Subsurface Soil Exploration
Proposed Retention Ponds
8.5-Acre Undeveloped Site
Brevard County, Florida

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Geotechnical, Environmental and
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January 12, 2007
File No. 06-5278

Brevard Land Development, LLC
6511 Arlington Lane
Parkland, Florida 33067

Attention: Mr. Art Franke

Subject: Subsurface Soil Exploration
Proposed Retention Ponds
8.5-Acre Undeveloped Site
Brevard County, Florida

Dear Mr. Franke:

As requested, we have completed a subsurface soil exploration for the subject project. The purpose of performing this exploration was to obtain data relative to soil and groundwater conditions within the proposed stormwater retention ponds at the above referenced site. In addition, we have estimated the normal seasonal high groundwater level at the boring locations and provided the results of soil permeability testing at four test pit locations on the site.

This report documents our findings and presents our engineering conclusions.

SITE LOCATION AND SITE DESCRIPTION

The subject site is located just west of Barna Avenue in Titusville, Brevard County, Florida (Section 16, Township 22 S, Range 35 E). The approximate site location is shown superimposed on a copy of the Titusville, Florida USGS quadrangle map included as the Site Location Map, Figure 1. The areas for the proposed dry retention ponds are currently grassed and lightly wooded.

REVIEW OF SOIL SURVEY MAPS

Based on the 1974 Soil Survey of Brevard County, Florida, as prepared by the U.S. Department of Agriculture Soil Conservation Service, the predominant soil types at the site appear to be "Astutula-Urban land complex", "Canaveral Urban land complex", and "Myakka-Urban land complex". A description of these soil types and their seasonal groundwater conditions, as obtained from the Soil Survey, is presented below:

Astatula-Urban land complex (At):

"Astatula-Urban land complex" is a nearly level to gently sloping soil that was formerly Astatula fine sand, dark surface, but now much of it has been altered for use as building sites or covered with pavement or buildings. About 45 to 65 percent of the land area is Astatula fine sand, dark surface.

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The rest is mostly Astatula fine sand, dark surface, but it has been reworked and reshaped. About 20 to 45 percent of the land area is covered with houses, streets, driveways, buildings, parking lots, and other related structures. Most areas that are not covered with pavement and buildings are in lawns, vacant lots, or playgrounds and generally are so small and intermixed with Urban land that it is impractical to map them separately.

Canaveral, Urban land complex (Cc):

"Canaveral-Urban land complex" consists of Canaveral sand and Urban land. About 20 to 40 percent of the acreage is covered with houses, streets, driveways, buildings, parking lots, and other construction related to urban use. About 70 percent of the area not covered by buildings and pavement is a mixture of sand and shells that have been dredged from the Indian and Banana Rivers, deposited on tidal marshes and swamps, and then leveled and smoothed. Soils in these areas have properties similar enough to Canaveral soils to be called Canaveral sand. Shells make up 10 to 80 percent of the fill material. The percentage of sand and shells varies from place to place. The sand is fine to coarse.

Most areas of this complex are artificially drained. In wet seasons the water table is between depths of 40 and 60 inches, and the rest of the year it is below a depth of 60 inches. The fill material ranges from about 12 to 72 inches or more in thickness but averages about 45 inches.

Myakka-Urban land complex (Mu):

"Myakka-Urban land complex" is 40 to 55 percent Myakka soil, 25 percent a Myakka soil that has been altered for use as building sites or covered by streets and buildings, and 20 to 45 percent Urban land or areas covered by houses, streets, driveways, buildings, parking lots, and other related construction. Most areas have had permanent drainage system installed. In these areas the water table generally is between depths of about 10 and more than 40 inches.

FIELD EXPLORATION PROGRAM

The field exploration program consisted of performing seven auger borings and four test pits in the proposed retention pond areas. The locations of the soil borings and test pit are schematically illustrated on the Boring Location Plan included as Figure 2. These locations were determined in the field by tape measurements from existing property boundaries/site features and other points of reference, and should be considered accurate only to the degree implied by the method of measurement used.

The auger borings, AB-1 through AB-7 on Figure 2, were drilled using 4-inch diameter, truck-mounted continuous flight auger to a depth of 15 feet below ground surface. A summary of this field procedure is included in the Appendix. Representative soil samples were recovered from the auger borings and returned to our laboratory for further visual review and classification. The groundwater level at each of the boring locations was measured upon completion of drilling.

Test Pits TP-1 through TP-4 were excavated by hand adjacent to Borings AB-1, AB-4, AB-5 and AB-7, respectively, to a depth of 2.5 feet below ground surface. A Shelby tube sample of soil was obtained from the bottom of the test pits in a vertical orientation at a depth of 2.5 to 3.0 feet below ground surface. The samples were returned to our laboratory for permeability testing.

LABORATORY PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual classification. The soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488). The resulting soil descriptions are shown on the Soil Boring Profiles presented on Figure 3.

A laboratory constant-head permeability test was conducted on the Shelby tube sample obtained from Test Pits TP-1 through TP-4. These samples were obtained in a vertical orientation from a depth of 2.5 to 3.0 feet below ground surface. The results of the permeability testing are tabulated in the "Soil Permeability" section of this report.

GENERAL SUBSURFACE CONDITIONS

General Soil Profile

The results of the field exploration and laboratory programs are graphically summarized on the Soil Boring Profiles presented on Figure 3. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory visual classification of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

Generally, the soils encountered in the borings consisted of fine sand and fine sand with silt (Unified Soil Classification SP and SP/SM, respectively) to the termination depth of the borings (15 feet below ground surface). The above soil profile is in general terms only; please refer to Figure 3 for soil profile details.

Measured Groundwater Level

The groundwater level was measured in the boreholes on the day drilled after stabilization of the downhole water level. As shown on the Soil Boring Profiles on Figure 3, the measured groundwater levels were encountered in Borings AB-1 through AB-7 at depths ranging from 5.0 to 5.6 feet below the ground surface on the date drilled. Fluctuations in groundwater levels should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted.

NORMAL SEASONAL HIGH GROUNDWATER LEVEL

The normal seasonal high groundwater level each year is the level in the August-September period at the end of the rainy season during a year of normal (average) rainfall. The water table elevations associated with a flood would be much higher than the normal seasonal high groundwater level.

The seasonal high groundwater level is affected by a number of factors. The drainage characteristics of the soils, the land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high groundwater level.

Based on our interpretation of the site conditions using our boring logs, we estimate the normal seasonal high groundwater level at the locations of the borings conducted on the site to be approximately 1½ feet higher than the groundwater levels measured at the time of our field exploration.

DISCUSSION RELATIVE TO RETENTION PONDS

We understand that four dry stormwater retention ponds are proposed for the site. For this study, the shallow soil stratigraphy and groundwater levels in the proposed pond areas were explored by conducting auger borings to a depth of 15 feet.

Soil Profile and Soil Permeabiity

The fine sand and fine sand with silt (Soil Strata Nos. 1 and 2 on Figure 3) are generally considered to be relatively permeable. The results of the laboratory constant-head permeability tests are presented in the following table.

Test Location	Test Depth (feet)	Measured Permeability (inches/hour)
TP-1/AB-1	2.5 – 3	5
TP-2/AB-4	2.5 – 3	8
TP-3/AB-5	2.5 – 3	18
TP-4/AB-7	2.5 - 3	20

It is noted that a suitable factor of safety should be used with these values. For the SP type of soils tested, a transformation ratio of 1:1 is appropriate (ie; the estimated ratio of horizontal to vertical permeability).

Other Retention Pond Considerations

For dry bottom retention ponds, pond performance will be significantly influenced by the soil permeability and the vertical separation between the pond bottom and the seasonal high groundwater level. The groundwater table level was encountered in Borings AB-1 through AB-7 at depths ranging from 5.0 to 5.6 feet below ground surface. As mentioned earlier, the normal seasonal high groundwater table level at the locations of the borings conducted at the site is anticipated to be approximately 1½ feet above the levels encountered during this exploration.

Ardaman & Associates, Inc. would be pleased to assist in evaluating the design exfiltration rates and/or groundwater baseflow as pond geometry and stormwater volume requirements become available.

CLOSURE

The information submitted herein is based upon the data obtained from the soil borings presented on Figures 2 and 3. This report does not reflect any variations which may occur adjacent to or between the borings and test pits. The nature and extent of the variations adjacent to or between the borings and test pits may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report after performing on-site observations during the construction period and noting the characteristics of the variations.

This report has been prepared for the exclusive use of Brevard Land Development, LLC in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made. In the event any changes occur in the design, nature, or location of the proposed ponds, we should review the applicability of conclusions and recommendations in this report.

It is noted that this report does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface.

We are pleased to be of assistance to you on this project. When we may be of further service to you or should you have any questions, please contact us.

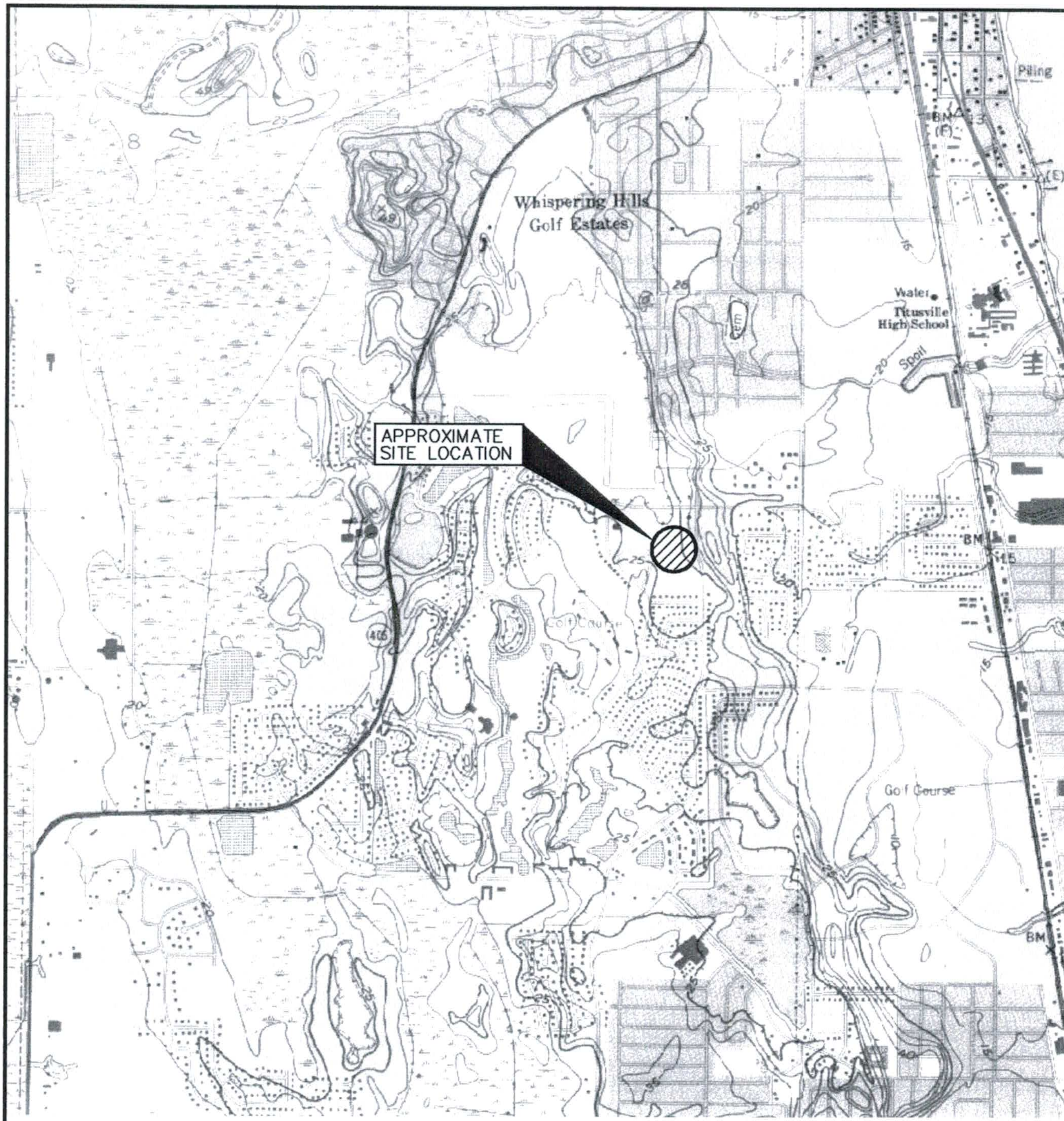
Very truly yours,

ARDAMAN & ASSOCIATES, INC.

Keith A. Ellis
Assistant Project Engineer

Jason P. Manning, P.E.
Branch Manager
Florida Registration No. 53265

KAE/JPM/msh
06-5278 SSE (REPORTS #Z2)



SECTION 16
TOWNSHIP 22 SOUTH
RANGE 35 EAST

OBTAINED FROM U.S.G.S. QUAD MAP: TITUSVILLE, FLORIDA

N

0 1000 2000

SCALE: — 1"=2000'

QUADRANGLE LOCATION

SITE LOCATION MAP

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SUBSURFACE SOIL EXPLORATION
8.5–ACRE UNDEVELOPED SITE
BREVARD COUNTY, FLORIDA

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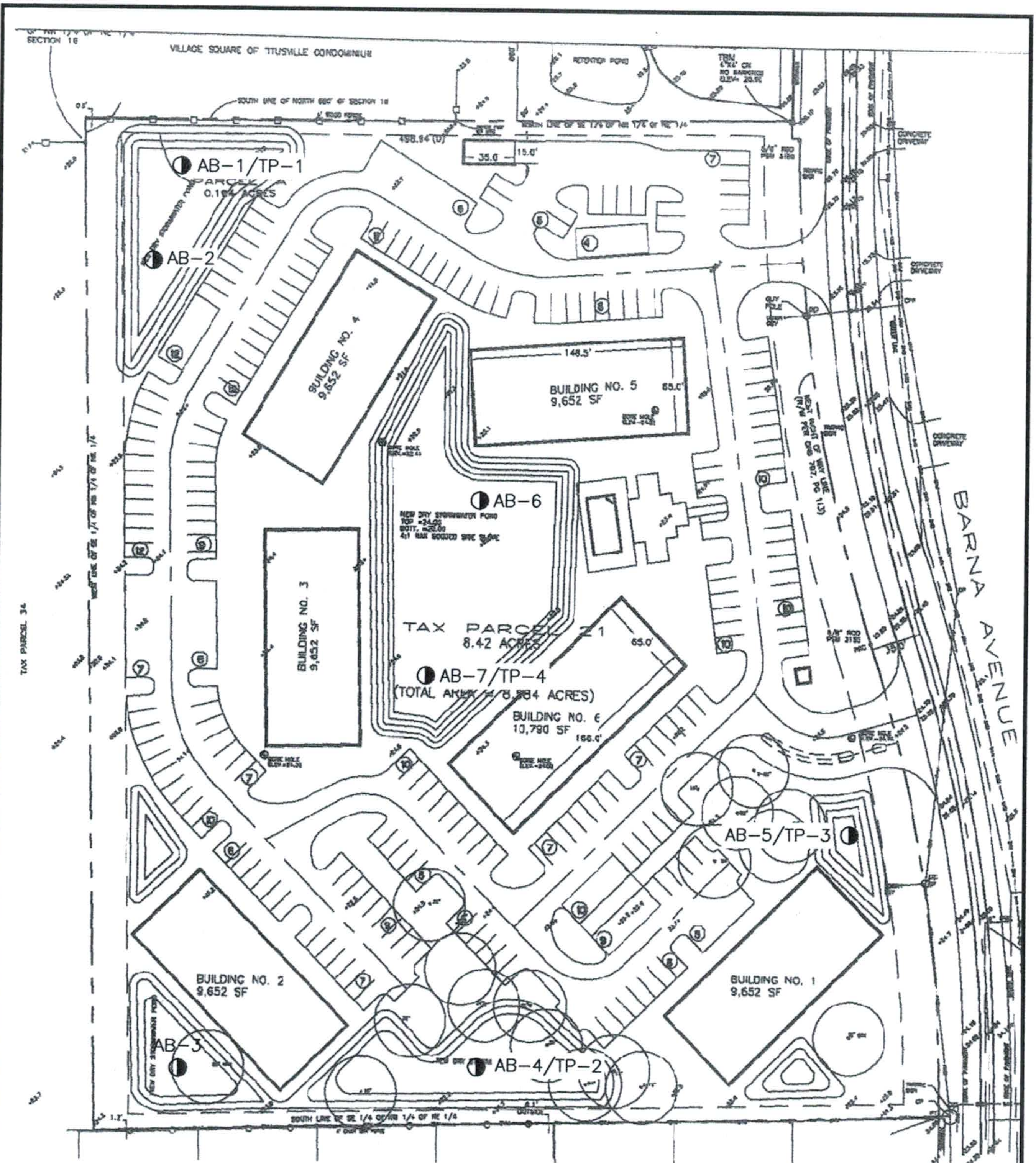

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SCALE: — 1"=100'

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LEGEND

◐ AB AUGER BORING LOCATION

TP TEST PIT LOCATION

BORING LOCATION PLAN

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SUBSURFACE SOIL EXPLORATION
8.5-ACRE UNDEVELOPED SITE
BREVARD COUNTY, FLORIDA

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APPENDIX

Auger Boring Procedures

AUGER BORINGS

Auger borings are used when a relatively large, continuous sampling of soil strata close to ground surface is desired. A 4-inch diameter, continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5-foot sections. It is powered by the rotation action of the Kelly bar of a rotary drill rig. The sample so obtained, is classified and representative samples put in bags or jars and brought back to the laboratory for classification testing.