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March 26, 2016

Geotechnical Site Assessment
Carbcom LLC Commercial Site
Site Address: 28xxx SR 410 E
Buckley, WA 98321
Parcel No's. 0619047003
LS&E Job No. 10537

For:
Carbcom Properties, LLC
10010 181st Avenue Ct. E.
Bonney Lake, WA 98391
253-431-6188

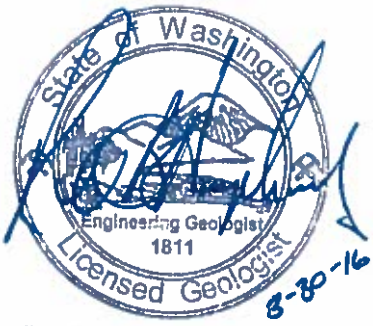

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Table of Contents

Introduction

It is the intent of this assessment to describe the surface and near surface soil conditions in order to provide geotechnical recommendations for design and development of the Carbcom LLC Commercial Site. We evaluated soil conditions throughout the site to make recommendations for storm water management and slab on grade. LeRoy Surveyors and Engineers (LS&E) visited the site on February 4, 2016 to observe and describe the surface and subsurface conditions observed on the approximate 1.16 acres. The parcel is located north of SR 410 E in the City of Buckley. This Assessment is intended to describe our findings and make preliminary recommendations for development of the project.

This report is for the exclusive use of Carbcom Properties, LLC, their consultants and contractors for the intended purpose described. Site observations and exploration methods applied and described in this evaluation represent the standard of practices for the industry. Sources of information cited are uniformly accepted resources when utilized in conjunction with field reconnaissance as confirmation. Opinions are based on using these standardized practices to adequately characterize the local surficial geology and general conditions at the site.

Information Sources

Soil identification and mapping for this assessment is supported by information from the Natural Resource Conservation Service (the Survey), soil profile observations in multiple and representative locations throughout the project site. Geologic information for this assessment is supported by information from the Department of Natural Resources, Division of Geology and Earth Resources (DNR) as represented on the Pierce County Geographical Information System (GIS). Our understanding of site geology is supported by the review of geologic mapping, published topographic and relief map layers, 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 and the DNR geologic map concur with our field findings.

Project Description

We reviewed the proposed Carbcom LLC Commercial Site and understand the applicant plans to build standard pole style buildings with metal siding and roof incorporating slab-on-grad with associated asphalt drive and parking areas.

The soil investigation will also evaluate the feasibility of on site infiltration.

The parcel is accessed from the north side of SR-410.

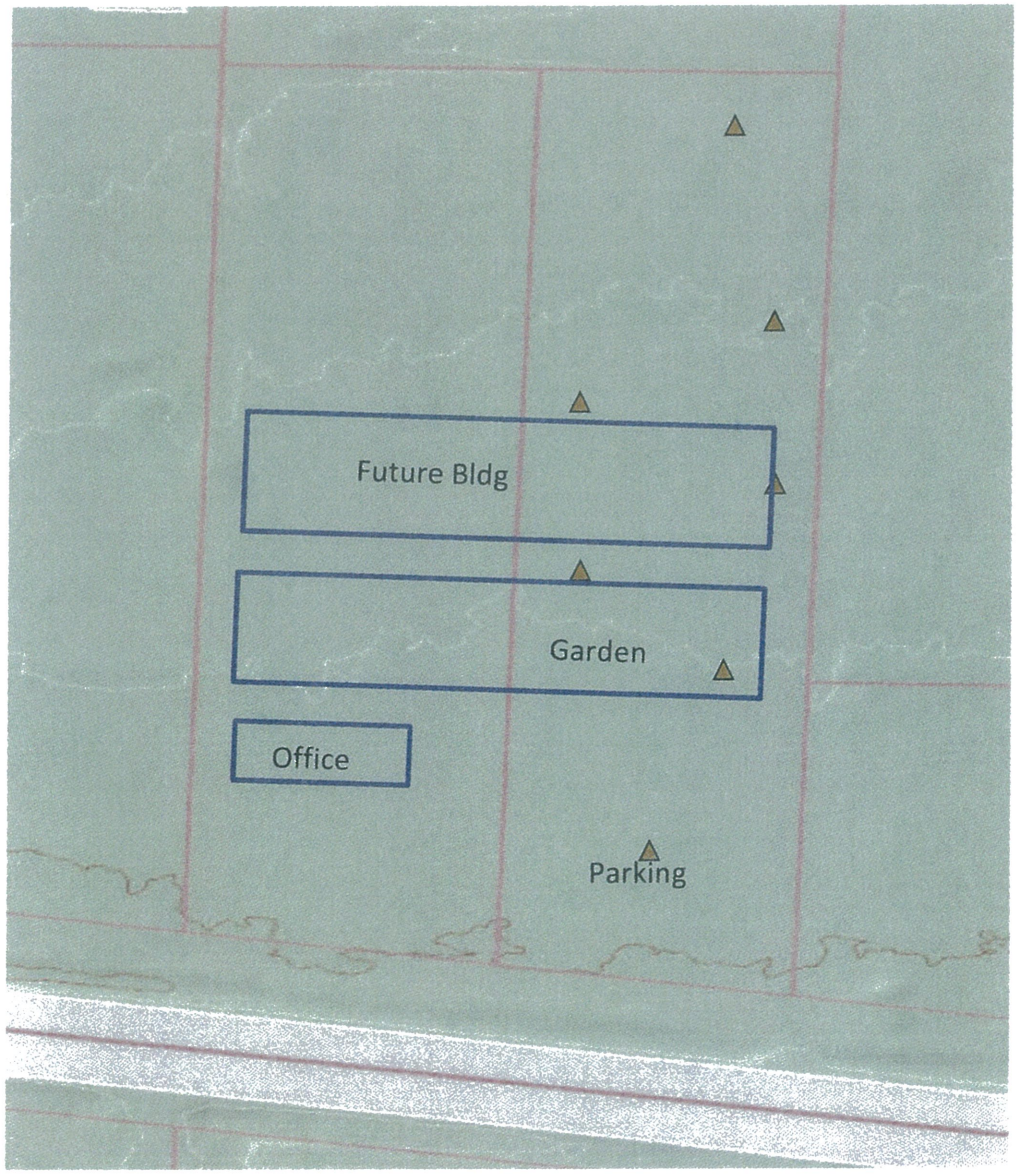
Site Description

The site is located on glacial uplands west of the Cascades and is dominated by more recent (5,600 yr) Oceola Mud Flow. The textural characteristics of this mudflow are a gravelly sandy loam. On this property, we observed soils typical of the Buckley gravelly sandy loam, as reported by the NRCS.

The site is bounded by SR 410 East along the southern boundary, vacant lots to the east and west and single family residences to the north. The project area consists of an open field with close cropped grass free of trees and brush.

Grades across the site are very gentle, approaching approximately 1.0 percent; 5 feet of vertical relief occurs in the north-south direction descending from the southern boundary of the site toward the north property line.

Figure 1 –Approximate Test Pits (NTS)



Taken from – Pierce County GIS

Soil

As discussed in the 'Published Information Accuracy' section above; on-site reconnaissance is necessary to verify soil conditions on specific properties. The Survey identifies the soil types over the property as Buckley gravelly silt loam. The Survey limits interpretation of soil to the upper five feet of the earth; therefore soil profiles found at greater depth are not mapped. Through our test pit observations we were able to confirm the soil condition throughout the project site.

Buckley gravelly silt loam: This nearly level soil is poorly drained. It formed in the Osceola mudflow under coniferous and deciduous trees. Slopes mainly range from zero to two percent, but in places the slope is as much as four to five percent. Elevation ranges from 500 to 800 feet. The mean annual precipitation is about 50 inches, mean annual air temperature is about 50 degrees F, and the frost-free season average about 190 days.

Included with this soil in mapping are as much as 10 percent moderately well drained Alderwood soils on knolls and very poorly drained soils that formed in the decaying plant remains in depressions.

In a typical profile the surface layer is very dark brown, medium acid loam about 10 inches thick. The upper part of the subsoil is brown, medium acid, prominently mottled sandy loam and gravelly sandy loam about 28 inches thick. The lower part of the subsoil, to a depth of more than 60 inches, is grayish brown, slightly acid gravelly sandy clay loam.

Permeability is slow. The available water capacity is high. Surface runoff is very slow, and there is no erosion hazard. Very few roots penetrate the lower part of the firm subsoil.

The poor drainage limits this soil to water-tolerant trees, such as western redcedar and western hemlock. Red alder grows well and is suited to intensive management. The high water table remains close to the surface throughout the rainy season. Logging roads constructed on this soil require additional gravel and suitable drainage; otherwise, the movement of equipment is restricted to the very dry season. Hand planting of Douglas-fir is difficult and the survival rate is very low because of the saturated soil condition.

Residential development on this soil is centered mainly in and around the town of Buckley. The primary limitation fro development is the high water table in winter and spring. Community sewerage systems must be used because septic tank drainage fields do not function properly during the rainy season.

Geology

The published (DNR) surficial geologic map and section of the Lake Tapps Quadrangle, Washington, 1956, describe the surficial geology as Osceola Mudflow. This suggests the geology would be characterized by an unsorted mixture of andesitic rock fragments in clayey sand matrix. This characterization generally agrees with the on-site reconnaissance and sub-surface exporation which reveal the surficial geology is characterized by gravelly sand with silt.

Site Development Considerations

General

Based on our field explorations, observations, research, and analyses, it is our opinion the area proposed for development is stable in its current setting. Our site development considerations are based, in part, on our interpretations and assumptions regarding site conditions; therefore, if variations in site conditions are observed at a later time, we may need to modify this report to reflect those changes.

Erosion Control

Before new construction begins, an appropriate erosion control system should be installed. This system should collect and filter all surface run off through either silt fencing or a series of properly placed and secured straw bales. If silt fencing is selected as a filter, this fencing fabric should meet the requirements of WSDOT Standard Specification 9-33.2 Table 3.

In addition, silt fencing should embed a minimum of 6 inches below existing grade.

If straw bailing is used as a filter, bales should be secured to the ground so that they will not shift under the weight of retained water. Regardless of the silt filter selected, an erosion control system requires occasional observation and maintenance. Specifically, holes in the filter and areas where the filter has shifted above ground surface should be replaced or repaired as soon as they are identified.

Temporary Drainage

We recommend intercepting and diverting any potential sources of surface or near-surface water within the construction zones before stripping begins. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and contractor's methods, final decisions regarding drainage systems are best made in the field at the time of construction. Based on our current understanding of the construction sketch, surface and subsurface conditions we anticipate silt fencing around the parimeter of the site should adequately contain surface runoff.

Clearing and Stripping

After surface and near-surface water sources have been controlled, the construction areas should be cleared and stripped of all duff and topsoil. Stripping is best performed during a period of dry weather. We anticipate 6 to 10 inches of black loam will be removed across the property.

Subgrade Compaction

Exposed subgrades for foundations and floors should be compacted to a firm, unyielding state before new concrete or fill soils are placed. Any localized zones of loose granular soils observed within a subgrade should be compacted to a density commensurate with the surrounding soils. In contrast, any organic, soft, or pumping soils observed within a subgrade should be over excavated and replaced with a suitable structural fill material.

Site Filling

Our conclusions regarding the reuse of on-site soils and our comments regarding wet-weather filling are presented subsequently. Regardless of soil type, all fill should be placed and

compacted according to our recommendations presented in the Structural Fill section of this letter. Specifically, building pad fill soil should be compacted to a uniform density of at least 95 percent (based on ASTM: D-1557).

It is our opinion that the Buckley gravelly silt loam is unsuitable as a structural fill due to the high content of silt in the soil matrix. The native soils should be removed from load bearing areas and used in non-structural areas, such as landscaping, or disposed of off-site. These soils may be used in parking and drive areas if the material is first dried and the moisture content can be controlled such that during material placement the compaction effort is able to achieve a uniform density of at least 95 percent (based on ASTM: D-1557). A suitable granular fill (pit run) from an approved source meeting the requirements of structural fill should then be imported and placed in such as manner that it conforms to the requirements in the Structural Fill section of this letter.

Mat Foundation

We understand based on conversations with representatives of Carbcom Properties, Inc. it is the intent of the owners to utilize a mat style slab-on-grad foundation for construction of the facilities. In our opinion a mat style slab foundation will provide adequate support if constructed according to manufacturer's recommendations.

Pole Buildings

Vertical support structures should be embedded per the manufacturer's recommendations. Excavations deeper than 30 inches can expect groundwater seepage into hole.

Bearing Subgrades: Slab-On-Grade foundations should bear on properly compacted structural fill, which bears on undisturbed native soils that have been stripped of surficial organic soils. In general, before foundation concrete is placed, any localized zones of loose soils exposed across the foundation 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.

Subgrade Observation: All foundation subgrades should consist of firm, unyielding, structural fill materials compacted to a density of at least 95 percent (based on ASTM: D-1557). Prior to placement of structural fill; the subgrade should be proof-rolled to identify areas of pumping subgrade which should then be compacted to a medium dense, or denser condition. Foundations should never be cast atop loose, soft, or frozen soil, slough, debris, existing uncontrolled fill, or surfaces covered by standing water.

Bearing Pressures: In our opinion, for static loading, foundations that bear on properly prepared subgrades can be designed for a maximum allowable soil bearing pressure of 1,500 pounds per square foot (psf). A one-third increase in allowable soil bearing capacity may be used for short-term loads created by seismic or wind related activities.

Floor Subbase: Structural fill subbases should be used under soil-supported slab-on-grade floors at the site. However, the final decision regarding the need for subbases should be based on actual subgrade conditions observed at the time of construction. If a subbase is needed, all subbase fill should be compacted to a density of at least 95 percent (based on ASTM: D-1557).

Drainage Systems

We offer the following recommendations and comments for drainage design and construction purposes.

Perimeter Drains: We recommend that buildings be encircled with a perimeter drain system to collect seepage water where shallow ground water is encountered. This drain should consist of a 4-inch-diameter perforated pipe within an envelope of pea gravel or washed rock, extending at least 6 inches on all sides of the pipe, and the gravel envelope should be wrapped with filter fabric to reduce the migration of fines from the surrounding soils. Ideally, the drain invert would be installed no more than 8 inches above the base of the perimeter foundations.

Discharge Considerations: If possible, all perimeter drains should discharge to a storm water control system or other suitable location by gravity flow.

Runoff Water: Roof-runoff and surface-runoff water should not discharge into the perimeter drain system. Instead, these sources should discharge into separate tight line pipes and be routed away from the building to a storm drain or other appropriate location.

Grading and Capping: Final site grades should slope downward away from the buildings so that runoff water will flow by gravity to suitable collection points, rather than ponding near the building. Ideally, the area surrounding the building would be capped with concrete, asphalt, or low-permeability (silty) soils to minimize or preclude surface-water infiltration.

Structural Fill

The term "structural fill" refers to any soil placed under, retaining walls, slab-on-grade floors, sidewalks, pavements, and other structures. Our comments, conclusions, and recommendations concerning structural fill are presented in the following paragraphs.

On-Site Soils:

We offer the following evaluation of on-site soils in relation to potential use as structural fill:

- Buckley Gravelly Silty Loam: As mentioned previously, due to the high silt content, the native soils are not considered suitable as structural fill material.

- Surficial Organic Soils: The duff and topsoil mantling the site are not suitable for use as structural fill under any circumstances, due to their high organic content. Consequently, these materials can be used only for non-structural purposes, such as in landscaping areas.

Materials: Typical structural fill materials include clean sand, gravel, pea gravel, washed rock, crushed rock, well-graded mixtures of sand and gravel (commonly called "gravel borrow" or "pit-run"), and miscellaneous mixtures of silt, sand, and gravel. Recycled asphalt, concrete, and glass, which are derived from pulverizing the parent materials, are also potentially useful as structural fill in certain applications. Soils used for structural fill should not contain any organic matter or debris, or any individual particles greater than about 6 inches in diameter.

Fill Placement: Clean sand, gravel, crushed rock, soil mixtures, and recycled materials should be placed in horizontal lifts not exceeding 8 inches in loose thickness, and each lift should be thoroughly compacted with a mechanical compactor.

Compaction Criteria: Using the Modified Proctor test (ASTM: D-1557) as a standard, we recommend that structural fill used for various on-site applications be compacted to the following minimum densities:

Fill Application	Minimum Compaction
Foundation subgrade and bearing pad	95 percent
Foundation backfill	90 percent
Slab-on-grade floor subgrade and subbase	95 percent

Subgrade Observation and Compaction Testing: Regardless of material or location, all structural fill should be placed over firm, unyielding subgrades prepared in accordance with the Site Preparation section of this report. The condition of all subgrades should be observed by geotechnical personnel before filling or construction begins. Also, fill soil compaction should be verified by means of in-place density tests performed during fill placement so that adequacy of soil compaction efforts may be evaluated as earthwork progresses.

Soil Moisture Considerations: The suitability of soils used for structural fill depends primarily on their grain-size distribution and moisture content when they are placed. As the "fines" content (that soil fraction passing the U.S. No. 200 Sieve) increases, soils become more sensitive to small changes in moisture content. Soils containing more than about 5 percent fines (by weight) cannot be consistently compacted to a firm, unyielding condition when the moisture content is more than 2 percentage points above or below optimum. For fill placement during wet-weather site work, we recommend using "clean" fill, which refers to soils that have a fines content of 5 percent or less (by weight) based on the soil fraction passing the U.S. No. 4 Sieve.

Storm Water Control

Due to the near surface water table and the poor infiltrative properties of the Buckley gravelly silty loam, infiltration into the native soils is not recommended. Porous paving of the drive and parking areas may be used only if free draining gravel is placed over the native soils to provide storage for stormwater runoff. In conjunction with porous paving, we recommend the use of a stormwater facility (storm pond) to capture and treat runoff prior to release to the natural drainage corridor.

Based on our understanding of the Osceola Mudflow deposition, and it's detrimental impacted to forested areas in the vicinity of the lahar, it is our opinion that modeling of the project site to reflect a forested condition prior to development does not accurately reflect the vegetative history of the site over the past 5,600 years. This region of the mudflow has not historically possessed a vegetative nature consistent with a forested condition since the time of deposition.

Closure

The conclusions and recommendations presented in this evaluation are based, in part, on our site explorations, research, existing mapping and reports at the time; therefore, variations in the subgrade conditions may be discovered. Future performance and integrity of site

development depends largely on proper initial site preparation, drainage, and construction procedures. Monitoring and testing by experienced geotechnical professional should be considered an integral part of the planning, development and construction process. LS&E is available to provide geotechnical monitoring of soils throughout construction.