Geotechnical Report

Carey Project

July 21, 2021

Prepared for:

Cary Property Management, LLC.

Prepared by:

PALMER
Geotechnical Consultants, Inc.

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July 21, 2021

Mary Carey
Carey Property Management, LLC
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Seattle, WA 98115
206.714.9554
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RE: Geotechnical Report
Parcel #: 00776800002300
21125 81st Drive NE • Arlington, WA 98223
PGC Project 21052

Dear Ms. Carey:

Palmer Geotechnical Consultants, Inc. (PGC) is pleased to present this geotechnical report regarding proposed improvements at the subject property. This report was prepared in accordance with our proposal dated May 10, 2021.

We appreciate the opportunity to be of service to you. If you have questions regarding this report, please do not hesitate to call.

Sincerely,

Palmer Geotechnical Consultants, Inc.

Scott Palmer, P.E.
President

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1.0 Introduction

A geotechnical report has been prepared for the design and construction of proposed improvements at the subject property located on 81st Drive NE in Arlington, Washington. The property is identified by the Snohomish County Assessor as parcel number 00776800002300 and is approximately 1.40-acres. The parcel is approximately rectangular in shape and grades moderately from the north parcel boundary to the south. Six test pits were excavated to depths ranging from 3.9 to 5.6 feet below present ground (BPG) on Monday, June 1, 2021. Logs of the test pits are provided in Appendix A.

2.0 Project Description

PGC understands that improvements include the construction of a new multi-family residence, stormwater facilities, and parking areas. PGC has reviewed document prepared by BRL Service, LLC that include a drainage report dated February 2, 2021, an undated preliminary site plan, an undated narrative, and an operations and maintenance manual dated November 2, 2020. In addition, conceptual drawings by CDFey Architects dated November 13, 2020, and a wetlands report by B&A, Inc dated October 29, 2020, were reviewed. At the time of this report stormwater facilities were in development though infiltration trenches were proposed in the above-mentioned drainage report. PGC assumes construction will be wood-framed and supported on shallow footings.

3.0 Scope of Services

The goal of our scope was to characterize the existing conditions of the steep slope in the vicinity of the proposed improvements, in accordance with the City of Arlington's critical area ordinance, City of Arlington Code (CAC) 20.93. Additionally, our scope was to provide geotechnical engineering recommendations for use in design and construction of the proposed multi-family improvements. Our services included visiting the site, observing, and logging six test pits, and preparing this report.

4.0 Site Description and Subsurface Conditions

4.1 Surface Conditions

The proposed construction involves a single parcel identified by the Snohomish County Assessor as parcel number 00776800002300. The parcel is approximately 1.40-acres and is currently undeveloped. The parcel is approximately rectangular in shape and oriented north to south with a

tail along the east property boundary that extend south encompassing 81st Street NE to Portage Street. The property generally slopes moderately across the parcel, gaining elevation off property approximately 80 feet to the north. Portage Creek is located on the property along the south property boundary. The parcel is generally well vegetated with grasses, blackberries, and scotch broom across the majority of the parcel. Mature coniferous and deciduous trees line the banks of Portage Creek. The parcel is bordered by developed parcels to the east, south, and west, and a large acre undeveloped parcel to the north. Access to the parcel if from Portage Street at the south at the intersection with 81st Street NE.

4.2 Subsurface Conditions

For this project, we excavated and observed six test pits. The test pits were advanced by a third-party utilizing rubber-track mini-excavator. A dynamic cone penetrometer (DCP) was deployed at intervals throughout the test pits. During advancement soils were classified and logged in accordance with the Unified Soil Classification System (USCS), bagged and discretely labeled to be transported to the laboratory for supplemental testing. Test pits were advanced throughout the property.

Test pits were advanced through approximately 0.6 to 1.6 feet of topsoil consisting of silty sand with organics. This unit was moist, loose, and dark brown in color. Beneath were approximately 0.2- to 4.4-foot-thick units of sandy gravel to gravelly sand with varying amounts of silt. These units were loose and medium dense near the surface, becoming dense to very dense with depth. Moisture content was generally damp to moist with orange mottling throughout. Colors ranged from brown near the surface to yellow brown and gray with depth. Groundwater was not observed in each of the test pits. Groundwater levels are expected to vary with seasonal conditions. See the exploration logs in Appendix A for additional information.

The Geologic Map of the Arlington East Quadrangle, Snohomish County, Washington published by United States Geological Survey, Miscellaneous Field Studies Map MF-1739 (Minard, 1985), maps the two distinct units at the site. The site surface geology across the south half of the parcel is mapped as Pleistocene Recessional Outwash – Marysville Sand Member of the Fraser Glaciation (Qvrm). The north half of the parcel is mapped as Pleistocene Recessional Outwash – Arlington Gravel Member of the Fraser Glaciation (Qvra)

Qvrm is generally described as stratified and well-drained sand with varying amounts of gravel and lesser amounts of silt. This massive unit may have interbedded silt and clay. Qvra is generally described as well-drained and stratified gravel that is coarse grained with varying amounts of sand and silt. This unit is thick to massive.

According to the United States Department of Agriculture (USDA) Web Soil Survey (WSS) soils mapped on the subject property consist of Norma Loam. The parent material is alluvium. This unit has moderately high to high permeability with a more than 80 inches to a restrictive feature. The land capability classification is 5w with a Hydrologic Soil Group (HSG) classification of B/D. The off-property slope to the north is mapped as Everett very gravelly sandy loam, 15 to 30 percent slopes. The parent material is sandy and gravelly glacial outwash. This unit has more than 80 inches to a restrictive feature and high permeability. The land capability classification is 4e with an HSG of A.

Soil conditions encountered in the field consisted of sandy gravel to gravelly sand with varying amounts of silt. These conditions are typical of native deposits in the region and are consistent with area geology sources.

4.3 Groundwater Conditions

During our exploration, a distinct groundwater surface representative of saturated flow in the phreatic zone was not encountered in any test pit. Additionally, mottled soils were observed in the test pits as described in Section 4.2. Mottled soils and low chroma colors generally indicate wetting and drying cycles that occur in the upper soil column from surface water and fluctuating interflow that are transmitted through stratigraphic variations of permeability.

The project scope did not include on-going measurement of groundwater level conditions. If long-term groundwater level conditions are desired a direct monitoring program, conducted during the wet months from October to May, should be undertaken. It should be understood that water conditions within the soil column may fluctuate in conjunction with stratigraphic permeability variations.

Department of Ecology well logs indicate observed static water levels within the vicinity of the subject property were recorded between approximately 120 and 170 feet BPG on properties with similar elevations to the project site.

4.4 Potential Geologic Hazards

As defined by CAC Chapter 20.93 the parcel is subject to review for environmentally critical areas (ECAs) including critical areas, natural resource lands, and protective buffers. This is "...to protect the public health, safety, and welfare of the city by providing for the long-term preservation of natural systems and their functions...". This report addresses geologically hazardous areas as defined in CAC Chapter 20.93.010 that includes: erosion, sliding, seismic activity, or other geological events.

The subject property is not an erosion hazard area as defined by CAC 20.93.600.b1 as the USDA Soil Conservation Service (SCS), United States Geologic Survey, or the Department of Ecology Coastal Zone Atlas do not classify the parcel as Class 3 to 5 or U, UOS, or URS. Nor is the parcel to the north with the steep slopes classified as such, though the land capability classification is 4e. The "4" indicates that the soils have severe limitation that restrict the choice of plants or require careful management and "e" indicates that erosion is possible unless close-growing plant cover is maintained.

The subject property is a landslide hazard area in accordance with CAC 20.93.600.b2C due to the location of Portage Creek near the south property boundary that could cause raid stream incision or stream bank erosion, though not undercutting by wave action. However, the parcel to the north does contain slopes greater than fifteen percent with impermeable soils interbedded with permeable granular soils (CAC 20.93.600.b2A) and a slope defined by the USDA SCS as having a severe limitation for building site development (CAC 20.93.600.b2F).

The subject parcel is not subject to review under CAC 20.93.600.b3A and B for slopes, though due to the proximity of the parcel to the north which contains moderate slopes greater than or equal to fifteen percent and less than thirty-three percent and steep slopes that are greater than or equal to thirty-three percent.

The subject property is not a seismic hazard area as defined by CAC 20.93.600.b4 as there are not cohesionless soils of low density in association with a shallow groundwater table beneath the subject property.

4.4.1 Erosional Hazard

Neither the City of Arlington nor Snohomish County maps the subject property as an erosion hazard. The property to the north has areas that meet the definition of steep slopes. These areas are mapped within a ravine near the north third of the property at the west end between the 145-foot and 170-foot topographic lines. During our site visit we observed that the slope is generally vegetated, with no areas of erosion and rilling observed across the slope face. Additionally, trees and vegetation were observed to near vertical with no general indication of slow movement or creep within the slope face. Grading and clearing activities should be accompanied by appropriate erosion control measures. Overall, the risk of erosion at the site is low.

4.4.2 Landslide Hazard

PGC conducted a visual reconnaissance of the slopes on the property to the north to observe existing surface processes as related to the proposed site improvements. During our visit,

conditions were assessed and catalogued using hand measurements and visual estimations as safe access allowed, visual mapping of salient surface features, photo documentation, and field evaluation of slope conditions. Any indications of past and ongoing surface raveling were noted, including geomorphic features and vegetation patterns. Snohomish County maps steep slopes on the property north of the subject site with the toe of the slope at 145feet above mean sea level (AMSL) and the crest at 170 AMSL, though no landslide hazards or potential landslide hazard areas are mapped on either property.

The highest point of elevation is at the parcel to the north is 175 feet AMSL. The toe of the slope is located approximately 65 feet from the subject parcel's north property boundary at its closest point. Observed from above in photographs and in the field, the slope faces consist of mature coniferous and deciduous trees and heavy undergrowth consisting of native species. Mature trees are generally in vertical growth positions. The subject property gently inclines from the south property boundary, with slope angles between 0 and 7 degrees (0 to 12.3 percent). The slope located on the property to the north gently ascends to the slope toe at approximately 5 degrees (8.8 percent) becoming 20 to 23 degrees (36.4 and 42.5 percent) on the slope face before ascending the slope crest at 11 degrees (19.4 percent) and leveling out across the upland area at 1 degree (1.8 percent. No areas of further over and under steepened sections corresponding to erosion or natural topography were observed. Due to the location of the slope being off property, a cross section was developed from the Snohomish County Assessor's website. The risk of landslide activity at the site or in the vicinity is low.

4.4.3 Seismic Hazard

The subject property does not contain mapped faults. An aerial photo review does not suggest linear or faultic features and no such features were observed during our site visit. The site lies approximately 6.5 miles south of the Mount Washington Fault and 10.0 miles south of the Devil's Mountain Fault Zone. We do not believe the proposed improvements will exacerbate the conditions associated with the nearby faults. Based on our findings, we believe the risk of fault rupture at the ground surface within the confines of the subject property to be low.

The site is mapped as low to moderate liquefaction risk by the Liquefaction Susceptibility produced by the Snohomish County (Emergency Management, 2015). The site is underlain by a sandy gravel to gravelly sand with varying amounts of silt. This soil gradation is not prone to liquefaction. We believe the risk of liquefaction to be quite low to negligible.

The site is not mapped in a Tsunami Inundation or Tsunami Evacuation Zone. We believe the risk of Tsunami at the site to be quite low or negligible.

4.4.4 Other Geologic Hazards

The site is near located in the foothills of the volcanic arc of the Cascade Range with Glacier Peak volcano located to the east. The subject property is mapped outside the projected lahar zone. Additionally, the site is mapped outside known Lahar Deposits.

During our site visit we did not observe any indications of rock fall or mud flows. We did not observe any signs of differential settlement at the subject property.

There is not any known present or historic mining in the area. Additionally, we did not observe evidence of any adits, shafts, or other mine workings during our site visit.

5.0 Conclusions

Based on our review of available data, soil conditions encountered during exploration, laboratory testing, and our analysis, the site is suitable for the proposed development.

Soils at the subject site were generally consistent throughout.

Though there are steep slopes on the property to the north, the proposed setback distance of 90 feet from the geologic hazards exceeds the required setback distance set forth in CAC 20.93.630. Therefore, risk is low. The proposed construction should be appropriately executed utilizing the recommendations set forth below.

6.0 Site Development Recommendations

6.1 Site Preparation

Initial grading shall include the removal of all vegetation within proposed construction areas. The actual depth of stripping should be reviewed by the Project Geotechnical Engineer of Record at the time of construction. Minimum stripping depths are expected to be approximately 0.5 to 1.6 feet BPG to remove topsoil and organics. Stripping depths for foundation elements are expected to be between 3.5 and 5.0 feet BPG to reach appropriate bearing subgrade. Stripping depths could vary 0.5 to 1.0 feet BPG from the recommended stripping depths if a significant amount of time lapses from the writing of this report.

All vegetation, trees, and roots larger than ¼-inch diameter or any accumulation of organic matter that will result in an organic content of more than 3 percent should be removed and not used as engineered fill. Roots larger than ¼-inch diameter should not be disced into the soils. These materials should be raked and hand-picked, as necessary, to ensure proper removal of organic materials.

Soil on site to be reused should be screened to remove oversized material greater than 3 inches in diameter.

6.2 Construction Considerations

The sandy gravel to gravelly sand with varying amounts of silt subgrade soils at the project site may be easily disturbed during wet weather and become difficult to work with. Haul roads and staging area improvements may be necessary for support of construction traffic during the rainy season or when the moisture content of the cover soil begins to elevate, generally within a few percentage points above optimum. If not carefully executed, site preparation and excavation activities can create extensive soft areas.

Earthwork should be planned and executed to minimize subgrade disturbance if site improvements are performed during wet weather months. The thickness of the haul roads and staging areas should be selected by the contractor. During winter months, haul roads subjected to repeated construction traffic may require a minimum of 12 inches of imported granular material. For light staging areas, 8 inches of imported granular material may be required. We recommend that imported granular material for haul roads and staging areas consist of durable crushed rock that is well graded with less than 8 percent by dry weight passing the U.S. Standard No. 200 sieve.

6.3 Construction Activity Erosion Control

The on-site soil will likely be susceptible to erosion. Thus, we recommend that all efforts are made to limit construction during periods of wet weather. However, if construction occurs during wet weather, erosion control measures should be implemented prior to construction and in conformance with City of Arlington Standards. If necessary, erosion control measures, such as truck tire washers and temporary detention and settling basins, should be used in accordance with local and state ordinances.

6.4 Slope Setback

City of Arlington code recommends a 50-foot setback distance from a steep slope. An inspection of the aerial photos indicated that slope is well vegetated and generally free of exposed soil over last several decades. After reviewing LIDAR data of the slope face, we did not observe any landslide scarps or features indicating past landslide activity. Additionally, during our reconnaissance, the slope was relatively dry and free of seepage fronts or other groundwater features. Based on these data we believe future soil movement on the slope face, if any, will be shallow. Continued failure modes will likely be infinite slope or raveling failures as opposed to deep-seated failures. To evaluate slope stability, we used the comparative strength analysis highlighted in Chapter 7 of the WSDOT Geotechnical Design Manual

$$FS = \frac{\tan(\emptyset)}{\tan(\beta)}.$$

Where ϕ is the angle of internal friction of the soil and β is the slope angle from the horizontal. This analysis indicated that setback of 90 feet is appropriate for a long-term factor of safety of 1.5.

Based on this analysis we recommend the proposed setback distance of 90 feet is appropriate for the site.

6.5 Slope Impact Mitigation

We understand that the steep slopes are located off property. However, we provide the following general recommendations to reduce long-term erosion potential of the steep slopes and maintain existing conditions for slope stability:

1. Minimize the volume and velocity of water that travels toward and down the slope face.
2. To avoid accelerating slope erosion and mass wasting due to human activity refrain from the following:
    a) Adding side-cast debris to the slopes
    b) Using heavy construction equipment on or near steep slopes
    c) Excavating near adjacent steep slope crests, toes or on the slope face
    d) Placing loads of excavated soil near the slope crest
3. Prior to construction, silt fences and/or a continuous line of straw bales should be placed downslope of the construction area. Inhibit the placement of heavy construction equipment, construction materials, or native and imported soils from being placed within close proximity to any erosion control devices. Suitable temporary erosion and sediment control measures should be implemented at the construction site prior to, during and immediately after ground disturbance occurs. Areas upslope and with minimal vegetation should be protected from erosion via a blanket of straw or rolled erosion control product (RECP) if site work is not continuous in the vicinity and prior to reseeding or re-vegetation.
4. At the completion of the project, all disturbed or removed vegetation should be repaired and maintained until established. Surface water should not be allowed to concentrate or traverse the slope during or after the construction phase of the project. Outlets for all drainage pipes should terminate in an energy dissipating device such as a T or through the use of riprap. Similarly, concentrated drainages should be captured in closed pipe systems and routed down slope to appropriate outfalls.
5. Avoid clearing of existing vegetation outside the construction area, especially on or near to the existing slopes, unless approved by a qualified professional. Any cleared or loose topsoil should be covered to minimize downslope movement.

6. Grading or excavation of soils during construction should be accompanied by grass reseeding and re-vegetation as the project is completed.
7. Care should be given to species selection regarding mature height of planted/reseeded vegetation to avoid adverse wind/storm damage to the slope. Species with a mature height of 15 feet or more should be avoided on the slope face or within 10 feet of the crest. According to "*Slope Stabilization and Erosion Control Using Vegetation*" (Myers, 1993) Table 1 below highlights vegetation that provide increased slope impact mitigation.

Table 1. Slope Stabilizing Vegetation

Common Name	Botanical Name	Deciduous/Evergreen	Mature Height (ft)
Vine Maple	Acer cricinatum	Deciduous	10+
Oceanspray	Holodiscus discolor	Deciduous	10+
Willow	Salix spp.	Deciduous	10+
Snowberry	Symphoricarpos albus	Deciduous	3+
Rose	Rose spp.	Deciduous	2-10
Salmonberry	Rubus spectabilis	Deciduous	To 12
Salal	Gaultheria shallon	Evergreen	To 4
Oregon grape	Mahonia spp.	Evergreen	To 6
Red huckleberry	Vaccinium parvifolium	Deciduous	To 12
Evergreen	Vaccinium ovatum	Evergreen	To 8
Serviceberry	Amelanchier alnifolia	Deciduous	12+

If extensive site landscaping or replanting is considered in the future, an approved and qualified licensed professional should be consulted prior to implementation.

6.6 Drainage

PGC recommends that drainage is collected from both the footing drains and roof downspouts. This drainage should be discharged to either a tightline or low impact development (LID) feature more than 10 feet away from the structural foundation elements. If LID features are to be used the elevation of the overflow inverts should be at an elevation lower than the grade adjacent to the foundation elements of the proposed structures. If these criteria are not feasible PGC should be contacted to develop potential alternatives.

If a new tightline is used it should be constructed from a minimum of 6-inch Advanced Drainage Systems (ADS) corrugated smooth interior polypropylene pipe or high-density polyethylene pipe (HDPE) and descend the length of the slope to discharge near the toe. During installation ensure that the connections are watertight and sealed, routine maintenance of the length of pipe, and appropriate termination utilities are installed such as a splash block or diffuser tee. Additionally,

if the tightline is installed with ongoing construction ensure that the tightline is not damaged during construction and is sufficient to carry the proposed runoff. The tightline should discharge to a roadside ditch or an appropriate termination near the toe of a slope.

PGC also recommends that an annual monitoring program is developed and initiated, by the owner or their designee, to ensure no damage or disconnect of the pipe or its accessories occurs.

6.7 Structural Fill

Structural fill includes fill proposed for use beneath foundations, slabs, pavements, any other areas intended to support structures, or within the influence zones of structures. Structural fill shall be free of organic matter and other deleterious material and, in general, should consist of a maximum particle size no larger than 3 inches in diameter. Recommendations for suitable fill material are provided in the following sections.

6.7.1 On-Site Native Soil

The on-site native soil consisting of sandy gravel to gravelly sand may be used as structural fill although based on our experience and laboratory testing, the on-site soil may be sensitive to small changes in moisture content and may be difficult, if not impossible, to compact adequately during wet weather or when its moisture content is more than a few percentage points from optimum. Therefore, this soil may require extensive wetting or drying if it is used as structural fill. We recommend using imported granular material for structural fill if the moisture content of the on-site soil cannot be properly achieved.

6.7.2 Imported Granular Material

PGC recommends using imported structural fill for the areas beneath the proposed structures. Imported structural fill material should conform to Section 9-03.14(2), Select Borrow, Section 9-03.9(3) Crushed Surfacing Base Course or Crushed Surfacing Top Course as outlined in the most recent edition of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications),* or approved equal verified by the Geotechnical Engineer of Record.

Trenches and other areas proposed for utilities should be backfilled utilizing material that conforms to Section 9-03.12(3) Gravel Backfill for Pipe Zone Bedding as outlined in the most recent edition of *WSDOT Standard Specifications*.

All granular material must be durable such that there is no degradation of the material during and after installation as structural fill. The percentage of fines can be increased to 12 percent if the fill is placed during dry weather and provided the fill material is moisture conditioned, as necessary,

for proper compaction. The material should be placed in lifts with a maximum uncompacted thickness of 8 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D 1557 for structures including catch basins. Material should be compacted to 90 percent of the maximum dry density as determined by ASTM D 1557 for drainage trenches. During the wet season or when wet subgrade conditions exist, the initial lift should have a maximum thickness of 15 inches and should be compacted by rolling with a smooth-drum, non-vibratory roller.

7.0 Design Recommendations

The site is generally underlain by medium dense becoming very dense sandy gravel to gravelly sand with varying amounts of silt. Locations with a higher or lower fines content will be difficult to work with in extreme dry or wet conditions. Areas where over-excavation is necessary to achieve appropriate subgrade compaction should have structural fill placed that extends a minimum of 1-foot in all directions. Recommendations for are provided in the following sections.

7.1 Spread Footings

We recommend that footings be designed with a minimum depth of 24 inches and a minimum width of 18 inches. An allowable bearing capacity of 2,500 psf may be used for design assuming a total settlement of 1-inch and differential settlement of ½-inch in 50 feet. A one-third increase in allowable bearing pressure is also typical for such systems when resisting short-term loads such as wind and seismic forces.

Lateral loads can be resisted by passive pressure against buried portions of the footings, retaining earth walls for the daylight basement, and sliding resistance between the bottoms of the footings. Table 2 below provides our recommended allowable soil parameters for shallow foundation design.

Table 2. Soil Parameters

Parameter	Value	Factor of Safety
Allowable Bearing Capacity	2,500 psf	3.0
Active – Free to Rotate	37 pcf	1.0
Active – At Rest	56 pcf	1.0
Passive	195 pcf	2.0
Soil Frictional Coefficient	0.35	1.5

These values assume footings are backfilled with native soils or structural fill. The upper 18 inches of soil should be ignored unless the area is paved or covered with concrete due to soil disturbance associated with freeze/thaw action.

Sliding resistance between subgrade soils and foundations value assumes concrete placed directly on the subgrade.

7.2 Infiltration Recommendations

In compliance with the 2014 SWMMWW, PGC performed a grain-size analysis on select samples obtained during our field investigation. The results of laboratory analysis performed on selected soil samples are presented below in Table 3.

PGC understands infiltration facility design is in the preliminary stages and multiple scenarios are proposed for the project to be located south of the parking area. Typical conditions below a layer of topsoil, consist of native sandy gravel to gravelly sand with varying amounts of silt and high to moderately high permeability.

Most units beneath the topsoil were observed not to be a distinct restrictive layer due to the presence varying fines content between 0.1 and 0.9 percent. However, in TP-3 a unit observed from 4.0 to 4.6 feet BPG had 20.1 percent fines. Additionally, the increasing consolidation of stratigraphy and orange mottling indicate potentially restrictive conditions below the maximum depths explored. Therefore, rates applied for design of systems should use a value corresponding to the restricting conditions.

For design purposes, PGC recommends a preliminary K_{sat} infiltration rate of *3.0 in/hr* in the sandy gravel to gravelly sand with varying amounts of silt. Final design should also take into account the effect of seasonal high groundwater. Based on observations of mottling and soil coloration patterns, typical winter season perched interflow may be affected by the complex hydrostratigraphy of the near-surface soils and prevalence of overconsolidated soils that temporarily perch interflow, at least for an undeveloped and uncontrolled site condition. Therefore, due to the proposed improvements at the site, perched water conditions are expected.

Table 3. Summary of Grain Size Analysis Method and Long-Term Infiltration Rate (LTIR)

Sample ID	Depth (BPG) (feet)	USCS Class	Fines %	D_{10} (mm)	D_{60} (mm)	D_{90} (mm)	CF	K_{sat} (in/hr.)	Moisture Content %
TP-1 @ 4.1'-4.3	4.1'-4.3'	**GP**	0.2	1.26	20.482	23.0	0.324	**3090.9**	20.3
TP-2 @ 3.7'-3.9'	3.7'-3.9'	GP	0.9	1.338	20.227	23.0	0.324	**4167.7**	2.0
TP-3 @ 4.3'-4.6'	4.3'-4.6'	**GM**	20.1	0.037	19.297	22.0	0.324	**5.6**	26.7
TP-4 @ 3.6'-3.9'	3.6'-3.9'	SP-SM	5.7	0.444	1.905	21.0	0.324	**37.4**	7.0
TP-5 @ 2.0'-2.2'	2.0'-2.2'	**GP**	0.4	0.893	16.905	24.0	0.324	**527.2**	4.1
TP-6 @ 3.5'-3.7'	3.5'-3.7'	GP	0.1	0.819	10.608	22.0	0.324	**330.5**	4.9

While potentially variable horizons that are moderate to high in fines content and the interpreted presence of shallow seasonal interflow should be incorporated into the site-appropriate design of the infiltration facilities, PGC observed the soil conditions were not uniform in the test pit locations proposed for stormwater facilities. The preliminary K_{sat} rate is based upon the most restrictive conditions observed during excavation. PGC recommends that if actual infiltration rates are desired for design, a Small-Scale Pit Test (PIT) is performed in the vicinity of the proposed facilities. Additionally, PGC recommends we be contacted to review design plans and specifications, to ensure design of the proposed stormwater facilities are consistent with the content and intent of recommendations presented herein. PGC may be contacted for additional consultation toward facility design at the request of the client and design engineer.

7.3 Slab Underlayment

PGC recommends the installation of slab underlayment consisting of a capillary break. We recommend the installation of 6 inches of crushed rock containing less than 5 percent by weight passing the No. 200 U.S. Sieve under a sheet of 12 mil (visqueen) plastic sheeting under 4 inches of ASTM-33 sand or approved equal.

7.4 Drainage

PGC recommends all foundation elements should have drains as well as roof downspouts. Both should be collected independently and tightlined a minimum of 10 feet away from any structural elements and away from steep slopes.

7.5 Wet Weather Conditions

If unstable conditions are encountered due to wet weather, windrowing, or mixing with dry materials may be required. In some cases, a sacrificial lift of unsuitable material may need to be used to cap the fill and removed later to continue fill process during more suitable weather conditions.

8.0 Seismic Design Criteria

The Liquefaction Susceptibility produced by Snohomish County (Emergency Management, 2015) indicates that there is a low to moderate potential on the subject property (Site Class D to E) for liquefaction. All structures should be designed according to criteria outlined by the latest edition, at the time of construction, of the International Code Council® for Site Class D.

9.0 Construction Observation

We recommend that PGC is retained to review any additional design plans and to evaluate conformance with our recommendations. Satisfactory earthwork and foundation performance depends to a large degree on the quality of construction. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions conform or have changed significantly from those anticipated.

10.0 General Comments

The analysis and recommendations presented in this report are based upon the data obtained from our exploration locations, available public records, and from other information and sources discussed in this report. This report does not reflect variations that may occur between known data points, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until construction begins or is completed. Should variations appear that differ from the data and recommendations contained within this report, PGC should be immediately notified so that further evaluation and supplemental recommendations can be provided. PGC is not responsible for ensuring that other members of the project team implement our recommendations.

The scope of our services does not include services related to construction safety precautions or dewatering operations. 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.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices. This report has been prepared for the exclusive use of our client and their representatives for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices in this area at the time this report was prepared. This report may not be relied upon by third parties or for other sites.

No warranties, either expressed or implied, are intended or made. Site safety and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless PGC reviews the changes and either verifies or modifies the conclusions of this report in writing.

If you have questions concerning this letter, please feel free to contact me at 360.929.5676.

Sincerely,

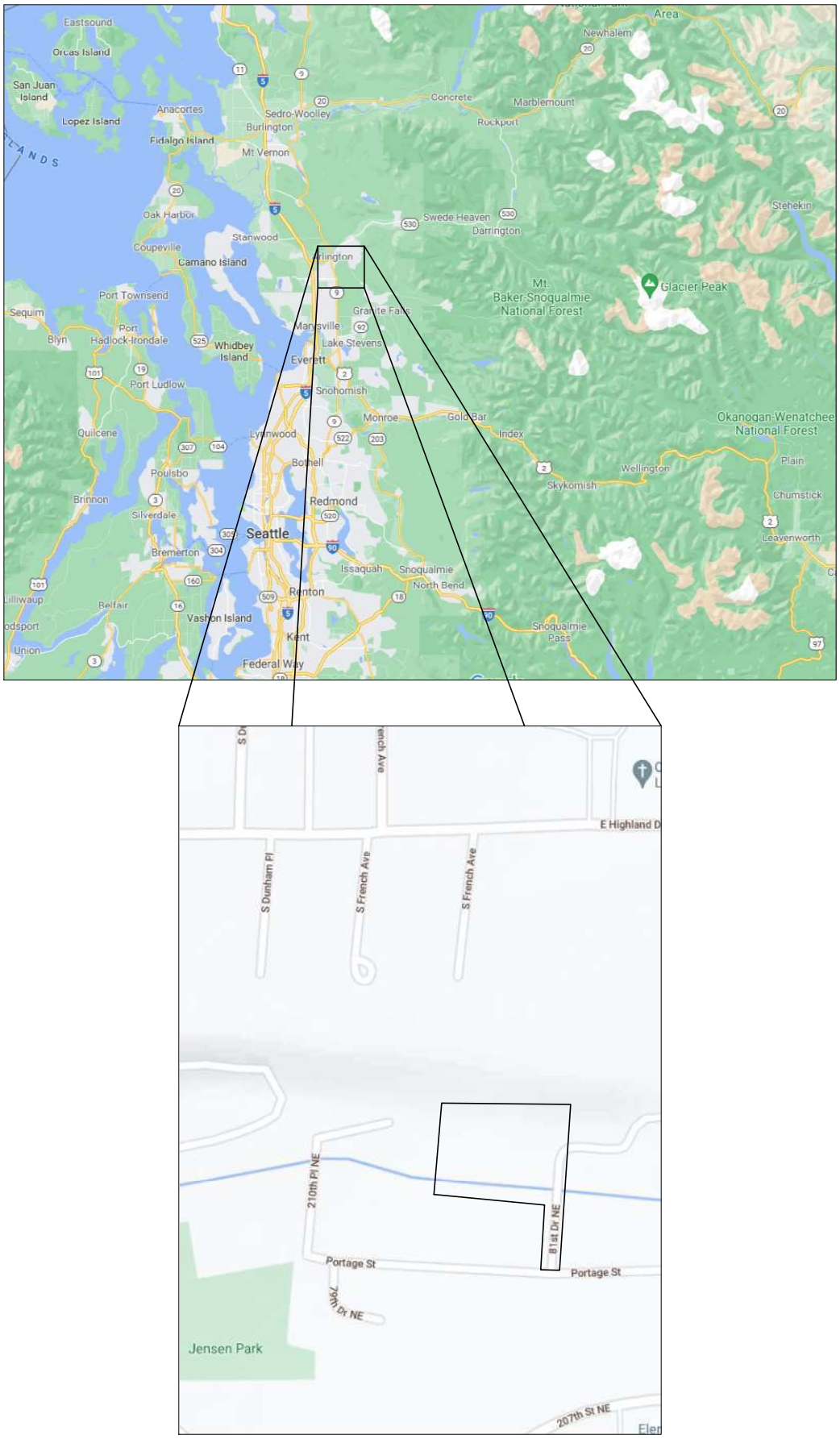
Palmer Geotechnical Consultants, Inc.

07-21-2021

Meghan Hallam

Scott A. Palmer, P.E.

Figure 1: Site Vicinity



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Carey Property
Arlington, WA

Figure:
1

Figure 2: Exploration Locations

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Figure:
2

Appendix A: Exploration Logs

TP-1

SAMPLE DATA / SOIL PROFILE

Exploration Method: Hand Auger
Ground Surface Elev: Approx 135' AMSL

Depth	Groundwater	Sample Interval	Sampler Type	Graphic Symbol	USCS Symbol	SOIL DESCRIPTION	N_{60} Blows/Ft	Water Content Percent	Percent Gravel	Percent Sand	Percent Fines
0'					SM	(0.0 - 0.6) TOPSOIL silty SAND with gravel and organics, loose, moist. DARK BROWN					
1'					SM	(0.6 - 1.7) gravelly SAND with some silt, roots throughout, medium dense, damp. LIGHT BROWN					
			Grab					5.7			
			Grab		SM	(1.7 - 1.9) gravelly SAND with silt, medium dense, moist. DARK BROWN		11.9			
2'						(1.9 - 5.2) sandy GRAVEL with trace silt, orange mottling throughout, medium dense becoming very dense, moist becoming damp. YELLOW BROWN	17				
3'											
4'			Grab		GP		26	20.3	76.0	23.8	0.2
5'			Grab				73	4.6			
						Termination at 5.2 feet. No Groundwater Encountered					
6'											

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Log of:
TP-1

TP-2

SAMPLE DATA

SOIL PROFILE

Exploration Method: Hand Auger
Ground Surface Elev: Approx 132' AMSL

Depth	Groundwater	Sample Interval	Sampler Type	Graphic Symbol	USCS Symbol	SOIL DESCRIPTION	N_{60} Blows/Ft	Water Content Percent	Percent Gravel	Percent Sand	Percent Fines
0'						(0.0 - 1.2) TOPSOIL silty SAND with gravel and organics, loose, moist. DARK BROWN					
1'					SM						
						(1.2 - 3.9) sandy GRAVEL with trace silt, very dense, dry. YELLOW BROWN					
2'			Grab					2.4			
					GP						
3'											
			Grab				61	2.0	74.4	24.7	0.9
4'						Termination at 3.9 feet. No Groundwater Encountered					
5'											
6'											

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Carey Property
Arlington, WA

Log of:
TP-2

TP-3

SAMPLE DATA

SOIL PROFILE

Exploration Method: Hand Auger
Ground Surface Elev: Approx 132' AMSL

Depth	Groundwater	Sample Interval	Sampler Type	Graphic Symbol	USCS Symbol	SOIL DESCRIPTION	N_{60} Blows/Ft	Water Content Percent	Percent Gravel	Percent Sand	Percent Fines
0'						(0.0 - 1.6) TOPSOIL silty SAND with gravel and organics, loose, moist. DARK BROWN					
1'					SM						
2'						(1.6 - 4.0) silty SAND with gravel, orange mottling throughout, very dense, moist. BROWN					
3'			Grab		SM		55	23.6			
4'						(4.0 - 4.6) silty sandy GRAVEL, orange mottling throughout, very dense, moist. GRAY					
			Grab		GM		50/6"	26.7	56.4	23.5	20.1
5'						Termination at 4.6 feet. No Groundwater Encountered					
6'											

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Log of:

TP-3

TP-4

SAMPLE DATA

SOIL PROFILE

Exploration Method: Hand Auger
Ground Surface Elev: Approx 135' AMSL

Depth	Groundwater	Sample Interval	Sampler Type	Graphic Symbol	USCS Symbol	SOIL DESCRIPTION	N_{60} Blows/Ft	Water Content Percent	Percent Gravel	Percent Sand	Percent Fines
0'					SM	(0.0 - 1.1) TOPSOIL silty SAND with gravel and organics, loose, moist. DARK BROWN					
1'											
2'			Grab		SP - SM	(1.1 - 3.9) gravelly SAND with some silt, orange mottling throughout, medium dense becoming very dense, damp. YELLOW BROWN	23	3.9			
3'											
4'			Grab				23	7.0	30.9	63.4	5.7
5'						Termination at 3.9 feet. No Groundwater Encountered					
6'											

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Arlington, WA

Log of:
TP-4

TP-5

SAMPLE DATA

SOIL PROFILE

Exploration Method: Hand Auger
Ground Surface Elev: Approx 135' AMSL

Depth	Groundwater	Sample Interval	Sampler Type	Graphic Symbol	USCS Symbol	SOIL DESCRIPTION	N_{60} Blows/Ft	Water Content Percent	Percent Gravel	Percent Sand	Percent Fines
0'						(0.0 - 1.2) TOPSOIL silty SAND with gravel and organics, loose, moist. DARK BROWN					
1'					SM						
2'			Grab			(1.2 - 5.6) sandy GRAVEL with trace silt, orange mottling throughout, medium dense, damp. GRAY		4.1	61.7	38.0	0.4
3'							13				
4'			Grab		GP		19	3.8			
5'			Grab				64	7.0			
6'						Termination at 5.6 feet. No Groundwater Encountered					

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Log of:
TP-5

TP-6

SAMPLE DATA / SOIL PROFILE

Exploration Method: Hand Auger
Ground Surface Elev: Approx 135' AMSL

Depth	Groundwater	Sample Interval	Sampler Type	Graphic Symbol	USCS Symbol	SOIL DESCRIPTION	N_{60} Blows/Ft	Water Content Percent	Percent Gravel	Percent Sand	Percent Fines
0'					SM	(0.0 - 1.1) TOPSOIL silty SAND with gravel and organics, loose, moist. DARK BROWN					
1'						(1.1 - 4.8) sandy GRAVEL with trace silt, orange mottling throughout, loose becoming very dense, damp. YELLOW BROWN					
2'			Grab					5.3			
3'					GP		6				
4'			Grab					4.9	54.3	45.5	0.1
5'			Grab				22	4.8			
6'						Termination at 4.8 feet. No Groundwater Encountered	64				

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Arlington, WA

Log of:
TP-6

Appendix B: Laboratory Testing

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Unified Soils Classification System
GP

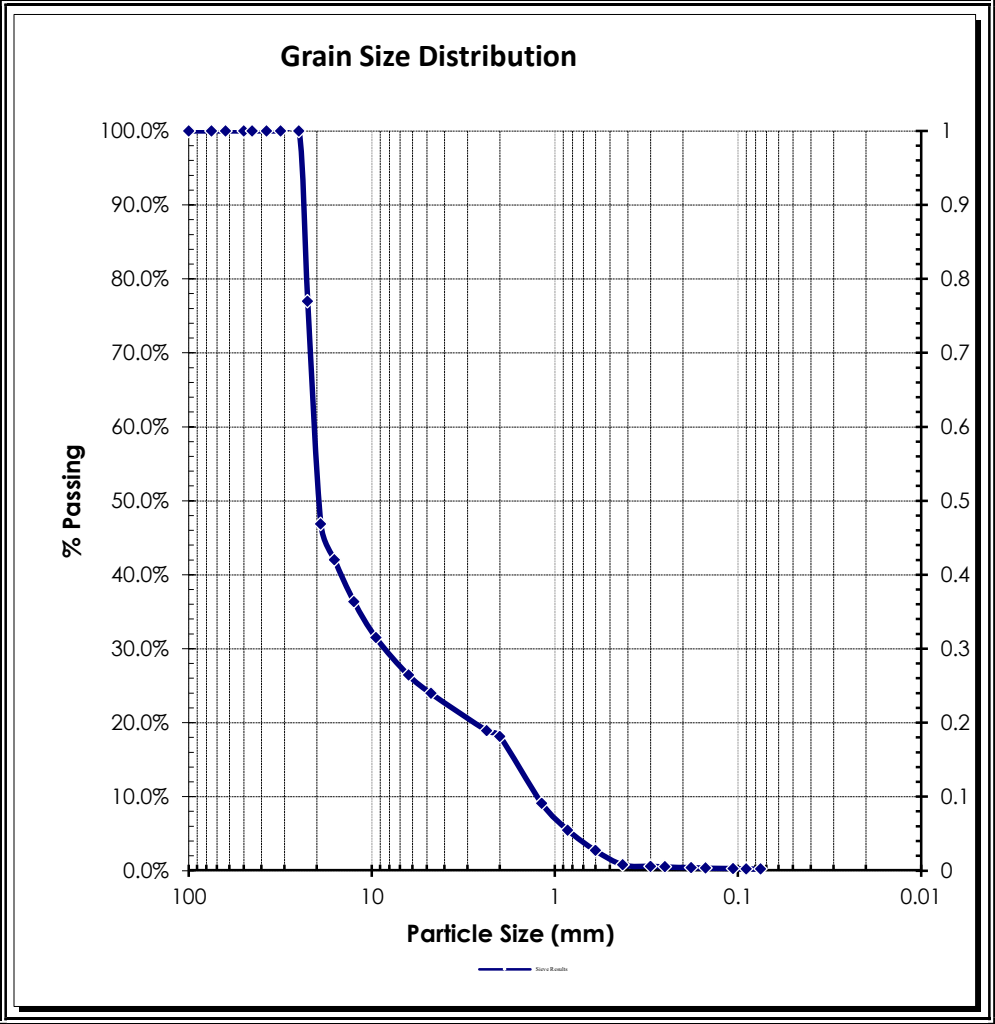
DateTested: 6/9/2021
Sample #: TP-1
Depth: 4.1-4.3
Project Carey

$D_{(10)}$= 1.260 mm
$D_{(30)}$= 8.545 mm
$D_{(60)}$= 20.482 mm
Liquid Limit= 0.0%

% Gravel = 76.0%
% Sand = 23.8%
% Silt & Clay = 0.2%
Plastic Limit= 0.0%

Coeff. of Curvature, C_C = 2.83
Coeff. of Uniformity, C_U = 16.26
Fineness Modulus= 6.66
Plasticity Index= 0.0%

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%	100.0%	0.0%
4.00"	100.00		100.0%	100.0%	0.0%
3.00"	75.00		100.0%	100.0%	0.0%
2.50"	63.00	100.0%	100.0%	100.0%	0.0%
2.00"	50.00	100.0%	100.0%	100.0%	0.0%
1.75"	45.00		100.0%	100.0%	0.0%
1.50"	37.50		100.0%	100.0%	0.0%
1.25"	31.50		100.0%	100.0%	0.0%
1.00"	25.00	100.0%	100.0%	100.0%	0.0%
7/8"	22.40		77.0%	100.0%	0.0%
3/4"	19.00	46.9%	46.9%	100.0%	0.0%
5/8"	16.00		42.0%	100.0%	0.0%
1/2"	12.50		36.4%	100.0%	0.0%
3/8"	9.50	31.5%	31.5%	100.0%	0.0%
1/4"	6.30		26.4%	100.0%	0.0%
#4	4.75	24.0%	24.0%	100.0%	0.0%
#8	2.360		18.9%	100.0%	0.0%
#10	2.000	18.2%	18.2%	100.0%	0.0%
#16	1.180		9.1%	100.0%	0.0%
#20	0.850		5.5%	100.0%	0.0%
#30	0.600		2.7%	100.0%	0.0%
#40	0.425	0.8%	0.8%	100.0%	0.0%
#50	0.300		0.6%	100.0%	0.0%
#60	0.250		0.5%	100.0%	0.0%
#80	0.180		0.4%	100.0%	0.0%
#100	0.150	0.4%	0.4%	100.0%	0.0%
#140	0.106		0.3%	100.0%	0.0%
#170	0.090		0.2%	100.0%	0.0%
#200	0.075	0.2%	0.2%	100.0%	0.0%



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Unified Soils Classification System
GP

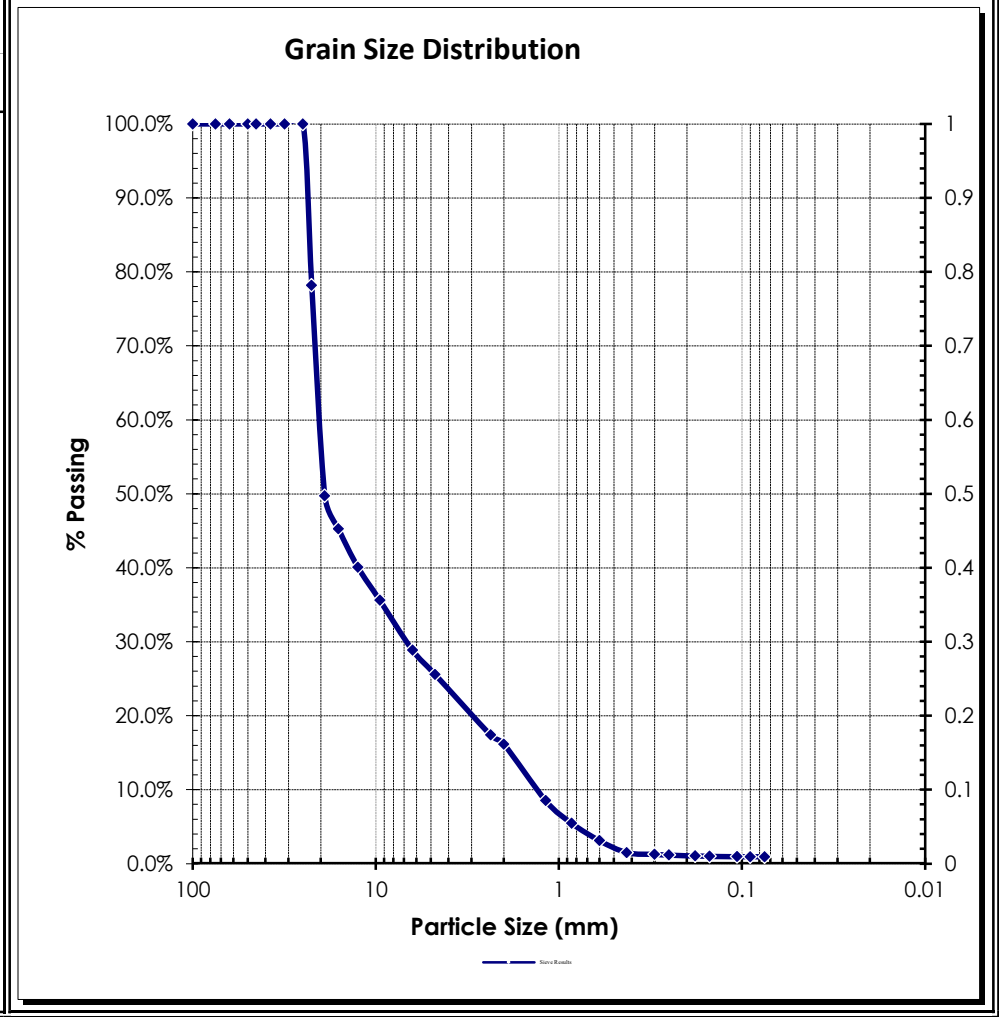
DateTested: 6/9/2021
Sample #: TP-2
Depth: 3.7-3.9
Project Carey

$D_{(10)}$= 1.338 mm
$D_{(30)}$= 6.839 mm
$D_{(60)}$= 20.227 mm
Liquid Limit= 0.0%

% Gravel = 74.4%
% Sand = 24.7%
% Silt & Clay = 0.9%
Plastic Limit= 0.0%

Coeff. of Curvature, C_C = 1.73
Coeff. of Uniformity, C_U = 15.12
Fineness Modulus= 6.58
Plasticity Index= 0.0%

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%	100.0%	0.0%
4.00"	100.00		100.0%	100.0%	0.0%
3.00"	75.00		100.0%	100.0%	0.0%
2.50"	63.00	100.0%	100.0%	100.0%	0.0%
2.00"	50.00	100.0%	100.0%	100.0%	0.0%
1.75"	45.00		100.0%	100.0%	0.0%
1.50"	37.50		100.0%	100.0%	0.0%
1.25"	31.50		100.0%	100.0%	0.0%
1.00"	25.00	100.0%	100.0%	100.0%	0.0%
7/8"	22.40		78.2%	100.0%	0.0%
3/4"	19.00	49.7%	49.7%	100.0%	0.0%
5/8"	16.00		45.3%	100.0%	0.0%
1/2"	12.50		40.1%	100.0%	0.0%
3/8"	9.50	35.6%	35.6%	100.0%	0.0%
1/4"	6.30		28.9%	100.0%	0.0%
#4	4.75	25.6%	25.6%	100.0%	0.0%
#8	2.360		17.4%	100.0%	0.0%
#10	2.000	16.2%	16.2%	100.0%	0.0%
#16	1.180		8.5%	100.0%	0.0%
#20	0.850		5.5%	100.0%	0.0%
#30	0.600		3.1%	100.0%	0.0%
#40	0.425	1.5%	1.5%	100.0%	0.0%
#50	0.300		1.3%	100.0%	0.0%
#60	0.250		1.2%	100.0%	0.0%
#80	0.180		1.0%	100.0%	0.0%
#100	0.150	1.0%	1.0%	100.0%	0.0%
#140	0.106		1.0%	100.0%	0.0%
#170	0.090		0.9%	100.0%	0.0%
#200	0.075	0.9%	0.9%	100.0%	0.0%



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Unified Soils Classification System
GM

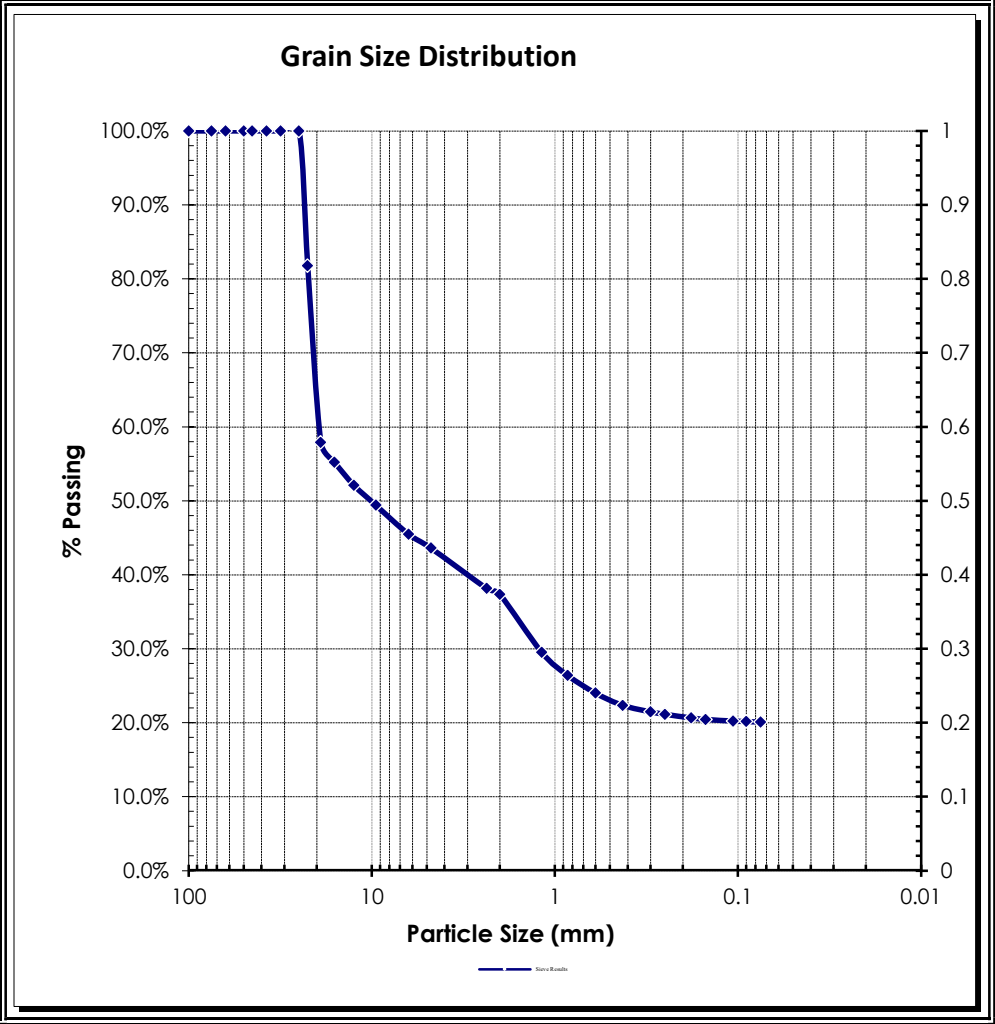
DateTested: 6/9/2021
Sample #: TP-3
Depth: 4.3-4.6
Project Carey

$D_{(10)}$= 0.037 mm
$D_{(30)}$= 1.229 mm
$D_{(60)}$= 19.297 mm
Liquid Limit= 0.0%

% Gravel = 56.4%
% Sand = 23.5%
% Silt & Clay = 20.1%
Plastic Limit= 0.0%

Coeff. of Curvature, C_C = 2.10
Coeff. of Uniformity, C_U = 517.01
Fineness Modulus= 5.15
Plasticity Index= 0.0%

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%	100.0%	0.0%
4.00"	100.00		100.0%	100.0%	0.0%
3.00"	75.00		100.0%	100.0%	0.0%
2.50"	63.00	100.0%	100.0%	100.0%	0.0%
2.00"	50.00	100.0%	100.0%	100.0%	0.0%
1.75"	45.00		100.0%	100.0%	0.0%
1.50"	37.50		100.0%	100.0%	0.0%
1.25"	31.50		100.0%	100.0%	0.0%
1.00"	25.00	100.0%	100.0%	100.0%	0.0%
7/8"	22.40		81.8%	100.0%	0.0%
3/4"	19.00	57.9%	57.9%	100.0%	0.0%
5/8"	16.00		55.2%	100.0%	0.0%
1/2"	12.50		52.1%	100.0%	0.0%
3/8"	9.50	49.4%	49.4%	100.0%	0.0%
1/4"	6.30		45.5%	100.0%	0.0%
#4	4.75	43.6%	43.6%	100.0%	0.0%
#8	2.360		38.2%	100.0%	0.0%
#10	2.000	37.4%	37.4%	100.0%	0.0%
#16	1.180		29.5%	100.0%	0.0%
#20	0.850		26.4%	100.0%	0.0%
#30	0.600		24.0%	100.0%	0.0%
#40	0.425	22.3%	22.3%	100.0%	0.0%
#50	0.300		21.5%	100.0%	0.0%
#60	0.250		21.1%	100.0%	0.0%
#80	0.180		20.7%	100.0%	0.0%
#100	0.150	20.4%	20.4%	100.0%	0.0%
#140	0.106		20.2%	100.0%	0.0%
#170	0.090		20.2%	100.0%	0.0%
#200	0.075	20.1%	20.1%	100.0%	0.0%



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Unified Soils Classification System
SP-SM

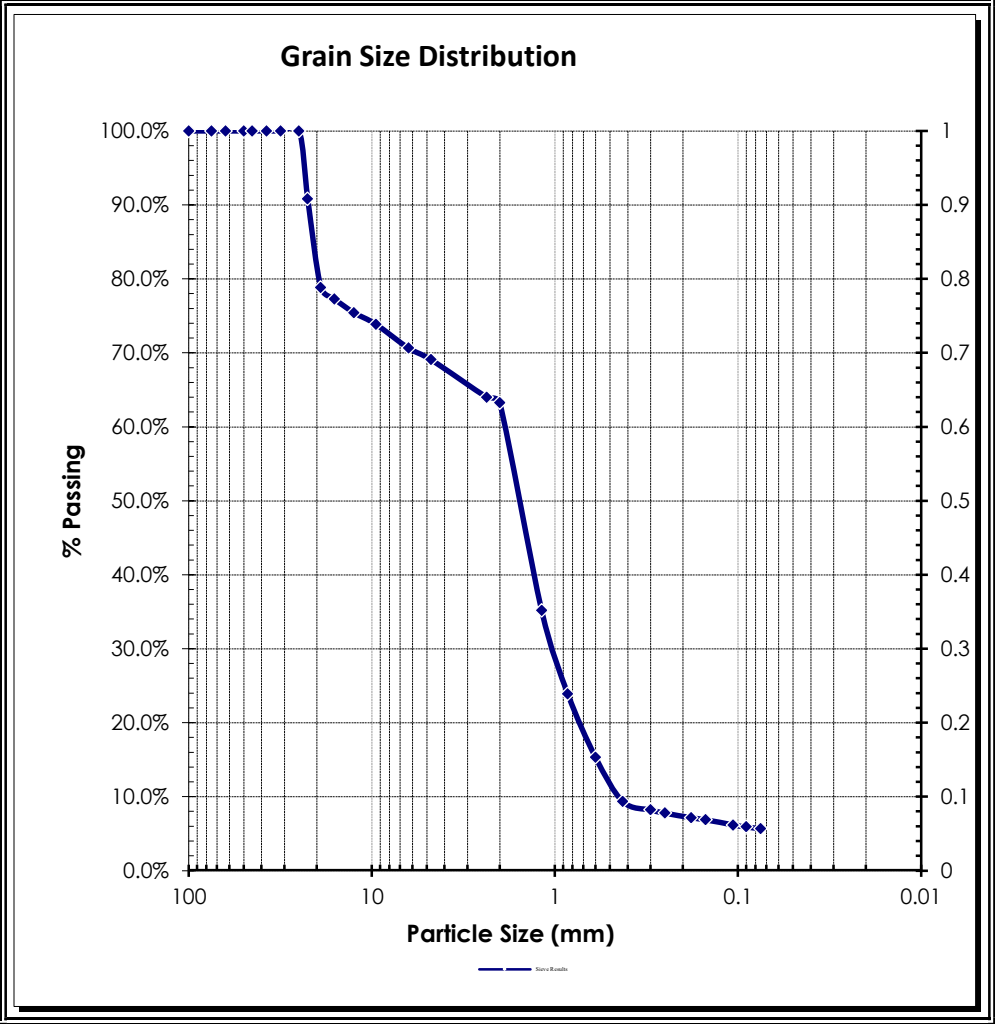
DateTested: 6/9/2021
Sample #: TP-4
Depth: 3.6-3.9
Project Carey

$D_{(10)}$= 0.444 mm
$D_{(30)}$= 1.029 mm
$D_{(60)}$= 1.905 mm
Liquid Limit= 0.0%

% Gravel = 30.9%
% Sand = 63.4%
% Silt & Clay = 5.7%
Plastic Limit= 0.0%

Coeff. of Curvature, C_C = 1.25
Coeff. of Uniformity, C_U = 4.29
Fineness Modulus= 4.49
Plasticity Index= 0.0%

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%	100.0%	0.0%
4.00"	100.00		100.0%	100.0%	0.0%
3.00"	75.00		100.0%	100.0%	0.0%
2.50"	63.00	100.0%	100.0%	100.0%	0.0%
2.00"	50.00	100.0%	100.0%	100.0%	0.0%
1.75"	45.00		100.0%	100.0%	0.0%
1.50"	37.50		100.0%	100.0%	0.0%
1.25"	31.50		100.0%	100.0%	0.0%
1.00"	25.00	100.0%	100.0%	100.0%	0.0%
7/8"	22.40		90.8%	100.0%	0.0%
3/4"	19.00	78.9%	78.9%	100.0%	0.0%
5/8"	16.00		77.3%	100.0%	0.0%
1/2"	12.50		75.4%	100.0%	0.0%
3/8"	9.50	73.9%	73.9%	100.0%	0.0%
1/4"	6.30		70.6%	100.0%	0.0%
#4	4.75	69.1%	69.1%	100.0%	0.0%
#8	2.360		64.0%	100.0%	0.0%
#10	2.000	63.3%	63.3%	100.0%	0.0%
#16	1.180		35.2%	100.0%	0.0%
#20	0.850		23.9%	100.0%	0.0%
#30	0.600		15.3%	100.0%	0.0%
#40	0.425	9.3%	9.3%	100.0%	0.0%
#50	0.300		8.2%	100.0%	0.0%
#60	0.250		7.8%	100.0%	0.0%
#80	0.180		7.2%	100.0%	0.0%
#100	0.150	6.9%	6.9%	100.0%	0.0%
#140	0.106		6.2%	100.0%	0.0%
#170	0.090		5.9%	100.0%	0.0%
#200	0.075	5.7%	5.7%	100.0%	0.0%



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Unified Soils Classification System
GP

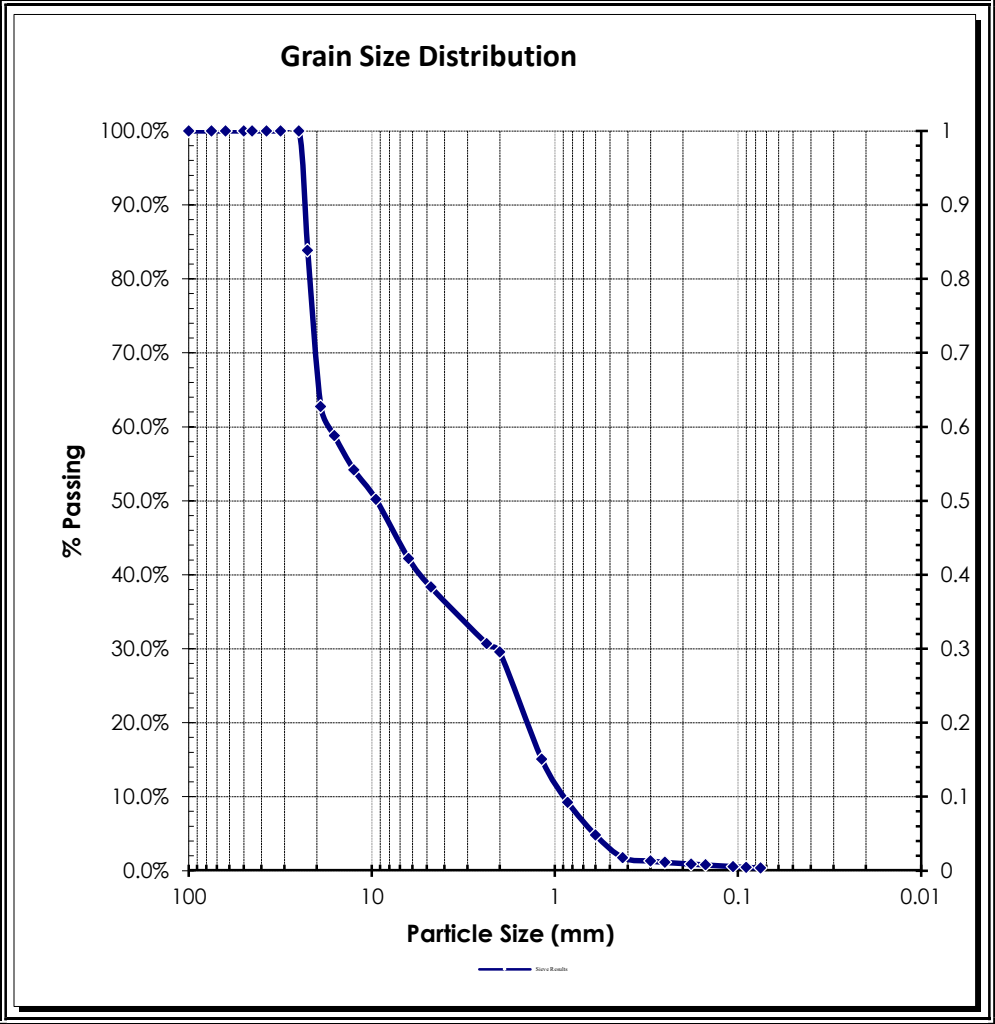
DateTested: 6/9/2021
Sample #: TP-5
Depth: 2.0-2.2
Project Carey

$D_{(10)}$= 0.893 mm
$D_{(30)}$= 2.143 mm
$D_{(60)}$= 16.905 mm
Liquid Limit= 0.0%

% Gravel = 61.7%
% Sand = 38.0%
% Silt & Clay = 0.4%
Plastic Limit= 0.0%

Coeff. of Curvature, C_C = 0.30
Coeff. of Uniformity, C_U = 18.94
Fineness Modulus= 5.96
Plasticity Index= 0.0%

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%	100.0%	0.0%
4.00"	100.00		100.0%	100.0%	0.0%
3.00"	75.00		100.0%	100.0%	0.0%
2.50"	63.00	100.0%	100.0%	100.0%	0.0%
2.00"	50.00	100.0%	100.0%	100.0%	0.0%
1.75"	45.00		100.0%	100.0%	0.0%
1.50"	37.50		100.0%	100.0%	0.0%
1.25"	31.50		100.0%	100.0%	0.0%
1.00"	25.00	100.0%	100.0%	100.0%	0.0%
7/8"	22.40		83.9%	100.0%	0.0%
3/4"	19.00	62.8%	62.8%	100.0%	0.0%
5/8"	16.00		58.8%	100.0%	0.0%
1/2"	12.50		54.2%	100.0%	0.0%
3/8"	9.50	50.2%	50.2%	100.0%	0.0%
1/4"	6.30		42.2%	100.0%	0.0%
#4	4.75	38.3%	38.3%	100.0%	0.0%
#8	2.360		30.7%	100.0%	0.0%
#10	2.000	29.5%	29.5%	100.0%	0.0%
#16	1.180		15.1%	100.0%	0.0%
#20	0.850		9.2%	100.0%	0.0%
#30	0.600		4.8%	100.0%	0.0%
#40	0.425	1.7%	1.7%	100.0%	0.0%
#50	0.300		1.3%	100.0%	0.0%
#60	0.250		1.1%	100.0%	0.0%
#80	0.180		0.9%	100.0%	0.0%
#100	0.150	0.8%	0.8%	100.0%	0.0%
#140	0.106		0.5%	100.0%	0.0%
#170	0.090		0.5%	100.0%	0.0%
#200	0.075	0.4%	0.4%	100.0%	0.0%



PALMER
Geotechnical Consultants, Inc.

Unified Soils Classification System
GP

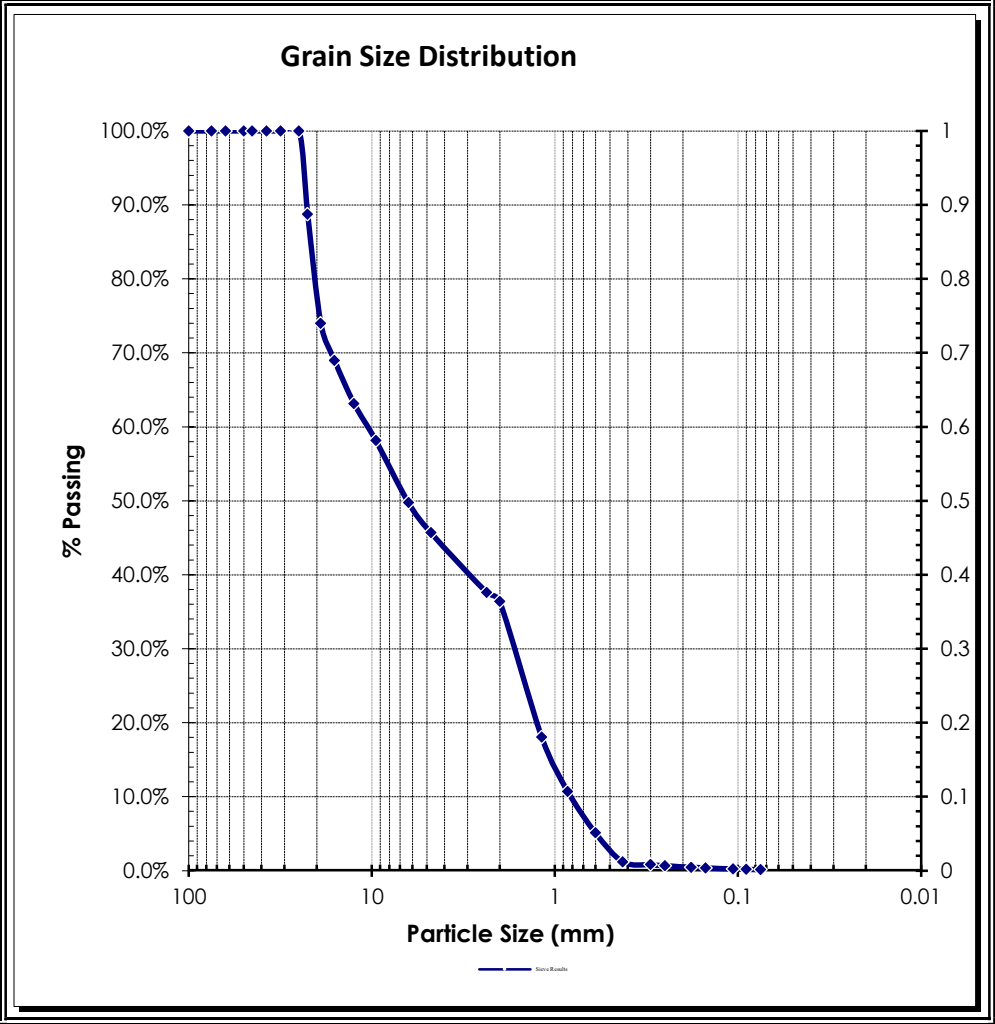
DateTested: 6/9/2021
Sample #: TP-6
Depth: 3.5-3.7
Project Carey

$D_{(10)}$= 0.819 mm
$D_{(30)}$= 1.714 mm
$D_{(60)}$= 10.608 mm
Liquid Limit= 0.0%

% Gravel = 54.3%
% Sand = 45.5%
% Silt & Clay = 0.1%
Plastic Limit= 0.0%

Coeff. of Curvature, C_C = 0.34
Coeff. of Uniformity, C_U = 12.96
Fineness Modulus= 5.60
Plasticity Index= 0.0%

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
6.00"	150.00		100.0%	100.0%	0.0%
4.00"	100.00		100.0%	100.0%	0.0%
3.00"	75.00		100.0%	100.0%	0.0%
2.50"	63.00	100.0%	100.0%	100.0%	0.0%
2.00"	50.00	100.0%	100.0%	100.0%	0.0%
1.75"	45.00		100.0%	100.0%	0.0%
1.50"	37.50		100.0%	100.0%	0.0%
1.25"	31.50		100.0%	100.0%	0.0%
1.00"	25.00	100.0%	100.0%	100.0%	0.0%
7/8"	22.40		88.7%	100.0%	0.0%
3/4"	19.00	74.0%	74.0%	100.0%	0.0%
5/8"	16.00		69.0%	100.0%	0.0%
1/2"	12.50		63.2%	100.0%	0.0%
3/8"	9.50	58.2%	58.2%	100.0%	0.0%
1/4"	6.30		49.8%	100.0%	0.0%
#4	4.75	45.7%	45.7%	100.0%	0.0%
#8	2.360		37.6%	100.0%	0.0%
#10	2.000	36.4%	36.4%	100.0%	0.0%
#16	1.180		18.1%	100.0%	0.0%
#20	0.850		10.7%	100.0%	0.0%
#30	0.600		5.1%	100.0%	0.0%
#40	0.425	1.2%	1.2%	100.0%	0.0%
#50	0.300		0.8%	100.0%	0.0%
#60	0.250		0.7%	100.0%	0.0%
#80	0.180		0.5%	100.0%	0.0%
#100	0.150	0.4%	0.4%	100.0%	0.0%
#140	0.106		0.2%	100.0%	0.0%
#170	0.090		0.2%	100.0%	0.0%
#200	0.075	0.1%	0.1%	100.0%	0.0%



soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

PAP-Accredited NAPT 2021

Soil & Plant Program 2021 NAPT Participating Laboratory

PALMER GEOTECHNICAL
P.O. BOX 1562

FREELAND , WA 98249

Laboratory #: S21-11043

Date Received: 6/26/2021
Grower: PROJ-21052 & 21044
Field: TP-1 4.1-4.3ft
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	5.9

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

Texture: 93.0 % Sand, 1.0 % Clay, 6.0 % Silt

USDA TEXTURE: Sand

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S21-11043 Account #: 261200 Reviewed by: K. Bair, PhD, C List Cost: $37.00

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soiltest farm consultants, inc.
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Soil & Plant Program 2021 NAPT Participating Laboratory

PALMER GEOTECHNICAL
P.O. BOX 1562

FREELAND , WA 98249

Laboratory #: S21-11044

Date Received: 6/26/2021
Grower: PROJ-21052 & 21044
Field: TP-2 3.7-3.9ft
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	8.2

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

Texture: 93.0 % Sand, 1.0 % Clay, 6.0 % Silt

USDA TEXTURE: Sand

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S21-11044 Account #: 261200 Reviewed by: K. Bair, PhD, C List Cost: $37.00

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
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PAP-Accredited NAPT 2021

Soil & Plant Program 2021 NAPT Participating Laboratory

PALMER GEOTECHNICAL
P.O. BOX 1562

FREELAND , WA 98249

Laboratory #: S21-11045

Date Received: 6/26/2021
Grower: PROJ-21052 & 21044
Field: TP-3 4.3-4.6ft
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	27.5

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

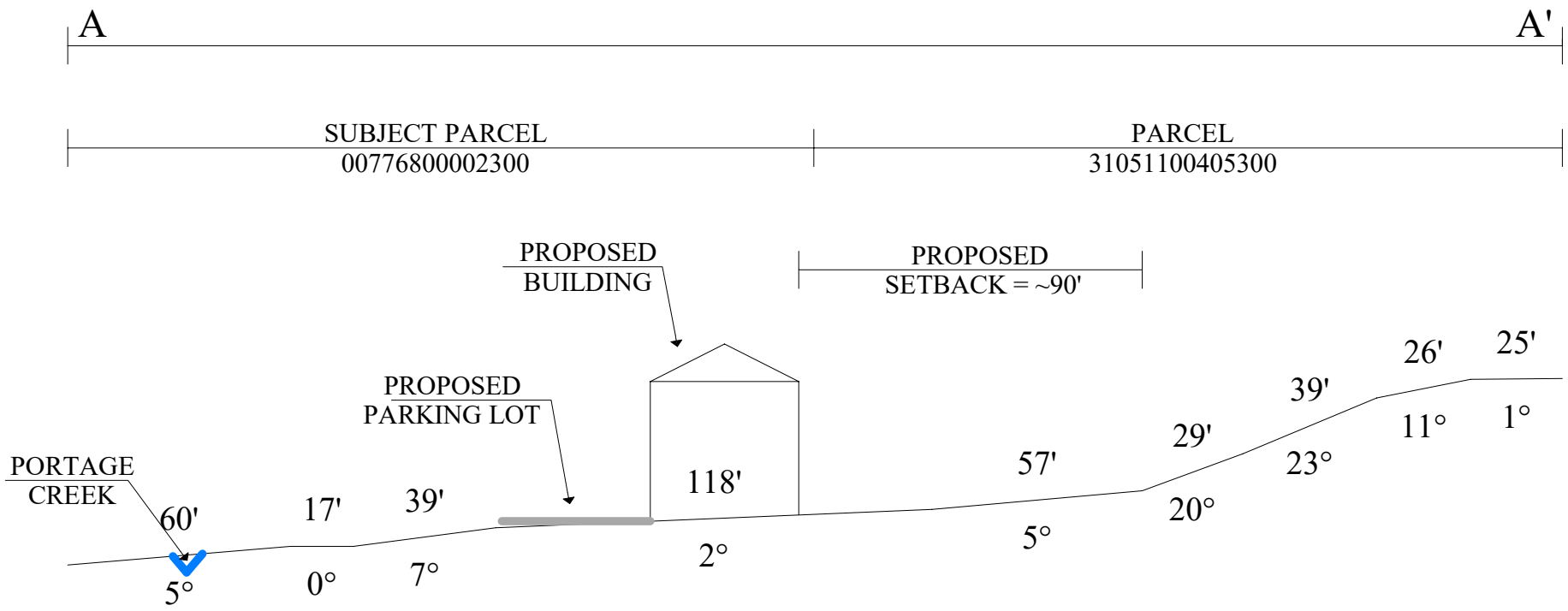
Texture: 51.0 % Sand, 14.0 % Clay, 35.0 % Silt

USDA TEXTURE: Loam

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S21-11045 Account #: 261200 Reviewed by: K. Bair, PhD, C List Cost: $37.00

Appendix C: Slope Profile



PALMER Geotechnical Consultants, Inc.

Carey Property
Arlington, WA

Not to Scale
Not to be Used for Construction

Slope Profile
A - A'
Date: 06.29.2021
By: M. Hallam