



# Agenda Report

2725 Judge Fran Jamieson  
Way  
Viera, FL 32940

## New Business - Development and Environmental Services Group

J.2.

10/25/2022

### Subject:

Authorization from the Board on Improvements at the Ritch Grissom Memorial Wetlands

### Fiscal Impact:

Wetland Ecological Improvements:

If wetland ecological improvements are done in a single phase, existing allocated \$2M ARPA funds will suffice to complete the project. If wetland improvements are done in a multi-phase approach, then the cost increases due to extending the duration of the project to phase the work and obtaining State permits needed in addition of the construction of temporary access points for the phasing of the work to be possible.

Bird towers (2) and gazebo:

Demolition of the three structures is \$75,000.

### Dept/Office:

Utility Services Department

### Requested Action:

Authorization from the Board to (1) complete the wetland improvements in a single-phase approach, this would require the closing of the wetlands during the 26-week estimated project duration, (2) approval to demolish the three structures (towers and gazebo), and (3) continue department's policy of allowing only pedestrian and bicycle traffic.

### Summary Explanation and Background:

There are 3 components of the Ritch Grissom Memorial Wetlands (further referred to as the "Wetlands") which this Department is seeking direction from the Board:

#### Direction on Approach to Comply with Florida Department of Environmental Protection Consent Order and Address Public Access

The Wetlands, constructed in the late 1980s, was part of the South-Central Wastewater Treatment Plant (WWTP) construction (see attachment A of map). The Wetlands function is to provide storage for all flows from the WWTP, being that the flows are reuse. The storage at the wetlands (300,000,000 gallons), per the Florida Department of Environmental Protection (FDEP) (see attachment B), is the primary disposal for treated effluent of this WWTP. The Wetlands were created to provide a natural biological treatment by the installed vegetation functioning to reduce suspended solids, nitrogen and phosphorus. If the capacity of the wetlands is maximized, excess flow is allowed per the FDEP, to be pumped into the 4 Mile Creek which feeds into the St

Johns River. Due to the excess flows from the wetlands ultimately discharging into the St Johns River, the FDEP requires stringent testing and allowable limits of the flows for suspended solids, nitrogen and phosphorus.

On March 25, 2021, the FDEP sent a consent order to the County due to exceeding the nutrient allowance during discharge events to the 4 Mile Creek (see attachment C). As a result, the FDEP, per the consent order, requested the County to consult with a professional engineer to evaluate the circumstances and provide recommendations. The consent order date to have the recommendations complete is April 24, 2023. This Department consulted with Tetra Tech to evaluate the Wetlands in its entirety to comply with the consent order (see attachment D & E). Per the evaluation from Tetra Tech, the recommendations included the following: removal of dead vegetation and demucking of the cells. In addition, the integrity of the weirs which hydraulically connects the wetlands to each other are also being rehabilitated due to their condition. This Department, soon after receiving these recommendations, continued with the efforts by Tetra Tech to prepare bid documents for a contractor to perform the work. Upon completion of the bid documents it is assessed that this project will take over 26 weeks for a contractor to complete, based on the wetlands being closed to public traffic. If the wetlands are completely closed, the awarded contractor could complete the work with no phasing required. If the Wetland improvements are done in a phased approach to accommodate public access this will require a longer construction duration, and the need to apply for an FDEP Environmental Resource Permit (ERP) to construct temporary construction access roads.

The overall project, based on a public access closure, is anticipated to be approximately \$2M. During the September 14, 2021 County Commission Meeting, the Board approved several ARPA projects to be implemented by departments. One of those projects approved was for the biological improvements to the Wetlands in the amount of \$2M. If phasing of the Wetland improvements is done, the cost is expected to increase thus requiring additional funds provided by this Department. In addition, the cost of the process to obtain an ERP permit is lengthy due to the due diligence required when impacting wetlands. Although a request of an extension may be made to the FDEP to comply with the consent order, there are no guarantees that the FDEP will accommodate them.

#### Direction on the Wetlands Roadway

Over the years since the Wetlands were constructed, the public gained attention to it as a natural habitat viewing destination. As a result, in the past the County allowed the public to enter the Wetland either by car, bicycle, or walking. Manatee County, Florida is another wastewater treatment system which incorporated an elevated earth-berm storage for its wastewater. On March 2021, the State of Florida issued a State of Emergency for north Manatee County due to a leak in the berm which resulted in the FDEP taking over operations and cleanup. During this time, the FDEP issued warning for all other entities to assess their elevated earth-berm storage for possible failures. It was at this time that this Department ceased all public vehicle access to the Wetlands.

Per this FDEP warning, an assessment of our Wetlands was performed. The assessment looked at the integrity of the roadway / berm and accessibility of vehicles and pedestrians.

This Department consulted with Atkins Engineering to assess the integrity of the berm along with suggestions if any roadway improvements were desired. As mentioned above, the public vehicle access to the wetlands was closed, only pedestrians and bicycles are permitted. In addition, with the concern of berm failure we also

considered the issue of accessibility for our field staff and for the public. The issue is that the width on top of the berm is approximately 11 feet (same as a thru lane of traffic) with steep slopes on both sides. This Department's staff are required to obtain samples from the wetlands once every hour, per FDEP. When public vehicle traffic is permitted this causes the following issues: parked public vehicles stop all traffic behind it, causes severe rutting on top of the berm, and pedestrians are forced to stand on the steep slopes to avoid contact with passing vehicles. Atkins completed a report (attachment F) which provides 3 options of paving the Wetland (ranging from \$2.1M to \$8.35M, not including engineering and permit fees). The Utilities Department does not have funding in the FY 22-23 budget for this effort.

If one of three additional options of roadway improvements were selected, per the attached engineer's report, the cost would range from an estimated \$2.10M to \$8.35M. Funding for any of these optional improvements would need to be identified.

It is the Utilities Department's recommendation based on cost and available funding considerations to continue our current policy of allowing only pedestrian and bicycle traffic only.

#### Direction on Wetland Bird Towers and Gazebo

There are currently 2 bird watch towers and a gazebo within the Wetlands that are over 20 years old. Recently, through the support of the County's Facilities Division, a condition assessment of the 3 structures was performed by, Master Consulting Engineers, Inc., a structural engineering firm (see attachments G, H, I). As stated for all 3 structures, the engineering firm states "The structure must remain closed to the public in any case until further structural repair or replacement takes place. At this time the structure can cause a human injury or death."

This Department is seeking Board approval to demolish the structures. Attachment J provides estimated costs for demolition and construction.

#### **Clerk to the Board Instructions:**

E-mail Clerk Memo to [rose.lyons@brevardfl.gov](mailto:rose.lyons@brevardfl.gov) and mail original to Utility Services, Attention: Rose Lyons



Kimberly Powell, Clerk to the Board, 400 South Street • P.O. Box 999, Titusville, Florida 32781-0999

Telephone: (321) 637-2001  
Fax: (321) 264-6972  
Kimberly.Powell@brevardclerk.us

October 26, 2022

**M E M O R A N D U M**

**TO:** Edward Fontanin, Utility Services Director      **Attn:** Rose Lyons  
**RE:** Item J.2., Authorization from the Board on Improvements at the Ritch Grissom Memorial Wetlands

The Board of County Commissioners, in regular session on October 25, 2022, authorized you to complete the ecological improvements in a single-phase using the funds already allocated and to include demolition of the structures within that project, with the ability to fund the demolition of the structures from the Utilities Department's Operations budget if need be; and to continue the policy of only allowing pedestrian and bicycle traffic.

Your continued cooperation is always appreciated.

Sincerely,

**BOARD OF COUNTY COMMISSIONERS  
RACHEL M. SADOFF, CLERK**

*for: Donna Scott*  
Kimberly Powell, Clerk to the Board

/sm

**cc: Finance  
Budget**

# **EXHIBIT A**

# GENERAL ARRANGEMENT

WEIR DISCHARGE TO ST. JOHN'S RIVER

ROAD OPTION 2

500' ROAD @ 20' = 10,000 FT<sup>2</sup>



NOTE: ■ = WEIR STRUCTURE

◇ = SIGNS X 6

1 2 3 4 5

A B C D

TREATMENT SOUTH CENTRAL REGIONAL  
WASTEWATER TREATMENT FACILITY  
VERA, FL



TETRA TECH  
1 RIVINGTON DRIVE  
SUITE 200  
COCOA, FL 32909  
TEL: 321.862.6700 EXT. 53100

NO.	DESCRIPTION	DATE	BY	CHK.
1	ISSUED FOR PERMIT	08/11/2020	J. HARRIS	J. HARRIS
2	ISSUED FOR CONSTRUCTION	08/11/2020	J. HARRIS	J. HARRIS
3	ISSUED FOR AS-BUILT	08/11/2020	J. HARRIS	J. HARRIS
4	ISSUED FOR RECORD	08/11/2020	J. HARRIS	J. HARRIS
5	ISSUED FOR FINAL	08/11/2020	J. HARRIS	J. HARRIS

Sheet Reference:  
Sheet of 15

NOT FOR CONSTRUCTION

# **EXHIBIT B**



# FLORIDA DEPARTMENT OF Environmental Protection

Central District Office  
3319 Maguire Blvd, Suite 232  
Orlando, Florida 32803-3767

**Ron DeSantis**  
Governor

**Jeanette Nuñez**  
Lt. Governor

**Shawn Hamilton**  
Interim Secretary

## STATE OF FLORIDA DOMESTIC WASTEWATER FACILITY PERMIT

**PERMITTEE:**  
Brevard County Utility Services Department

**RESPONSIBLE OFFICIAL:**  
Edward Fontanin  
2725 Judge Fran Jamieson Way  
BLDG. A-213  
Melbourne, Florida 32940-6605  
(321) 633-2091  
edward.fontanin@brevardfl.gov

**PERMIT NUMBER:** FL0102679 MI  
**FILE NUMBER:** FL0102679-018-DW1P  
**ISSUANCE DATE:** July 12, 2021  
**EFFECTIVE DATE:** July 12, 2021  
**EXPIRATION DATE:** July 11, 2026

**FACILITY:**  
BCUD/South Central Regional  
10001 N Wickham Rd  
Melbourne, FL 32940-6604  
Brevard County  
Latitude: 28°13' 44.98" N Longitude: 80°45' 26.37" W

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and applicable rules of the Florida Administrative Code (F.A.C.) and constitutes authorization to discharge to waters of the state under the National Pollutant Discharge Elimination System. This permit does not constitute authorization to discharge wastewater other than as expressly stated in this permit. The above-named permittee is hereby authorized to operate the facilities in accordance with the documents attached hereto and specifically described as follows:

### WASTEWATER TREATMENT:

An existing 12.0 million gallon per day (MGD) annual average daily flow (AADF) permitted capacity activated sludge advanced wastewater treatment (AWT) plant utilizing the IFAS BNR and Carrousel BNR Treatment Process. The plant consists of a mechanical bar screen and de-gritter assembly, 5-stage IFAS BNR and 4-stage Carrousel BNR Process (anaerobic tanks, first anoxic tanks, extended oxidation ditches, second anoxic tanks, re-aeration tanks), clarifiers, chemical feed facilities, filters and chlorination, with aerobic digestion and belt-thickening of biosolids. The facility utilizes electronic sensors and automatic diversion valves, two (2) 1.0 million gallon on-site reclaimed water covered ground storage tanks and associated high service pump stations, and a standby power generator.

The facility includes a Septage and Grease receiving station with flow metering, mechanical screening, and a holding tank with a submersible mixer.

The facility may supplement the reclaimed water production with storm water introduced into the collection system of the facility.

### REUSE OR DISPOSAL:

**Surface Water Discharge D-001:** An existing 0.990 MGD annual average daily flow discharge to 4-Mile Canal, Class III Fresh Waters, (WBID# 2893N) which is approximately 128 feet in length and discharges at a depth of approximately 0 feet. The outfall pipe is a 60" diameter concrete culvert that discharges to the 4-Mile Canal. The point of discharge is located approximately at latitude 28°13' 48" N, longitude 80°46' 14" W.



PERMITTEE: Brevard County Utility Services Department  
FACILITY: BCUD/South Central Regional

PERMIT NUMBER: FL0102679  
EXPIRATION DATE: July 11, 2026

**Land Application R-001:** An existing 8.2 MGD annual average daily flow permitted capacity slow-rate public access system. R-001 is a reuse system which consists of on-site irrigation at the plant, and within the approved Reuse Service Area, as shown on the attached map, and identified in Section IV of this permit

Reclaimed water is discharged into stormwater storage lake system(s) D-002 located at the Indian River Colony Club Golf Course. The reclaimed water is stored in an existing stormwater retention pond with a storage capacity of 4.5 million gallons, which has an intermittent discharge to adjacent drainage features (6-Mile Canal), which ultimately discharges to the St. Johns River. Discharge of reclaimed water to this stormwater retention pond shall be in accordance with Condition I.B. 12 of this permit.

Stormwater from the following sources may be introduced into the sanitary sewerage system to augment the supply of reclaimed water: The facility may introduce storm water from a retention pond into the collection system at the wet well of Lift Station W-09 (Silver Pines Subdivision).

**Land Application R-002:** An existing 2.5 MGD annual average daily flow permitted capacity slow-rate restricted public access system. R-002 is a reuse system which consists of **Created Wetlands** with 200± acres (163± total wetted acres) comprising four (4) cells and an interior lake. The detention time through this created wetland system is approximately 53 days, and is located approximately at latitude 28°13' 47" N, longitude 80°46' 18" W.

**IN ACCORDANCE WITH:** The limitations, monitoring requirements, and other conditions set forth in this cover sheet and Part I through Part IX on pages 1 through 29 of this permit.

# **EXHIBIT C**



# FLORIDA DEPARTMENT OF Environmental Protection

CENTRAL DISTRICT OFFICE  
3319 MAGUIRE BLVD., SUITE 232  
ORLANDO, FLORIDA 32803

Ron DeSantis  
Governor

Jeanette Nuñez  
Lt. Governor

Noah Valenstein  
Secretary

March 25, 2021

Frank Abbate, County Manager  
Brevard County Utilities Department  
2725 Judge Fran Jamieson Way  
Viera, FL 32940  
[Frank.Abbate@brevardfl.gov](mailto:Frank.Abbate@brevardfl.gov)

Re: BCUD South Central WWTF  
DW Facility ID # FL0102679  
OGC Case #21-0180

Dear Mr. Abbate:

Enclosed is the executed Consent Order to resolve the above referenced case. This copy is for your records.

Should you have any questions or comments, please contact Manuel F. Cardona at 407-897-4134 or via e-mail at [Manuel.Cardona@FloridaDEP.gov](mailto:Manuel.Cardona@FloridaDEP.gov).

Your cooperation in this matter will be appreciated.

Sincerely,

A handwritten signature in black ink, appearing to read "Aaron Watkins".

Aaron Watkins  
Director, Central District

Enclosure: Consent Order OGC#21-0180

cc: Lea Crandall, OGC  
Zoey Carr, Daun Festa, Central District  
Courtney Duff, [Courtney.Duff@brevardfl.gov](mailto:Courtney.Duff@brevardfl.gov)  
Matthew Prendergast, [Matthew.Prendergast@brevardfl.gov](mailto:Matthew.Prendergast@brevardfl.gov)  
David Smicherko, Manuel Cardona, Central District

4. The Department finds that the following violation(s) occurred. All the observations that follow are possible violations of Chapter 403, F.S. and Chapter 62-620, F.A.C. and Chapter 62-520 F.A.C.:

a) These violations were observed at the WEP-1 monitoring location:

- The Total Nitrogen (TN) maximum result reported on the DMR for July 2020 exceeded the maximum limit of 3.2 milligrams per liter(mg/L).
- The TN monthly average result reported on the DMR for July 2020 exceeded the maximum limit of 2.0 milligrams per liter(mg/L).
- The TN weekly average result reported on the DMR for July 2020 exceeded the maximum limit of 2.4 milligrams per liter(mg/L).
- The Carbonaceous 5 day, 20C BOD, (CBOD) maximum results reported on the DMRs for July 2020, September 2020, and October 2020, exceeded the maximum limit of 6.0 mg/L.
- The CBOD weekly average results reported on the DMRs for July 2020, and October 2020, exceeded the maximum limit of 4.5 mg/L.
- The CBOD annual average results reported on the DMRs for July 2020, September 2020, October 2020, and November 2020, exceeded the maximum limit of 3.0 mg/L.
- The CBOD monthly average results reported on the DMRs for July 2020 and September 2020, exceeded the maximum limit of 3.75 mg/L.
- The CBOD annual average results reported on the DMRs for July 2020, September 2020, October 2020, and November 2020, exceeded the maximum limit of 3.0 mg/L.
- The Total Suspended Solids (TSS) maximum result reported on the DMRs for October 2020 exceeded the maximum limit of 6.0 mg/L.

b) These violations were observed at the EFB-2 monitoring location:

- The % less than detection Fecal Coliform results reported on the DMRs for August 2020 and September 2020, did not meet the 75% limit.

- The Fecal Coliform (FC) maximum results reported on the DMRs for August 2020 and September 2020, exceeded the maximum limit of 25/100 mL.
  - The Total Suspended Solids (TSS) maximum result reported on the DMRs for November 2020 exceeded the maximum limit of 5.0 mg/L.
- c) This violation was observed at the Groundwater monitoring location:
- The FC results reported for the groundwater monitoring reports for the 4th quarter 2019, 2nd quarter 2020, and 3rd quarter 2020, exceeded the permit limit of 4 fecal coliform colonies per 100 milliliters (fcc/100mL).

Having reached a resolution of the matter Respondent and the Department mutually agree and it is

**ORDERED:**

5. Respondent shall comply with the following corrective actions within the stated time periods:

a) Within 60 days of the effective date of this Order, Respondent shall submit to the Department an evaluation, conducted by a professional engineer registered in the state of Florida, to discover the cause or causes of the violations identified in subparagraphs 4.a) and 4.c), above. The evaluation shall contain recommended corrective actions including applicable design modification(s).

b) Within 60 days of the due date for submission of the evaluation and design modification(s) in subparagraph a), Respondent shall submit a complete application for a Department permit to construct the modifications submitted pursuant to paragraph a) above, if such a permit is required. In the event the Department requires additional information to process the permit application Respondent shall provide a written response containing the information requested by the Department within 90 days of the date of the request.

c) Within 545 days after issuance of the permit referenced in subparagraph b) above, or if no permit is required, within 545 days of the approval of the design modification(s) in subparagraph a) above, Respondent shall complete construction of the modification(s) submitted pursuant to subparagraph a) above.

6. Every quarter after the effective date of this Order and continuing until all corrective actions have been completed, Respondent shall submit to the Department a written report containing information about the status and progress of projects being completed under this Order, information about compliance or noncompliance with the applicable requirements of this Order, including construction requirements and effluent limitations, and any reasons for noncompliance. These reports shall also include a projection of the work Respondent will perform pursuant to this Order during the 12-month period which will follow the report. Respondent shall submit the reports to the Department within 30 days of the end of each quarter.


7. Notwithstanding the time periods described in the paragraphs above, Respondent shall complete all corrective actions required by paragraph 5 above, within 760 days of the effective date of this Order and be in full compliance with Rule 62-620, F.A.C., regardless of any intervening events or alternative time frames imposed in this Order.

8. Within 30 days of the effective date of this Order, Respondent shall pay the Department \$6,750.00 in settlement of the regulatory matters addressed in this Order. This amount includes \$6,250.00 for civil penalties and \$500.00 for costs and expenses incurred by the Department during the investigation of this matter and the preparation and tracking of this Order.

9. Respondent agrees to pay the Department stipulated penalties in the amount of \$1,000.00 per day for each and every day Respondent fails to timely comply with any of the requirements of paragraph(s) 5 and 6 above, of this Order. The Department may demand stipulated penalties at any time after violations occur. Respondent shall pay stipulated penalties owed within 30 days of the Department's issuance of written demand for payment and shall do so as further described in paragraph 10, below. Nothing in this paragraph shall prevent the Department from filing suit to specifically enforce any terms of this Order. Any stipulated penalties assessed under this paragraph shall be in addition to the civil penalties agreed to in paragraph 8 above, of this Order.

DONE AND ORDERED this 25th day of March, 2021, in Orange County,  
Florida.

STATE OF FLORIDA DEPARTMENT  
OF ENVIRONMENTAL PROTECTION



\_\_\_\_\_  
Aaron Watkins  
District Director  
Central District

Filed, on this date, pursuant to section 120.52, F.S., with the designated Department Clerk,  
receipt of which is hereby acknowledged.



\_\_\_\_\_  
Clerk

March 25, 2021

Date

Copies furnished to:

Lea Crandall, Agency Clerk  
Mail Station 35

# EXHIBIT D





June 15, 2021

Edward Fontanin  
Brevard County Utility Services Department  
2725 Judge Fran Jamieson Way Bldg A-213  
Melbourne, Florida 32940-6605  
[Edward.Fontanin@brevardfl.gov](mailto:Edward.Fontanin@brevardfl.gov)

Reference: BCUD South Central WWTF  
DW Facility ID # FL0102679  
OGC Case #21-0180  
Response to Order 5. a)

Dear Mr. Fontanin:

On March 25, 2021 a consent order was entered into between the Florida Department of Environmental Protection (DEP) and Brevard County. The consent order identified water quality exceedances at the South Central Regional Wastewater Treatment Facility (SC WWTF) (the Site). The following water quality exceedances were identified at the SC WWTF:

- The outfall of the wetlands in the Northwest corner of Cell 4 to the canal leading to the Saint Johns River (WEP-1)
  - Total Nitrogen (TN)
  - Carbonaceous Biological Oxygen Demand (CBOD)
  - Total Suspended Solids (TSS)
- Discharge from the SC WWTF to the holding ponds (EFB-2)
  - Fecal Coliforms
  - TSS
- Two monitoring wells adjacent to the holding ponds, located to the north of the wetlands (MWC-5-SOD and MWC-6-SOD)
  - Fecal Coliform

The consent order, in Order 5. a), required Brevard County to complete an evaluation to discover the cause or causes of the violations. The evaluation is to contain recommended corrective actions, including applicable design modifications. Order 5 b) will require an application to the DEP within 60 days of the evaluation in 5 a) for design modifications to address the causes identified in Order 5 a). Order 5 c) required the construction of the permitted system outlined in Order 5 b) within 545 days of receipt of the permit.

Tetra Tech has been asked to provide the required assessment outlined in Order 5 a) of the consent order limited to the following:

- Discover the cause or causes of the violations
- Develop a list of recommended corrective actions

Tetra Tech, Inc.

11 Riverside Drive, Suite 204, Cocoa, FL 32922

Tel 321.636.6470 Fax 321.636.6473 [www.tetratech.com](http://www.tetratech.com)

Conversations with Brevard County Utilities Department identified a spray event used to control cattails (*Typha* sp.) in the wetlands as a potential source of nitrogen and increased BOD. The cattails and other vegetation were left in place and created decaying material, particularly within Cells 3 and 4. This conversation also identified that a temporarily failed filter screen caused the exceedances at EFB-2, and investigation of the EFB-2 exceedance will not be required.

### **Water Sampling and Analysis:**

#### *WEP-1 Effluent Sampling and Analysis*

On May 4, 2021, a sample was collected at the weir prior to discharging from Cell 4 of the wetland (WEP-1) to evaluate the conditions and nutrient concentrations compared to previous sampling events. A manual grab sample was collected in accordance with FDEP Standard Operating Procedures (SOPs), FS 2400 (FDEP, 2017). Groundwater samples were delivered to Pace Laboratories in Pompano Beach, Florida, under proper chain of custody protocol, for analysis of TSS, BOD, cBOD, total nitrogen, total Kjeldahl nitrogen (TKN), and nitrogen as NO<sub>2</sub> and NO<sub>3</sub>.

#### *WEP-1 Effluent Sampling Results*

BOD was detected at 2.4 mg/L, total nitrogen was detected at 1.6 mg/L, which are less than the permit limits. TSS was detected at 4.6 mg/L, which exceeds the monthly average, but not the single sample limit, which is the applicable limit. No analytes sampled on May 4, 2021 exceeded the permit limits for a single sample.

The location of WEP-1 is provided on Figure 1. A summary of the analytical results compared to the historic analytical results collected since 2018 and the permit limits is provided in Table 1. Laboratory analytical results are provided in Attachment 1.

#### *Groundwater*

On May 4, 2021, groundwater samples were collected from monitoring wells MWC-5-SOD and MWC-6-SOD to evaluate the concentration and source of fecal coliforms detected in previous sampling events. Monitoring well purging and sampling activities were conducted in accordance with FDEP SOP, FS 2200 (FDEP, 2017). Groundwater samples were delivered to Pace Laboratories in Ormond Beach, Florida, under proper chain of custody protocol, for analysis of fecal coliforms. In addition, groundwater samples were delivered to Source Molecular Laboratories in Miami Lakes, Florida, under proper chain of custody protocol, for detection and quantification of the fecal host associated gene biomarker by quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology. Specifically, markers for human, ruminant and birds were analyzed.

#### *Groundwater Sampling Results*

Fecal coliforms were detected in the samples sent to Pace Laboratories at 172 most probable number/100 ml in MWC-5-SOD and were not detected in MWC-6-SOD. Fecal coliform tracing completed in the samples sent to Source Molecular detected bird biomarkers in MWC-5-SOD and MWC-6-SOD but below the limit of quantitation. Human and Ruminant biomarkers were not detected in either sample.

The monitoring well locations are provided on Figure 1. A summary of the groundwater analytical results compared to the historic analytical results collected since 2018 and the permit limits is provided in Table 2. Laboratory analytical results are provided in Attachment 1. Monitoring well sampling forms and calibration logs are provided as Attachment 2.

### Survey of Cell 4 and Muck Presence

Oceanside Solutions of Satellite Beach, Florida provided surveying and muck probing services to identify the presence or absence of muck in the accessible open water areas of Cell 4. On April 27, 2021, Oceanside Solutions arrived on site to collect muck thickness data from a small shallow draft boat. Survey grade RTK GPS Equipment was used to identify the vertical and horizontal location of the hard bottom. A 1-inch diameter graduated PVC push rod was used to identify the top of the muck and was pushed to the hard-bottom depth to determine the muck thickness.

Data were collected from a total of 119 points in Cell 4. Muck thickness ranged from 0.05 to 1.4 feet thick, with an average thickness of 0.32 feet. An algal mat was apparent on the bottom in four locations and was not detectable with the probe. The presence of the algal mat could only be determined in areas where the water was relatively shallow and clear to identify the presence by sight. A summary of the survey data is provided in Table 3. The locations of the survey points, and maps summarizing the relative thickness of the muck are provided as Attachment 3. Based on the collected data, a total of 6,571 cubic yards of muck is present in the open water area in the western portion of Cell 4.

### Biological Walkdown:

On May 5, 2021, Tetra Tech mobilized to the site to conduct a biological walkdown at Cells 3 and 4 of the SC WWTF.

The original planting plan outlined the herbaceous species that were to be installed on-site; however, it is unclear whether those plants were available for use from nurseries during the planting event. The table below details the planting list from the original planting plan. Those observed during the biological walkdown are denoted by an asterisk.

Scientific Name	Common Name
<i>Pontederia cordata</i> *	Pickerelweed
<i>Sagittaria lancifolia</i> *	Duck potato
<i>Sagittaria latifolia</i>	Arrowhead
<i>Scirpus validus</i> *	Soft-stem bulrush
<i>Cyperus articulatus</i>	Jointed flatsedge
<i>Scirpus olneyi</i>	Olney's three square
<i>Zizania aquatica</i> *	Wild rice
<i>Thalia geniculata</i>	Fire flag
<i>Eleocharis</i> spp.	Spikerush
<i>Cladium jamaicense</i>	Sawgrass
<i>Najas guadalupensis</i>	Bushy pondweed
<i>Ceratophyllum demersum</i>	Coontail

Other species in the table may have been present in the deeper water areas but were not observed from the bermed path locations.

The Dominant Vegetative Cover is provided as Figure 2, depicts the vegetative composition of the cells based on observations made during the biological walkdown. Cells 3 and 4 were observed from the bermed paths surrounding each of the cells. Twenty-four total photo stations were

established on the bermed perimeter of the collective cells and documented via GPS. Fourteen photo stations (Dominant Vegetative Cover Map, PS 1-14) were established at Cell 4 and ten (Dominant Vegetative Cover Map, PS 15-24) were established at Cell 3. A vegetative assessment was then conducted at each photo station to determine the approximate percent coverage of each species, contributing to the Dominant Vegetative Cover Figure enclosed with this memo. The dominant species observed included cattail (*Typha* sp.), duck potato, and pickerelweed. Cattail dominated both cells, with both living and dead plants observed. The dead cattail covered approximately 12% of Cell 3 and 11% of Cell 4. Mixed and monotypic stands of cattail were observed in Cell 4, whereas the cattails in Cell 3 were solely monotypic stands. The green algae-like species was determined to be filamentous algae, observed in mats in the areas of open water in both cells. The increased presence of algae is likely due to the decaying material produced by the dead cattails. One area (approximately 0.7 acres) of torpedo grass (*Panicum repens*) was observed in Cell 4. According to the Florida Exotic Pest Plant Council Invasive Plant List, torpedo grass is considered a Category I invasive species.

During the biological walkdown, evidence of listed species was observed within the site. The tricolored heron (*Egretta tricolor*) and the little blue heron (*Egretta caerulea*) were observed on-site, both of which are State-designated as Threatened. The Federally-designated Threatened (due to similarity of appearance) American alligator (*Alligator mississippiensis*) was also observed. Other wildlife observed on-site can be found in Table 4.

Photos from the biological walkdown are provided as Attachment 4.

### Conclusions

The project was divided into three focus areas water sampling, biological walkdown, and sediment evaluation for the purpose of data collection and evaluation of the wetlands system. The water, sediment, and biology of the wetlands system are interconnected and require a balance for a healthy system that provides the desired effluent water quality.

The assumption entering the project was the spraying of the cattails and leaving them in the system to decay was the root cause of the effluent water quality exceedances at WEP-1. The spray event occurred on May 11, 2020.

Review of the historical effluent sampling data identified permit exceedances immediately following the spray event. The highest cBOD result in the sample set was in July and September 2020, with cBOD results exceeding the 3.75 mg/L monthly average permit limit in WEP-1 at concentrations of 5.15 and 4.11 mg/L, respectively. Total nitrogen results slightly exceeded the 2.0 mg/L monthly average permit limit at a concentration of 2.1 mg/L. These water data indicate an increase in the cBOD and nitrogen two and four months following the herbicide spraying event, and likely was the result of the decaying plant material. The presence or absence of filamentous algae is not known prior to the spray event; however, the presence of this algae is likely a response to the increase in nutrients in the system. The algae grow and take up the excess nutrients. This may be creating the rebalancing of nitrogen after September 2020, as the plants continue to degrade and input nitrogen the algae grow and take up that nitrogen. At some point in time the algae will die off and sink to the bottom creating muck. A history of this practice has resulted in muck forming at the bottom of the open water area of Cell 4. Other areas of the wetlands were not evaluated for the presence or absence of muck.

When water quality is good, sediments are a sink for nutrients. When water quality degrades, muck will flux nutrients into the water column and may be a source for nutrients. One of the main drivers for this is dissolved oxygen. Generally dissolved oxygen should maintain a level

above 2 mg/L. Dissolved oxygen in the water column, as measured at WEP-1, remains well above the 2 mg/L threshold; however, dissolved oxygen at the sediment water interface, particularly overnight when oxygen is consumed and photosynthesis is not adding oxygen to the system, may dictate the role of the sediments to be a source for nutrients. While the volume of muck in the system is relatively low, the presence of muck throughout the measured area of Cell 4 is a potential for nutrient flux into the water column under poor water quality conditions.

The presence of fecal coliforms in MWC-5-SOD does not appear to be an issue with the water treatment. Fecal coliforms were detected in MWC-5-SOD at 172 most probable number/100 mL and not detected in MWC-6-SOD; however, source tracing identified bird markers and no human markers for fecal coliforms. In March 2021 a large flock of White Pelicans (*Pelecanus erythrorhynchos*) was observed on the north side of the lake. White Pelicans will fish in these lakes by surrounding fish and "herding" them into the flock to scoop out of the water. White Pelicans are among the largest bird species in North America and migrate to Florida for the late winter months. The source tracing data suggest that bird species such as the White pelican and other bird species that frequent these ponds throughout the year may be the primary source of fecal coliforms in the monitoring wells.

#### **Proposed Corrective Actions**


Based on our understanding of the system and the data collected to date, Tetra Tech recommends the following remediation and mitigation options:

- Cease spraying of herbicide on cattail stands;
- Remove dead, decaying cattail stands;
- Herbicide spray monotypic areas of torpedo grass, allow to die back, then remove dead vegetation and underlying organic material;
- Adopt a mechanical removal plan for excess filamentous algae, cattails, dead vegetation, and underlying organic material. This may include cutting of plant material and should include removal and disposal of all cut or observed floating or sinking detritus;
- If nutrient exceedances continue, prepare a plan for the removal of muck from Cell 4, and evaluate the presence or absence of muck in Cells 1, 2, and 3. After completion of the above tasks, replant these areas with planting-zone appropriate and available vegetation from the original "Planting Plan".
- There are no recommended actions for fecal coliforms in MWC-5-SOD or MWC-6-SOD, since no human markers for fecal coliforms were identified, and bird markers were confirmed.

Should you have any questions or require additional information, please contact me at (321) 636-6470.

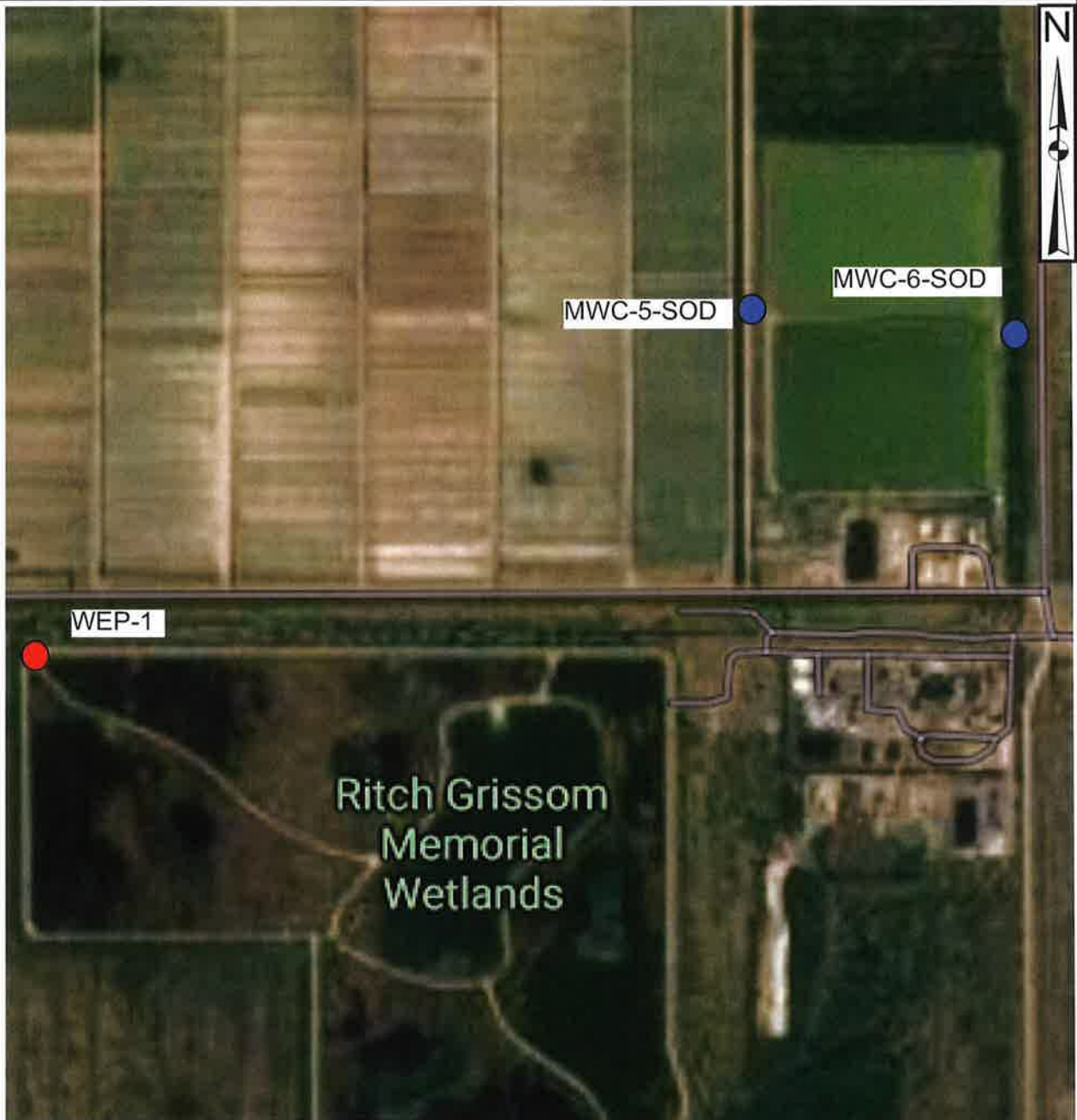
Sincerely,

  
Matthew Shelton  
Project Manager

  
William Musser, P.E., P.H., CFM  
Vice-President

Attachments

## FIGURES



**LEGEND**

- Monitoring Well Location
- Effluent Sampling Location



DRAWN BY	DATE
M. SHELTON	6/2/2021
CHECKED BY	DATE
SCALE AS NOTED	



Water Sample Location Map  
Brevard Wastewater Treatment Facility  
Brevard County, Florida

CONTRACT NUMBER	
100-WTR-T41397.01	
APPROVED BY	DATE
FIGURE NO.	
1	

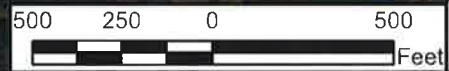


**LEGEND**

- Photo Stations
- ▭ Site Boundary

**Vegetative Cover**

- Dead Typha sp. (11.38%)
- Open Water (16.36%)
- Pontederia cordata (0.10%)
- Pontederia cordata and Typha sp. (0.48%)
- Sagittaria lancifolia (2.29%)
- Sagittaria/Typha/Pontederia (24.47%)
- Sagittaria and Pontederia (11.96%)
- Sagittaria and Salix caroliniana (0.44%)
- Scirpus validus (0.21%)
- Panicum repens (1.18%)
- Tree Island (4%)
- Typha sp. (27.14%)



Percent coverage and vegetative boundaries are an estimate based on limited ground truthing using the methods described in the Scope of Work

DRAWN BY	DATE
N. BOTS	5/18/2021
CHECKED BY	DATE
R. HEILMAN	5/18/2021
SCALE AS NOTED	



Dominant Vegetative Cover  
Brevard Wastewater Treatment Facility  
Brevard County, Florida

CONTRACT NUMBER	
100-WTR-T41397.01	
APPROVED BY	DATE
H. CAROLAN	5/18/2021
FIGURE NO. 2	



## TABLES

**TABLE 1 - WEP-1 EFFLUENT SAMPLING RESULTS**

Brevard County Utility Services - South Central Regional WWTF

Sample	DO	BOD, 5 day	CBOD	TSS	TOTAL Nitrogen	Nitrogen, Kjeldahl, Total	Nitrogen, NO2 plus NO3	Ammonia	TOTAL Phosphorus
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Avg. July 2018	NA	NA	2.4	3.74	1.93	NA	NA	NS	0.086
2019 - No Discharge									
Avg. July 2020	4.06	NA	<b>5.15</b>	1.58	<b>2.10</b>	NA	NA	0.17	0.06
Avg. September 2020	3.83	NA	<b>4.11</b>	2.33	1.44	NA	NA	0.19	0.05
Avg. October 2020	3.53	NA	3.15	2.25	1.30	NA	NA	0.24	0.05
Avg. January 2021	5.54	NA	1.32	0.77	1.40	NA	NA	0.18	0.05
Avg. February 2021	5.34	NA	1.84	2.43	1.65	NA	NA	0.26	<b>1.20</b>
Avg. March 2021	5.73	NA	1.99	1.20	1.64	NA	NA	0.1	0.07
Grab - May 4, 2021	NA	2.4	2,000 U	4.6	1.6	1.5	0.033 U	0.1	NA

**Permit Limits**

Single Sample	-	-	6	6	3.2	-	-	-	0.32
Monthly Average	-	-	3.75	3.75	2	-	-	-	0.2

**Notes:**

Average discharge results provided for months where discharges occurred from 2018 through 2021.

**Bold results indicate exceedance of permit limits.**

mg/L - milligrams per liter

DO - dissolved oxygen

BOD - Biological Oxygen Demand

cBOD - carbonaceous BOD

TSS - total suspended solids

U - not detected at the noted method detection limit

NA - not analyzed

**TABLE 2 - GROUNDWATER SAMPLING RESULTS**

Brevard County Utility Services - South Central Regional WWTF

Sample	Date	Water Elevation	Fecal Coliforms
		(feet NGVD)	(MPN/100mL)
MWC-5-SOD	2/8/2018	20.57	<1
	4/10/2018	20.33	1
	7/16/2018	5.22	<1
	10/22/2018	20.73	<b>9</b>
	1/21/2019	20.52	<1
	4/10/2019	20.88	1
	7/2/2019	20.75	<1
	10/8/2019	19.87	<b>43</b>
	1/16/2020	21.29	3
	6/22/2020	20.32	<1
	9/28/2020	21.08	<b>9</b>
	12/8/2020	20.68	1
	3/4/2021	21.22	2
5/4/2021	23.45	<b>172</b>	

MWC-6-SOD	2/8/2018	22.61	<1
	4/10/2018	21.86	1
	7/16/2018	21.86	<1
	10/22/2018	21.86	<1
	1/21/2019	21.86	<1
	4/10/2019	21.86	1
	7/2/2019	21.86	<1
	10/8/2019	21.86	<b>16</b>
	1/16/2020	21.86	<1
	6/22/2020	21.86	<1
	9/28/2020	21.86	<1
	12/8/2020	21.86	<b>8</b>
	3/4/2021	21.86	<1
5/4/2021	21.86	1 U	

Permit limit	4
--------------	---

Notes:

Bold values exceed the permit limits.

feet NGVD - elevation in feet above National Geodetic Vertical Datum

MPN/100ml - most probable number per 100 milliliters

< - less than noted value

**TABLE 3 - MUCK PROBING AND SURVEY RESULTS**  
 Brevard County Utility Services - South Central Regional WWTF

Point No.	Easting	Northing	Elevation of Hard-Bottom (feet NAVD88)	Muck Thickness (Feet)
P1	730891.11	1416095.16	20.03	0.35
P2	730983.4	1416066.41	20.14	0.15
P3	731038.12	1416073.48	20.31	0.2
P4	731081.06	1416035.92	19.75	0.25
P5	731154.21	1416006.05	20.57	0.45
P6	731202.92	1415981.8	20.49	0.1
P7	731222.42	1415955.51	20.59	0.1
P8	731239.55	1415932.9	20.37	0.3
P9	731227.71	1415912.02	20.26	0.1
P10	731193.53	1415886.01	20.4	0.1
P11	731179.05	1415860.16	20.28	0.1
P12	731154.24	1415819.99	20.15	0.2
P13	731144.15	1415790.01	21.36	0.5
P14	731161.55	1415764.85	20.16	0.35
P15	731176.18	1415770.45	19.27	0.8
P16	731218.08	1415773.41	19.7	0.45
P17	731257.66	1415777.95	20.55	0.2
P18	731265.89	1415816.33	20.89	0.25
P19	731287.68	1415847.17	20.39	0.2
P20	731301.83	1415856.74	20.69	0.1
P21	731317.34	1415841.31	20.97	0.15
P22	731351.79	1415816.65	20.78	0.4
P23	731395.56	1415776.18	20.68	0.1
P24	731414.45	1415751.84	20.95	0.35
P25	731338.89	1415772.93	20.38	0.25
P26	731256.79	1415779.59	20.09	0.4
P27	731211.31	1415774.82	19.76	0.25
P28	731145.64	1415768.21	20.36	0.2
P29	731096.5	1415765.94	19.72	0.65
P30	731085.03	1415651.34	20.41	1
P31	731072.68	1415698.3	20.15	0.55
P32	731072.43	1415734.87	20.3	0.4
P33	731060.32	1415770.87	19.64	0.75
P34	731023.79	1415771.81	19.31	0.55
P35	730976.11	1415783.39	20.09	0.2
P36	730948.61	1415778.07	20.27	0.15
P37	730951.16	1415730.14	19.98	0.15
P38	730992.39	1415734.68	20.47	0.05
P39	730973.27	1415707.71	20.13	0.2
P40	730958.4	1415680.51	20.23	0.6
P41	730990.27	1415662.36	20.32	0.25
P42	730961.53	1415635.24	20.17	0.35
P43	730968.96	1415559.74	19.66	0.3
P44	730953.91	1415585.5	19.35	0.15
P45	730931.07	1415665.48	20.08	0.1

Point No.	Easting	Northing	Elevation of Hard-Bottom (feet NAVD88)	Muck Thickness (Feet)
P46	730926.6	1415781.97	20.33	0.6
P47	730892.02	1415781.91	19.84	0.75
P48	730893.86	1415742.61	19.89	0.3
P49	730922.55	1415716.71	19.97	0.25
P50	730887.62	1415693.23	19.89	0.25
P51	730886.74	1415629.65	19.64	0.30 {0.75 ALGAE MAT}
P52	730855.96	1415664.85	19.82	0.20 {0.50 ALGAE MAT}
P53	730813.95	1415679.08	19.79	0.40 {0.55 ALGAE MAT}
P54	730826.09	1415714.79	20.23	0.5
P55	730781.37	1415696.26	19.82	0.15
P56	730730.71	1415727.6	19.61	0.2
P58	730703.51	1415741.01	20.06	0.15 {0.50 ALGAE MAT}
P59	730655.08	1415759.51	19.89	0.35
P60	730616.94	1415777.44	19.89	0.15
P61	730577.07	1415798.73	19.58	0.1
P62	730584.58	1415825.37	20.59	0.3
P63	730524.19	1415812.59	20.4	0.15
P64	730589.77	1415868.47	20.17	0.2
P65	730559.75	1415904.62	20.15	0.55
P66	730553.58	1415936.07	20.25	0.2
P67	730549.5	1415972.74	20.13	0.2
P68	730521.11	1415999.66	20.15	0.7
P69	730513.09	1415962.54	20.81	0.8
P70	730473.16	1415956.89	20.63	0.3
P71	730440.57	1415905.81	20.19	0.4
P72	730445.41	1415860.95	20.18	0.1
P73	730474.48	1415835.45	20.12	0.15
P74	730413.99	1415867.32	20.02	0.25
P75	730380.33	1415873.98	19.95	0.2
P76	730346.16	1415892.53	19.75	0.15
P77	730391.1	1415902.79	20.39	0.4
P78	730439.5	1415940.24	20.5	0.9
P79	730428.84	1415992.09	20.43	1
P80	730406.09	1416038	19.88	0.2
P81	730380.66	1416074.81	19.5	0.1
P82	730325.04	1416075.17	19.41	0.4
P83	730435.47	1416086.45	20.28	0.25
P84	730502.48	1416092.09	19.63	1.4
P86	730544.31	1416079.11	20.45	0.65
P87	730607.21	1416054.59	19.81	0.3
P88	730655.52	1416066.26	20.01	0.4
P89	730698.71	1416079.9	19.61	0.1
P90	730755.77	1416074.32	20.17	0.35
P91	730811.09	1416095.01	20.2	0.1

Point No.	Easting	Northing	Elevation of Hard-Bottom (feet NAVD88)	Muck Thickness (Feet)
P92	730853.67	1416091.69	19.79	0.05
P93	730899.11	1416043.77	19.58	0.05
P94	730899.54	1416000.34	20.13	0.15
P95	730897.9	1415998.53	19.83	0.2
P96	730860.85	1415992.62	20.1	0.25
P97	730900.1	1415946.62	19.71	0.1
P98	730859.83	1415937.4	20.24	0.15
P100	730828.77	1415973.56	19.94	0.2
P101	730808.18	1416007.99	20.04	0.2
P102	730781.88	1416004.98	20.49	0.25
P103	730776.84	1415970.63	20.3	0.15
P104	730768.18	1415922.43	20.23	0.25
P105	730724.8	1415887.03	20.35	0.2
P106	730722.46	1415954.91	20.03	0.3
P107	730727.26	1415999.87	19.56	0.5
P108	730662.7	1416023.33	19.96	0.2
P109	730642.91	1415968.57	19.89	0.25
P110	730660.82	1415912.18	20.06	0.15
P111	730578.68	1416002.49	19.41	0.2
P112	730520.22	1416001.42	20.58	0.45
P113	730480.92	1416027	20.78	0.55
P114	730153.12	1416004.7	20.49	0.4
P115	730134.35	1416040.52	19.45	0.4
P116	730101.04	1416090.85	19.65	0.55
P117	730117.75	1416067.95	19.43	0.35
P118	730146.47	1416063.65	19.8	0.2
P119	730154.33	1416075.26	19.58	0.3
<b>Average</b>				<b>0.32</b>

Notes:

Average muck thickness does not include apparent algal mat, which was only identified by sight.

Data collected by:

OCEANSIDE SOLUTIONS LLC

Professional Hydrographic Survey Consultants

Surveyed - April 27, 2021

Datum - NAD83-FL East 0901 and NAVD88- G12B

NAD83-FL East 0901 - North American Datum of 1983, State Plane Florida East

NAVD88 - North American Vertical Datum of 1988

**TABLE 4 - OBSERVED WILDLIFE SPECIES TABLE**  
 Brevard County Utility Services - South Central Regional WWTF

<b>Birds</b>	
Anhinga	<i>Anhinga anhinga</i>
Boat-tailed Grackle	<i>Quiscalus major</i>
Glossy Ibis	<i>Plegadis falcinellus</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
Little Blue Heron (ST)	<i>Egretta caerulea</i>
Osprey	<i>Pandion haliaetus</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-wing Blackbird	<i>Agelaius phoeniceus</i>
Tricolored Heron (ST)	<i>Egretta tricolor</i>
White Ibis	<i>Eudocimus albus</i>
<b>Mammals</b>	
Marsh Rabbit	<i>Sylvilagus palustris</i>
<b>Reptiles</b>	
American Alligator (FT)	<i>Alligator mississippiensis</i>

Notes:

ST - State Threatened

FT - Federally Threatened (similar appearance)

**ATTACHMENT 1**  
**Laboratory Analytical Results**





Pace Analytical Services, LLC  
8 East Tower Circle  
Ormond Beach, FL 32174  
(386)672-5668

May 11, 2021

Mr. Matt Shelton  
Tetra-Tech Cocoa  
11 Riverside Drive  
Ste 204  
Cocoa, FL 32922

RE: Project: Brevard County  
Pace Project No.: 35630343

Dear Mr. Shelton:

Enclosed are the analytical results for sample(s) received by the laboratory on May 04, 2021. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:  
• Pace Analytical Services - Ormond Beach

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Lori Palmer  
lori.palmer@pacelabs.com  
813-855-1844  
Project Manager

Enclosures



### REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
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CERTIFICATIONS

Project: Brevard County
Pace Project No.: 35630343

Pace Analytical Services Ormond Beach

8 East Tower Circle, Ormond Beach, FL 32174
Alaska DEC- CS/UST/LUST
Alabama Certification #: 41320
Arizona Certification# AZ0819
Colorado Certification: FL NELAC Reciprocity
Connecticut Certification #: PH-0216
Delaware Certification: FL NELAC Reciprocity
Florida Certification #: E83079
Georgia Certification #: 955
Guam Certification: FL NELAC Reciprocity
Hawaii Certification: FL NELAC Reciprocity
Illinois Certification #: 200068
Indiana Certification: FL NELAC Reciprocity
Kansas Certification #: E-10383
Kentucky Certification #: 90050
Louisiana Certification #: FL NELAC Reciprocity
Louisiana Environmental Certificate #: 05007
Maryland Certification: #346
Michigan Certification #: 9911
Mississippi Certification: FL NELAC Reciprocity
Missouri Certification #: 236

Montana Certification #: Cert 0074
Nebraska Certification: NE-OS-28-14
New Hampshire Certification #: 2958
New Jersey Certification #: FL022
New York Certification #: 11608
North Carolina Environmental Certificate #: 667
North Carolina Certification #: 12710
North Dakota Certification #: R-216
Ohio DEP 87780
Oklahoma Certification #: D9947
Pennsylvania Certification #: 68-00547
Puerto Rico Certification #: FL01264
South Carolina Certification: #96042001
Tennessee Certification #: TN02974
Texas Certification: FL NELAC Reciprocity
US Virgin Islands Certification: FL NELAC Reciprocity
Virginia Environmental Certification #: 460165
West Virginia Certification #: 9962C
Wisconsin Certification #: 399079670
Wyoming (EPA Region 8): FL NELAC Reciprocity

REPORT OF LABORATORY ANALYSIS

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### SAMPLE SUMMARY

Project: Brevard County  
Pace Project No.: 35630343

Lab ID	Sample ID	Matrix	Date Collected	Date Received
35630343001	SCWWTF-WEP-1-050421	Water	05/04/21 09:25	05/04/21 15:15
35630343002	SCWWTF-MWC-5-SOD-050421	Water	05/04/21 10:45	05/04/21 15:15
35630343003	SCWWTF-MWC-6-SOD-050421	Water	05/04/21 11:55	05/04/21 15:15

### REPORT OF LABORATORY ANALYSIS

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**SAMPLE ANALYTE COUNT**

Project: Brevard County  
 Pace Project No.: 35630343

Lab ID	Sample ID	Method	Analysts	Analytes Reported
35630343001	SCWWTF-WEP-1-050421	SM 2540D	RAK	1
		SM 5210B	MCD	1
		SM 5210B	EM2	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CHP	1
		EPA 353.2	CLL	1
35630343002	SCWWTF-MWC-5-SOD-050421	Colilert/Quani-Tray	MEB	1
35630343003	SCWWTF-MWC-6-SOD-050421	Colilert/Quani-Tray	MEB	1

PASI-O = Pace Analytical Services - Ormond Beach

**REPORT OF LABORATORY ANALYSIS**

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### SUMMARY OF DETECTION

Project: Brevard County  
 Pace Project No.: 35630343

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
<b>35630343001</b>	<b>SCWWTF-WEP-1-050421</b>					
SM 2540D	Total Suspended Solids	4.6	mg/L	1.0	05/09/21 15:12	
SM 5210B	BOD, 5 day	2.4	mg/L	2.0	05/10/21 16:18	
TKN+NOx Calculation	Total Nitrogen	1.6	mg/L	0.50	05/10/21 14:46	
EPA 351.2	Nitrogen, Kjeldahl, Total	1.5	mg/L	0.50	05/07/21 11:55	
<b>35630343002</b>	<b>SCWWTF-MWC-5-SOD-050421</b>					
Colilert/Quani-Tray	Fecal Coliforms	172	MPN/100mL	1.0	05/05/21 11:31	

### REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: Brevard County  
 Pace Project No.: 35630343

Sample: SCWWTF-WEP-1-050421 Lab ID: 35630343001 Collected: 05/04/21 09:25 Received: 05/04/21 15:15 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>2540D Total Suspended Solids</b>	Analytical Method: SM 2540D Initial Volume/Weight: 1000 mL Final Volume/Weight: 1000 mL Pace Analytical Services - Ormond Beach								
Total Suspended Solids	4.6	mg/L	1.0	1.0	1		05/09/21 15:12		
<b>5210B BOD, 5 day</b>	Analytical Method: SM 5210B Initial Volume/Weight: 300 mL Final Volume/Weight: 300 mL Pace Analytical Services - Ormond Beach								
BOD, 5 day	2.4	mg/L	2.0	2.0	1	05/05/21 13:13	05/10/21 16:18		
<b>5210B cBOD, 5 day</b>	Analytical Method: SM 5210B Preparation Method: SM 5210B Initial Volume/Weight: 300 mL Final Volume/Weight: 300 mL Pace Analytical Services - Ormond Beach								
Carbonaceous BOD, 5 day	2.0 U	mg/L	2.0	2.0	1	05/06/21 09:24	05/11/21 07:20		
<b>Total Nitrogen Calculation</b>	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen	1.6	mg/L	0.50	0.086	1		05/10/21 14:46		
<b>351.2 Total Kjeldahl Nitrogen</b>	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Initial Volume/Weight: 20 mL Final Volume/Weight: 20 mL Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	1.5	mg/L	0.50	0.086	1	05/06/21 12:37	05/07/21 11:55	7727-37-9	
<b>353.2 Nitrogen, NO2/NO3 pres.</b>	Analytical Method: EPA 353.2 Initial Volume/Weight: 50 mL Final Volume/Weight: 50 mL Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	0.033 U	mg/L	0.050	0.033	1		05/08/21 12:35		

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**ANALYTICAL RESULTS**

Project: Brevard County  
 Pace Project No.: 35630343

Sample: SCWWTF-MWC-5-SOD-050421 Lab ID: 35630343002 Collected: 05/04/21 10:45 Received: 05/04/21 15:15 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>MBIO Fecal Coliforms</b>	Analytical Method: Colilert/Quani-Tray Preparation Method: Colilert/Quani-Tray Initial Volume/Weight: 100 mL Final Volume/Weight: Pace Analytical Services - Ormond Beach								
Fecal Coliforms	172	MPN/100mL	1.0	1.0	1	05/04/21 16:51	05/05/21 11:31		

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**ANALYTICAL RESULTS**

Project: Brevard County  
 Pace Project No.: 35630343

Sample: SCWWTF-MWC-6-SOD-050421 Lab ID: 35630343003 Collected: 05/04/21 11:55 Received: 05/04/21 15:15 Matrix: Water

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>MBIO Fecal Coliforms</b>	Analytical Method: Colilert/Quani-Tray Preparation Method: Colilert/Quani-Tray Initial Volume/Weight: 100 mL Final Volume/Weight: Pace Analytical Services - Ormond Beach								
Fecal Coliforms	1.0 U	MPN/100mL	1.0	1.0	1	05/04/21 16:51	05/05/21 11:31		

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QUALITY CONTROL DATA

Project: Brevard County  
Pace Project No.: 35630343

QC Batch: 726798      Analysis Method: Colilert/Quani-Tray  
QC Batch Method: Colilert/Quani-Tray      Analysis Description: FCOLMPN MBIO Fecal Coliform  
Laboratory: Pace Analytical Services - Ormond Beach  
Associated Lab Samples: 35630343002, 35630343003

METHOD BLANK: 3961204      Matrix: Solid  
Associated Lab Samples: 35630343002, 35630343003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Fecal Coliforms	MPN/100mL	1.0 U	1.0	1.0	05/05/21 11:31	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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**QUALITY CONTROL DATA**

Project: Brevard County  
 Pace Project No.: 35630343

QC Batch: 727660      Analysis Method: SM 2540D  
 QC Batch Method: SM 2540D      Analysis Description: 2540D Total Suspended Solids  
 Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 35630343001

METHOD BLANK: 3966956      Matrix: Water

Associated Lab Samples: 35630343001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Suspended Solids	mg/L	1.0 U	1.0	1.0	05/09/21 15:11	

LABORATORY CONTROL SAMPLE & LCSD: 3966957

3966960

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	100	96.0	100	96	100	90-110	4	10	

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**QUALITY CONTROL DATA**

Project: Brevard County  
 Pace Project No.: 35630343

QC Batch: 726625      Analysis Method: SM 5210B  
 QC Batch Method: SM 5210B      Analysis Description: 5210B BOD, 5 day  
 Laboratory: Pace Analytical Services - Ormond Beach  
 Associated Lab Samples: 35630343001

METHOD BLANK: 3960266      Matrix: Water  
 Associated Lab Samples: 35630343001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
BOD, 5 day	mg/L	2.0 U	2.0	2.0	05/10/21 15:16	

LABORATORY CONTROL SAMPLE: 3960268

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
BOD, 5 day	mg/L	199	170	85	85-115	

SAMPLE DUPLICATE: 3960269

Parameter	Units	35630435001 Result	Dup Result	RPD	Max RPD	Qualifiers
BOD, 5 day	mg/L	298	307	3	20	

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**QUALITY CONTROL DATA**

Project: Brevard County  
 Pace Project No.: 35630343

QC Batch: 726940      Analysis Method: SM 5210B  
 QC Batch Method: SM 5210B      Analysis Description: 5210B cBOD, 5 day  
 Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 35630343001

METHOD BLANK: 3961945      Matrix: Water

Associated Lab Samples: 35630343001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Carbonaceous BOD, 5 day	mg/L	2.0 U	2.0	2.0	05/11/21 07:12	

LABORATORY CONTROL SAMPLE: 3961947

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Carbonaceous BOD, 5 day	mg/L	199	178	90	85-115	

SAMPLE DUPLICATE: 3961948

Parameter	Units	35630315001 Result	Dup Result	RPD	Max RPD	Qualifiers
Carbonaceous BOD, 5 day	mg/L	125	128	2	20	

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**QUALITY CONTROL DATA**

Project: Brevard County  
 Pace Project No.: 35630343

QC Batch: 726898 Analysis Method: EPA 351.2  
 QC Batch Method: EPA 351.2 Analysis Description: 351.2 TKN  
 Laboratory: Pace Analytical Services - Ormond Beach  
 Associated Lab Samples: 35630343001

METHOD BLANK: 3961781 Matrix: Water  
 Associated Lab Samples: 35630343001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	0.086 U	0.50	0.086	05/07/21 11:26	

LABORATORY CONTROL SAMPLE: 3961782

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	20	20.6	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3961784 3961783

Parameter	Units	35629428001		3961784		3961783		% Rec Limits	RPD	Max RPD	Qual	
		MS Result	MSD Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result					MS % Rec
Nitrogen, Kjeldahl, Total	mg/L	0.41	0.41	20	20	20.6	20.7	101	102	90-110	0	20

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3961786 3961785

Parameter	Units	35629428003		3961786		3961785		% Rec Limits	RPD	Max RPD	Qual	
		MS Result	MSD Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result					MS % Rec
Nitrogen, Kjeldahl, Total	mg/L	0.64	0.64	20	20	21.2	21.2	103	103	90-110	0	20

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**QUALITY CONTROL DATA**

Project: Brevard County  
 Pace Project No.: 35630343

QC Batch: 727572      Analysis Method: EPA 353.2  
 QC Batch Method: EPA 353.2      Analysis Description: 353.2 Nitrate + Nitrite, preserved  
 Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 35630343001

METHOD BLANK: 3966076      Matrix: Water

Associated Lab Samples: 35630343001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	0.033 U	0.050	0.033	05/08/21 12:16	

LABORATORY CONTROL SAMPLE: 3966077

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	2	2.2	108	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3966079      3966078

Parameter	Units	35628916003		3966079		3966078		% Rec Limits	RPD	Max RPD	Qual	
		MS Result	MSD Spike Conc.	MS Result	MSD Spike Conc.	MS Result	MSD Spike Conc.					
Nitrogen, NO2 plus NO3	mg/L	0.073	2	2	2	2.1	2.1	102	102	90-110	1	20

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3966081      3966080

Parameter	Units	35628883002		3966081		3966080		% Rec Limits	RPD	Max RPD	Qual	
		MS Result	MSD Spike Conc.	MS Result	MSD Spike Conc.	MS Result	MSD Spike Conc.					
Nitrogen, NO2 plus NO3	mg/L	1.2	2	2	2	2.8	1.4	84	13	90-110	67	20 J(M1), J(R1)

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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## QUALIFIERS

Project: Brevard County  
Pace Project No.: 35630343

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### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.  
ND - Not Detected at or above adjusted reporting limit.  
TNTC - Too Numerous To Count  
MDL - Adjusted Method Detection Limit.  
PQL - Practical Quantitation Limit.  
RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.  
S - Surrogate  
1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.  
Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.  
LCS(D) - Laboratory Control Sample (Duplicate)  
MS(D) - Matrix Spike (Duplicate)  
DUP - Sample Duplicate  
RPD - Relative Percent Difference  
NC - Not Calculable.  
SG - Silica Gel - Clean-Up  
U - Indicates the compound was analyzed for, but not detected.  
N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.  
Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.  
TNI - The NELAC Institute.

### ANALYTE QUALIFIERS

I The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.  
U Compound was analyzed for but not detected.  
J(M1) Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.  
J(R1) Estimated Value. RPD value was outside control limits.

## REPORT OF LABORATORY ANALYSIS

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**QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: Brevard County  
 Pace Project No.: 35630343

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
35630343002	SCWWTF-MWC-5-SOD-050421	Colilert/Quani-Tray	726798	Colilert/Quani-Tray	726799
35630343003	SCWWTF-MWC-6-SOD-050421	Colilert/Quani-Tray	726798	Colilert/Quani-Tray	726799
35630343001	SCWWTF-WEP-1-050421	SM 2540D	727660		
35630343001	SCWWTF-WEP-1-050421	SM 5210B	726625	SM 5210B	727867
35630343001	SCWWTF-WEP-1-050421	SM 5210B	726940	SM 5210B	728062
35630343001	SCWWTF-WEP-1-050421	TKN+NOx Calculation	727932		
35630343001	SCWWTF-WEP-1-050421	EPA 351.2	726898	EPA 351.2	727192
35630343001	SCWWTF-WEP-1-050421	EPA 353.2	727572		

**REPORT OF LABORATORY ANALYSIS**

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# WO# : 35630343



35630343

### CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

**Section A** Required Client Information: Company: Tetra Tech, Inc  
Address: 11 Riverside Drive  
Cocoa, FL 32822  
Phone: 3216586470  
Requested Due Date:  
Fax:  
Email:

**Section B** Required Project Information: Report To: Mr. Matt Shelton  
Copy To:  
Purchase Order #:   
Project Name: Brevard County  
Project #:  
State / Location: FL

**Section C** Invoice Information: Attention:  
Company Name:  
Address:  
Face Quote:  
Face Project Manager: Ion Palmer@pacelabs.com  
Face Profile #: 8480-20  
Regulatory Agency:  
State / Location: FL

Page: 1 Of 1

ITEM #	MATRIX	MATRIX CODE (see valid codes to left)	COLLECTED		SAMPLE TYPE (G-GRAB C-COMP)	# OF CONTAINERS	Preservatives										Analytes Test Y/N	BOD 5-day	BOD 5-day	TSS	Feal Coliform MPN	TN (TKN+NOX)	Residual Chlorine (Y/N)	SAMPLE CONDITIONS														
			START DATE	END DATE			H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Received on	Custody	Sealed								Cooler														
1		SCWMTF-WEP-1-050421	5-4	0920	5-4	0925	✓										✓	✓	✓																			
2		SCWMTF-MWC-5-SOD-050421	5-4	1040	5-4	1045	✓										✓			✓																		
3		SCWMTF-MWC-U-SOD-050421	5-4	1150	5-4	1155	✓										✓			✓																		
4																																						
5																																						
6																																						
7																																						
8																																						
9																																						
10																																						
11																																						
12																																						

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	TEMP in C	Received on	Custody	Sealed	Cooler	Samples Intact (Y/N)
Bottle Kit	Pace	5/10/14	1510	Pace	5/14/14	1318						
	MJ DRA	5-4-21	1515	KAT / Pace	5-4-21	1515	30	Y	Y	Y	Y	Y

NOTE: Coliforms have 8 hour hold time

SAMPLER NAME AND SIGNATURE: MISSA BENNETT  
PRINT Name of SAMPLER: MISSA BENNETT  
SIGNATURE of SAMPLER: [Signature]

DATE Signed: 5-4-14

Page 17 of 702

**Sample Condition Upon Receipt Form (SCUR)**

**Project #** WO#: 35630343 **Date and Initials of person:**  
**Project Manager:** PM: LAP **Due Date:** 05/11/21  
**Client:** CLIENT: TETCOC **Examining contents:** \_\_\_\_\_  
**Label:** KAT  
**Deliver:** \_\_\_\_\_  
**pH:** \_\_\_\_\_

Thermometer Used: T-338 Date: 5/4/21 Time: 1525 Initials: KMF

State of Origin: \_\_\_\_\_  For WV projects, all containers verified to ≤6 °C  
 Cooler #1 Temp. °C 2.9 (Visual) +0.1 (Correction Factor) 30 (Actual)  Samples on ice, cooling process has begun  
 Cooler #2 Temp. °C \_\_\_\_\_ (Visual) \_\_\_\_\_ (Correction Factor) \_\_\_\_\_ (Actual)  Samples on ice, cooling process has begun  
 Cooler #3 Temp. °C \_\_\_\_\_ (Visual) \_\_\_\_\_ (Correction Factor) \_\_\_\_\_ (Actual)  Samples on ice, cooling process has begun  
 Cooler #4 Temp. °C \_\_\_\_\_ (Visual) \_\_\_\_\_ (Correction Factor) \_\_\_\_\_ (Actual)  Samples on ice, cooling process has begun  
 Cooler #5 Temp. °C \_\_\_\_\_ (Visual) \_\_\_\_\_ (Correction Factor) \_\_\_\_\_ (Actual)  Samples on ice, cooling process has begun  
 Cooler #6 Temp. °C \_\_\_\_\_ (Visual) \_\_\_\_\_ (Correction Factor) \_\_\_\_\_ (Actual)  Samples on ice, cooling process has begun

Courier:  Fed Ex  UPS  USPS  Client  Commercial  Pace  Other \_\_\_\_\_  
 Shipping Method:  First Overnight  Priority Overnight  Standard Overnight  Ground  International Priority  
 Other \_\_\_\_\_  
 Billing:  Recipient  Sender  Third Party  Credit Card  Unknown  
 Tracking # \_\_\_\_\_

Custody Seal on Cooler/Box Present:  Yes  No Seals intact:  Yes  No Ice: Wet Blue Dry None  
 Packing Material:  Bubble Wrap  Bubble Bags  None  Other \_\_\_\_\_  
 Samples shorted to lab (If Yes, complete) Shorted Date: 5/4/21 Shorted Time: 1530 Qty: 2SPST

Comments:		
Chain of Custody Present	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Chain of Custody Filled Out	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Relinquished Signature & Sampler Name COC	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Samples Arrived within Hold Time	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Rush TAT requested on COC	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Sufficient Volume	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Correct Containers Used	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Sample Labels match COC (sample IDs & date/time of collection)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
All containers needing acid/base preservation have been checked.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Preservation Information: Preservative: _____ Lot #/Trace #: _____ Date: _____ Time: _____ Initials: _____
All Containers needing preservation are found to be in compliance with EPA recommendation. Exceptions: VOA, Coliform, TOC, O&G, Carbamates	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Headspace in VOA Vials? (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Trip Blank Present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

**Client Notification/ Resolution:**  
 Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

**Comments/ Resolution (use back for additional comments):** \_\_\_\_\_

Project Manager Review: \_\_\_\_\_ Date: \_\_\_\_\_



15280 NW 79th Court, Suite 107 Miami Lakes, Florida 33016  
 Tel: (1) 786-220-0379 Fax: (1) 786-513-2733  
 Email: info@sourcemolecular.com



### Fecal Host Quantification ID Test Results Report

Detection and quantification of the fecal host associated gene biomarker by quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Tetra Tech  
 Date Received/Processed: May 5, 2021  
 Report Generated: May 17, 2021

ND: Not Detected  
 DNQ: Detected Not Quantified

SM #	Sample ID	Date Collected	Time Collected	Analysis Requested	Marker Quantified	Result Unit
SM21E05178	SCWWTF-MWC-5-SOD-050421	5/4/2021	10:40 AM	Human_HF183	ND	copies per 100ml
SM21E05179	SCWWTF-MWC-6-SOD-050421	5/4/2021	11:50 AM	Human_HF183	ND	copies per 100ml
SM21E05180	SCWWTF-MWC-5-SOD-050421	5/4/2021	10:40 AM	Ruminant_Rum2Bac	ND	copies per 100ml
SM21E05181	SCWWTF-MWC-6-SOD-050421	5/4/2021	11:50 AM	Ruminant_Rum2Bac	ND	copies per 100ml
SM21E05182	SCWWTF-MWC-5-SOD-050421	5/4/2021	10:40 AM	Bird_GFD	DNQ	copies per 100ml
SM21E05183	SCWWTF-MWC-6-SOD-050421	5/4/2021	11:50 AM	Bird_GFD	DNQ	copies per 100ml

Reported Results Authorized By: Anda Quintero, Quality Manager

Results reported herein apply only to the sample matrices as received.  
 Results reported herein relate to the genetic material extracted from the sample matrix processed and included in the analysis.

Revision 1.4  
 Effective Date 12/12/19



15280 NW 79th Court, Suite 107 Miami Lakes, Florida 33016  
Tel: (1) 786-220-0379 Fax: (1) 786-513-2733  
Email: [info@sourcemolecular.com](mailto:info@sourcemolecular.com)



## Fecal Host Quantification ID Test Results Report

Detection and quantification of the fecal host associated gene biomarker by quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Tetra Tech  
Date Received/Processed: May 5, 2021  
Report Generated: May 17, 2021

SM #	Sample ID	Sample Type	Extraction Date	Analysis Date	Amount Processed	Amount Processed Unit	Analytical Volume (ul)
SM21E05178	SCWWTF-MWC-5-SOD-050421	Water	5/11/2021	5/12/2021	100	ml	2
SM21E05179	SCWWTF-MWC-6-SOD-050421	Water	5/11/2021	5/12/2021	100	ml	2
SM21E05180	SCWWTF-MWC-5-SOD-050421	Water	5/11/2021	5/12/2021	100	ml	2
SM21E05181	SCWWTF-MWC-6-SOD-050421	Water	5/11/2021	5/12/2021	100	ml	2
SM21E05182	SCWWTF-MWC-5-SOD-050421	Water	5/11/2021	5/12/2021	100	ml	2
SM21E05183	SCWWTF-MWC-6-SOD-050421	Water	5/11/2021	5/12/2021	100	ml	2

Reported Results Authorized By: Anda Quintero, Quality Manager

Results reported herein apply only to the sample matrices as received.  
Results reported herein relate to the genetic material extracted from the sample matrix processed and included in the analysis.

## Laboratory Comments

Submitter: Tetra Tech

Report Generated: May 17, 2021

### Non-Detect Results

In sample(s) classified as non-detect, the host-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis.

### Detected Results

In sample(s) classified as detected, the host-associated fecal gene biomarker(s) was detected in both test replicates suggesting that the host's fecal contamination is present in the sample(s). Copy number measurements reported are relative, not absolute, quantification.

### Detected Not Quantified (DNQ) Results

In sample(s) classified as Detected Not Quantified (DNQ), the host-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with the respective host was present in the sample(s) but in low concentrations.

### Fecal Reference Samples

The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the host-associated biomarker with the regional population. A more precise interpretation would be available to the client with the submittal of such baseline samples.

### Result Interpretations

The presence of the biomarker does not signify the presence or absence of that form of fecal pollution conclusively. The most reliable way to accurately test for contamination is to combine genetic testing with scientifically sound and adequate study design appropriate for the water quality questions to be answered or issues to be resolved.

### Additional Testing

A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination.

#### Limitation of Damages – Repayment of Service Price

It is agreed that in the event of breach of any warranty or breach of contract, or negligence of Source Molecular Corporation, as well as its agents or representatives, the liability of the company shall be limited to the repayment, to the purchaser (submitter), of the individual analysis price paid by him/her to Source Molecular Corp. The company shall not be liable for any damages, either direct or consequential. Source Molecular Corp. provides analytical services on a PRIME CONTRACT BASIS ONLY. Terms are available upon request. The sample(s) cited in this report may be used for research purposes after an archiving period of 3 months from the date of this report. Research includes, but is not limited to internal validation studies and peer-reviewed research publications. Anonymity of the sample(s), including the exact geographic location will be maintained by assigning an arbitrary internal reference. These anonymous samples will only be grouped by state / province of origin for research purposes. The client must contact Source Molecular in writing within 10 days from the date of this report if he/she does not wish for their submitted sample(s) to be used for any type of future research.

### DNA Analytical Method Explanation

**Water Samples:** Each submitted water sample is filtered through 0.45 micron membrane filter(s). Each filter is placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample is homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol. Deviations to these procedures may occur at the client's request.

**Non-Water Samples:** Each non-water sample submitted by the client is processed as per internal laboratory extraction procedures. An extracted DNA sample is proceed directly to PCR analysis. Details available upon request.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul sample extract, forward primer, reverse primer, probe and an optimized buffer. All assays are run in duplicate. Quantification is achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control and a negative control, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.



**ATTACHMENT 2**  
**Monitoring Well Sampling Forms and Calibration Logs**



TETRA TECH

Tetra Tech / FDEP Groundwater Sampling Sheet

SITE NAME: Brevard SC WWTF		SITE LOCATION: N. Wickham Rd	
LOCATION ID: MWC-6-SOD	SAMPLE ID: SCWWTF-MWC-6-SOD -050421 Sample depth (ddd d)=[bottom of screen (feet bls)-Top depth] x 0.5-bottom of screen (feet bls)	DATE: 05 / 04 / 2021	

PURGING DATA

STATIC DEPTH TO WATER (feet bloc): 9.70	CASING HEIGHT (feet als): 7.2	STATIC DEPTH TO WATER (feet bls) = (bloc) - Casing Height (feet als): 6.50	WELL SCREEN INTERVAL DEPTH (feet bls)	
WELL DIAMETER (Inches): 2	TUBING DIAMETER (Inches): 1/4	PURGE PUMP TYPE OR BAILER: Geo-Perl Pump	TOP DEPTH = top of screen or depth to water which ever is greatest (feet bls):	BOTTOM DEPTH (feet bls) 21.65 - 2.2 (casing height)
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) 7.29 Liters (18.45 - 6.50) x 0.61				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) Liters				

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 13	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 13	PURGING INITIATED AT: 1100	PURGING ENDED AT: 1145	TOTAL VOLUME PURGED (Liters): 11.25							
TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (mlpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	ORP (mV)	COLOR (describe)
1135	8.75	8.75	250	9.89	7.51	21.3	2221	0.20	5.28	-243.1	clear
1140	1.25	10.00	250	9.89	7.52	21.5	2222	0.20	3.03	-245.1	clear
1145	1.25	11.25	250	9.89	7.52	21.5	2224	0.20	2.61	-245.6	clear

WELL CAPACITY (Liters Per Foot): 0.75" = 0.076; 1" = 0.15; 1.25" = 0.23; 2" = 0.61; 3" = 1.40; 4" = 2.46; 5" = 3.86; 6" = 5.57; 12" = 22.26  
 TUBING INSIDE DIA. CAPACITY (Liters/Ft.): 1/8" = 0.002; 3/16" = 0.005; 1/4" = 0.0098; 5/16" = 0.015; 3/8" = 0.023; 1/2" = 0.038; 5/8" = 0.06

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Melissa Bennett / TT	SAMPLER(S) SIGNATURES: [Signature]	SAMPLING INITIATED AT: 150	SAMPLING ENDED AT: 1155
PUMP OR TUBING DEPTH IN WELL (feet): 13	SAMPLE PUMP FLOW RATE (mL per minute): 100	TUBING MATERIAL CODE: HDPE	
FIELD DECONTAMINATION: Y <input checked="" type="checkbox"/> NO <input type="checkbox"/>	FIELD-FILTERED: Y <input checked="" type="checkbox"/> NO <input type="checkbox"/> FILTER SIZE: _____ µm	DUPLICATE: Y <input checked="" type="checkbox"/> NO <input type="checkbox"/>	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
	3	CG	100 ml	None - Sterile			Fecal Coliform	
	1	PE	0.5 L	None			Fecal Coliform Source Tracking	

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)  
 SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)





# Tetra Tech / FDEP Groundwater Sampling Sheet

SITE NAME: <b>Brevard SC WWTF</b>	SITE LOCATION: <b>N. Wickham Rd</b>
LOCATION ID: <b>MWC-5-SOD</b>	SAMPLE ID: <b>SCWWTF-MWC-5-SOD -050421</b> <small>Sample depth (ddd.d)=[bottom of screen (feet bls)-Top depth] x 0.5-bottom of screen (feet bls)</small>
DATE: <u>05</u> / <u>4</u> / <u>2021</u>	

## PURGING DATA

STATIC DEPTH TO WATER (feet bloc): <b>5.91</b>	CASING HEIGHT (feet als): <b>3.3</b>	STATIC DEPTH TO WATER (feet bls) = (bloc) - Casing Height (feet als): <b>2.61</b>	WELL SCREEN INTERVAL DEPTH (feet bls):
WELL DIAMETER (Inches): <b>2</b>	TUBING DIAMETER (Inches): <b>1/4</b>	PURGE PUMP TYPE OR BAILER: <b>Geo-Perf Pump</b>	TOP DEPTH = top of screen or depth to water which ever is greatest (feet bls):
			BOTTOM DEPTH (feet bls): <b>22.10</b> - (casing height = ) =

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY  
(only fill out if applicable)  
 $4.48$  Liters  $(22.10 - 2.61) \times 0.23 = 4.48$  L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME  
(only fill out if applicable)  
\_\_\_\_\_ Liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <b>9</b>	FINAL PUMP OR TUBING DEPTH IN WELL (feet): <b>9</b>	PURGING INITIATED AT: <b>0950</b>	PURGING ENDED AT: <b>1035</b>	TOTAL VOLUME PURGED (Liters): <b>10.25</b>
---	---	-----------------------------------	-------------------------------	--

TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (mlpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	ORP (mV)	COLOR (describe)
1020	7.5	7.50	250	6.21	7.31	21.9	1643	0.14	5.60	-64.9	clear
1025	1.25	6.75	250	6.21	7.32	22.3	1643	0.14	4.01	-65.3	clear
1030	1.25	8.00	250	6.21	7.32	22.3	1644	0.14	2.67	-66.5	clear
1035	1.25	10.25	250	6.21	7.32	22.4	1644	0.14	2.85	-67.5	clear

WELL CAPACITY (Liters Per Foot): 0.75" = 0.076; 1" = 0.15; 1.25" = 0.23; 2" = 0.61; 3" = 1.40; 4" = 2.46; 5" = 3.86; 6" = 5.57; 12" = 22.26  
TUBING INSIDE DIA. CAPACITY (Liters/Ft.): 1/8" = 0.002; 3/16" = 0.005; 1/4" = 0.0098; 5/16" = 0.015; 3/8" = 0.023; 1/2" = 0.038; 5/8" = 0.06

SAMPLING DATA	
SAMPLED BY (PRINT) / AFFILIATION: <b>Melissa Bennett CT</b>	SAMPLER(S) SIGNATURES: <i>Melissa Bennett</i>
PUMP OR TUBING DEPTH IN WELL (feet): <b>9</b>	SAMPLE PUMP FLOW RATE (mL per minute): <b>100</b>
FIELD DECONTAMINATION: <b>Y N</b>	FIELD-FILTERED: <b>Y N</b> FILTER SIZE: _____ µm
	TUBING MATERIAL CODE: <b>HBPE Teflon</b>
	DUPLICATE: <b>Y N</b>
SAMPLING INITIATED AT: <b>1040</b>	SAMPLING ENDED AT: <b>1045</b>
Filtration Equipment Type: _____	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
	<b>2</b>	<b>GG PECH</b>	<b>100 ml</b>	<b>None - Sterile</b>	<b>-</b>	<b>7.32</b>	<b>Fecal Coliform</b>	<b>APP</b>
	<b>1</b>	<b>PE</b>	<b>0.5 L</b>	<b>None</b>	<b>-</b>	<b>7.32</b>	<b>Fecal Coliform Source Tracking</b>	<b>APP</b>

REMARKS: **no odor.**

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Baller; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)



Tetra Tech, Inc.

# YSI 556 EQUIPMENT CALIBRATION SHEET

**PROJECT NAME :** Brevard County Utilities      **INSTRUMENT NAME/MODEL:** YSI 556 MPS

**SITE NAME:** SC WWTF      **MANUFACTURER:** YSI

**PROJECT No.:** \_\_\_\_\_      **SERIAL NUMBER:** 197 10434

Date of Calibration (mm/dd/yy)	Person Performing Calibration (Name)	pH (S.U.)			Cond. (µS/cm)	Temp. (Celsius)	Dissolved Oxygen (%)	ORP (mV)	Calibration Standard (Lot#/Expiration Date)	Comments
		4.0	7.0	10.0						
05/04/21	MPS	4.05	7.03	9.97	1412	21.7	100.3	238	Lot# 066473 Exp.Date: Mar 22	Ph 4.0
		4.0	7.0	10.0	1413			238	Lot# 066473 Exp.Date: Mar 22	Ph 7.0
		4.0	7.0	10.0					Lot# 066473 Exp.Date: Mar 22	Ph 10.0
		4.0	7.0	10.0					Lot# 066473 Exp.Date: Mar 22	ORP
		4.0	7.0	10.0					Lot# 066473 Exp.Date: Mar 22	Conductivity



Tetra Tech NUS, Inc.

### LAMOTTE TURBIDITY METER CALIBRATION LOG

PROJECT NAME: Breward County Utilities INSTRUMENT NAME/MODEL: Lamotte 2010+

SITE NAME: SWTF MANUFACTURER: Lamotte

PROJECT No.: \_\_\_\_\_ SERIAL NUMBER: 1512-2219

Date of Calibration (mm/dd/yy)	Instrument I.D. Number (Number)	Person Performing Calibration (Name)	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.) (Number)	Remarks and Comments
			Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		
			Nephelometric Turbidity Units (NTUs)					
5-4-21	20850	MB	1.0	1.0	1.10	1.0		
			10.0	10.0	9.91	10.1		
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				
			1.0	1.0				
			10.0	10.0				

**ATTACHMENT 3**  
**Cell 4 Muck Maps**

1 2 3 4 5

TOP MUCK CONTOURS OVERLAYED ON  
HARD BOTTOM CONTOURS



**Cut/Fill Summary**

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
VOLUME	1.000	1.000	495757.79 Sq. Ft.	653.69 Cu. Yd.	7224.76 Cu. Yd.	6571.07 Cu. Yd.<fill>
Totals			495757.79 Sq. Ft.	653.69 Cu. Yd.	7224.76 Cu. Yd.	6571.07 Cu. Yd.<fill>

NOTE: MUCK PROBE SURVEY  
PERFORMED BY OCEANSIDE  
SOLUTIONS LLC ON 27, APRIL 2021

 <b>TETRA TECH</b> 11 AVERSIDE DRIVE SUITE 104 COCOA, FL 32909 TEL: 321.828.6470 FAX: 321.828.6099		VERA, FL CELL 4	Sheet Reference Sheet 1 of 3
Date: 04/27/21 Drawn: [blank] Check: [blank]	Scale: [blank] Project: [blank] Client: [blank]		

HARD BOTTOM CONTOUR MAP IN FEET  
<NAVD88>



4 3 2 1 0

NO.	DESCRIPTION	DATE

**TERMA TECH**  
 11 WILSON BLVD  
 SUITE 202  
 COCKEN, FL 32909  
 TEL: 888-832-6210 EXT 6270009  
 FAX: 888-832-6210  
 WWW: WWW.TERMA-TECH.COM

VIERA WASTE TREATMENT  
 CELL 4  
 VIERA, FL

Sheet Reference  
 Sheet 2 of 3

NOTE: MUCK PROBE SURVEY  
 PERFORMED BY OCEANSIDE  
 SOLUTIONS LLC ON 27, APRIL  
 2021



Source: Bathymetry Data from Google Earth, NOAA, and USACE. Data is for informational purposes only.

NOTE: MUCK PROBE SURVEY  
PERFORMED BY OCEANSIDE  
SOLUTIONS LLC ON 27, APRIL 2021

VIERRA WASTE TREATMENT  
CELL 4  
VIERRA, FL

Sheet Reference:  
Sheet 3 of 5

TERRA TECH  
11000 SW 15th St  
Miami, FL 33185  
TEL: 305.486.0000 FAX: 305.486.0001

NO.	DATE	BY	CHECKED	SCALE
1	2/27/21	JM	MM	1"=40'
2				
3				
4				
5				

TOP MUCK CONTOURS IN FEET (NAVD 88)



NOTE: MUCK PROBE SURVEY  
PERFORMED BY OCEANSIDE  
SOLUTIONS LLC ON 27, APRIL  
2021

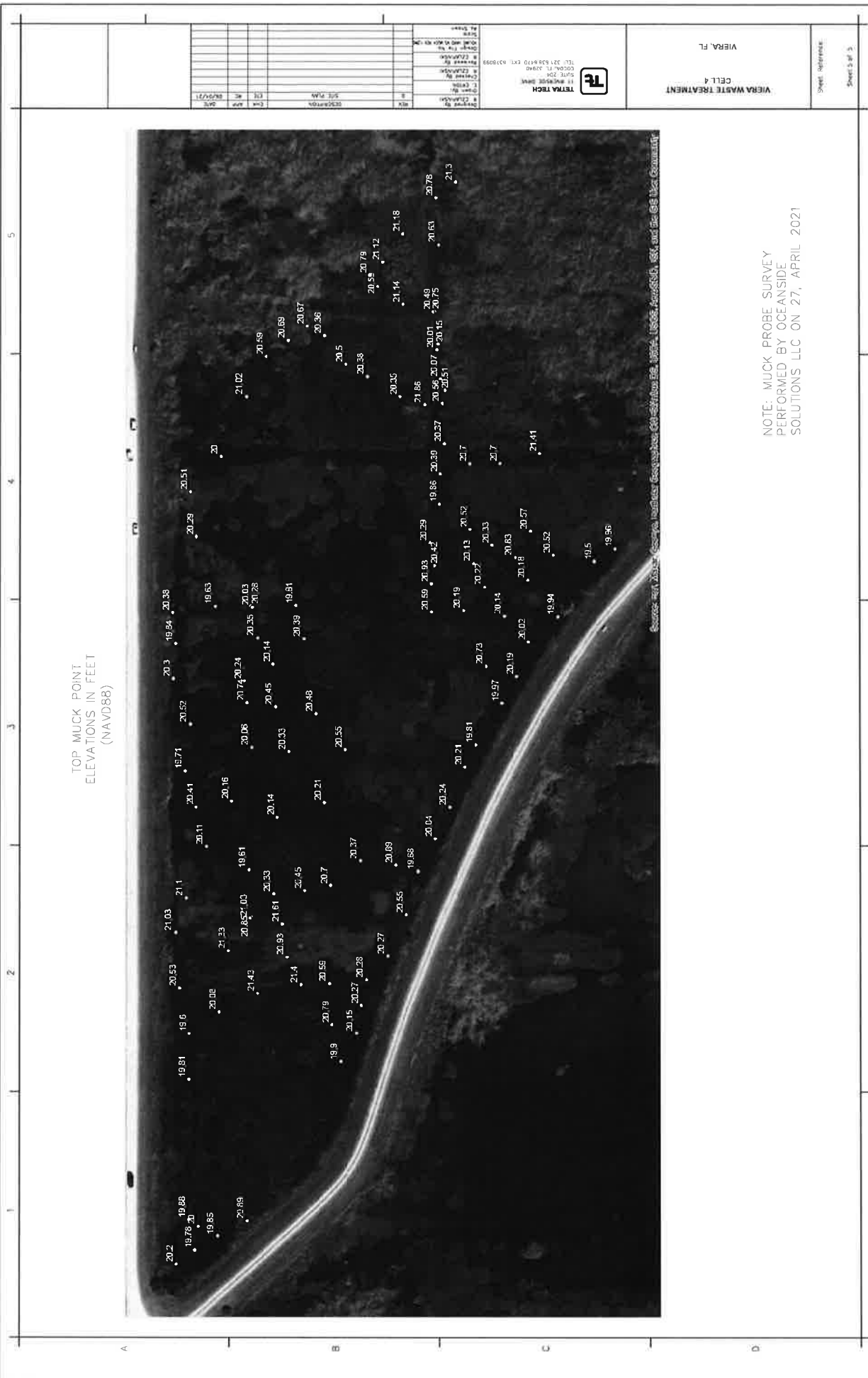
REV	DESCRIPTION	DATE	BY	CHK
1	ISSUED	04/27/21	TR	TR

TR  
11 HUNTERS DRIVE  
SUITE 204  
CORONA FL 33065  
TEL: 305.555.8470 EXT: 6370999  
OCEAN TECH  
11 HUNTERS DRIVE  
SUITE 204  
CORONA FL 33065  
TEL: 305.555.8470 EXT: 6370999

VIERA WASTE TREATMENT  
CELL 4  
VIERA, FL

Sheet Reference:  
Sheet 4 of 5





**ATTACHMENT 4**  
**Biological Walkdown Photo Log**

**Photo Page Exhibit**



Pickerelweed and duck potato in equal distribution at Cell 4, Photo Station 2; facing north.



Open water and algal mats at Cell 4, Photo Station 3; facing northwest.



Living and dead cattails (from the spraying event) at Cell 4, Photo Station 5; facing northwest.



Living and dead cattails (from the spraying event) at Cell 4, Photo Station 9;  
facing south.



Invasive torpedo grass at Cell 4, Photo Station 11; facing south.



Dead and decaying cattails at Cell 3, Photo Station 24; facing south.



# EXHIBIT E



November 17, 2021

Edward Fontanin  
Brevard County Utility Services Department (BCUD)  
2725 Judge Fran Jamieson Way Bldg A-213  
Melbourne, Florida 32940-6605  
[Edward.Fontanin@brevardfl.gov](mailto:Edward.Fontanin@brevardfl.gov)

Reference: BCUD South Central Regional Wastewater Treatment Facility (WWTF)  
DW Facility ID # FL0102679  
OGC Case #21-0180

Dear Mr. Fontanin:

This letter is an update to the June 15, 2021 letter from Tetra Tech in response to the March 25, 2021 consent order from the Florida Department of Environmental Protection (DEP), and includes the assessment of Cells 1, 2, and 3 (Cell 4 was previously assessed).

On March 25, 2021 a consent order was entered into between DEP and Brevard County. The consent order identified water quality exceedances at the South Central Regional (SC) WWTF (the Site). The following water quality exceedances were identified at the SC WWTF:

- The outfall of the wetlands in the northwest corner of Cell 4 to the canal leading to the St. Johns River (WEP-1)
  - Total Nitrogen (TN)
  - Carbonaceous Biological Oxygen Demand (CBOD)
  - Total Suspended Solids (TSS)
- Discharge from the SC WWTF to the holding ponds (EFB-2)
  - Fecal Coliforms
  - TSS
- Two monitoring wells adjacent to the holding ponds, located to the north of the wetlands (MWC-5-SOD and MWC-6-SOD)
  - Fecal Coliforms

The consent order, in Order 5 a), required Brevard County to complete an evaluation to discover the cause or causes of the violations, and recommend corrective actions including applicable design modifications. Order 5 b) required an application to DEP within 60 days of the evaluation in Order 5 a) for design modifications to address the causes identified in Order 5 a). Order 5 c) required the construction of the permitted system outlined in Order 5 b) within 545 days of receipt of the permit.

Tetra Tech was asked to provide the required assessment outlined in Order 5 a) limited to the following:

- Discover the cause or causes of the violations; and

- Develop a list of recommended corrective actions.

Conversations with BCUD identified a spray event used to control cattails (*Typha* sp.) in the wetlands as a potential source of nitrogen and increased CBOD. The cattails and other vegetation were left in place and created decaying material, particularly within Cells 3 and 4. This conversation also identified that a temporarily failed filter screen caused the exceedances at EFB-2, and investigation of the EFB-2 exceedance was not required.

The June 15, 2021 letter outlined Tetra Tech's understanding of the system and the data collected at that time. Tetra Tech recommended the following remediation and mitigation options:

- Cease spraying of herbicide on cattail stands;
- Remove dead, decaying cattail stands;
- Herbicide spray monotypic areas of torpedo grass, allow to die back, then remove dead vegetation and underlying organic material;
- Adopt a mechanical removal plan for excess filamentous algae, cattails, dead vegetation, and underlying organic material, which may include cutting of plant material and should include removal and disposal of all cut or observed floating or sinking detritus;
- If nutrient exceedances continue, prepare a plan for the removal of muck from Cell 4, and evaluate the presence or absence of muck in Cells 1, 2, and 3, and then replant these areas with planting-zone appropriate and available vegetation from the original "Planting Plan;" and
- There are no recommended actions for fecal coliforms in MWC-5-SOD or MWC-6-SOD, since no human markers for fecal coliforms were identified, and bird markers were confirmed.

Subsequent to the June 15, 2021 letter, Tetra Tech was asked to evaluate all four cells for the presence of muck and invasive and nuisance species. This letter provides an update on this assessment of Cells 1 through 3 and includes the findings for Cell 4.

### **Survey of Muck Presence**

Oceanside Solutions of Satellite Beach, Florida provided surveying and muck probing services to identify the presence or absence of muck in the accessible open water areas. On April 27, 2021, Oceanside Solutions arrived on site to collect muck thickness data from a small shallow draft boat in Cell 4. Cells 1, 2, and 3 were completed from October 13 to October 18, 2021. Survey grade real-time kinematic (RTK) global positioning system (GPS) equipment was used to identify the vertical and horizontal location of the hard bottom. A 1-inch diameter graduated polyvinyl chloride (PVC) push rod was used to identify the top of the muck and was pushed to the hard-bottom depth to determine the muck thickness.

### **Cells 1, 2, and 3 Muck Presence**

Data were collected from a total of 523 points in Cells 1, 2, and 3. Muck thickness ranged from 0 to 0.9 feet thick, with an average thickness of 0.16 feet. A summary of the survey data is provided in Table 1. The maps summarizing the relative thickness of the muck are provided as Attachment 1. Based on the collected data, a total of 3,472; 8,894; and 5,352 cubic yards of muck is present in the open water area in the western portion of Cells 1, 2, and 3, respectively.

**Cell 4 Muck Presence**

Data were collected from a total of 119 points in Cell 4. Muck thickness ranged from 0.05 to 1.4 feet thick, with an average thickness of 0.32 feet. A summary of the survey data is provided in Table 2. The locations of the survey points, and maps summarizing the relative thickness of the muck are provided as Attachment 1. Based on the collected data, a total of 6,569 cubic yards of muck is present in the open water area in the western portion of Cell 4.

**Biological Walkdown**

On May 5, 2021, Tetra Tech mobilized to the site to conduct a biological walkdown at Cells 3 and 4 of the SC WWTF. On November 3, 2021, Cells 1 and 2 were completed.

The original planting plan outlined the herbaceous species that were to be installed onsite; however, it is unclear whether those plants were available for use from nurseries during the planting event. The table below details the list from the original planting plan. Those observed during the biological walkdown are denoted by an asterisk.

<b>Scientific Name</b>	<b>Common Name</b>
<i>Pontederia cordata</i> *	Pickerelweed
<i>Sagittaria lancifolia</i> *	Duck potato
<i>Sagittaria latifolia</i>	Arrowhead
<i>Scirpus validus</i> *	Soft-stem bulrush
<i>Cyperus articulatus</i>	Jointed flatsedge
<i>Scirpus olneyi</i>	Olney's three square
<i>Zizania aquatica</i> *	Wild rice
<i>Thalia geniculata</i> *	Fire flag
<i>Eleocharis</i> spp.	Spikerush
<i>Cladium jamaicense</i>	Sawgrass
<i>Najas guadalupensis</i>	Bushy pondweed
<i>Ceratophyllum demersum</i> *	Coontail

Other species in the table may have been present in the deeper water areas but were not observed from the bermed path locations.

**Cells 3 and 4 (May 5, 2021)**

The Dominant Vegetative Cover for Cells 3 and 4 is provided as Figure 1 and depicts the vegetative composition of the cells based on observations made during the biological walkdown. Cells 3 and 4 were observed from the bermed paths surrounding each of the cells. A total of 24 photo stations were established on the bermed perimeter of the collective cells and documented via GPS. Fourteen photo stations (Dominant Vegetative Cover Map, PS 1–14) were established at Cell 4 and ten (Dominant Vegetative Cover Map, PS 15–24) were established at Cell 3. A vegetative assessment was then conducted at each photo station to determine the approximate percent coverage of each species contributing to the Dominant Vegetative Cover Figure 1 enclosed with this memo. The dominant species observed included cattail (*Typha* sp.), duck potato, and pickerelweed. Cattail dominated both cells, with living and dead plants observed. The dead cattail covered approximately 12% of Cell 3 and 11% of Cell 4. Mixed and monotypic stands of cattail were observed in Cell 4, whereas the cattails in Cell 3

were solely monotypic stands. The green algae-like species was determined to be filamentous algae, observed in mats in the areas of open water in both cells. The increased presence of algae is likely due to the decaying material produced by the dead cattails. One area (approximately 0.7 acres) of torpedo grass (*Panicum repens*) was observed in Cell 4. According to the Florida Exotic Pest Plant Council Invasive Plant List, torpedo grass is considered a Category I invasive species.

During the biological walkdown, evidence of listed species was observed within the site. The tricolored heron (*Egretta tricolor*) and little blue heron (*Egretta caerulea*) were observed onsite, both of which are state-designated as Threatened. The federally-designated Threatened (due to similarity of appearance) American alligator (*Alligator mississippiensis*) was also observed. Other wildlife observed on-site can be found in Table 3.

Photos from the biological walkdown are provided as Attachment 2.

#### **Cells 1 and 2 (November 3, 2021)**

The Dominant Vegetative Cover for Cells 1 and 2 is provided as Figure 2 and depicts the results of the species observed during the biological walkdown. Cells 1 and 2 were observed from the bermed paths surrounding each of the cells. A total of 36 photo stations were established on the bermed perimeters of both cells and documented via GPS. Sixteen photo stations were established at Cell 1 and 20 were established at Cell 2. A vegetative assessment was then conducted at each photo station to determine the approximate percent coverage of each species, contributing to the Dominant Vegetative Species Figure 2 enclosed with this memo. The dominant species observed included cattail (*Typha sp.*) and bulrush (*Scirpus validus*). Cattail dominated both cells, with living and dead individuals observed. The cattail covered approximately 41.5% of Cell 1 and 22.23% of Cell 2. Mixed and monotypic stands of cattail were observed in Cell 2, whereas the cattails in Cell 1 were solely monotypic stands. According to the Florida Exotic Pest Plant Council Invasive Plant List, four species that occur on the site are considered a Category I invasive species: Brazilian pepper (*Schinus terebinthifolia*), cogon grass (*Imperata cylindrica*), torpedo grass (*Panicum repens*), and water primrose (*Ludwigia peruviana*). Additional plant species were observed during the biological walkdown but in limited quantities and are included in Table 4.

Photos from the biological walkdown are provided as Attachment 3.

#### **Conclusions**

The assumption entering the project was the spraying of the cattails and leaving them in the system to decay was the root cause of the effluent water quality exceedances at WEP-1. The spray event occurred on May 11, 2020.

Review of the historical effluent sampling data identified permit exceedances immediately following the spray event. The highest CBOD result in the sample set was in July and September 2020, with CBOD results exceeding the 3.75 mg/L monthly average permit limit in WEP-1 at concentrations of 5.15 and 4.11 mg/L, respectively. TN results slightly exceeded the 2.0 mg/L monthly average permit limit at a concentration of 2.1 mg/L. These water data indicate an increase in the CBOD and TN two and four months following the herbicide spraying event, and likely were the result of the decaying plant material. The presence or absence of filamentous algae is not known prior to the spray event; however, the presence of this algae is likely a response to the increase in nutrients in the system. The algae grow and take up the excess nutrients. This may be creating the rebalancing of nitrogen after September 2020. As the

plants continue to degrade and input nitrogen, the algae grow and take up that nitrogen. At some point in time, the algae will die off and sink to the bottom creating muck. A history of this practice has resulted in muck forming at the bottom of the open water area of Cell 4, and to a lesser extent in Cells 1, 2, and 3.

When water quality is good, sediments are a sink for nutrients. When water quality degrades, muck will flux nutrients into the water column and may be a source for nutrients. One of the main drivers for this is dissolved oxygen. Generally dissolved oxygen should be maintained at a level above 2 mg/L. Dissolved oxygen in the water column, as measured at WEP-1, remains well above the 2 mg/L threshold; however, dissolved oxygen at the sediment water interface, particularly overnight when oxygen is consumed and photosynthesis is not adding oxygen to the system, may dictate the role of the sediments to be a source for nutrients. While the volume of muck in the system is relatively low, the presence of muck throughout the measured area of Cell 4 is a potential for nutrient flux into the water column under poor water quality conditions.

#### **Proposed Corrective Actions**

Based on our understanding of the system and the data collected to date, Tetra Tech recommends the following remediation and mitigation options:

- Cease spraying of herbicide on cattail stands;
- Remove dead, decaying cattail stands;
- Herbicide spray monotypic areas of torpedo grass, allow to die back, then remove dead vegetation and underlying organic material;
- Adopt a mechanical removal plan for excess filamentous algae, cattails, dead vegetation, and underlying organic material, which may include cutting of plant material and should include removal and disposal of all cut or observed floating or sinking detritus; and
- Prepare a plan for the removal of muck from Cells 3 and 4 and replant the disturbed areas with planting-zone appropriate and available vegetation from the original "Planting Plan."

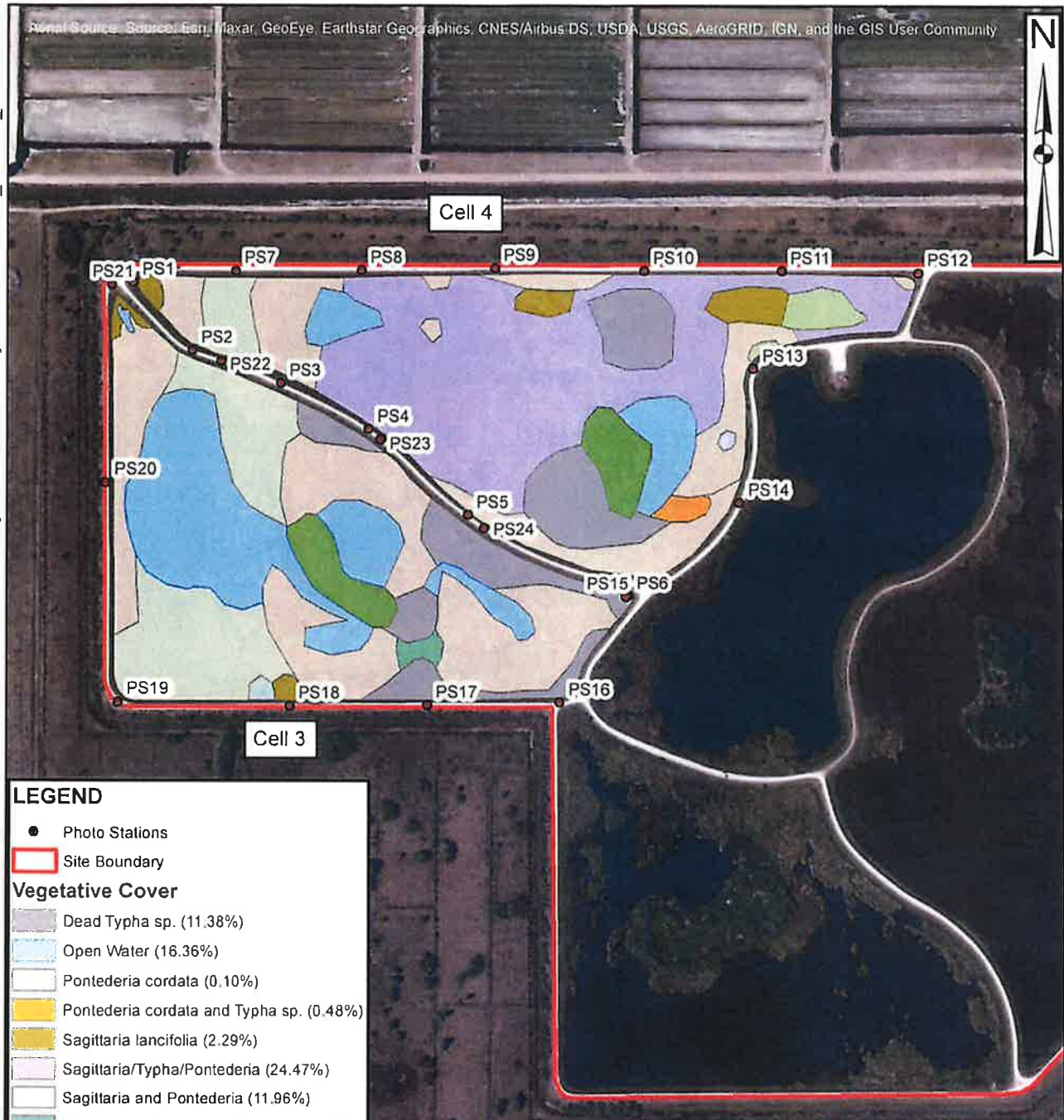
Should you have any questions or require additional information, please contact me at (321) 636-6470.

Sincerely,

  
Matthew Shelton  
Project Manager

Attachments

## FIGURES

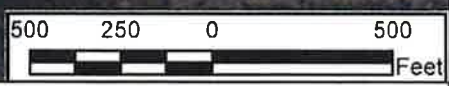


**LEGEND**

- Photo Stations
- ▭ Site Boundary


**Vegetative Cover**

- Dead Typha sp. (11.38%)
- Open Water (16.36%)
- Pontederia cordata (0.10%)
- Pontederia cordata and Typha sp. (0.48%)
- Sagittaria lancifolia (2.29%)
- Sagittaria/Typha/Pontederia (24.47%)
- Sagittaria and Pontederia (11.96%)
- Sagittaria and Salix caroliniana (0.44%)
- Scirpus validus (0.21%)
- Panicum repens (1.18%)
- Tree Island (4%)
- Typha sp. (27.14%)



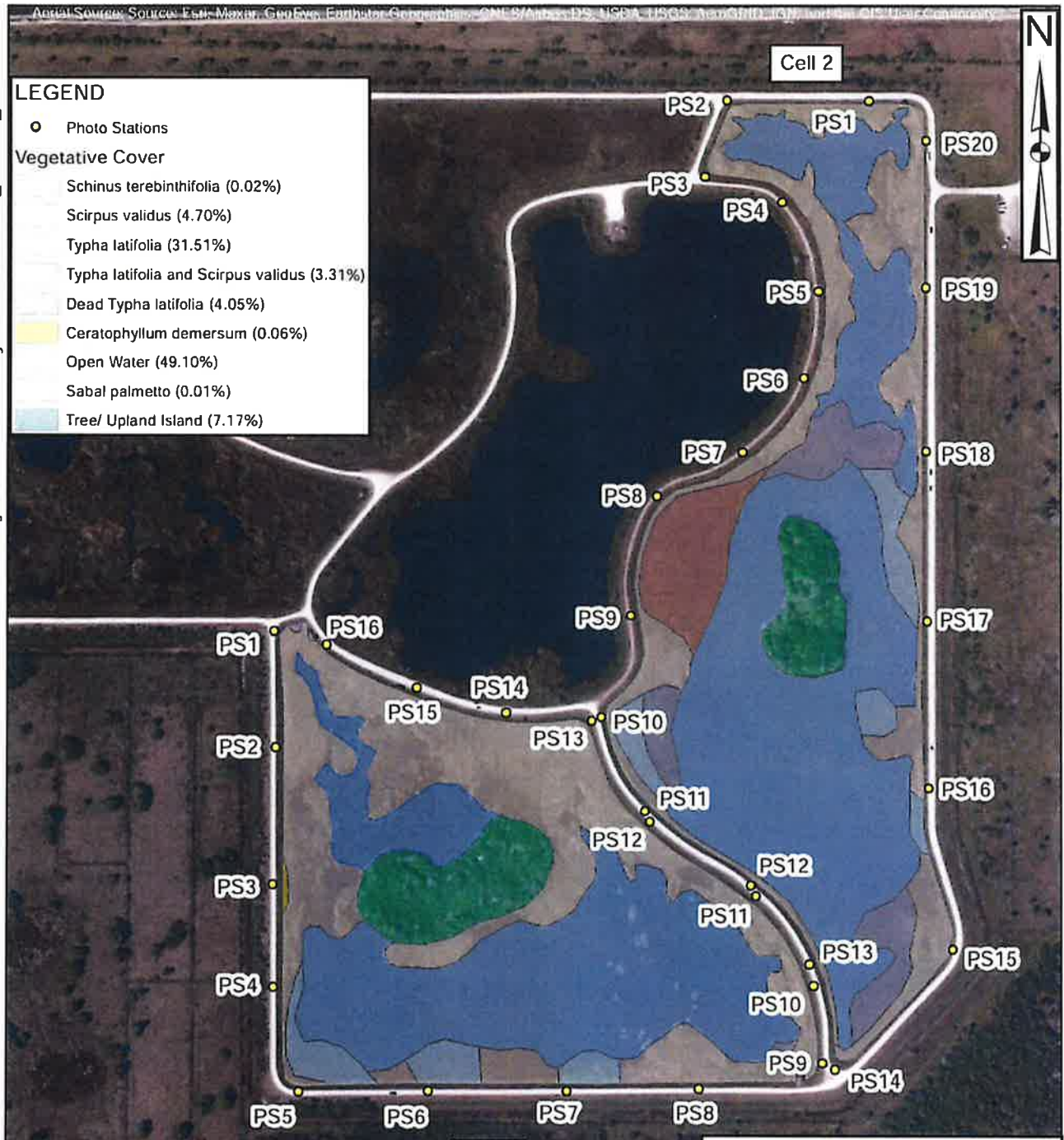
Percent coverage and vegetative boundaries are an estimate based on limited ground truthing using the methods described in the Scope of Work

DRAWN BY	DATE
N. BOTS	5/18/2021
CHECKED BY	DATE
R. HEILMAN	5/18/2021
SCALE AS NOTED	


**TETRA TECH**  
 Dominant Vegetative Cover  
 Brevard Wastewater Treatment Facility  
 Brevard County, Florida

CONTRACT NUMBER	
100-WTR-T41397.01	
APPROVED BY	DATE
H. CAROLAN	5/18/2021
FIGURE NO. 1	





Percent coverage and vegetative boundaries are an estimate based on limited ground truthing using the methods described in the Scope of Work.

DRAWN BY N. BOTS	DATE 11/9/2021
CHECKED BY R. HEILMAN	DATE 11/9/2021
SCALE AS NOTED	



Dominant Vegetative Cover  
Brevard Wastewater Treatment Facility  
Brevard County, Florida

CONTRACT NUMBER 100-WTR-T41397.02	
APPROVED BY H. CAROLAN	DATE 11/9/2021
FIGURE NO. 2	

## TABLES

**TABLE 1 - MUCK PROBING AND SURVEYING RESULTS - CELLS 1, 2, AND 3**  
 Brevard County Utility Services - South Central Regional WWTF

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
1	733239.78	1416093.18	21.86	21.71	0.15
2	733212.04	1416095.94	22.54	22.34	0.2
3	733212.04	1416095.94	22.54	22.44	0.1
4	733123.61	1416093.22	21.96	21.76	0.2
5	733088.78	1416091.09	21.83	21.73	0.1
6	733043.17	1416085.3	21.38	21.28	0.1
7	732971.41	1416088.99	21.93	21.73	0.2
8	732909.59	1416094.39	21.79	21.54	0.25
9	732869.73	1416072.73	21.37	21.07	0.3
10	732828.04	1416098.92	21.66	21.26	0.4
11	732772.48	1416089.93	21.55	21.05	0.5
12	732734.4	1416070.77	21.68	21.48	0.2
13	732717	1416033.33	21.88	21.68	0.2
14	732755.12	1416013.94	21.1	21	0.1
15	732704.23	1416003.31	21.85	21.65	0.2
16	732725.72	1415969.9	21.6	21.2	0.4
17	732726.48	1415939.3	21.96	21.76	0.2
18	732781.36	1415939.3	21.93	21.78	0.15
19	732778.59	1415983.62	21.44	21.34	0.1
20	732789.98	1416027.61	21.57	21.47	0.1
21	732795.26	1416064.18	21.49	21.39	0.1
22	732850.69	1416051.66	21.16	21.06	0.1
23	732863.1	1415999.77	21.36	21.16	0.2
24	732848.8	1415941.54	22	21.8	0.2
25	732889.39	1415907.94	22.44	22.34	0.1
26	732909.51	1415961.86	21.57	21.47	0.1
27	732923.02	1416032.41	21.61	21.51	0.1
28	732973.78	1416060.27	21.42	21.32	0.1
29	732972.62	1416011.6	20.98	20.78	0.2
30	732970.12	1415939.59	20.67	20.47	0.2
31	732952.27	1415832.82	22.23	22.08	0.15
32	733002.68	1415778.79	21.89	21.69	0.2
33	733013.17	1415717.34	22.13	21.98	0.15
34	733014.8	1415848.9	21.31	21.21	0.1
35	733026.3	1415938.26	21.17	21.07	0.1
36	733040.23	1415999.23	21.33	21.23	0.1
37	733031	1416062.04	21.12	21.02	0.1
38	733080.38	1416065.62	21.38	21.28	0.1
39	733090.33	1416004.72	21.27	21.17	0.1
40	733082.52	1415939.79	21.23	21.13	0.1
41	733093	1415848.08	20.75	20.55	0.2
42	733109.63	1415812.26	21.46	21.36	0.1
43	733119.67	1415771.44	21.96	21.71	0.25

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
44	733124.47	1415712.68	21.49	21.19	0.3
45	733126.08	1415655.51	21.41	21.26	0.15
46	733126.71	1415599.93	21.26	21.06	0.2
47	733129.67	1415546.62	21.48	21.38	0.1
48	733126.18	1415510.52	21.2	21.1	0.1
49	733121.55	1415470.67	21.34	21.14	0.2
50	733121.69	1415394.83	21.17	21.12	0.05
51	733065.54	1415348.56	21.46	21.36	0.1
52	732982.56	1415301.81	21.24	21.14	0.1
53	732919.34	1415245.7	21.6	21.5	0.1
54	732845.17	1415169.45	22.01	21.81	0.2
55	732815.36	1415118.9	22.06	21.86	0.2
56	732742.99	1415086.9	22.07	21.57	0.5
57	732719	1414993.31	20.99	20.89	0.1
58	732734.26	1414909.02	21.23	21.18	0.05
59	732752.52	1414832.72	19.25	19.2	0.05
60	732730.45	1414755.6	20.69	20.59	0.1
61	732708.64	1414689.88	21.63	21.58	0.05
62	732674.04	1414615.71	20.81	20.71	0.1
63	732623.97	1414551.84	20.77	20.62	0.15
64	732542.33	1414593.62	20.99	20.89	0.1
65	732631.2	1414482.04	20.16	20.01	0.15
66	732606.1	1414383.65	20.25	20.1	0.15
67	732614.4	1414272.99	20.55	20.5	0.05
68	732577.44	1414188.87	21.16	21.01	0.15
69	732666.91	1414090.58	20.57	20.57	0
70	732731.65	1414158.27	20.57	20.52	0.05
71	732799.5	1414305.66	20.52	20.42	0.1
72	732819.51	1414421.26	20.52	20.37	0.15
73	732845.26	1414537.26	20.85	20.6	0.25
74	732763.74	1414616	20.98	20.58	0.4
75	732805.99	1414707.74	20.18	19.98	0.2
76	732850.97	1414796.5	19	18.7	0.3
77	732840.61	1414955.81	20.4	20.2	0.2
78	732940.99	1415068.96	20.64	20.54	0.1
79	733041.15	1415086.2	20.28	20.23	0.05
80	733121.61	1415091.93	20.27	20.12	0.15
81	733195.41	1415153.42	21.66	21.61	0.05
82	733219.5	1415247.51	21.29	21.24	0.05
83	733157.8	1415312.95	21.68	21.38	0.3
84	733190.36	1415442.08	21.52	21.42	0.1
85	733203.18	1415497.33	21.52	21.37	0.15
86	733217.26	1415599.36	21.14	20.99	0.15
87	733228.52	1415720.13	21.2	21.05	0.15
88	733236.03	1415794.45	21.77	21.57	0.2

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
89	733236.79	1415873.08	21.74	21.44	0.3
90	733234.93	1415942.54	21.67	21.52	0.15
91	733225.51	1416017.46	21.23	20.98	0.25
92	733172.8	1415986.52	21.79	21.69	0.1
93	733167.72	1415911.5	21.75	21.5	0.25
94	733157.47	1415827.11	20.72	20.47	0.25
95	730798.61	1414725.68	20.49	20.19	0.3
96	730802.72	1414758.6	19.85	19.7	0.15
97	730840.88	1414773.5	19.59	19.49	0.1
98	730872.4	1414784.09	19.86	19.76	0.1
99	730835.76	1414795.18	19.65	19.25	0.4
100	730841.31	1414820	21.02	20.72	0.3
101	730803.07	1414818.63	20.19	19.89	0.3
102	730783.17	1414847.37	20.49	20.19	0.3
103	730752.54	1414830.67	21.15	20.75	0.4
104	730789.42	1414817.78	20.88	20.78	0.1
105	730780.93	1414793.48	20.08	19.93	0.15
106	730778.03	1414772.3	19.99	19.89	0.1
107	730792.89	1414758.68	20.18	19.98	0.2
108	733224.15	1415432.74	21.94	21.64	0.3
109	733248.87	1415367.88	22.1	22	0.1
110	733244.81	1415250.07	21.57	21.52	0.05
111	733246.97	1415150.29	21.74	21.64	0.1
112	733238.17	1415029.17	21.34	21.24	0.1
113	733236.64	1414924.39	21.29	20.79	0.5
114	733220.41	1414848.79	22.13	21.93	0.2
115	733250.29	1414781.81	21.64	21.14	0.5
116	733202.95	1414782.91	22.16	22.06	0.1
117	733157.36	1414742.63	20.56	20.26	0.3
118	733153.55	1414670	20.7	20.6	0.1
119	733247.86	1414647.84	21.07	20.97	0.1
120	733240.96	1414546.39	21.41	21.36	0.05
121	733138.24	1414582.37	20.27	20.22	0.05
122	733127.65	1414482.96	20.45	20.35	0.1
123	733230.62	1414493.2	21.35	21.25	0.1
124	733236.08	1414411.56	21.15	21.1	0.05
125	733193.44	1414368.22	20.9	20.8	0.1
126	733235.64	1414281.98	21.09	20.99	0.1
127	733147.97	1414285.42	20.96	20.86	0.1
128	733135.04	1414215.6	20.87	20.72	0.15
129	733243.77	1414200.86	21.13	21.03	0.1
130	733107.02	1414158.15	20.88	20.63	0.25
131	733215.25	1414126.91	21.32	21.17	0.15
132	733125.65	1414055.28	21	20.9	0.1
133	733242.54	1414046.05	21.14	21.04	0.1

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottome	
134	733279.71	1413975.97	20.51	20.31	0.2
135	733234.32	1413963.13	21.12	21.02	0.1
136	733207.48	1413902.53	20.94	20.89	0.05
137	733298.28	1413899.55	20.83	20.78	0.05
138	733309.12	1413852.61	21.25	21.15	0.1
139	733299.36	1413794.27	21.26	21.01	0.25
140	733255.04	1413741.22	21.11	20.81	0.3
141	733214.13	1413685.83	20.88	20.73	0.15
142	733161.08	1413667.53	20.79	20.59	0.2
143	733138.21	1413617.64	21.43	21.33	0.1
144	733205.88	1413743.2	20.47	20.27	0.2
145	733200.25	1413796.69	20.92	20.82	0.1
146	733253.45	1413794.24	21.11	20.96	0.15
147	733165.58	1413825.47	20.75	20.4	0.35
148	733119.93	1413749.25	20.68	20.43	0.25
149	733088.09	1413685.85	21.06	20.66	0.4
150	733064.9	1413664.08	21.11	20.86	0.25
151	733049.64	1413629.72	20.77	20.47	0.3
152	733074.86	1413583.6	21.31	21.11	0.2
153	733077.39	1413511.87	21.51	21.01	0.5
154	733033.08	1413510.18	21.12	20.77	0.35
155	733043.83	1413567.29	20.58	19.93	0.65
156	733019.87	1413620.35	21.17	20.92	0.25
157	733039.94	1413664.59	20.78	20.48	0.3
158	733050.29	1413728.98	20.99	20.74	0.25
159	733053.61	1413816.29	21	20.9	0.1
160	733016.86	1413884.01	20.97	20.87	0.1
161	732957.47	1413949.79	21.1	21.05	0.05
162	732917.83	1413994.39	21.17	20.92	0.25
163	732861.71	1414025.37	21.48	21.33	0.15
164	732826.29	1414063.68	20.8	20.7	0.1
165	732781.04	1414108.18	20.87	20.77	0.1
166	732741.09	1414042.89	20.91	20.46	0.45
167	732787.25	1414005.52	20.77	20.27	0.5
168	732859.35	1413934.78	21.82	21.32	0.5
169	732911.8	1413880.17	21.25	20.75	0.5
170	732944.68	1413827.79	21.34	21.14	0.2
171	732971.71	1413770.97	21.62	21.47	0.15
172	733007.03	1413728.47	20.55	20.25	0.3
173	733097.59	1413880.4	20.81	20.66	0.15
174	733154.52	1413910.76	20.49	20.44	0.05
175	733083.61	1413951.5	20.93	20.78	0.15
176	733077.46	1414051.47	21.18	20.88	0.3
177	733080.9	1414140.21	20.96	20.86	0.1
178	733083.11	1414226.62	20.96	20.86	0.1

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
179	733085.06	1414349.91	20.95	20.85	0.1
180	733128.37	1414465.53	20.29	20.29	0
181	733134.38	1414590.46	20.23	20.18	0.05
182	733132.77	1414698.81	20.2	19.8	0.4
183	733125.94	1414836.32	19.88	19.58	0.3
184	733147.37	1414883.38	21.16	21.06	0.1
185	733159.72	1414829.03	22.03	21.78	0.25
186	733171.48	1414958.49	21.27	21.17	0.1
187	733178.07	1415003.8	21.34	20.79	0.55
188	733137.19	1415044.57	20.5	20.45	0.05
189	733058.42	1415187.95	20.46	20.46	0
190	733063.42	1415135.53	20.58	20.38	0.2
191	733008.18	1415168.23	20.82	20.82	0
192	732947.79	1415160.79	21.04	20.74	0.3
193	732911.88	1415141.63	20.63	20.53	0.1
194	732895.96	1415022.83	21.09	20.79	0.3
195	732952.63	1415032.91	20.38	20.18	0.2
196	732989.6	1415001.03	21.75	21.65	0.1
197	733008.39	1414964.22	21.67	21.47	0.2
198	733028.57	1414932.21	20.08	19.83	0.25
199	733103.9	1414999.03	20.06	19.91	0.15
200	733056.57	1414861.68	20.42	20.02	0.4
201	733052.38	1414793.04	20.19	19.84	0.35
202	733069.97	1414709.02	20.47	20.37	0.1
203	733076.15	1414642.15	20.21	19.66	0.55
204	733062.37	1414571.19	20.36	20.01	0.35
205	733040.26	1414538.17	20.05	19.75	0.3
206	732986.48	1414527.15	19.6	19.45	0.15
207	732937.49	1414529.41	19.84	19.84	0
208	732884.39	1414528.33	20.08	20.08	0
209	732926.76	1414466.23	19.74	19.69	0.05
210	732809.21	1414129.03	20.16	20.11	0.05
211	732835.99	1414116.88	19.75	19.7	0.05
212	732932.34	1414064.25	20.54	20.44	0.1
213	732934.6	1414133.2	20.97	20.92	0.05
214	732939.99	1414168.85	20.42	20.17	0.25
215	732948.05	1414228.17	20.82	20.72	0.1
216	732887.88	1414250.64	20.9	20.8	0.1
217	732891.2	1414195.72	19.62	19.47	0.15
218	732972.69	1414322.74	20.54	20.44	0.1
219	732972.48	1414396.17	19.84	19.79	0.05
220	732940.52	1414435.96	19.98	19.88	0.1
221	732898.71	1414354.38	21.05	21	0.05
222	732992.76	1414138.15	20.61	20.56	0.05
223	733015.52	1414297.59	20.83	20.73	0.1

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottoeme	
224	733030.43	1414396.88	19.97	19.87	0.1
225	733049.32	1414488.81	19.56	19.51	0.05
226	733194.02	1415082.19	21.47	21.37	0.1
227	733156.62	1415254.79	21.24	21.19	0.05
228	733094.96	1415261.38	20.96	20.86	0.1
229	733052.69	1415317.83	21.1	21.1	0
230	732230.16	1413498.87	19.7	19.55	0.15
231	732186.75	1413518.47	19.6	19.6	0
232	732151.01	1413535.74	18.95	18.75	0.2
233	732101.18	1413483.83	19.73	19.63	0.1
234	732095.03	1413530.79	19.27	19.17	0.1
235	732046.1	1413538	20.13	20.13	0
236	731978.48	1413551.36	20.03	19.98	0.05
237	731930.86	1413552.69	20.41	20.36	0.05
238	731869.89	1413537.05	20.53	20.43	0.1
239	731832.28	1413514.75	20.29	20.04	0.25
240	731843.87	1413466.96	19.85	19.6	0.25
241	731801.05	1413440.88	19.21	19.21	0
242	731764.43	1413444.8	19.04	18.84	0.2
243	731719.25	1413467.85	20.19	19.94	0.25
244	731682.35	1413543.66	20.34	20.19	0.15
245	731623.81	1413576.4	20.27	20.22	0.05
246	731570.22	1413550.57	20.19	19.84	0.35
247	731575.98	1413603.9	20.44	20.04	0.4
248	731599.76	1413675.31	19.67	19.57	0.1
249	731507.48	1413552.3	20.72	20.62	0.1
250	731654.11	1413712.64	20.32	20.12	0.2
251	731694.27	1413781.36	20.54	20.49	0.05
252	731729.58	1413826.87	20.12	20.07	0.05
253	731689.79	1413866.17	19.4	19.3	0.1
254	731753.28	1413805.83	20.23	20.08	0.15
255	731740.79	1413751.48	20.34	20.14	0.2
256	731777.76	1413714.5	20.4	20.25	0.15
257	731844.66	1413693	19.83	19.78	0.05
258	731924.27	1413684.82	20.4	20.2	0.2
259	731980.31	1413689.22	20.29	20.14	0.15
260	732031.13	1413749.97	20.03	20.03	0
261	732065.44	1413810.2	19.96	19.71	0.25
262	732125.68	1413797.99	20.26	20.21	0.05
263	732132.73	1413849.99	20.45	20.45	0
264	732200.83	1413793.79	19.71	19.51	0.2
265	732273.47	1413808.48	20.51	20.41	0.1
266	732309.92	1413843.6	20.53	20.28	0.25
267	732344.43	1413890.24	20.07	19.77	0.3
268	732391.7	1413897.52	20.46	20.26	0.2



Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
269	732424.52	1413860.82	20.21	19.96	0.25
270	732452	1413828.9	20.29	20.29	0
271	732419.32	1413791.11	20.27	19.97	0.3
272	732370.54	1413757.68	20.54	20.49	0.05
273	732387.4	1413713.1	19.47	19.07	0.4
274	732412.81	1413685.04	20.16	20.11	0.05
275	732383.72	1413649.22	19.58	19.48	0.1
276	732407.68	1413607.53	20.57	20.37	0.2
277	732408.01	1413570.63	20.49	20.44	0.05
278	732453.06	1413502.36	20.55	20.45	0.1
279	732411.72	1413507.23	20.7	20.5	0.2
280	732370.21	1413530.96	20.64	20.34	0.3
281	732318.1	1413510.41	20.44	20.44	0
282	732273.75	1413491.17	19.99	19.79	0.2
283	732238.96	1413468.42	20.09	19.84	0.25
284	732242.17	1413432.51	20.37	20.17	0.2
285	732304.17	1413564.55	20.34	20.19	0.15
286	732288.03	1413657.21	20.2	20.2	0
287	732307.19	1413773.12	20.46	20.36	0.1
288	732194.59	1413777.99	19.58	19.48	0.1
289	732215.99	1413686.29	19.12	18.97	0.15
290	732273.3	1413572.67	19.95	19.85	0.1
291	732189.14	1413574.44	18.48	18.43	0.05
292	732178.28	1413704.49	19.64	19.64	0
293	732136.9	1413764.51	19.86	19.76	0.1
294	732098.06	1413709.66	19.94	19.69	0.25
295	732142.45	1413601.54	18.52	18.42	0.1
296	732045.25	1413551.76	20.11	20.01	0.1
297	732026.1	1413673.48	20.16	20.01	0.15
298	731986.23	1413603.78	19.95	19.75	0.2
299	731930.01	1413632.04	19.97	19.92	0.05
300	731874.32	1413560.15	20.4	20.3	0.1
301	731793.65	1413537.56	20.38	20.18	0.2
302	731779.22	1413670.93	20.17	20.07	0.1
303	731698.21	1413680.64	20.25	20.2	0.05
304	731706.69	1413579.26	19.97	19.92	0.05
305	731648.8	1413653.92	19.93	19.73	0.2
306	732446.65	1413592.92	20.17	20.07	0.1
307	732476.98	1413626.23	19.99	19.79	0.2
308	732583.96	1413623.07	20.7	20.5	0.2
309	732537.08	1413594.44	20.33	20.23	0.1
310	732479.92	1413693.47	20.05	20	0.05
311	732536.74	1413760.89	19.73	19.63	0.1
312	732503.29	1413766.67	20.63	20.43	0.2
313	732522.31	1413818.77	20	19.9	0.1

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
314	732496.4	1413854.5	20.1	19.95	0.15
315	732484.03	1413915.41	20.34	20.24	0.1
316	732514.98	1413965.2	20.39	20.34	0.05
317	732545.63	1413892.64	20.05	19.95	0.1
318	732599.61	1413887.69	19.83	19.78	0.05
319	732607.02	1413923.16	20.14	19.99	0.15
320	732639.49	1413905.39	20.24	20.24	0
321	732655.13	1413891.01	20.43	20.38	0.05
322	732707.51	1413854.04	20.37	20.12	0.25
323	732746.74	1413788.61	20.64	20.44	0.2
324	732782.21	1413761.66	20.38	20.28	0.1
325	732835.53	1413741.64	20.8	20.7	0.1
326	732807.03	1413701.89	20.54	20.49	0.05
327	732784.69	1413666.94	20.55	20.35	0.2
328	732815.45	1413613.19	20.76	20.36	0.4
329	732841.31	1413572.41	20.72	20.52	0.2
330	732880.84	1413548.85	21.01	20.81	0.2
331	732822.55	1413520.66	20.94	20.74	0.2
332	732778.31	1413494.1	20.64	20.54	0.1
333	732735.93	1413521.04	20.57	20.52	0.05
334	732708.62	1413569.7	20.62	20.52	0.1
335	732670.89	1413603.97	20.73	20.63	0.1
336	732677.59	1413658.75	20.33	20.18	0.15
337	732658.29	1413711.46	20.36	20.26	0.1
338	732618.85	1413700.39	20.6	20.5	0.1
339	732593.03	1413775.69	19.68	19.63	0.05
340	732648.21	1413814.19	19.62	19.57	0.05
341	732715.35	1413762.07	20.48	20.38	0.1
342	732742.56	1413701.94	20.58	20.38	0.2
343	732770.53	1413619.8	20.88	20.68	0.2
344	732780.03	1413557.53	20.53	20.48	0.05
345	732720.91	1413634.42	20.28	19.68	0.6
346	732662.94	1413728.08	20.25	20.25	0
347	730192.84	1414712.59	22.2	22.1	0.1
348	730186.28	1414728	20.6	20.55	0.05
349	730212.89	1414732.72	19.98	19.88	0.1
350	730252.6	1414735.7	20.11	20.06	0.05
351	730273.06	1414766.75	19.65	19.55	0.1
352	730303.59	1414806.7	20	19.9	0.1
353	730291.71	1414849.78	19.75	19.65	0.1
354	730311.18	1414773.42	19.78	19.48	0.3
355	730299.97	1414739.51	19.8	19.5	0.3
356	730336.87	1414738.73	20.01	19.91	0.1
357	730346.91	1414764.09	20.34	19.84	0.5
358	730365.78	1414767.28	20.32	20.22	0.1

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottome	
359	730327.88	1414803.41	19.79	19.19	0.6
360	730372.69	1414831.19	20.61	20.41	0.2
361	730405.3	1414865.93	20.38	19.98	0.4
362	730449.06	1414881.64	20.9	20.6	0.3
363	730110.7	1414723.49	20.54	20.34	0.2
364	730088.23	1414724.66	20.4	20.1	0.3
365	730125.86	1414731.15	20.07	19.97	0.1
366	730147.75	1414737.73	20.65	20.55	0.1
367	730152.94	1414769.56	20.22	19.92	0.3
368	730156.68	1414802.17	19.68	19.28	0.4
369	730192.88	1414809.24	19.25	18.65	0.6
370	730217.56	1414800.39	19.4	19.2	0.2
371	730221.84	1414825.67	20.34	20.14	0.2
372	730233.53	1414835.69	19.83	19.53	0.3
373	730212.51	1414866.12	19.39	18.99	0.4
374	730178.82	1414852.02	19.82	19.77	0.05
375	730150.67	1414858.6	19.92	19.67	0.25
376	730117.51	1414825.11	20.23	20.03	0.2
377	730123.63	1414844.98	19.87	19.77	0.1
378	730103.78	1414872.03	20.15	20.05	0.1
379	730070.63	1414879.96	19.68	19.43	0.25
380	730043.08	1414889.85	19.51	19.51	0
381	730046.71	1414909.5	19.56	19.46	0.1
382	730043.1	1414938.12	19.41	19.31	0.1
383	730026.5	1414933.62	19.26	19.16	0.1
384	730012.41	1414957.11	19.46	19.36	0.1
385	730044.69	1414970.05	19.35	19.15	0.2
386	730075.66	1414937.93	19.53	18.93	0.6
387	730104.61	1414944.01	19.69	18.79	0.9
388	730108.87	1414985.86	19.55	19.25	0.3
389	730085.24	1415010.16	20.19	19.99	0.2
390	730074.83	1415059.06	19.71	19.61	0.1
391	730052.07	1415091.1	19.26	19.06	0.2
392	730082.9	1415105.75	19.37	19.37	0
393	730121.12	1415078.12	19.11	18.71	0.4
394	730131.4	1415036.7	18.99	18.89	0.1
395	730159.71	1415052.78	19.53	19.43	0.1
396	730183.23	1415046.57	19.39	19.19	0.2
397	730202.85	1415021.42	19.24	19.04	0.2
398	730196.97	1414979.84	19.43	19.13	0.3
399	730201.8	1414945.94	19.37	18.87	0.5
400	730233.97	1414962.65	19.54	19.34	0.2
401	730248.43	1415008.51	19.1	18.9	0.2
402	730261.2	1415043.02	18.87	18.77	0.1
403	730233.98	1415073.2	20.06	19.76	0.3

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
404	730284.3	1415068.03	19.47	19.37	0.1
405	730312.59	1415115.09	19.19	18.89	0.3
406	730324.32	1415152.38	19.16	19.06	0.1
407	730365.52	1415155.72	19.72	19.42	0.3
408	730400.13	1415136.33	20.31	19.81	0.5
409	730427.29	1415099.37	19.45	19.25	0.2
410	730448.9	1415045.52	20.16	19.96	0.2
411	730486.4	1415015.15	19.63	19.43	0.2
412	730465.29	1415001.69	19.78	19.58	0.2
413	730419.98	1414995.8	20	19.7	0.3
414	730398.9	1415008.08	20.03	19.63	0.4
415	730376.81	1415019.82	19.35	19.15	0.2
416	730368.62	1414981.04	19.66	19.36	0.3
417	730389.25	1414945.22	20.13	19.93	0.2
418	730356.44	1414924.48	19.84	19.64	0.2
419	730351.82	1414965.05	19.27	19.02	0.25
420	730334.53	1415007.11	19.28	19.23	0.05
421	730326.45	1415043.94	19.79	19.69	0.1
422	730310.7	1415096.24	19.1	18.95	0.15
423	730281.36	1415148.63	19.01	18.91	0.1
424	730207.18	1415144.04	18.37	18.32	0.05
425	730147.62	1415151.58	19.29	19.19	0.1
426	730142.16	1415191.89	18.92	18.67	0.25
427	730122.14	1415232.39	19.22	19.07	0.15
428	730096.1	1415253.99	18.89	18.59	0.3
429	730074.65	1415300.32	18.91	18.71	0.2
430	730061.82	1415311.58	19.5	19.3	0.2
431	730047.74	1415317.23	19.3	19	0.3
432	730032.87	1415300.77	19.65	19.3	0.35
433	730036.76	1415355.09	19.55	19.35	0.2
434	730048.51	1415407.44	19.01	18.86	0.15
435	730047.15	1415440.47	19.17	19.07	0.1
436	730021.69	1415446.84	19.82	19.77	0.05
437	730089.52	1415383.17	19.12	19.12	0
438	730116.76	1415428.41	19.12	19.07	0.05
439	730117.8	1415484.56	19.38	19.33	0.05
440	730130.22	1415537.33	19.41	19.11	0.3
441	730146.46	1415586.42	19.79	19.74	0.05
442	730145.37	1415635.24	19.59	19.59	0
443	730148.87	1415680.01	20.26	20.16	0.1
444	730135.2	1415712.94	19.59	19.49	0.1
445	730135.22	1415742.6	19.28	19.18	0.1
446	730136.58	1415780.04	19.29	19.14	0.15
447	730106.7	1415721.7	20.01	19.91	0.1
448	730102.09	1415696.87	19.85	19.55	0.3

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottome	
449	730098.59	1415667.59	19.87	19.87	0
450	730097.73	1415622.63	19.66	19.56	0.1
451	730092.75	1415588.48	19.75	19.7	0.05
452	730089.44	1415562.01	20.14	20.09	0.05
453	730084.3	1415515.78	19.39	19.39	0
454	730088.45	1415454.5	19.47	19.47	0
455	730083.83	1415409.17	18.99	18.89	0.1
456	730081.56	1415354.99	20.4	20.35	0.05
457	730071.9	1415322.44	19.57	19.57	0
458	730107.22	1415283.94	19.33	19.23	0.1
459	730170.4	1415300.44	19.83	19.73	0.1
460	730213.72	1415294.83	18.68	18.38	0.3
461	730253.67	1415291.19	18.88	18.68	0.2
462	730307.07	1415284.73	20.01	19.81	0.2
463	730338.18	1415258.06	20.61	20.61	0
464	730345.96	1415332.97	20.15	20.15	0
465	730390.29	1415360.68	20.19	20.14	0.05
466	730294.5	1415342.94	19.27	19.17	0.1
467	730246.62	1415361.23	18.66	18.66	0
468	730195.49	1415380.5	18.93	18.83	0.1
469	730160.8	1415421.22	19.27	19.22	0.05
470	730197.03	1415428.51	18.91	18.81	0.1
471	730229.89	1415423.09	19.01	18.81	0.2
472	730284.15	1415406.22	19.34	19.14	0.2
473	730332.63	1415409.56	19.7	19.3	0.4
474	730384.03	1415406.88	20	19.6	0.4
475	730430.26	1415417.75	19.99	19.59	0.4
476	730467.79	1415423.12	19.9	19.7	0.2
477	730520.47	1415436.64	20.17	20.07	0.1
478	730563.26	1415446	20.23	20.13	0.1
479	730607.23	1415453.45	20.21	20.06	0.15
480	730510.15	1415459.8	19.3	19.25	0.05
481	730508.92	1415492.09	20.1	19.95	0.15
482	730488.56	1415477.5	20.27	20.17	0.1
483	730470.9	1415510.21	19.56	19.36	0.2
484	730488.6	1415544.76	20.07	19.97	0.1
485	730514.3	1415573.15	19.59	19.49	0.1
486	730550.86	1415596	20.06	19.86	0.2
487	730436.1	1415531.06	20.04	19.84	0.2
488	730421.84	1415566.84	19.8	19.65	0.15
489	730380.67	1415590.81	19.81	19.51	0.3
490	730372.8	1415629.62	19.91	19.81	0.1
491	730397.67	1415674.95	19.89	19.79	0.1
492	730407.76	1415711.27	20.12	20.07	0.05
493	730346.33	1415702.1	19.92	19.82	0.1

Point No.	Easting	Northing	Elevatio (feet NAVD88)		Muck Thickness (feet)
			Top of Muck	Hard Bottom	
494	730334.81	1415669.49	19.69	19.69	0
495	730324.93	1415619.31	18.71	18.71	0
496	730341.75	1415564.53	19.8	19.8	0
497	730344.14	1415494.59	19.22	19.22	0
498	730281.97	1415466.77	18.8	18.7	0.1
499	730229.72	1415475.2	18.94	18.84	0.1
500	730181.22	1415529.9	19.48	19.48	0
501	730236.81	1415560.71	19.43	19.38	0.05
502	730282.13	1415570.27	19.01	18.91	0.1
503	730304.89	1415606.16	18.53	18.33	0.2
504	730293.95	1415673.02	18.85	18.65	0.2
505	730330.03	1415724.96	19.76	19.66	0.1
506	730364.31	1415747.51	20.05	20.05	0
507	730336.6	1415776.83	20.12	20.02	0.1
508	730289.02	1415718.5	19.22	19.07	0.15
509	730238.21	1415728.52	19.14	19.09	0.05
510	730260.12	1415775.59	19.42	19.32	0.1
511	730199.17	1415731.49	19.87	19.77	0.1
512	730164.88	1415770.06	19.71	19.61	0.1
513	730187.26	1415680.77	18.8	18.75	0.05
514	730240.53	1415680.36	19	18.95	0.05
515	730246.64	1415630.33	19.45	19.4	0.05
516	730236.44	1415581.08	19.35	19.3	0.05
517	730029.39	1415491.97	19.83	19.78	0.05
518	730029.31	1415533.04	19.81	19.71	0.1
519	730028.23	1415559.11	19.66	19.61	0.05
520	730026.66	1415595.25	19.65	19.6	0.05
521	730018.77	1415638.47	20.09	19.99	0.1
522	730022.17	1415669.01	19.8	19.75	0.05
523	730018.52	1415720.46	19.77	19.72	0.05

0.162141491

**TABLE 2 - MUCK PROBING AND SURVEY RESULTS - CELL 4**  
 Brevard County Utility Services - South Central Regional WWTF

Point No.	Easting	Northing	Elevation of Hard-Bottom (feet NAVD88)	Muck Thickness (Feet)
P1	730891.11	1416095.16	20.03	0.35
P2	730983.4	1416066.41	20.14	0.15
P3	731038.12	1416073.48	20.31	0.2
P4	731081.06	1416035.92	19.75	0.25
P5	731154.21	1416006.05	20.57	0.45
P6	731202.92	1415981.8	20.49	0.1
P7	731222.42	1415955.51	20.59	0.1
P8	731239.55	1415932.9	20.37	0.3
P9	731227.71	1415912.02	20.26	0.1
P10	731193.53	1415886.01	20.4	0.1
P11	731179.05	1415860.16	20.28	0.1
P12	731154.24	1415819.99	20.15	0.2
P13	731144.15	1415790.01	21.36	0.5
P14	731161.55	1415764.85	20.16	0.35
P15	731176.18	1415770.45	19.27	0.8
P16	731218.08	1415773.41	19.7	0.45
P17	731257.66	1415777.95	20.55	0.2
P18	731265.89	1415816.33	20.89	0.25
P19	731287.68	1415847.17	20.39	0.2
P20	731301.83	1415856.74	20.69	0.1
P21	731317.34	1415841.31	20.97	0.15
P22	731351.79	1415816.65	20.78	0.4
P23	731395.56	1415776.18	20.68	0.1
P24	731414.45	1415751.84	20.95	0.35
P25	731338.89	1415772.93	20.38	0.25
P26	731256.79	1415779.59	20.09	0.4
P27	731211.31	1415774.82	19.76	0.25
P28	731145.64	1415768.21	20.36	0.2
P29	731096.5	1415765.94	19.72	0.65
P30	731085.03	1415651.34	20.41	1
P31	731072.68	1415698.3	20.15	0.55
P32	731072.43	1415734.87	20.3	0.4
P33	731060.32	1415770.87	19.64	0.75
P34	731023.79	1415771.81	19.31	0.55
P35	730976.11	1415783.39	20.09	0.2
P36	730948.61	1415778.07	20.27	0.15
P37	730951.16	1415730.14	19.98	0.15
P38	730992.39	1415734.68	20.47	0.05
P39	730973.27	1415707.71	20.13	0.2
P40	730958.4	1415680.51	20.23	0.6
P41	730990.27	1415662.36	20.32	0.25
P42	730961.53	1415635.24	20.17	0.35
P43	730968.96	1415559.74	19.66	0.3
P44	730953.91	1415585.5	19.35	0.15
P45	730931.07	1415665.48	20.08	0.1

Point No.	Easting	Northing	Elevation of Hard-Bottom (feet NAVD88)	Muck Thickness (Feet)
P46	730926.6	1415781.97	20.33	0.6
P47	730892.02	1415781.91	19.84	0.75
P48	730893.86	1415742.61	19.89	0.3
P49	730922.55	1415716.71	19.97	0.25
P50	730887.62	1415693.23	19.89	0.25
P51	730886.74	1415629.65	19.64	0.30 {0.75 ALGAE MAT}
P52	730855.96	1415664.85	19.82	0.20 {0.50 ALGAE MAT}
P53	730813.95	1415679.08	19.79	0.40 {0.55 ALGAE MAT}
P54	730826.09	1415714.79	20.23	0.5
P55	730781.37	1415696.26	19.82	0.15
P56	730730.71	1415727.6	19.61	0.2
P58	730703.51	1415741.01	20.06	0.15 {0.50 ALGAE MAT}
P59	730655.08	1415759.51	19.89	0.35
P60	730616.94	1415777.44	19.89	0.15
P61	730577.07	1415798.73	19.58	0.1
P62	730584.58	1415825.37	20.59	0.3
P63	730524.19	1415812.59	20.4	0.15
P64	730589.77	1415868.47	20.17	0.2
P65	730559.75	1415904.62	20.15	0.55
P66	730553.58	1415936.07	20.25	0.2
P67	730549.5	1415972.74	20.13	0.2
P68	730521.11	1415999.66	20.15	0.7
P69	730513.09	1415962.54	20.81	0.8
P70	730473.16	1415956.89	20.63	0.3
P71	730440.57	1415905.81	20.19	0.4
P72	730445.41	1415860.95	20.18	0.1
P73	730474.48	1415835.45	20.12	0.15
P74	730413.99	1415867.32	20.02	0.25
P75	730380.33	1415873.98	19.95	0.2
P76	730346.16	1415892.53	19.75	0.15
P77	730391.1	1415902.79	20.39	0.4
P78	730439.5	1415940.24	20.5	0.9
P79	730428.84	1415992.09	20.43	1
P80	730406.09	1416038	19.88	0.2
P81	730380.66	1416074.81	19.5	0.1
P82	730325.04	1416075.17	19.41	0.4
P83	730435.47	1416086.45	20.28	0.25
P84	730502.48	1416092.09	19.63	1.4
P86	730544.31	1416079.11	20.45	0.65
P87	730607.21	1416054.59	19.81	0.3
P88	730655.52	1416066.26	20.01	0.4
P89	730698.71	1416079.9	19.61	0.1
P90	730755.77	1416074.32	20.17	0.35
P91	730811.09	1416095.01	20.2	0.1



Point No.	Easting	Northing	Elevation of Hard-Bottom (feet NAVD88)	Muck Thickness (Feet)
P92	730853.67	1416091.69	19.79	0.05
P93	730899.11	1416043.77	19.58	0.05
P94	730899.54	1416000.34	20.13	0.15
P95	730897.9	1415998.53	19.83	0.2
P96	730860.85	1415992.62	20.1	0.25
P97	730900.1	1415946.62	19.71	0.1
P98	730859.83	1415937.4	20.24	0.15
P100	730828.77	1415973.56	19.94	0.2
P101	730808.18	1416007.99	20.04	0.2
P102	730781.88	1416004.98	20.49	0.25
P103	730776.84	1415970.63	20.3	0.15
P104	730768.18	1415922.43	20.23	0.25
P105	730724.8	1415887.03	20.35	0.2
P106	730722.46	1415954.91	20.03	0.3
P107	730727.26	1415999.87	19.56	0.5
P108	730662.7	1416023.33	19.96	0.2
P109	730642.91	1415968.57	19.89	0.25
P110	730660.82	1415912.18	20.06	0.15
P111	730578.68	1416002.49	19.41	0.2
P112	730520.22	1416001.42	20.58	0.45
P113	730480.92	1416027	20.78	0.55
P114	730153.12	1416004.7	20.49	0.4
P115	730134.35	1416040.52	19.45	0.4
P116	730101.04	1416090.85	19.65	0.55
P117	730117.75	1416067.95	19.43	0.35
P118	730146.47	1416063.65	19.8	0.2
P119	730154.33	1416075.26	19.58	0.3
<b>Average</b>				<b>0.32</b>

**Notes:**

Average muck thickness does not include apparent algal mat, which was only identified by sight.

Data collected by:

OCEANSIDE SOLUTIONS LLC

Professional Hydrographic Survey Consultants

Surveyed - April 27, 2021

Datum - NAD83-FL East 0901 and NAVD88- G12B

NAD83-FL East 0901 - North American Datum of 1983, State Plane Florida East

NAVD88 - North American Vertical Datum of 1988

**TABLE 3 - OBSERVED WILDLIFE SPECIES TABLE - MAY 5, 2021**  
 Brevard County Utility Services - South Central Regional WWTF

<b>Birds</b>	
Anhinga	<i>Anhinga anhinga</i>
Boat-tailed Grackle	<i>Quiscalus major</i>
Glossy Ibis	<i>Plegadis falcinellus</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
Little Blue Heron (ST)	<i>Egretta caerulea</i>
Osprey	<i>Pandion haliaetus</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Red-wing Blackbird	<i>Agelaius phoeniceus</i>
Tricolored Heron (ST)	<i>Egretta tricolor</i>
White Ibis	<i>Eudocimus albus</i>
<b>Mammals</b>	
Marsh Rabbit	<i>Sylvilagus palustris</i>
<b>Reptiles</b>	
American Alligator (FT)	<i>Alligator mississippiensis</i>

**Notes:**

ST - State Threatened

FT - Federally Threatened (similar appearance)

**TABLE 4 - OBSERVED WILDLIFE SPECIES TABLE - November 3, 2021**  
**Brevard County Utility Services - South Central Regional WWTF**

<b>Birds</b>	
American Coot	<i>Fulica americana</i>
Anhinga	<i>Anhinga anhinga</i>
Boat-tailed Grackle	<i>Quiscalus major</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
Osprey	<i>Pandion haliaetus</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Sandhill Crane (ST)	<i>Grus canadensis</i>
Tricolored Heron (ST)	<i>Egretta tricolor</i>
White Ibis	<i>Eudocimus albus</i>
<b>Reptiles</b>	
American Alligator (FT)	<i>Alligator mississippiensis</i>

**Notes:**

ST - State Threatened


FT - Federally Threatened (similar appearance)

**ATTACHMENT 1**  
**Muck Thickness Maps**

CELL 1 TOP MUCK VS. HARD BOTTOM THICKNESS MAP




MAP LEGEND	
0.25'-0.60'	
0.20'-0.25'	
0.15'-0.20'	
0.10'-0.15'	
0.00'-0.10'	
Min. Elevation	0.00'
Max. Elevation	0.60'

 <p><b>TERRA TECH</b>          11111 W. BAYVIEW BLVD.          SUITE 200          MIAMI, FL 33149          TEL: 305.442.2200</p>		<p>VIERA, FL  <b>CELL 4</b>          VIERA WASTE TREATMENT</p>	<p>Sheet: 10 of 12          Date: 10/15/2010</p>
<p>Project No.: 10-00000000          Client: Viera Water Treatment Plant          Designer: [Name]          Checker: [Name]          Date: 10/15/2010</p>		<p>Scale: 1" = 100'</p>	

CELL 2 TOP MUCK VS. HARD BOTTOM THICKNESS MAP

MAP LEGEND	
0.25'-0.65'	[Dark Blue Swatch]
0.20'-0.25'	[Medium-Dark Blue Swatch]
0.15'-0.20'	[Medium Blue Swatch]
0.10'-0.15'	[Light Blue Swatch]
-0.05'-0.10'	[Lightest Blue Swatch]
Min. Elevation -0.05'	[Lightest Blue Swatch]
Max. Elevation .65'	[Dark Blue Swatch]




Sheet # of 2	Scale Reference	<b>VIERA WASTE TREATMENT CELL 4</b>  VIERA, FL	 <b>TETRA TECH</b> 11 WINDSOCK DRIVE SUITE 100 BOCA RATON, FL 33433 TEL: 561-996-8470 FAX: 561-996-8471	Designed By E. COLLINS Drawn By J. LINDEN Checked By M. COLLINS Approved By E. COLLINS Project File No. WWT-0128-15-11-001-010 Date 04/20/15	REV	DESCRIPTION	CHK	APP	DATE
		[Empty Revision Table]							

CELL 3 TOP MUCK VS. HARD BOTTOM THICKNESS MAP



MAP LEGEND	
0.25'-0.81'	[Dark Blue Swatch]
0.20'-0.25'	[Medium-Dark Blue Swatch]
0.15'-0.20'	[Medium Blue Swatch]
0.10'-0.15'	[Light Blue Swatch]
0.00'-0.10'	[Very Light Blue Swatch]
Min. Elevation	0.00'
Max. Elevation	0.81'

A B C D

 <b>TETRA TECH</b> 11 MERCER DRIVE SUITE 204 ROCKY HILL, CT 06067 TEL: 860.396.6100		VERA, FL CELL 4 VERA WASTE TREATMENT	SHEET: 01 OF 1 DATE: 10/1/2014
Project No. Client Location Date Scale Author Checker Approver	Revision Description Date By Checked By	VERA, FL CELL 4 VERA WASTE TREATMENT	

CELL 4 TOP MUCK VS. HARD BOTTOM THICKNESS MAP



MAP LEGEND	
0.50'-1.71'	(Dark Blue)
0.38'-0.50'	(Medium-Dark Blue)
0.20'-0.38'	(Medium Blue)
0.5'-0.20'	(Light Blue)
-0.94'-0.5'	(Very Light Blue)
Min. Elevation	-0.94'
Max. Elevation	1.71'

<p>VERA WASTE TREATMENT CELL 4 VERA FL</p>		<p>TEMA TECH 11 KINGSWAY DRIVE MILWAUKEE, WI 53233 TEL: 212.634.8100 EXT. 200</p>	<p>Project No. 100000000 Revision No. 001 Date 01/15/2010 Scale 1"=100' Drawing Title Drawing No. 100000000-001</p>	<p>Sheet Reference Sheet of 2</p>
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VOLUME SUMMARY

**Cut/Fill Summary**

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
CELL 3	1.000	1.000	781078.02 Sq. Ft.	0.03 Cu. Yd.	5352.17 Cu. Yd.	5352.14 Cu. Yd.<Fill>
CELL 2	1.000	1.000	671157.10 Sq. Ft.	0.03 Cu. Yd.	3827.46 Cu. Yd.	3827.46 Cu. Yd.<Fill>
CELL 1	1.000	1.000	1476511.53 Sq. Ft.	0.36 Cu. Yd.	8595.00 Cu. Yd.	8594.02 Cu. Yd.<Fill>
CELL 4	1.000	1.000	495757.79 Sq. Ft.	653.94 Cu. Yd.	7223.12 Cu. Yd.	6569.17 Cu. Yd.<Fill>
<b>Totals</b>			<b>3444004.44 Sq. Ft.</b>	<b>654.96 Cu. Yd.</b>	<b>24897.75 Cu. Yd.</b>	<b>24242.79 Cu. Yd.&lt;Fill&gt;</b>

NO. \_\_\_\_\_

DESCRIPTION \_\_\_\_\_

DATE \_\_\_\_\_

BY \_\_\_\_\_

VERMA TECH  
11 RIVERVIEW DR  
DUNELAND, NJ 08040  
TEL: 908-645-1100 FAX: 908-645-1101

**VERA WASTE TREATMENT  
CELL 4**

VERA, FL

Sheet Reference  
Sheet of 3

**ATTACHMENT 2**  
**Biological Walkdown Photo Log (May 5, 2021)**

Photo Page Exhibit



Pickerelweed and duck potato in equal distribution at Cell 4, Photo Station 2; facing north.



\* Open water and algal mats at Cell 4, Photo Station 3; facing northwest.



Living and dead cattails (from the spraying event) at Cell 4, Photo Station 5; facing northwest.



Living and dead cattails (from the spraying event) at Cell 4, Photo Station 9; facing south.



Invasive torpedo grass at Cell 4, Photo Station 11; facing south.



Dead and decaying cattails at Cell 3, Photo Station 24; facing south.



**ATTACHMENT 3**  
**Biological Walkdown Photo Log (November 3, 2021)**

**Photo Page Exhibit**



Cattails and bulrush with open water at Cell 1, Photo Station 4; facing east.



Living and dead cattails at Cell 1, Photo Station 9; facing west.



Cattails and cogon grass at Cell 1, Photo Station 13; facing west.



Sandhill cranes observed traveling between Cells 2 and 1; facing south.



Cattails and bulrush at Cell 2, Photo Station 9; facing northeast.



Living and dead cattails at Cell 2, Photo Station 14; facing north.



Bulrush and cattails at Cell 2, Photo Station 18; facing west.



# **EXHIBIT F**

# Ritch Grissom Memorial Wetlands Access Path

## Feasibility Study

Task Order No. 10

June 6, 2022



This item has been electronically signed and sealed by Maryelen E. Samitas, PE on the date adjacent to the seal using a SHA authenticiate code. Printed copies of this document are not considered signed and sealed and the SHA authentication code must be verified on any electronic copies.  
2022.10.06 10:57:08-04'00'

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## Document history

Document title: Feasibility Study

Document reference: 100076504

Revision	Purpose description	Originated	Checked	Reviewed	Authorized	Date
0	Draft Report	KC/MS	JW	FV	FV	11/19/2021
1	Final Report	KC/MS	JW	FV	FV	6/06/2022

## Client signoff

Client	Task Order No. 10
Project	Grissom Wetlands Access Feasibility Study
Job number	100076504
Client signature/date	

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## EXECUTIVE SUMMARY

Brevard County has identified the need to evaluate the existing unpaved maintenance access that was constructed with the South-Central Regional Wastewater System (SCRWS) Constructed Wetlands in 1999/2000. The site is located at the west end of Wickham Road in Viera, in unincorporated Brevard County, adjacent to the existing SCRW Treatment Plant. This feasibility study evaluated the existing condition of the access road and recommends certain improvements to be made to the facilities so that the cell containment berms can be accessed by the general public for recreational use such as walking, cycling and viewing the wetland wildlife. Three separate options were considered:

- Constructing a paved one-way public access road with adjacent shared use path,
- Constructing a paved shared use path.
- Constructing an un-paved shared use path with a paved section for wheelchairs.
- All three options will include improving the existing parking area.

Our evaluation included the following tasks:

- Field observations and review of available data provided by the County.
- Geometric design requirements for vehicular roadways, shared use paths and accessible requirements,
- Evaluate factors that may limit the number of vehicles allowed on the paved access road.
- Preliminary environmental analysis to identify wetlands, surface waters and potential threatened and endangered species habitat that may be impacted by the proposed improvements.
- Research jurisdictional agency permitting requirements.
- Geotechnical investigation and structural stability review of the existing cell containment berms and evaluation of the existing subsurface soils.
- Recommendations for modifying the cell containment berms in the areas where the safety factors are too low to make the areas suitable for construction of the proposed improvements.

Findings of the evaluation are provided in this feasibility report and include separate concept plans and a cost estimate for each option based on existing publicly available aerial imagery.

Our analysis concludes that constructing an unpaved shared use path with a paved section for wheelchairs provides the best combination of accessibility while preserving the existing natural aesthetics of the facility and controlling upfront costs. Constructing a vehicular access road is the most expensive option, creates vehicle interaction risks with cyclist/pedestrians, requires significant environmental permitting, redesign and re-construction of the cell containment berms and a longer construction period.



Figure 1 Site Aerial

## A. EXISTING SITE CONDITIONS

### A.1. General Site Conditions

The project area is located at the west end of Wickham Road in Viera, in unincorporated Brevard County, adjacent to the existing South Central Regional Wastewater (SCRW) Treatment Plant Facility. The SCRW Treatment Plant first began operation in June 1990 with substantial modifications in 1994 and again in 1999 under FDEP permit DO05-197556 with the addition of the wetlands as part of the effluent disposal and reclaimed water reuse system. The 200-acre constructed wetland serves under current permit FL0102679 as a surface water discharge for treated effluent from the plant and storage for reuse water used by neighbouring golf courses and subdivisions. This wetland area has become a popular vantage point for use by the public to observe waterfowl and other wildlife using the wetland area as habitat. An existing unpaved maintenance access road is located along the top of the cell containment berm and an unpaved parking lot is located at the entrance to the facility in the northeast corner of the site with an unpaved ramp leading up to the top of the berm. Until recently a gate at the top of the ramp was left open to allow for vehicular access by the public to the maintenance access along the top of the berm. Currently the gate is closed but the public is still permitted to walk and bike along the maintenance access path.

The constructed wetland area is approximately 200 acres in size and consists of four 35-acre cells separated by an earthen berm. The center basin serves as a lake with a deeper water body and a maintained littoral zone. The Lake is also accessible via a perimeter berm, forming an inner loop named Heron Loop East & West. An earthen berm surrounds and contains the entire wetland area, forming the outer loop: Coot Lane to north, Limpkin EL to the south, Gator Trail to the east, and Otter EL to the west. A supply of reclaimed water from the treatment plant enters the flow control structure in the southeast corner where it is split to feed spreader pipes at Cells 1 and 2. This inflow is distributed through the remainder of the constructed wetland system via culverts and control structures. Under normal operating conditions, flow from Cells 1 and 2 will discharge through control structures into the lake. Bypass structures are provided to direct flow to Cells 3 and 4 if the Lake must be bypassed. The overflow from the entire wetland system is discharged to Four-Mile Canal via a control structure at the northwest corner of the site and ultimately released into the St Johns River.

## A.2. Site Observations

A site visit was conducted by Atkins staff on 8/19/2021 to observe the existing condition of the cell containment berms, maintenance access road and parking lot. The berms appeared well vegetated with no signs of erosion. The maintenance access appeared to consist of a compacted crushed shell surface. Approximately 70% of the driving surface was stable with grass and other vegetative growth along the shoulders and to a lesser extent, within the driving surface itself. Thick, overgrown grass was encountered in some areas including the east side of the lake, however the road base still felt substantial to drive on even though visibility of the road surface was poor. The pull-off / parking area at the north side of the lake was stabilized and level with little sign of erosion. Several deep potholes capable of causing vehicle damage were noted along the north perimeter berm of Coot Lane. This may be due to the height of the shoulder vegetation being higher than the road, restricting drainage, causing standing water and road base degradation. There was a stockpile of sand/baseroack located at the northwest junction of Coot Lane and Cattail Divide which did not have erosion protection and was partially blocking passage, however this was assumed to be a temporary condition. The parking lot outside of the gate is in poor condition with clear signs of erosion. The access drive from Charlie Corbeil Way to the parking lot and gate is severely rutted to the point where it has become hazardous to standard passenger vehicles. An interview with utility staff during the site visit revealed that the Brevard County Public Works Department would frequently mobilize on site to repair road damage after large storm events, especially when public vehicles were still allowed inside the gate. This further confirms the possibility that adjacent vegetation is restricting positive drainage from the road surface, saturating the base material.

An environmental / ecological study was conducted on 8/6/2021 by Atkins environmental scientists to identify the environmental resources present within the project boundaries including wetland and surface water limits, potential threatened and endangered species habitat, and other observed environmental constraints. Results of the study and site visit are summarized below:

- Within the Study Area, all wetland and surface water feature limits were confined to toe of slope of their original design when created under FDEP permit FL0102679

- If direct impacts to the wetlands and/or surface water are anticipated, then permitting through state/federal agencies may be required. Once project specifics have been determined, a pre-application meeting with the agencies is recommended.
- No documented (historic) bald eagle or crested caracara nests were observed in the Study Area or its vicinity.
- Although not directly observed, numerous listed species are known to utilize the Study Area.
- Every effort should be made to conduct planned construction activities outside of the nesting seasons of listed species; and if not possible, then consultation with FWC and USFWS is recommended to determine proper survey protocols. In addition, it is recommended that a clearance letter be submitted to FWC/USFWS to determine suggested avoidance measures.

Refer to Appendix C for full Environmental Assessment Memo.

### A.3. Geotechnical Report

A subsurface geotechnical investigation was conducted in September/October 2021 by Ardaman and Associates, the project geotechnical engineer. The preliminary results of the investigation are located in Appendix D.1. The boring profiles include three 50 ft test holes, eleven 25 ft test holes, and eighteen 5 ft auger borings. The results indicate a mix of silt and clay with fine sands and traces of shell. A full geotechnical report and cell containment berm global stability analysis were conducted in January/February 2022 by Ardaman and Associates. Ten berm cross sections were analysed, and calculated factors of safety ranged from approximately 1.5 to 2.4. A minimum safety factor of 1.3 is typically used for this application, which was exceeded for the ten cross sections that were analysed. These results are provided in Appendix D.2. The results of the subsurface geotechnical investigations and the global stability analysis indicate that the existing soils on the site are suitable for the construction of the proposed berms, the asphalt roadways, and the asphalt parking area. Recommendations for the site preparation and construction were also provided and located in Appendix D.3.

## B. PROPOSED IMPROVEMENTS

### B.1. References:

The evaluation was based on the following information and reference materials:

- Client Provided Information,
- Historical permits and plans,
- Field Research & Observations,
- Brevard County GIS Data,
- St. John's Water Management District; Online Permit Search (ePermitting),
- FEMA Flood Mapping Online,
- FDEP Map Direct Gallery,
- USDA NRCS Web Soil Survey,
- USFWS National Wetland Inventory,
- USGS Quadrangle Topographic Map,
- Florida Greenbook,
- Florida Department of Transportation (FDOT) Design Manual,
- Brevard County Land Development Details
- National Fire Protection Association (NFPA)



## B.2. Geometry Requirements:

The following design guidelines and requirements were used for all options to define the roadway and shared path geometry and typical section:

- Two-way vehicular entrance drive width 20 ft (two 10 ft lanes) with 6 ft stabilized shoulders based on the following:
  - FDOT Design Manual Table 210.2.1 – Minimum Travel and Auxiliary Lane Widths allows 10 ft wide lanes
  - FDOT Design Manual Section 210.4.1 - Shoulder Cross Slopes recommends 0.06 outside shoulder slope.
  - Brevard County Land Development Exhibit 2, Marginal Access and Local Streets Rural Section allows 6 ft wide stabilized shoulders at 6%.
  - 20 ft pavement width must closely match the existing width of Charlie Corbeil Way
- One-way vehicular drive width along berm based on the following:
  - FDOT Design Manual Table 210.2.1 – Minimum Travel and Auxiliary Lane Widths allows 10 ft wide lane.
  - FDOT Design Manual Section 210.4.1 - Shoulder Cross Slopes recommends 0.06 outside shoulder slope.
  - Brevard County Land Development Exhibit 2, Marginal Access and Local Streets Rural Section allows 6 ft wide stabilized shoulders at 6%.
  - Because the speed limit is under 15 mph and due to the corridor width constraints, a travel lane of 10 ft with 4 ft stabilized shoulders was deemed safe and acceptable.
  - NFPA 1 Chapter 18.2.3.4 Emergency Response access width of 20 ft, provided by the 10 ft vehicular drive, the 6 ft stabilized shoulder/clear zone and the 10 ft shared use path.
- Multiuse shared path width 10 ft based on:
  - FDOT Design Manual Section 224.4 which allows 10 ft wide where there is limited right-of-way.
- Multiuse shared path 4' clear area including 2' wide graded area with 1:6 slope adjacent to both sides of the path:
  - FDOT Design Manual Section 224.7 Horizontal Clearance
- Clear zone separation between vehicle travel lane and shared path 6 ft based on:
  - FDOT Design Manual Table 215.2.1 – Clear Zone Width Requirements which allows 6 ft for RRR projects.
- Paved roadway cross slope 2% based on:
  - Brevard County Land Development Exhibit 2, Marginal Access and Local Streets Rural Section recommends 2% cross slope across the travel lane.
- Paved shared use path cross slope 1.5% design, 2% max based on:
  - BC Lands Development Criteria, Exhibit 13 Pedway Construction Details
  - ADA Standards for Accessible Design
- Un-paved shared use path cross slope 4% based on:
  - Brevard County Land Development Exhibit 10, note 20 requires minimum slope of 2% on unpaved roads.
  - Gravel Roads Construction & Maintenance Guide published 2015 by Federal Highway Administration - recommends cross slope between 4% - 6% on unpaved roads, creating less potential for water to concentrate and scour the road surface or penetrate and weaken the road base.

- Berm side slopes of 4:1
  - Brevard County Land Development Exhibit 10, note 17 requires maximum slope of 4:1 on roadside swales.
- Paved parking:
  - Brevard County Code Section 62-3206 Parking & Loading requirements –
    - (c)(1)a. 9 ft wide by 20 ft long (or 18 ft long with front bumper overhang)
    - (c)(2)a. 24 ft two-way drive aisle
    - (d)(25) Parks and recreation areas: Parking spaces should be considered on the specific parks development plan and should be determined by its active or passive facilities. A parking study must be reviewed and approved by the county traffic section.

### B.3. Proposed Improvement Options

#### B.3.1. Option A - Constructing a paved one-way public access road with adjacent shared use path

This option is for the construction of a paved 10 ft wide one-way public access road and a paved 10 ft wide accompanying shared use path separated by a 6 ft grassed clear zone and 4 ft shoulders for safety. Nearly all of the existing maintenance roads along the cell containment berms are one way and approximately 12 ft wide with 4 ft shoulders (top of berm width of 20 ft), therefore constructing this plan would require extensive modifications to the existing berm widths. To accommodate two 10 ft lanes, a 6 ft clear zone, and 4 ft shoulders, the top of berm would need to be widened to 34 ft. This requires a total expansion of approximately 14 ft or 7 ft on each side. Keeping the same berm side slopes would require the bottom width of the berm to increase by the same amount creating major impacts to the geometry of the cells, surface water storage capacity, and many piping components. Environmental permitting requirements would be triggered, both to provide treatment volume for the paved roadway and mitigation for the surface water and habitat impacts. This option is graphically depicted in Appendix A.1.

In addition to the challenges with the tight corridor geometry, the need for ample signage and striping to maintain safe operation of vehicles and pedestrians/bicyclists side by side would now become a critical component to consider with Option A. At every intersection, signage and striping would be required to direct motorists to stop and yield to pedestrians at cross walks. Each intersection is unique based on the direction of travel, number of turning movements and orientation of the shared use path in relation to the motorists. A few examples of the level of detail that may be required in the final design for these intersections are included with the concept plan. Albeit an improvement over the previous condition where the same unpaved road was shared by both vehicles and pedestrians, constructing a *dedicated* shared use path may draw more users to the site creating more opportunities for conflicts between motor vehicles and pedestrians/cyclists. If this option *is* desired, it is recommended to consider limiting public vehicular traffic to the outer and inner loops, using gates accessible only to maintenance traffic on Cattail Divide, Snail Cut, and Caracara Divide. This would eliminate a number of conflict points while still maintaining pedestrian and bicyclist accessibility to all areas via bollards or other physical barrier selective to vehicles. It is anticipated that the 10 ft wide shared use path would be blocked off from vehicle

use with bollards and appropriate pavement markings and signage conspicuous enough for motorists to not mistake the shared use path as a motor vehicle lane.

For all options including Option A, access to the wetlands would be at the existing entry gate via a new 20 ft wide, paved two-way drive where the unpaved entry is currently located. The parking lot outside the entry gate would be reconstructed with asphalt pavement and graded to drain to the perimeter retention. ADA parking and access isle will be denoted in the new parking lot plan as well as an ADA compliant connection between the parking lot and the paved, shared use path.

Permitting Requirements for Option A will require a modification to the original ERP and wetland mitigation through SJRWMD and FDEP

#### Advantages of Option A:

- Allows the public to access the wetlands without leaving their vehicle.
- Provides paved vehicular access to both public and maintenance personnel.
- Reduces erosion and frequency of future road maintenance.

#### Disadvantages of Option A:

- This option is the most costly concept.
- Requires adding fill to the cellular containment berm to create the required top width.
- Requires permitting through SJRWMD and FDEP.
- Requires reconstructing the spreader pipe system from the treatment plant effluent piping into the Cells 1 & 2.
- Requires lengthening culverts through the cell containment berms connecting internal control structures.
- Requires modification and design revision to the wetland treatment facility due to the loss of surface water storage volume needed to widen the base of the cell containment berms.
- May require hydraulic modelling calculations and modification of internal control structures.
- A longer design, permitting and construction schedule is anticipated due to the impacts to the existing features and the amount of fill required.
- The vehicular access through the wetland contributes noise and air pollution and detracts from the natural aesthetics of the wetland area.
- With paved roads, speeding could become an issue, encouraging vehicular accidents.
- The similar width and asphalt surface of the vehicular road and shared use path is likely to cause confusion to motorists, pedestrians and cyclists. Options to mitigate the risk of vehicles driving off the road would require a combination of fencing, bollards, signage, curbs and pavement markings that would further increase the project cost, detract from the natural aesthetics and reduce emergency response access.

### B.3.2. Option B - Construct a paved shared use path

This option consists of the construction of a paved 12 ft wide shared use path connecting all cell containment berms. The path would not be accessible to public vehicles but only to pedestrians, bicyclists, and other recreational users. Since the existing width of berm is 12 ft plus shoulders and used by maintenance vehicles, it is recommended that the paved shared use path also be 12 ft wide, paved with asphalt or concrete. For the purpose of this exercise, the preferred pavement type was assumed to be asphalt. This will allow ample width for maintenance or emergency vehicles as required (12 ft paved width plus 4 ft stabilized shoulders on each side). Some signage will be required at intersections but unlike Option A, there is no risk of accidents with passenger cars. Access by maintenance staff will be provided by a locked gate with fencing. This option is graphically depicted in A.2.

Unlike Option A, the geometry of the existing cell containment berms will remain the same in Option B. Since the paved road will not be designed for public traffic, shoulder width can be reduced, resulting in a proposed section that closely matches the existing condition, greatly simplifying the design, permitting and construction process.

For all options including Option B, access to the wetlands would be at the existing entry gate via a new, 20 ft wide, paved, two-way drive where the unpaved entry is currently located. The parking lot outside the entry gate would be reconstructed with asphalt pavement and graded to drain to the perimeter retention. ADA parking and access isle will be denoted in the new parking lot plan as well as an ADA compliant connection between the parking lot and the paved, shared use path. Unique to Options B and C is the addition of a 2<sup>nd</sup> entry gate immediately west of the parking lot driveway. The 2-way paved drive between the parking lot and wetland entrance would therefore only be for maintenance use and special events. Otherwise, this portion of the drive will be for foot/bike traffic only. This will allow for a shorter ADA compliant connection and eliminate the vehicular dead end at the current entry gate, affording motorists the opportunity to turn around in the parking lot rather than backing up.

Permitting Requirements for Option B will be to file for an exemption under FAC 62-330.051 Exempt Activities; relevant sections noted below:

- (e) Repair, stabilization, paving, or repaving of existing roads, and the repair or replacement of vehicular bridges that are part of the road, where:*
  - 1. They were in existence on or before January 1, 2002, and have:*
    - a. Been publicly-used and under county or municipal ownership and maintenance thereafter, including when they have been presumed to be dedicated in accordance with Section 95.361, F.S.;*
  - 2. The work does not realign the road or expand the number of traffic lanes of the existing road, but may include safety shoulders, clearing vegetation, and other work reasonably necessary to repair, stabilize, pave, or repave the road, provided that the work is constructed using generally*

*accepted roadway design standards:*

5. *Roadside swales or other effective means of stormwater treatment are incorporated as part of the work;*
6. *No more dredging or filling of wetlands or water of the state is performed than is reasonably necessary to perform the work in accordance with generally accepted roadway design standards;*
7. *Notice of intent to use this exemption is provided to the Agency 30 days before performing any work; and*
8. *All work is conducted in compliance with subsection 62-330.050(9), F.A.C.*

**Advantages of Option B:**

- Less costly than Option A
- The entire trail is paved to provide smooth wheelchair access.
- Provides paved vehicular access for maintenance personnel.
- Reduces erosion and frequency of road maintenance.
- The total paved and stabilized width is sufficient to allow for 20 ft wide emergency vehicle access.

**Disadvantages of Option B:**

- Extensive asphalt pavement may detract from the aesthetics of a nature trail.
- Additional paved asphalt surface to maintain.
- More costly than Option C

**B.3.3. Option C - Constructing an un-paved shared use path with a paved section for wheelchairs**

This option consists of the construction of a paved shared use path along the front loop only. The remainder of the cell containment berms will have a newly constructed, unpaved, shared use trail. Both the paved shared use path and the unpaved shared use trail will primarily be in the same footprint as the current existing maintenance roads but would be reconstructed and graded properly to provide stormwater drainage off the edge of the shared use surface, unimpeded by vegetative growth along the shoulder. Similar to Option B, Option C will not require geometry change to the berm width or significant earth work, surface water impacts, or import fill. This option is graphically depicted in A.3.

The advantage of having the paved shared use path along the front loop is combining ADA accessibility in proximity to the parking and minimizing cost with a reduced scope of overall paving. The proposed paved loop would be Gator Trail to Hog Cut, Heron Loop East along the Lake, and down Caracara Drive back to Gator Trail.

For all options including Option C, access to the wetlands would be at the existing entry gate via a new paved 20 ft wide two-way drive. The parking lot outside the entry gate would be reconstructed with asphalt pavement and graded to drain to the perimeter retention. ADA parking and access aisle will be denoted in the new parking lot plan as well as an ADA compliant connection between the parking lot and the paved, shared use path. Unique to Options B and C is the addition of a 2<sup>nd</sup> entry gate immediately west of the parking lot driveway. The 2-way

paved drive between the parking lot and the wetland entrance would provide access for maintenance and special events. Otherwise, this portion of the drive will be for foot/bicycle traffic only. This will allow for a shorter ADA compliant connection and eliminate the vehicular dead end at the current entry gate, affording motorists the opportunity to turn around in the parking lot rather than backing up.

Permitting Requirements for Option C will be to file for an exemption under FAC 62-330.051 Exempt Activities which includes *Repair, stabilization, paving or repaving of existing roads* as outlined in the previous section.

#### Advantages of Option C:

- Lowest cost option.
- Additional segments of the shared use path can easily be paved later if desired.
- Provides a balance between paved accessible path and un-paved trail, optimizing the natural aesthetics of the facility.

#### Disadvantages of Option C:

- The design cross section of the unpaved trail will require periodic maintenance; however, it is anticipated this will be less often because vehicular traffic will be limited to maintenance and emergency vehicles.
- ADA accessibility would be limited to the front loop only.

As previously noted, all options anticipate providing a paved parking lot at the entrance with a paved access drive and gated access control. The access control gate would accommodate vehicles and pedestrians/bikes/wheelchair access so that the facility can be completely closed if necessary. It is understood that the anticipated users will be pedestrians and cyclists and NOT equestrian or ATV enthusiasts. For Parks and recreation areas, the Brevard County code does not specify a number of parking spaces for the trail head. Instead, it instructs that the number of spaces be based on the specific park development plan and facilities. A parking study is recommended to determine current usage and forecast projected usage after improvements. The study will need to be reviewed and approved by the county traffic section. The concept plans enclosed depict the parking lot of equivalent size as existing, provides 15 parking spaces includes 2 dedicated ADA, and has the potential for overflow parking in the grass.

## C. SUMMARY

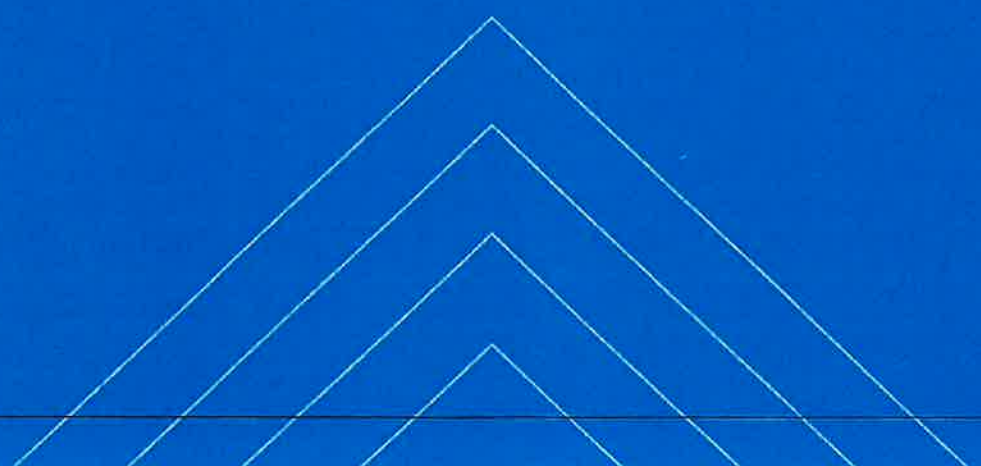
Based on our evaluation and cost estimates for the three concept plans, we recommend Option C as the most cost-effective way to improve public access to the wetland observation path. This option provides a paved section for wheelchair access and an unpaved shared use path, offering the best combination of accessibility while preserving the existing natural aesthetics of the facility and controlling upfront costs. Rutting of the unpaved

surface will be significantly reduced by proper gravel material selection, cross slope grading, reduction of high shoulders and limiting vehicular traffic to maintenance vehicles only.

By comparison, constructing a vehicular access road is the most expensive option, creates vehicle interaction risks with cyclist/pedestrians, requires significant environmental permitting, redesign and re-construction of the cell containment berms and a longer construction period.

Option C also provides the future opportunity to easily extend the limits of the paved shared use path further west into the wetland site should this be desired based on public use and feedback.

# APPENDICIES

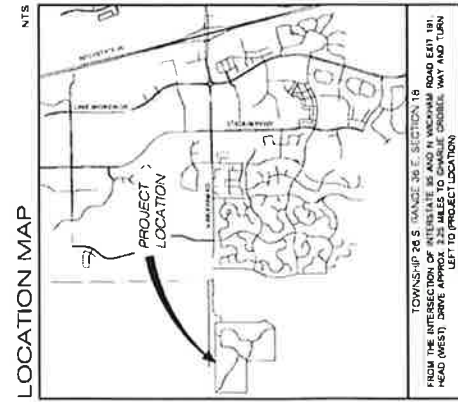




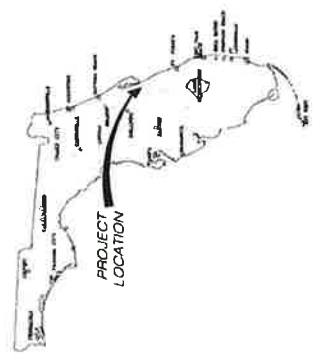
## Appendix A. Concept Plans

- A.1. Option A – Paved One-way road with shared use path
- A.2. Option B – Paved shared use path
- A.3. Option C – Partially paved shared use path
- A.4. Paved Parking Area (all options)

# RITCH GRISSOM MEMORIAL WETLANDS ACCESS IMPROVEMENTS



BREVARD COUNTY, FLORIDA



CIVIL ENGINEER

**MARVEL ATKINS**  
2871 W. EAU GALLE BLVD  
MELBOURNE, FL 32935  
(321) 242-4842

OWNER

**BREVARD COUNTY  
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(321)-4833-2880

GEOTECHNICAL ENGINEER

**ARDAMAN &  
ASSOCIATES**  
1300 N. COLLETT RD  
COPPIN, FL 32932  
(321)-4832-2503

## DRAWING INDEX

- 0-000 COVER SHEET
- 05-100 GENERAL SITE PLAN - OPTION A
- 05-101 GENERAL SITE PLAN - OPTION A
- 05-102 GENERAL SITE PLAN - OPTION B
- 05-103 SECTIONS AND DETAILS - OPTION B
- 05-104 GENERAL SITE PLAN - OPTION C
- 05-105 SECTIONS AND DETAILS - OPTION C
- 05-106 SITE PLAN - PARKING AREA

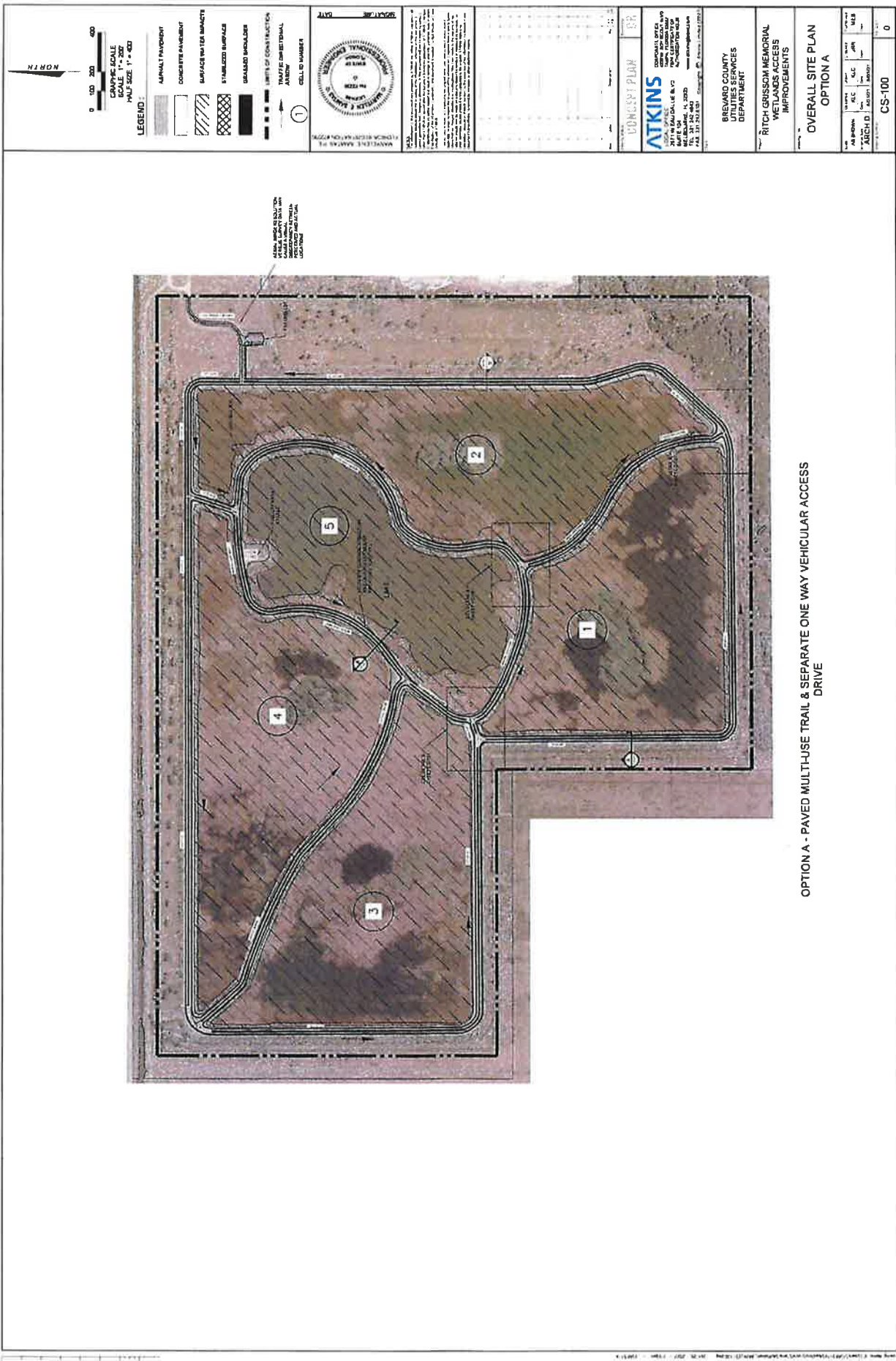
ENGINEER OF RECORD DATE

JUNE 2022

NOT VALID FOR CONSTRUCTION UNLESS SIGNED IN THIS BLOCK

**BOARD OF COUNTY COMMISSIONERS**  
District 1: Rita Pritchett (Chairman)  
District 2: Bryan Lober  
District 3: John Tobia  
District 4: Curt Smith  
District 5: Kristine Zonka (Vice Chairman)

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FLORIDA CERTIFICATE OF AUTHORIZATION NO. 24  
2871 W. EAU GALLE BLVD  
SUITE 104  
MELBOURNE, FL 32935  
TEL: (321) 242-4842



**SECTION AND DETAILS**  
**OPTION A**

**ATKINS**  
CORPORATE OFFICE  
10000 RIVERCHASE DRIVE, SUITE 1000  
DALLAS, TEXAS 75244  
TEL: 972-784-3400 FAX: 972-784-3401  
WWW.ATKINS.COM

**BREWSTER COUNTY**  
SHERIFF'S OFFICE  
DEPARTMENT

**RITCHIE GERRISON MEMORIAL**  
WETLANDS ACCESS  
IMPROVEMENTS

**CONCEPT PLAN**

**LEGEND:**  
 ALPHALY PAVEMENT  
 CONCRETE PAVEMENT  
 SURFACE WATER STRUCTURES  
 STABILIZED SURFACES  
 STABILIZED SURFACES - DAMAGED / UNSTABILIZED AREAS  
 EXISTING DRAINAGE  
 ORIGINAL WATER LEVEL  
 TYPICAL

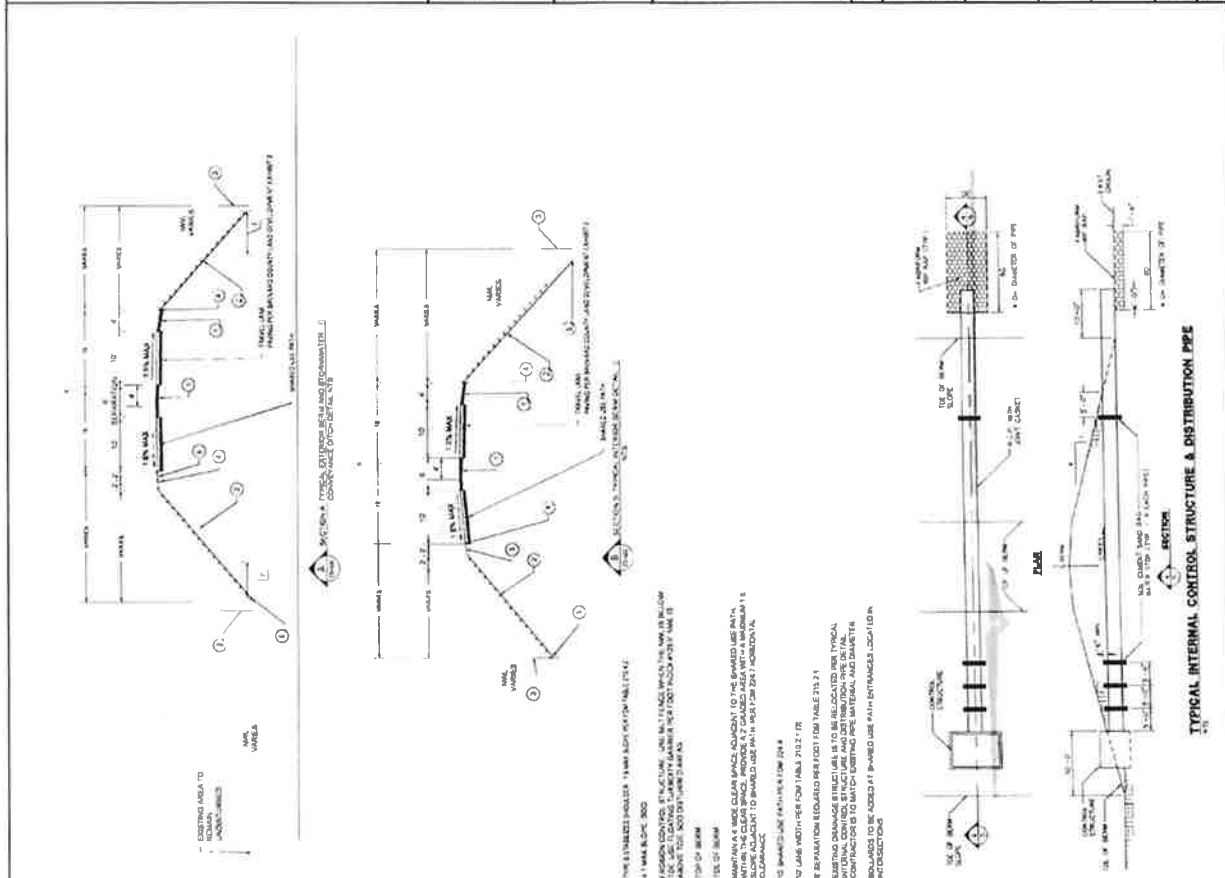
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 VERTICAL SCALE: 1" = 20'  
 HALF SIZE: 1" = 40'

**DATE:** 03/20/2012

**PROJECT NO:** CS-101

**SCALE:** 0 100 200 400

**NORTH**



- 1. THE STABILIZED SHOULDER IS 18" MAX. HIGH AND 18" WIDE.
- 2. 1/8" MAX. & 2" MIN. CURB.
- 3. EXISTING DRAINAGE STRUCTURES TO BE RELOCATED PER TYPICAL CONTRACTOR TO MATCH EXISTING PIPE MATERIAL AND DIAMETER. LOCATIONS TO BE ADDED AT 18" WIDE USE WITH ENTRENCHES LOCATED IN REVISIONS.
- 4. 1/8" MAX. & 2" MIN. CURB.
- 5. 1/8" MAX. & 2" MIN. CURB.
- 6. 1/8" MAX. & 2" MIN. CURB.
- 7. 1/8" MAX. & 2" MIN. CURB.
- 8. 1/8" MAX. & 2" MIN. CURB.
- 9. 1/8" MAX. & 2" MIN. CURB.
- 10. 1/8" MAX. & 2" MIN. CURB.
- 11. 1/8" MAX. & 2" MIN. CURB.
- 12. 1/8" MAX. & 2" MIN. CURB.
- 13. 1/8" MAX. & 2" MIN. CURB.
- 14. 1/8" MAX. & 2" MIN. CURB.
- 15. 1/8" MAX. & 2" MIN. CURB.
- 16. 1/8" MAX. & 2" MIN. CURB.
- 17. 1/8" MAX. & 2" MIN. CURB.
- 18. 1/8" MAX. & 2" MIN. CURB.
- 19. 1/8" MAX. & 2" MIN. CURB.
- 20. 1/8" MAX. & 2" MIN. CURB.

**LEGEND:**

- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- SURFACE WATER IMPACTS
- GRAVELLED SURFACE
- GRAVELLED SHOULDER
- TRAFFIC DEVIATION
- TRAFFIC DIRECTIONAL ARROW
- CELL NUMBER

**GRAPHIC SCALE:**  
 0 100 200 400  
 HORIZONTAL SCALE: 1" = 200'  
 VERTICAL SCALE: 1" = 400'

**ATKINS**  
 CONSULTING ENGINEERS  
 1000 WEST PALM BLVD.  
 SUITE 200  
 WEST PALM BEACH, FL 33411  
 TEL: 561.833.2200  
 WWW.ATKINSGROUP.COM

**BREVARD COUNTY  
 UTILITIES SERVICES  
 DEPARTMENT**

**VIERA WETLANDS  
 ACCESS IMPROVEMENTS**

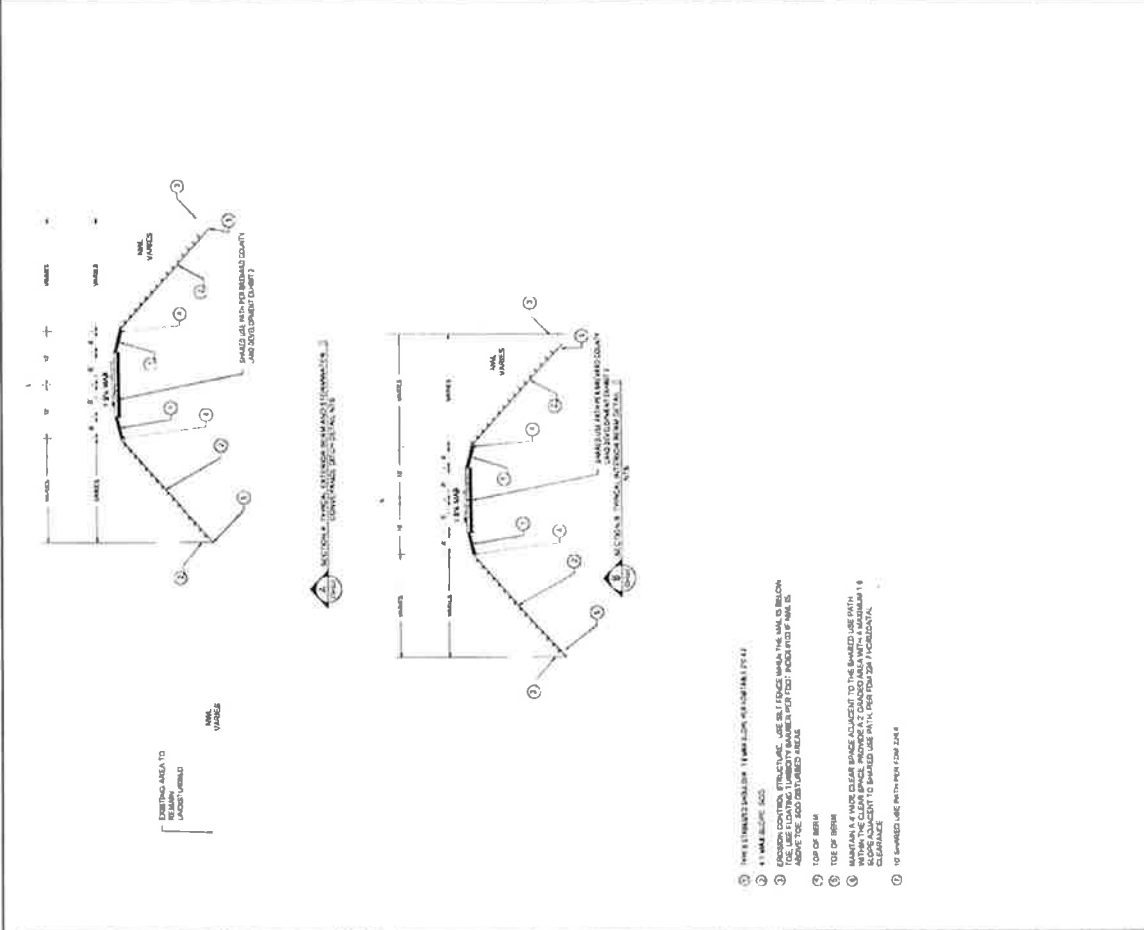
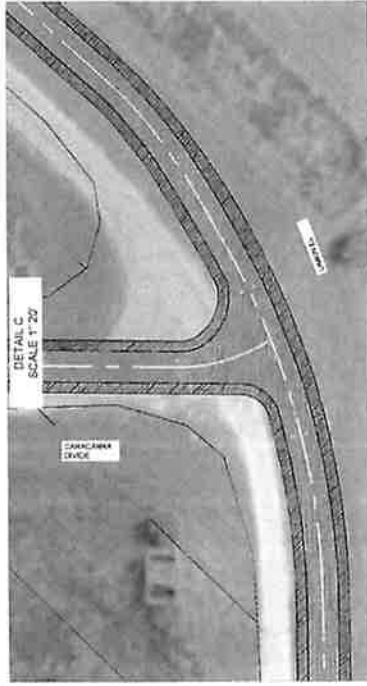
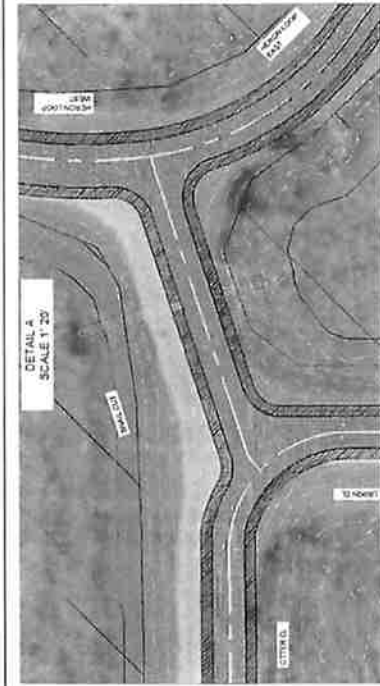
**SITE PLAN - CELL 2  
 OPTION B**

DATE: 08/20/13  
 DRAWN BY: [Name]  
 CHECKED BY: [Name]  
 APPROVED BY: [Name]

PROJECT NUMBER: CS-102  
 SHEET NUMBER: 0



OPTION B - PAVED MULTI-USE PATH WITH NO PUBLIC VEHICULAR ACCESS



- 1. THE ELEVATIONS SHOWN IN THIS PLAN ARE BASED ON THE DATUM OF MEAN SEA LEVEL.
- 2. ALL ELEVATIONS ARE IN FEET.
- 3. EXISTING CONTROL STRUCTURES, USE SET POINTS WITHIN THE MAIL IS BELOW INDICATED. ADDITIONAL AREAS AS SHOWN.
- 4. TOP OF ROAD.
- 5. TOP OF SIDEWALK.
- 6. MAINTAIN A MINIMUM CLEAR SPACE ADJACENT TO THE BARBED WIRE WITHIN THE CLEAR SPACE. PROVIDE A 2' CANALIZED AREA WITH A MINIMUM 18" CLEARANCE TO BARBED WIRE WITHIN THE CLEAR SPACE.
- 7. TO BARBED WIRE WITHIN THE CLEAR SPACE.

**LEGEND :**

- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- SURFACE WATER IMPACTS
- UNPAVED SURFACE
- GRAVEL SURFACE
- GRAVELLED PAVED AREA
- EXISTING GRADE
- NORMAL WATER LEVEL
- TYPICAL

**CONCRETE PLAN**

**ATKINS**

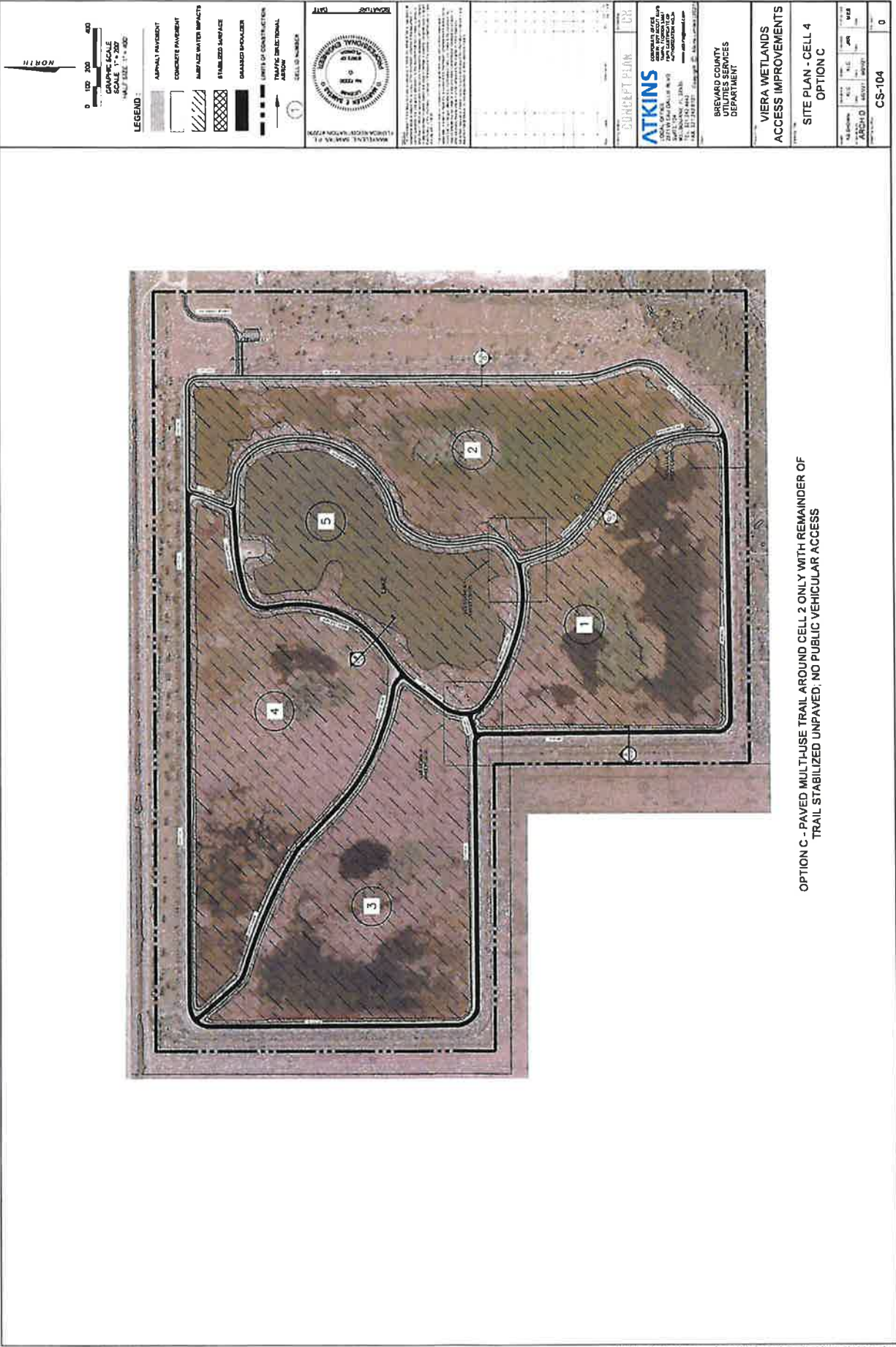
CORPORATE OFFICE  
1000 N. W. 10TH AVENUE, SUITE 1000  
MIAMI, FLORIDA 33136  
TEL: 305-575-4400 FAX: 305-575-4401  
WWW.ATKINS.COM

**BROWARD COUNTY**  
UNIFORM SERVICES  
DEPARTMENT

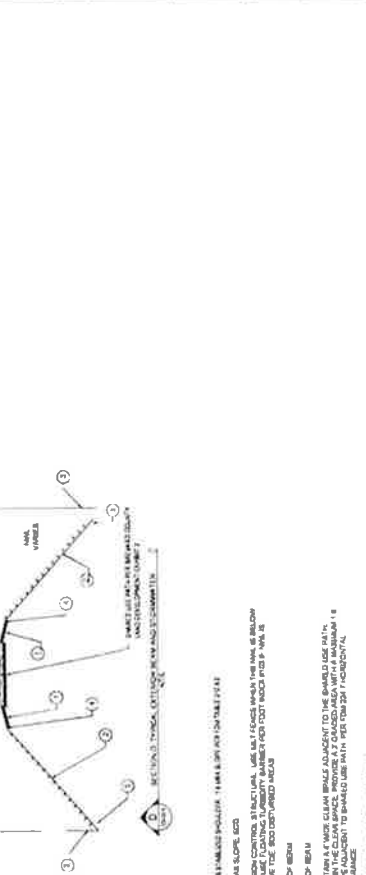
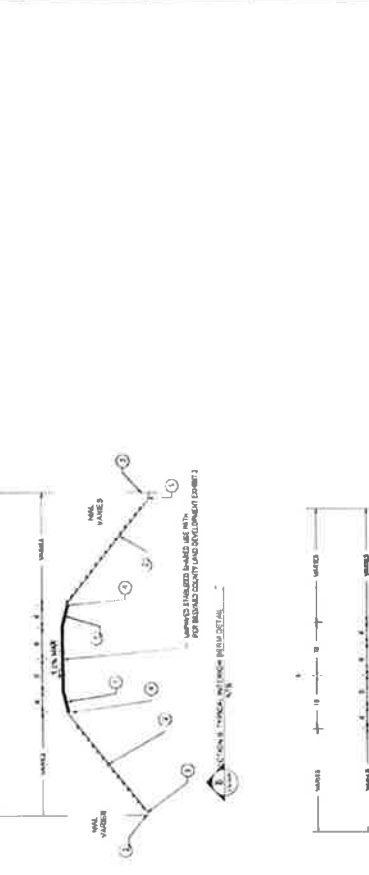
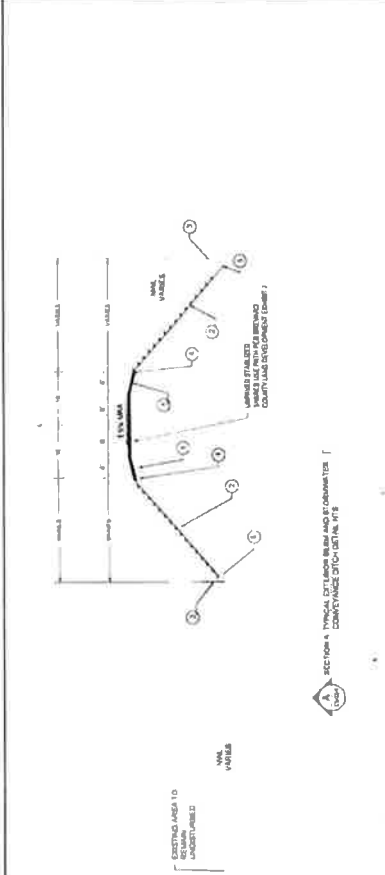
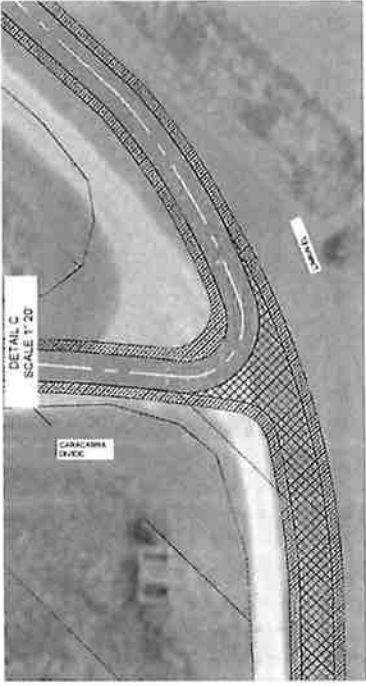
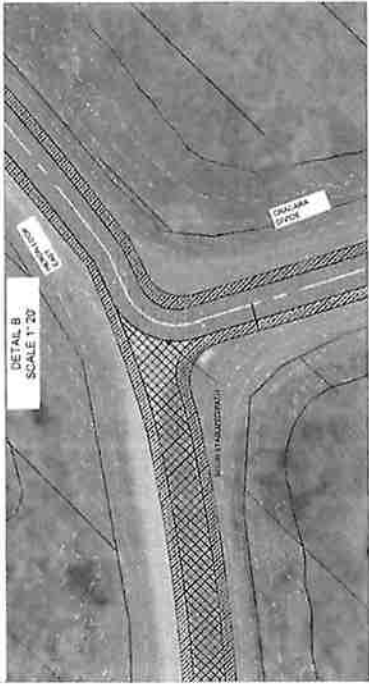
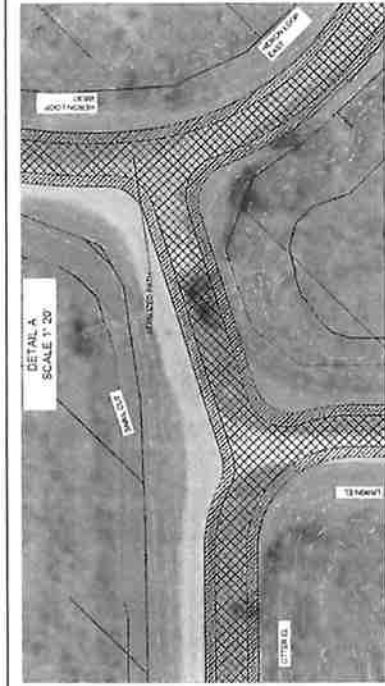
**VIERA WETLANDS**  
ACCESS IMPROVEMENTS  
OPTION B

**SECTION AND DETAILS**  
OPTION B

DATE: MARCH 09 10:50 AM  
SCALE: 1"=20'  
PROJECT: CS-103



OPTION C - PAVED MULTI-USE TRAIL AROUND CELL 2 ONLY WITH REMAINDER OF TRAIL STABILIZED UNPAVED, NO PUBLIC VEHICULAR ACCESS



- 1 1/4" MIN. SLOPE, 4:1
- 2 4" MIN. SLOPE, 4:1
- 3 EXISTING BANK, STABILIZED BANK, 18" MIN. SLOPE, 4:1
- 4 18" MIN. SLOPE, 4:1
- 5 18" MIN. SLOPE, 4:1
- 6 18" MIN. SLOPE, 4:1
- 7 18" MIN. SLOPE, 4:1
- 8 18" MIN. SLOPE, 4:1
- 9 18" MIN. SLOPE, 4:1
- 10 18" MIN. SLOPE, 4:1

**LEGEND:**

- ASPHALT PAVEMENT
- CONCRETE PAVEMENT
- SURFACE WATER IMPACTS
- STABILIZED SURFACE
- SHADED STABILIZED AREA
- EXISTING GRASSY AREA
- NORMAL WATER LEVEL
- TOP

**CONCEPT PLAN**

**ATKINS**

CONCEPT PLAN

CONCEPT PLAN

**VIERRA WETLANDS**

ACCESS IMPROVEMENTS

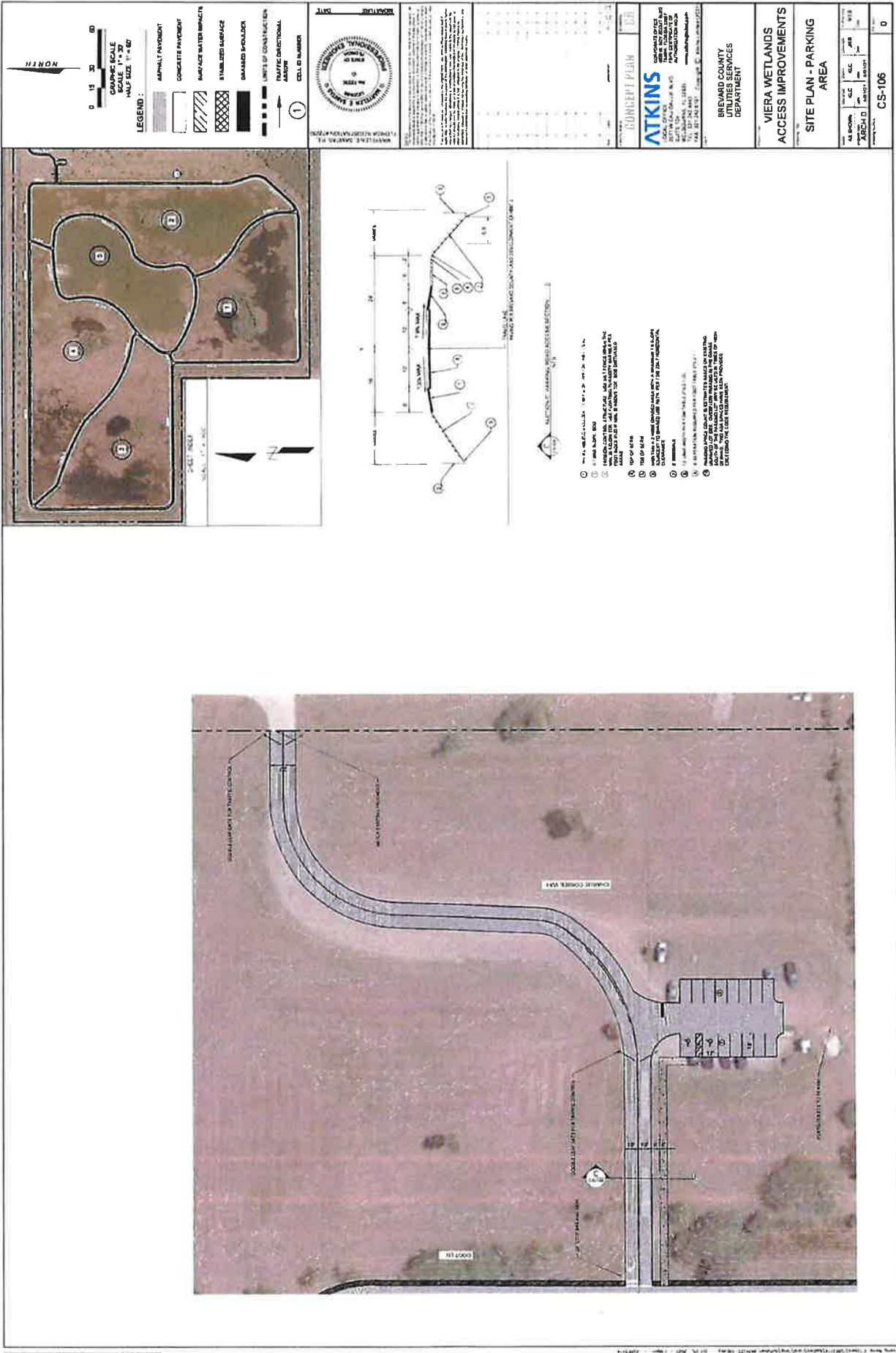
SECTION AND DETAILS

OPTION C

**CS-105**

0





DATE: 03/15/2017 11:58 AM  
 PROJECT: VIERA WETLANDS ACCESS IMPROVEMENTS  
 SHEET: 10 OF 10  
 DRAWN BY: J. B. [unreadable]  
 CHECKED BY: [unreadable]  
 APPROVED BY: [unreadable]

ATKINS  
 CONSULTANTS  
 10000 W. BOULEVARD  
 SUITE 100  
 BOCA RATON, FL 33433  
 TEL: 561-993-4400  
 FAX: 561-993-4401  
 www.atkins.com

BREVARD COUNTY  
 SERVICES  
 DEPARTMENT

VIERA WETLANDS  
 ACCESS IMPROVEMENTS  
 SITE PLAN - PARKING  
 AREA

DATE: 03/15/2017 11:58 AM  
 PROJECT: VIERA WETLANDS ACCESS IMPROVEMENTS  
 SHEET: 10 OF 10  
 DRAWN BY: J. B. [unreadable]  
 CHECKED BY: [unreadable]  
 APPROVED BY: [unreadable]

CS-106  
 0

## Appendix B. Cost Estimates

- B.1. Option A – Paved One-way road with shared use path
- B.2. Option B – Paved shared use path
- B.3. Option C – Partially paved shared use path
- B.4. Paved Parking Lot



**ESTIMATE OF PROBABLE CONSTRUCTION COST  
FOR  
OPTION A - ONE WAY DRIVE WITH SHARED USE PATH  
Concept Plans**

**6/6/2022**

THIS ESTIMATE REPRESENTS IMPROVEMENTS SHOWN ONLY IN OPTION A. VALUES SHOWN DO NOT INCLUDE COST OF PARKING LOT CONSTRUCTION.

ITEM DESCRIPTION	QTY	UNIT	UNIT-COST	TOTAL COST
<b>000-199</b>				
101-1 MOBILIZATION	1	LS	\$ 630,600.00	\$ 630,600.00
102-1 MAINTENANCE OF TRAFFIC	1	LS	\$ 183,700.00	\$ 183,700.00
104-12 STAKED TURBIDITY BARRIER (SILT FENCE)	41,000	LF	\$ 5.00	\$ 205,000.00
104-18 INLET PROTECTION	14	EA	\$ 166.00	\$ 2,324.00
110-1-1 CLEARING & GRUBBING	13.9	AC	\$ 25,000.00	\$ 347,500.00
120-6 EMBANKMENT	73,200	CY	\$ 21.00	\$ 1,537,200.00
160-4 TYPE B STABILIZATION	81,000	SY	\$ 10.00	\$ 810,000.00
<b>200-299</b>				
285-701 OPTIONAL BASE 1	24,000	SY	\$ 15.00	\$ 360,000.00
285-706 OPTIONAL BASE 6	81,000	SY	\$ 18.00	\$ 1,539,000.00
<b>300-399</b>				
334-1-13 SUPERPAVE ASPHALTIC CONC, TRAFFIC B	3,709	TN	\$ 98.00	\$ 363,482.00
<b>400-499</b>				
425-11 MODIFY EXISTING DRAINAGE STRUCTURE	14	EA	\$ 15,893.00	\$ 222,502.00
430-175-130 PIPE CULVERT, OPT MATERIAL, ROUND 30" S/CD	84	LF	\$ 217.00	\$ 18,228.00
430-175-136 PIPE CULVERT, OPT MATERIAL, ROUND 36" S/CD	56	LF	\$ 338.00	\$ 18,928.00
430-175-148 PIPE CULVERT, OPT MATERIAL, ROUND 48" S/CD	14	LF	\$ 540.00	\$ 7,560.00
430-175-154 PIPE CULVERT, OPT MATERIAL, ROUND 54" S/CD	14	LF	\$ 701.00	\$ 9,814.00
430-94-1 DE SILT PIPES 0-24"	1,052	LF	\$ 15.00	\$ 15,780.00
<b>500-599</b>				
519-7-8 BOLLARD	24	EA	\$ 2,433.00	\$ 58,392.00
527-2 DETECTABLE WARNINGS	400	SF	\$ 45.00	\$ 18,000.00
530-1100 RIP-RAP - SAND CEMENT BAGS	80	CY	\$ 750.00	\$ 60,000.00
570-1-2 SODDING (BAHIA)	130,009	SY	\$ 4.00	\$ 520,000.00
<b>600-699</b>				
<b>700-799</b>				
711-11-123 SOLID TRAFFIC STRIPE (THERMOPLASTIC, 12" WHITE, FOR CROSSWALK)	587	LF	\$ 5.00	\$ 2,935.00
711-11-125 THERMOPLASTIC, STANDARD, WHITE, SOLID, 24" FOR STOP LINE AND CROSSWALK	205	LF	\$ 9.00	\$ 1,845.00
711-11-170 THERMOPLASTIC, STANDARD, WHITE, ARROW	19	EA	\$ 100.00	\$ 1,900.00
711-11-224 THERMOPLASTIC, STANDARD, YELLOW, SOLID, 18" FOR DIAGONAL OR CHEVRON	46	LF	\$ 7.00	\$ 322.00
711-16-201 THERMOPLASTIC, STANDARD, YELLOW, SOLID, 6"	600	LF	\$ 2.00	\$ 1,200.00
<b>800-899</b>				
<b>900-999</b>				
<b>1000-1999</b>				
<b>ESTIMATED SUB TOTAL</b>			<b>\$</b>	<b>6,936,212.00</b>
Estimated Contingency			<b>25%</b>	<b>\$ 1,734,100.00</b>
<b>Estimated Total</b>			<b>\$</b>	<b>8,670,312.00</b>

**NOTES:**

- Quantities are considered approximate only, it is the contractors responsibility to verify the actual quantities required.
- This estimate was developed to determine a reasonable cost to construct the proposed improvements based on CONCEPT PHASE PLANS
- This estimate assumes that the proposed improvements will not have any site work conflicts other than those indicated on the plans.
- Estimate assumes existing soils are adequate for the proposed improvements.
- Estimate excludes the removal and replacement of muck or any unsuitable soils.
- Estimate is based on unit prices from FDOT and historical ATKINS projects.
- Estimate excludes cost associated with dewatering.
- Estimate excludes Environmental Remediation & Mitigation, if required.
- Does not include relocation of power poles or subsurface utilities.
- Unit Bid Prices include overhead and profit.
- Estimate does not include cost associated with obtaining right-of-way and/or easements.

Unit Prices Updated:  
June 2, 2022

**CONCEPT PLANS  
NOT FOR CONSTRUCTION**

Date:

**Maryelen Samitas, PE  
FL Reg No 72230**

ATKINS | 2671 W. Eau Gallie Blvd, Suite  
104 | Melbourne | FL | 32935



**ESTIMATE OF PROBABLE CONSTRUCTION COST**  
 FOR  
**OPTION B - PAVED SHARED USE PATH**  
**Concept Plans**  
 6/6/2022

THIS ESTIMATE REPRESENTS IMPROVEMENTS SHOWN ONLY IN OPTION B. VALUES SHOWN DO NOT INCLUDE COST OF PARKING LOT CONSTRUCTION.

	ITEM DESCRIPTION	QTY	UNIT	UNIT-COST	TOTAL COST
<b>000-199</b>					
101-1	MOBILIZATION	1	LS	\$ 170,000.00	\$ 170,000.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	\$ 49,000.00	\$ 49,000.00
104-12	STAKED TURBIDITY BARRIER (SILT FENCE)	41,000	LF	\$ 5.00	\$ 205,000.00
104-1B	INLET PROTECTION	14	EA	\$ 166.00	\$ 2,324.00
110-1-1	CLEARING & GRUBBING	0.9	AC	\$ 25,000.00	\$ 22,956.84
160-4	TYPE B STABILIZATION	50,000	SY	\$ 10.00	\$ 500,000.00
<b>200-299</b>					
285-701	OPTIONAL BASE	45,000	SY	\$ 15.00	\$ 675,000.00
<b>300-399</b>					
334-1-13	SUPERPAVE ASPHALTIC CONC, TRAFFIC B	2,225	TN	\$ 98.00	\$ 218,057.84
<b>400-499</b>					
<b>500-599</b>					
570-1-2	SODDING (BAHIA)	9,000	SY	\$ 4.00	\$ 36,000.00
<b>600-699</b>					
<b>700-799</b>					
<b>800-899</b>					
<b>900-999</b>					
<b>1000-1999</b>					
	<b>ESTIMATED SUB TOTAL</b>			<b>\$ 1,880,038.68</b>	
	Estimated Contingency		25%	<b>\$ 470,000.00</b>	
			<b>Estimated Total</b>	<b>\$ 2,350,038.68</b>	

**NOTES:**

- Quantities are considered approximate only, it is the contractors responsibility to verify the actual quantities required.
- This estimate was developed to determine a reasonable cost to construct the proposed improvements based on CONCEPT PHASE PLANS
- This estimate assumes that the proposed improvements will not have any site work conflicts other than those indicated on the plans.
- Estimate assumes existing soils are adequate for the proposed improvements.
- Estimate excludes the removal and replacement of muck or any unsuitable soils. **Unit Prices Updated: June 2, 2022**
- Estimate is based on unit prices from FDOT and historical ATKINS projects.
- Estimate excludes cost associated with dewatering.
- Estimate excludes Environmental Remediation & Mitigation, if required.
- Does not include relocation of power poles or subsurface utilities.
- Unit Bid Prices include overhead and profit.
- Estimate does not include cost associated with obtaining right-of-way and/or easements.

**CONCEPT PLANS  
NOT FOR CONSTRUCTION**

Date: \_\_\_\_\_  
**Maryelen Samitas, PE**

FL Reg No 72230  
ATKINS | 2671 W. Eau Gallie Blvd,  
Suite 104 | Melbourne | FL | 32935



**ESTIMATE OF PROBABLE CONSTRUCTION COST**  
**FOR**  
**OPTION C - PARTIALLY PAVED SHARED USE PATH**  
**Concept Plans**  
**6/6/2022**

THIS ESTIMATE REPRESENTS IMPROVEMENTS SHOWN ONLY IN OPTION C. VALUES SHOWN DO NOT INCLUDE COST OF PARKING LOT CONSTRUCTION.

ITEM DESCRIPTION	QTY	UNIT	UNIT-COST	TOTAL COST
<b>000-199</b>				
101-1 MOBILIZATION	1	LS	\$ 153,300.00	\$ 153,300.00
102-1 MAINTENANCE OF TRAFFIC	1	LS	\$ 44,600.00	\$ 44,600.00
104-12 STAKED TURBIDITY BARRIER (SILT FENCE)	41,000	LF	\$ 5.00	\$ 205,000.00
104-18 INLET PROTECTION	14	EA	\$ 166.00	\$ 2,324.00
110-1-1 CLEARING & GRUBBING	0.8	AC	\$ 25,000.00	\$ 22,956.84
160-4 TYPE B STABILIZATION	50,000	SY	\$ 10.00	\$ 500,000.00
<b>200-299</b>				
285-701 OPTIONAL BASE 1 (4" TOPPING FOR UNPAVED AREAS)	45,000	SY	\$ 15.00	\$ 675,000.00
<b>300-399</b>				
334-1-13 SUPERPAVE ASPHALTIC CONC, TRAFFIC C	478	TN	\$ 98.00	\$ 45,844.00
<b>400-499</b>				
570-1-2 SODDING (BAHIA)	9,000	SY	\$ 4.00	\$ 36,000.00
<b>600-699</b>				
<b>700-799</b>				
<b>800-899</b>				
<b>900-999</b>				
<b>1000-1999</b>				
<b>ESTIMATED SUB TOTAL</b>				<b>\$ 1,686,024.84</b>
Estimated Contingency			25%	\$ 421,500.00
<b>Estimated Total</b>				<b>\$ 2,107,524.84</b>

**NOTES:**

- Quantities are considered approximate only, it is the contractors responsibility to verify the actual quantities required.
- This estimate was developed to determine a reasonable cost to construct the proposed improvements based on CONCEPT PHASE PLANS
- This estimate assumes that the proposed improvements will not have any site work conflicts other than those indicated on the plans.
- Estimate assumes existing soils are adequate for the proposed improvements.
- Estimate excludes the removal and replacement of muck or any unsuitable soils.
- Estimate is based on unit prices from FDOT and historical ATKINS projects.
- Estimate excludes cost associated with dewatering.
- Estimate excludes Environmental Remediation & Mitigation, if required.
- Does not include relocation of power poles or subsurface utilities.
- Unit Bid Prices include overhead and profit.
- Estimate does not include cost associated with obtaining right-of-way and/or easements.

Unit Prices Updated:  
June 2, 2022

**CONCEPT PLANS  
NOT FOR CONSTRUCTION**

Date: Maryelen Samitas, PE  
FL Reg No 72230

ATKINS | 2671 W. Eau Gallie Blvd,  
Suite 104 | Melbourne | FL | 32935



**ESTIMATE OF PROBABLE CONSTRUCTION COST  
FOR  
PAVED PARKING LOT  
Concept Plans  
6/6/2021**

THIS ESTIMATE REPRESENTS IMPROVEMENTS SHOWN ONLY IN PARKING AREA. VALUES SHOWN DO NOT INCLUDE COST OF TRAIL IMPROVEMENTS.

ITEM DESCRIPTION	QTY	UNIT	UNIT-COST	TOTAL COST
<b>000-199</b>				
101-1 MOBILIZATION	1	LS	\$ 13,000.00	\$ 13,000.00
102-1 MAINTENANCE OF TRAFFIC	1	LS	\$ 3,800.00	\$ 3,800.00
104-12 STAKED TURBIDITY BARRIER (SILT FENCE)	1,300	LF	\$ 5.00	\$ 6,500.00
110-1-1 CLEARING & GRUBBING	0.1	AC	\$ 25,000.00	\$ 2,500.00
120-6 EMBANKMENT	375	CY	\$ 21.00	\$ 7,875.00
160-4 TYPE B STABILIZATION	900	SY	\$ 10.00	\$ 9,000.00
<b>200-299</b>				
285-706 OPTIONAL BASE	1,400	SY	\$ 19.00	\$ 26,600.00
<b>300-399</b>				
334-1-13 SUPERPAVE ASPHALTIC CONC. TRAFFIC B	116	TN	\$ 98.00	\$ 11,392.00
<b>400-499</b>				
<b>500-599</b>				
522-2 CONCRETE 6" THICK - SIDEWALKS & DRIVEWAYS	136	SY	\$ 72.00	\$ 9,792.00
527-2 DETECTABLE WARNINGS	12	SF	\$ 30.00	\$ 360.00
570-1-2 SODDING (BAHIA)	11,800	SY	\$ 4.00	\$ 47,200.00
550-60-122 DOUBLE LEAF SWING GATE	2	EA	\$ 1,200.00	\$ 2,400.00
<b>700-799</b>				
711-11-125 THERMOPLASTIC, STANDARD, WHITE, SOLID, 24" FOR STOP LINE AND CROSSWALK	11	LF	\$ 9.00	\$ 99.00
711-11-201 THERMOPLASTIC, STANDARD, YELLOW, SOLID, 6"	630	LF	\$ 2.00	\$ 1,260.00
711-14-160 THERMOPLASTIC, PREFORMED, WHITE, MESSAGE	2	EA	\$ 267.00	\$ 534.00
711-15-101 THERMOPLASTIC, SOLID 6" WHITE	286	LF	\$ 1.00	\$ 286.00
<b>800-899</b>				
<b>900-999</b>				
<b>1000-1999</b>				
<b>ESTIMATED SUB TOTAL</b>			\$	<b>143,168.18</b>
Estimated Contingency			25%	\$ 35,800.00
<b>Estimated Total</b>			\$	<b>178,968.18</b>

**NOTES:**

- Quantities are considered approximate only, it is the contractor's responsibility to verify the actual quantities required.
- This estimate was developed to determine a reasonable cost to construct the proposed improvements based on CONCEPT PHASE PLANS
- This estimate assumes that the proposed improvements will not have any site work conflicts other than those indicated on the plans.
- Estimate assumes existing soils are adequate for the proposed improvements.
- Estimate excludes the removal and replacement of rock or any unsuitable soils.
- Estimate is based on unit prices from FDOT and historical ATKINS projects.
- Estimate excludes cost associated with dewatering.
- Estimate excludes Environmental Remediation & Mitigation, if required.
- Does not include relocation of power poles or subsurface utilities.
- Unit Bid Prices include overhead and profit.
- Estimate does not include cost associated with obtaining right-of-way and/or easements.

Unit Prices Updated:  
June 2, 2022

**CONCEPT PLANS  
NOT FOR CONSTRUCTION**

Date: \_\_\_\_\_  
Maryelen Samitas, PE

FL Reg No 72230  
ATKINS | 2671 W. Eau Gallie Blvd, Suite 104  
| Melbourne | FL | 32935

## Appendix C. Environmental Assessment

### C.1. Environmental Assessment Memo



## Memo

To: Ferdinand Vasquez, P.E.  
Atkins

From:	Michael Ray, Sr. Scientist II	Email:	michael.ray@atkinsglobal.com
Date:	August 17 2021	Phone:	407.806.4344
Ref:		cc:	

Subject: Brevard County Viera Wetlands Road Feasibility: Environmental Assessment Memo

This document summarizes the environmental features located within the boundaries and vicinity of the Viera Wetlands, also referred to as the Ritch Grissom Memorial Wetlands (Study Area). The Study Area is located at 3658 Charlie Corbeil Way, Viera, FL 32940 in Brevard County (Sections 07 & 18; Township 26 South; Range 36 East) (**Map 1**). The approximate midpoint of the Study Area is 28.226531 N, -80.764753 W.

Brevard County has identified the need for a feasibility study to evaluate the existing unpaved maintenance access that was constructed within the Study Area (then known as South-Central Regional Wastewater System (SCRWS) Constructed Wetlands in 1999/2000). This environmental assessment was commissioned to identify environmental issues within the Study Area and its vicinity.

Per the Brevard County website<sup>1</sup>, the Viera Wetlands:

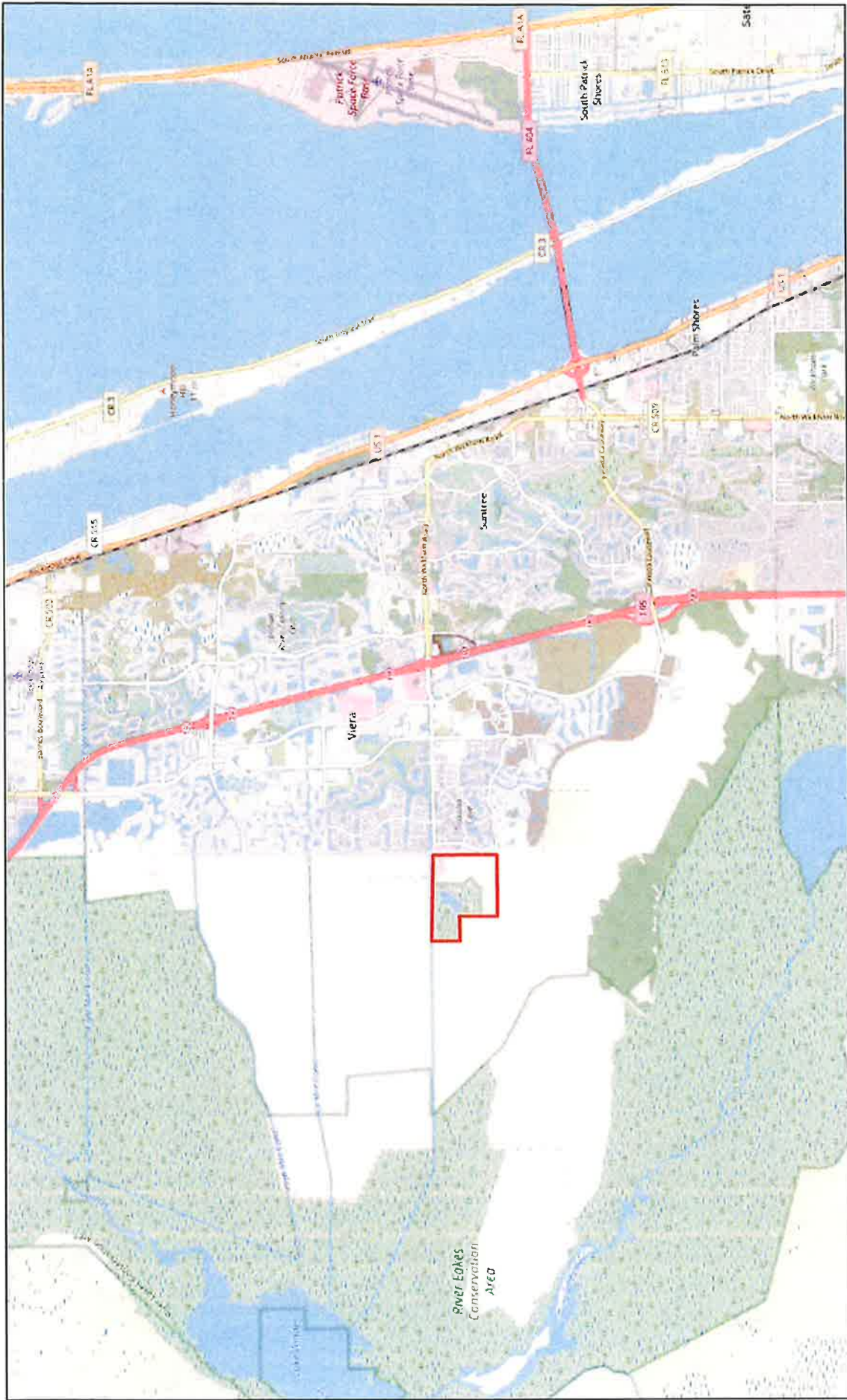
*consist of 200 acres divided into four cells of approximately 35 acres each, plus a central lake. The cells were designed to maintain differing depths of water, reflecting diverse wetland conditions. These treatment wetlands are an integral component of Brevard County's water reuse system. Providing increased water quality and savings over traditional water treatment methods, the constructed wetland system polishes reclaimed water for irrigation or overflow into the adjacent Four-mile Canal. Approximately 210,000 visitors/year pass through the main entrance to the constructed treatment wetland system, many drawn by the site's breath-taking views and stunning abundance of wildlife.*

Atkins scientists reviewed published data resources to identify recorded onsite ecologic conditions within the Study Area. These resources included:

- previous permits and plans
- topographic maps

<sup>1</sup> <https://www.brevardfl.gov/UtilityServices/VieraWetlands>. 2021. Brevard County website. Accessed 08/12/21






**Map 1**  
 Date: 8/13/2021 | Author: M. Ray  
 Section: 07 & 18  
 Township: 26 South  
 Range: 36 East  
 1 inch equals 1.5 miles

**Property Boundary**

**Study Area Location Map**  
**Brevard County Viera Wetlands  
 Road Feasibility Study  
 Brevard County, FL**



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- National Resource Conservation Service (NRCS) Soil Survey
- high-resolution aerial photographs
- St. Johns River Water Management District (SJRWMD) land use map(s)
- National Wetland Inventory (NWI) map
- Florida Natural Areas Inventory (FNAI) database of listed species
- Brevard County Scrub Jay database
- Florida Fish and Wildlife Conservation Commission (FWC) Bald Eagle Nest Locator database
- previous recorded data from other Atkins (PBSJ) studies conducted onsite

After completion of the data review, a site visit was scheduled to identify the environmental resources present within the proposed project areas (wetland area, berms, and proposed parking enhancement area).

On August 6, 2021, Atkins scientists conducted a site visit to identify environmental resources present within the boundaries and vicinity of the Study Area. The site assessment of the Study Area included identifying the wetlands and surface waters limits and potential threatened and endangered species habitat. Wetlands and surface waters were not formally delineated; however, the approximate limits of the wetlands and surface waters areas were confirmed during the onsite review. Potential habitat for threatened and endangered species, listed species observations, and/or other observed environmental constraints were also identified.

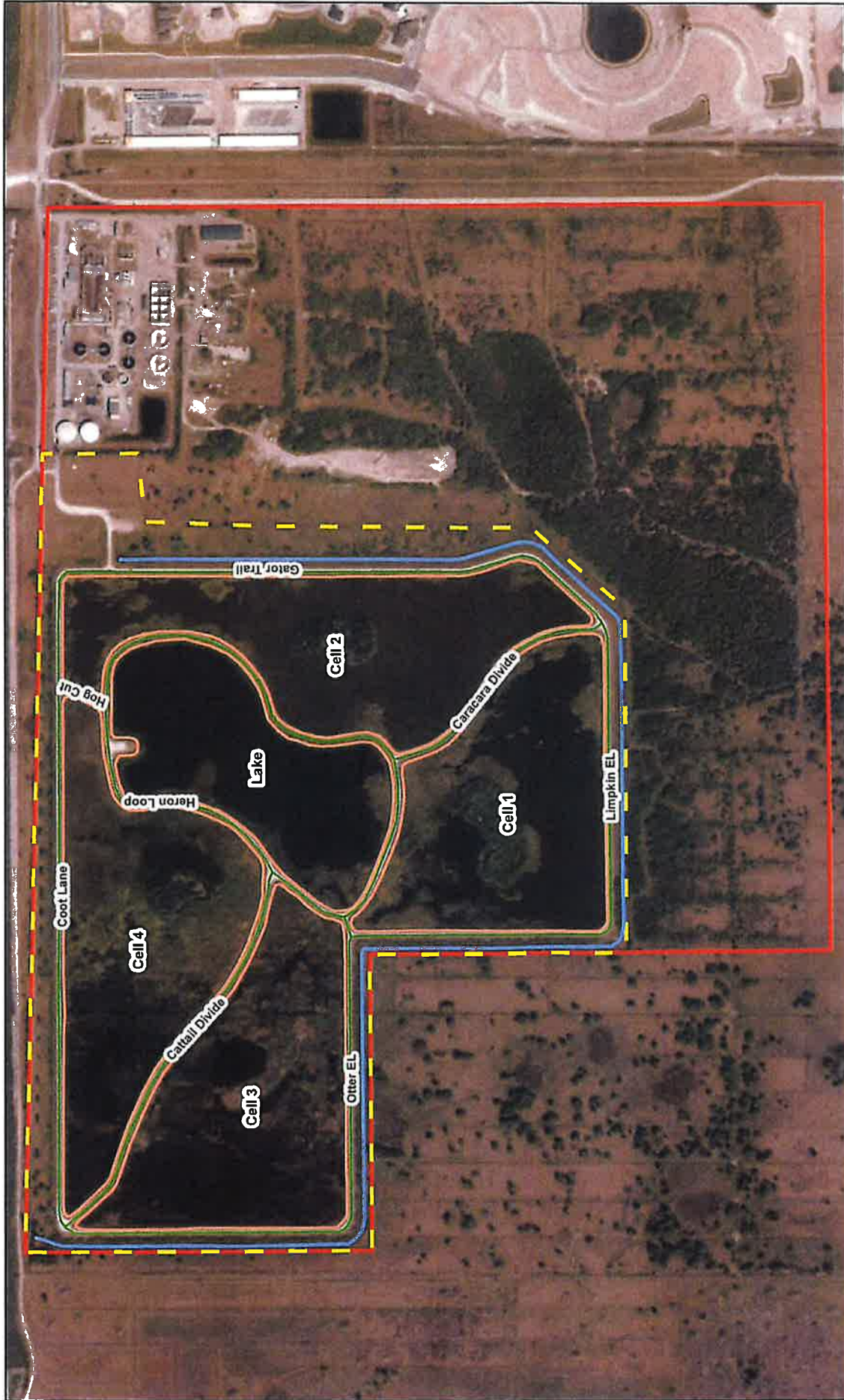
This Environmental Assessment Memo describes wetland, surface water, vegetation, and listed wildlife conditions observed onsite.

#### **WETLANDS AND SURFACE WATERS**

During the August 2021 site visit, Atkins scientists inspected the Study Area for the presence of aquatic habitats (i.e., wetlands, surface waters, and other surface waters) as determined in accordance with *Chapter 62-340, Florida Administrative Code (F.A.C.)*, and the *2010 Regional Supplement to the Army Corps of Engineers (ACOE) Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)*. **Map 2** depicts the overall location and extent of all areas identified within the Study Area. Representative photos of all identified systems can be found in the **Photolog (Attachment A)**. Since this was a preliminary environmental assessment, no boundaries were formally delineated.

The Study Area is comprised of four wetland “cells” and one open water lake, all which are freshwater and were created under the Florida Department of Environmental Protection (FDEP) Permit FL0102679 when the Viera Wetlands were constructed in 1999/2000 (**Attachment B**). The limits of these wetlands are constrained to (and mimic) the toe of slope (TOS) of the berm roads throughout the Study Area. All wetland “cells” also contained a created upland island within its limits. A brief description of these wetlands can be found below:

- **Wetland Cell 1** – This wetland is located in the southern portion of the Study Area. Dominant vegetation observed within this system included: cattail (*Typha sp.*), torpedograss (*Panicum repens*), hempvine (*Mikania sp.*), giant bulrush (*Schoenoplectus californicus*) and spikerush



**Map 2**  
 Date: 8/13/2021 Author: M.Ray  
 Section: 07 & 18  
 Township: 26 South  
 Range: 36 East  
 1 in = 650 ft  
 0 325 650  
 Feet  
 N

**Wetland and Surface Water Map**  
 Brevard County Viera Wetlands  
 Road Feasibility Study  
 Brevard County, FL

Legend:  
 Wetland Cell  
 Surface Water Ditch  
 Berm Road  
 Study Area  
 Property Boundary

**ATKINS**  
 SNC • LAWALIN



(*Eleocharis sp.*). This system contained an upland island named Cypress Dome Island which was dominated by Brazilian pepper (*Schinus terebinthifolia*), wax myrtle (*Morella cerifera*), cabbage palm (*Sabal palmetto*), Australian pine (*Casuarina equisetifolia*), and cypress (*Taxodium sp.*). Water depth within this system was greater than 12 inches.

- **Wetland Cell 2** – This wetland is located in the eastern portion of the Study Area. Dominant vegetation observed within this system included: cattail, torpedograss, hempvine, giant bulrush, pickerelweed (*Pontederia cordata*) and manyflower marshpennywort (*Hydrocotyle umbellata*). This system contained an upland island named Hardwood Hammock Island which was dominated by Brazilian pepper, red maple (*Acer rubrum*), and a variety of oaks (*Quercus sp.*). Water depth within this system was greater than 12 inches.
- **Wetland Cell 3** – This wetland is located in the western portion of the Study Area. Dominant vegetation observed within this system included: cattail, torpedograss, hempvine, giant bulrush, pickerelweed, manyflower marshpennywort, bulltongue arrowhead (*Sagittaria lancifolia*), and yellow bristlegrass (*Setaria parviflora*). This system contained an upland island named Shorebird Nesting Island which was dominated by Brazilian pepper and wax myrtle. Water depth within this system was greater than 12 inches.
- **Wetland Cell 4** – This wetland is located in the northern portion of the Study Area. Dominant vegetation observed within this system included: cattail, torpedograss, spikerush, giant bulrush, pickerelweed, bulltongue arrowhead, alligatorflag (*Thalia geniculata*), fragrant flatsedge (*Cyperus odoratus*), and Carolina willow (*Salix caroliniana*). This system contained an upland island named Cedar Upland Island which was dominated by Brazilian pepper and red cedar (*Juniperus virginiana*). Water depth within this system was greater than 12 inches.
- **Lake** – This open water lake is located in the central portion of the Study Area. Dominant vegetation observed along the littoral zone included: cattail, torpedograss, spikerush, pickerelweed, bulltongue arrowhead, hempvine, wax myrtle, fragrant flatsedge and smartweed (*Persicaria sp.*). Water depth within this system was greater than 12 inches.

Reclaimed water flows through the system by first entering Wetland Cells 1 & 2 before discharging into the Lake through control structures. From the Lake, the flow is further split into Wetland Cells 3 & 4 via control structures, before eventually leaving Wetland Cells 3 & 4 through a combined common structure located in the northwest corner for discharge into 4-Mile Canal (**Attachment B**).

One surface water ditch (SWD) was also identified as within the Study Area. In many locations, the SWD limits were also associated with the TOS of the exterior berm roads. A description of the SWD groups can be found below:

- **Surface Water Ditch**- This freshwater ditch traverses the western, southern, and eastern boundaries of the Study Area. Based on historic aerial imagery, it also connects (discharges) to the Four-mile Canal at its northwest terminus (**Attachment B**). Dominant vegetation observed along the littoral zone included: cattail, torpedograss, spikerush, pickerelweed, bulltongue arrowhead, wax myrtle, alligatorflag, and cogongrass (*Imperata cylindrica*). Water depth within this system ranged between 2-12+ inches.



**Wetland Berm Roads**

Approximately two miles of berm roads traverse the Study Area and encircle and divide all four wetland cells as well as the open water lake. Currently, the berm roads are closed to public vehicular traffic due to previous high-traffic (and costly) wear & tear and occasional berm blockage disruption caused by visiting public vehicles. Overall, the berm roads consist of pervious material and appeared in fair to poor condition, with some rutting and erosion observed. **Map 2** depicts the location and names of all berm roads traversing the Study Area. Representative photos of these berm roads can also be found in the **Photolog (Attachment A)**.

**Wildlife Utilization**

During the August 2021 site visit, a variety of wildlife species were observed utilizing all aspects of the Study Area. The following is a list of wildlife species observed during the site visit:

**Bird**

- |                                |                               |
|--------------------------------|-------------------------------|
| • American Coot                | <i>Fulica americana</i>       |
| • Anhinga                      | <i>Anhinga</i>                |
| • Black Vulture                | <i>Coragyps atratus</i>       |
| • Black-bellied Whistling-Duck | <i>Dendrocygna autumnalis</i> |
| • Boat-tailed Grackle          | <i>Quiscalus major</i>        |
| • Cattle Egret                 | <i>Bubulcus ibis</i>          |
| • Common Gallinule             | <i>Gallinula galeata</i>      |
| • Common Grackle               | <i>Quiscalus quiscula</i>     |
| • Double-crested Cormorant     | <i>Phalacrocorax auritus</i>  |
| • Glossy Ibis                  | <i>Plegadis falcinellus</i>   |
| • Great Blue Heron             | <i>Ardea herodias</i>         |
| • Great Egret                  | <i>Ardea alba</i>             |
| • Green Heron                  | <i>Butorides virescens</i>    |
| • Limpkin                      | <i>Aramus guarauna</i>        |
| • Little Blue Heron            | <i>Egretta caerulea</i>       |
| • Osprey                       | <i>Pandion haliaetus</i>      |
| • Red-winged Blackbird         | <i>Agelaius phoeniceus</i>    |
| • Sandhill Crane               | <i>Grus canadensis</i>        |
| • Snowy Egret                  | <i>Egretta thula</i>          |
| • Turkey Vulture               | <i>Cathartes aura</i>         |
| • White Ibis                   | <i>Eudocimus albus</i>        |

**Reptile**

- |                      |                                   |
|----------------------|-----------------------------------|
| • American Alligator | <i>Alligator mississippiensis</i> |
|----------------------|-----------------------------------|

**Amphibian**

- |                     |                                |
|---------------------|--------------------------------|
| • American Bullfrog | <i>Lithobates catesbeianus</i> |
| • Pig Frog          | <i>Lithobates grylio</i>       |

**Mammal**

- |               |                          |
|---------------|--------------------------|
| • River Otter | <i>Lontra canadensis</i> |
|---------------|--------------------------|

**FEDERAL & STATE PROTECTED SPECIES**

Prior to the field survey, numerous resources were referenced to determine the potential existence of wildlife species listed as endangered, threatened, or of special concern within and in the vicinity



of the Study Area. Field assessments were also conducted by qualified Atkins scientists during the August 2021 site visit to determine if suitable habitat for listed species was present, and if any protected species were present and observed within the Study Area. If encountered, evidence of direct observation, vocalizations, scat, tracks, burrows, dens, nests, etc. was to be noted and recorded via a sub-meter GPS device.

Based on the available data from the Florida Natural Areas Inventory (FNAI) website<sup>2</sup> (Attachment C) and the observations made during the site visit, the Study Area provides suitable habitat for multiple native wildlife species that are likely to occur. These include: Crested Caracara (*Caracara cheriway*), bald eagle (*Haliaeetus leucocephalus*), snail kite (*Rostrhamus sociabilis plumbeus*), sandhill crane (*Grus canadensis*), wood stork (*Mycteria americana*), and eastern indigo snake (*Drymarchon couperi*).

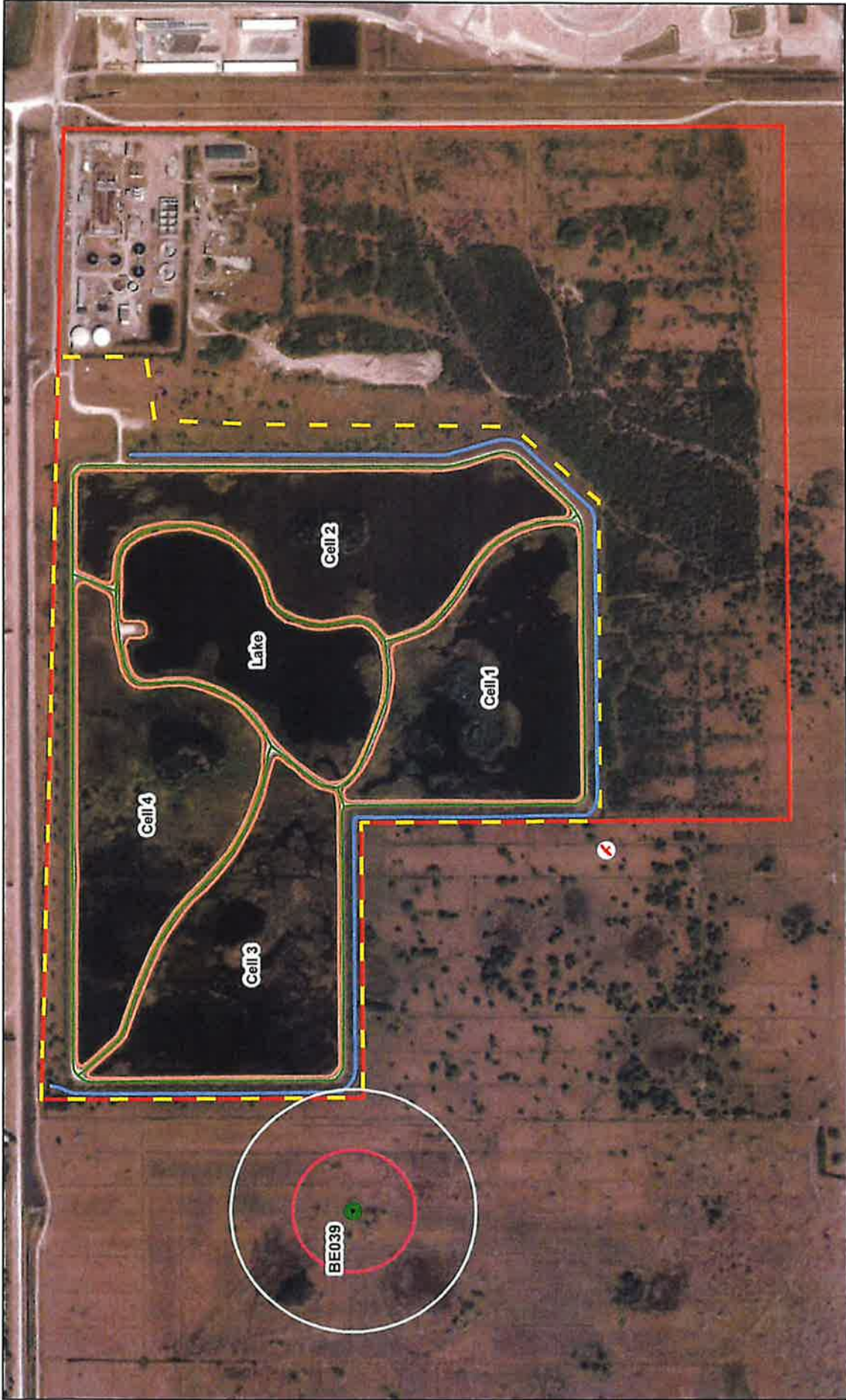
Crested Caracara – The crested caracara is a large species of raptor that has a dark brown-black belly, wings, back, and crown, and a white lower belly, head, and throat. The caracara also has a bluish-gray to light bluish bill, red cere (facial skin) and a white tail with dark crossbars. Suitable habitat consists of open country, including dry or wet prairie and pasture lands with cabbage palm, cabbage palm/live oak hammocks, and shallow ponds and sloughs. Preferred nest trees are cabbage palms, followed by live oaks. **Nesting season is from January 10 to April 30.** The crested caracara is protected by the U.S. Migratory Bird Treaty Act. It is also protected as a Threatened species by the Federal Endangered Species Act and as a Federally (USFWS) designated Threatened species by Florida's Endangered and Threatened Species Rule.

Historically, caracaras have been observed throughout the site. In 2007, a viable nest tree was recorded and monitored approximately 200ft. southwest of Wetland Cell 1. **Map 3** depicts the recorded location of the historic nest tree. During the August 2021 site visit, no nest was observed in this designated location or anywhere within the vicinity of the Study Area. However, suitable foraging and nesting habitat exists within the Study Area and its vicinity.

In order to avoid the potential for unauthorized take, any project sites within the caracara consultation area (**Map 4**) that contain suitable habitats, are recommended to undergo a formal caracara survey to determine site utilization by caracaras. USFWS Crested Caracara Draft Survey Protocol<sup>3</sup> recommends a survey area which should include the project area and a 1,500-m buffer zone around the perimeter of the project area (including access roads) to account for off-site nest trees in territories that might overlap onto the project area. A complete survey of the project area consists of one survey session every two weeks of each observation block within the project area and the 1,500-m buffer from early January (i.e., Jan 1-10) through April 30 (unless a nest is found within the observation block prior to April 30; in that event, a Nest Productivity Survey will need to commence). If a nest tree is confirmed or highly suspected, nest productivity surveys begin. These nest productivity surveys involve the same repeated, two-week visits, but the surveyor is only required to observe the nest for the necessary amount of time needed to determine nest status (i.e., incubating, nestlings, fledglings, or failed). If an active nest is encountered, no construction

<sup>2</sup> FNAI Biodiversity Matrix website: <https://www.fnai.org/BiodiversityMatrix/index.html> Accessed August 2021

<sup>3</sup> USFWS Crested Caracara Survey protocol USFWS Website: [https://www.fws.gov/verobeach/BirdsPDFs/20161209\\_CCsurveyprotocol.pdf](https://www.fws.gov/verobeach/BirdsPDFs/20161209_CCsurveyprotocol.pdf) Accessed August 2021



	<p><b>Listed Species Map</b></p> <p><b>Brevard County Viera Wetlands Road Feasibility Study</b>  <b>Brevard County, FL</b></p>	<p><b>Map 3</b></p> <p>Date: 8/17/2021 Author: M. Ray</p> <p>Section: 07 &amp; 18          Township: 26 South          Range: 36 East</p> <p>1 in = 700 ft</p> <p>0 350 700 Feet</p>
	<p><b>ATKINS</b></p>	<ul style="list-style-type: none"> <li> Historic Crested Caracara Nest (2007*)</li> <li> Historic Bald Eagle Nest (2008*)</li> <li> 330-ft. Buffer</li> <li> 660-ft. Buffer</li> <li> Wetland Cell</li> <li> Surface Water Ditch</li> <li> Berm Road</li> <li> Study Area</li> <li> Property Boundary</li> </ul>
<p>*Date documented as last active</p>		<p>812</p>



**Map 4**  
 Date: 8/17/2021 | Author: M. Ray  
 Section: 07 & 18  
 Township: 26 South  
 Range: 36 East  
 1 in = 2,250 ft  
 0 1.125 2.250  
 Feet  
 N

- Study Area
- 1500m Buffer
- Crested Caracara Consultation Area
- Snail Kite Consultation Area
- Historic Crested Caracara Nest (2007)
- Wetland Cell
- Property Boundary

**Listed Species Consultation Area Map**  
 Brevard County Viera Wetlands  
 Road Feasibility Study  
 Brevard County, FL

**ATKINS**  
 Environmental & Planning  
 SMC • LAWLIN





activity can occur within 985ft. of the nest tree. Construction activities can commence between 985ft. and 1,500ft. when monitored by a qualified professional during periods of construction.

**Bald Eagle** – Bald eagles are large raptors. Adult bald eagles have white heads and tails with dark brown bodies and wings. Their legs and bills are bright yellow. Immature birds have mostly dark heads and tails; with wings and bodies mottled with white. Bald eagles can be found in a variety of habitats but mainly near lakes, reservoirs, rivers, marshes, and coasts. Although the species was delisted from the Endangered Species Act in 2007, eagle populations are still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Act. A search of the FWC Bald Eagle Nest Locator website<sup>4</sup> was used to determine if any previously documented eagle nests are located in or near the Study Area. The search returned a positive result within the vicinity of the Study Area. FWC Nest ID 1667 (BE039) was deemed as active from 1999-2008. It was last monitored by FWC in 2016. **Map 3** depicts the recorded location of the historic nest tree. During the August 2021 site visit, no nest was observed in this designated location or anywhere within the vicinity of the Study Area. It is highly possible that this nest tree was lost due to tree fall since its last know activity was 13+ years ago.

The FWC Bald Eagle Management Plan states that the ***bald eagle nesting season is defined as the period from October 1 through May 15.*** No bald eagles (or nest) were observed during the site visit; however, the Study Area is known to have potential for nesting. If a bald eagle nest is encountered, then consultation with U.S. Fish and Wildlife Service (USFWS) should be done to determine if a federal permit is required when proposing work activities in the vicinity of a nest. According to the USFWS website<sup>5</sup>, the Bald Eagle Management Guidelines and Conservation Measures detail further information regarding nest buffers of 330- ft and 660- ft during periods of construction.

**Snail Kite** – The snail kite is a medium-sized raptor, with a tail that is square-tipped with a distinctive white base and broad, paddle-shaped wings. Adults of both sexes have red eyes, while juveniles have brown eyes. They have a slender, distinguishing, decurved bill which is used for extracting the kite's primary prey, the apple snail (*Pomacea sp.*). Snail kite habitat consists of freshwater marshes and the shallow vegetated edges of lakes where apple snails can be found. ***The snail kite nests throughout the year, with a peak nesting season between the months of February and July.*** The nest is a woven configuration of dry sticks and plant material. The sticks are insulated with green nest material that forms a cup to hold the eggs. Males do most of the nest building which are built over water to reduce access to the nest by predators<sup>6</sup>.

The snail kite is protected as an Endangered species by the Federal Endangered Species Act and as a Federally designated Endangered species by Florida's Endangered and Threatened Species Rule. The USFWS recommends staying at least 500ft. from any active snail kite nest. During the August 2021 site visit, no snail kites were observed in the Study Area or its vicinity. However, the Study

<sup>4</sup> FWC Bald Eagle Nest Locator website <https://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=fca6f17a0def64b7b8bdcb51c9de43b4> Accessed August 2021

<sup>5</sup> USFWS Ecological Services website <https://www.fws.gov/northeast/ecologicalservices/eagleguidelines/constructionnesting.html>. Accessed August 2021

<sup>6</sup> FWC Website Snail Kite Species Profile <https://myfwc.com/wildlifehabitats/profiles/birds/raptors-and-vultures/everglade-snail-kite/> Accessed August 2021



Area lies within the snail kite consultation area (**Map 4**) and does contain suitable habitats for foraging and nesting.

Sandhill Crane - Sandhill Cranes are very large, tall birds with a long neck, long black legs, and very broad wings. They are slate gray in color, often with a rusty wash on the upperparts. Adults have a pale cheek and red skin on the crown. Sandhill Cranes breed and forage in open prairies, grasslands, and wetlands. ***Nesting season is defined as a period from January 1 to July 31.*** Sandhill cranes nest on mats of vegetation about two feet in diameter, and nests are located in shallow water to aid in predator avoidance. The Florida sandhill crane is protected by the U.S. Migratory Bird Treaty Act as well as being listed as a State-designated Threatened species by Florida's Endangered and Threatened Species Rule. FWC Final Florida Sandhill Crane Species Guidelines (2016)<sup>7</sup> recommend avoidance measures to eliminate the need for FWC take permitting, which includes no construction activity within 400ft. of an active nesting site. During the August 2021 site visit, two pairs of sandhill cranes were observed foraging in the Study Area. The Study Area also contains suitable habitat for nesting.

Wood Stork - The wood stork is a large, long legged wading bird. Both primary and tail feathers are black. The head and upper neck of adult wood storks have no feathers but have gray rough scaly skin. Wood storks also have a black bill and black legs with pink toes<sup>8</sup>. Wood storks typically nest in colonies within habitats such as inundated forested wetlands (including cypress strands and domes), mixed hardwood swamps, mangroves, and sloughs from ***November to March***. The species is also increasingly found in artificial habitats such as impoundments and dredged areas with native or exotic vegetation. Wood storks generally forage in shallow water (less than 10-12 inches) in habitats such as freshwater marshes, lagoons, swamps, ponds, tidal creeks, and flooded pastures and ditches. Wood storks tend to seek out areas with reduced water levels where their prey (mostly fish) is concentrated. The wood stork is protected by the U.S. Migratory Bird Treaty Act. It is also protected as a Threatened species by the Federal Endangered Species Act and as a Federally designated Threatened species by Florida's Endangered and Threatened Species Rule. The wood stork was reclassified by the USFWS on June 30, 2014, from Endangered to Threatened. During the August 2021 site visit, no wood storks were observed in the Study Area or its vicinity. However, the Study Area contains suitable habitats for foraging and roosting.

Eastern Indigo Snake - The eastern indigo snake is federally listed as a threatened species by the USFWS. This large, thick bodied snake is glossy black and in sunlight has iridescent blue highlights. The chin and throat are reddish or white, and the color may extend down the body. The scales on its back are smooth, but some individuals may possess some scales that are partially keeled. It occurs in a broad range of habitats and requires large tracts of land for survival. It is often considered a gopher tortoise commensal, as it often winters in burrows found in xeric habitats. It also uses mesic and wetland habitats for foraging during the warmer summer months. No occurrences were documented within 1 mile of the Study Area, based on FNAI biodiversity matrix records, but there is a potential to occur. During the August 2021 site visit, no indigo snakes were

<sup>7</sup> FWC Website: Florida Sandhill Crane Species Overview <https://myfwc.com/media/11565/final-florida-sandhill-crane-species-guidelines-2016.pdf>. Accessed August 2021

<sup>8</sup> FWC Website: Wood Stork Species Profile <https://myfwc.com/wildlife/habitats/profiles/birds/waterbirds/wood-stork/>. Accessed August 2021



observed in the Study Area or its vicinity. Suitable foraging habitat does exist within the Study Area, although the potential for occurrence remains low due to development of surrounding habitats that would provide limited winter refugia.

If an eastern indigo snake is encountered within 100-feet of the Study Area during any construction activities, the *USFWS Standard Protection Measures Protocol for Eastern Indigo Snake* shall be implemented. Training for construction personnel and signage with direction on how to identify the species and what to do if encountered should be provided prior to commencement of silt fence installation and staging for construction.

### **Conclusion**

In summary:

- Within the Study Area, all wetland and surface water feature limits were confined to toe of slope of their original design when created under FDEP permit FL0102679
- If direct impacts to the wetlands and/or surface water are anticipated, then permitting through state/federal agencies may be required. Once project specifics have been determined, a pre-application meeting with the agencies is recommended
- No documented (historic) bald eagle or crested caracara nests were observed in the Study Area or its vicinity
- Although not directly observed, numerous listed species are known to utilize the Study Area
- Every effort should be made to conduct planned construction activities outside of the nesting seasons of listed species; and if not possible, then consultation with FWC and USFWS is recommended to determine proper survey protocols. In addition, it is recommended that a clearance letter be submitted to FWC/USFWS to determine suggested avoidance measures.

Should there be questions regarding the site visit or the Study Area ecological conditions, please feel free to contact Atkins staff by email or office phone.

**Attachment A**  
**Photolog**

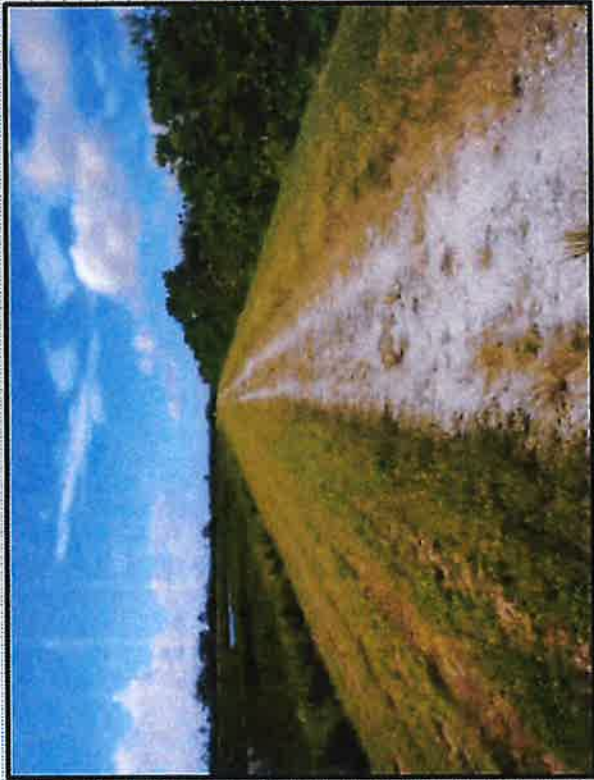
Rich Grissom Wetlands Roads Feasibility Environmental Study



Coot Lane – Looking West



Coot Lane – Looking East



Otter EL – Looking South



Otter EL – Looking North

Rich Grissom Wetlands Roads Feasibility Environmental Study



Limpkin EL – Looking West



Limpkin EL – Looking East



Gator Trail- Looking South



Gator Trail – Looking North

# Photolog

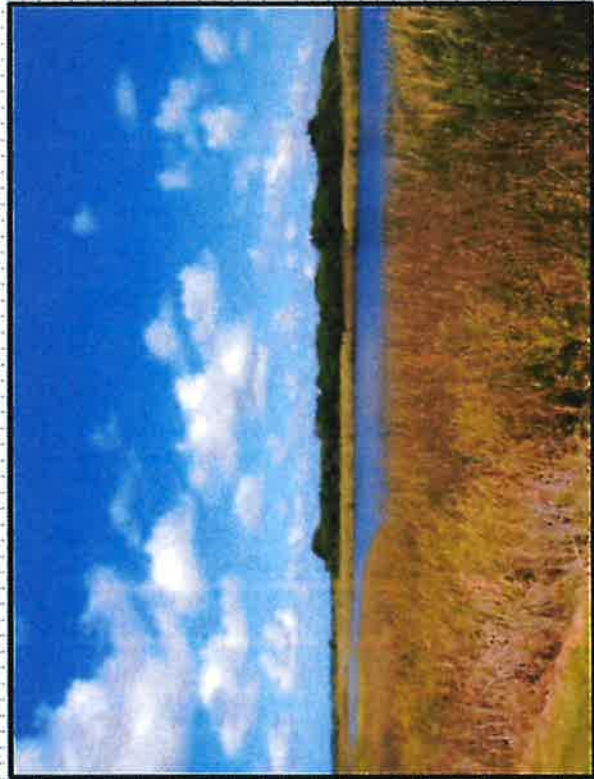
## Rich Grissom Wetlands Roads Feasibility Environmental Study



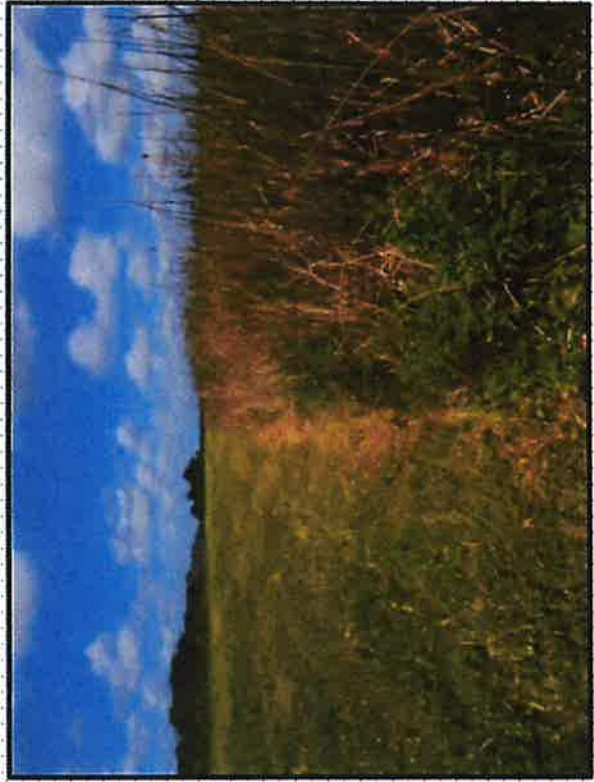
Heron Loop – Looking North



Heron Loop – Looking South



Wetland Cell 1 – Looking Northwest

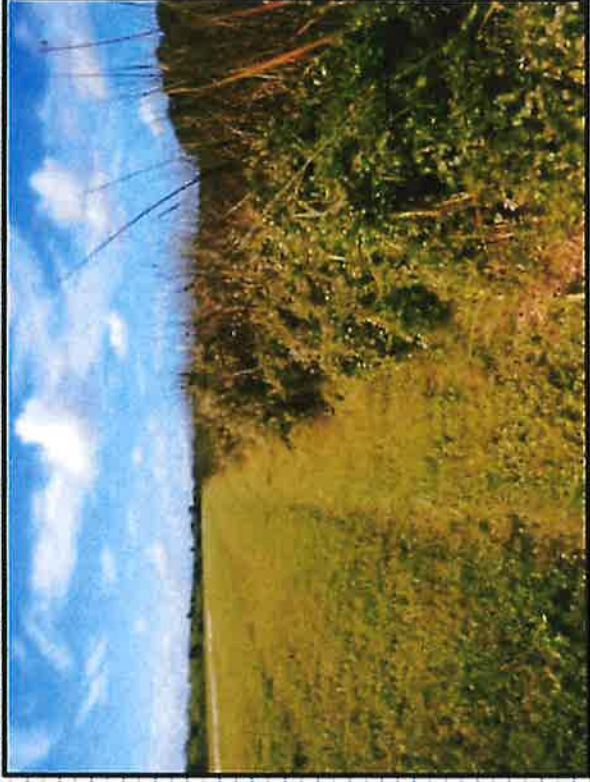


Wetland Cell 1 TOS – Looking West

Rich Grissom Wetlands Roads Feasibility Environmental Study



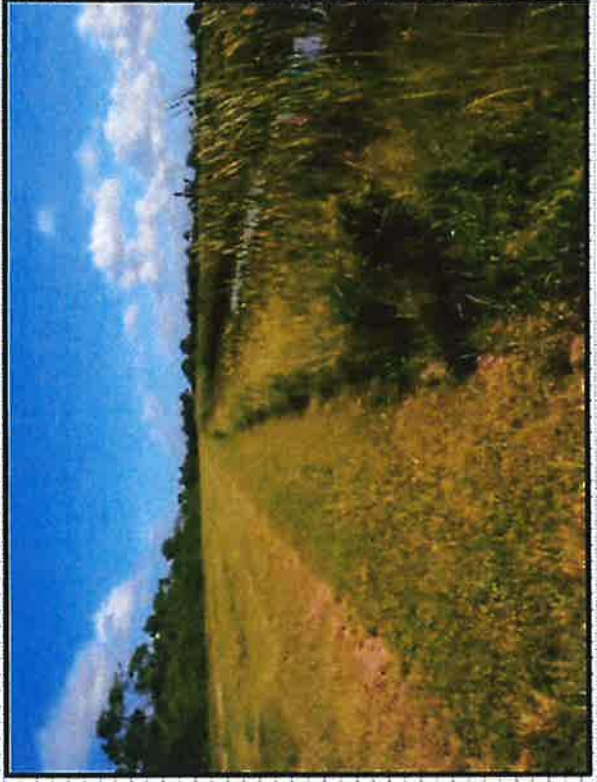
Wetland Cell 2 – Looking Northwest



Wetland Cell 2 TOS – Looking South



Wetland Cell 3 – Looking Southeast



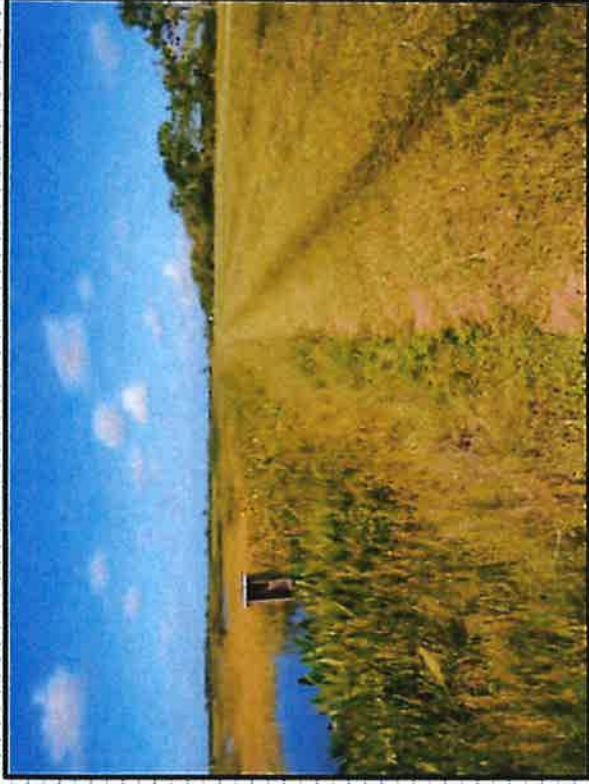
Wetland Cell 3 TOS – Looking North



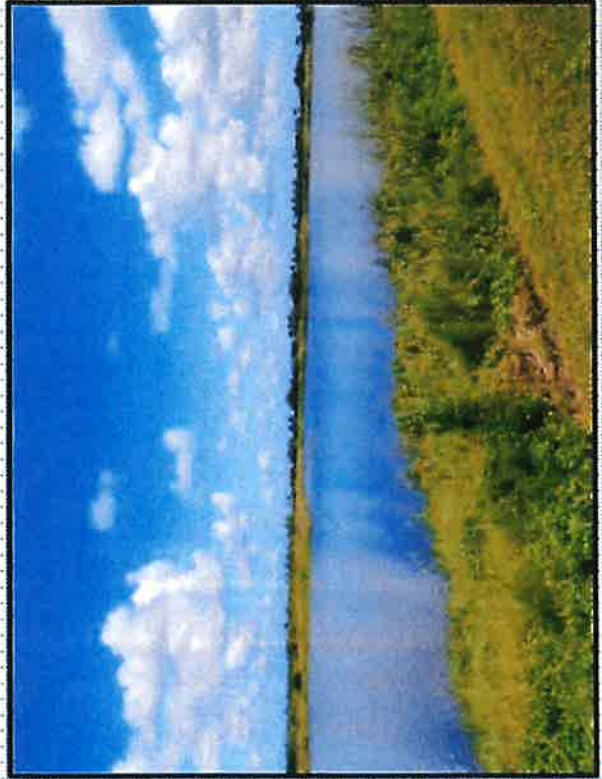
Rich Grissom Wetlands Roads Feasibility Environmental Study



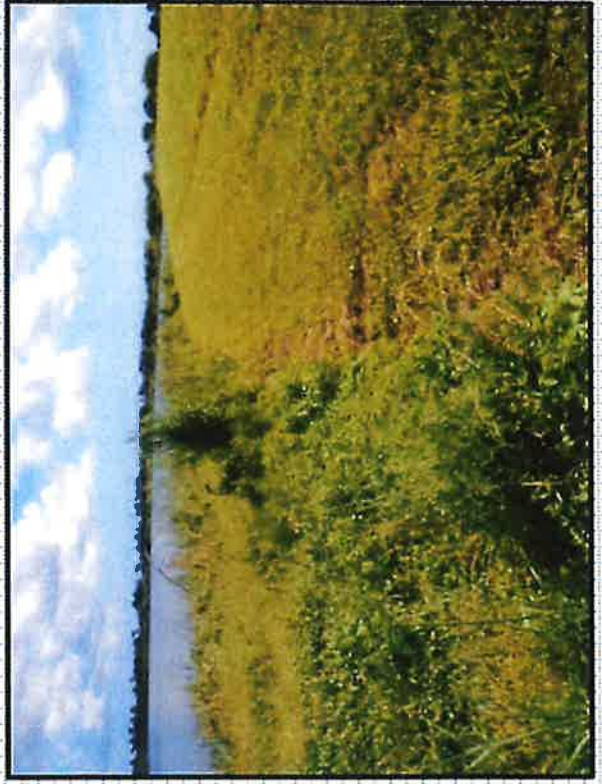
Wetland Cell 4 – Looking Southwest



Wetland Cell 4 TOS – Looking West



Lake – Looking Northwest

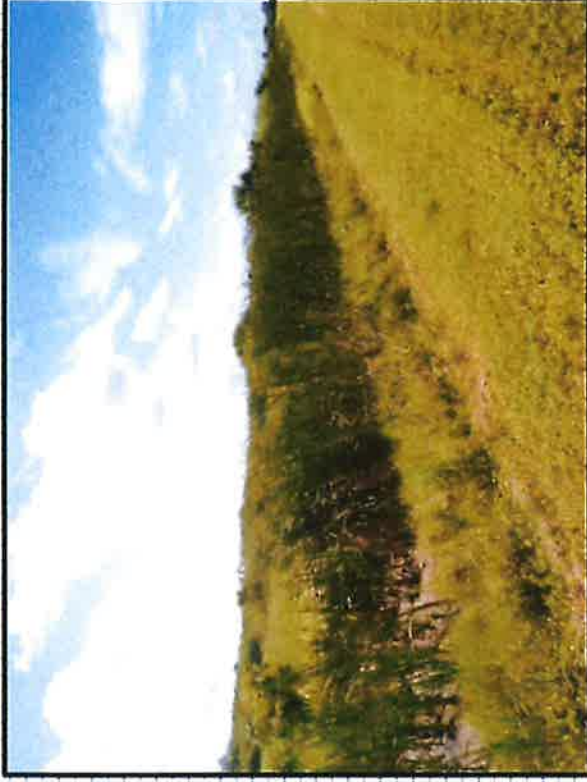


Lake TOS – Looking North

Rich Grissom Wetlands Roads Feasibility Environmental Study



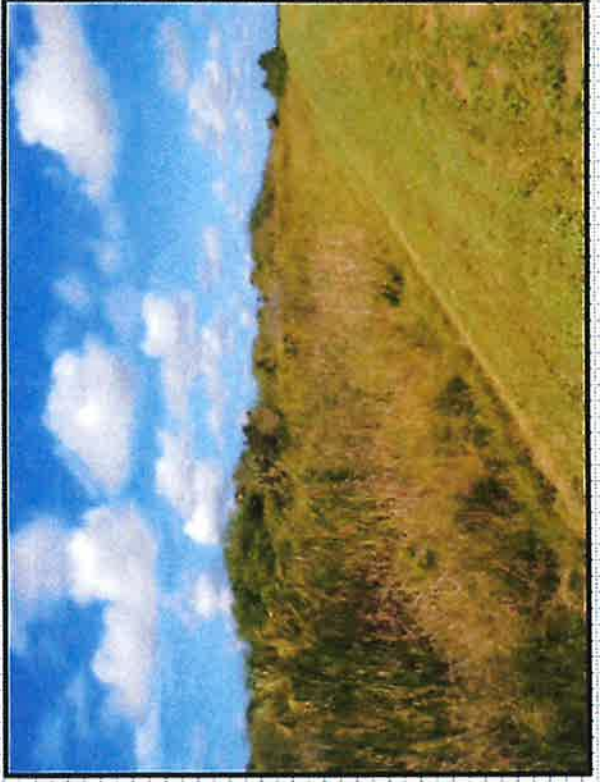
Surface Water Ditch – Looking North



Surface Water Ditch – Looking South

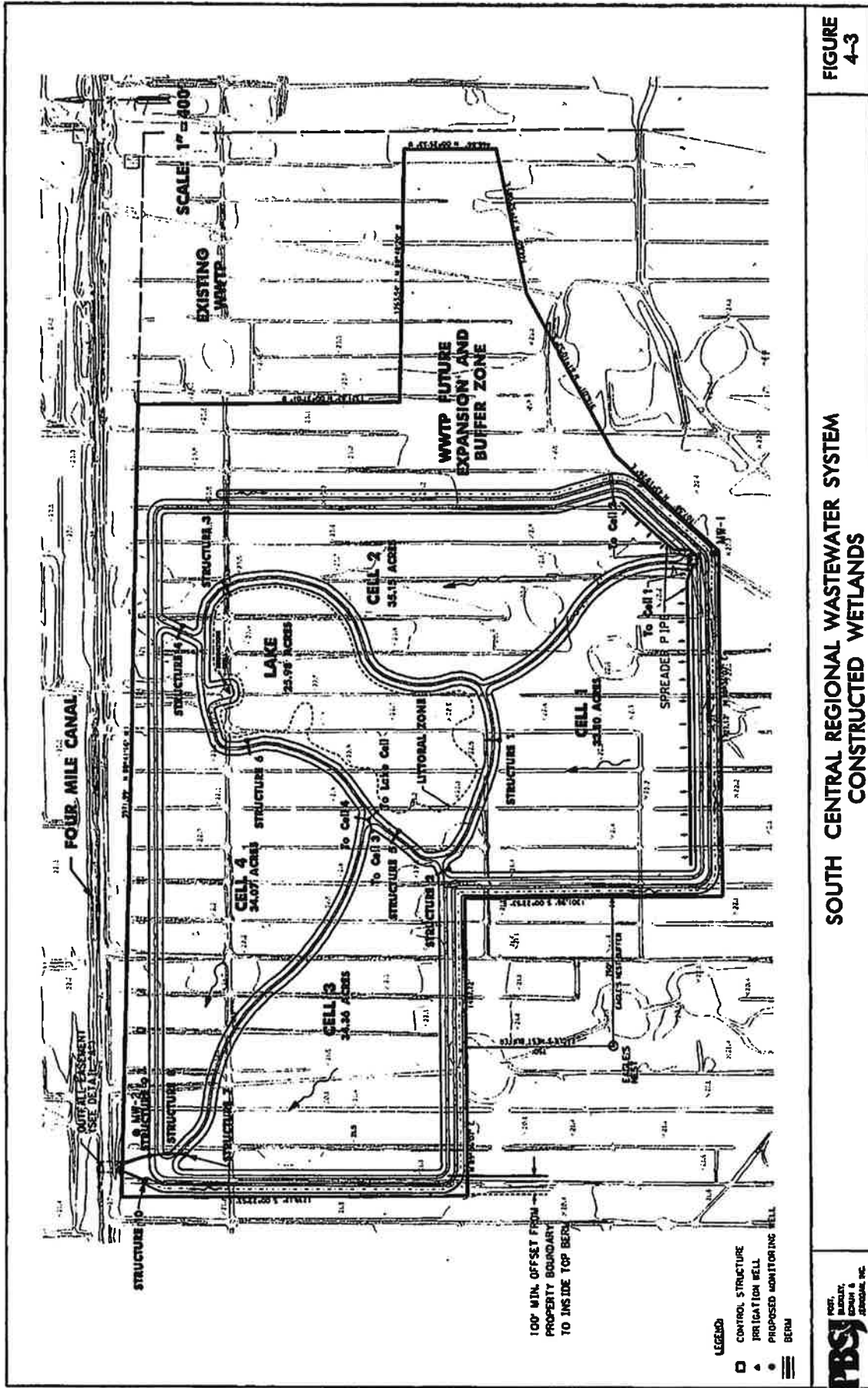


Surface Water Ditch – Looking East



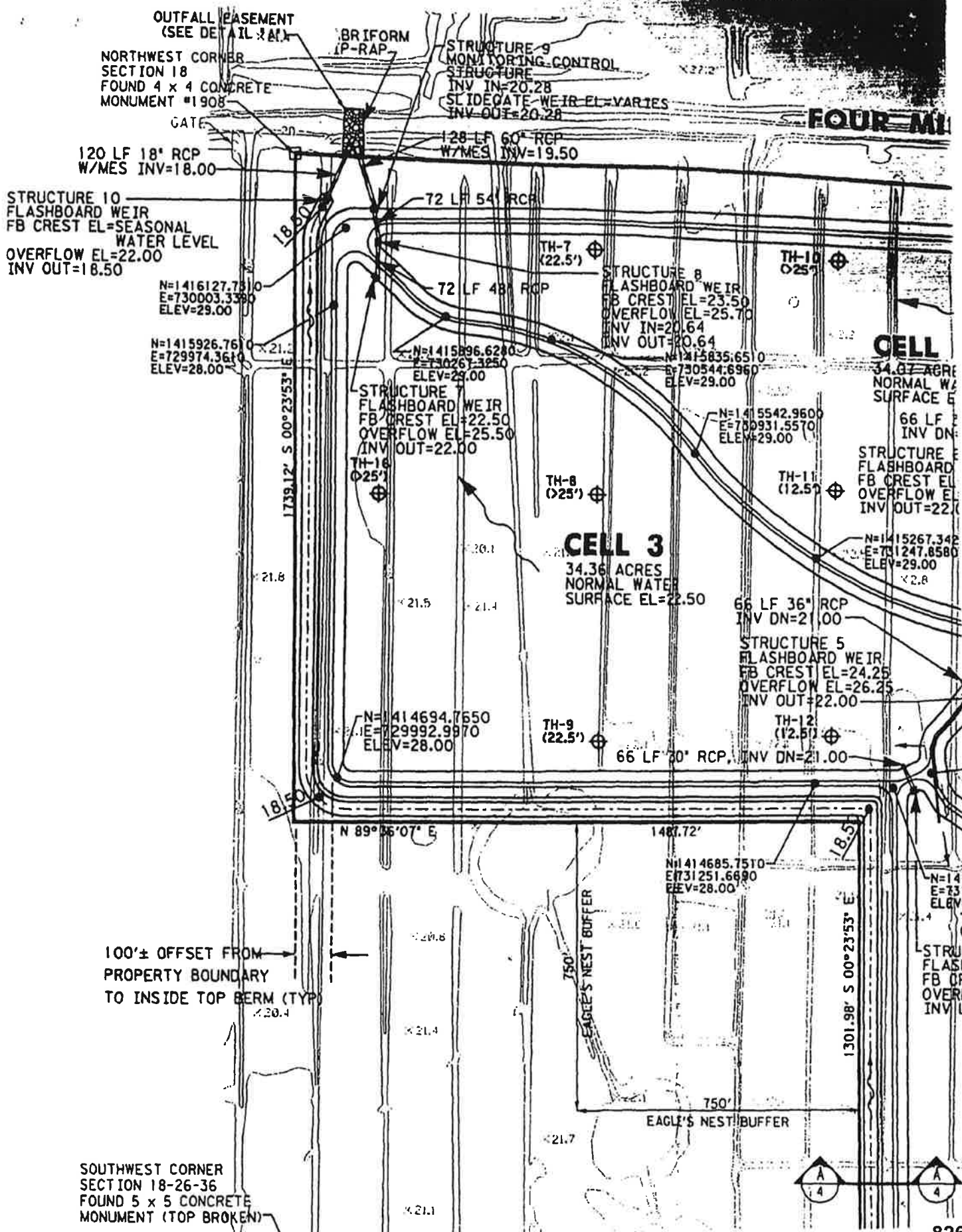
Surface Water Ditch – Looking East

**Attachment B**  
**Permit Drawings**



**FIGURE 4-3**

**SOUTH CENTRAL REGIONAL WASTEWATER SYSTEM  
CONSTRUCTED WETLANDS**



OUTFALL EASEMENT  
(SEE DETAIL 1A)  
NORTHWEST CORNER  
SECTION 18  
FOUND 4 x 4 CONCRETE  
MONUMENT #1908

STRUCTURE 9  
MONITORING-CONTROL  
STRUCTURE  
INV IN=20.28  
SL IDE GATE-WEIR EL=VARIES  
INV OUT=20.28

120 LF 18" RCP  
W/MES INV=18.00

128 LF 60" RCP  
W/MES INV=19.50

STRUCTURE 10  
FLASHBOARD WEIR  
FB CREST EL=SEASONAL  
WATER LEVEL  
OVERFLOW EL=22.00  
INV OUT=18.50

72 LF 54" RCP

STRUCTURE 8  
FLASHBOARD WEIR  
FB CREST EL=23.50  
OVERFLOW EL=25.70  
INV IN=20.64  
INV OUT=20.64

N=1416127.75  
E=730003.33  
ELEV=29.00

N=1415896.62  
E=730267.32  
ELEV=29.00

N=1415835.65  
E=730544.69  
ELEV=29.00

N=1415926.76  
E=729974.36  
ELEV=28.00

STRUCTURE 7  
FLASHBOARD WEIR  
FB CREST EL=22.50  
OVERFLOW EL=25.50  
INV OUT=22.00

N=1415542.96  
E=730931.55  
ELEV=29.00

CELL 4  
34.87 ACRES  
NORMAL WATER  
SURFACE EL=22.50

66 LF 36" RCP  
INV DN=21.00

STRUCTURE 5  
FLASHBOARD WEIR  
FB CREST EL=24.25  
OVERFLOW EL=26.25  
INV OUT=22.00

CELL 3  
34.36 ACRES  
NORMAL WATER  
SURFACE EL=22.50

66 LF 30" RCP  
INV DN=21.00

N=1414694.76  
E=729992.99  
ELEV=28.00

TH-9  
(22.5')

TH-12  
(12.5')

100'± OFFSET FROM  
PROPERTY BOUNDARY  
TO INSIDE TOP BERM (TYP)

SOUTHWEST CORNER  
SECTION 18-26-36  
FOUND 5 x 5 CONCRETE  
MONUMENT (TOP BROKEN)

**Attachment C**  
**FNAI Biodiversity**



FLORIDA  
Natural Areas  
INVENTORY

1918 Hammock Rd.  
Suite 2000  
Tallahassee, FL 32303  
850-224-8207  
850-651-5044 fax  
www.fnai.org

## Florida Natural Areas Inventory

### Biodiversity Matrix Query Results

#### UNOFFICIAL REPORT

Created 8/17/2021

(Contact the FNAI Data Services Coordinator at 850.224.8207 or  
kbrinegar@fnai.fsu.edu for information on an official Standard Data Report)

NOTE: The Biodiversity Matrix includes only rare species and natural communities tracked by FNAI.

#### Report for 2 Matrix Units: 59356 , 59357

	<p><b>Descriptions</b></p> <p><b>DOCUMENTED</b> - There is a documented occurrence in the FNAI database of the species or community within this Matrix Unit.</p> <p><b>DOCUMENTED-HISTORIC</b> - There is a documented occurrence in the FNAI database of the species or community within this Matrix Unit; however the occurrence has not been observed/reported within the last twenty years.</p> <p><b>LIKELY</b> - The species or community is <i>known</i> to occur in this vicinity, and is considered likely within this Matrix Unit because:</p> <ol style="list-style-type: none"> <li>1. documented occurrence overlaps this and adjacent Matrix Units, but the documentation isn't precise enough to indicate which of those Units the species or community is actually located in; <i>or</i></li> <li>2. there is a documented occurrence in the vicinity and there is suitable habitat for that species or community within this Matrix Unit.</li> </ol> <p><b>POTENTIAL</b> - This Matrix Unit lies within the known or predicted range of the species or community based on expert knowledge and environmental variables such as climate, soils, topography, and landcover.</p>
--	--

#### Matrix Unit ID: 59356

##### 1 Documented Element Found

Scientific and Common Names	Global Rank	State Rank	Federal Status	State Listing
<a href="#">Haliaeetus leucocephalus</a> Bald Eagle	G5	S3	N	N

##### 0 Documented-Historic Elements Found

##### 2 Likely Elements Found

Scientific and Common Names	Global Rank	State Rank	Federal Status	State Listing
<a href="#">Caracara cheriway</a> Crested Caracara	G5	S2	LT	FT
<a href="#">Mycteria americana</a> Wood Stork	G4	S2	LT	FT

**Matrix Unit ID: 59357**

0 Documented Elements Found

0 Documented-Historic Elements Found

2 Likely Elements Found

Scientific and Common Names	Global Rank	State Rank	Federal Status	State Listing
<u><i>Caracara cheriway</i></u> Crested Caracara	G5	S2	LT	FT
<u><i>Mycteria americana</i></u> Wood Stork	G4	S2	LT	FT

**Matrix Unit IDs: 59356 , 59357**

18 Potential Elements Common to Any of the 2 Matrix Units

Scientific and Common Names	Global Rank	State Rank	Federal Status	State Listing
<u><i>Athene cunicularia floridana</i></u> Florida Burrowing Owl	G4T3	S3	N	SSC
<u><i>Calopogon multiflorus</i></u> Many-flowered Grass-pink	G2G3	S2S3	N	T
<i>Carex chapmanii</i> Chapman's Sedge	G3	S3	N	T
<u><i>Centrosema arenicola</i></u> Sand Butterfly Pea	G2Q	S2	N	E
<i>Conradina brevifolia</i> Short-leaved Rosemary	G2Q	S2	LE	E
<u><i>Drymarchon couperi</i></u> Eastern Indigo Snake	G3	S3	LT	FT
<u><i>Gopherus polyphemus</i></u> Gopher Tortoise	G3	S3	C	ST
<u><i>Grus canadensis pratensis</i></u> Florida Sandhill Crane	G5T2T3	S2S3	N	ST
<i>Lechea cernua</i> Nodding Pinweed	G3	S3	N	T
<u><i>Linum carteri var. smallii</i></u> Small's Flax	G2T2	S2	N	E
<i>Mustela frenata peninsulæ</i> Florida Long-tailed Weasel	G5T3	S3	N	N
<u><i>Nemastylis floridana</i></u> Celestial Lily	G2	S2	N	E
<i>Nolina atopocarpa</i> Florida Beargrass	G3	S3	N	T
<i>Panicum abscissum</i> Cutthroat Grass	G3	S3	N	E
<i>Peucaea aestivalis</i> Bachman's Sparrow	G3	S3	N	N
<u><i>Picoides borealis</i></u> Red-cockaded Woodpecker	G3	S2	LE	FE
<u><i>Sceloporus woodi</i></u> Florida Scrub Lizard	G2G3	S2S3	N	N
<u><i>Sciurus niger shermani</i></u> Sherman's Fox Squirrel	G5T3	S3	N	SSC

**Disclaimer**

The data maintained by the Florida Natural Areas Inventory represent the single most comprehensive source of information available on the locations of rare species and other significant ecological resources statewide. However, the data are not always based on comprehensive or site-specific field surveys. Therefore, this information should not be regarded as a final statement on the biological resources of the site being considered, nor should it be substituted for on-site surveys. FNAI shall not be held liable



for the accuracy and completeness of these data, or opinions or conclusions drawn from these data. FNAI is not inviting reliance on these data. Inventory data are designed for the purposes of conservation planning and scientific research and are not intended for use as the primary criteria for regulatory decisions.

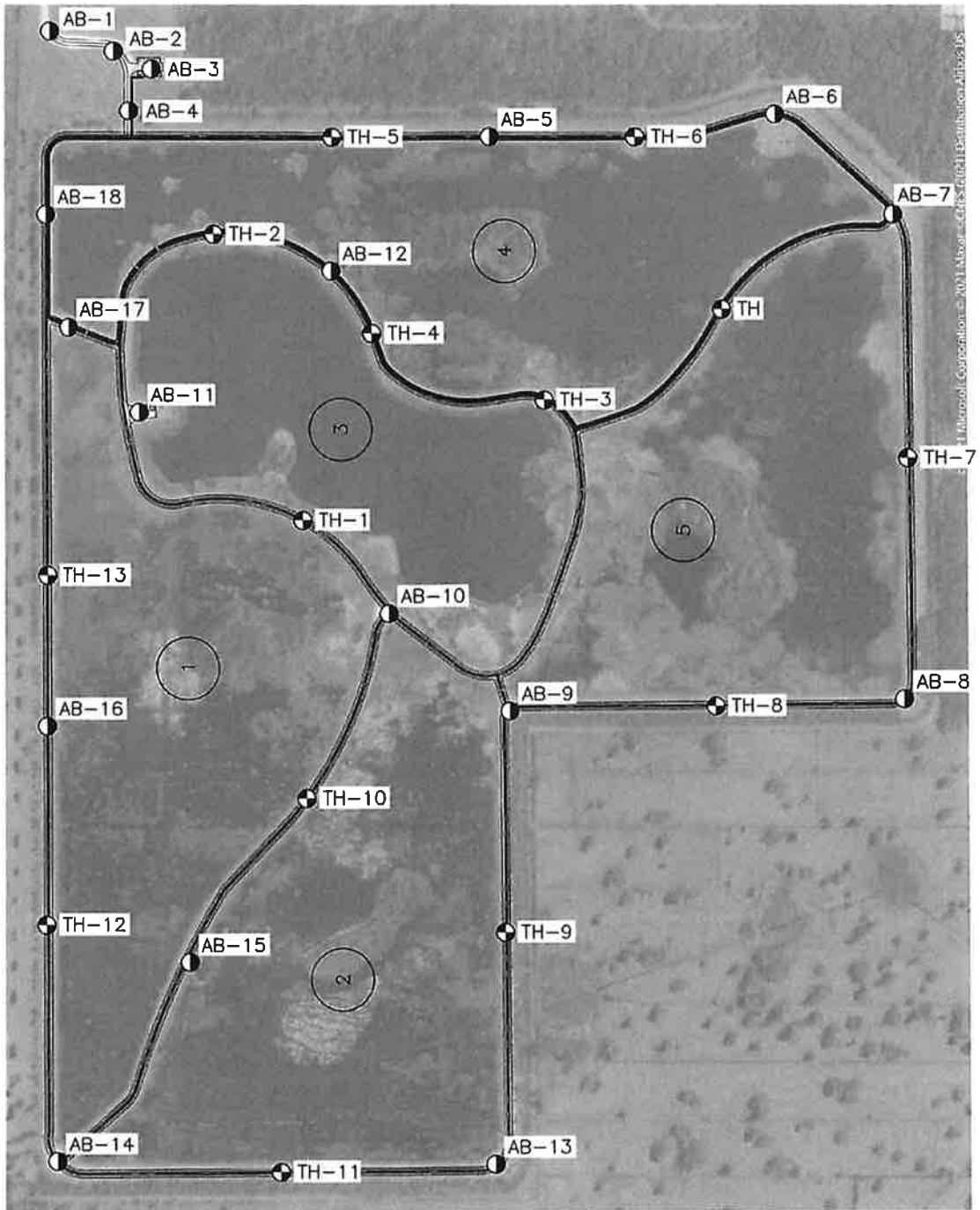
**Unofficial Report**

These results are considered unofficial. FNAI offers a [Standard Data Request](#) option for those needing certifiable data.

## Appendix D. Geotechnical Investigation

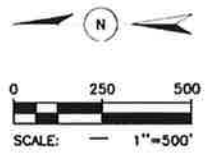
- D.1. Preliminary Soil Boring Profiles
- D.2. Cell Containment Berm Global Stability Analysis
- D.3. Recommendations for Site Preparation and Construction



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**LEGEND**



-  TH STANDARD PENETRATION TEST (SPT) BORING LOCATION
-  AB AUGER BORING LOCATION

**BORING LOCATION PLAN**






**Ardaman & Associates, Inc.**  
 Geotechnical, Environmental and  
 Materials Consultants

SUBSURFACE SOIL EXPLORATION  
 RICH GRISSOM MEMORIAL WETLAND TRAIL  
 VIERA, FLORIDA

DRAWN BY: TAT	CHECKED BY:	DATE: 10/1/21
FILE NO. 21-5280	APPROVED BY:	FIGURE: 2

# LEGEND

## SOIL DESCRIPTIONS

-  ① FINE SAND (SP)
-  ② FINE SAND WITH SILT (SP-SM)
-  ③ SILTY FINE SAND (SM)
-  ④ CLAYEY FINE SAND (SC)
-  ⑤ CLAY (CL,CH)

## COLORS

- Ⓐ LIGHT BROWN TO BROWN
- Ⓑ GRAYISH-BROWN
- Ⓒ LIGHT GRAY TO GRAY
- Ⓓ DARK GRAY OR DARK BROWN
- Ⓔ YELLOWISH BROWN OR ORANGE-BROWN

TH STANDARD PENETRATION TEST (SPT) BORING

AB AUGER BORING

N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT

WOH SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS ONLY

GNE GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED

GNM GROUNDWATER NOT ENCOUNTERED ABOVE 10.5 FEET ON DATE DRILLED

 GROUNDWATER LEVEL MEASURED ON DATE DRILLED

-200 PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)

NM NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)

SP,SP-SM  
SM,SC,CH  
UNIFIED SOIL CLASSIFICATION SYSTEM

## ENGINEERING CLASSIFICATION

### I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

### II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
MEDIUM STIFF	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR. ABSENCE OF WATER SURFACE DATA ON CERTAIN BORINGS IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE, BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THESE LOCATIONS OR WITHIN THE VERTICAL REACHES OF THESE BORINGS IN THE FUTURE.

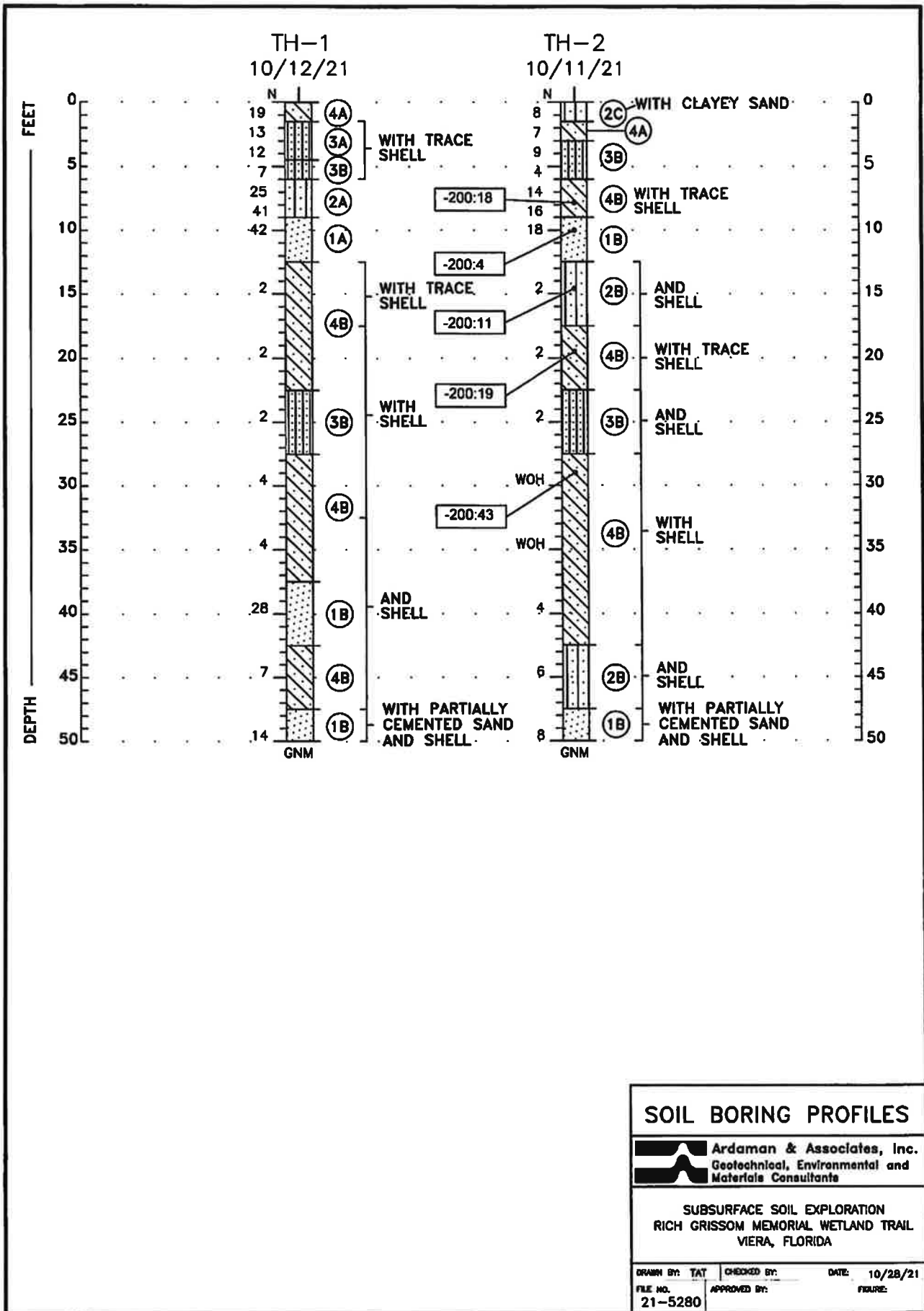
## SOIL PROFILES LEGEND

 **Ardaman & Associates, Inc.**  
Geotechnical, Environmental and  
Materials Consultants

SUBSURFACE SOIL EXPLORATION  
RICH GRISSOM MEMORIAL WETLAND TRAIL  
VIERA, FLORIDA

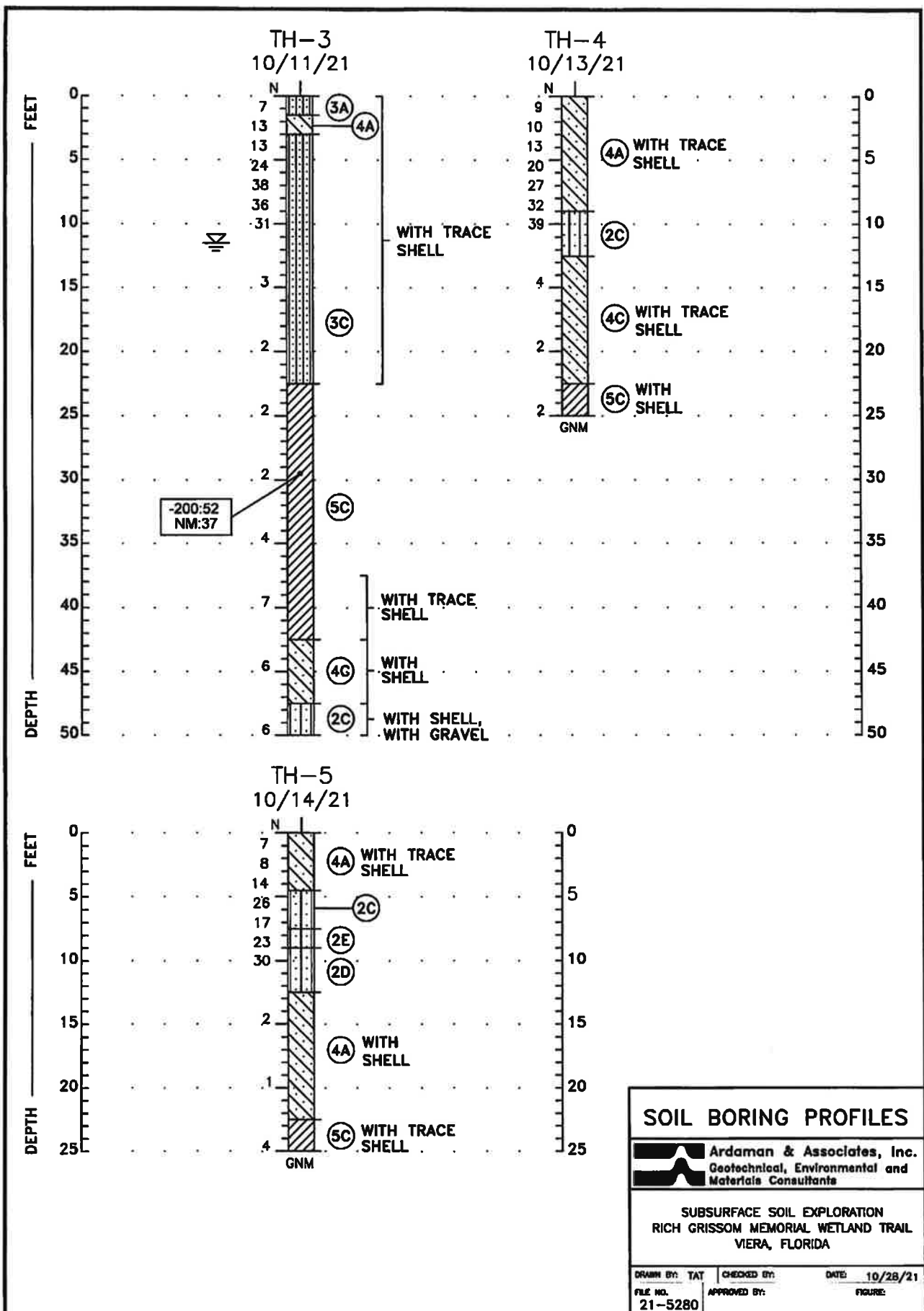
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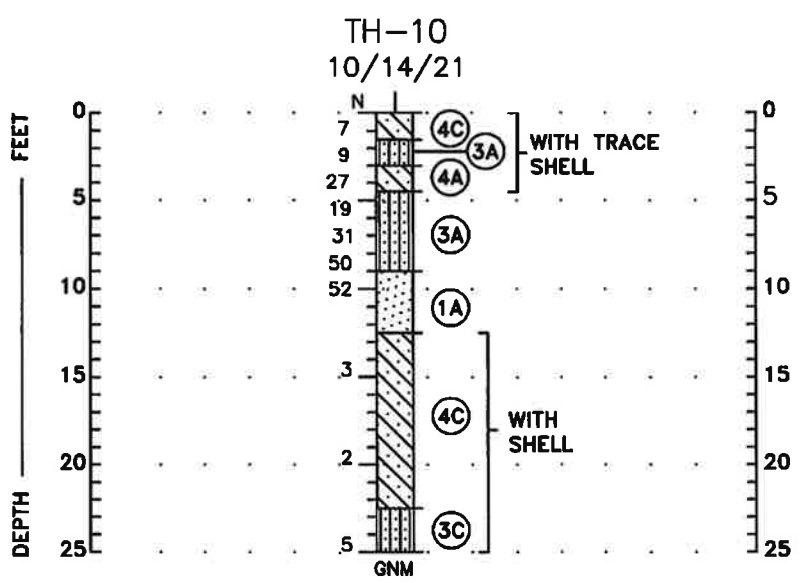
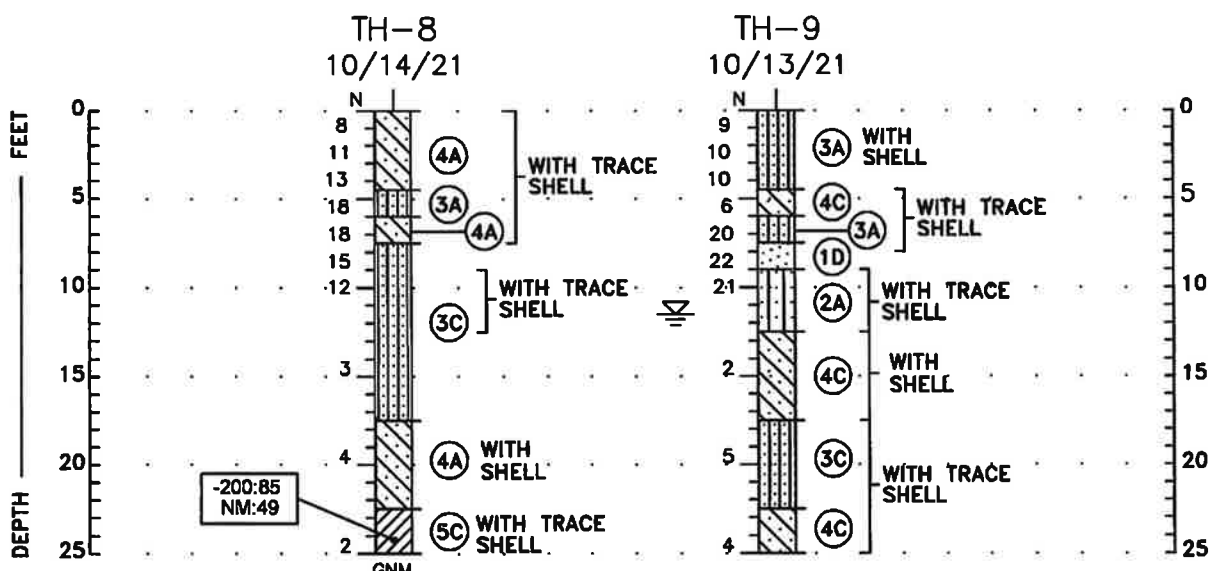
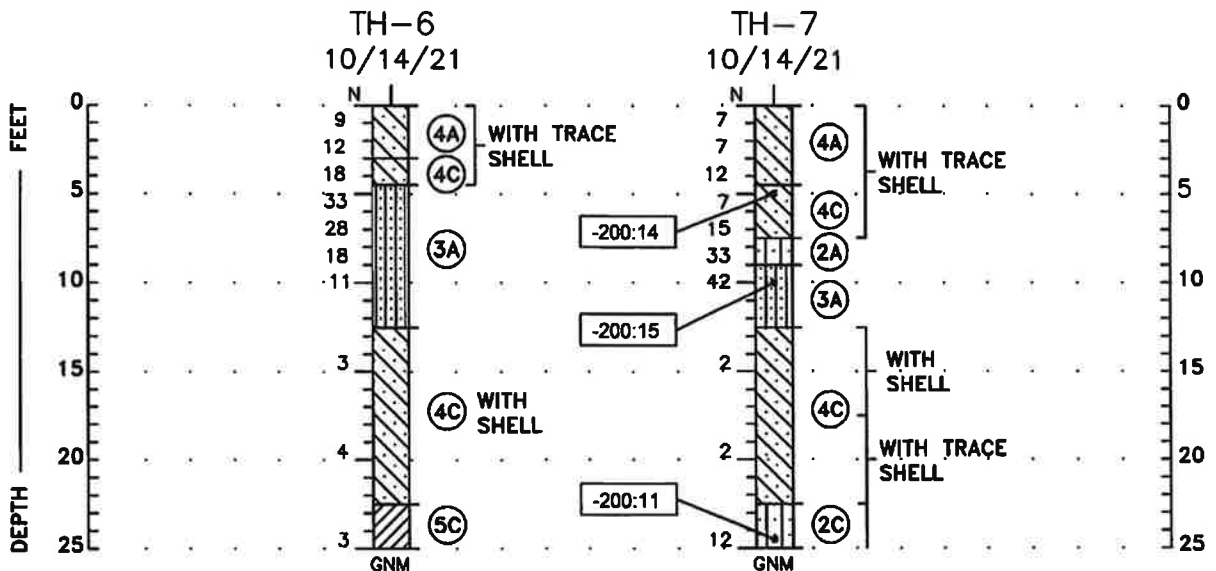
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<b>Ardaman &amp; Associates, Inc.</b> Geotechnical, Environmental and Materials Consultants		
SUBSURFACE SOIL EXPLORATION RICH GRISSOM MEMORIAL WETLAND TRAIL VIERA, FLORIDA		
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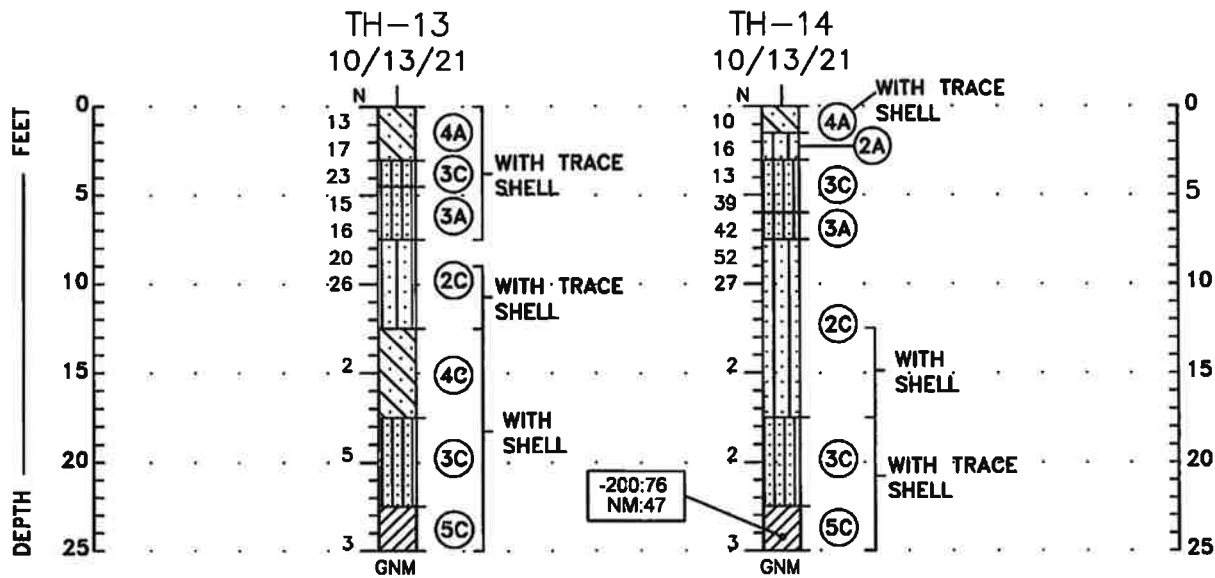
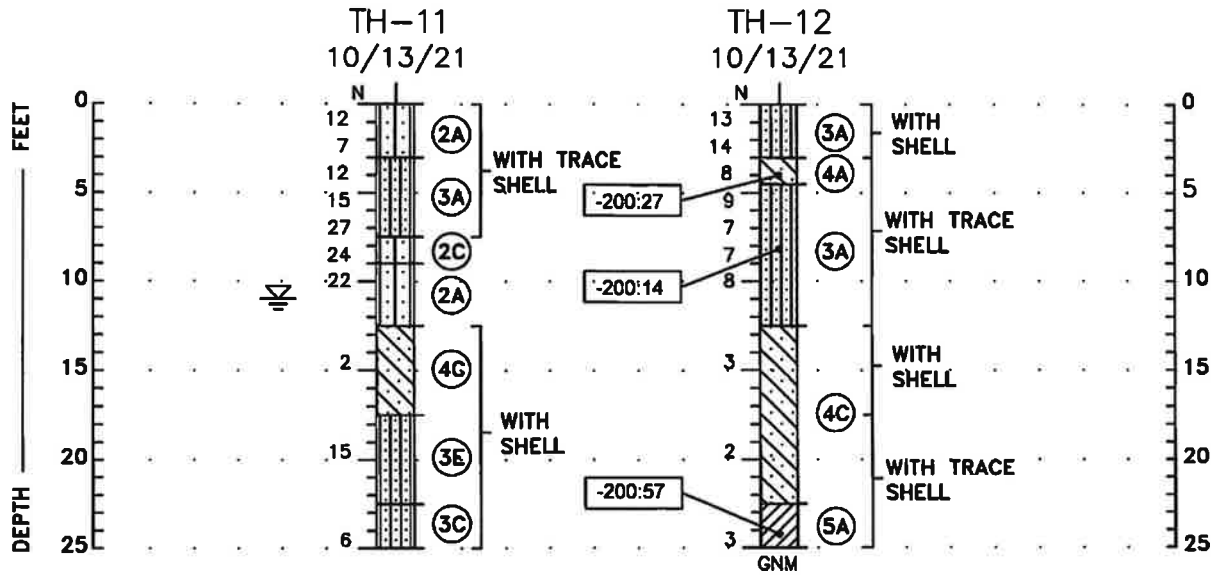
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SOIL BORING PROFILES		
 <b>Ardaman &amp; Associates, Inc.</b> Geotechnical, Environmental and Materials Consultants		
SUBSURFACE SOIL EXPLORATION RICH GRISSOM MEMORIAL WETLAND TRAIL VIERA, FLORIDA		
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SOIL BORING PROFILES			
 <b>Ardaman &amp; Associates, Inc.</b> Geotechnical, Environmental and Materials Consultants			
SUBSURFACE SOIL EXPLORATION RICH GRISSOM MEMORIAL WETLAND TRAIL VIERA, FLORIDA			
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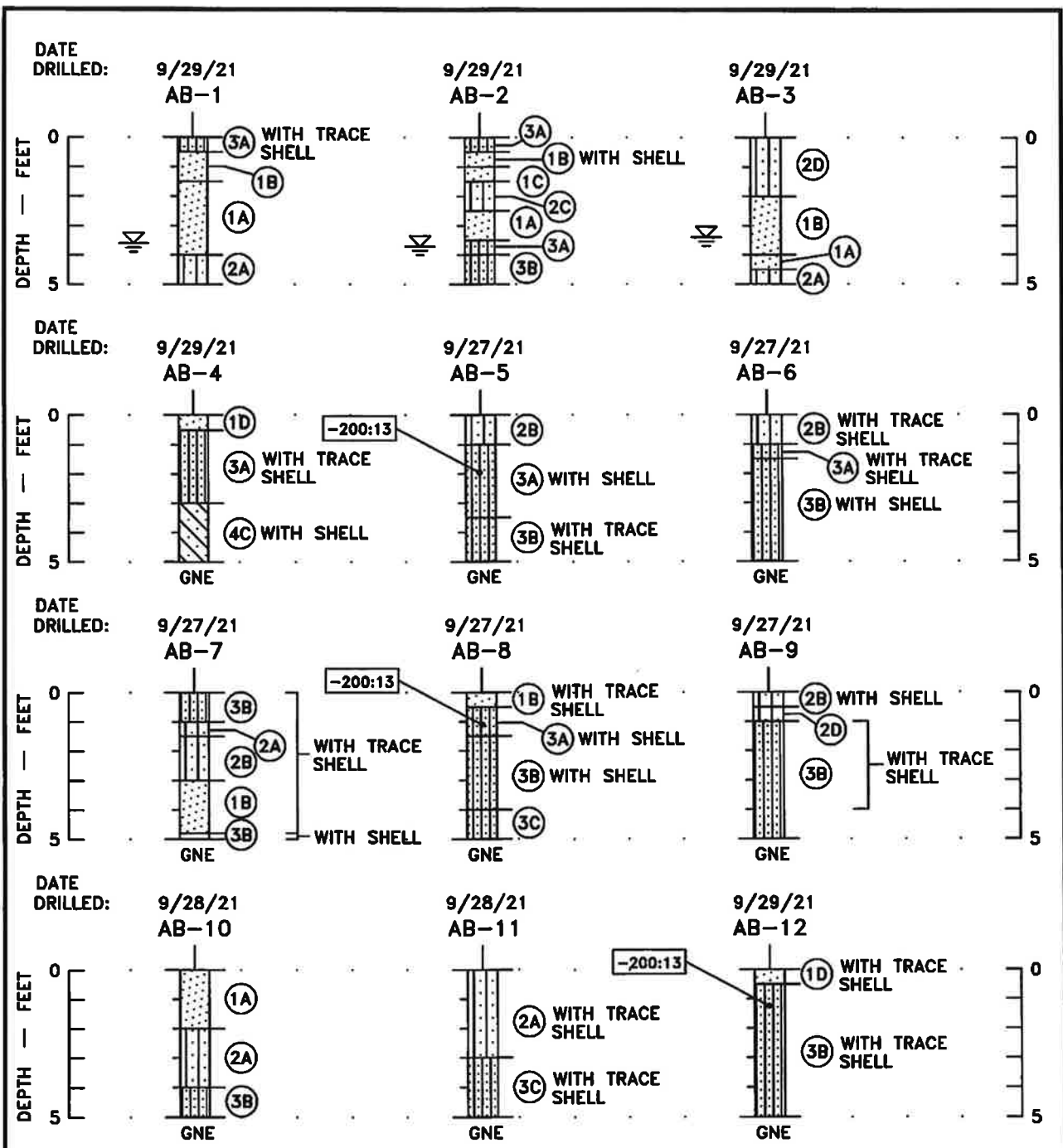
**SOIL BORING PROFILES**



SUBSURFACE SOIL EXPLORATION  
RICH GRISSOM MEMORIAL WETLAND TRAIL  
VIERA, FLORIDA

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### SOIL BORING PROFILES

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SUBSURFACE SOIL EXPLORATION  
 RICH GRISSOM MEMORIAL WETLAND TRAIL  
 VIERA, FLORIDA

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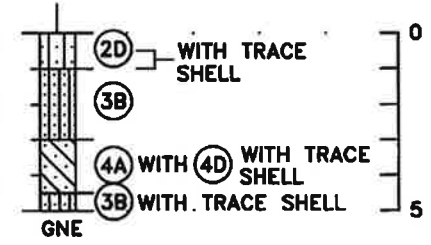
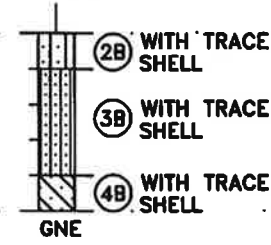
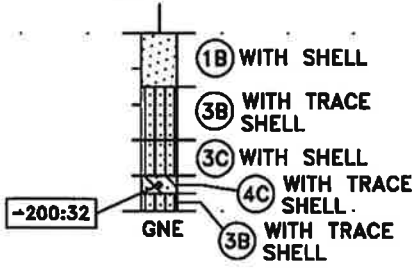
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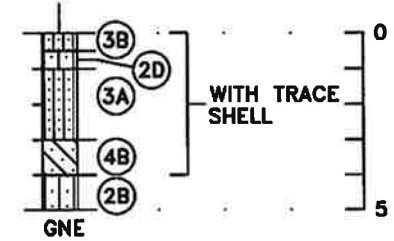
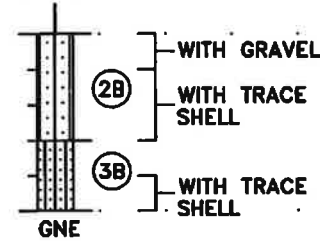
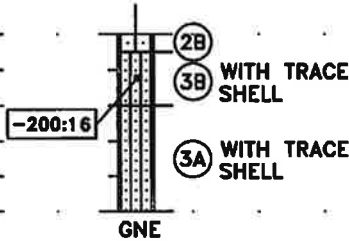
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**SOIL BORING PROFILES**

**Ardaman & Associates, Inc.**  
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION  
RICH GRISSOM MEMORIAL WETLAND TRAIL  
VIERA, FLORIDA

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**Global Stability Results  
Rich Grissom Memorial Wetland Trail**

<b>Cross Section by AAI Boring</b>	<b>Factor of Safety per Vehicle Type</b>			
	<b>N/A (i.e., Pedestrian)</b>	<b>Passenger Vehicle</b>	<b>Dump Truck (Full)</b>	<b>Bulldozer</b>
TH-1	2.0	2.0	1.9	1.8
TH-2	2.3	2.2	2.0	1.9
TH-5	1.9	1.9	1.7	1.5
TH-7	1.9	1.9	1.8	1.6
TH-8	1.8	1.8	1.7	1.6
TH-9	1.9	1.9	1.9	1.6
TH-10	2.4	2.3	2.2	1.8
TH-11	2.0	2.0	1.8	1.5
TH-13	1.9	1.9	1.8	1.6
TH-14	2.4	2.3	2.1	1.7

## **Proposed Roadway and Parking Improvements**

### General

The results of our exploration indicate that, with proper site preparation as recommended in this report, the existing soils are suitable for construction of the proposed berms, for construction of the asphalt paved roadways on top of the berms, and for the proposed asphalt paved parking area at the facility entrance.

The following are our recommendations for overall site preparation and pavement construction which we feel are best suited for the proposed facility and existing soil conditions. The recommendations are made as a guide for the design engineer, parts of which should be incorporated into the project's specifications.

### Stripping and Grubbing

The "footprints" of the proposed berm and pavement areas, plus a minimum margin of 5 feet, should be stripped of all surface vegetation, stumps, debris, organic topsoil or other deleterious materials, as encountered. Buried utilities should be removed or plugged to eliminate conduits into which surrounding soils could erode.

After stripping, the construction areas should be grubbed or root-raked such that roots with a diameter greater than ½ inch, stumps, or small roots in a dense state, are completely removed. The actual depth(s) of stripping and grubbing must be determined by visual observation and judgment during the earthwork operation.

### Proof-rolling

We recommend proof-rolling the cleared surface to locate any unforeseen soft areas or unsuitable surface or near-surface soils, to increase the density of the upper soils, and to prepare the existing surface for the addition of the fill soils (as required). Proof-rolling of the berm and pavement areas should consist of at least three passes of a compactor capable of achieving the density requirements described in the next paragraph. Each pass should overlap the preceding pass by 30 percent to achieve complete coverage. If deemed necessary, in areas that continue to "yield", remove all deleterious material and replace with clean, compacted sand backfill. The proof-rolling should occur after cutting and before filling.

A density equivalent to or greater than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 1 foot in the berm and pavement areas must be achieved beneath the stripped and grubbed ground surface. Additional passes and/or overexcavation and recompaction may be required if these minimum density requirements are not achieved. The soil moisture should be adjusted as necessary during compaction.

Care should be exercised to avoid damaging any neighboring structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing condition (i.e. cracks) of the structures documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and Ardaman & Associates should be notified immediately. Heavy vibratory

compaction equipment should not be used on top of the existing berms or within 200 feet of existing structures.

#### Suitable Fill Material and the Compaction of Fill Soils

All fill soil should be free of organic materials, such as roots and vegetation. We recommend using fill with less than 12 percent by dry weight of material passing the U.S. Standard No. 200 sieve size. The fine sand and fine sand with silt (Strata Nos. 1 and 2 as shown in Appendix II) are suitable for use as fill soil and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 12 percent passing the No. 200 sieve (Strata Nos. 3 and 4) can be used in some applications, but will be more difficult to compact due to their inherent nature to retain soil moisture.

All fill beneath in the berm construction areas and the pavement areas should be placed in level lifts not to exceed 12 inches in uncompacted thickness. Each lift should be compacted to at least 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value. The filling and compaction operations should continue in lifts until the desired elevation(s) is achieved. If hand-held compaction equipment is used, the lift thickness should be reduced to no more than 6 inches.

#### Dewatering

Dewatering will be necessary for the berm construction and may also be necessary during construction of the proposed parking area at the facility entrance. If the control of groundwater is required to achieve the necessary stripping, excavation, proof-rolling, filling, compaction, and any other earthwork, sitework, and/or foundation subgrade preparation operations required for the project, the actual method(s) of dewatering should be determined by the contractor. Dewatering should be performed to lower the groundwater level to depths that are adequately below excavations and compaction surfaces. Adequate groundwater level depths below excavations and compaction surfaces vary depending on soil type and construction method, and are usually 2 feet or more. Dewatering solely with sump pumps may not achieve the desired results.

#### Typical Asphaltic Concrete Surface Pavement Section

All areas to be paved should be prepared as previously outlined. Prior to pavement base installation, the subgrade soil compaction should be verified for a depth of 12 inches (i.e.; compacted to at least 95 percent of the modified Proctor (ASTM D-1557, AASHTO T-180) maximum dry density value).

##### A. Limerock or Cemented Coquina Base

A limerock or cemented coquina base course 6 inches thick overlying an 8-inch thick stabilized subbase can be used provided that grading and drainage plans preclude periodic saturation of the base material. The periodic saturation of a limerock/coquina base material could lead to premature pavement distress. A minimum clearance of 18 inches must be maintained between the bottom of the limerock/coquina base and the seasonal high groundwater table.

The limerock or cemented coquina should have a minimum Limerock Bearing Ratio (LBR) value of 100 and should be compacted to at least 98 percent of the modified Proctor (ASTM D-1557,

AASHTO T-180) maximum density value. For truck parking and drive areas, the base thickness should be a minimum of 8 inches.

An 8-inch thick subbase having a minimum Limerock Bearing Ratio (LBR) value of 40 must be achieved beneath the limerock or cemented coquina base. The natural soils may have to be stabilized with suitable clayey soil in order to achieve the required LBR value. The stabilized subbase must be compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180).

#### B. Recycled Concrete Aggregate Base (Optional)

Recycled concrete aggregate base supported by a free-draining subgrade may be used. Six inches of recycled concrete aggregate base should be used in automobile parking areas and 8 inches of recycled concrete aggregate base should be used in truck parking and drive areas. A minimum clearance of 12 inches should be maintained between the bottom of the recycled concrete aggregate base and the seasonal high groundwater table.

The recycled concrete aggregate base should have a minimum LBR value of 150 and should be compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180). The recycled concrete aggregated should meet gradation requirements according to Section 911-3.4 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition. Other requirements for recycled concrete aggregate base are outlined in Section 334 in the Florida Department of Transportation, Standards for Road and Bridge Construction, latest edition. The subgrade beneath the recycled concrete aggregate base should consist of free draining sand compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180).

We note that if the contractor's means and methods include stabilizing soils beneath the recycled concrete aggregate base, then the stabilizing material should be coarse material (e.g; gravel). Low permeability soils (e.g; silt and/or clay) should not be used as stabilizing material beneath recycled concrete aggregate base.

If recycled concrete aggregate base is utilized for the proposed parking area at the facility entrance, we recommend that the silty fine sand soil (Stratum No. 3 in Appendix II) encountered at the existing ground surface in Borings AB-1 and AB-2 be removed in its entirety and replaced with clean, compacted fine sand of the Unified Soil Classification SP.

#### C. Wearing Surface

A minimum 1½-inch layer of Type SP-9.5 or SP-12.5 asphaltic concrete should be used for a wearing surface in automobile parking/drive areas. For truck parking and drive areas, 2 inches of Type SP-9.5 or SP-12.5 asphaltic concrete should be used.

Specific requirements for the Type-SP asphaltic concrete wearing surface are outlined in Section 334 in the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, latest edition. Equivalent Type S asphaltic concrete may be substituted for Type SP-9.5 or SP-12.5; however, we recommend a minimum Marshall stability of 2,200 pounds if Type S is used.

The latest specifications of Florida Department of Transportation shall govern the placement of the base and asphaltic concrete wearing surface. The above minimum requirements will satisfactorily support Traffic Level A\*. If a heavier traffic pattern is anticipated, the design section should be increased accordingly.

### QUALITY ASSURANCE

We recommend establishing a comprehensive quality assurance program to verify that all site preparation and pavement construction is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Ardaman & Associates.

As a minimum, an on-site engineering technician should monitor all stripping and grubbing to verify that all deleterious materials have been removed and should observe the proof-rolling operation to verify that the appropriate number of passes are applied to the subgrade. In-situ density tests should be conducted during filling activities and below all pavement areas to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered.

Additionally for the pavements, Limerock Bearing Ratio tests should be performed. The base course(s) should be tested for density and thickness. We recommend that Ardaman & Associates be retained to review the asphalt pavement mix design proposed for use on the project prior to pavement placement. During asphalt pavement construction, samples of the asphaltic concrete should be obtained and tested in the laboratory to verify compliance with the mix design, including testing Marshall Stability (Type S asphalt), flow, asphalt content, and aggregate gradation. We also recommend full-time monitoring/testing in the batch plant and on the site during pavement placement. The asphaltic concrete thickness should be verified in the field.

### IN-PLACE DENSITY TESTING FREQUENCY

In Central Florida, earthwork testing is typically performed on an on-call basis when the contractor has completed a portion of the work. The test result from a specific location is only representative of a larger area if the contractor has used consistent means and methods and the soils are practically uniform throughout. The frequency of testing can be increased and full-time construction inspection can be provided to account for variations. We recommend that the following minimum testing frequencies be utilized.

In the proposed parking area, a minimum frequency of one in-place density test for each 5,000 square feet of area (minimum of four test locations) should be used. In the proposed roadway areas, a minimum frequency of one in-place density test for each 200 lineal feet of roadway should be used. The existing, natural ground should be tested to a depth of 12 inches at the prescribed frequency. Each 12-inch lift of fill, as well as the stabilized subgrade (where applicable) and base should be tested at this frequency. Utility backfill should be tested at a minimum frequency of one

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\* Reference: "Flexible Pavement Design Manual", Florida Department of Transportation. (Latest Edition)

in-place density test for each 12-inch lift for each 200 linear feet of pipe. Additional tests should be performed in backfill for manholes, inlets, etc.

Representative samples of the various natural ground and fill soils, as well as stabilized subgrade (where applicable) and base materials, should be obtained and transported to our laboratory for Proctor compaction tests. These tests will determine the maximum dry density and optimum moisture content for the materials tested and will be used in conjunction with the results of the in-place density tests to determine the degree of compaction achieved.



# **EXHIBIT G**



**Brevard County, FL  
Bird Watching Tower  
Structural Assessment**



July 8, 2022

# MEMO

TO: Brevard County Facilities Department  
ATTN: Michael Dunlap – Facilities Construction Coordinator  
FROM: Nikos Moschovakis E.I.  
DATE: July 8, 2022  
RE: Structural Inspection  
  
Bird Watching Tower  
Viera Wetlands, West of 10001 N Wickham Rd,  
Melbourne, FL 32940

On June 19, 2022, I, Nikos Moschovakis E.I. performed an inspection of the bird watch tower at the above-mentioned address to provide an assessment of its structural condition.

Based on the visual inspection of exposed structural members, the birdwatch tower NEEDS STRUCTURAL REPAIRS. There was no destructive testing done at this building and none of the covered structural members could be visually inspected. As a routine matter, and to avoid misunderstandings, nothing in this report should be construed directly or indirectly as a guarantee for any portion of the structure. To the best of my knowledge and ability, this report represents an accurate appraisal of the present condition of the structures based on careful evaluation of observed conditions to the extent reasonably possible.

## **Inspection subject:**

The subject of the birdwatch tower inspection was to perform a structural visual condition assessment of the current condition of the tower.

## **Structural System:**

The 2 story birdwatch tower is a wood structure that consists of round wood foundation piles under the water table, wood beams, and floor planks. Also, wood stairs and wood railing on the stairs and the perimeter of the structure. Members are connected with Simpson connections, nails, and bolts.

## **Inspection Map**



### **Required Structural Repairs:**

1. The structure should be prohibited to the public in any case, as coordinated previously. The current conditions can cause human injury or death. Operation of the structure can continue after all the required repairs are performed or replacement of the structure.
2. Repair/replace all the wood railing in the structure.
3. Replace all wood floor planks.
4. Repair/replace stair girder and all defected wood beams.
5. Replace all rusted nails and bolts.
6. Replace all rusted and damaged Simpson connections (Hurricane ties and beam bucket connections).
7. Additional special inspection and analysis are required for the wood piers and columns. Visual inspection cannot guarantee the adequacy of the members.
8. Repair/replace wood stairs.

**Pictures**



Picture 1

Damaged wood planks from weather and moisture.



Picture 2

Bended railing posts.



Picture 3

Damaged railing top plywood.



Picture 4

Damaged and "dry" floor planks.



Picture 5

Rusted Simpson hurricane ties and floor beam connections  
nails all over the structure.



Picture 6

Rusted Simpson hurricane ties in multiple locations.



Picture 7

Broken floor plank. Many planks appeared at risk of collapse.



Picture 8

Excessive moisture and mold in multiple wood members.





Picture 9

Excessive moisture and stains on wood members and rusted Simpson hurricane ties.



Picture 10

Surface damaged on the round wood column. Larger core shear cracks might occur.



Picture 11

Wood column surface damage and rusted Simpson hurricane ties.



Picture 12

Damaged and deflected stair girder.



Picture 13

Cracked wood plank.



Picture 14

Round wood piles. Additional analysis and special inspection are required for the pile adequacy.



### Conclusion

**The structure must remain closed to the public in any case until further structural repair or replacement takes place. At this time the structure can cause a human injury or death.**

The wood railing appeared unstable all around the building on both stories and on wood stairs. Wood floor planks appeared damaged and in bad condition. Multiple steel connections appeared rusted and inadequate. Some floor beams appeared damaged from moisture in addition to deflect. Surface damage on the wood columns and possible core cracks. Structural repairs or tower replacement is required in order to continue the operation of the birdwatch tower. Replace the superstructure with a new superstructure is recommended.

Should you have any questions or concerns, please do not hesitate to contact us.

Respectfully submitted

**Master Consulting Engineers, Inc.**

---

Nikos Moschovakis E.I.

# EXHIBIT H



**Brevard County, FL  
Bird Watching Tower 2  
Structural Assessment**



September 26, 2022

# MEMO

TO: Brevard County Facilities Department  
ATTN: Michael Dunlap – Facilities Construction Coordinator  
FROM: Nikos Moschovakis E.I.  
DATE: September 26, 2022  
RE: Structural Inspection

Bird Watching Tower 2 – North East Tower  
Viera Wetlands, West of 10001 N Wickham Rd,  
Melbourne, FL 32940

On August 22, 2022, I performed an inspection of the bird watch tower at the above-mentioned address to provide an assessment of its structural condition.

Based on the visual inspection of exposed structural members, the birdwatch tower NEEDS STRUCTURAL REPAIRS. There was no destructive testing done at this building and none of the covered structural members could be visually inspected. As a routine matter, and to avoid misunderstandings, nothing in this report should be construed directly or indirectly as a guarantee for any portion of the structure. To the best of my knowledge and ability, this report represents an accurate appraisal of the present condition of the structures based on careful evaluation of observed conditions to the extent reasonably possible.

## **Inspection subject:**

The subject of the birdwatch tower inspection was to perform a structural visual condition assessment of the current condition of the tower.

## **Structural System:**

The 2 story birdwatch tower is a wood structure that consists of round wood foundation piles under the water table, wood beams, and floor planks. Also, wood stairs and wood railing on the stairs and the perimeter of the structure. Members are connected with Simpson connections, nails, and bolts.



## **Inspection Map**



Northeast bird watch tower

### **Required Structural Repairs:**

1. The structure should be prohibited to the public in any case, as coordinated previously. The current conditions can cause human injury or death. Operation of the structure can continue after all the required repairs are performed or replacement of the structure. Keep away from the structure in the case of an extreme event.
2. Repair/replace all the wood railing in the structure along with the bolted connections.
3. Replace all wood floor planks, on both levels.
4. Repair/replace stair girder and all primary wood beams.
5. Replace all rusted nails and bolts.
6. Replace all rusted and damaged Simpson connections (Hurricane ties and beam bucket connections). Connections might fail in the case of an extreme event.
7. Additional special inspection and analysis are required for the wood piers and columns. Visual inspection cannot guarantee the adequacy of the members.
8. Repair/replace wood stairs and stair stringers.

**Pictures**



**Picture 1**

Damaged wood planks from weather and moisture.



**Picture 2**

Multiple damaged railing posts. Shear cracks show at bolted connections.



Picture 3

Missing railing bolt on the top deck railing.



Picture 4

Damaged wood planks from weather and moisture. An excessive deflection was noticed while walking on the deck.



Picture 5

Several hurricane ties and bolts appeared rusted.



Picture 6

Rusted Simpson hurricane ties in multiple locations.



Picture 7

Timber foundation pile surface damage.  
Excessive moisture on primary wood beam.



Picture 8

Damaged stair stringers and an excessive deflection  
was noticed while walking on the stairs.



Picture 9

Stairs and deck railing and floor deck planks are in bad condition due to excessive moisture and weather.

**Conclusion**



**The structure must remain closed to the public in any case until further structural repair or replacement takes place. At this time the structure can cause a human injury or death. The structure might collapse in excessive vertical loads or in case of an extreme event.**

The wood railing appeared unstable all around the building on both stories and on the wood stairs. Wood floor planks appeared damaged and in bad condition due to excessive moisture and weather. Multiple steel connections appeared rusted and inadequate in tensional forces. Some floor beams appeared damaged from moisture in addition to excessive visual deflection. Surface damage on the timber foundation piles and possible core cracks. Excessive deflection was recorded during the inspection, mainly on the stairs and second deck. Structural repairs or tower replacement is required in order to continue the operation of the birdwatch tower. Replace the superstructure with a new superstructure is recommended. Some members and connections appeared in better condition. These members might have been replaced recently.

Should you have any questions or concerns, please do not hesitate to contact us.

Respectfully submitted

**Master Consulting Engineers, Inc.**

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Nikos Moschovakis E.I.

# EXHIBIT I





**Brevard County, FL  
Gazebo  
Structural Assessment**



September 26, 2022

# MEMO

TO: Brevard County Facilities Department  
ATTN: Michael Dunlap – Facilities Construction Coordinator  
FROM: Nikos Moschovakis E.I.  
DATE: September 26, 2022  
RE: Structural Inspection

Gazebo  
Viera Wetlands, West of 10001 N Wickham Rd,  
Melbourne, FL 32940

On August 22, 2022, I performed an inspection of the gazebo at the above-mentioned address to provide an assessment of its structural condition.

Based on the visual inspection of exposed structural members, the gazebo NEEDS STRUCTURAL REPAIRS. There was no destructive testing done at this building and none of the covered structural members could be visually inspected. As a routine matter, and to avoid misunderstandings, nothing in this report should be construed directly or indirectly as a guarantee for any portion of the structure. To the best of my knowledge and ability, this report represents an accurate appraisal of the present condition of the structures based on careful evaluation of observed conditions to the extent reasonably possible.

## **Inspection subject:**

The subject of the gazebo inspection was to perform a structural visual condition assessment of the current condition of the tower.

## **Structural System:**

The 1 story gazebo is a wood structure that consists of wood posts and floor planks with perimeter wood railing. The roof consists of metal standing seams, wood beams, and rafters. Roof wood beams are supported on truss-type girders that span between wood posts. The gazebo entrance consists of a wood plank slopped walkway with wood railing. The gazebo is supported on wood grade beams. No visual connection between the wood grade beam to the ground. Wood railing restricts the perimeter area to the wetlands.

## Inspection Map



Gazebo

### Required Structural Repairs:

1. The structure should be prohibited to the public in any case, as coordinated previously. The current conditions can cause human injury or death. Operation of the structure can continue after all the required repairs are performed or replacement of the structure. Keep away from the structure in the case of an extreme event. The structure appeared unstable.
2. Repair/replace all the wood railing in the structure.
3. Replace all wood floor planks including the walkway.
4. Replace all rusted nails that attach the metal seam to the rafters.
5. Replace all rusted and damaged Simpson connections (Hurricane ties). Connections might fail in the case of an extreme event.
6. Replace/repair wood posts and beams.
7. Replace grade beams and the beams that support the gazebo on the grade beams.
8. Verify the foundation that grade beams are connected to.
9. Remove/replace the barrel structure.

**Pictures**



Picture 1

Surface cracks with the possibility of grain shear on wood posts.



Picture 2

Damaged-cracked wood floor planks. Excessive deflection while walking on the deck.



Picture 3

Damaged-cracked wood floor planks.



Picture 4

Damaged wood planks on the walkway. An excessive deflection was noticed while walking on the deck.



Picture 5  
Damaged railing.



Picture 6  
Damaged walkway railing and walkway beam in bad condition.





Picture 7

Moisture signs and surface cracks on multiple roof beams and rafters. Screws connecting the metal seam with the rafter appeared rusted and possibly not adequate on uplift forces in an extreme event.



Picture 8

Hurricane ties appeared in bad condition and deflected. Rusted metal seam roof and signs of a water leak.



Picture 9

Grade beams and perimeter low beams are in bad condition. Surface cracks and possible further damage due to weather and moisture.



Picture 10

A damaged exterior structure that supports the water barrel.





Picture 11

Damaged and unstable perimeter area wood railing.

## **Conclusion**



**The structure must remain closed to the public in any case until further structural repair or replacement takes place. At this time the structure can cause a human injury or death. The structure might collapse in excessive vertical loads or in case of an extreme event.**

The wood railing appeared unstable all around the gazebo, the walkway, and the perimeter area. Wood floor planks appeared damaged and in bad condition due to excessive moisture and weather. Hurricane ties appeared deflected and possibly inadequate in tensional forces. The roof metal seam appeared rusted and the screws rusted. Some floor beams appeared damaged by moisture. Surface damage on the wood posts and possible core cracks. Excessive deck deflection was experienced during the inspection. Grade beams appeared in bad condition, and the connection to the ground is unknown. Structural repairs or gazebo replacement is required in order to continue the operation of the gazebo. Replace the gazebo with a new gazebo is recommended.

Should you have any questions or concerns, please do not hesitate to contact us.

Respectfully submitted

**Master Consulting Engineers, Inc.**

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Nikos Moschovakis E.I.

# EXHIBIT J



Facilities Department  
 2725 Judge Fran Jamieson Way  
 Suite A207  
 Viera, FL 32940-6605

**FACILITIES CONSTRUCTION  
 COST ANALYSIS WORKSHEET**

REVISED Y/N  
 NO

**Project:** Replace Bird Tower #1  
**WO#:** 5066207

**Date:** 10/5/2022

Fund: Cost Center: GL: IO# or WO#:

1. Estimated Construction Cost \$150,000.00  
 2. Associated Costs Not Included in Estimated Construction Cost:

<u>Estimated By:</u>	<u>Cost Estimate:</u>
A. Surveys, Aerials, Topo	\$ -
B. Permits	\$2,500
C. Impact Fees	\$ -
D. Consultant/Geotech	\$ -
E. Architect/Engineer (outside)	\$ 10,000.00
F. Geotechnical Testing	\$ 2,000.00
G. Roof Consultant	\$ -
H. Legal Advertisement	\$ -
I. Reproduction/Printing	\$ -
J. Communications	\$ -
K. Asbestos Survey	\$ -
L. Furnishings	\$ -
M. Security:	\$ -
N. Other Demolition	\$ 25,000.00
O. Reference Material Updates	\$ -

3. Total 2A thru 2O (Associated Costs Not Included in Est. Construction Cost): \$ 39,500.00

4. Project Budget Subtotal 1+3: \$ 189,500.00  
 (Estimated Construction Cost + Associated Costs Not Included in Est. Const Cost)

5. Plus Contingency @ 10% of Line 4  Estimate by FCD  Estimate by Others \$ 18,950.00

6. Subtotal Estimated Funds Required for Project (4 Plus 5) \$ 208,450.00

7. Facilities Construction Fee(3.5% Line 6 per BCC-48) \$ 7,295.75

**8. TOTAL ESTIMATED FUNDS REQUIRED FOR PROJECT (6+7): \$ 215,745.75**

9. Initial Project Budget: (Kick-Off from User Dept)

10. Budget available (or shortage)

\_\_\_\_\_  
 Building & Operations Mgr Date

\_\_\_\_\_  
 \*REQUESTING DEPT SIGNATURE Date

\_\_\_\_\_  
 Tim Lawry, Construction Manager Date

\* Requesting Department signature constitutes accounting, budget availability and authorization to proceed with requested work to limit of budget.

\_\_\_\_\_  
 Initials for Finance Initials for Project Mgr



Facilities Department  
 2725 Judge Fran Jamieson Way  
 Suite A207  
 Viera, FL 32940-6605

**FACILITIES CONSTRUCTION  
 COST ANALYSIS WORKSHEET**

**REVISED Y/N**  
 NO

**Project:** Replace Bird Tower #2  
**WO#:** 5066207

**Date:** 10/5/2022

**Fund:**                      **Cost Center:**                      **GL:**                      **IO# or WO#:**

1. Estimated Construction Cost \$150,000.00  
 2. Associated Costs Not Included in Estimated Construction Cost:

Estimated By:                      Cost Estimate:

A. Surveys, Aerials, Topo	\$ -
B. Permits	\$2,500
C. Impact Fees	\$ -
D. Consultant/Geotech	\$ -
E. Architect/Engineer (outside)	\$ 10,000.00
F. Geotechnical Testing	\$ 2,000.00
G. Roof Consultant	\$ -
H. Legal Advertisement	\$ -
I. Reproduction/Printing	\$ -
J. Communications	\$ -
K. Asbestos Survey	\$ -
L. Furnishings	\$ -
M. Security:	\$ -
N. Other              Demolition	\$ 25,000.00
O. Reference Material Updates	

3. Total 2A thru 2O (Associated Costs Not Included in Est. Construction Cost): \$ 39,500.00

4. Project Budget Subtotal 1+3: \$ 189,500.00  
 (Estimated Construction Cost + Associated Costs Not Included in Est. Const Cost)

5. Plus Contingency @ 10% of Line 4     Estimate by FCD     Estimate by Others \$ 18,950.00

6. Subtotal Estimated Funds Required for Project (4 Plus 5) \$ 208,450.00

7. Facilities Construction Fee(3.5% Line 6 per BCC-48) \$ 7,295.75

**8. TOTAL ESTIMATED FUNDS REQUIRED FOR PROJECT (6+7):** **\$ 215,745.75**

9. Initial Project Budget: (Kick-Off from User Dept)

10. Budget available (or shortage)

\_\_\_\_\_  
 Building & Operations Mgr                      Date

\_\_\_\_\_  
 \*REQUESTING DEPT SIGNATURE    Date

\_\_\_\_\_  
 Tim Lawry, Construction Manager    Date

\* Requesting Department signature constitutes accounting, budget availability and authorization to proceed with requested work to limit of budget.

\_\_\_\_\_  
 Initials for Finance    Initials for Project Mgr



Facilities Department  
 2725 Judge Fran Jamieson Way  
 Suite A207  
 Viera, FL 32940-6605

**FACILITIES CONSTRUCTION  
 COST ANALYSIS WORKSHEET**

REVISED Y/N  
 NO

**Project:** Replace Gazebo  
**WO#:** 5066207

**Date:** 10/5/2022

Fund: Cost Center: GL: IO# or WO#:

1. Estimated Construction Cost \$120,000.00  
 2. Associated Costs Not Included in Estimated Construction Cost:

<u>Estimated By:</u>	<u>Cost Estimate:</u>
A. Surveys, Aerials, Topo	\$ -
B. Permits	\$1,500
C. Impact Fees	\$ -
D. Consultant/Geotech	\$ -
E. Architect/Engineer (outside)	\$ 10,000.00
F. Geotechnical Testing	\$ -
G. Roof Consultant	\$ 2,000.00
H. Legal Advertisement	\$ -
I. Reproduction/Printing	\$ -
J. Communications	\$ -
K. Asbestos Survey	\$ -
L. Furnishings	\$ -
M. Security:	\$ -
N. Other Demolition	\$ 20,000.00
O. Reference Material Updates	\$ -

3. Total 2A thru 2O (Associated Costs Not Included in Est. Construction Cost): \$ 33,500.00  
 4. Project Budget Subtotal 1+3: \$ 153,500.00  
 (Estimated Construction Cost + Associated Costs Not Included in Est. Const Cost)  
 5. Plus Contingency @ 10% of Line 4  Estimate by FCD  Estimate by Others \$ 15,350.00  
 6. Subtotal Estimated Funds Required for Project (4 Plus 5) \$ 168,850.00  
 7. Facilities Construction Fee (4% Line 6 per BCC-48) \$ 6,754.00  
**8. TOTAL ESTIMATED FUNDS REQUIRED FOR PROJECT (6+7): \$ 175,604.00**

9. Initial Project Budget: (Kick-Off from User Dept)

10. Budget available (or shortage)

\_\_\_\_\_  
 Building & Operations Mgr Date

\_\_\_\_\_  
 \*REQUESTING DEPT SIGNATURE Date

\_\_\_\_\_  
 Tim Lawry, Construction Manager Date

\* Requesting Department signature constitutes accounting, budget availability and authorization to proceed with requested work to limit of budget.

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