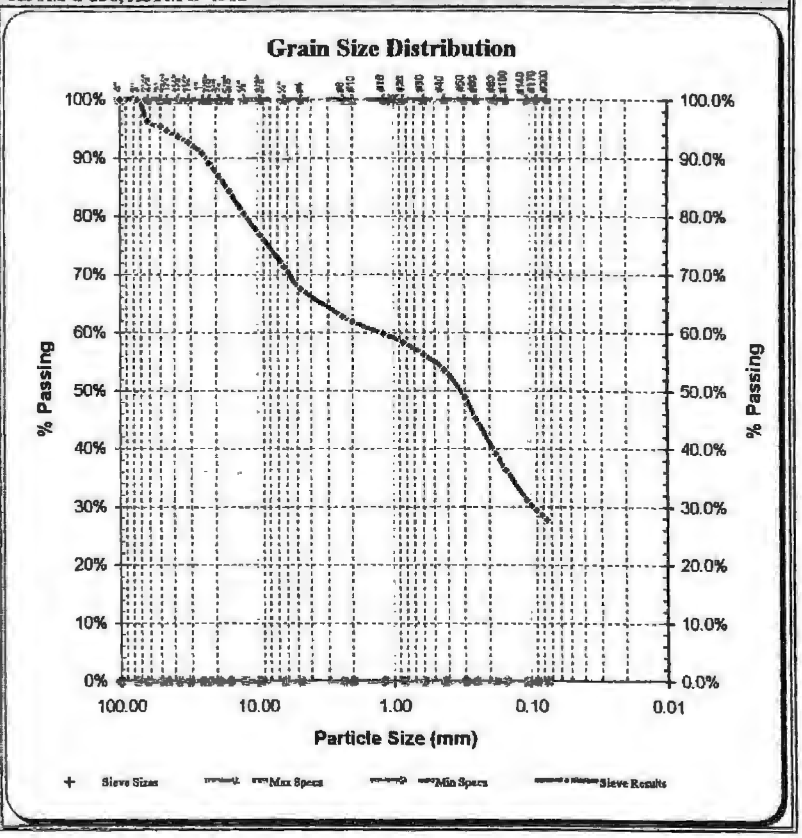
$D_{(5)}$ = 0.014 mm
$D_{(10)}$ = 0.027 mm
$D_{(30)}$ = 0.095 mm
$D_{(50)}$ = 0.331 mm
$D_{(60)}$ = 1.281 mm
$D_{(90)}$ = 26.428 mm

% Gravel = 32.5%
% Sand = 39.8%
% Silt & Clay = 27.7%
Fracture % = n/a
Moisture % as sampled = 3.7%

Coeff of Curvature, C_C = 0.26
Coeff. of Uniformity, C_U = 47.34
Fineness Modulus = 3.11
Liquid Limit = 18.0%
Plastic Limit = 14.0%
Plasticity Index = 4.0%

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	96%	96%	100.0%	0.0%
2.00"	50.00	95%	95%	100.0%	0.0%
1.75"	45.00		95%	100.0%	0.0%
1.50"	37.50	94%	94%	100.0%	0.0%
1.25"	31.50	93%	93%	100.0%	0.0%
1.00"	25.00	91%	91%	100.0%	0.0%
7/8"	22.40		89%	100.0%	0.0%
3/4"	19.00	87%	87%	100.0%	0.0%
5/8"	16.00	84%	84%	100.0%	0.0%
1/2"	12.50	80%	80%	100.0%	0.0%
3/8"	9.50	77%	77%	100.0%	0.0%
1/4"	6.30	71%	71%	100.0%	0.0%
#4	4.75	67%	67%	100.0%	0.0%
#8	2.360	63%	63%	100.0%	0.0%
#10	2.000	62%	62%	100.0%	0.0%
#16	1.180	60%	60%	100.0%	0.0%
#20	0.850	58%	58%	100.0%	0.0%
#30	0.600	56%	56%	100.0%	0.0%
#40	0.425	54%	54%	100.0%	0.0%
#50	0.300	49%	49%	100.0%	0.0%
#60	0.250	45%	45%	100.0%	0.0%
#80	0.180	39%	39%	100.0%	0.0%
#100	0.150	36%	36%	100.0%	0.0%
#140	0.106		31%	100.0%	0.0%
#170	0.090		29%	100.0%	0.0%
#200	0.075	27.7%	27.7%	100.0%	0.0%



Comments:

Reviewed by:

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PL-PPLAT-21-0002 et al
Hearing Examiner 11.07.2023
Exhibit E

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 5 65' - 70'
Sample#: C-05-255

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: T. Nelson / L. Saylor

ASTM D-2487 Unified Soils Classification System
GP, Poorly graded Gravel with Sand

Specifications
No Specs
Sample Meets Specs ? NA

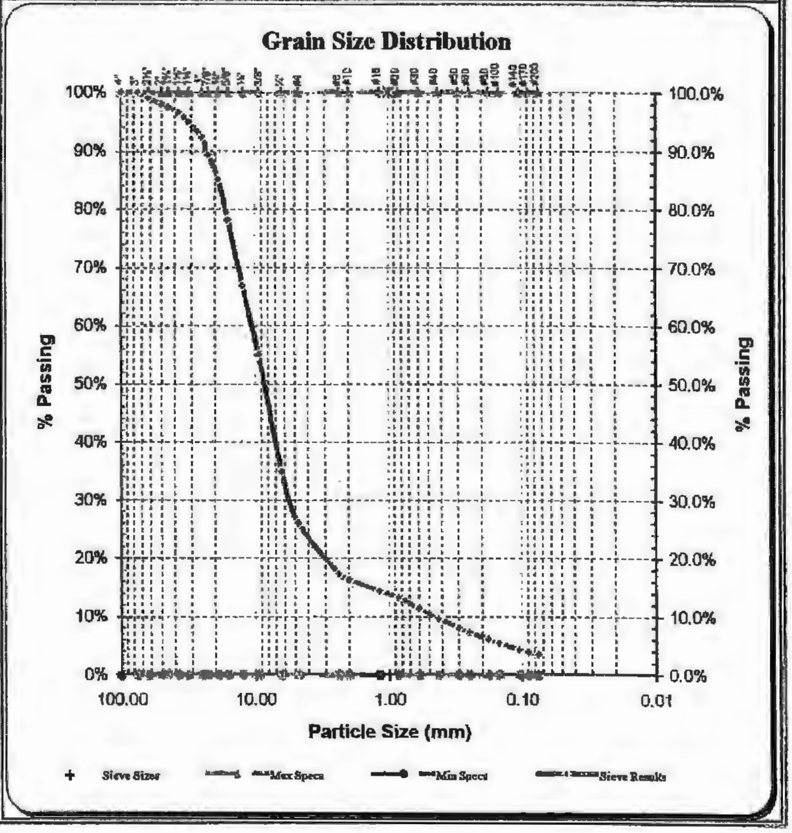
$D_{(5)}$ = 0.132 mm
$D_{(10)}$ = 0.462 mm
$D_{(30)}$ = 5.440 mm
$D_{(50)}$ = 8.704 mm
$D_{(60)}$ = 10.761 mm
$D_{(90)}$ = 25.594 mm

% Gravel = 73.9%
% Sand = 22.6%
% Silt & Clay = 3.5%
Fracture % = n/a
Moisture %, as sampled = 2.0%

Coeff of Curvature, C_C = 5.96
Coeff. of Uniformity, C_U = 23.32
Fineness Modulus = 5.80
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	99%	99%	100.0%	0.0%
2.00"	50.00	98%	98%	100.0%	0.0%
1.75"	45.00		97%	100.0%	0.0%
1.50"	37.50	97%	97%	100.0%	0.0%
1.25"	31.50	95%	95%	100.0%	0.0%
1.00"	25.00	92%	92%	100.0%	0.0%
7/8"	22.40		89%	100.0%	0.0%
3/4"	19.00	85%	85%	100.0%	0.0%
5/8"	16.00	78%	78%	100.0%	0.0%
1/2"	12.50	67%	67%	100.0%	0.0%
3/8"	9.50	55%	55%	100.0%	0.0%
1/4"	6.30	35%	35%	100.0%	0.0%
#4	4.75	26%	26%	100.0%	0.0%
#8	2.360	17%	17%	100.0%	0.0%
#10	2.000	16%	16%	100.0%	0.0%
#16	1.180	14%	14%	100.0%	0.0%
#20	0.850	13%	13%	100.0%	0.0%
#30	0.600	11%	11%	100.0%	0.0%
#40	0.425	10%	10%	100.0%	0.0%
#50	0.300	8%	8%	100.0%	0.0%
#60	0.250	7%	7%	100.0%	0.0%
#80	0.180	6%	6%	100.0%	0.0%
#100	0.150	5%	5%	100.0%	0.0%
#140	0.106		4%	100.0%	0.0%
#170	0.090		4%	100.0%	0.0%
#200	0.075	3.5%	3.5%	100.0%	0.0%



Comments:

Reviewed by:

Materials Testing and Consulting, Inc.

Sieve Report

Project: Sand Pit - Gig Harbor
Project #: 05C112
Client: Sunrise Enterprises
Source: Hole 5 85' - 90'
Sample#: C-05-256

Date Received: 5-Sep-05
Sampled By: Client Rep. / MTC
Date Tested: 29-Sep-05
Tested By: L. Sayler

ASTM D-2487 Unified Soils Classification System
GW, Well-graded Gravel with Saod

Specifications
No Specs
Sample Meets Specs ? NA

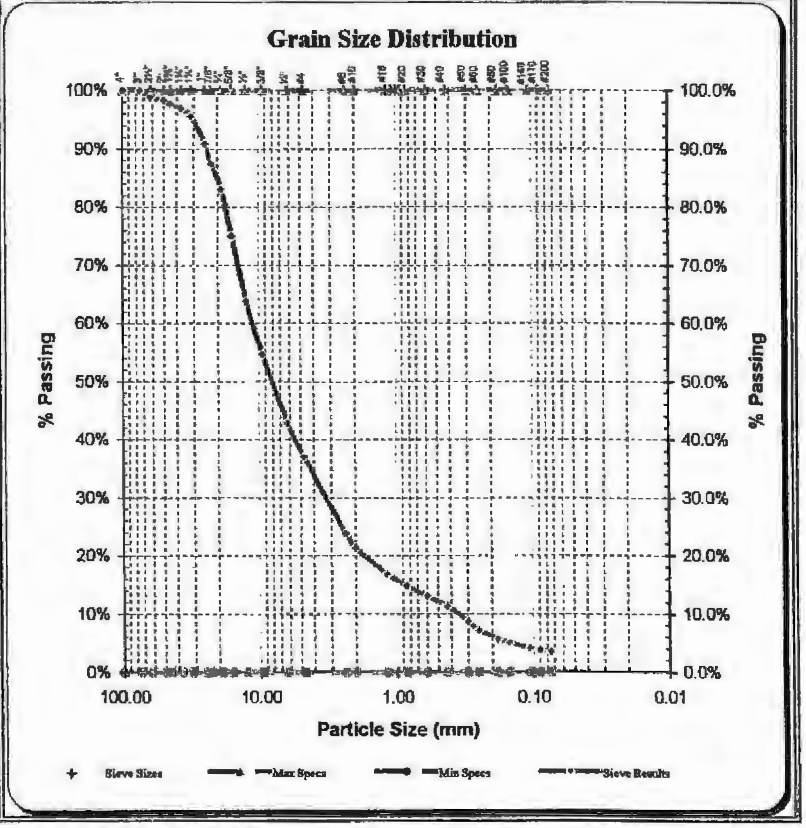
$D_{(5)}$ = 0.146 mm
$D_{(10)}$ = 0.362 mm
$D_{(30)}$ = 3.481 mm
$D_{(50)}$ = 8.254 mm
$D_{(60)}$ = 11.257 mm
$D_{(90)}$ = 26.988 mm

% Gravel = 63.0%
% Sand = 33.5%
% Silt & Clay = 3.5%
Fracture % = n/a
Moisture %, as sampled = 2.3%

Coeff. of Curvature, C_C = 2.97
Coeff. of Uniformity, C_U = 31.07
Fineness Modulus = 5.61
Liquid Limit = NA
Plastic Limit = NP
Plasticity Index = NP

ASTM C-136, ASTM D-4318

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	99%	99%	100.0%	0.0%
2.00"	50.00	98%	98%	100.0%	0.0%
1.75"	45.00		98%	100.0%	0.0%
1.50"	37.50	97%	97%	100.0%	0.0%
1.25"	31.50	96%	96%	100.0%	0.0%
1.00"	25.00	91%	91%	100.0%	0.0%
7/8"	22.40		87%	100.0%	0.0%
3/4"	19.00	83%	83%	100.0%	0.0%
5/8"	16.00	75%	75%	100.0%	0.0%
1/2"	12.50	64%	64%	100.0%	0.0%
3/8"	9.50	55%	55%	100.0%	0.0%
1/4"	6.30	43%	43%	100.0%	0.0%
#4	4.75	37%	37%	100.0%	0.0%
#8	2.360	24%	24%	100.0%	0.0%
#10	2.000	21%	21%	100.0%	0.0%
#16	1.180	17%	17%	100.0%	0.0%
#20	0.850	15%	15%	100.0%	0.0%
#30	0.600	13%	13%	100.0%	0.0%
#40	0.425	11%	11%	100.0%	0.0%
#50	0.300	9%	9%	100.0%	0.0%
#60	0.250	7%	7%	100.0%	0.0%
#80	0.180	6%	6%	100.0%	0.0%
#100	0.150	5%	5%	100.0%	0.0%
#140	0.106		4%	100.0%	0.0%
#170	0.090		4%	100.0%	0.0%
#200	0.075	3.5%	3.5%	100.0%	0.0%



Comments:

Reviewed by: