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PLSA

Engineering & Surveying

REPORT ON GEOTECHNICAL OBSERVATIONS

Surf City
190 East Umptanum Road
Ellensburg, WA 98926

Revised: April 13, 2015
PLSA Project No. 14276

Prepared for:
Canyon Road Investors, LLC
c/o Doug Mitchell
P.O. Box 862
Ellensburg, WA 98926

1.0 INTRODUCTION

Canyon Road Investors, LLC retained PLSA Engineering and Surveying to perform a geotechnical investigation encompassing 4 separate tax parcels totaling approximately fifteen acres. The subject property is located directly north of Interstate 90 and at the south end of South Opportunity Street in Ellensburg Washington.

This report summarizes the results of our geotechnical investigation and offers our recommendations for soil bearing values and site preparation for mobilizing soil support for a future water park and hotel facility. The investigation consisted of visual inspection of the area, drawing upon extensive local knowledge of nearby soil conditions, and examination and logging of 6 test pits excavated using a CAT 420D tractor mounted backhoe. See Figure 1, Test Pit Location Map. A geotechnical engineer from PLSA, experienced with local soil conditions, logged the excavations and observed and field classified the soils found.

Included in this report are the following:

- Excavation logs and field classifications of the soils encountered in the 6 test pits.
- Groundwater presence.
- Estimated frost penetration.
- Recommended minimum footing depth and width.
- Recommended footing trench preparation.
- Soil bearing recommendations.
- Slab on grade support recommendations.
- Structural fill recommendations.
- Parking lot site preparation and paving recommendations.
- Seismic zone information.
- Liquefaction Potential.

2.0 LAND USE AND SURFACE CONDITIONS

The site is relatively flat with an approximate half percent slope from north to south. Currently the site is unused and supports a growth of pasture grasses and weeds. A large pond owned by Washington Fish & Wildlife is located adjacent to the project along the west boundary. A smaller pond is located in the southwest corner of the project and Wilson Creek runs from north to south along the west boundary. Electric, municipal water and sewer, solid waste, and telephone utilities are all available.

3.0 SEISMIC PARAMETERS

IBC Table 1615.1.1 seismic soil classification is Site Class D, which is the default classification for the area. Based on Soil Site Class D, the USGS reports the following seismic parameters for designs using the provisions of the ASCE 7-10 Standard.

Table 1. Seismic Design Parameters

	0.2 Second	1.0 Second
Maximum Considered Earthquake (MCE) Spectral Acceleration	S_s=0.528	S_1=0.219
Site Coefficient	F_a=1.378	F_v=1.963
MCE Adjusted for Site Class effects	S_{MS}=0.727	S_{M1}=0.429
Design Spectral Acceleration	S_{DS}=0.485	S_{D1}=0.286

4.0 LIQUEFACTION POTENTIAL

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure, in loose soils, that reduces the effective stress between soil particles to near zero. This rapid increase in pore water pressure can cause a loss of soil shear strength. Washington State Department of Natural Resources Liquefaction Susceptibility maps show the susceptibility of the location to be moderate to high. However, this location, as well as many of the Kittitas Valley lowlands, has no history of liquefaction and the deep gravel stratum underlying the site has very low liquefaction potential.

5.0 SUB-SURFACE CONDITIONS

All test pit excavations were extended from the surface down until free groundwater was encountered at which point excavations were terminated. The surface stratum in all test pits consisted of silt topsoil ranging in thickness from 1 to 2 feet in depth. This surface stratum is followed by a deep stratum of gravels and sand. Test pit logs may be found in Plates 1 through 6. A foot and a half of loose fill was observed at Test Pit 2. The number of test pits excavated is sufficient to characterize the site as evidenced by the uniformity of the soil profiles observed. Approximate test pit locations may be found in Figure 2.

Groundwater at the time of the investigation was observed between 3.5 and 5 feet below the ground surface (bgs). Depth to groundwater was relatively uniform with minor variations likely due to localized differences in surface elevations. Seasonal fluctuations in groundwater depth are anticipated due primarily by the influence of precipitation and irrigation. Seasonal high groundwater is typically observed at the elevation of the interface of the lower sand and gravel and the top soil layer. Although not observed during the investigation, capillary action could cause top soils to become wet during high groundwater conditions.

Frost penetration for the project location is estimated at 36 inches. Frost damage may be minimized by placing footings a minimum of 36 inches below finished grade and by directing drainage away from the buildings.

6.0 SOIL BEARING RECOMMENDATIONS

PLSA understands that two six story hotel structures having sidewall height of approximately 56 feet and maximum height at the peak of 75 feet, is proposed for construction on the property. In addition to the hotels, an indoor water park is propose with similar elevations.

The underlying sand and gravel stratum is capable of substantial bearing support. Placement of footings on the native surface stratum is not recommended. Footings are recommended to be placed at a minimum footing depth of 3 feet below finished grade for frost protection, with a minimum footing width of 2 feet.

Recommended footing trench preparation is as follows: Excavate footing trenches two feet wider than footing width. Proof roll the exposed trench bottom. At locations where native gravels are located lower than desired footing depth, backfill the footing trench with structural fill as recommended herein up to the desired footing grade.

Using a minimum footing width and the footing trench preparation recommended above, satisfactory soil support for loadings up to 6,000 pounds per square foot (psf) should be achieved. If a greater soil bearing value is required contact this office for additional recommendations.

Slabs on grade may be placed over silt surface soil. Remove all vegetation and other organic material from over areas planned to support slabs. Proof roll the exposed surface to 95 percent of maximum density as determined by ASTM D-1557. If optimum moisture content for compaction is exceeded, dry the soil by excavation, aeration, or replacement. Place a 6 inch minimum thickness layer consisting of compact, granular, free-draining material such as 5/8 inch minus crushed rock meeting APWA standard specifications for top course. Compact the granular material in a minimum of two layers to 95 percent of maximum density as determined by ASTM D-1557. Using this preparation, a subgrade reaction value, Ks, of 250 should be achieved.

All roof and surface drainage is recommended to be directed away from the footings and exterior slabs. Buildings should be elevated or placed on structural fill as necessary to provide slope to insure adequate drainage.

7.0 LATERAL EARTH PRESSURE

Magnitude of lateral earth pressure varies with the height of the supported face, soil internal friction, backfill soil density, presence or absence of water, and amount of surcharge, if any. The native silt is loose and has minimal structure. A vertical face will stand for only a short time as evidenced by test pit excavation. Saturation would likely change the structural characteristic to the extent that support would be necessary. PLSA recommends selecting 120 pounds per cubic foot (pcf) as an appropriate unit weight of compacted native top soil backfill. Use of other soil types for backfill will require using a unit weight appropriate for the type of soil selected.

Coefficients of lateral pressure and unsaturated equivalent fluid weight for the native silty sand soil are as follows:

Equiv. Fluid Wt.

			(silty sand) (pcf)
Active	K_a	0.33	40
At Rest	K_o	0.50	60
Passive	K_p	3.0	360

8.0 COEFFICIENT OF FRICTION

The allowable coefficient of friction for the near surface soil observed on this site is 0.30.

9.0 STRUCTURAL FILL

All areas to receive structural fill are recommended to be stripped of all paving, vegetation, organic material, and trash. Proof roll the exposed surface to 95 percent of maximum density as determined by ASTM D-1557 for a depth of 6 inches before placing fill. The soil should be near optimum moisture content for compaction. Add water or dry the soil by processing as necessary to achieve moisture content suitable for compaction. If the fill subgrade soils are persistently too wet to achieve specified compaction, contact this office for additional fill subgrade preparation recommendations.

Imported soil used for structural fill is recommended to be cohesionless, free draining, non-plastic material with a maximum particle size of two inches, or other material as approved by a geotechnical engineer from this office.

All structural fill should be placed and compacted in layers not exceeding 6 inches in thickness. Water should be added as needed to achieve satisfactory moisture content for compaction. Soils too wet to be adequately compacted should be dried to a suitable moisture content before incorporation into structural fill. Recommended compaction for structural fill is 95 percent of maximum density as determined by ASTM D-1557. It is further recommended that all soil compaction as recommended herein be monitored using a nuclear density gauge and documented.

Structural fill should not be placed over debris which may be poorly consolidated or contain organic material or metal that may decompose and settle with time. All such unsuitable materials should be removed and replaced with additional structural fill as described above.

Excavations resulting from removal of underground structures such as septic tanks, or petroleum tanks are recommended to be backfilled using procedures described for structural fill.

Structural fill placed as described above is expected to provide bearing support equivalent to that for recommended preparation of footing trenches in the native soil supporting the fill. Soil bearing support for slabs on grade on structural fill placed as recommended herein is also expected to be equivalent to that recommended for the native soil prepared as recommended herein.

10.0 STORMWATER DISPOSAL

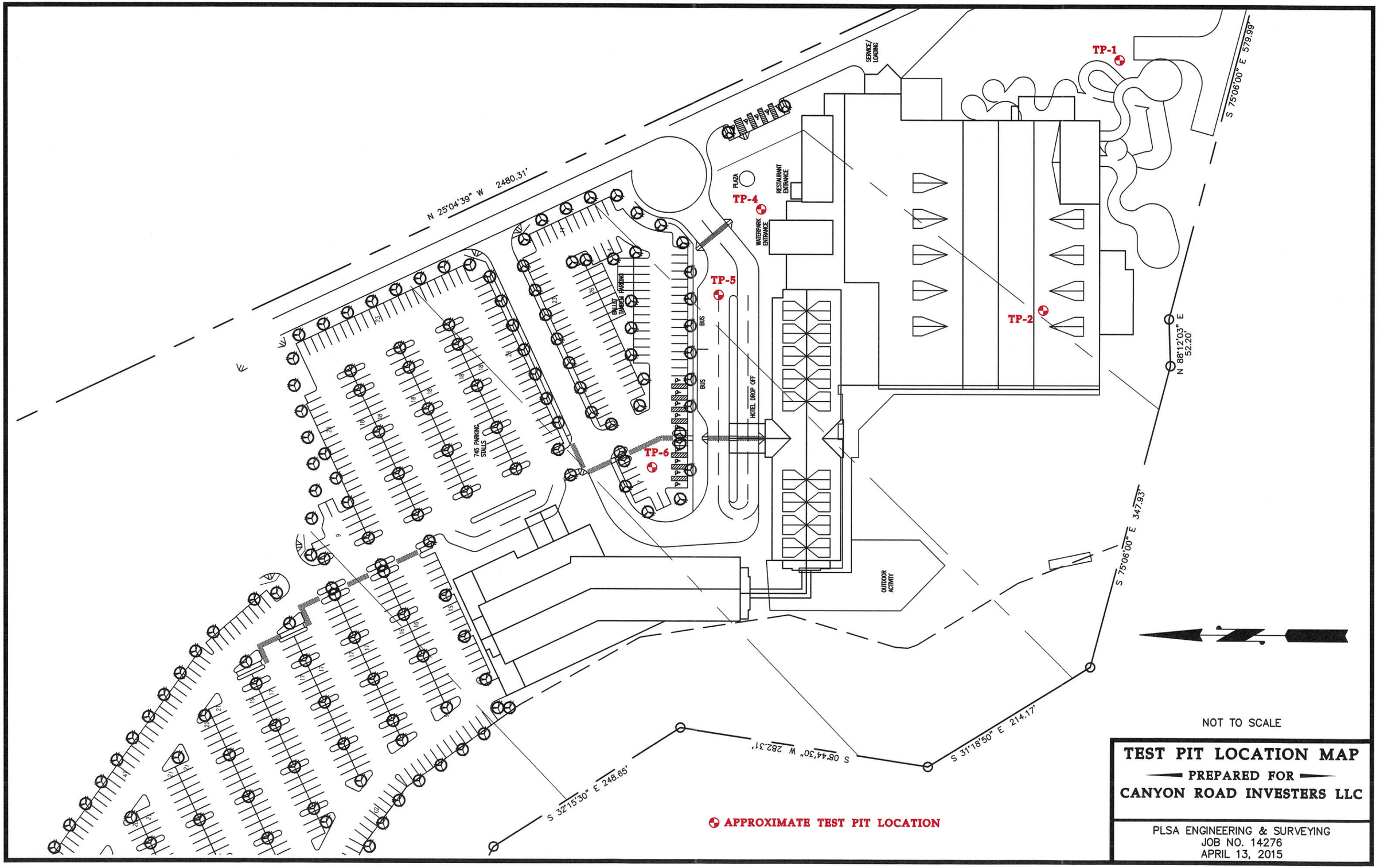
The high water table observed on the site will present a significant challenge for on-site stormwater management. The upper stratum of silty sand is expected to have a long term infiltration rate of 0.5 inches per hour depending on surface treatment. Swales should be protected from compaction during construction and planted by hand planting or seeding. Sod should be avoided in stormwater retention and infiltration swales. The under lying sand and gravel is anticipated to have a long term infiltration rate of 6.0 inches per hour if kept free of silt and is above the groundwater.

11.0 PAVING RECOMMENDATIONS

All areas to be paved should be cleared of all grass, roots, trash, metal and organic materials down to full depth below the paving mat. The exposed soil surface should then be proof rolled and compacted to a 6 inch depth to 90 percent of maximum density as determined by ASTM D-1557 using a mechanical vibratory compactor. Fine grained silt soil found on the site exhibits high capillarity. This, and the possibility of saturation during wet weather, may result in the subgrade being persistently too moist to achieve the amount of compaction required to achieve road and parking area subgrade support. To remedy this problem, increase the thickness of the base material as recommended by this office and place the granular base over geotextile fabric such as Mirafi 500X or equivalent.

The following specification is our recommendation for paving and subgrade: Asphaltic Concrete Paving shall conform to Washington State Department of Transportation Standard Specifications 2004, Division 5, Class HMA ½. Areas subject to truck traffic shall be a minimum of 3 inches of asphaltic concrete placed over a minimum of 9 inches of free-draining, compact, granular base material conforming to the particle size distribution found in the Standard Specifications, Division 9 for HMA ½.

Asphaltic concrete paving placed on parking lot areas used exclusively by automobiles may be reduced to 2 inches compacted thickness.



NOT TO SCALE

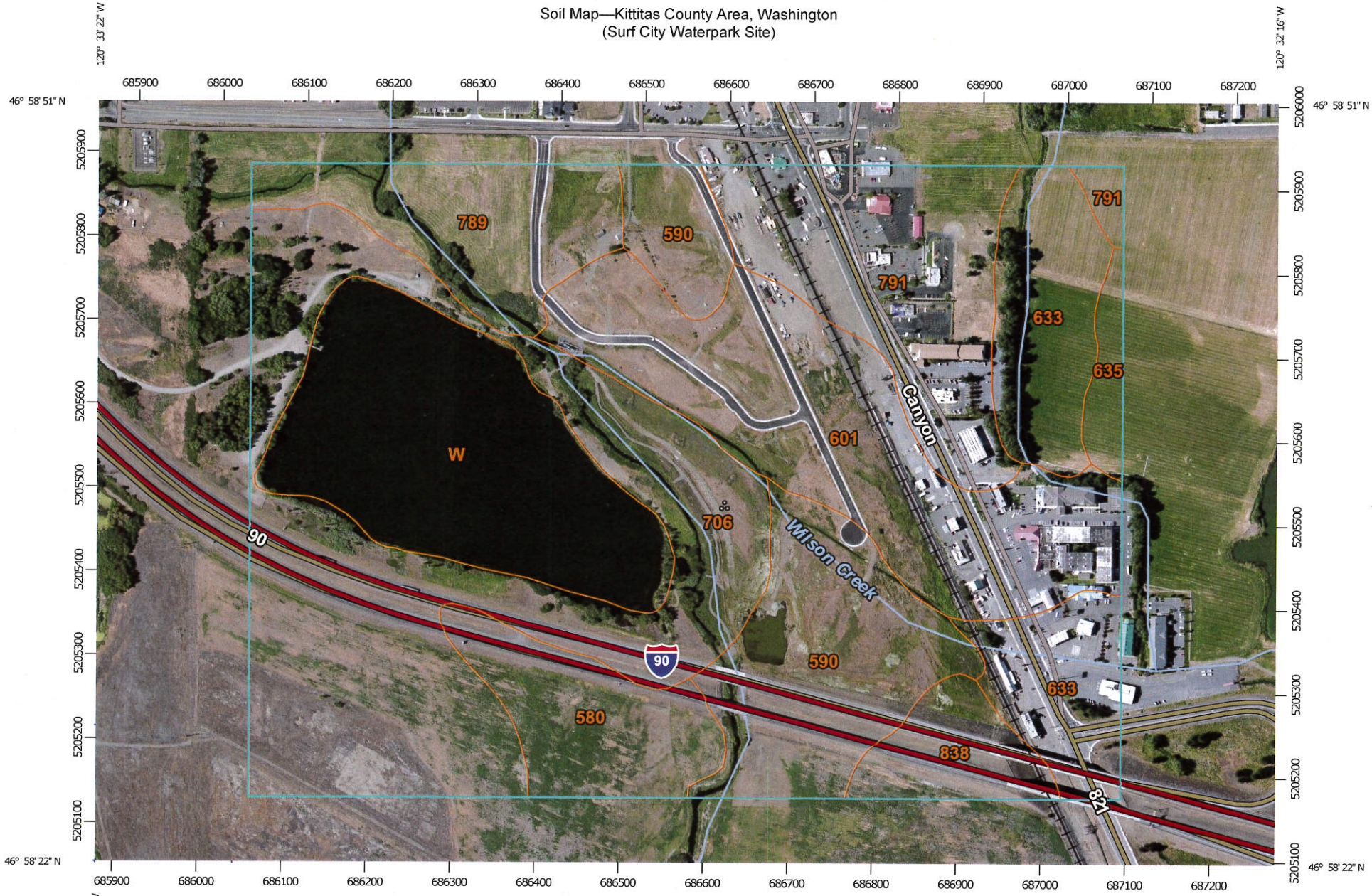
TEST PIT LOCATION MAP

PREPARED FOR

CANYON ROAD INVESTERS LLC

PLSA ENGINEERING & SURVEYING
JOB NO. 14276
APRIL 13, 2015

Soil Map—Kittitas County Area, Washington
(Surf City Waterpark Site)



Map Scale: 1:6,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

3/24/2015
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Attachment D

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 7, Sep 3, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 19, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kittitas County Area, Washington (WA637)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
580	Woldale clay loam, 0 to 2 percent slopes	10.5	5.4%
590	Brickmill-Nanum complex, 0 to 5 percent slopes	22.0	11.4%
601	Brickmill gravelly ashy loam, 0 to 2 percent slopes	29.3	15.1%
633	Nack ashy loam, 0 to 2 percent slopes	18.0	9.3%
635	Opnish ashy loam, 0 to 2 percent slopes	2.3	1.2%
706	Kayak gravelly ashy loam, 0 to 2 percent slopes	45.9	23.7%
789	Deedale clay loam, 0 to 2 percent slopes	12.6	6.5%
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	20.6	10.6%
838	Nosal ashy silt loam, 0 to 2 percent slopes	5.8	3.0%
W	Water	26.5	13.7%
Totals for Area of Interest		**193.5**	**100.0%**