

Dos Lagos Asset, LLC 810 E. Pico Blvd, Unit B24 Los Angeles, CA. 90021 213-614-8887 August 6, 2020 *Updated* April 23, 2021

<u>Geotechnical Soil Observation Report</u> Parcel No. 0419102118, 0419106024, 0419106025, 0419106026, 0419106028, 0419106030 Site Address – 405 39th Ave SE LS&E Job No. 12896 Assessments Performed: 7/7/2020

Project Description

A geotechnical site and soil assessment is necessary for the proposed development of multifamily apartment buildings and the associated hard surfaces on the above referenced properties in order to make recommendations for site development and stormwater design plans. For this report we reviewed available published geological and soil information and made on site observations to gather additional in-situ information. Using a track-mounted excavator, we made several excavations throughout the sites and examined soil depth, texture, and gathered samples for cation exchange capacity (CEC) testing.

For the design of infiltration facilities, confirmation of available soil depth is required by the City of Puyallup. PIT infiltration testing or similar usually takes place at the time of observation of onsite groundwater ports. Terrain and soil depth indicators allow us to make preliminary estimates of depth and infiltration rates to begin the design. It was discovered during excavation of test pits that the onsite soil conditions are highly variable, shallow in many locations, rendering subsurface infiltration infeasible. More detail concerning soils and more specifically, infiltration capacity within, are found in 'Soil Characteristics' below. Bearing capacity recommendations are based on classification via the 2018 International Building Code (IBC), Table 1806.2 – Presumptive Load Bearing Values.

For the purposes of this report, Parcels 0419106026 & 0419106028 will be hereinafter referred to as Site B, 0419106024 & 0419106025 as Site C, 0419102118 as Site D, and 0419106030 as Site E.

Information Sources

Soil identification and mapping for this assessment is supported by information from the Natural Resource Conservation Service (the Survey) and from the excavation and observations of test pits throughout the sites conducted for our review. Geologic information for this assessment is supported by information from the United States Geological Survey (USGS) *Draft* Geologic Map of the Puyallup 7.5 Minute Quadrangle, Washington. Our understanding of site geology is supported by the review of geologic mapping, published topographic and relief map

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layers from the Pierce County Geographical Information System (GIS), and site observations. Our opinions are based on our interpretation of the cumulative information and the contemporary conditions of the geologic setting.

Published Information Accuracy

It should be noted that the Survey, the USGS and/or DNR geologic maps, and the Pierce County GIS define general areas of soil deposits, geology, and landforms. Given the large areas to identify and limited sample points, the authors of the above sources had to infer boundaries, contacts, and other representations in some areas. Only through on-site reconnaissance can we further detail and adjust information from the maps as they relate to each site. They are not (from our experience) accurate on a lot by lot basis in all cases. In this case, the Survey, the USGS unit identification, and the in-situ conditions are in general concurrence, however the sites have been amended with mineral soil dominant fill (gravel and sand, with very limited organic material).

Site Description

General

The sites in this project are in the City of Puyallup and situated on glacial till, flood, lacustrine, or outwash deposits. Figure 1, below, illustrates the location of individual parcels and sites of the project and Figure 2 illustrates the test locations on the sites. The site descriptions are as follows:

- Site B is undeveloped and mostly vegetated with grasses, small hardwoods, and understory. Much of the site has been modified with 3-5' of fill containing occasional debris placed on top of native soils, creating a mostly level property. It is bound by what appears to be a retention pond on the north side of the site, developed decades ago according to county pictures and maps, 3rd St SE on the west, 5th St SE on the east, and 39th Ave SE to the south.
- Site C is undeveloped with second-growth trees and understory, and is bound on the north by 39th Ave SE, the west and south by light industrial buildings, and to the east by Site D. Site C may not be developed in this project.
- Site D is comprised of a low-lying area in the west portion of the property, and a manmade bench that is about 10-15' higher in the east portion of the property. There is a large storm culvert and manhole that has an outlet into a drainage ditch in the southeast portion of the property. It appears that roadway stormwater, along with stormwater from some neighboring properties, is released to this low-lying portion of the site. It is bound by 39th Ave SE to the north, light industrial buildings and some vacant land to the west, 5th St SE to the east, and Site E to the south.
- Site E is mostly level due to fill placed over native soils, like Site B, with a slightly lower section in the extreme western portion of the site. Site E is bound by light industrial to the west, 5th St SE to the east, and 43rd Ave SE to the south. An assisted living facility is located on the east side of 5th St SE.

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Figure 1: Site Map of Individual Parcel Locations and Corresponding Site Designations

Figure 2: Test Pit (▲) and CEC Sample (♦) Locations



Soil

As discussed in the 'Published Information Accuracy' section above; on-site reconnaissance is necessary to verify soil conditions on specific properties. Both the Survey and the geologic map describe materials of similar characteristics and origin. Per the Survey, the type of soil in Site B is Indianola loamy sand in the extreme western portion and Bellingham silty clay loam in the rest of the site; Site C is Everett very gravelly sandy loam; Site D is Bellingham silty clay loam in the lower, western portion, and Neilton gravelly loamy sand in the higher, eastern bench area (the soils found in the 8-10' depths in Site D are most likely found throughout the next lowest bench elevation on the site); Site E is Everett very gravelly sandy loam in the lower, western portion, and Neilton gravelly loams (soil log forms to be included in final report, see Appendix A for transcribed soil logs), except that much of Site B and Site E have 3-5 feet of fill with occasional debris placed on top of the native soil. Below this is the native layers described above. Site C was not examined on-site for in-situ soil properties at this time. Find individual Test Pit Soil Log descriptions in "Attachments." Figure 3 below illustrates the site position within the soil environment.

Indianola Loamy Sand:

The Indianola loamy sand is somewhat excessively drained. It formed in sandy glacial outwash on broad uplands. Conifer forests are predominant. The typical elevation of this soil series ranges from 200 and 800 feet. This soil may be found adjacent to areas of a soil with shallow, consolidated restrictive layers, or "hardpan" at depths of about three feet. In a typical profile the surface layer (approximately seven inches in thickness) is dark brown loamy sand. The underlying material, to a depth of more than 60 inches, is dark yellowish brown, brown, or olive brown sand. Permeability is rapid. The available water capacity is low to moderate. Surface runoff is medium, and the erosion hazard is moderate. Roots extend to a depth of more than 60 inches.

Bellingham Silty Clay Loam:

The Bellingham silty clay loam is a nearly level soil that is poorly drained. It formed in alluvium in upland depressions. Elevation ranges from 20 to 600 feet. Vegetation is primarily grasses and sedges and some conifers and hardwoods. This soil is generally in areas of five to 20 acres, but an area of 120 acres in on Anderson Island. Most areas are long and narrow, but a few are nearly round. Slopes dominantly range from zero to two percent, but in a few places the slope is as much as seven percent.

Included with this soil in mapping are areas of soils that have gravelly sand at a depth of 12 to 18 inches. In a typical profile the surface layer is mottled, very dark grayish brown silty clay loam about four inches thick. In places the surface layer is black muck. The subsoil, to a depth of 11 inches, is mottled dark grayish brown clay. Reaction ranges from strongly acid to neutral. Permeability is slow. The available water capacity is high. Surface runoff is ponded to slow, and the erosion hazard is none to slight. Very few roots penetrate the substratum. The primary limitations for urban development are a high water table, seasonal ponding, and the shrink-swell potential of the subsoil as it wets and dries. Septic tank drainage fields do not function properly during the wet season because of the high water table.

Neilton Gravelly Loamy Sand:

The Neilton gravelly loamy sand is excessively drained. It formed in stratified, gravelly glacial outwash deposits on uplands. Typical vegetation is made up of conifers. Elevation ranges from about 100 to 400 feet. In a typical profile a thin mat of undecomposed needles and wood overlies a three-inch, black gravelly loamy sand surface layer. The subsoil, to a depth of 21 inches, is composed of brown gravelly loamy sand. The substratum, to a depth of more than 60 inches, is made up of stratified layers of clean sand or very gravelly sand. Permeability is rapid. The available water capacity is low. Surface runoff is slow, and there is a slight erosion hazard. The effective rooting depth is 60 inches.

Everett Very Gravelly Sandy Loam:

This rolling soil is somewhat excessively drained. It formed in gravelly glacial outwash under conifers. The typical elevation range for this soil is from 200 to 700 feet. Included with this soil in mapping are about eight percent Alderwood soils. Also included are some areas that are as much as five percent sandy Indianola soils and ten percent gravelly Neilton soils and less sloping Everett soils. In a typical profile the surface layer is very dark brown gravelly sandy loam about two inches thick. The subsoil, between depths of two and 19 inches, is dark yellowish brown gravelly sandy loam and dark brown very gravelly coarse sandy loam. The substratum, between depths of 19 and more than 60 inches, is clean, loose very gravelly sand.

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Figure 3: Site Position in NRCS Soil Mapping

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4A	Bellingham silty clay loam	10.9	10.5%
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	28.3	27.3%
18B	Indianola loamy sand, 0 to 5 percent slopes	5.7	5.5%
18C	Indianola loamy sand, 5 to 15 percent slopes	6.7	6.5%
19B	Kapowsin gravelly ashy loam, 0 to 6 percent slopes	10.7	10.4%
20B	Kitsap silt loam, 2 to 8 percent slopes	13.3	12.9%
24D	Neilton gravelly loamy sand, 8 to 25 percent slopes	21.6	20.8%
w	Water	6.3	6.1%
Totals for Area of Interest		103.5	100.0%

Geology and Morphology

The property is situated on the broad deposit of glacial outburst flood deposits that occurred during and at the end of the Vashon Stade of the Fraser glaciation period. As glacial Lake Puyallup, located at the base of the Cascade Range foothills, would fill with seasonal runoff, the valley glaciers (acting as a natural dam) would repeatedly fail releasing vast amounts of water that would erode the lowland formations and subsequently deposit new sediment as floodwater abated. This local landscape still includes Kettle depressions formed by portions of ice blocks that were trapped in place. Outwash deposits surrounded the ice blocks. Figure 4 below illustrates the site position in the regional geology.





Qvs

Steilacoom Gravel of Walters and Kimmel (1968)—Sandy gravel and cobbles; clean
to silty; poorly to well sorted; horizontally to cross bedded; loose
to dense. Deposits vary from veneer of <1 to 15 m (3 to ~ 50 ft)
thick. Deposited by multiple outburst floods from subsequently
lower elevations of Glacial Lake Puyallup. Locally subdivided
first by channel affiliation (Clover Creek or Bradley) and
secondarily by relative age in descending series of deposits; higher
number denotes younger (lower) deposit. Clover Creek channel
(Bretz, 1913) begins in section 8, T19N, R4E. Bradley channel;
herein named for Lake Bradley in section 3, T19N, R4E; begins in
section 2, T19N, R4E. Numbering system contiguous w/adjacent
Tacoma South quadrangle where multiple Clover Creek deposits
are mapped (Troost, 2006). Mapable deposits consist of:Qvs b3Bradley deposit at elevation 420 – 440 ft

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Soil Characteristics

Infiltration Feasibility

When proposing stormwater facilities within the City of Puyallup, infiltration feasibility is required. The City requires the available soil depth above seasonal groundwater to be verified between December 21st and March 31st, as required by the Stormwater Management Manual for Western Washington. To perform this observation, groundwater monitoring ports are installed at roughly equidistant and representative locations within the site and along the planned alignment of parking and stormwater facilities.

As stated in 'Project Description' above, the soil types and depths across the sites are highly variable, with most infeasible for infiltration. Where available soil depths were found to be deeper, most were overlain by fill debris, including stones and bricks. In the few locations where infiltration was believed to be feasible, the areal extent was too limited. It is due to the observation of these conditions that stormwater infiltration is considered infeasible for these sites, in our opinion. The concern that saturation and fouling of stormwater trenches and permeable pavement is high. Alternatives for stormwater capture, treatment, and release should be utilized.

Permeable Pavement Feasibility

Some types of stormwater design rely on treatment afforded by the native soil. Many chemicals of concern within stormwater runoff from pollution generating surfaces can be described as positively charged ions (Cations) and can be assimilated or held by negatively charged clay and organic particles within soil. A given soil's capacity to hold and exchange cations is referred to as Cation Exchange Capacity (CEC). Our firm collected four samples as shown in Figure 2 above. The samples exhibited positive results for treatment capability, but this is of little consequence as it is now our opinion that permeable pavement is infeasible for this project.

Not only were available soil depths or conditions infeasible for infiltration in most areas across the sites, but the over excavation required due to the presence of fill would compact and destroy the subsurface conditions needed for permeable pavement. Undisturbed, native subsurface soil conditions are required for the infiltrative capacity of permeable pavement, bearing capacity of the soil, and treatment capacity of the soil (CEC). Placement of structural fill for the proper infiltrative and bearing characteristics required for permeable pavement would essentially negate any of the treatment capabilities due to the competing nature of these requirements.

Foundation Bearing Capacity

Test pits demonstrate that the subsurface conditions throughout the sites are composed predominantly of 3-5' of long-existing, rather compact fine to medium sand with gravel fill placed directly upon native soils. Geologic maps and soil maps illustrate that the subsurface conditions throughout the sites are composed of fine to medium sand with gravel, and in some low-lying areas this is overlaying a moist silty sand. Sand is favorable for projects requiring average bearing capacity. The gravelly sand found throughout the project site is shown below

as having a presumptive load-bearing value of 3000 psf. We recommend the more conservative design value of 2000 psf bearing capacity per Figure 5. The 2018 International Building Code (IBC) Chapter 18 provides expected capacities based on material classification. Please see Figure 5 below for an illustration of expected bearing capacity per the IBC.

Bearing surfaces should be medium dense or denser, undisturbed native soils which have been stripped of surficial organic soils, or on properly compacted structural fill which bears on undisturbed native soils which have been stripped of surficial organic soils. In general, before foundation concrete is placed, any localized zones of loose soils exposed across the footing subgrades should be compacted to a firm, unyielding condition, and any localized zones of soft, organic, or debris-laden soils should be over-excavated and replaced with suitable structural fill.

TABLE 1806.2 PRESUMPTIVE LOAD-BEARING VALUES				
	VERTICAL	LATERAL BEARING PRESSURE	LATERAL SLIDING RESISTANCE	
CLASS OF MATERIALS	ASS OF MATERIALS FOUNDATION PRESSURE (psf) (psf/ft bel natural grade)		Coefficient of friction ^a	Cohesion (psf) ^b
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and gravel (GW and GP)	3,000	200	0.35	_
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	_	130

Figure 5: 2018 International Building Code (IBC) Excerpt

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Closure

The information gathered for this report is standard practice and relevant for this type of project. The number and distribution of sampling locations is typical and reliable for obtaining an accurate understanding of the site. The conclusions and recommendations presented in this letter are based on our observations, interpretations, and assumptions regarding shallow subsurface conditions. However, if any variations in the site conditions are discovered later, please contact our office to review and if necessary, modify this report accordingly. We appreciate the opportunity to be of service on this project. If you have any questions regarding this letter or any aspects of the project, please feel free to contact our office.

Respectfully submitted, LeRoy Surveyors & Engineers, Inc.



William Creveling, L.G. Principal Geologist

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Joshua Thompson, E.I.T. Civil Engineering Technician



Damon DeRosa, P.E. Principal Engineer

Attachments:

Graphic Soil Logs

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Appendix A: Graphic Soil Logs



Bottome of Test Pit at: 8.0 ft Ground Water/Seepage: None Observed

Side Wall Caving:







Bottome of Test Pit at: Ground Water/Seepage Side Wall Caving: 8.0 ft None Observed None Observed



Bottome of Test Pit at: Ground Water/Seepage Side Wall Caving: 8.0 ft None Observed None Observed







Bottome of Test Pit at: Ground Water/Seepage Side Wall Caving: 9.0 ft None Observed None Observed

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		Surveying • E	ingineering • Geology • Septic Design • GPS • GIS Mapping	
Client: Dos Lagos Asset, LLC			LC	Test Pit Number: TP 9
Job N	lumber: <u>128</u>	396		Project Name: Dos Lagos
Date	Started: 7	/7/20		Ground Elevation: 444 Test Pit Size: 2x6
Date	Completed	: 7/7/20		Ground Water Levels:
Excav	ation Cont	ractor: <u>N//</u>	A	At Time of Excavation: None
Excav	ation Meth	od: Track	Mounted Excavator	At End of Excavation None
Logge	ed By: <u>JET</u>	Check	ked By: <u>BC</u>	Static Water Depth: None
Notes	: Significa	nt fill prese	ent, no organics within, preloaded condition.	
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Bottome of Test Pit at: Ground Water/Seepage: None Observed None Observed

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Client: Dos Lagos Asset, I Job Number: <u>12896</u> Date Started: <u>7/7/20</u> Date Completed: <u>7/7/20</u> Excavation Contractor: <u>N/</u> Excavation Method: <u>Track</u> Logged By: <u>JET</u> Chec Notes: <u>Water at 6 ft</u> .	A Mounted Excavator ked By: BC	C. Test Pit Number: TP 10 Project Name: Dos Lagos Ground Elevation: 436 Test Pit Size: 2x6 Ground Water Levels: At Time of Excavation: None At End of Excavation None Static Water Depth: None
Depth Graphic Log USCS	Material I	Description
0 0 0 0 0 0 0 0 0 0 0 0 0 0	brn fine sand w/sig grav, loose tan med-Cse sand	
-5+ SP	tan/ora med-Cse sand, mott'd water	
10		

Bottome of Test Pit at: Ground Water/Seepage: Side Wall Caving: 7.0 ft None Observed None Observed

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	L	Surveying • E	Engineering • Geology • Septic Design • GPS • GIS Mapping
Client [.] Dos Lagos Asset, LLC			LLC Test Pit Number: TP 11
Job N	umber: 12	896	Project Name: Dos Lagos
Date	Started: 7	7/7/20	Ground Elevation: 438 Test Pit Size: 2x6
Date	Completed	: 7/7/20	Ground Water Levels:
Exca	vation Cont	tractor: N//	A At Time of Excavation: None
Exca	ation Meth	nod: Track	Mounted Excavator At End of Excavation None
Logge	ed By: JET	Checł	ked By: <u>BC</u> Static Water Depth: <u>None</u>
Notes	: Water at	7 ft.	
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Bottome of Test Pit at: Ground Water/Seepage Side Wall Caving:

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