YOVAISH
ENGINEERING SERVICES, LLC

Consulting Engineers in the Earth Sciences, Geotechnology, Hydrogeology and Construction Materials Testing

April 1, 2022

June Engineering Consultants, Inc.
132 West Plant Street, Suite 200
Winter Garden, Florida 34777

Attention: Mr. Jeff Sedloff

Subject: **Seepage Analyses, Proposed Pond SWM-1, Howey Self Storage Site, North Side of State Road 19, East of South Florida Avenue, Howey-in-the-Hills, Florida (PN 22-E0001.103)**

Dear Mr. Sedloff:

As requested, we have reviewed the request for additional information (RAI) presented by the St. Johns River Water Management District (SJRWMD) staff in their correspondence dated August 13, 2021. The following report presents the results our seepage analyses required as input to permitting the proposed pond and geotechnical related responses to the RAI. In addition, recommendations for the clearing, filling, and grading of the proposed pond areas are provided herein.

1.0 BACKGROUND

As you are aware, the subsoil and groundwater level conditions within the subject site were previously investigated by Yovaish Engineering Sciences, Inc. with the results presented in the following reports entitled:

- "*Subsurface Soil and Groundwater Level Investigation, Proposed Roadway and Retention Areas, The Howey-In-The-Hills Subdivision, Lake County, Florida (PN 06-E1472.02)),*" dated July 14, 2017.

- "*Geotechnical Responses to St. Johns River Water Management District Staff's Comments, The Reserve at Howey in the Hills, Lake County, Florida (PN 06-E1472.02B)(SJRWMD Application No: 4-069-18971-4),*" dated January 17, 2008.

As discussed above and as additional input to our evaluations presented herein, we reviewed the SJRWMD correspondence dated August 13, 2021. Specifically, the following staff comment:

#8: *The stormwater report performed by Bowyer-Singleton & Associates, Inc. and the seepage analysis performed by Yovaish Engineering Sciences, Inc. both appear to be out of date. In demonstrating that the stormwater system will provide adequate water quality and quantity treatments, please choose one of the following options:*

a. Please provide a recent geotechnical report with at least one boring conducted in the footprint of each pond.

b. Provide a signed and sealed letter from a geotechnical engineer certifying that the seasonal high groundwater table elevation and seepage analysis are still valid.

Based upon review of historic aerial photographs since completing the initial field work, the noted site conditions by the principal investigator and author of this report, the site hyrdrogeologic conditions are unchanged. Furthermore, the site use and conditions have not changed. As such, the subsoil and groundwater level conditions from our previous investigations are unchanged and still valid.

The proposed pond location, pertinent boring locations and results of the same from our previous investigation(s) are presented on the Location Plan in on Figure 1. The results of our field and laboratory investigations (to date) and the stormwater runoff information prepared by June Engineering, Inc., form the basis for our evaluations presented herein.

2.0 EVALUATIONS AND SEEPAGE ANALYSES

2.1 Pond Description

Based upon plans prepared by you, we understand that the stormwater management system will include one (1) dry bottom retention pond (Pond SWM-1). The approximate pond location and configuration are depicted on the Location Plan on Figure 1. Based upon information provided to us, the dry bottom pond will be designed with the elevations and design parameters outlined in Table 1, below.

Table 1. Proposed Dry Pond SWM-1 Engineering Parameters.

Bottom Elevation (ft)	Retention Volume Provided (ac-ft)
+83.5	1.137

2.2 Seepage Analysis

2.2.1 Effective Aquifer: As input to our seepage analysis, we have assumed that the pond bottom will be over-excavated to elevation of +78.5 feet. It is our opinion that the horizontal extent of the low permeability soil below each pond area presented above may be best determined at the time of construction and when the pond areas have been staked. For preliminary planning purposes, we have estimated that the entire bottom area will be undercut. We recommend that Yovaish Engineering Services, LLC., be retained to inspect the over-excavation procedures in order to provide proper documentation of the earthwork activities. The recommended pond undercutting procedures are as follows:

1. The existing vegetation and topsoil layers (where encountered) should be removed in their entirety from within the proposed pond areas. The unsuitable material generated during the earthwork activities shall be disposed of as directed by the owner.

- Upon completion of the pond clearing and stripping the shall be excavated and under cut to elevation +78.5 feet (5.0 feet below the design bottom elevation +83.5 feet). As part of planning the excavation work, we recommend that the upper light colored permeable fine sands (Strata 2 and 3) be stockpiled separately. The backfill soils should comprise permeable fine sands as specified below.

- Upon approval by the Geotechnical Engineer, the excavated areas shall be scarified and then backfilled with clean fine sands with the following engineering properties:

    - minimum permeability equal to 30 feet per day, when compacted to minimum density equivalent to 92 percent of the soil's Modified Proctor Density Value (ASTM D-1557)

    - maximum fines content (percent passing the U.S. No. 200 sieve) of 4 percent. The on-site fine sands comprising Strata 2 and 3 should be suitable for use as backfill.

- No burying of on-site unsuitable soils, strippings or debris is permitted within or beneath the pond bottom or side slopes

In order to maintain the necessary infiltration capacity, the soils below the retention pond areas shall not be over compacted/densified by the construction equipment. As such and upon completion of each pond grading operation, the vertical permeability of the fine sands below the pond area should be checked (minimum 1 location). If the measured permeability is less than 30 feet per day, the affected pond bottom area should be scarified using a root rake and/or similar equipment (to loosen the soils to a minimum depth of 2 feet). Thereafter, the pond area may be re-graded using light weight rubber tire and/or low contact pressure trac-mounted equipment and the permeability of the loosened soils retested.

Provided that the affected ponds are constructed as described above, it is our opinion that the effective aquifer below the ponds may be modeled as a single layered system. As discussed previously. the borings utilized to evaluate the aquifer parameters are presented in Appendix A. A discussion of our seepage analysis methodology is provided below.

2.3 Seepage Analysis Methodology and Results

The pond configuration, the idealized shallow water table aquifer parameters, and the design parameters presented in Table 1, were input to the computer program "PONDS" in order to evaluate the time required to dissipate the respecitve retention volumes. The computer program "PONDS" was written by Mr. Devo Seereeram, Ph.D., and is on the St. Johns River Water Management District's list of accepted methodologies for analysis.

The required input, computer output results, and recovery time for the required retention volume are presented on Computer Output A. Based upon the seepage analyses results, the pond will recover their required retention volumes in less than 1 day.

3.0 CLOSURE

We appreciate the opportunity to be of service on this project and trust that the enclosed data and evaluation are sufficient for your needs. If you have any questions concerning the contents of this report, please do not hesitate to contact our office.

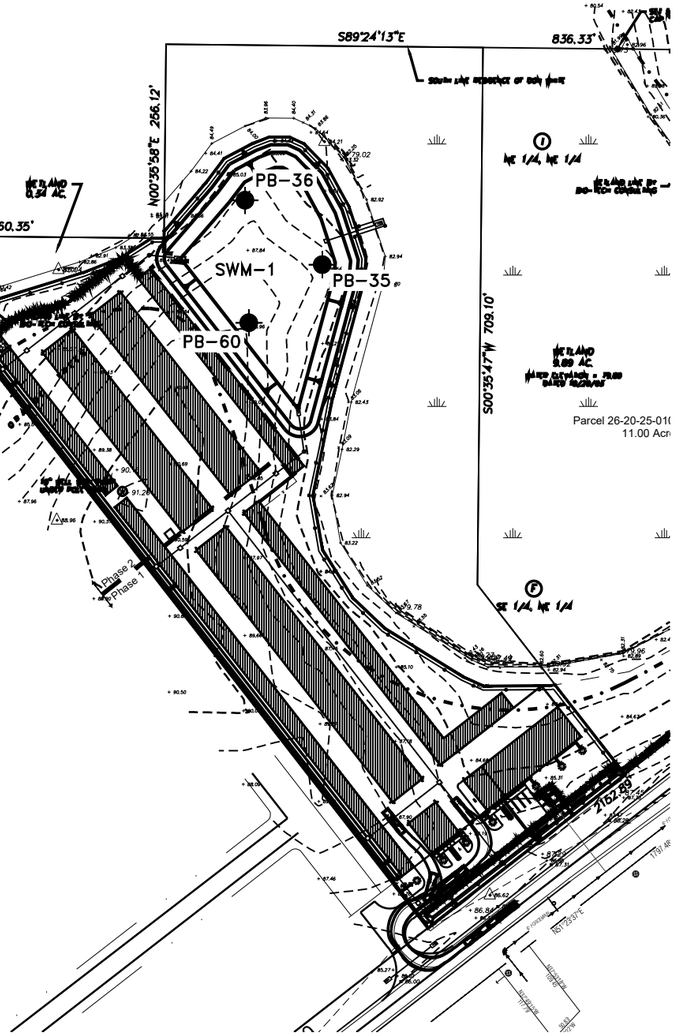
Sincerely,

Yovaish Engineering Services, LLC.
Certificate of Authorization No. 30214

4-2-2022

Douglas J. Yovaish, P.E.
Principal Engineer
Florida Registration No. 52247

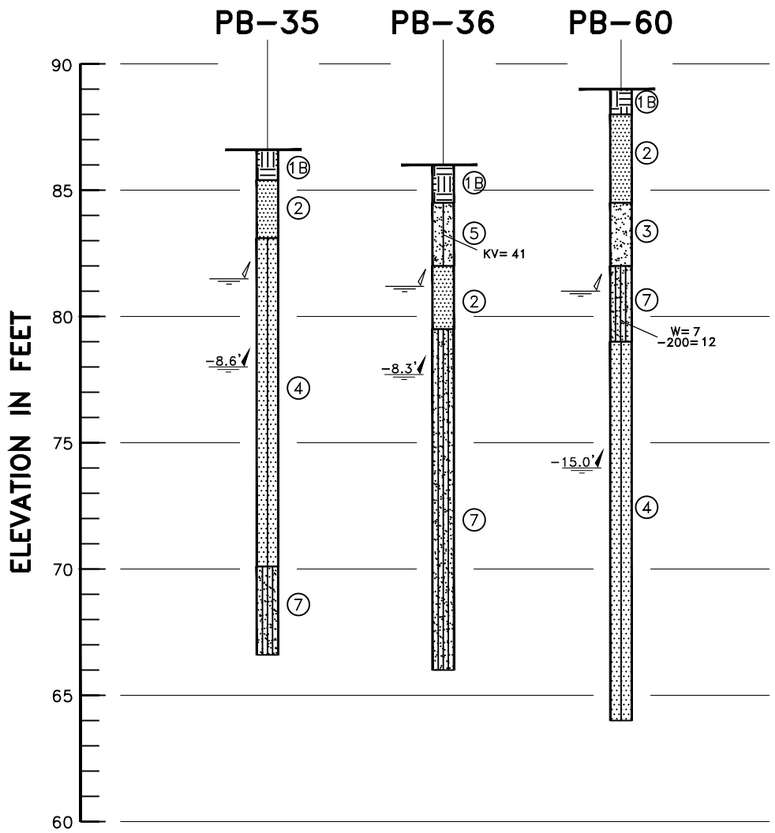
Attachments: Figure 1 - Location Plan and Soil Profiles
Computer Output A - Ponds Seepage Analyses Results



LOCATION PLAN

0 50 100 200

Scale in Feet



SOIL PROFILES

LEGEND

(1A)	BROWN TO DARK BROWN FINE SAND WITH OCCASIONAL SMALL ROOTS (TILLED TOPSOIL)
(1B)	DARK GRAYISH BROWN TO DARK GRAY FINE SAND WITH SMALL ROOTS (TILLED TOPSOIL)
(2)	GRAYISH BROWN TO BROWN MEDIUM SAND (SP)
(3)	LIGHT ORANGISH BROWN TO LIGHT BROWN FINE SAND (SP)
(4)	LIGHT TO VERY LIGHT GRAYISH BROWN MEDIUM SAND TO SLIGHTLY SILTY MEDIUM SAND (SP)(SP-SM)
(5)	DARK REDDISH BROWN TO REDDISH BROWN MEDIUM SAND TO SLIGHTLY SILTY MEDIUM SAND (SP)(SP-SM)
(5A)	VERY DARK REDDISH BROWN SLIGHTLY SILTY FINE SAND WITH SOME ORGANICS (SP)(SP-SM)
(6)	DARK REDDISH BROWN TO REDDISH BROWN SILTY MEDIUM SAND (SM)
(7)	GRAYISH BROWN TO LIGHT GRAYISH BROWN SILTY TO SLIGHTLY CLAYEY MEDIUM SAND (SM)(SM-SC)
(SP)	UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
-4.2'	DEPTH TO GROUNDWATER LEVEL (MEASURED 4/07)
	ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL
W	NATURAL MOISTURE CONTENT IN PERCENT
-200	PERCENT FINES PASSING U.S. NO. 200 SIEVE
OC	ORGANIC CONTENT IN PERCENT DRY WEIGHT
KV	COEFFICIENT OF VERTICAL PERMEABILITY (FEET/DAY)

LEGEND

AUGER BORING LOCATION

LOC PLAN & SOIL PROFILES

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SEEPAGE ANALYSES

PROPOSED POND SWM-1
HOWEY SELF STORAGE
HOWEY IN THE HILLS, FLORIDA

DRAWN :	SCALE :	JOB NO. :
RNR	NOTED	22-E0001.103
APPROVED :	DATE :	FIGURE:
DJY	4/1/2022	1

PONDS Version 3.3.0278
Retention Pond Recovery - Refined Method

Devo Seereeram, Ph.D., P.E.

Project Data

Project Name:	Howey Self Storage
Simulation Description:	Pond SWM-1
Project Number:	22-E0001.103
Engineer :	RNR
Supervising Engineer:	DJY
Date:	04-01-2022

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	78.00
Water Table Elevation, [WT] (ft datum):	81.00
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	20.00
Fillable Porosity, [n] (%):	30.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	20.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²):	42000.0

Geometry Data

Equivalent Pond Length, [L] (ft):	270.0
Equivalent Pond Width, [W] (ft):	200.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
83.50	38332.8
84.50	41817.6
85.50	44866.8
86.50	48351.6
87.50	52272.0

PONDS Version 3.3.0278
Retention Pond Recovery - Refined Method
Copyright 2012
Devo Seereeram, Ph.D., P.E.

Scenario Input Data

Scenario 1 :: POND SWM-1 Retention Volume Provided (1.137 ac-ft)

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft^3) 49528

Initial ground water level (ft datum) 81.00 (default)

Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.000
0.250	2.500
0.500	3.000
1.000	3.500
1.500	4.000

PONDS Version 3.3.0278
Retention Pond Recovery - Refined Method
Copyright 2012
Devo Seereeram, Ph.D., P.E.

Summary of Results *:: Scenario 1 :: POND SWM-1 Retention Volume Provided (1.137 ac-ft)*

	Time (hours)	Stage (ft datum)	Rate (ft^3/s)	Volume (ft^3)
Stage				
Minimum	0.000	81.00		
Maximum	0.002	84.72		
Inflow				
Rate - Maximum - Positive	0.002		8254.6670	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	0.002			49528.0
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	96.000			49528.0
Infiltration				
Rate - Maximum - Positive	0.002		9.7184	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	36.000			49528.0
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	96.000			49528.0
Combined Discharge				
Rate - Maximum - Positive	None		None	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	None			None
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	96.000			0.0
Discharge Structure 1 - inactive				
Rate - Maximum - Positive	disabled		disabled	
Rate - Maximum - Negative	disabled		disabled	
Cumulative Volume - Maximum Positive	disabled			disabled
Cumulative Volume - Maximum Negative	disabled			disabled
Cumulative Volume - End of Simulation	disabled			disabled
Discharge Structure 2 - inactive				
Rate - Maximum - Positive	disabled		disabled	
Rate - Maximum - Negative	disabled		disabled	
Cumulative Volume - Maximum Positive	disabled			disabled
Cumulative Volume - Maximum Negative	disabled			disabled
Cumulative Volume - End of Simulation	disabled			disabled
Discharge Structure 3 - inactive				
Rate - Maximum - Positive	disabled		disabled	
Rate - Maximum - Negative	disabled		disabled	
Cumulative Volume - Maximum Positive	disabled			disabled
Cumulative Volume - Maximum Negative	disabled			disabled
Cumulative Volume - End of Simulation	disabled			disabled
Pollution Abatement:				
36 Hour Stage and Infiltration Volume	36.000	83.48		49528.0
72 Hour Stage and Infiltration Volume	72.000	83.14		49528.0