August 3, 2018

BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA

Y18-784-EB / ADDENDUM # 1
BONNIE BROOK PUMP STATION RETROFIT

Bid Opening Date: August 9, 2018

This addendum is hereby incorporated into the bid documents of the project referenced above. The following items are clarifications, corrections, additions, deletions and/or revisions to and shall take precedence over the original documents. Underlining indicates additions, deletions are indicated by ~~strikethrough.~~

A. The following information is provided to answer questions received from prospective bidders:

1. **Question:** Pay Item 110-1 – Clearing and Grubbing: This pay item doesn't seem applicable for this project as we will only be working in the pump well. Please provide more detail on this pay item. **Answer:** With regards to clearing and grubbing: the pay item footnote says "110-1 - INCLUDES REMOVAL OF ANY EXISTING FACILITIES TO SUPPORT THE PROPOSED IMPROVEMENTS". County's intention is that this pay item would handle any such needs by the contractor in preparing the site for the work.

2. **Question:** Pay Item 900-12 – Pump Station Dewatering: Please confirm if the existing concrete retainage structure has been designed to be empty. In other words, will "dewatering" around the retention structure be required so that ground water pressures do not enable to the retention area to float? **Answer:** The Bonnie Brook pump station was designed to resist buoyancy forces. A buoyancy analysis was completed as part of the original design by BPC/TEK Joint Venture (November 15, 2011). The relevant pages from said report are attached to this Addendum. A seepage analysis was also completed as part of the design.

3. **Question:** Please confirm the "Pump Station Dewatering" is for "bypass" in lieu of "dewatering" the pump station. In other words, it is assumed the retention area will have to be drained to perform the work, however the retention area will have to remain in service during the course of the work. **Answer:** The intent of this pay item is to dewater (remove) water from the basin to allow work to commence as well as maintain the work area as needed to complete the work by providing for bypass of any stormwater from the inflow pipe to an acceptable downstream discharge location in the nearby canal.

4. **Question:** If this "bypassing" is required, please provide the GPM and head pressures required. Also, will these bypass pumps have to be fuel driven or can electrical pumps

be hooked up to the existing electrical service. If we can hook up to the existing service, will the County pay for the electrical use? **Answer:** With regard to flows incoming to the concrete basin, based on hydrologic and hydraulic modeling of the upstream drainage system (from the Bonnie Brook Watershed Management Plan efforts), the following peak flows by design storm were estimated:

5. Mean Annual (2.33 year) / 24 hour storm – 20.52 cfs
6. 10 year storm / 24 hour storm – 29.75 cfs
7. 25 year / 24 hour storm – 30.62 cfs
8. 100 year / 24 hour storm – 30.74 cfs
9. 100 year / 72 hour storm – 32.51 cfs

With regard to fuel versus electrical pumps and service hook-ups, that would be based on County preference.

5. **Question:** It is assumed the stormwater is flowing from the street to the retention area then pumped into the canal. What size pipe opening is going into the basin? **Answer:** The size of the inflow pipe to the concrete basin is 36" RCP based on survey.

B. All other terms and conditions of the IFB remain the same.

C. The Proposer shall acknowledge receipt of this addendum by completing the applicable section in the solicitation or by completion of the acknowledgement information on the addendum. Either form of acknowledgement must be completed and returned not later than the date and time for receipt of the proposal.

Receipt acknowledged by:

______________________________ __________________________

Authorized Signature Date Signed

____

Title

____

Name of Firm

Bonnie Brook Subdivision
Pump Station & Pond Improvement Evaluation
Orange County

Engineering Study Report

Prepared for:

ORANGE COUNTY GOVERNMENT FLORIDA

Roads & Drainage Division
4200 S. John Young Parkway
Orlando, FL 32839-9205
407-836-7870

Prepared By:

BPC/TEK Joint Venture

6925 Lake Ellenor Drive, Suite 112
Orlando, Florida 32809
407-267-8905

November 15, 2011
Project Number: C07904E009

5.0 SEEPAGE ANALYSIS

5.1 SITE CHARACTERISTICS

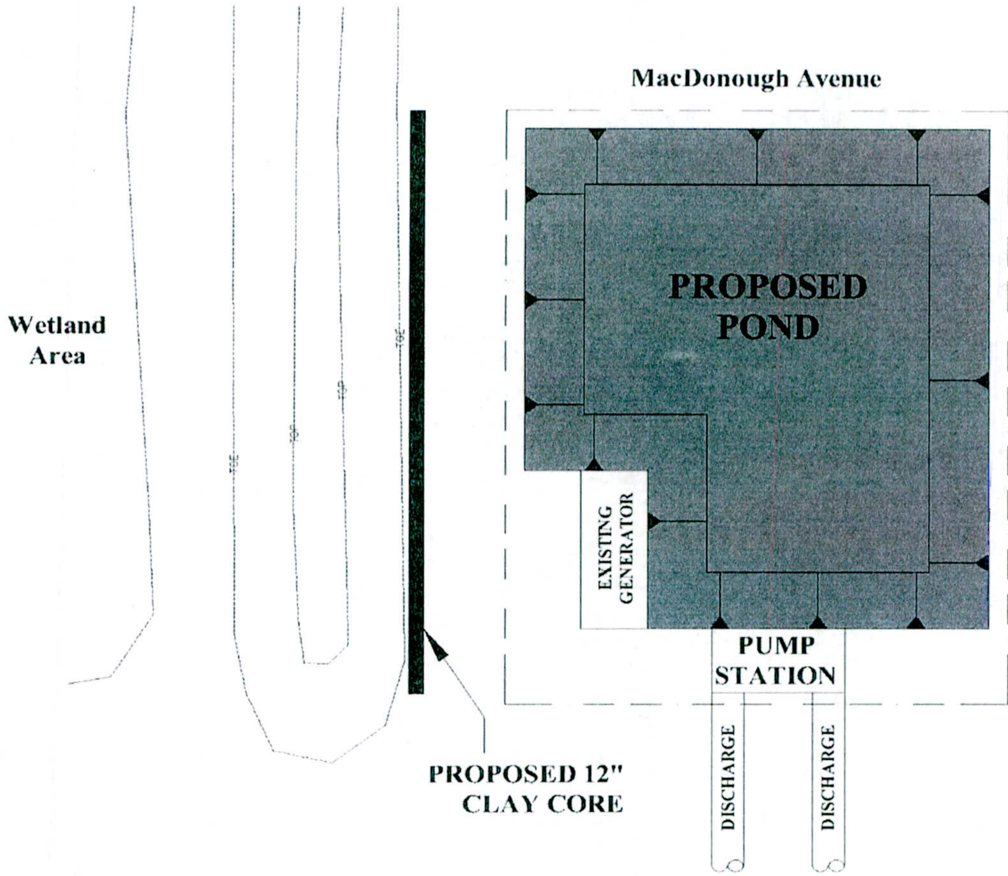
The Bonnie Brook stormwater pump station is bordered to the west by a created wetland. Concern of possible infiltration from the wetland into the facility has been evaluated. A clay core is proposed to be installed on the west side of the pond to prevent any possible infiltration from the wetland.

5.2 SEEPAGE ANALYSIS

One typical cross-section across the concrete pond structure was prepared for seepage analyses modeling using SEEP2D within the GMS 5.1 environment. This section extends from the wetlands as upstream with a hydraulic stage (water level) of 89.0 ft-NGVD along the west to a few feet beyond the end of the structure and along the east with a water level of 84.8 ft-NGVD. This is based on the geotechnical engineering report which indicates the seasonal normal high water level is about 3.0 ft below the ground surface. The geologic cross-section is also based on the geotechnical engineering report which indicates the subsurface materials consists of a layer of about 5 feet of SP-SM materials underlain by a thick layer of SM materials to the depth of borings (20 ft below ground surface).

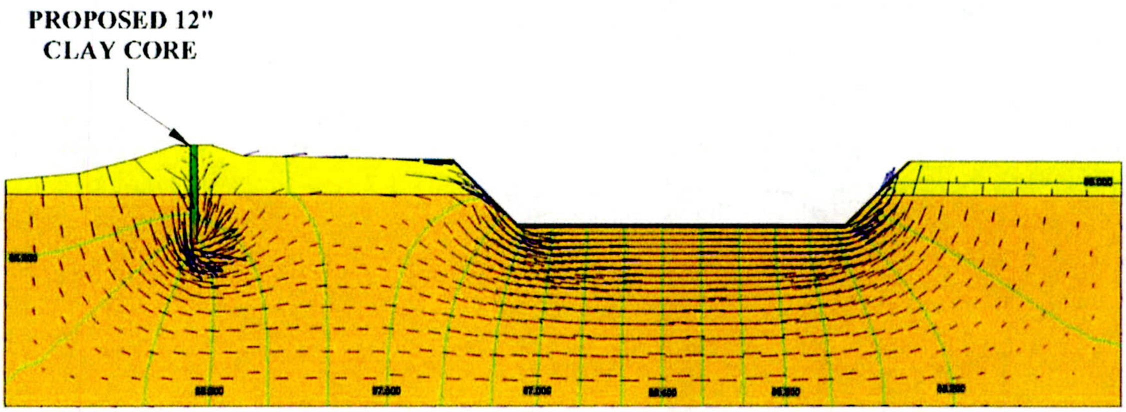
For the purpose of this seepage analysis, the SP-SM layer is considered 5 feet thick and the SM layer is considered about 30 feet thick. A clay core 12 inches thick (wide) is considered along the berm separating the wetlands from the proposed pond (as shown on Figure 4-4) to a depth of 76 ft-NGVD, which is a few feet below the concrete pond bottom elevation. The hydraulic conductivities of the SP-SM and SM layers were assumed to be 3.28 ft/day and 0.328 ft/day, respectively. These values were assumed since there is no on-site data available and on-site determination of these values was beyond the scope of work for this project. The horizontal hydraulic conductivity of the proposed clay core and the concrete pond bottom is assumed to be 0.00028 ft/day (10^{-7} cm/sec) with an anisotropy of 10 (Horizontal: Vertical = 10:1).

Figure 5-14 Proposed 12" Clay Core Location Plan



The results are presented on Figure 5-2 which shows the total head distribution (green lines) and flow gradients (blue lines/arrows) with a total flow rate passing through the site originating from the wetlands is only 0.293 cubic feet/day (2.2 gpd) which is negligible.

Figure 5-2 Seepage Analysis Graphic Results



6.0 WET WELL ANALYSIS

6.1 CURRENT WET WELL

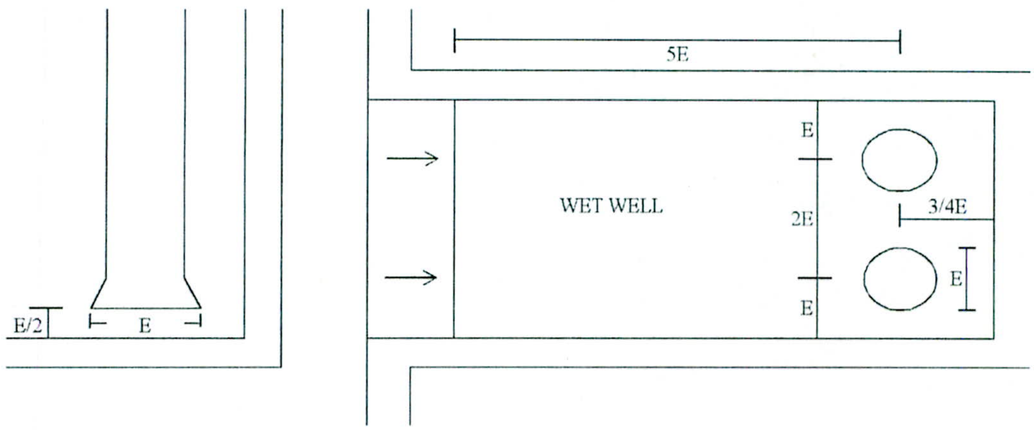
Orange County Pump Station PS-029 serves the Bonnie Brook subdivision. Under the current design stormwater is held in a holding basin connected to the pump station wet well by a 36" RCP pipe. The wet well itself is a 7' diameter concrete manhole.

In the summer of 2010, Orange County replaced the pumps and motors at the Bonnie Brook Pump Station PS-029, upgrading to pumps rated at 8,000 gpm at 15 feet TDH, with 40 HP motors. Once in operation the pumps began experiencing overheating problems. Locke Well & Pump Company (the pump supplier) evaluated the motors and pulled the pumps to determine the possible cause. When inspecting the pumps they found that both props had evidence of heat and contained mineral deposits, indicating that cavitation was occurring while the pumps were in operation. Locke Well & Pump Company produced a report, dated January 28, 2011, reflecting their findings and providing the suggestion that the cavitation which was responsible for the overheating was caused by inadequate wet well design. Included in the report was information from Cascade Pumps (the pump manufacturer) that included an excerpt from the Hydraulic Institute concerning wet well design parameters for vertical suction pumps. According to the excerpt, the current wet well dimensions were inadequate to prevent cavitation.

6.2 PROPOSED WET WELL DESIGN

Based on the information provided in the Locke Well and Pump Company report, a new wet well has been designed. The new design reflects the recommendations by the Hydraulic Institute for minimum dimensions for efficient operation. Figure 4-8 is a wet well sump design schematic that reflects the recommendations of the Hydraulic Institute.

Figure 6-1 Wet Well Design Schematic



Based on the dimensional recommendations, Table 4-12 indicates the resulting minimum wet well dimensions required.

Table 6-1 Wet Well Minimum Dimensions

E	Suction Bell Diameter	27	in.
E/2	Min. Bell Distance Above Floor	13.5	in.
E	Min. CL of Bell From Side Wall	27	in.
2E	Min. CL of Bell Separation	54	in.
3/4E	Min CL of Bell From Rear Wall	20.25	in.
5E	Min. Distance from Change in Well Floor Profile	135	in.

Minimum Wet Well Width:	108	in.	**9.0**	**ft.**
Minimum Wet Well Depth from Change of Slope:	155.25	in.	**12.9**	**ft.**

In addition to the dimensional recommendations, the Hydraulic Institute recommends that a minimum submergence depth (Q) above the suction bell be maintained. According to Locke Well and Pump Company, the provided pumps have a Q depth of 2.0 feet. This depth will be confirmed and the float system set accordingly when the pumps are re-installed in the new wet well.

7.0 BUOYANCY ANALYSIS

According to the Geotechnical Analysis, the seasonal high groundwater elevation (SHGW) at the Bonnie Brook stormwater pump station site is 1' below the existing grade. At this elevation floatation of the proposed pond is a concern.

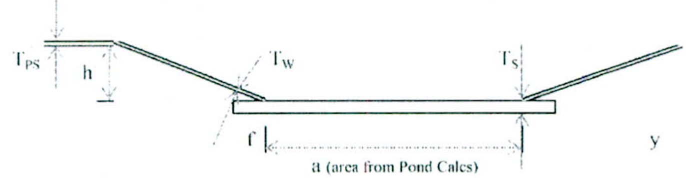
Flotation of the proposed pond, or buoyancy, is calculated based on the volume of the pond and pond structure below the SHGW elevation: this determines the uplift force of the groundwater on the structure if the groundwater is at its maximum elevation and the pond is pumped dry. To offset buoyancy, the weight of the structure must compensate for the uplift force: this is accomplished by increasing the size of the concrete structure to provide the necessary weight. A factor of safety of 1.15 is applied in calculating the weight of the concrete structure to insure the structure will not float.

7.1 STORMWATER HOLDING BASIN BUOYANCY ANALYSIS

The stormwater holding will normally be pumped such that it holds little or no water, thus making floatation a constant concern. The basin is designed with a base slab/footer, 45° walls on three sides, a vertical wall on the wet well side and a 5' wide flat perimeter slab around the 45° walls. All of these are connected with reinforcing, thus providing a single structure of which the weight offsets the groundwater buoyancy force. Figure 7-1 indicates the buoyancy analysis design considerations for the stormwater holding basin analysis.

Figure 7-1 Stormwater Holding Basin Buoyancy Design Diagram

h = Pond Depth (feet)
a = Pond bottom area (ft^2)
y = Pond wall side slope
T_S = Bottom Slab Thickness (ft)
T_W = Incline Wall Thickness (ft)



BPC/TEK Joint Venture

Bonnie Brook Report Text

Table 7-1 indicates the calculations used in the stormwater holding basin buoyancy calculations. A factor of safety of 1.16 is obtained for the entire structure.

Table 7-1 Stormwater Holding Basin Buoyancy Calculations

Buoyancy Force (F_B) = Weight of water displaced (by basin and structure)

Presume Seasonal High Groundwater 1' below surface

$F_B = (V_P+V_S) * d_W$

$V_P =$ 38,427 (ft^3)

$V_S = (T_S*a)+(T_W*L*((h-1)^2+(y*(h-1))^2)^{1/2})+(T_{V-W}*L_V*(h-1))+(T_S*L_V*(f+T_{W-V}))$

$V_S =$ 16,504 (ft^3)

$F_B =$ 3,427,643 lbs

Hold-Down Force (F_T) = Weight of Concrete plus weight of soil over footer

NOTE: Friction of soil against walls ignored (since negligible on 45-deg walls & short vert wall). Only soil directly above footer considered

$V_{BS} =$	Volume Bottom Slab	$(T_S * a)$	7,820	ft^3
$V_{W-S} =$	Volume Sloped Walls	$(T_W * L * (h^2+(yh)^2)^{1/2})$	4,105	ft^3
$V_{W-V} =$	Volume Vert. Walls	$(T_{V-W} * L_V * h)$	2,385	ft^3
$V_f =$	Volume Footer	$(T_S * L_V * (f+T_{W-V}))$	2,915	ft^3
$V_{PS} =$	Volume Perim. Slab	$(T_{PS} * w_{PS} * L_{PS})$	800	ft^3
$V_{SOIL} =$	Volume Soil over Footer	$(f * h * L_V)$	10,733	ft^3

$F_T = [(V_{BS}+V_{W-S}+V_{W-V}+V_f+V_{PS}) * d_c] + [V_{SOIL} * d_s]$

$h =$	9.0	ft	$T_S =$	2.00	ft
$a =$	3910	ft^2	$T_W =$	1.50	ft
$y =$	1.0		$T_{W-V} =$	1.00	ft
$L =$	215	ft	$T_{PS} =$	0.67	ft
$L_V =$	265	ft	$w_{PS} =$	5.00	ft
$f =$	4.5	ft	$L_{PS} =$	240	ft

SF = 1.16

$F_T =$ 3,991,613 lbs

7.2 WET WELL BUOYANCY ANALYSIS

The new wet well has been designed to accommodate the increased pump capabilities of the system: the new wet well is a poured concrete structure that will usually be pumped down to maintain maximum available stormwater storage capacity; as such it is also susceptible to floatation concerns. The wet well will be a monolithic reinforced concrete structure containing the floor slab, footer and vertical walls, all of which will provide the weight necessary to offset the buoyancy force. Figure 7-2 indicates the buoyancy analysis design considerations for the wet well analysis.

Figure 7-2 Wet Well Buoyancy Design Diagram

h = Wet Well Depth (feet)
w = Wet Well Width (feet)
x = Wet Well Length (feet)
a = Wet Well Bottom Area (ft^2) *($w * x$)*
T_S = Bottom Slab Thickness (ft)
f = Wet Well Footer Width (feet)
a_{TS} = Bottom Slab Area (ft^2) *$[(w + 2f + 2T_W) * (x + f + T_W)]$*
T_W = Wall Thickness (ft)
L = Average Pond Wall Length (ft) *($2x * w$)*
d_W = Density of Water = 62.4 lb/ft^3
d_C = Density of Concrete = 150 lb/ft^3
d_S = Density of Soil Above Footer = 120 lb/ft^3
V_P = Pond Volume (ft^3) ([(h-1) * a]
V_S = Structure volume (ft^3) 1' below grade
SF = Safety Factor

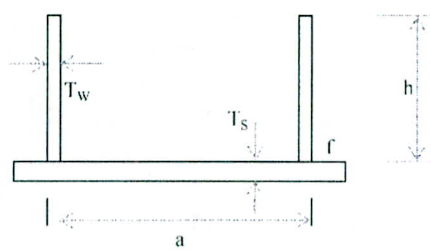


Table 7-2 indicates the calculations used in the stormwater holding basin buoyancy calculations. A factor of safety of 1.51 is obtained for the entire wet well.

Table 7-2 Wet Well Buoyancy Calculations

Buoyancy Force (F_B) = Weight of water displaced (by basin and structure)

Presume Seasonal High Groundwater 1' below surface

F_B =	$(V_P+V_S) * d_W$	
V_P =	1,355	(ft^3)
V_S =	$(T_W*L*(h-1))+(T_S*a)+(T_S*(f+T_W)*L)$	
V_S =	712	(ft^3)
F_B =	**129,007**	**lbs**

Hold-Down Force (F_T) = Weight of Concrete plus weight of soil over footer

NOTE: Friction of soil against walls ignored, only soil directly above footer considered

V_S =	Volume Bottom Slab & Footer	$(T_S * a_{TS})$
V_W =	Volume Walls	$(T_W * L * h)$
V_{SOIL} =	Volume Soil over Footer	$(f * h * L)$
F_T =	$[(V_S+V_W) * dc] + [V_{SOIL} * d_S]$	

h =	12.6	ft	a =	117	ft^2
w =	9.0	ft	a_{TS} =	217	ft^2
x =	13.0	ft	T_S =	1.50	ft
f =	1.5	ft	T_W =	1.00	ft
SF =	**1.51**		L =	35	ft

F_W = 194,162 lbs