

Hazen & Sawyer, P.C.
201 N.W. Corporate Boulevard
Suite 301
Boca Raton, Florida 33431

January 8, 2014

Attention: Mr. Eric Stanley, P.E.

Subject: **Estimated Geotechnical Properties and Parameters
For Subsurface Materials
310 Ansin Boulevard Site
Hallandale Beach, Florida
Project No. 34135005**

Gentlemen:

Our contract for the preliminary subsurface study of the above captioned site required that we provide geotechnical properties and parameters for the profile components that were encountered. As noted in our report dated December 24, 2013, the upper 8 to 24 feet of the stratigraphic profile is dominated by fill that consists of silty fine sands mixed with construction and demolition debris composed of concrete, milled lumber, carpet remnants and roots. Fill consisting of organic silty fine sand and peat with fragments of tree limbs was found beneath the more granular materials in two of the borings (i.e. B-1 between depths of 18 and 23 feet and B-2 between 12 and 23 feet). A naturally occurring formation of weakly to well cemented silty to sandy limestone underlies the fill materials and persists to the maximum depth of exploration (35 feet).

Because the fill materials are very heterogeneous in composition and were placed without benefit of engineering control in an unwatered excavation, it is difficult to predict their geotechnical properties and characteristics with any degree of certainty. This notwithstanding, we have estimated index and strength properties for the fill materials together with geotechnical parameters that can be used for characterization of the fill. These along with geotechnical considerations for the fill are presented hereafter.

Soil Classification

The sandy fill may be designated SM in the Unified Soil Classification System and the organic fine sand with peat OL-PT.



Index and Engineering Properties

<u>Material</u>	<u>Unit Weight (pcf)</u>		<u>Angle of Internal Friction (Degrees)</u>
	<u>Moist</u>	<u>Buoyant</u>	
Sandy fill with C&D debris	110	55	25
Organic fine sand and peat fill	----	35	17

Lateral Pressure Coefficients

<u>Material</u>	<u>At Rest</u>	<u>Lateral Pressure Coefficients</u>	
		<u>Active</u>	<u>Passive</u>
Sandy fill with C&D debris	0.58	0.40	2.46
Organic fine sand and peat fill	0.71	0.55	1.83

Slope Stability

Cut slopes within the sandy fill with C&D debris are expected to remain stable at an inclination of two horizontal to one vertical provided that they are not subjected to vibration or seepage forces. Flatter cut slopes on the order of four horizontal to one vertical will be needed to preserve stability if the slopes sustain groundwater seepage .

We do not envision a situation where the fill materials would be used to create embankments. Consequently we offer no slope recommendations for fills.

OHSA Requirements For Temporary Excavations

Sandy fill with C&D debris above the water table may be considered a Type B material per the OHSA classification system. These same materials should be classified as Type C when submerged or experiencing groundwater seepage.

Subgrade Moduli

The fill materials that cover the site are too weak and compressible to offer safe support to shallow foundations and slab-on-grade systems. Therefore a subgrade modulus for design of such features is not applicable.

With regard to pavements, the surficial components of the fill are expected to afford a subgrade modulus of 150 pounds per cubic inch when compacted to 98 percent of the AASHTO T-180 maximum dry density. Construction of concrete slab-on-grade systems and rigid pavements upon the fill is not recommended owing to concerns for distress arising from long term settlement. Paving should be of the flexible type (i.e. asphalt concrete over granular base course) due to its ability to respond to modest ground subsidence without cracking. Fill materials densified to 98 percent relative compaction are expected to provide a Limerock Bearing Ratio of 15.

____oOo____

We trust that the information presented herein is sufficient for your needs. Should it require any clarification or amplification, please feel free to contact Mr. Thomas J. Tepper, P.E. at 954-730-9114.

Very truly yours,
DUNKELBERGER ENGINEERING & TESTING
A TERRACON COMPANY

Juan Ramirez by TT

Juan Ramirez, P.E.
Project Engineer
FL. Registration No. 76173

