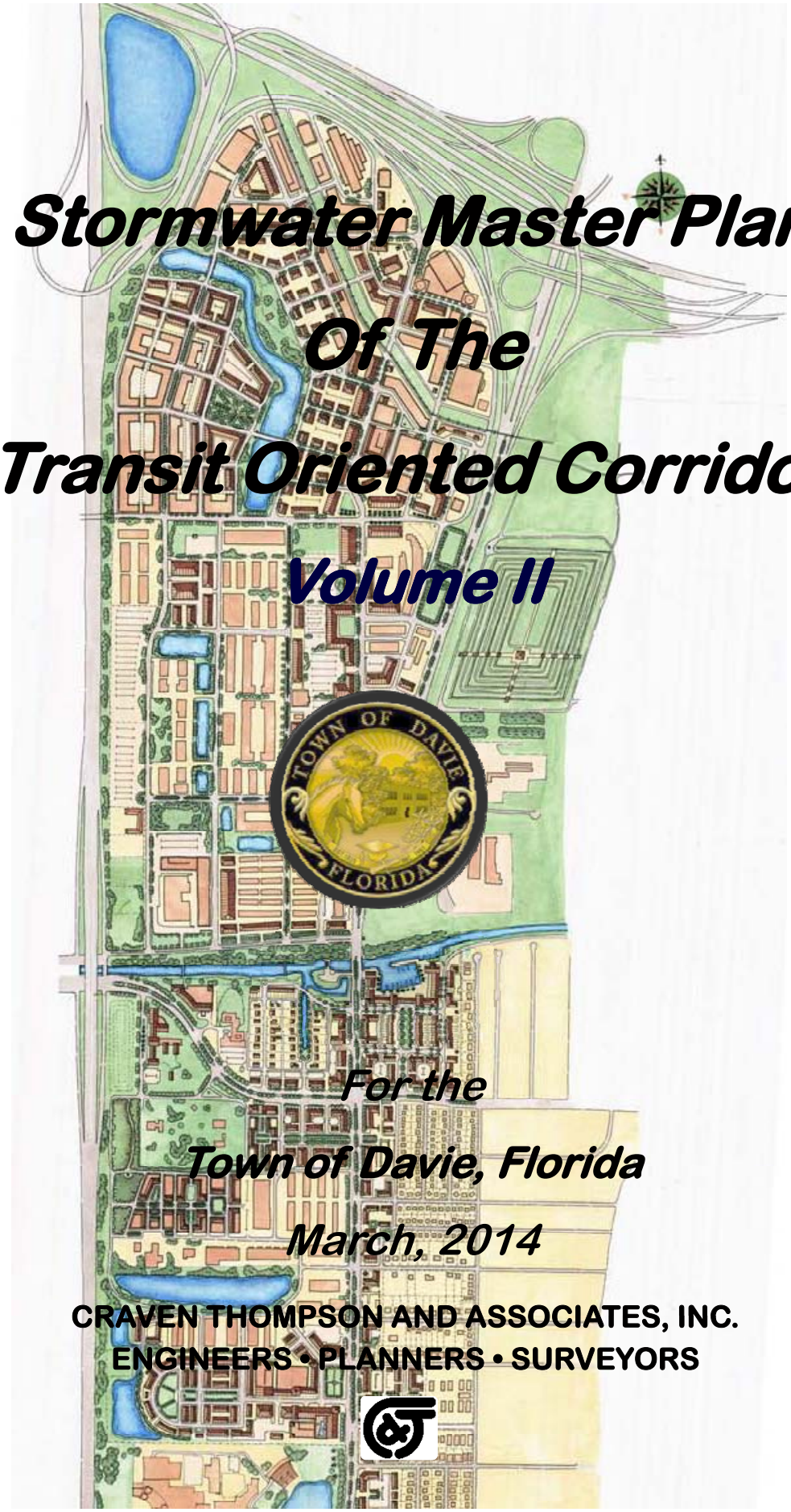

Stormwater Master Plan Of The Transit Oriented Corridor

Volume II

For the

Town of Davie, Florida

March, 2014

CRAVEN THOMPSON AND ASSOCIATES, INC.

ENGINEERS • PLANNERS • SURVEYORS

VOLUME II

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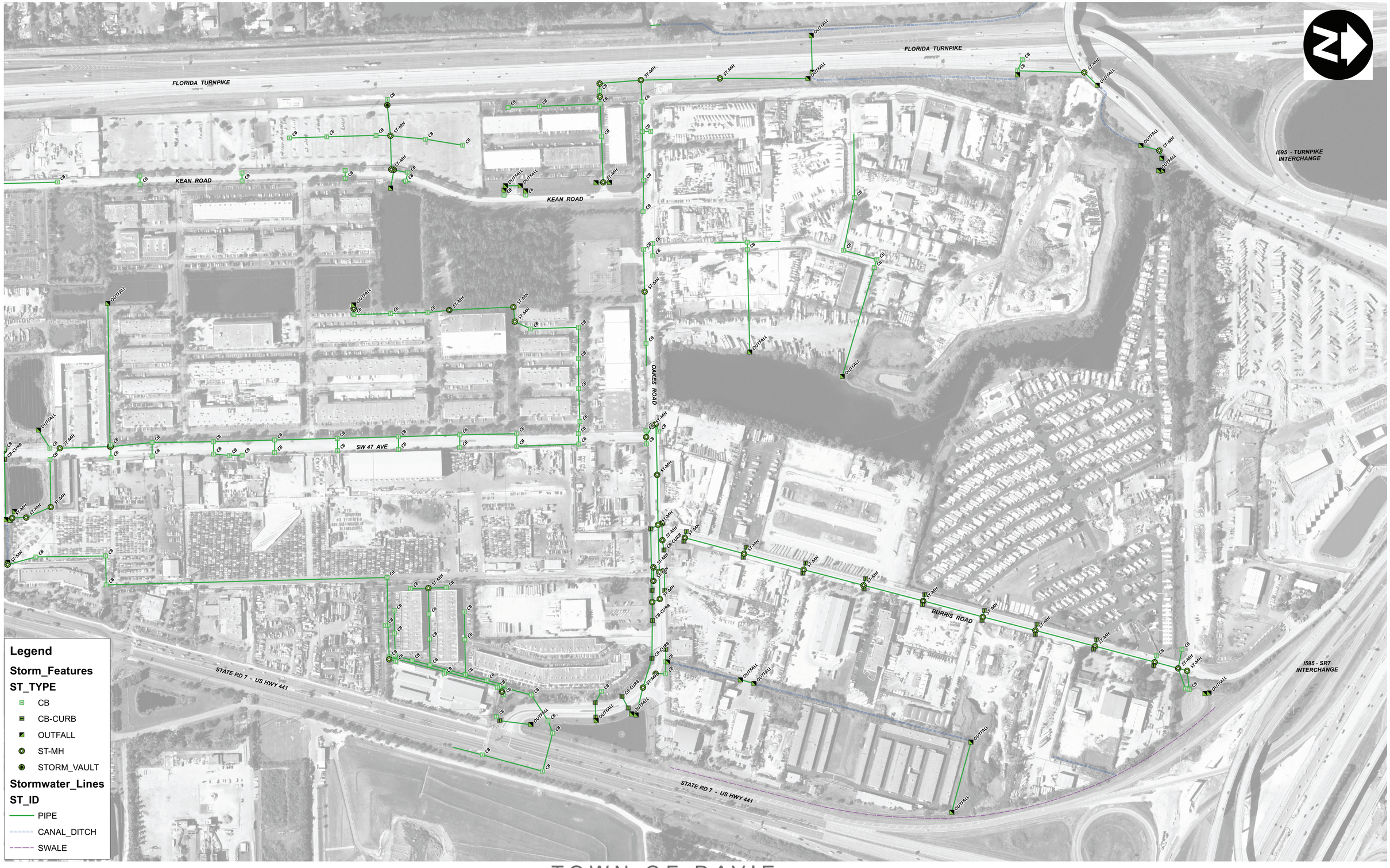
2. Variance Request Documents Submitted To CBWCD To Utilize A DWL Of 2.0 Ft-NGVD
3. Geotechnical Report of Permeability Tests Conducted Within The TOC
4. Drainage Calculations & ICPR Model of the Existing Conditions
5. Final Drainage Calculations & ICPR Model of the Final Stormwater Master Plan

APPENDIX 1: GIS DATABASE OF DRAINAGE INFRASTRUCTURE WITHIN THE TOC



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(Tel) 954-739-6400 (Fax) 954-739-6409
www.craventhompson.com

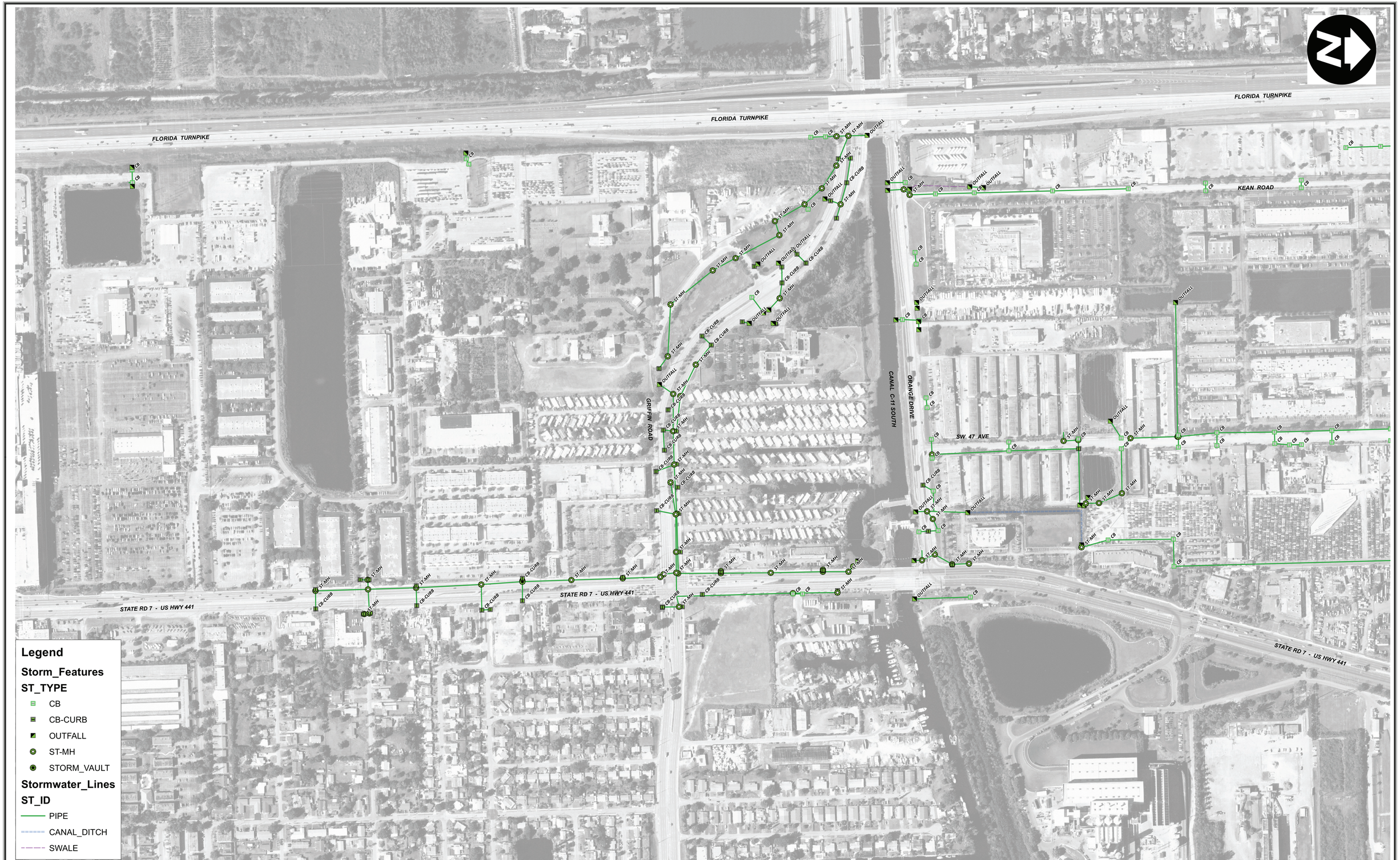
TOWN OF DAVIE

STORM WATER MASTERPLAN - GIS

200 100 0 200 400 600 800
Feet

12/16/2011 R.D.P.

CTA PROJ. NO. 11-0009-001-01



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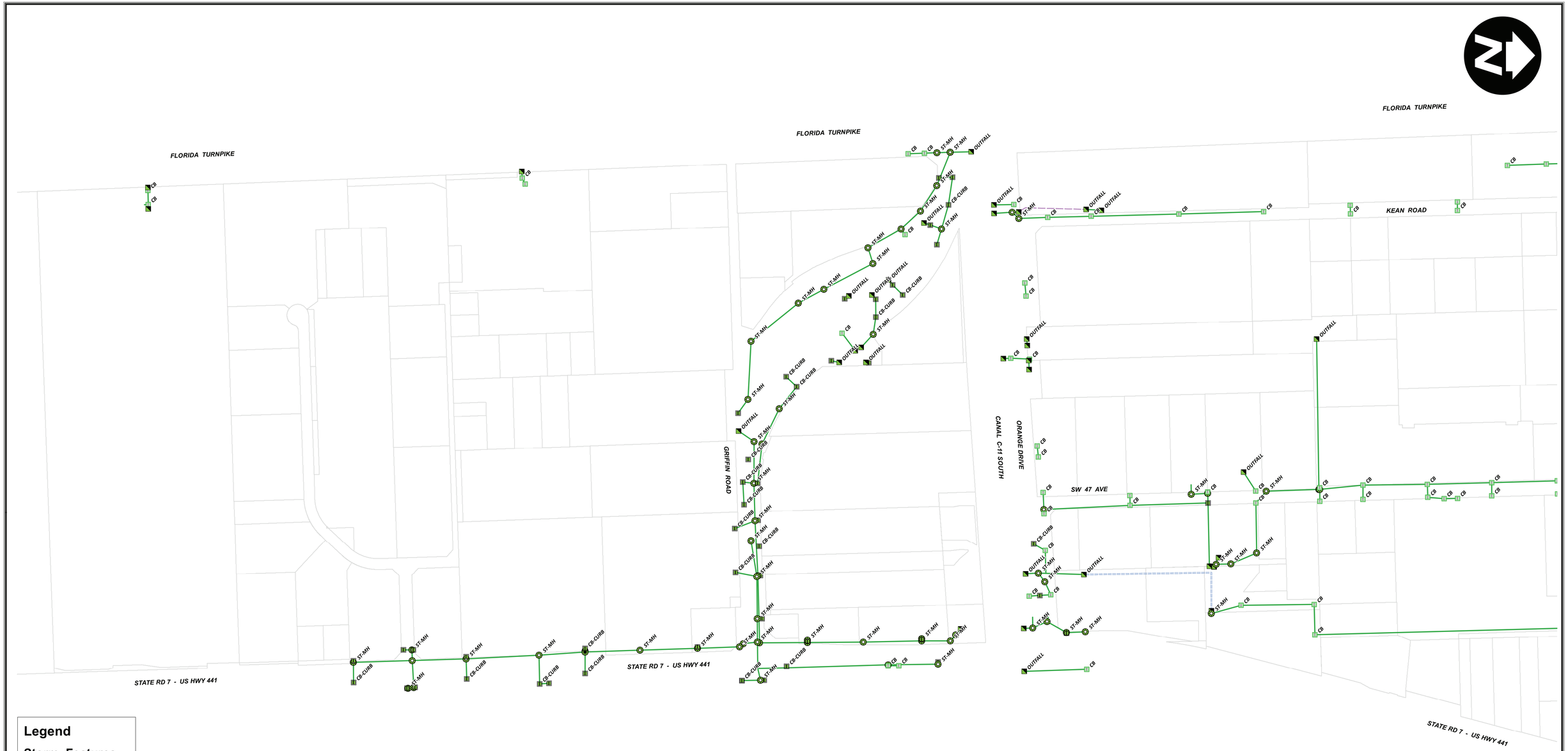

Legend

Storm_Features

ST_TYPE

- CB
- CB-CURB
- OUTFALL
- ST-MH
- STORM_VAULT

Stormwater_Lines

ST_ID

- PIPE
- CANAL_DITCH
- SWALE

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TOWN OF DAVIE

STORM WATER MASTERPLAN - GIS

200 100 0 200 400 600 800
Feet

12/16/2011 R.D.P.

CTA PROJ. NO. 11-0009-001-01

APPENDIX 2: VARIANCE REQUEST DOCUMENTS SUBMITTED TO CBWCD TO UTILIZE A DWL OF 2.0 FT-NGVD

Chris Lips

From: Chris Lips
Sent: Thursday, April 12, 2012 10:08 AM
To: 'mtcrowley@bellsouth.net'
Cc: Pat Gibney; Adolfo A. Gonzalez; Rares Petrica
Subject: Town of Davie Stormwater Master Plan for the TOC
Attachments: DSWT_MAP.pdf; TOC WSWT_MAP.pdf; Exhibit of TOC and Surrounding Areas with DWL Below 3.pdf

Mr. Crowley,

While performing research for above referenced project we have observed numerous permits, calculations and plans reflecting a wet season water level ranging between 2.00 to 3.00 ft-NGVD. The attached pdf file named *"Exhibit of TOC and Surrounding Areas with DWL Below 3"* is a map identifying the projects utilizing a design water level (DWL) below 3.0 ft-NGVD.

We have spoken with Adolfo Gonzalez, the District Engineer, as well as Rares Petrica, and they both informed that CBWCD criteria stipulates a DWL of 3.0 ft-NGVD which must be utilized for projects within the CBWCD (east C-11 basin). However, Mr. Gonzalez also informed that FDOT received a variance from CBWCD, to utilize a DWL at elevation 2.0 for the Turnpike project adjacent to the western TOC project limits. Given this information, we have researched further and found the following water table information:

- The Broward County Map of the Average Wet Season Water Table reflects a 2.0 ft-NGVD contour bisecting the project and the 3.0 ft-NGVD contour is located outside the project limits to the northwest as shown on the attached pdf file named *"TOC WSWT MAP."* In addition the pdf file named *"DSWT Map"* shows that almost all of the TOC project limits are located within the 2.0 contour.
- The SFWMD Structure S-13 which serves to control the C-11 east basin states that the structure is 'operated to maintain an optimum headwater elevation of 1.6 feet, when sufficient water is available to maintain this level.' And that the Spillway Operation will function as follows: 'When the headwater elevation rises to elevation 1.8 feet, the gate will open; When the headwater elevation falls or rises to elevation 1.6 feet, the gate will become stationary; When the headwater elevation falls to 1.4 feet, the gates will close.' The pdf copy of the Structure S-13 description is attached.
- The northwestern portion of this project is located within THISCD and has a published wet season water table of 2.0 ft-NGVD.
- The North New River Canal located on the opposite side of I-595 from the TOC limits is tidal, having tributary areas with DWL=2.0.
- The areas east and south of the TOC limits (outside the CBWCD), have a WSWT of 2.00 ft-NGVD as shown on the B.C. Map referenced above.
- The N-4 Canal, located along the west limits of the TOC, is hydraulically connected to the C-11. Given the close proximity to the S-13 structure and the fact that this canal serves THISCD with a DWL of 2.0, the DWL of this canal is essentially 2.0.

Given the above information, it appears the best DWL to utilize within the TOC limits is 2.0. Even if a control structure were installed at elevation 3.0 ft-NGVD, since the control elevations to the North, East, South and West are all at 2.0, the positive head will likely create groundwater flow to ultimately draw down the water level within the TOC until equilibrium is reach with the surrounding control elevations.

Can you please review the attachments and inform if a variance could be applied for, to utilize a DWL below 3.0 and closer to 2.0 ft-NGVD?

The goal of this request is to construct dry retention ponds beneath the FPL power lines, and elsewhere within the TOC, as low as possible to maximize stormwater storage. We have met with FPL and they have confirmed that dry retention ponds below the power lines are acceptable. The FDOT (Griffin Road) retention ponds at elevation 3.2 ft-NGVD have been observed, since commencement of this project, to remain dry and routine maintenance is not hindered. If a variance reflecting a water table below 3.0 ft-NGVD can be obtained, the elevation for dry retentions within the TOC can be below 4.0 ft-NGVD, 1' above the approved water table elevation.

Thank you in advance for your time and attention to this request. Please feel free to call me if you have any questions or need any additional information. Furthermore, I would be more than willing to meet with you to discuss this request.

Sincerely,

Chris Lips, P.E.
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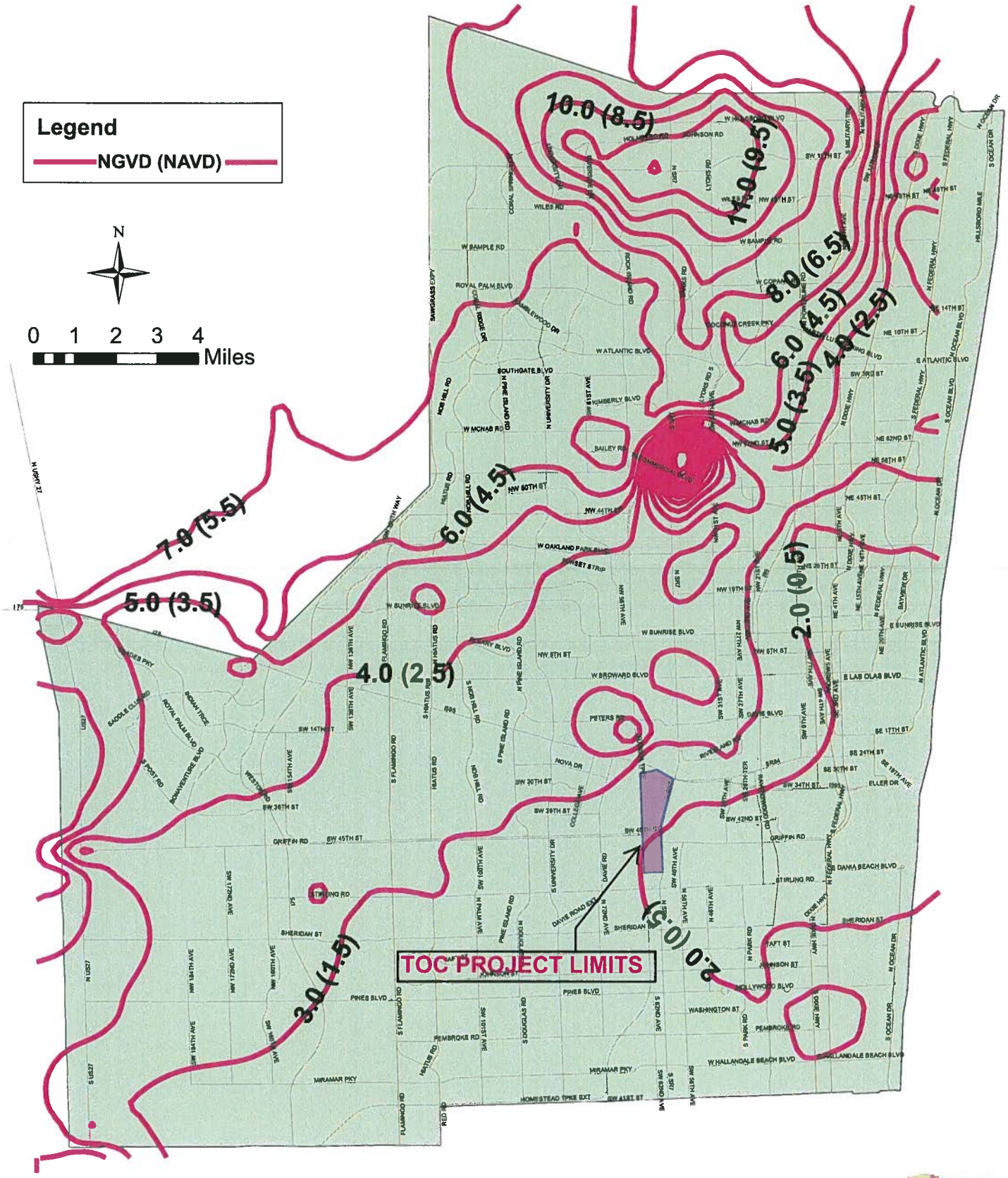
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

WATER TABLE MAP
Average Wet Season



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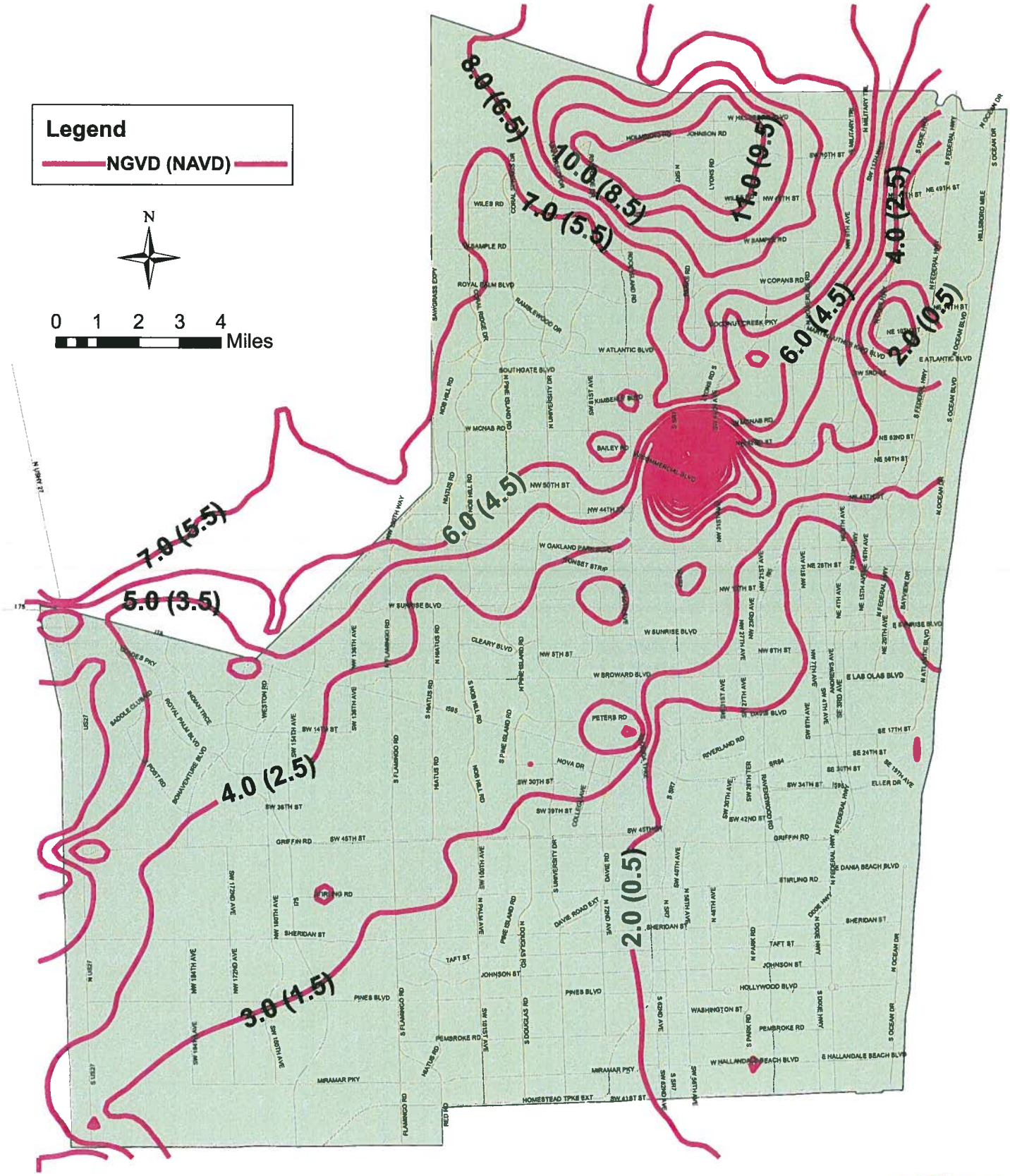
Elevations Converted from NGVD to NAVD using the FEMA approved conversion factor for Broward County of (-)1.5

BROWARD COUNTY FLORIDA

WATER TABLE MAP

Average Dry Season



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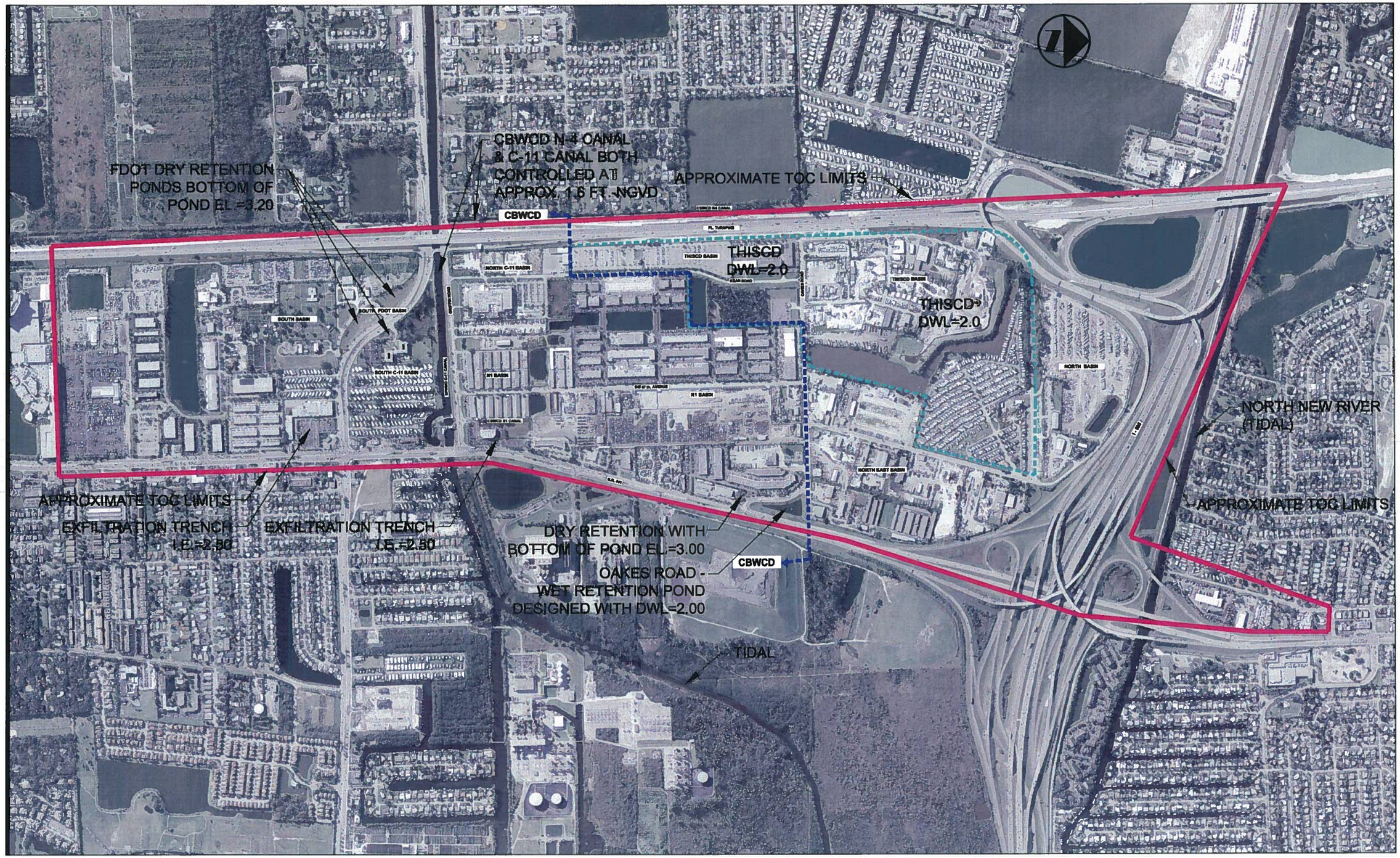
BROWARD COUNTY FLORIDA



DATE:	3/29/12
SCALE:	NTS
DESIGN BY:	
DRAWN BY:	
CHECKED BY:	
APPROVED BY:	

DESCRIPTION:	BY:	DATE:

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TOWN OF DAVIE
TRANSIT ORIENTED CORRIDOR - STATE ROAD 7 DRI

PREPARED FOR:
TOWN OF DAVIE

SITES WITH DWL (3 FT-NGVD

PROJECT NO.
11-0009

SHEET 1 OF 1

July 26, 2012

Mr. Javier Rodriguez, P.E.
R.J. Behar & Company, Inc.
6861 SW 196th Avenue, Suite 302
Pembroke Pines, Florida 33332

RE: TOWN OF DAVIE TRANSIT ORIENTED CORRIDOR (T.O.C.) STORMWATER MASTER PLAN
CBWCD—VARIANCE REQUEST FOR DWL OF 2.00 FT-NGVD WITHIN T.O.C.
CT&A PROJECT NO. 11-0009

Dear Mr. Rodriguez:

CRAVEN THOMPSON & ASSOCIATES INC.

Engineers
Planners
Surveyors

Pat Gibney and I met with Mike Crowley, Andrea Ramudo and you on June 15, 2012 to discuss utilizing a DWL of 2.00 ft-NGVD for the above referenced project, which is one foot below the CBWCD stipulated DWL of 3.00 ft-NGVD. During the meeting we laid out the engineering reasons behind our request and there were no apparent objections to the reasoning; however you requested a formal submittal be made to your attention to allow adequate time to review and evaluate that the reasoning makes 'sound engineering sense.' Please review the attached maps along with the below list of reasons to permit a DWL of 2.00 ft-NGVD with the TOC limits.

- The Broward County Map of the Average Wet Season Water Table reflects a 2.0 ft-NGVD contour bisecting the project and the 3.0 ft-NGVD contour is located entirely outside the project limits to the northwest. In addition the Broward County Map of the Average Dry Season Water Table shows that almost all of the TOC project limits are located within the 2.0 contour and the 3.0 ft-NGVD contour is located entirely outside the project limits to the northwest. Both maps are enclosed with the TOC limits superimposed.
- The SFWMD Structure S-13 which controls the C-11 east basin states that the structure is 'operated to maintain an optimum headwater elevation of 1.6 feet, when sufficient water is available to maintain this level.' And that the Spillway Operation will function as follows: 'When the headwater elevation rises to elevation 1.8 feet, the gate will open; When the headwater elevation falls or rises to elevation 1.6 feet, the gate will become stationary; When the headwater elevation falls to 1.4 feet, the gates will close.' The copy of the Structure S-13 description is attached.
- The northwestern portion of this project is located within THISCD which has a published wet season water table of 2.0 ft-NGVD.
- The North New River Canal located on the opposite side of I-595 from the TOC limits is tidal.

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(954) 739-6400
Fax (954) 739-6409

West Palm Beach

- The areas east and south of the TOC limits have a WSWT of 2.00 ft-NGVD as shown on the B.C. Map referenced above.
- The N-4 Canal, located along the west limits of the TOC, is hydraulically connected to the C-11. Given the close proximity to the S-13 structure and the fact that this canal serves THISCD with a DWL of 2.0, the DWL of this canal is essentially 2.0 or below.
- A map titled 'Sites with DWL < 3.0 Ft-NGVD' is enclosed illustrating sites within and adjacent to the TOC limits with a DWL less than 3.0 Ft-NGVD. If a control structure were installed at elevation 3.0 ft-NGVD pursuant to the CBWCD criteria, since the control elevations to the North, East, South and West are all at 2.0, the positive head will likely create groundwater flow to ultimately draw down the water level within the TOC until equilibrium is reach with the surrounding control elevations.

The above reasoning and the enclosed maps demonstrate that utilizing a DWL of 2.00 ft-NGVD within the TOC is sound engineering.

Please review and inform if you concur with our engineering reasoning so we can proceed to 'Request Conceptual Approval to Utilize 2.00 ft-NGVD' from the CBWCD.

Thank you in advance for your time and attention to this request. Please feel free to call me if you have any questions or need any additional information.

Sincerely,

CRAVEN THOMPSON & ASSOCIATES, INC.

WCL

William C. Lips, P.E.
Senior Engineer

Enclosures

cc: Mike Crowley, CBWCD
Andrea Ramudo, E.I., R.J. Behar & Company Inc.
Pat Gibney, P.E., CTA

STRUCTURE S-13

This structure is a pumping station with a gated spillway which can control flows which bypass the pumps. The structure is located in Canal 11 (South New River Canal) about 300 feet west of U.S. Highway 441 and 5½ miles southwest of Fort Lauderdale and is a reinforced concrete structure with concrete block superstructure. The pumping station is equipped with three Fairbanks Morse 60-inch Figure 6310W vertical propeller pumps each having a rated capacity of 180 c.f.s. at a 4-foot static head. Each pumping unit is driven through a Bradfoot Gear Works 2-stage right-angle reducer by a Detroit Diesel V-71 285 horsepower in-line diesel engine. At the south side of the station, there is a 16-foot wide by 11-foot high vertical lift gate which is raised or lowered by means of Baldor 3 Phase stem hoists. Operation of the gate hoist is normally controlled automatically but may be controlled manually during emergencies or for servicing. Other equipment includes a Wright 5-ton manually operated overhead bridge crane for general maintenance and a dual water stage recorder.

PURPOSE

The purpose of the structure is to release flood runoff from, prevent overdrainage of, and saltwater intrusion into the agricultural area served by Canal 11 (South New River Canal) west of the structure.

The purpose of the pumping units in the structure is to pump surplus water through Canal 11 from the agricultural area west of the structure at the rate of 3/4 inch per day from the tributary drainage area, so as to keep water level in the canal west of the structure at optimum elevation of 2.2 feet above mean sea level, insofar as practicable.

The purpose of the gated spillway in the structure is to release runoff from, prevent overdrainage of, and prevent intrusion of salt water into the agricultural area west of the structure.

OPERATION

This structure will be operated to maintain an optimum headwater elevation of 1.6 feet, when sufficient water is available to maintain this level.

Spillway Operation

The automatic controls on the spillway will function as follows:

When the headwater elevation rises to elevation 1.8 feet, the gate will open;

When the headwater elevation falls or rises to elevation 1.6 feet, the gate will become stationary;

When the headwater elevation falls to 1.4 feet, the gates will close.

In addition to maintaining optimum upstream freshwater control as described above, the automatic gate controls on this structure have an overriding control which closes the gates, regardless of the upstream water level in the rare event of a high flood tide, whenever the differential between the head and tailwater pool elevations reaches 0.2 feet.

A special timing device has been installed at this site to protect manatees during automatic gate operation. During this operation when the upstream float sensor indicates that the gate should open, the gate opens a minimum of 2.5 feet. If this opening results in a headwater stage below the gate close level, as it often does, the gate will begin to close and the normal automatic operation will take control.

Pump Operations

The pumps shall be operated whenever water level in Canal 11 westerly of the structure exceeds the optimum elevation of 2 1/2 feet above mean sea level and water level easterly thereof is less than 8 feet above mean sea level. In addition, the pumps will be used when either excessive rainfall and/or high tides are predicted which could compromise gravity operation. The manually controlled pumping units shall be started and stopped slowly, one at a time, so that surges do not occur in the canal.

FLOOD DISCHARGE CHARACTERISTICS

	Pump Design	Gravity Design
Discharge Rate	540 cfs	540 cfs
	* % SPF	* % SPF
Headwater Elevation	2.2 to 2.5 ft.	1.2 feet

Tailwater Elevation	6.2 to 6.5 ft.	1.0 feet
Type Discharge	Pumped	Submerged, uncontrolled

*Design flow not related to Standard Project Flood

DESCRIPTION OF STRUCTURE

Type Three pumping units and one gated spillway in reinforced concrete and concrete block structure

Spillway

Weir Crest

Net Length 16.0 feet

Elevation -8.0 feet

Service Bridge Elevation 8.0 feet

Water Level which will by-pass structure 8.0 feet

Gates

Number 1

Size 11.3 ft. high by 17.3 ft. wide

Type vertical lift

Bottom elevation of gates, full open 3.0 ft. Normal

9.0 ft. Maximum

Top elevation of gates, full closed 3.5 feet

CONTROL On-site, Automatic and remote by telemetry

Lifting Mechanism

Type Hoist Converted from direct drive electric motor gear connected to stem lifts to cable lifts December 2001.

Date of Transfer: November 1, 1954

ACCESS: Highway 441 to Orange Drive, west of 441 on south bank, in Davie

Pumping station

Number of Pumps 3

Size & Type of Pumps 60" vertical lift propeller type

Design rating 180 c.f.s. each

Propeller speed 191 r.p.m.

Pump Manufacturer Fairbanks Morse

Engine Make and Type General Motors, 6-cylinder in-line diesel

Engine Horsepower 275 each

Engine Speed 1625* r.p.m.

Gates (per bay)

Number 1

Location upstream

Type vertical lift

Size 16 feet wide by 11 feet high (clear opening)

Control manual

Lifting Mechanism direct drive electric motor gear connected to cable lifts

HYDRAULIC AND HYDROLOGIC MEASUREMENTS

Water Level On-site, upstream and downstream remote digital recorder.

Gate Position Recorder On-site - remote recorder

Rain Gauge remote digital recorder

Engine Tachometer: On-site remote digital recorder

Electric Power Source

Normal commercial electricity

Emergency diesel engine driven electric generator

SPILLWAY DEWATERING FACILITIES

Upstream and Downstream

Storage West Palm Beach Field Station

Type aluminum needles

Size and Number (per bay)

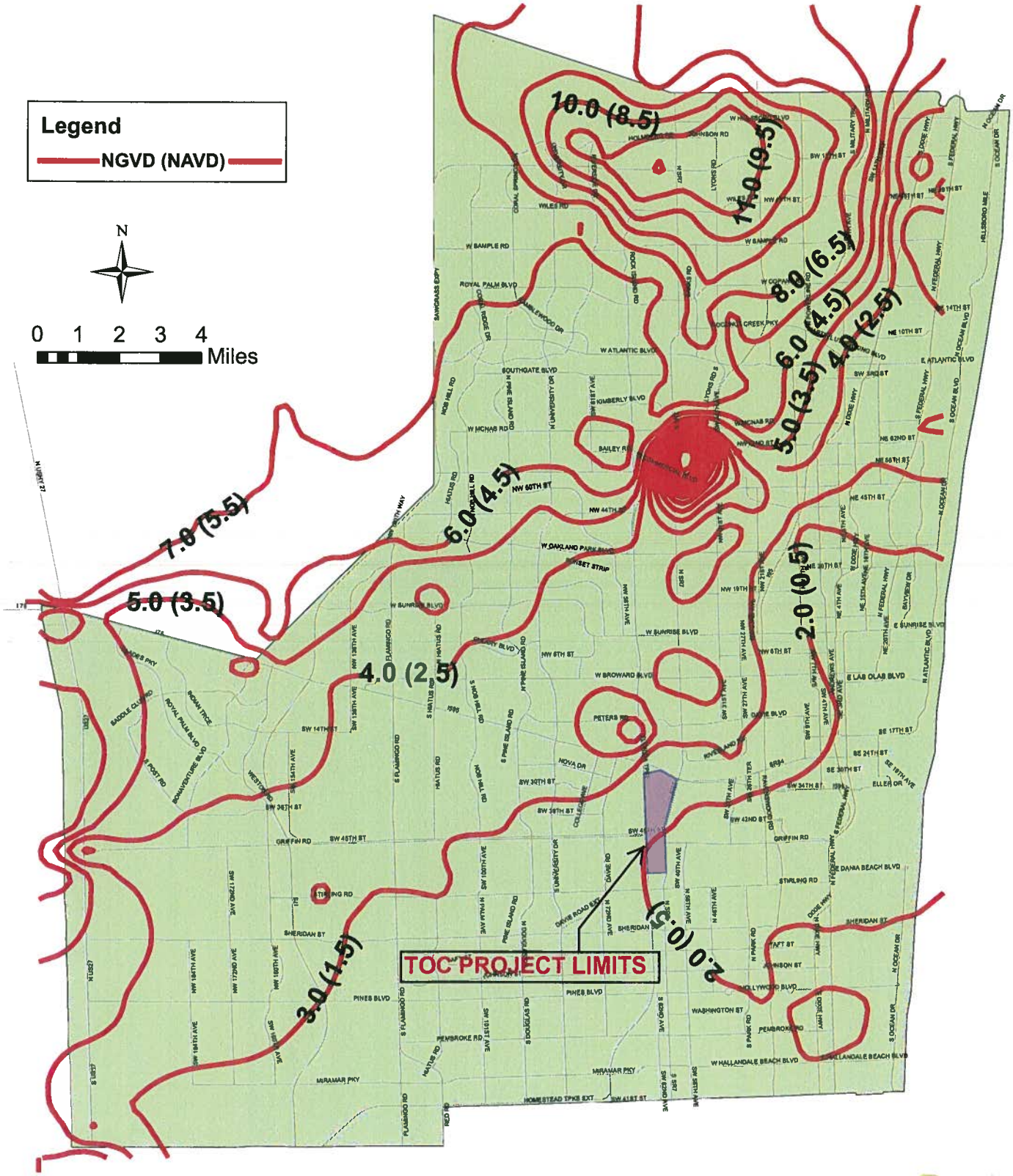
4 @ 4' wide

PUMP DEWATERING FACILITIES - None

*Engine speed was increased from 1200 to 1625 rpm with change in gear ratio to maintain design pump rpm when engines were replaced 10/94 - 2/95.

WATER TABLE MAP

Average Wet Season



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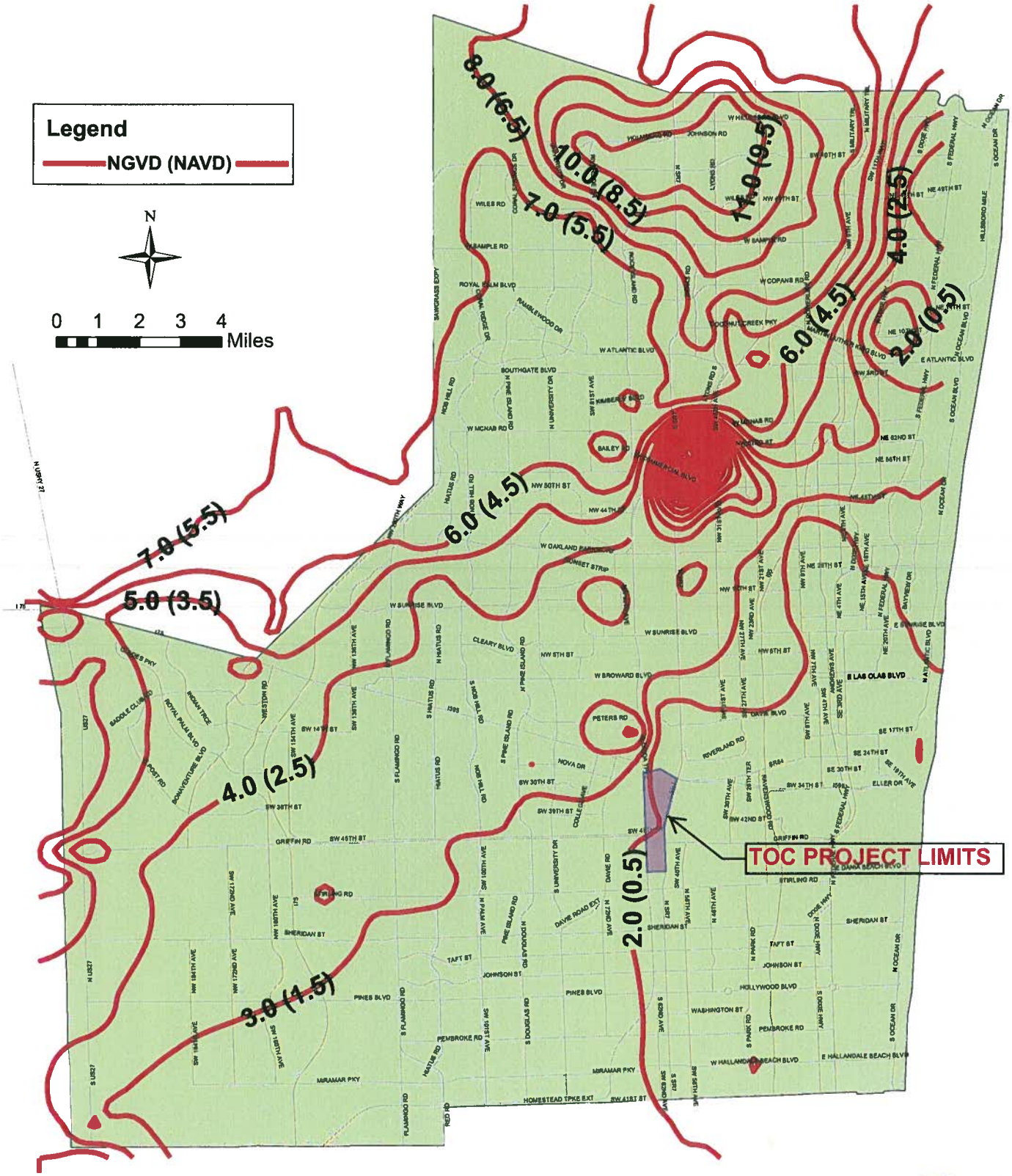
BROWARD COUNTY FLORIDA

WATER TABLE MAP

Average Dry Season



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BROWARD COUNTY FLORIDA

DATE	DESCRIPTION	BY	DATE

DATE: 3/29/12
SCALE: NTS
DESIGN BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

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TOWN OF DAVIE
TRANSIT ORIENTED CORRIDOR - STATE ROAD 7 DRI

PREPARED FOR:
TOWN OF DAVIE

SITES WITH DWL (3 FT-NGVD

PROJECT NO.
11-0009

SHEET 1 OF 1

Chris Lips

From: Chris Lips
Sent: Friday, September 07, 2012 4:32 PM
To: 'Andrea Virgin'
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan
Attachments: USGS FTl Water Table Map October 1977.pdf; BC WSWT 1980 & revised 1986.pdf; BC WSWT Map 3-27-2000.pdf; Latest BC WSWT MAP 2000.pdf; Response Letter to Behar 9.07.2012.pdf; THISCD Basin Map Exhibit.2012.pdf; THISCD Table 1.pdf; USGS Avg WSWT for years 1974--1982.pdf; USGS BC Water Table Map May 1972.pdf; USGS BC Water Table Map May 1978.pdf; USGS BC Water Table Map October 1976.pdf; USGS BC Water Table Map October 1977.pdf; USGS Ftl Water Table Map May 1977.pdf

Andrea,

Thank you for your review and consideration to our request for a variance from CBWCD to use a DWL of 2.0 ft-NGVD. We have reviewed and responded to the comments and have provided exhibits as requested. Please review the attached pdf files and let me know if you have any questions or need hard copies to be mailed.

Sincerely,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
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Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Monday, August 13, 2012 3:45 PM
To: Chris Lips
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

We are in receipt of the materials you sent in your email below, as well as the hard copies sent in the mail. In response to your request, please see below. These responses correlate to the bullet points provided in your letter, dated 7/26/12.

- *"The Broward County Map of the Average Wet Season Water Table reflects a 2.0 ft-NGVD contour bisecting the project and the 3.0 ft-NGVD contour is located entirely outside the project limits to the northwest. In addition the Broward County Map of the Average Dry Season Water Table shows that almost all of the TOC project limits are located within the 2.0 contour and the 3.0 ft-NGVD contour is located entirely outside the project limits to the northwest. Both maps are enclosed with the TOC limits superimposed."*

- **RESPONSE:**
  South of the C-11, a DWL of 2.0 appears to be applicable as much of this area has in fact been designed with a DWL of 2.0. However, a portion of the TOC project limits still lies outside of the 2.0 contour line on the BC WSWT Map. Although this portion does not specifically lie on the 3.0 contour, it still lies higher than the DWL you are asking to use. To confirm, please indicate what the ponds within this area were designed at. Were they designed to be controlled at the CBWCD DWL of 3.0? If not, please show evidence that they were designed lower and what those elevations were.

- *The SFWMD Structure S-13 which controls the C-11 east basin states that the structure is 'operated to maintain an optimum headwater elevation of 1.6 feet, when sufficient water is available to maintain this level.' And that the Spillway Operation will function as follows: 'When the headwater elevation rises to elevation 1.8 feet, the gate will open; When the headwater elevation falls or rises to elevation 1.6 feet, the gate will become stationary; When the headwater elevation falls to 1.4 feet, the gates will close.' The copy of the Structure S-13 description is attached.*
  - **RESPONSE:**
    Please notate the location of Structure S-13 on your Sheet 1 of 1 that was provided with your submittal.

    Also, will you be discharging directly to the C-11? If so will you be flowing through the same control structure? Or will you be discharging to the N-4? Please clarify.

- *The northwestern portion of this project is located within THISCD which has a published wet season water table of 2.0 ft-NGVD.*
  - **RESPONSE:**
    Please provide documentation supporting THISCD's published wet season water table of 2.0 ft-NGVD.

- *The areas east and south of the TOC limits have a WSWT of 2.00 ft-NGVD as shown on the B.C. Map referenced above.*
  - **RESPONSE:**
    Please confirm your assumption regarding the groundwater hydraulic gradient. The fact that the areas north and west are higher than the 2.0 ft-NGVD are based on sub-basin or district criteria and should not be taken as criteria for this project. Also, the control elevation (or DWL) is not always equal to the WSWT, but rather is usually higher and needs to be considered.

    Lastly, there still lies a portion of the TOC limits (mainly north of the C-11) that is outside the 2.0 contour and this area may have already been controlled at 3.0'. More clarification is needed or a higher DWL than 2.0 would need to be proposed.

- *The N-4 Canal, located along the west limits of the TOC, is hydraulically connected to the C-11. Given the close proximity to the S-13 structure and the fact that this canal serves THISCD with a DWL of 2.0, the DWL of this canal is essentially 2.0 or below.*
  - **RESPONSE:**
    Please reference in your plan sheet where Structure S-13 lies in proximity to the TOC project limits.

    Also, the N-4 is designed using CBWCD's control elevation of 3.0 NGVD (1.6 NAVD). Although it is hydraulically connected, if discharging to the N-4, the same control elevation would need to be maintained.

    Lastly, please confirm what the ponds within the TOC north of the C-11 were designed to be controlled at.

- *A map titled 'Sites with DWL < 3.0 Ft-NGVD' is enclosed illustrating sites within and adjacent to the TOC limits with a DWL less than 3.0 Ft-NGVD. If a control structure were installed at elevation 3.0 ft-NGVD pursuant to the CBWCD criteria, since the control elevations to the North, East, South and West are all at 2.0, the positive head will likely create groundwater flow to ultimately draw down the water level within the TOC until equilibrium is reach with the surrounding control elevations.*
    - **RESPONSE:**
      The area of the TOC south of the C-11 warrants a DWL of 2.0' since this area used this same control elevation. However, the area within CBWCD north of the C-11 is higher than 2.0' on the WSWT BC Map and may have already been designed using a control elevation of 3.0'. Please review and provide confirmation showing what this area is controlled at.

      It would appear that this area would need to be treated differently than the area to the south of C-11.

In summary, we are in agreement that perhaps the 3.0 ft-NGVD DWL may not be applicable within the TOC limits south of the C-11, but do not yet agree with lowering the DWL to 2.0 ft-NGVD in the areas north of the C-11. After your review of the responses above, if you can provide further documentation supporting your request to use a DWL of 2.0 ft-NGVD in these areas, please do so. Otherwise, you may propose an alternative that would better suit the conditions within this portion of the TOC project limits. Also, please provide all other requested documentation.

After your review of these responses, if you have any questions or would like further clarification, please feel free to contact me. Thank you and I look forward to your reply.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Thursday, July 26, 2012 11:52 AM
To: Javier Rodriguez
Cc: Pat Gibney; Andrea Virgin; District Manager
Subject: Town of Davie TOC Stormwater Master Plan

Mr. Rodriquez,

A cover letter requesting a variance from CBWCD stipulated DWL of 3.00 ft-NGVD at attached as a pdf file, along with other exhibits. Original Hard copies will be sent in the mail. Please review and inform if you have any questions or comments.

Regards,

Chris Lips, P.E.

CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

September 7, 2012

Ms. Andrea Virgin, P.E.
R.J. Behar & Company, Inc.
6861 SW 196th Avenue, Suite 302
Pembroke Pines, Florida 33332

RE: TOWN OF DAVIE TRANSIT ORIENTED CORRIDOR (T.O.C.) STORMWATER MASTER PLAN
CBWCD—VARIANCE REQUEST FOR DWL OF 2.00 FT-NGVD WITHIN T.O.C.
CT&A PROJECT NO. 11-0009

Dear Ms. Virgin:

CRAVEN THOMPSON
& ASSOCIATES INC.

Engineers
Planners
Surveyors

Craven Thompson & Associates have received and reviewed your comments dated August 13, 2012. We are pleased with your acknowledgment that utilizing a DWL of 2.00 ft-NGVD makes sound engineering sense for the portion of the TOC south of the C-11 canal. We also recognize the concerns expressed in your comments regarding the portion north of the C-11. Below we will respond to your comments and more clearly identify the reasons that utilizing a DWL of 2.00 ft-NGVD makes sound engineering sense, for the portion of the TOC north of the C-11. However, prior to responding to the comments, we will identify some historical wet season water tables and drainage patterns within the portion of the TOC north of the C-11 canal which were not previously explained.

The Wet Season Water Table (WSWT) Maps have evolved over time as demonstrated on the three attached Broward County WSWT Maps dating back to 1980. The most recent B.C. WSWT map, dated 2000, shows a 3.0 ft-NGVD contour bisecting THISCD which is perplexing since the THISCD basins are controlled at 2.0 & 2.5 ft-NGVD. We contacted Carl Archie, P.E. Engineer IV of Broward County to inquire why the WSWT Maps of 1980 and 2000 were different and why the latest map showed a 3.0 ft-NGVD contour through THISCD, which has a DWL of 2.0 ft-NGVD and the contours do not reflect an influence from Structures S-13 or G-54, the salinity barrier structures for the C-11 and North New River Canal respectively. Mr. Archie replied that the latest Broward County WSWT Map is rough at best and has been found to be inaccurate in places and suggested searching for WSWT Maps from the USGS. Many USGS Maps for Broward County were found and are enclosed for your review, depicting the entire TOC limits to be within or below the 2.0 ft-NGVD contour. Recognizing the multiple USGS Maps and two former B.C. WSWT Maps which all depict a water table of 2.0 ft-NGVD within the TOC limits, no adverse impacts should be expected if the control is set at 2.0 ft-NGVD for the TOC. On the other hand, if the control is set above the historical water table and above existing projects which were designed pursuant to the historical water table maps having a lower control elevation, adverse impacts can be expected.

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West Palm Beach

We further researched the USGS website and found reports and maps which date back to the 1940's showing the progression of canals which were dug to drain the land and protect areas from flooding as well as structures which were built to retain freshwater for droughts and reduce saltwater intrusion. One concept that was made clear in the various reports was that "Canal seepage has a major effect on water levels due to the highly transmissive nature of the surficial aquifer system in southeastern Florida. Canals display both gaining or losing flow characteristics depending on whether ground water is discharged from the surficial aquifer system to canals or surface water in canals seeps into the aquifer system." Taken from USGS Website article titled 'Impact of Anthropogenic Development on Coastal Ground-Water Hydrology in Southeastern Florida 1900-2000.' Recognizing the above described phenomenon and considering the linear water bodies surrounding the TOC such as the C-11, N-1, N-4, North New River Canal, and including the bulk of water bodies within THISCD and the ditch which extends north from the C-11 through the eastern part of the TOC, collectively these bodies serve to draw the water table (surficial aquifer) within the TOC to resemble the levels within these bodies. The C-11 is maintained below 2.0 ft-NGVD and hydraulically connected to the N-1, N-4, THISCD and the ditch mentioned above. The ditch and its significance will be described below. THISCD is permitted to be controlled at 2.0 ft-NGVD, with discharge through the N-4 canal to the C-11. Therefore, the CBWCD N-4 cannot be separated from the C-11 without adversely affecting historical flows from THISCD. Recognizing the existing hydraulic gradient from the TOC to the surrounding and internal water bodies, all having a control elevation of 2.0 ft-NGVD or below, validates the use of a DWL of 2.0 ft-NGVD within the TOC.

The ditch mentioned above was constructed in the 1950's west of S.R. 7, from the C-11 canal north to the S.R. 84 Spur Road. This ditch was designed with an invert of -4.97 ft-NGVD at the south end and -1.33 ft-NGVD at the previous intersection of the 84 Spur Road, serving to drain the surrounding areas into the C-11 canal. Over the years, a majority of this ditch has been modified but still serves to drain the surrounding areas. The southernmost portion of the ditch has been widened and is currently known as the CBWCD N-1 canal. The ditch section between the N-1 canal and Oakes road has been culverted and filled in. The ditch section north of Oakes road still exists as a ditch, but is unmaintained and overgrown with vegetation. The northernmost reaches of the ditch have been disconnected, culverted and rerouted eastward to the S.R. 7 Right-of-Way line.

Many properties along the ditch were developed assuming the ditch is hydraulically connected to the C-11 canal and utilizing a DWL or HWL between 2.00—3.00 ft-NGVD. **Exhibit 1A** is enclosed and depicts the <u>known</u> properties that discharge into the N-1 Canal, the culverted ditch and the open ditch section which were designed with a DWL below 3.00 ft-NGVD. For many sites however, no record drawings or permit files were found particularly north of Oakes Road, to evaluate the control elevation of their respective design. Below is a description of the properties identified on the exhibit.

- S.W. 47th Avenue is directly connected to the N-1 Canal via culverts and with no control structure.
- Existing Storage Warehouse Projects located just north of Orange Drive, on the west side of S.W. 47th Avenue, discharge into a wet retention pond that is directly connected via culverts to the N-1 canal. The engineering plans identify the DWL of the N-1 canal as 2.0 ft-NGVD.
- Similarly, the existing Storage Warehouse Projects located just north of Orange Drive, on the east side of S.W. 47th Avenue, discharge into a wet retention pond. The pond is connected via a control structure and culverts to the N-1 canal, with a bleed down orifice at invert elevation 2.50 ft-NGVD.

- A commercial development located at the northwest intersection of Orange Drive and S.R. 7 was designed utilizing exfiltration trench with invert elevations of 2.50 ft-NGVD. The permit for this project states the control elevation is 2.50 ft-NGVD.
- Oakes Road and Burris Road were designed with interconnected culverts having outfalls to a wet retention pond, a dry retention pond and the lateral ditch No. 1. The engineering plans identify the DWL of 2.00 ft-NGVD in the wet retention pond.
- An Industrial Site located north of Oakes Road, was designed with a dry retention pond bottom elevation of 3.50 ft-NGVD and an outfall into the existing ditch. The plans show the ditch with a DWL = 2.00 ft-NGVD.
- The southwestern intersection of the I-595 and S.R. 7, with a tributary area of approximately 13 acres has an outfall into a 54-inch culvert, which is the northernmost extension of the ditch. The ICPR model from the recent I-595 expansion project identifies the tailwater conditions of this outfall with a time vs. stage node, resembling the stages of the North New River Canal, which have a starting and ending elevations of 1.40 ft-NGVD.

  The original I-595 engineering plans show the existing ditch, but identified on the plans as an existing canal. The subject plans identify the canal with a D.W.S.=1.80 ft-NGVD and include a proposed culvert outfall into the ditch at invert elevation 1.46 ft-NGVD.

Pursuant to previous discussions with the District Manager Mike Crowley, the proposed TOC Master Plan should consist of a control structure hydraulically separating the N-1 canal from the C-11, controlling discharge to 40 CSM maximum from the TOC into the C-11 canal. Also, a control structure should be installed north of Oakes Road, to ensure 40 CSM maximum discharge from the ditch into CBWCD. If the control structures are set with bleed down mechanisms higher than the DWL of existing properties, the properties will be adversely affected. However, if the bleed down mechanisms are set at the original DWL of the ditch, adverse affects will be reduced and projects designed with higher DWL should not be adversely affected. While impacts to select properties are to be anticipated and considered in the master planning, historical flow patterns outside the TOC limits must also be considered and maintained, namely the FDOT runoff from I-595 & S.R. 7.

I trust the above clarifications are sufficient for CBWCD to recognize and justify approving a variance for the use of a DWL of 2.0 ft-NGVD within the TOC. However, to ensure the initial review questions are specifically addressed, the comments are provided below followed by a response in bold font.

1. Please indicate what the ponds within this area were designed at. Were they designed to be controlled at the CBWCD DWL of 3.0? If not, please show evidence that they were designed lower and what those elevations were.

   Aerial Exhibit 1B is attached showing the properties that were designed with a DWL less than 3.00 ft-NGVD.

2. Please notate the location of Structure S-13 on your Sheet 1 of 1 that was provided with your submittal.

   Structure S-13 is located just west of S.R. 7 and has been identified on Exhibits 1A & 1B.

3. Also, will you be discharging directly to the C-11? If so will you be flowing through the same control structure? Or will you be discharging to the N-4? Please clarify.

   Discharge south of the C-11 will be directly into the C-11 through one control structure. Discharge north of the C-11 will be into the N-1 canal, as previously described above. In addition, the portion of the TOC within THISCD will maintain the same drainage patterns, ultimately discharging into the N-4 canal.

4. Please provide documentation supporting THISCD's published wet season water table of 2.0 ft-NGVD.

   Documentation is enclosed identifying THISCD's published wet season water table as well as a map of the THISCD Basin Map Exhibit. The TOC lies within THISCD Basin C.

5. Please confirm your assumption regarding the groundwater hydraulic gradient. The fact that the areas north and west are higher than the 2.0 ft-NGVD are based on sub-basin or district criteria and should not be taken as criteria for this project. Also, the control elevation (or DWL) is not always equal to the WSWT, but rather is usually higher and needs to be considered.

   Our assumption regarding the groundwater hydraulic gradient is based on the surrounding areas and water bodies which are tidal or maintained at elevations 2.00 ft-NGVD or below. Exhibit 1B is attached showing the TOC portion north of the C-11 illustrating the canals and lakes that are maintained at or below elevation 2.00 ft-NGVD.

   We agree that the control elevation is not always equal to the WSWT, but as described previously, if a control elevation is raised above a previously designed control elevation, existing properties could be adversely impacted.

6. There still lies a portion of the TOC limits (mainly north of the C-11) that is outside the 2.0 contour and this area may have already been controlled at 3.0'. More clarification is needed or a higher DWL than 2.0 would need to be proposed

   An aerial exhibit is attached showing the properties that were designed with a DWL less than 3.00 ft-NGVD. There are projects north of the C-11 which were designed with DWL of 3.0 ft-NGVD, 2.50 ft-NGVD and 2.0 ft-NGVD. Master planning all of these properties under one control structure has reduced adverse impacts if the control is set at the lowest of the existing controls.

7. The N-4 is designed using CBWCD's control elevation of 3.0 NGVD (1.6 NAVD). Although it is hydraulically connected, if discharging to the N-4, the same control elevation would need to be maintained.

   No discharge from this project is proposed directly into the N-4 canal. However, the portion of the TOC which is within THISCD does historically and will continue to flow into the N-4 canal, with a 2.0 ft-NGVD control elevation.

8. Please confirm what the ponds within the TOC north of the C-11 were designed to be controlled at.

As explained above, the existing ponds within the TOC north of the C-11 were designed at various elevations ranging from 2.0, 2.5 and 3.0 ft-NGVD.

9. The area within CBWCD north of the C-11 is higher than 2.0' on the WSWT BC Map and may have already been designed using a control elevation of 3.0'. Please review and provide confirmation showing what this area is controlled at.

   As previously explained, the projects north of the C-11 have been designed using varying control elevations between 2.00 and 3.00 ft-NGVD. Utilizing all of the previous WSWT Maps published by Broward County identifies historical WSWT of 2.0 ft-NGVD within the TOC. Since the latest BC WSWT Map shows the 3.0 ft-NGVD contour clearly outside the TOC limits and since all previous maps showed the TOC clearly within the 2.0 ft-NGVD contour and recognizing that existing projects within the TOC limits were designed with various control elevations between 2.0—3.0 ft-NGVD, the control elevation that would best suite the existing and future projects north of the C-11 is 2.00 ft-NGVD.

If CBWCD agrees with the above responses please inform so we can proceed to 'Request Conceptual Approval to Utilize a DWL of 2.00 ft-NGVD' from the CBWCD.

Please feel free to call me if you have any questions or need any additional information.

Sincerely,

CRAVEN THOMPSON & ASSOCIATES, INC.

William C. Lips, P.E.
Senior Engineer

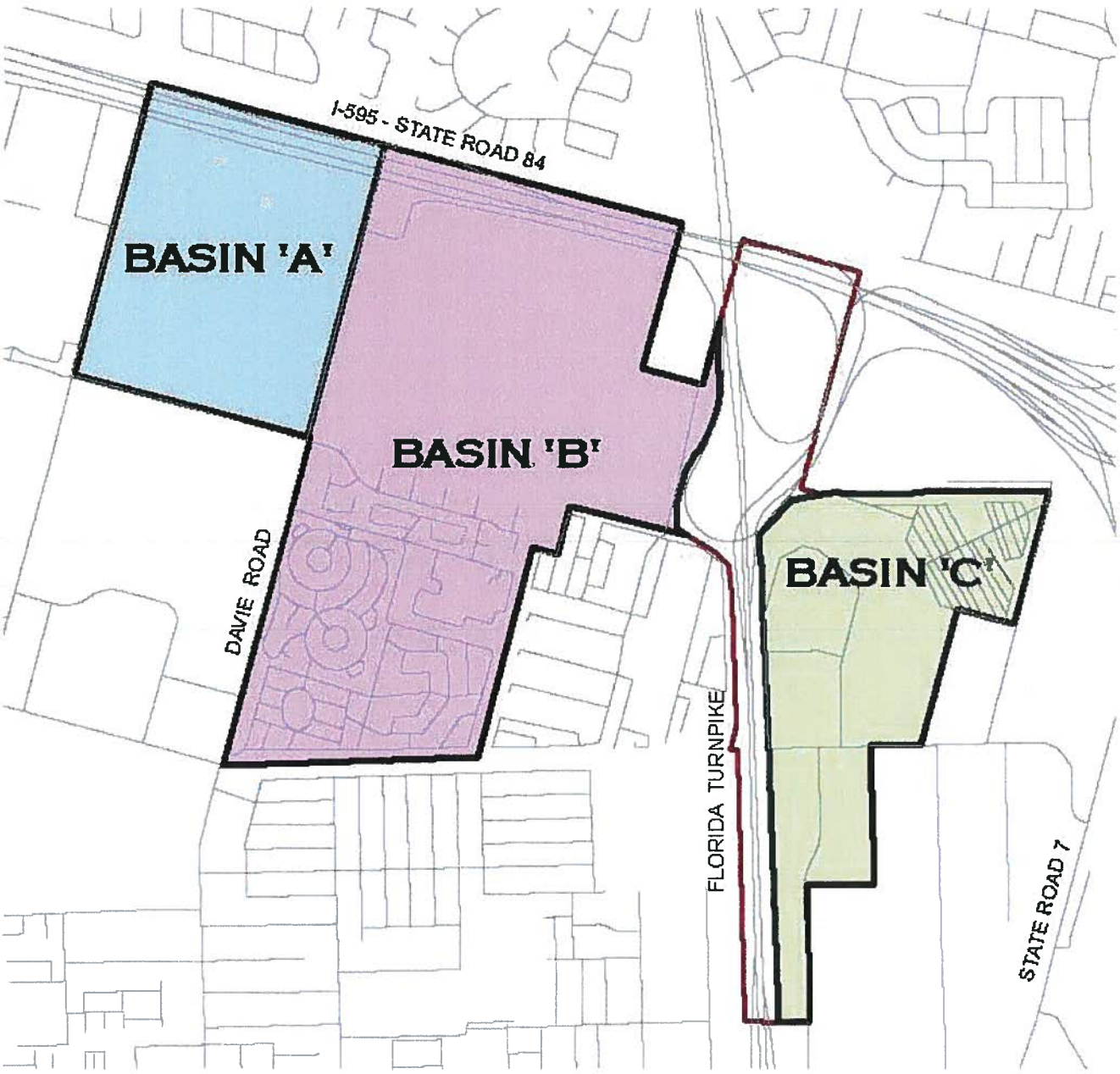
Enclosures

cc: Mike Crowley, CBWCD
Javier Rodriquez, P.E., R.J. Behar & Company Inc.
Pat Gibney, P.E., CTA

EXHIBIT

TINDALL HAMMOCK
IRRIGATION & SOIL CONSERVATION DISTRICT

2007 DRAINAGE BASINS



CRAVEN THOMPSON & ASSOCIATES, INC.
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www.craventhompson.com

CTA Project No.
04-0168-001-02

SEPTEMBER 23, 2008 RDP

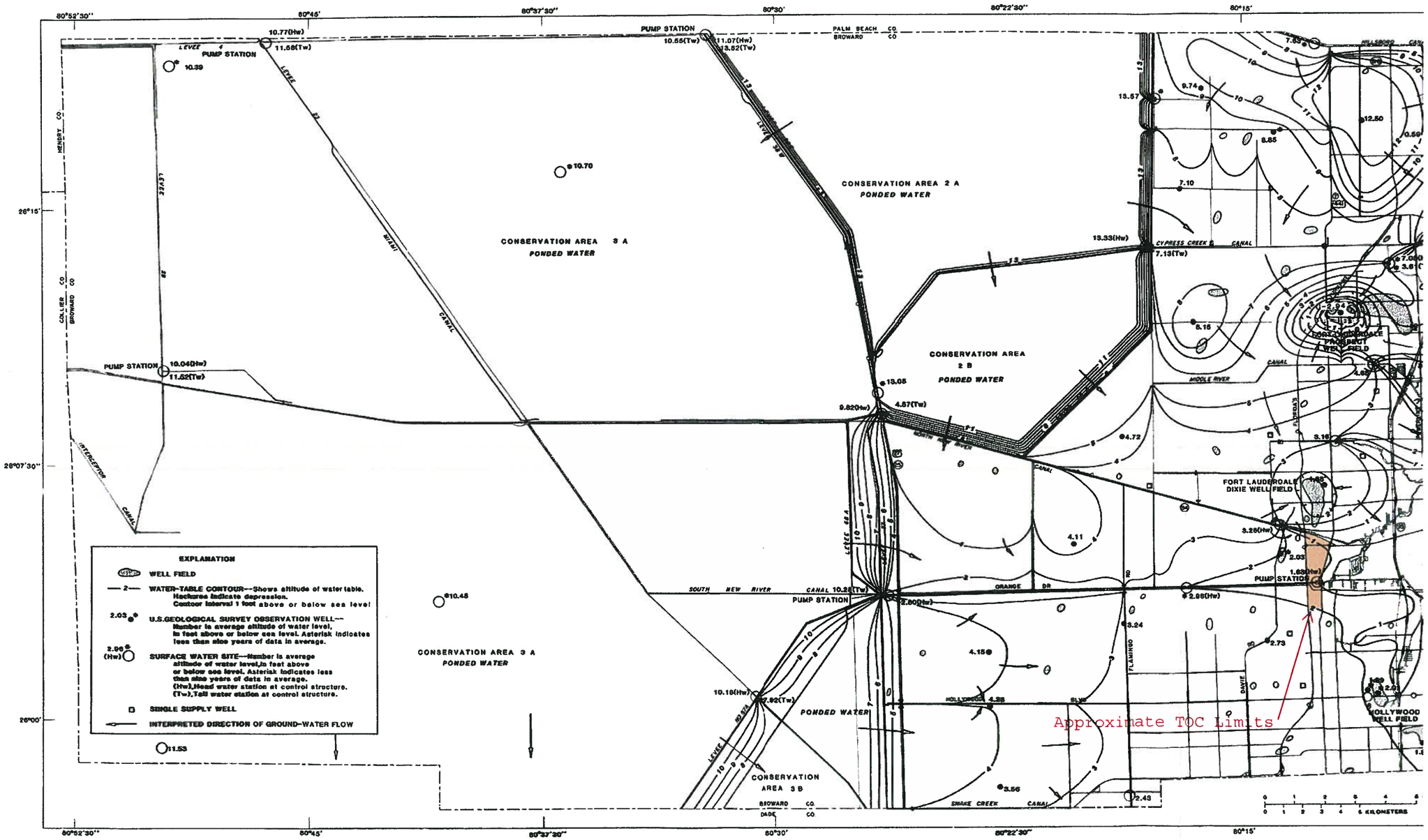
TABLE I

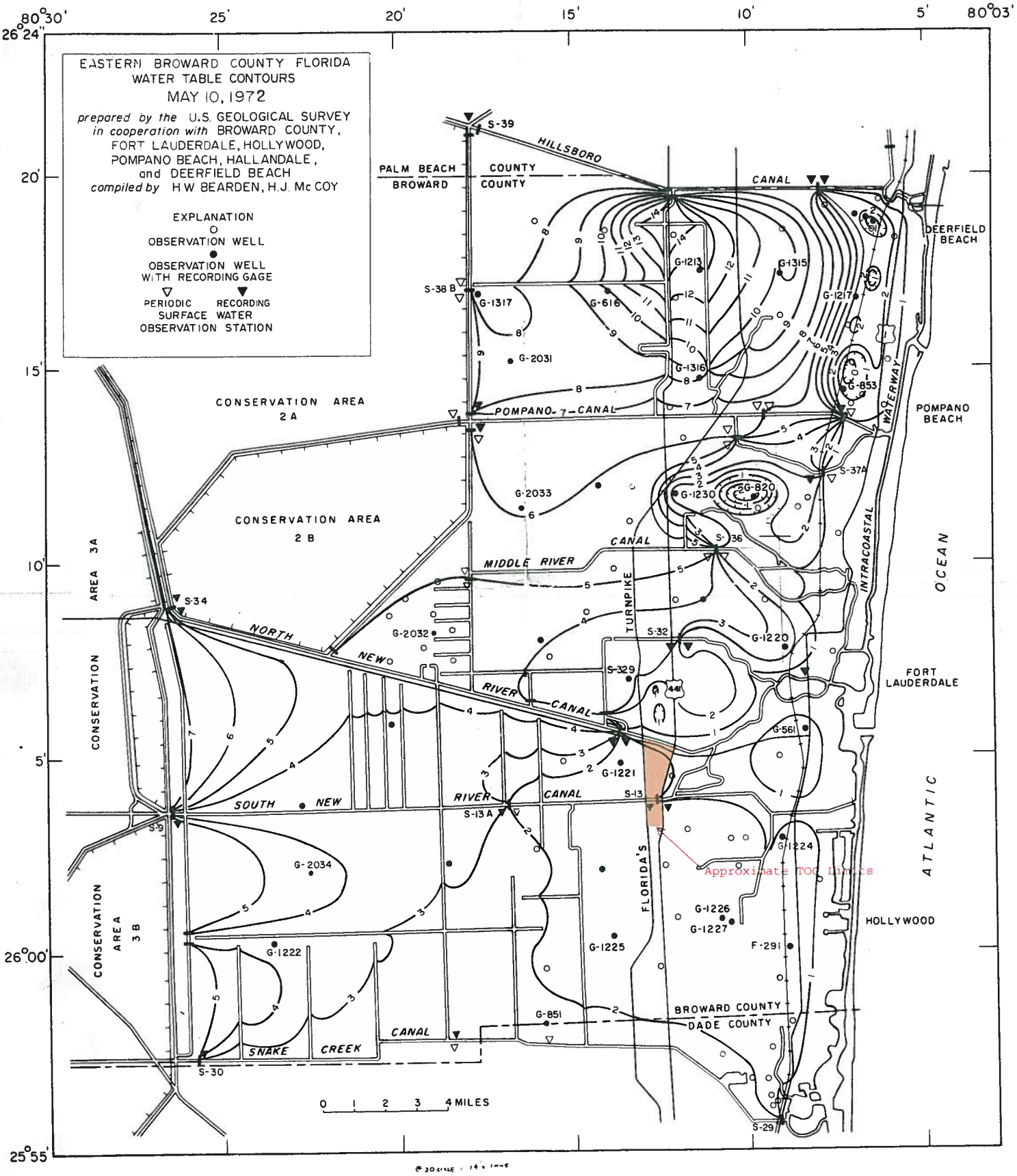
SURFACE WATER MANAGEMENT DATA FOR TINDALL HAMMOCK IRRIGATION AND SOIL CONSERVATION DISTRICT

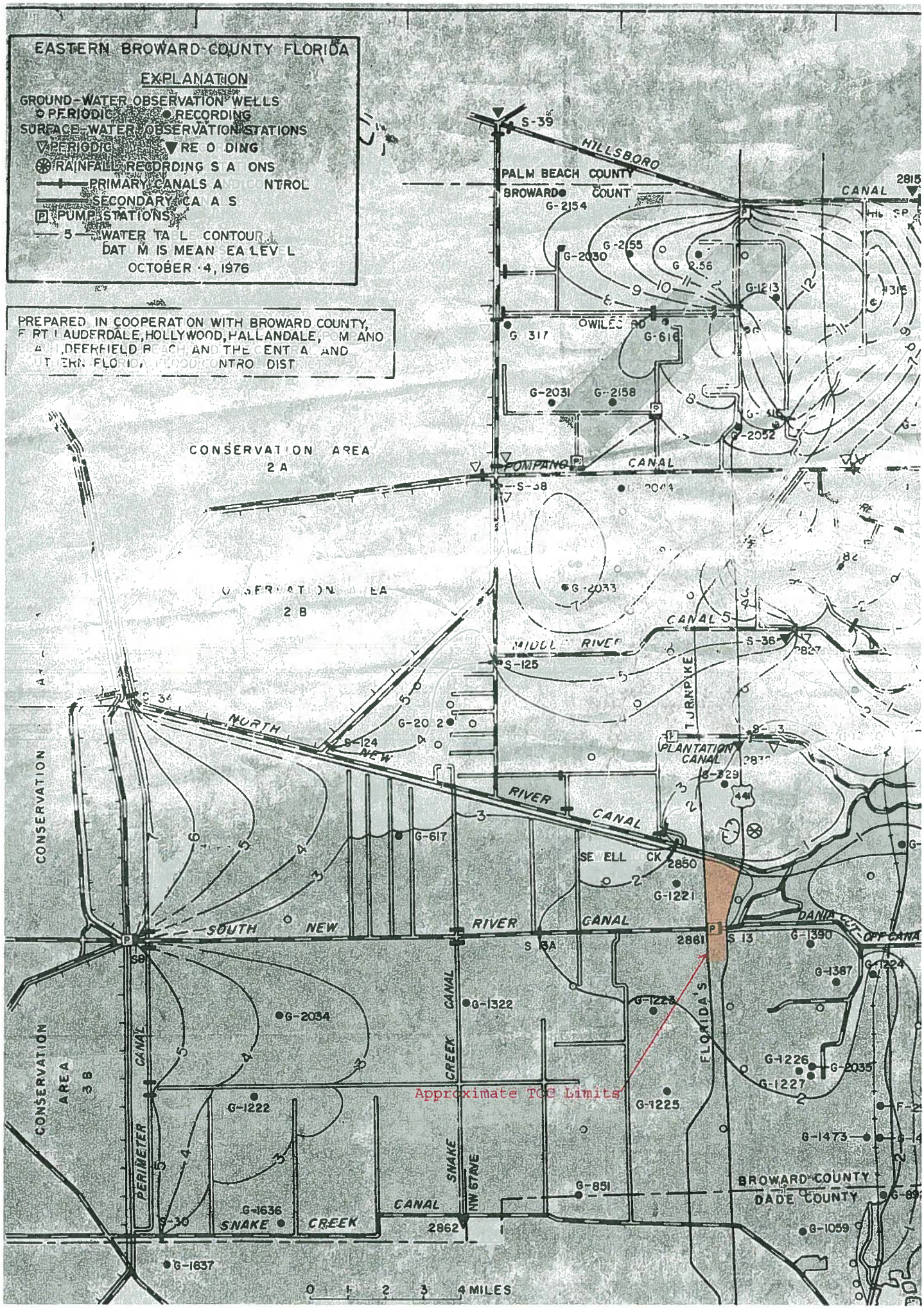
Drainage Basin	Basin Control Elevation	10-Year Flood Elevation	100-Year Flood Elevation	Minimum Finished Floor Elevation	Required Minimum Storage at 10-Year Elevation (AF/ac)*	Required Minimum Storage at 100-Year Elevation (AF/ac)*
A	2.5	6.5	8.0	8.0	129	248
B	2.0	6.5	7.5	7.5		
C	2.0	6.0	7.0	7.5		

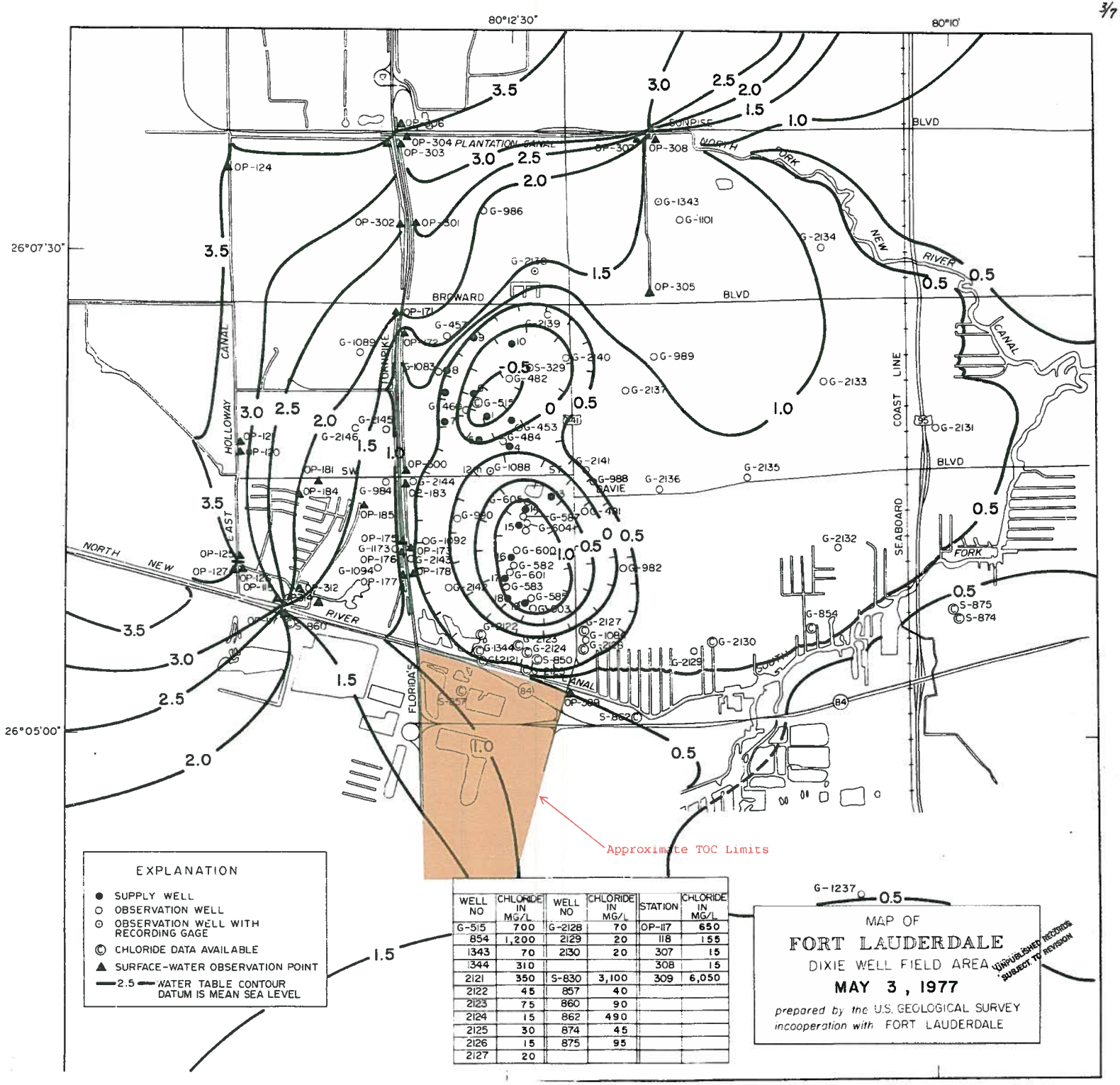
* (AF/ac) Storage required per acre of open area.

NOTE: All elevations referenced to NGVD.

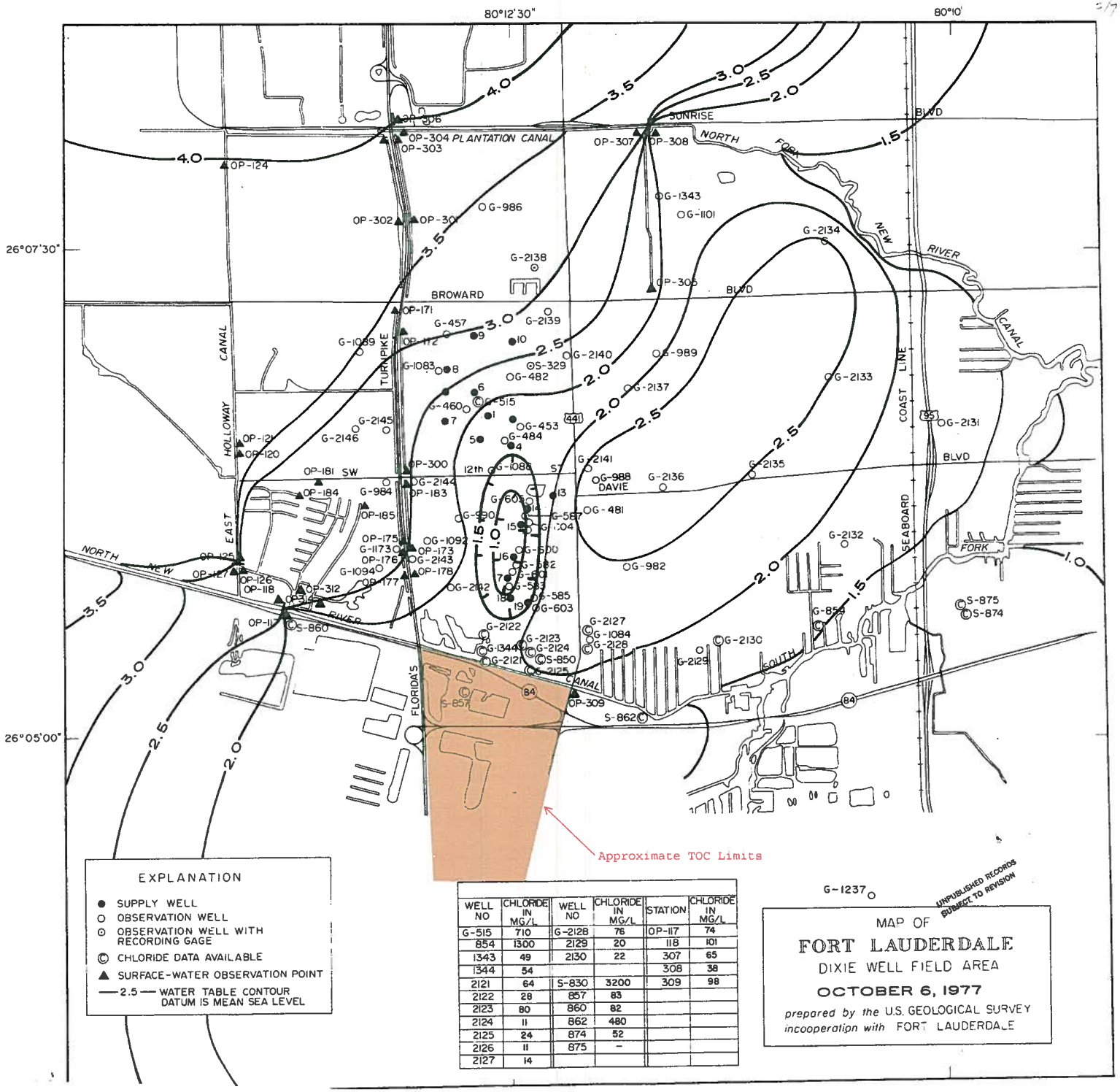

80°52'30"
80°45'
80°37'30"
80°30'
80°22'30"
80°15'
26°15'
26°07'30"
26°00'
PUMP STATION
10.77(Hw)
11.58(Tw)
10.39
10.55(Tw)
11.07(Hw)
3.62(Tw)
PALM BEACH CO
BROWARD CO
HENDRY CO
COLLIER CO
BROWARD CO
LEVEE 4
LEVEE 31
LEVEE 28
LEVEE 29
LEVEE 30
LEVEE 31A
LEVEE 31B
LEVEE 32A
LEVEE 32B
MIAMI CANAL
INTERCEPTOR CANAL
10.70
CONSERVATION AREA 3 A
PONDED WATER
CONSERVATION AREA 2 A
PONDED WATER
CONSERVATION AREA
2 B
PONDED WATER
13.57
9.74
8.85
12.50
7.10
13.33(Hw)
7.13(Tw)
CYPRESS CREEK CANAL
8.16
MIDDLE RIVER CANAL
PONDED WATER
PUMP STATION
10.04(Hw)
11.52(Tw)
13.05
9.82(Hw)
4.57(Tw)
4.72
3.16
FORT LAUDERDALE
DIXIE WELL FIELD
4.11
3.26(Hw)
2.03
1.63(Hw)
PUMP STATION
SOUTH NEW RIVER CANAL
10.28(Tw)
PUMP STATION
2.60(Hw)
ORANGE DR
2.98(Hw)
3.24
FLAMINGO RD
2.73
DAVIE RD
4.15
HOLLYWOOD 4.25
SILVER
10.45
CONSERVATION AREA 3 A
PONDED WATER
10.18(Hw)
7.92(Tw)
PONDED WATER
LEVEE 32A
LEVEE 32B
CONSERVATION
AREA 3 B
BROWARD CO
DADE CO
2.56
SNAKE CREEK CANAL
2.43
HOLLYWOOD
WELL FIELD
Approximate TOC Limits
11.53
EXPLANATION
WELL FIELD
WATER-TABLE CONTOUR--Shows altitude of water table. Hachures indicate depression. Contour interval 1 foot above or below sea level
U.S.GEOLOGICAL SURVEY OBSERVATION WELL--Number is average altitude of water level, in feet above or below sea level. Asterisk indicates less than nine years of data in average.
SURFACE WATER SITE--Number is average altitude of water level,in feet above or below sea level. Asterisk indicates less than nine years of data in average. (Hw),Head water station at control structure. (Tw),Tail water station at control structure.
SINGLE SUPPLY WELL
INTERPRETED DIRECTION OF GROUND-WATER FLOW
0 1 2 3 4 5 KILOMETERS


EASTERN BROWARD COUNTY FLORIDA
WATER TABLE CONTOURS
MAY 10, 1972
prepared by the U.S. GEOLOGICAL SURVEY
in cooperation with BROWARD COUNTY,
FORT LAUDERDALE, HOLLYWOOD,
POMPANO BEACH, HALLANDALE,
and DEERFIELD BEACH
compiled by H.W. BEARDEN, H.J. Mc COY
EXPLANATION
OBSERVATION WELL
OBSERVATION WELL WITH RECORDING GAGE
PERIODIC SURFACE WATER OBSERVATION STATION
RECORDING
80°30'
25'
20'
15'
10'
5'
80°03'
26°24'
20'
15'
10'
5'
26°00'
25°55'
S-39
HILLSBORO
CANAL
PALM BEACH COUNTY
BROWARD COUNTY
DEERFIELD BEACH
S-38 B
G-1317
G-616
G-1213
G-1315
G-1217
G-2031
G-1316
G-853
CONSERVATION AREA 2 A
POMPANO CANAL
POMPANO BEACH
WATERWAY
S-37A
G-2033
G-1230
G-820
CONSERVATION AREA 2 B
CANAL
S-36
MIDDLE RIVER
INTRACOASTAL
OCEAN
AREA 3A
S-34
NORTH NEW RIVER CANAL
TURNPIKE
G-2032
S-32
G-1220
S-329
FORT LAUDERDALE
CONSERVATION
G-561
G-1221
SOUTH NEW RIVER CANAL
S-13
S-13A
S-9
G-1224
ATLANTIC
Approximate TOC Limits
G-2034
FLORIDA'S
G-1226
G-1227
HOLLYWOOD
CONSERVATION AREA 3 B
G-1222
G-1225
F-291
BROWARD COUNTY
DADE COUNTY
G-851
CANAL
SNAKE CREEK
S-30
0 1 2 3 4 MILES
S-29


EASTERN BROWARD COUNTY FLORIDA
EXPLANATION
GROUND-WATER OBSERVATION WELLS
PERIODIC
RECORDING
SURFACE-WATER OBSERVATION STATIONS
PERIODIC
RECORDING
RAINFALL RECORDING STATIONS
PRIMARY CANALS AND CONTROL
SECONDARY CANALS
PUMP STATIONS
WATER TABLE CONTOUR
DATUM IS MEAN SEA LEVEL
OCTOBER 4, 1976
PREPARED IN COOPERATION WITH BROWARD COUNTY, FORT LAUDERDALE, HOLLYWOOD, HALLANDALE, POMPANO BEACH, DEERFIELD BEACH AND THE CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DIST
PALM BEACH COUNTY
BROWARD COUNTY
HILLSBORO
CANAL
S-39
G-2154
G-2030
G-2155
G-2156
G-1213
G-317
G-616
G-2031
G-2158
G-2052
POMPANO
CANAL
S-38
CONSERVATION AREA 2A
CONSERVATION AREA 2B
G-2033
MIDDLE RIVER
CANAL
S-36
S-125
TURNPIKE
NORTH NEW RIVER CANAL
S-124
PLANTATION CANAL
G-329
G-617
SEWELL CK
2850
G-1221
SOUTH NEW RIVER CANAL
2861
S-13
G-1390
DANIA CUT-OFF CANAL
G-1387
G-1224
G-1322
G-1223
G-2034
CONSERVATION AREA 3B
PERIMETER CANAL
SNAKE CREEK CANAL
FLORIDA'S
G-1226
G-2035
G-1227
Approximate TCC Limits
G-1222
G-1225
G-1473
NW 67 AVE
G-851
BROWARD COUNTY
DADE COUNTY
G-1636
SNAKE CREEK CANAL
2862
G-1059
G-1637
0 1 2 3 4 MILES



WELL NO	CHLORIDE IN MG/L	WELL NO	CHLORIDE IN MG/L	STATION	CHLORIDE IN MG/L
G-515	700	G-2128	70	OP-117	650
854	1,200	2129	20	118	155
1343	70	2130	20	307	15
1344	310			308	15
2121	350	S-830	3,100	309	6,050
2122	45	857	40		
2123	75	860	90		
2124	15	862	490		
2125	30	874	45		
2126	15	875	95		
2127	20				



EXPLANATION

- ● SUPPLY WELL
- ○ OBSERVATION WELL
- ⊙ OBSERVATION WELL WITH RECORDING GAGE
- © CHLORIDE DATA AVAILABLE
- ▲ SURFACE-WATER OBSERVATION POINT
- —2.5— WATER TABLE CONTOUR DATUM IS MEAN SEA LEVEL

WELL NO	CHLORIDE IN MG/L	WELL NO	CHLORIDE IN MG/L	STATION	CHLORIDE IN MG/L
G-515	710	G-2128	76	OP-117	74
854	1300	2129	20	118	101
1343	49	2130	22	307	65
1344	54			308	38
2121	64	S-830	3200	309	98
2122	28	857	83		
2123	80	860	82		
2124	11	862	480		
2125	24	874	52		
2126	11	875	–		
2127	14				

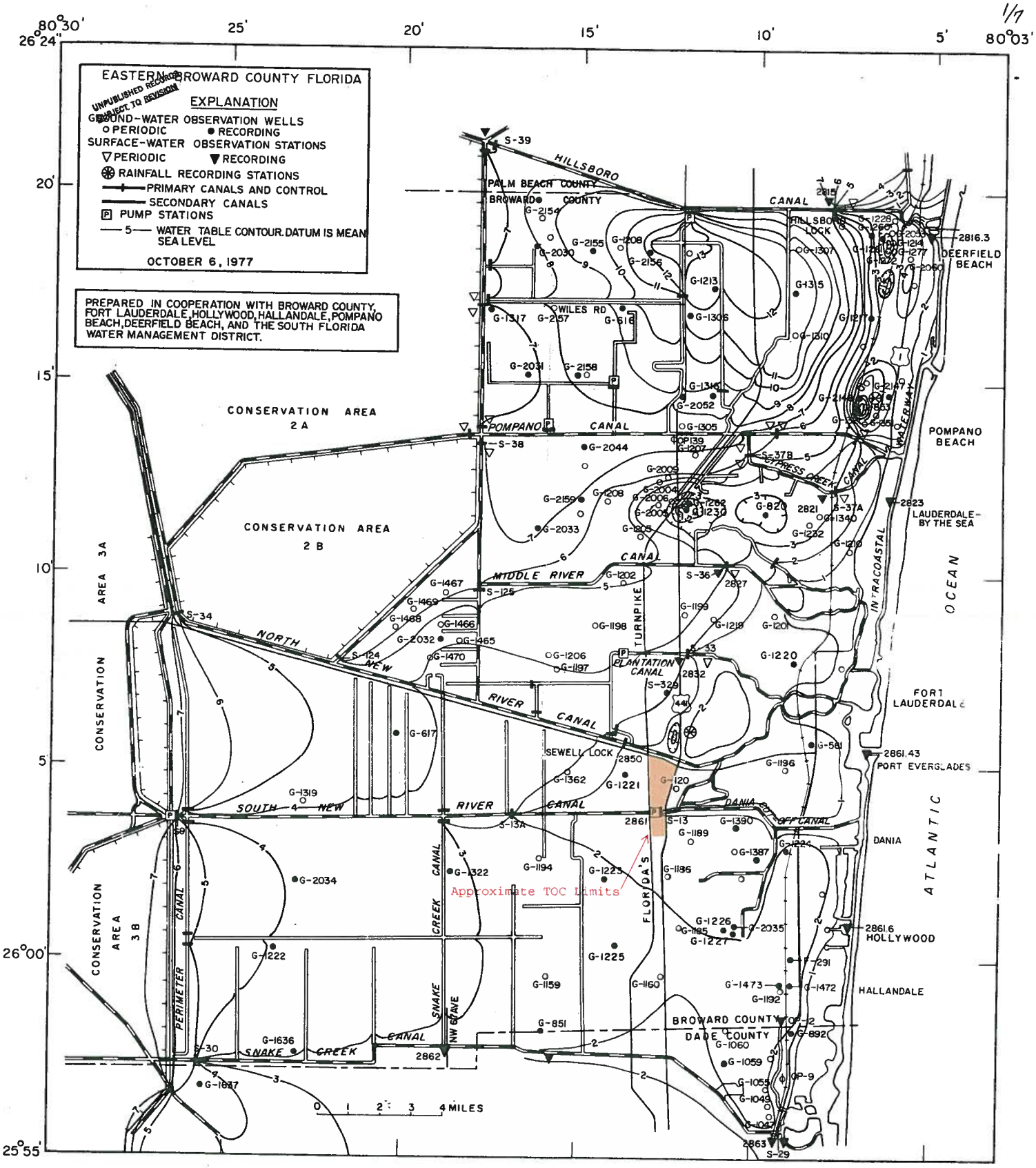
MAP OF

FORT LAUDERDALE

DIXIE WELL FIELD AREA

OCTOBER 6, 1977

prepared by the U.S. GEOLOGICAL SURVEY *incooperation with* FORT LAUDERDALE



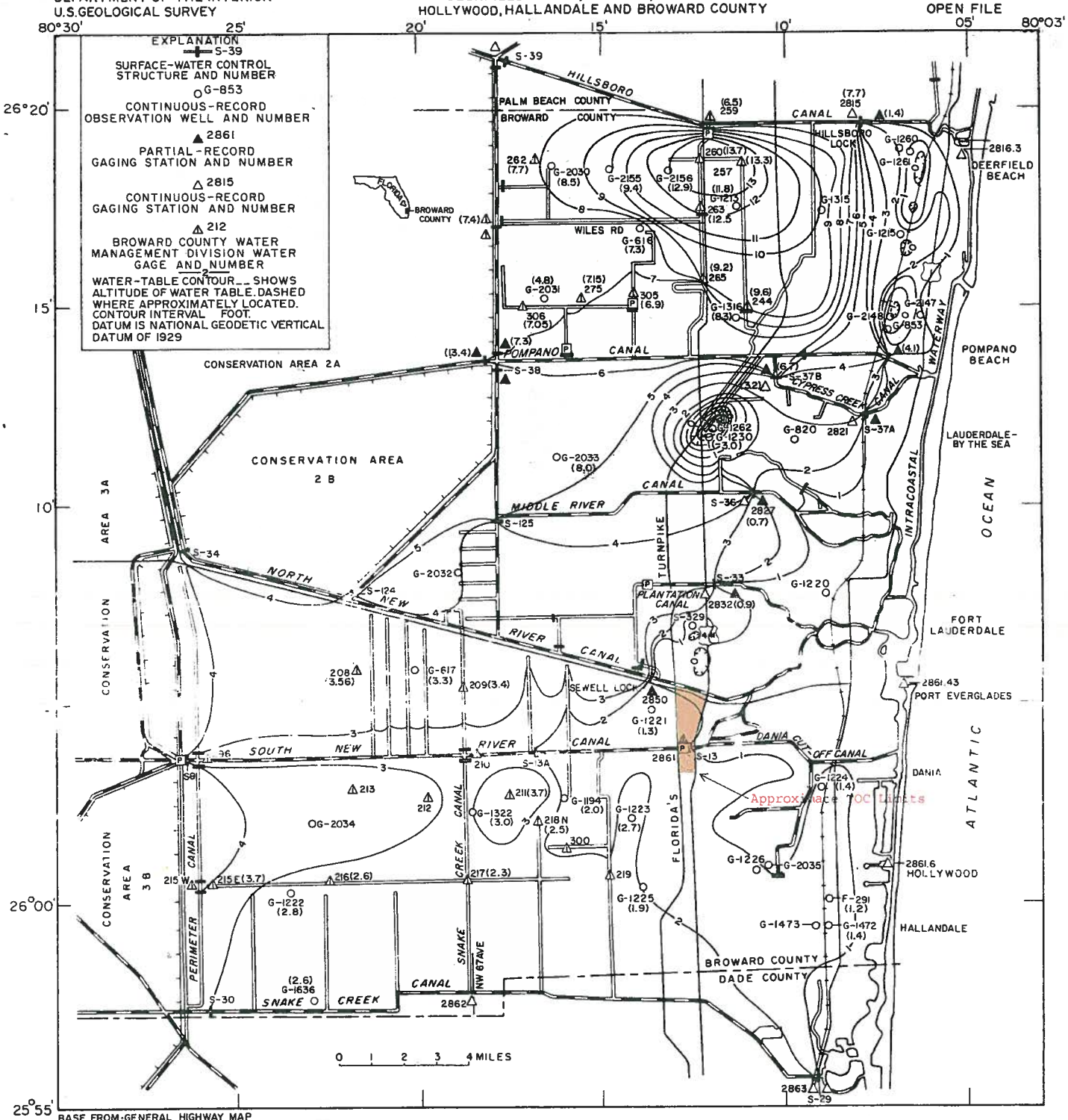
UNPUBLISHED RECORDS
SUBJECT TO REVISION

EARLY MAY, 1978

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
DEERFIELD BEACH, POMPANO, FT. LAUDERDALE
HOLLYWOOD, HALLANDALE AND BROWARD COUNTY

OPEN FILE



BASE FROM: GENERAL HIGHWAY MAP
BROWARD COUNTY, 1969

UNPUBLISHED RECORDS SUBJECT TO REVISION

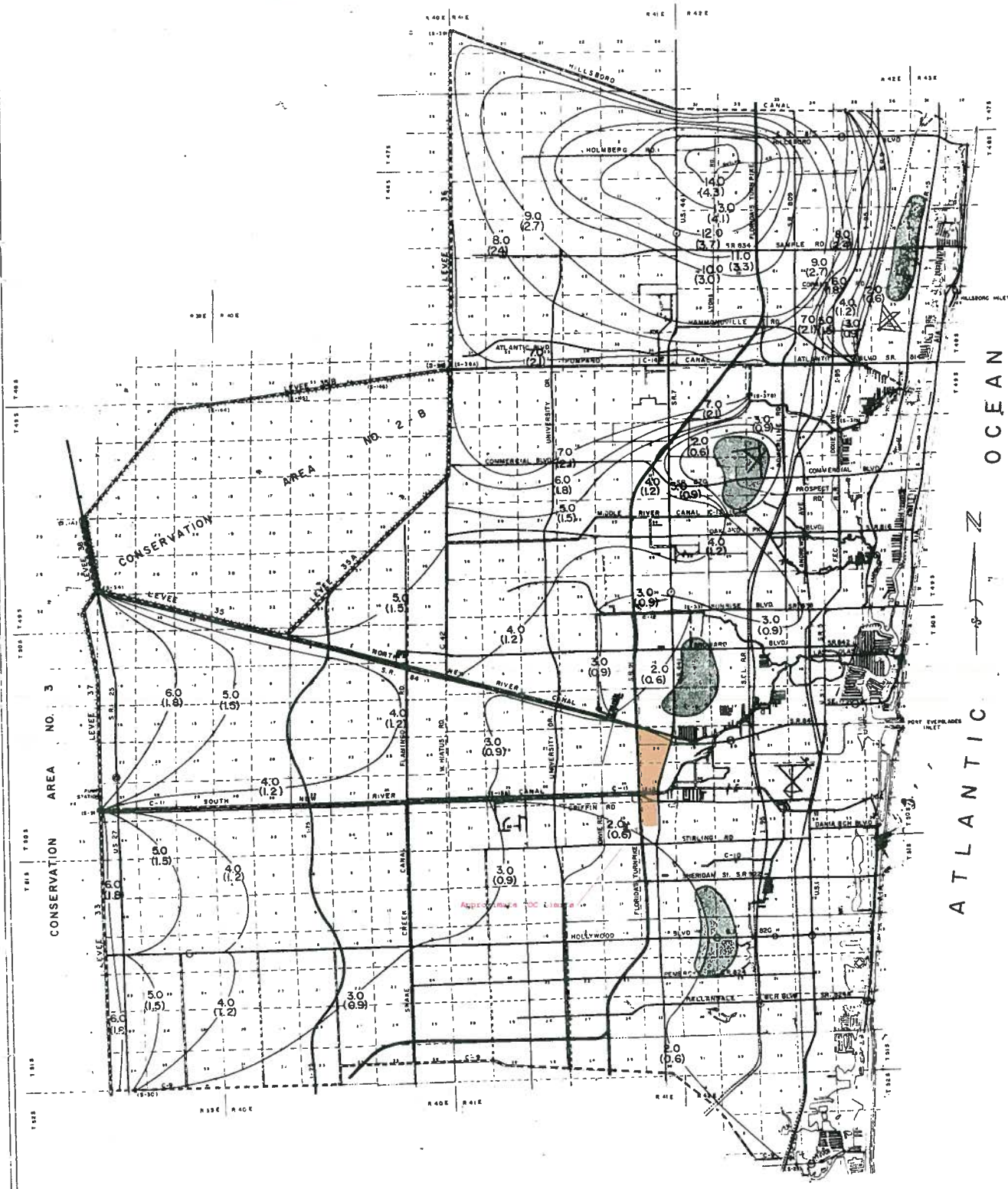
ALTITUDE OF WATER TABLE OF THE BISCAYNE AQUIFER IN EASTERN BROWARD COUNTY, FL.

EARLY MAY, 1978

By Gary M. Russell

LEGEND

PRIMARY CANALS
SECONDARY CANALS
LEVEE WITH BORROW CANAL
AREAS OF LOWER WATER LEVEL DUE TO WELL FIELD PUMPING



NOV 9 8 1988

BOARD OF COUNTY COMMISSIONERS
BROWARD COUNTY, FLORIDA

AVERAGE WET SEASON WATER LEVELS

SCALE IN MILES

BROWARD COUNTY TRANSPORTATION DEPT.
WATER MANAGEMENT DIVISION

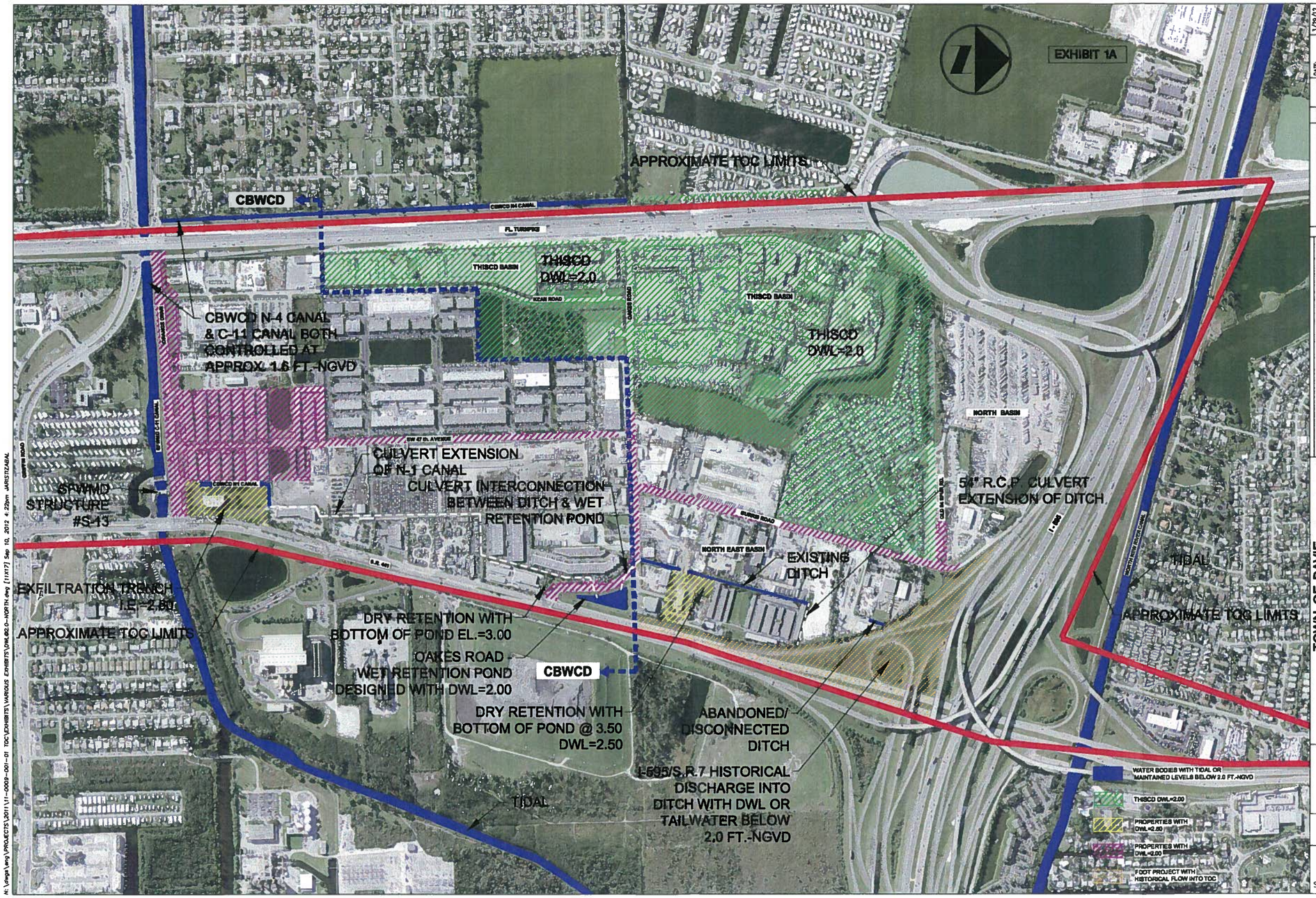
DRAWING ENHANCED DEC. 2, 1988
BOK. AUG. 1988

DATE DEC. 1980 SHEET ONE OF ONE

WATER TABLE MAP
Wet Season

Broward County Office of
Environmental Services
Water Management Division

March 27, 2000
Wetsea2234.apr



DATE:	3/29/12		
SCALE:	NTS		
DESIGN BY:			
DRAWN BY:			
CHECKED BY:			
APPROVED BY:			
DESCRIPTION:	BY:	DATE:	

CRAVEN · THOMPSON AND ASSOCIATES, INC.
ENGINEERS · PLANNERS · SURVEYORS
3243 N.W. 53RD STREET, FORT LAUDERDALE, FLORIDA 33309
FAX: (954) 739-6409 TEL.: (954) 739-6400
FLORIDA LICENSED ENGINEERING, SURVEYING & MAPPING BUSINESS No. 271
FLORIDA LICENSED LANDSCAPE ARCHITECTURE & BUSINESS No. 2000011

TOWN OF DAVIE
TRANSIT ORIENTED CORRIDOR - STATE ROAD 7 DRI
PREPARED FOR:
TOWN OF DAVIE

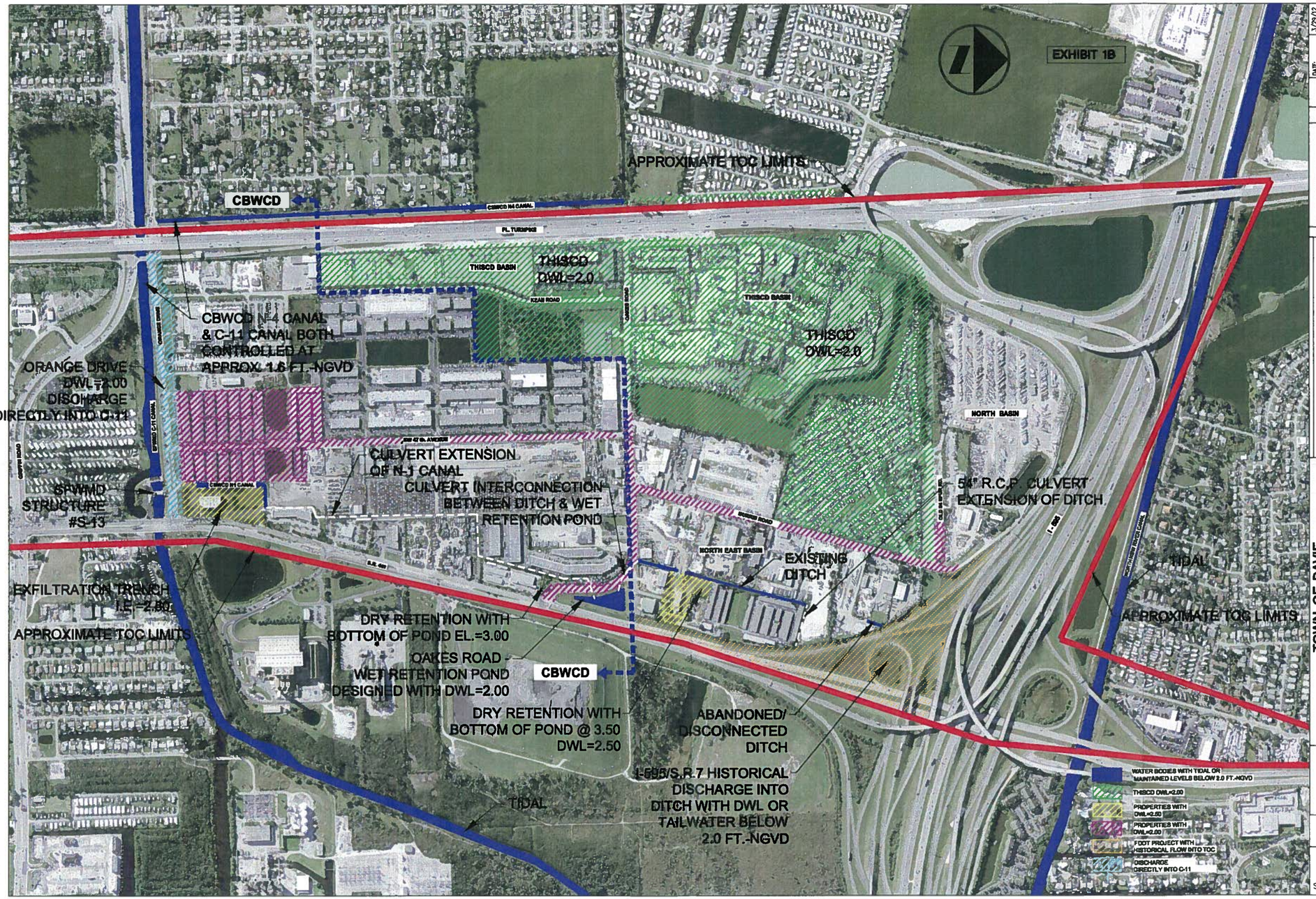
SITES WITH DWL (3 FT-NGVD NORTH OF C-11 CANAL

PROJECT NO.
11-0009

EXHIBIT 1A

SHEET 1 OF 1

N:\dwg\dwg\PROJECTS\2011\11-0009-001-01 TOC\EXHIBITS\VARIOUS EXHIBITS\DWLBEL0-NORTH.dwg [11X17] Sep 10, 2012 4:22pm JARISTIZABAL



DATE:	3/29/12
SCALE:	NTS
DESIGN BY:	
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APPROVED BY:	

DATE:	BY:	DESCRIPTION

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LICENSED ENGINEERS, PLANNERS, SURVEYORS & LANDSCAPE ARCHITECTS

TOWN OF DAVIE
TRANSIT ORIENTED CORRIDOR - STATE ROAD 7 DRI
PREPARED FOR:
TOWN OF DAVIE

SITES WITH DWL (3 FT-NGVD NORTH OF C-11 CANAL

PROJECT NO.
11-0009

EXHIBIT 1B

SHEET 1 OF 1

N:\dwg\wrg\PROJECTS\2011\11-0009-001-01 TOC\EXHIBITS\VARIOUS EXHIBITS\EXHIBIT-1B.dwg [11X17] Sep 10, 2012 4:26pm JARSTEZABAL

Chris Lips

From: Chris Lips
Sent: Tuesday, September 18, 2012 11:42 AM
To: 'Andrea Virgin'
Cc: Javier Rodriguez; Pat Gibney
Subject: RE: Town of Davie TOC Stormwater Master Plan

Andrea,

As explained during our telephone conversation, the only difference between the two exhibits is that Orange Drive has a different hatch pattern identifying that Orange Drive does not discharge into the N-1 canal but directly into the C-11. Orange Drive is identified as having a DWL of 2.0 ft-NGVD.

As you requested, below is a description of the adverse impacts that could be expected if the control elevation is raised above the control of existing projects:

1. Dry Retention Ponds, designed per SFWMD minimum criteria of 1-foot above the WSWT, would be less than this criteria creating soggy areas that are difficult to maintain and more prone to standing water, consequently increasing mosquito populations.
2. Decreased ground storage and decreased storage in exfiltration trench systems, resulting in higher flood stages, increased frequency of flooding and elongated time of recovery. The flooding could make parking areas wet and unusable as well as increased depth of street flooding creating access problems.
3. Redevelopment for the same parcel would be more costly because a higher control elevation requires more land to be set aside for stormwater retention or requires more exfiltration trench to be constructed to store the required runoff volumes, as there is a net loose of 1 ac-ft of storage per acre of a retention pond if the control elevation is raised from 2.0 to 3.0 ft-NGVD.

Please let me know if you have any further questions.

Regards,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Tuesday, September 18, 2012 9:20 AM
To: Chris Lips
Cc: Javier Rodriguez
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

We will be providing our response to you by the end of the day today.

To confirm, what is the difference between Exhibits 1A and 1B? I only see a difference in the hatching along Orange Drive, but unsure why two different exhibits were made. Not a big deal, just making sure I'm not missing any other difference.

Thank you in advance for the clarification.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Monday, September 10, 2012 4:37 PM
To: Andrea Virgin
Cc: Javier Rodriguez
Subject: RE: Town of Davie TOC Stormwater Master Plan

Andrea,

I mistakenly forgot these exhibits. Sorry for this oversight. They are attached as pdf files.

Regards,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Monday, September 10, 2012 4:11 PM
To: Chris Lips
Cc: Javier Rodriguez
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

Were Exhibits 1A and 1B attached? I do not see them listed within the attachments in your email.

Thank you in advance for the clarification.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Friday, September 07, 2012 4:32 PM
To: Andrea Virgin
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Andrea,

Thank you for your review and consideration to our request for a variance from CBWCD to use a DWL of 2.0 ft-NGVD. We have reviewed and responded to the comments and have provided exhibits as requested. Please review the attached pdf files and let me know if you have any questions or need hard copies to be mailed.

Sincerely,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Monday, August 13, 2012 3:45 PM
To: Chris Lips
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

We are in receipt of the materials you sent in your email below, as well as the hard copies sent in the mail. In response to your request, please see below. These responses correlate to the bullet points provided in your letter, dated 7/26/12.

- *"The Broward County Map of the Average Wet Season Water Table reflects a 2.0 ft-NGVD contour bisecting the project and the 3.0 ft-NGVD contour is located entirely outside the project limits to the northwest. In addition the Broward County Map of the Average Dry Season Water Table shows that almost all of the TOC project limits are located within the 2.0 contour and the 3.0 ft-NGVD contour is located entirely outside the project limits to the northwest. Both maps are enclosed with the TOC limits superimposed."*
    - **RESPONSE:**
      South of the C-11, a DWL of 2.0 appears to be applicable as much of this area has in fact been designed with a DWL of 2.0. However, a portion of the TOC project limits still lies outside of the 2.0 contour line on the BC WSWT Map. Although this portion does not specifically lie on the 3.0 contour, it still lies higher than the DWL you are asking to use. To confirm, please indicate what the ponds within this area were designed at. Were they designed to be controlled at the CBWCD DWL of 3.0? If not, please show evidence that they were designed lower and what those elevations were.

- *The SFWMD Structure S-13 which controls the C-11 east basin states that the structure is 'operated to maintain an optimum headwater elevation of 1.6 feet, when sufficient water is available to maintain this level.' And that the Spillway Operation will function as follows: 'When the headwater elevation rises to elevation 1.8 feet, the gate will open; When the headwater elevation falls or rises to elevation 1.6 feet, the gate will become stationary; When the headwater elevation falls to 1.4 feet, the gates will close.' The copy of the Structure S-13 description is attached.*
    - **RESPONSE:**
      Please notate the location of Structure S-13 on your Sheet 1 of 1 that was provided with your submittal.

      Also, will you be discharging directly to the C-11? If so will you be flowing through the same control structure? Or will you be discharging to the N-4? Please clarify.

- *The northwestern portion of this project is located within THISCD which has a published wet season water table of 2.0 ft-NGVD.*
    - **RESPONSE:**
      Please provide documentation supporting THISCD's published wet season water table of 2.0 ft-NGVD.

- *The areas east and south of the TOC limits have a WSWT of 2.00 ft-NGVD as shown on the B.C. Map referenced above.*
    - **RESPONSE:**
      Please confirm your assumption regarding the groundwater hydraulic gradient. The fact that the areas north and west are higher than the 2.0 ft-NGVD are based on sub-basin or district criteria and should not be taken as criteria for this project. Also, the control elevation (or DWL) is not always equal to the WSWT, but rather is usually higher and needs to be considered.

      Lastly, there still lies a portion of the TOC limits (mainly north of the C-11) that is outside the 2.0 contour and this area may have already been controlled at 3.0'. More clarification is needed or a higher DWL than 2.0 would need to be proposed.

- *The N-4 Canal, located along the west limits of the TOC, is hydraulically connected to the C-11. Given the close proximity to the S-13 structure and the fact that this canal serves THISCD with a DWL of 2.0, the DWL of this canal is essentially 2.0 or below.*
    - **RESPONSE:**
      Please reference in your plan sheet where Structure S-13 lies in proximity to the TOC project limits.

      Also, the N-4 is designed using CBWCD's control elevation of 3.0 NGVD (1.6 NAVD). Although it is hydraulically connected, if discharging to the N-4, the same control elevation would need to be maintained.

      Lastly, please confirm what the ponds within the TOC north of the C-11 were designed to be controlled at.

- *A map titled 'Sites with DWL < 3.0 Ft-NGVD' is enclosed illustrating sites within and adjacent to the TOC limits with a DWL less than 3.0 Ft-NGVD. If a control structure were installed at elevation 3.0 ft-NGVD pursuant to the CBWCD criteria, since the control elevations to the North, East, South and West are all at 2.0, the positive head will likely create groundwater flow to ultimately draw down the water level within the TOC until equilibrium is reach with the surrounding control elevations.*
    - **RESPONSE:**
      The area of the TOC south of the C-11 warrants a DWL of 2.0' since this area used this same control elevation. However, the area within CBWCD north of the C-11 is higher than 2.0' on the WSWT BC Map and may have already been designed using a control elevation of 3.0'. Please review and provide confirmation showing what this area is controlled at.

      It would appear that this area would need to be treated differently than the area to the south of C-11.

In summary, we are in agreement that perhaps the 3.0 ft-NGVD DWL may not be applicable within the TOC limits south of the C-11, but do not yet agree with lowering the DWL to 2.0 ft-NGVD in the areas north of the C-11. After your review of the responses above, if you can provide further documentation supporting your request to use a DWL of 2.0 ft-NGVD in these areas, please do so. Otherwise, you may propose an alternative that would better suit the conditions within this portion of the TOC project limits. Also, please provide all other requested documentation.

After your review of these responses, if you have any questions or would like further clarification, please feel free to contact me. Thank you and I look forward to your reply.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Thursday, July 26, 2012 11:52 AM

To: Javier Rodriguez
Cc: Pat Gibney; Andrea Virgin; District Manager
Subject: Town of Davie TOC Stormwater Master Plan

Mr. Rodriquez,

A cover letter requesting a variance from CBWCD stipulated DWL of 3.00 ft-NGVD at attached as a pdf file, along with other exhibits. Original Hard copies will be sent in the mail. Please review and inform if you have any questions or comments.

Regards,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

Chris Lips

From: Chris Lips
Sent: Tuesday, September 25, 2012 12:45 PM
To: 'Andrea Virgin'
Cc: Javier Rodriguez; Pat Gibney; districtmanager@centralbrowardwcd.org; 'David Quigley'; Rod Ley
Subject: RE: Town of Davie TOC Stormwater Master Plan

Andrea,

I look forward to meeting again in hopes to resolve any remaining concerns regarding our request for a variance to utilize at WSWT elevation of 2.0 ft-NGVD. Below please find a copy of your additional questions followed by a response.

I was wondering if you could clarify one question: If the 3.0-ft NGVD criteria was kept, what would be the Town's hardship in regards to storage area?

If the 3.0 ft-NGVD WSWT criteria was kept, the hardship would consist of an increased number of properties that are impacted by the master plan, particularly existing properties that have been designed and constructed with a WSWT less than 3.00 ft-NGVD. The impact to these properties would consist of drainage systems that no longer work as originally designed, having higher flood stages, more frequent and longer duration of street or parking lot flooding. Depending of the level of flooding within each property, the impacts may require the property to be absorbed into the master plan as areas to be purchased, demolished and either utilized as part of the stormwater management system or redeveloped according to the 3.0 ft-NGVD WSWT. While the intent is to encourage redevelopment, the goal is not to force redevelopment.

Given that the development has not yet been master planned or designed, wouldn't this required area still be able to be considered into the master plan?

The 'development' is a master plan that is to incorporate the properties as they currently exists as well as if the properties were redeveloped. Therefore, the existing designs and existing developments which were created years ago in accordance with historical WSWT maps, are the foundation from which to the proposed master design and planning begins. The goal of the TOC master plan is not to start over with a fresh canvas by removing the existing businesses and residences, but to create a stormwater master plan that would serve and benefit the existing land owners as well as accommodate and encourage redevelopment within the TOC.

If you have further questions or need clarification to the above responses, we can discuss at our meeting today. David Quigley, the Town's Planning & Zoning Manager as well as Rod Ley, the Town's Engineer, are also planning on attending the meeting today to provide additional insight or clarification of the TOC Master Plan.

Sincerely,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Tuesday, September 25, 2012 8:02 AM
To: Chris Lips
Cc: Javier Rodriguez
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

We look forward to meeting with you today and appreciate your time. I believe this meeting will greatly help to solidify our observations and clarify some of our thoughts.

Before we meet today, I was wondering if you could clarify one question: If the 3.0-ft NGVD criteria was kept, what would be the Town's hardship in regards to storage area? Given that the development has not yet been master planned or designed, wouldn't this required area still be able to be considered into the master plan?

In other words, what would be the Town's real hardship in meeting the District Criteria?

Your clarification of this question would be greatly appreciated. Thank you in advance and we look forward to meeting with you later this afternoon.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Friday, September 21, 2012 4:53 PM
To: Andrea Virgin
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Andrea,

2:30 PM works fine for me. Pat Gibney most likely will not be able to attend.

Thanks,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street

Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Friday, September 21, 2012 3:16 PM
To: Chris Lips
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

Although you have presented a very well-thought and thorough response, we still have some concerns we would like to discuss in person to facilitate a quicker turn-around. Please confirm your availability for Tuesday afternoon anytime after 2:30pm.

Thank you in advance for your attention to this request, and I look forward to your reply.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
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Sent: Friday, September 07, 2012 4:32 PM
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Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Andrea,

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Sincerely,

Chris Lips, P.E.

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From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Monday, August 13, 2012 3:45 PM
To: Chris Lips
Cc: Pat Gibney; Javier Rodriguez; districtmanager@centralbrowardwcd.org
Subject: RE: Town of Davie TOC Stormwater Master Plan

Chris,

We are in receipt of the materials you sent in your email below, as well as the hard copies sent in the mail. In response to your request, please see below. These responses correlate to the bullet points provided in your letter, dated 7/26/12.

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    - **RESPONSE:**
      South of the C-11, a DWL of 2.0 appears to be applicable as much of this area has in fact been designed with a DWL of 2.0. However, a portion of the TOC project limits still lies outside of the 2.0 contour line on the BC WSWT Map. Although this portion does not specifically lie on the 3.0 contour, it still lies higher than the DWL you are asking to use. To confirm, please indicate what the ponds within this area were designed at. Were they designed to be controlled at the CBWCD DWL of 3.0? If not, please show evidence that they were designed lower and what those elevations were.

- *The SFWMD Structure S-13 which controls the C-11 east basin states that the structure is 'operated to maintain an optimum headwater elevation of 1.6 feet, when sufficient water is available to maintain this level.' And that the Spillway Operation will function as follows: 'When the headwater elevation rises to elevation 1.8 feet, the gate will open; When the headwater elevation falls or rises to elevation 1.6 feet, the gate will become stationary; When the headwater elevation falls to 1.4 feet, the gates will close.' The copy of the Structure S-13 description is attached.*
    - **RESPONSE:**
      Please notate the location of Structure S-13 on your Sheet 1 of 1 that was provided with your submittal.

      Also, will you be discharging directly to the C-11? If so will you be flowing through the same control structure? Or will you be discharging to the N-4? Please clarify.

- *The northwestern portion of this project is located within THISCD which has a published wet season water table of 2.0 ft-NGVD.*

- **RESPONSE:**
  Please provide documentation supporting THISCD's published wet season water table of 2.0 ft-NGVD.

- *The areas east and south of the TOC limits have a WSWT of 2.00 ft-NGVD as shown on the B.C. Map referenced above.*
  - **RESPONSE:**
    Please confirm your assumption regarding the groundwater hydraulic gradient. The fact that the areas north and west are higher than the 2.0 ft-NGVD are based on sub-basin or district criteria and should not be taken as criteria for this project. Also, the control elevation (or DWL) is not always equal to the WSWT, but rather is usually higher and needs to be considered.

    Lastly, there still lies a portion of the TOC limits (mainly north of the C-11) that is outside the 2.0 contour and this area may have already been controlled at 3.0'. More clarification is needed or a higher DWL than 2.0 would need to be proposed.

- *The N-4 Canal, located along the west limits of the TOC, is hydraulically connected to the C-11. Given the close proximity to the S-13 structure and the fact that this canal serves THISCD with a DWL of 2.0, the DWL of this canal is essentially 2.0 or below.*
  - **RESPONSE:**
    Please reference in your plan sheet where Structure S-13 lies in proximity to the TOC project limits.

    Also, the N-4 is designed using CBWCD's control elevation of 3.0 NGVD (1.6 NAVD). Although it is hydraulically connected, if discharging to the N-4, the same control elevation would need to be maintained.

    Lastly, please confirm what the ponds within the TOC north of the C-11 were designed to be controlled at.

- *A map titled 'Sites with DWL < 3.0 Ft-NGVD' is enclosed illustrating sites within and adjacent to the TOC limits with a DWL less than 3.0 Ft-NGVD. If a control structure were installed at elevation 3.0 ft-NGVD pursuant to the CBWCD criteria, since the control elevations to the North, East, South and West are all at 2.0, the positive head will likely create groundwater flow to ultimately draw down the water level within the TOC until equilibrium is reach with the surrounding control elevations.*
  - **RESPONSE:**
    The area of the TOC south of the C-11 warrants a DWL of 2.0' since this area used this same control elevation. However, the area within CBWCD north of the C-11 is higher than 2.0' on the WSWT BC Map and may have already been designed using a control elevation of 3.0'. Please review and provide confirmation showing what this area is controlled at.

    It would appear that this area would need to be treated differently than the area to the south of C-11.

In summary, we are in agreement that perhaps the 3.0 ft-NGVD DWL may not be applicable within the TOC limits south of the C-11, but do not yet agree with lowering the DWL to 2.0 ft-NGVD in the areas north of the C-11. After your review of the responses above, if you can provide further documentation supporting your request to use a DWL of 2.0 ft-NGVD in these areas, please do so. Otherwise, you may propose an alternative that would better suit the conditions within this portion of the TOC project limits. Also, please provide all other requested documentation.

After your review of these responses, if you have any questions or would like further clarification, please feel free to contact me. Thank you and I look forward to your reply.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

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Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Thursday, July 26, 2012 11:52 AM
To: Javier Rodriguez
Cc: Pat Gibney; Andrea Virgin; District Manager
Subject: Town of Davie TOC Stormwater Master Plan

Mr. Rodriquez,

A cover letter requesting a variance from CBWCD stipulated DWL of 3.00 ft-NGVD at attached as a pdf file, along with other exhibits. Original Hard copies will be sent in the mail. Please review and inform if you have any questions or comments.

Regards,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

OFFICE OF THE TOWN ADMINISTRATOR

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www.davie-fl.gov

TOWN COUNCIL
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MAYOR

COUNCILMEMBERS

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District 1

Caryl Hattan
District 2

Susan Starkey
District 3

Vice Mayor
Marlon Luis
District 4

September 27, 2012

Mr. Michael Crowley
District Manager
Central Broward Water Control District
8020 Stirling Road
Hollywood, FL 33024

RE: Town of Davie Transit Oriented Corridor Stormwater Master Plan

Dear Mr. Crowley:

I wanted to provide some additional background on how the Town's Transit Oriented Corridor (TOC) master plan was formed and how the development of this area would help to implement regional goals established by Broward County and the South Florida Regional Planning Council. Beginning around 2000, a group of representatives from the local governments along the 25.6 mile State Road 7 corridor formed the "State Road 7 Collaborative" to develop a master plan to improve the function and maximize economic potential of the corridor. In 2003, the Collaborative received a $1.9 million federal grant for development of a Strategic Master Plan for the Corridor. With additional assistance from the John D. and Catherine T. MacArthur Foundation, the South Florida Regional Planning Council and others, a series of master plans were prepared for each sub-region. The economic potential of the overall corridor plan was also supported by a 2003 study by the Urban Land Institute ULI). Based on a Future Land Use designation created by Broward County, the Town of Davie adopted the TOC designation in 2009 for the 925 acre area east of turnpike. In 2011, the Town convened a ULI Technical Assistance Panel to update the economic assumptions (for the Town's portion) and the Town has since been moving forward to implement the master plan. The State Road 7 Collaborative continues to meet quarterly to support the redevelopment goals of all of the participating local governments along the corridor.

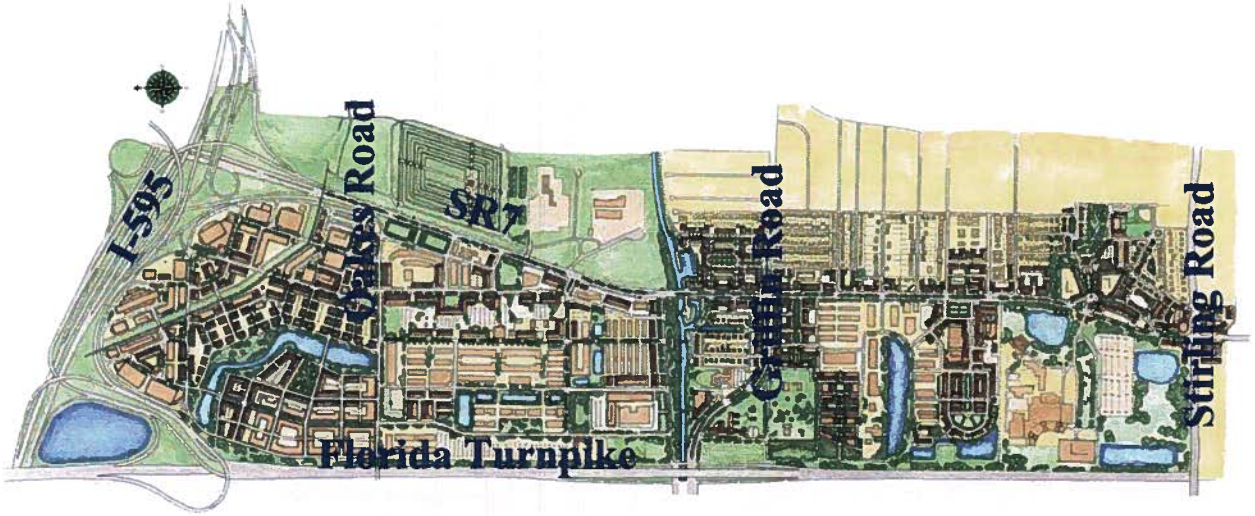
As illustrated in the attached slides, the Town's goal is to help transform the existing development pattern into one which current and future transit is coordinated with land use to maximize the economic potential of the area. The stormwater master plan is a critical factor in this transformation and the Town is actively engaging the landowners in the area to generate support for developing the system through impact fees or similar "enterprise" funding mechanism. The Town believes that the TOC stormwater master plan will not only help to meet redevelopment goals but also result in a more efficient and effective stormwater system for the area.

Sincerely,

Richard J. Lemack
Town Administrator

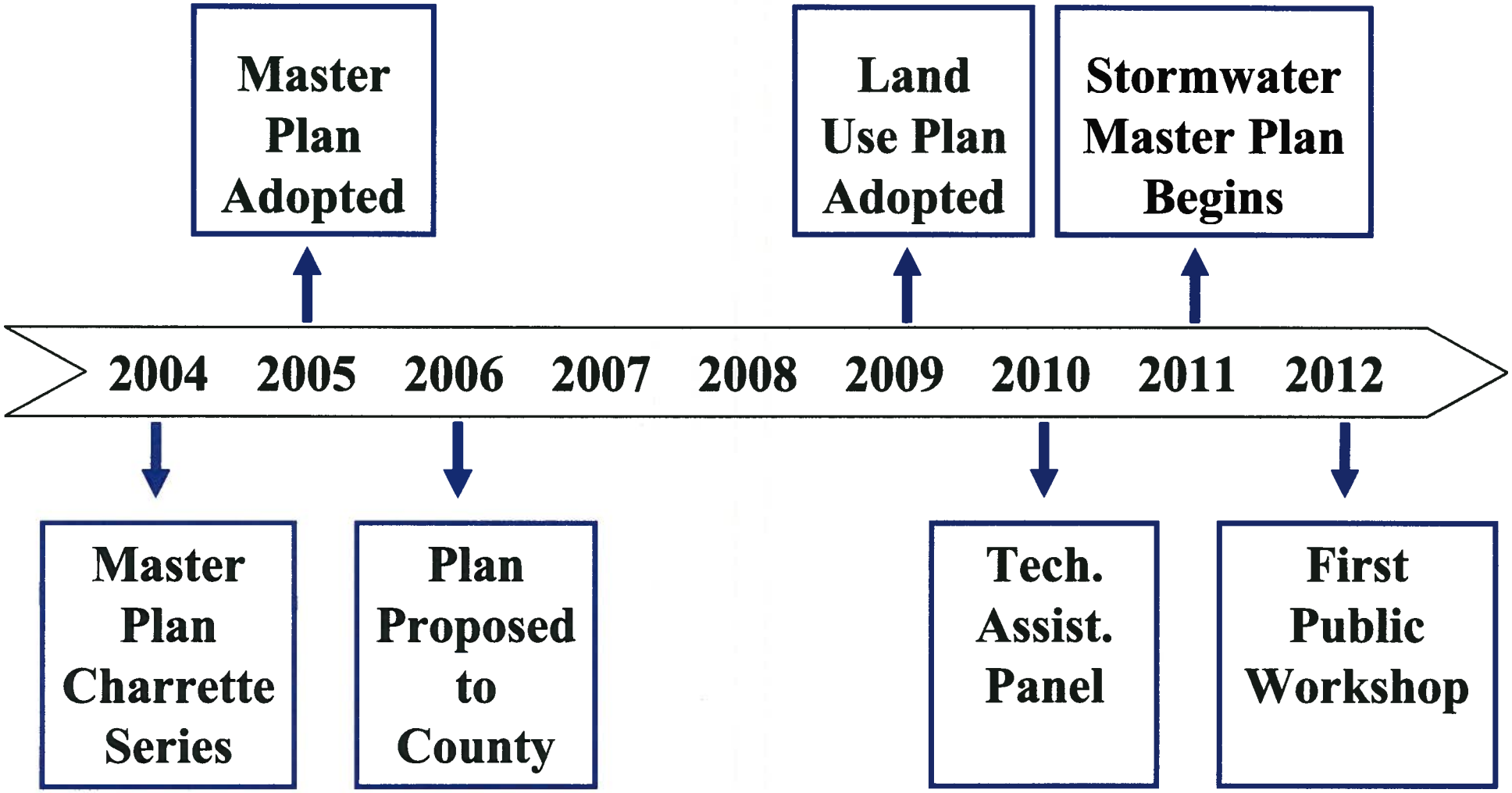
TOWN OF DAVIE
STATE ROAD 7
TRANSIT ORIENTED CORRIDOR (TOC)

The Master Plan



<u>Goal of TOC adopted in 2006</u>: Encourage transit supportive development along the SR 7/US-441 Corridor, along with the development of an interconnected system of streets, sidewalks and other pathways to public transit stops and public parking areas, thereby capturing the economic development potential of the regional transit and transportation systems.

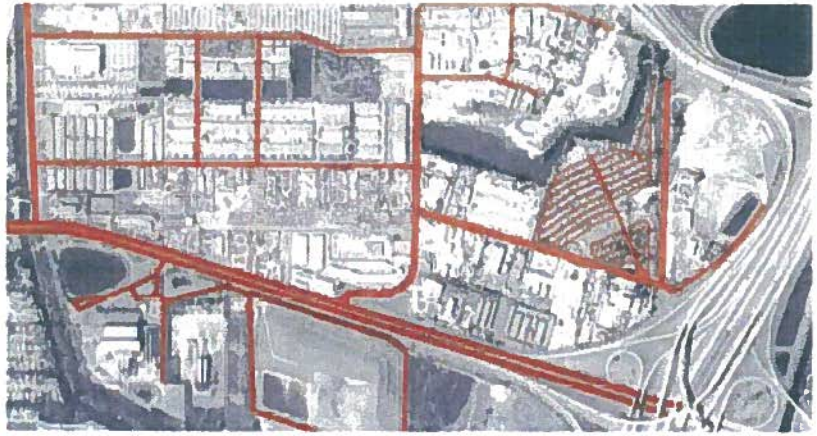
TOC History


Master Plan Adopted
Land Use Plan Adopted
Stormwater Master Plan Begins
2004
2005
2006
2007
2008
2009
2010
2011
2012
Master Plan Charrette Series
Plan Proposed to County
Tech. Assist. Panel
First Public Workshop

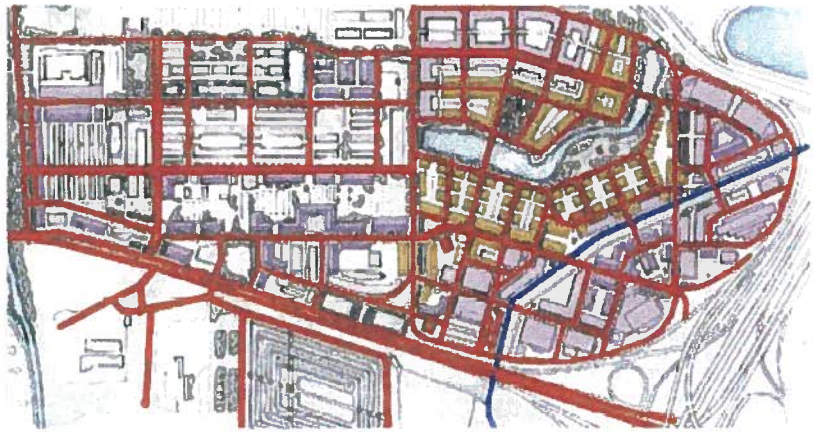
Master Plan Concepts

Improving Connectivity - The Network of Streets North of the C-11 Canal

11



Existing system of streets north of the C-11 Canal



Proposed system of streets north of the C-11 Canal

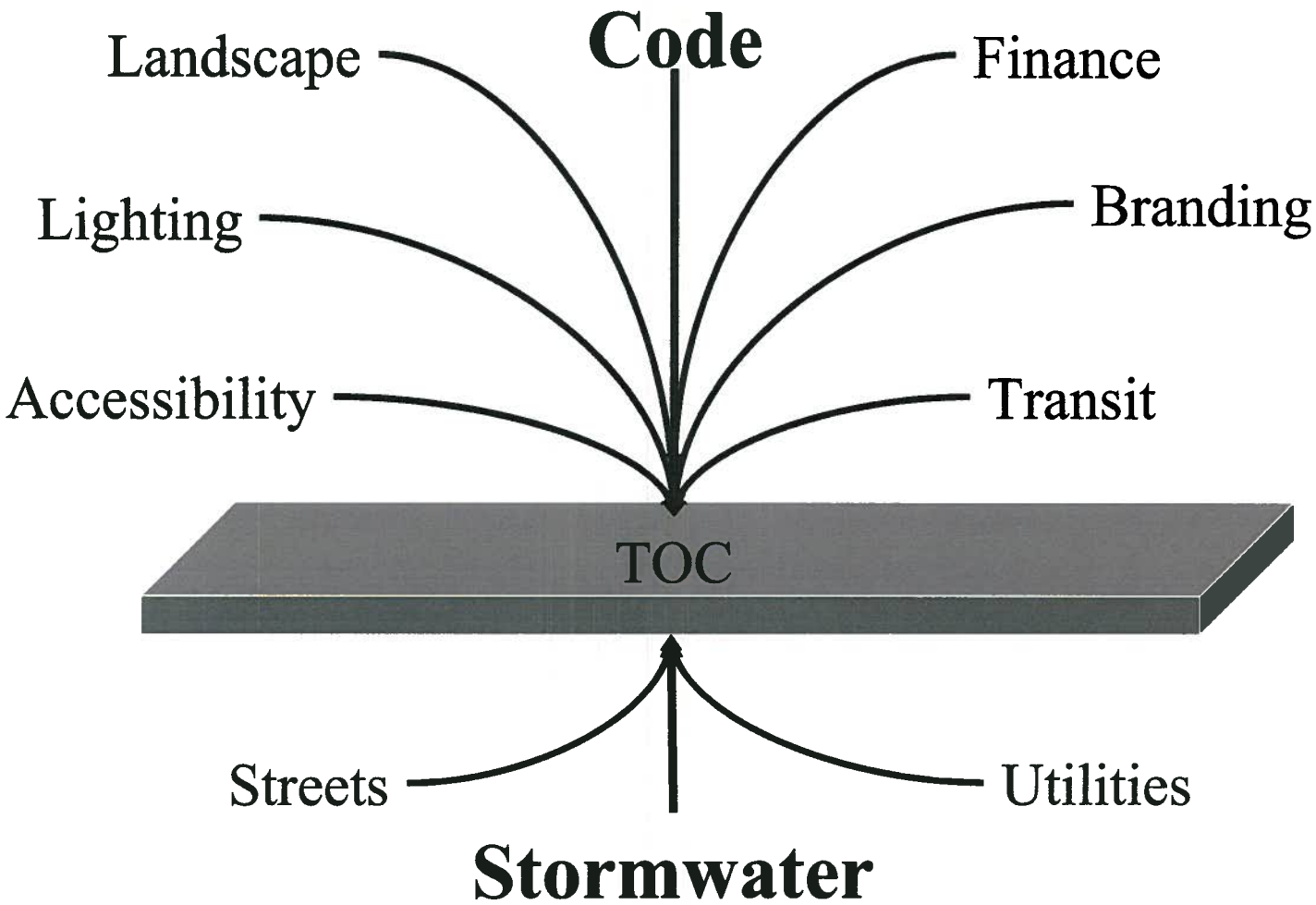
The Southwest Neighborhood and Town Center - A Virtual Tour

52

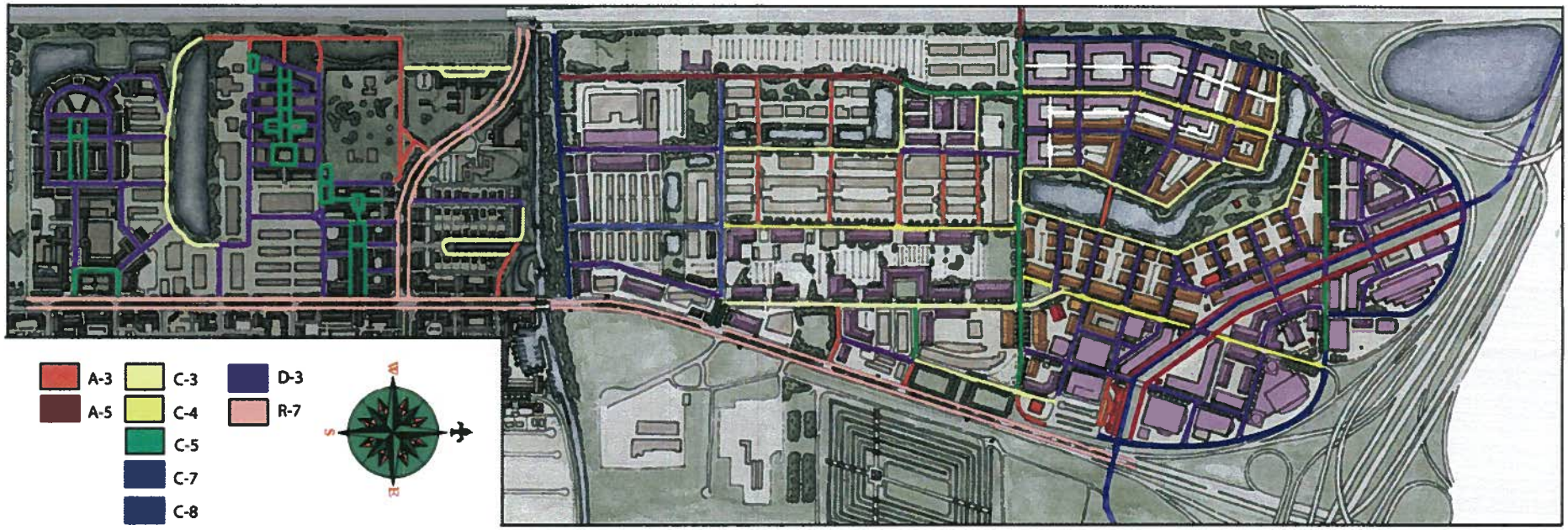
View west down the entrance street to the Southwest Neighborhood.

View of a residential and retail block along the entrance street.

Implementation Tasks



Roadway Plan



Premium Transit Studies in Area

Premium Transit Studies

- The Wave Streetcar (Planning Underway)
- FEC (Planning Underway)
- Phase 1: SR 7 (Planning Underway)
- Phase 2: SR 7 (FY 13-14 Planning)
- University Drive (Planning About to Start)
- Central Broward Transit – Griffin Road Alternative
- Central Broward Transit – SR 7/Broward Alternative

broward MPO
metropolitan planning organization

Chris Lips

From: Chris Lips
Sent: Monday, November 12, 2012 1:23 PM
To: 'Andrea Virgin'; District Manager
Cc: Javier Rodriguez; Pat Gibney; Douglas Bell
Subject: RE: Town of Davie TOC Stormwater Master Plan--CBWCD Variance Request
Attachments: DBHydro S13A Stages & Graphs 95-99.pdf; DBHydro S13 Stages & Graphs 00-06.pdf; DBHydro S13 Stages & Graphs 07-12.pdf; DBHydro S13 Stages & Graphs 90-94.pdf; DBHydro S13 Stages & Graphs 95-99.pdf; DBHydro S13A Stages & Graphs 00-05.pdf; DBHydro S13A Stages & Graphs 90-94.pdf; DBHydro S13 & S13A Stages October 1999.pdf

Mr. Crowley,

Thank you for setting up this meeting and I will be available to attend. Pat Gibney is not certain he can attend at this point.

Since the CBWCD meeting, I have researched the SFWMD DBHyrdo data to obtain more information about the stages within the C-11 Canal. SFWMD keeps daily records of the stages at structure 13 (located just west of S.R. 7) and structure 13A (located at Palm Avenue/Nob Hill Road). The daily stages of each structure were graphed per year from years 1990-2012 for structure 13 and years 1990-2005 structure 13A.

The most severe stages found during this time frame was in October 1999 from Hurricane Irene, which recorded 17.9 inches of rain, equivalent to a 100 yr-3day event. A graph of the stages in the C-11 at structures 13 & 13A is attached, revealing the stages are consistently lower at the east end of the C-11 (S13) and about 1' lower during the peak of the storm.

As stated during the CBWCD meeting on October 10, the requested variance is to lower the proposed DWL to match the wet season water table of 2.0 ft-NGVD. This variance would allow wet retention ponds and dry retention ponds to be designed at 2.0 & 3.0 ft-NGVD respectively. However, the minimum parking, roadway & building elevations will meet the CBWCD criteria. Therefore, if we consider a 100 yr-3 day event similar to Hurricane Irene, the pavement and buildings within TOC limits will have the same level of protection as the rest of the CBWCD east basin. However, since the C-11 stages adjacent to the TOC are lower than the areas further west, the TOC will have a hydraulic advantage greater that areas further west, allowing a greater opportunity to recover after a storm.

Please review the attached pdf files and let me know if you have any questions or comments. I look forward to meeting with you, Commissioner Bell, Mr. Rodriquez and Ms. Virgin to discuss any questions or concerns about the variance request.

Sincerely,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Friday, November 09, 2012 11:55 AM

To: District Manager; Chris Lips
Cc: Javier Rodriguez; Pat Gibney; Douglas Bell
Subject: RE: Town of Davie TOC Stormwater Master Plan--CBWCD Variance Request

My apologies. I was out of the office yesterday. Javier and I will be both be available.

Thank you, and we look forward to seeing you all next week.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: District Manager [mailto:districtmanager@centralbrowardwcd.org]
Sent: Thursday, November 08, 2012 2:33 PM
To: Andrea Virgin; 'Chris Lips'
Cc: Javier Rodriguez; 'Pat Gibney'; 'Douglas Bell'
Subject: RE: Town of Davie TOC Stormwater Master Plan--CBWCD Variance Request

Andrea, I just spoke to Doug Bell and he would like to meet next Friday 16th in the District office at 9:00 a.m. Please let me know who is available from R.J.Behar office and Craven Thompson. We are looking to have this variance request back on for our Dec. 12th District meeting.
Thanks Mike

From: Andrea Virgin [mailto:avirgin@rjbehar.com]
Sent: Wednesday, October 31, 2012 10:08 AM
To: Chris Lips
Cc: Javier Rodriguez; Pat Gibney; District Manager
Subject: RE: Town of Davie TOC Stormwater Master Plan--CBWCD Variance Request

Chris,

Thank you for the information. I just spoke with Mike and he will be giving Doug Bell a call to organize a meeting. I will let you know if I hear of anything.

For scheduling, I am not sure how likely it would be to put this item on next week's agenda. How soon we can meet, and ensuring Doug has all the information he needs, will dictate how quickly this could be put on the agenda. We will do our best to ensure this is processed efficiently, but need to make sure that all are in good understanding before placing this back on the agenda for discussion and vote.

Also, please note that Mike Crowley's email has changed to: districtmanager@centralbrowardwcd.org

Should you have any questions, please feel free to contact me. Thank you and I hope you have a wonderful day.

Sincerely,

Andrea R. Virgin, P.E., LEED AP
Project Engineer

R.J. Behar & Company, Inc.
6861 S.W. 196th Avenue, Suite 302
Pembroke Pines, Florida 33332
Tel: (954) 680-7771 x. 214
Fax: (954) 680-7781
Email: avirgin@rjbehar.com

From: Chris Lips [mailto:clips@craventhompson.com]
Sent: Wednesday, October 31, 2012 9:55 AM
To: Andrea Virgin
Cc: Javier Rodriguez; mtcrowley@bellsouth.net; Pat Gibney
Subject: FW: Town of Davie TOC Stormwater Master Plan--CBWCD Variance Request

Andrea,

Below is the e-mail sent to Doug Bell last week. I also called him this week and left a voice mail. I have not heard back from him. Please confirm we will be on the next agenda and we are willing meet with Mr. Bell and/or any other commissioners to discuss their concerns.

Thanks,

Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

From: Chris Lips
Sent: Friday, October 26, 2012 5:09 PM
To: 'bell8526@bellsouth.net'
Cc: Pat Gibney
Subject: Town of Davie TOC Stormwater Master Plan--CBWCD Variance Request

Mr. Bell,

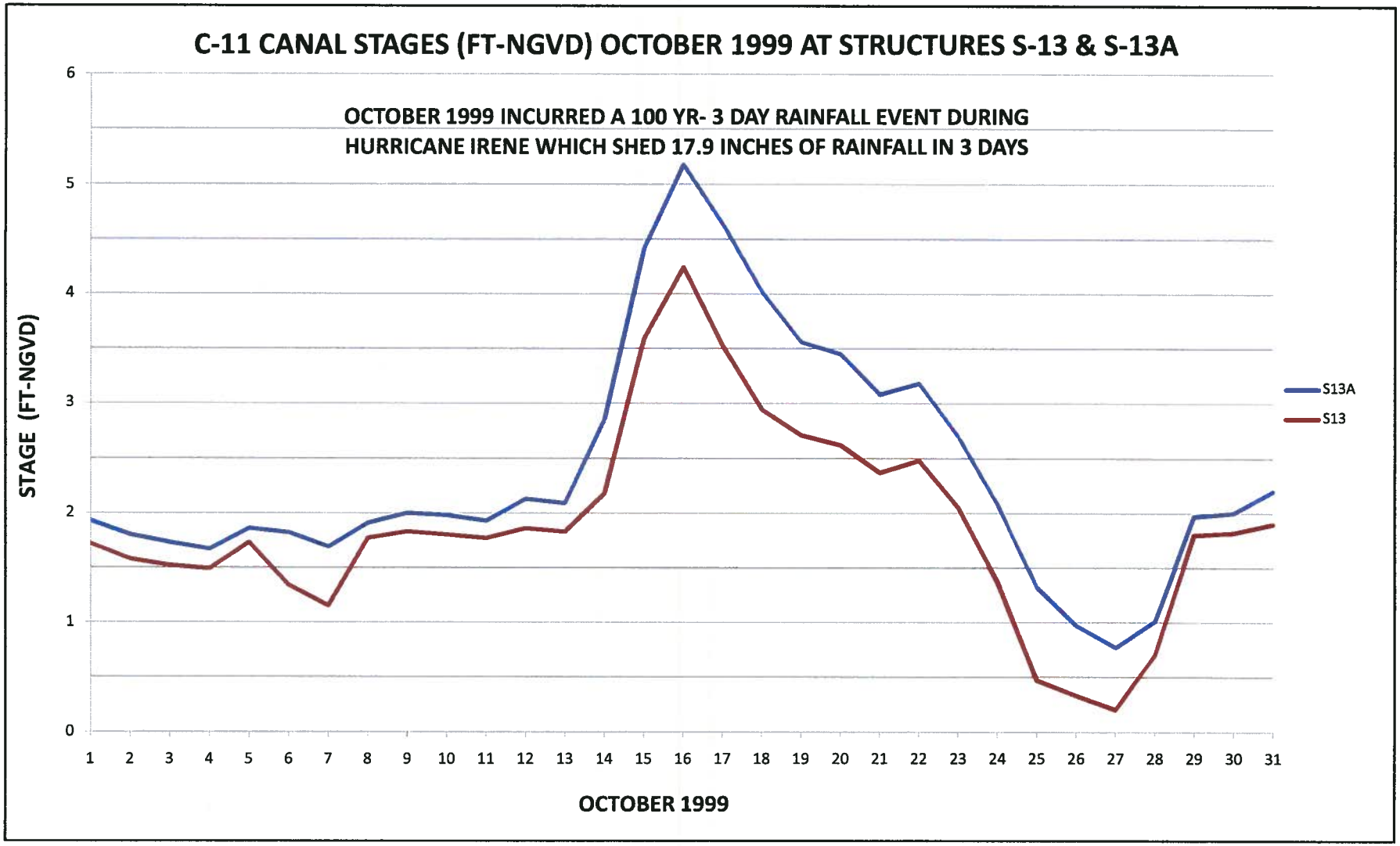
As requested during the CBWCD Commission meeting this past Wednesday, a description of the SFWMD Structure S-13 which serves the C-11 East Basin is attached for your review. Also attached is an e-mail from the Town of Davie with information about the workshops held regarding this project.

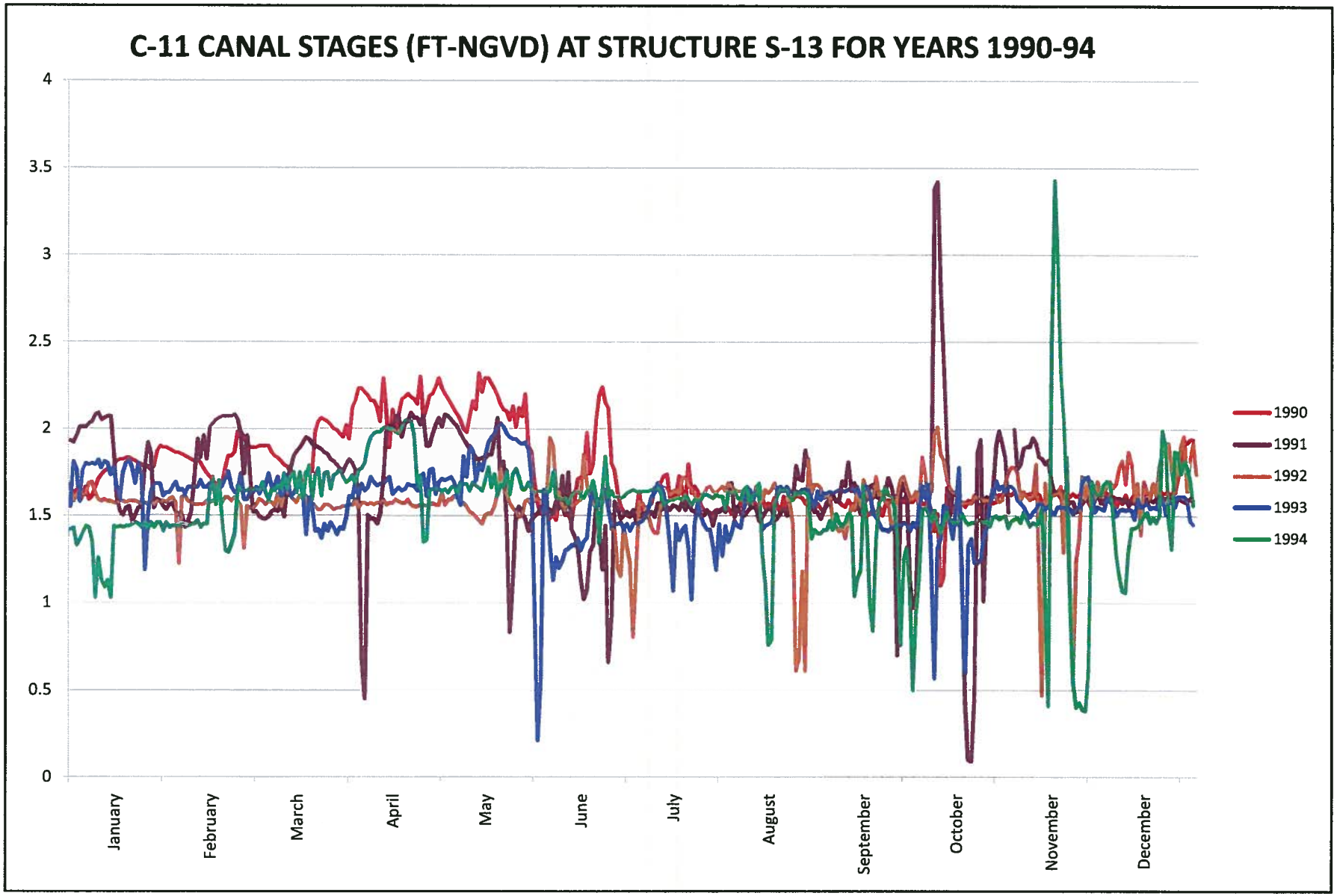
Please let me know if you have any questions or if you need any additional information. Furthermore, please let me know you would like to meet prior to the next commission meeting to discuss any questions or concerns you may have.

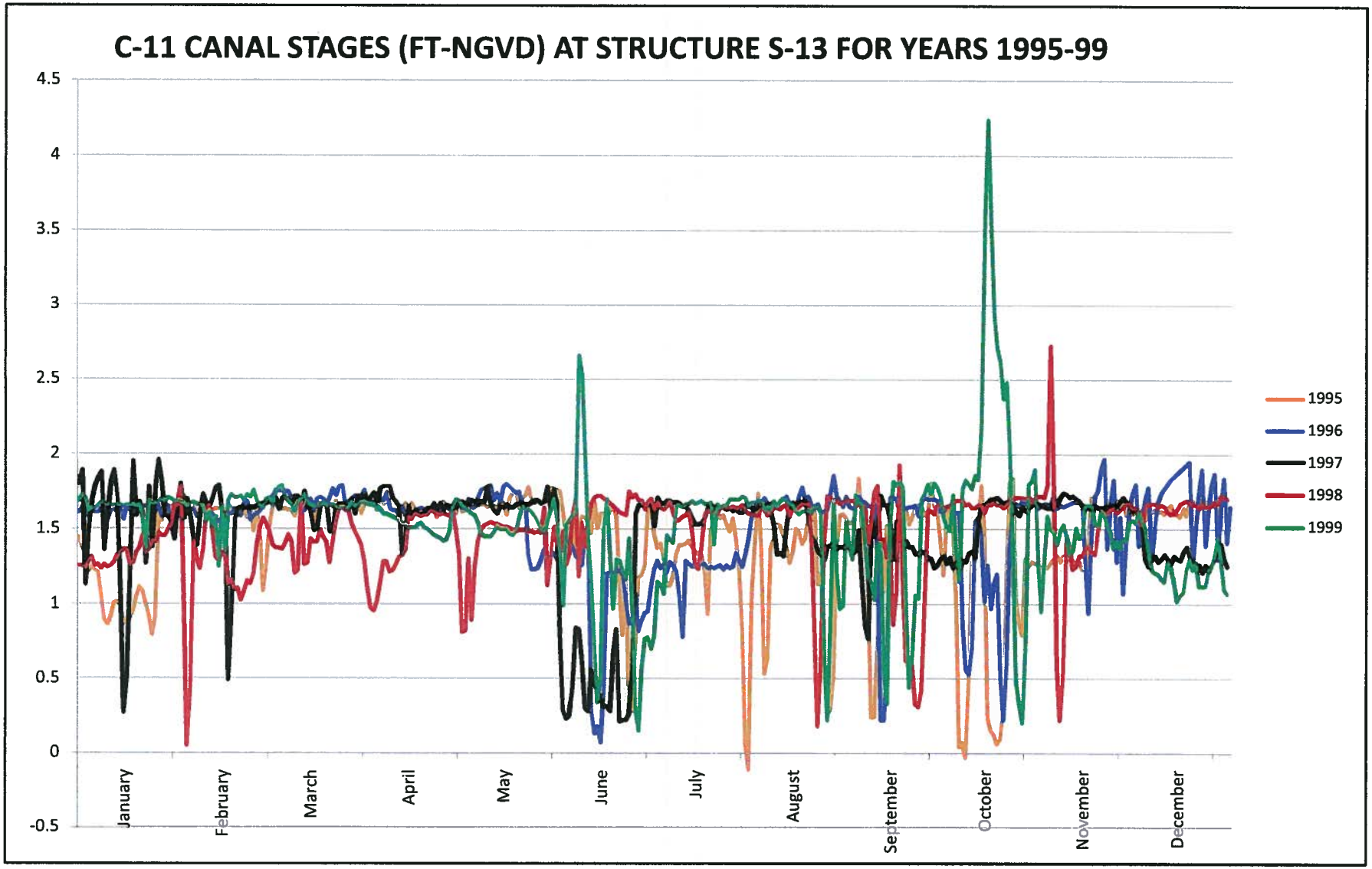
Thank you for your consideration and attention to our request for a variance.

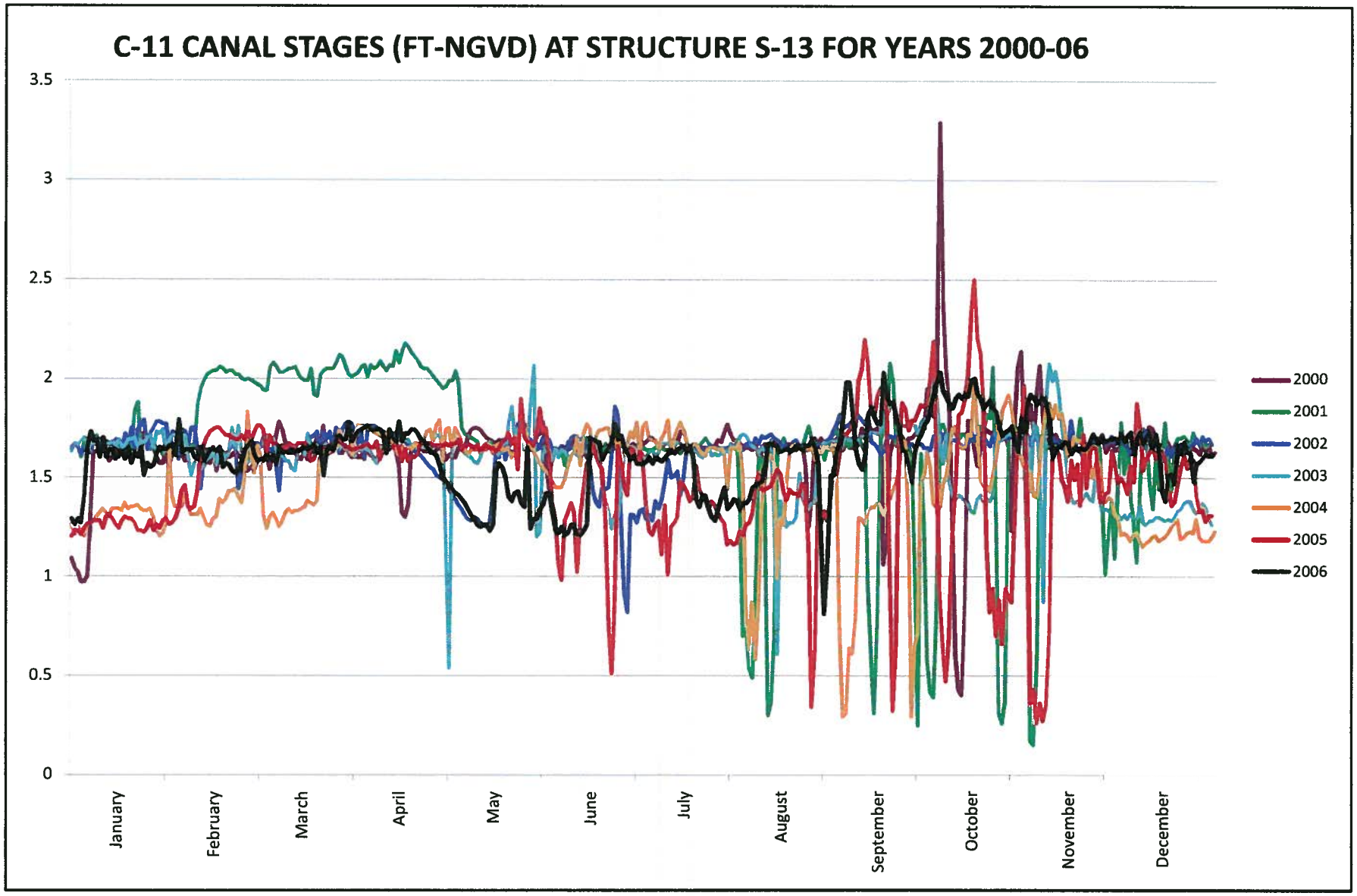
Sincerely,

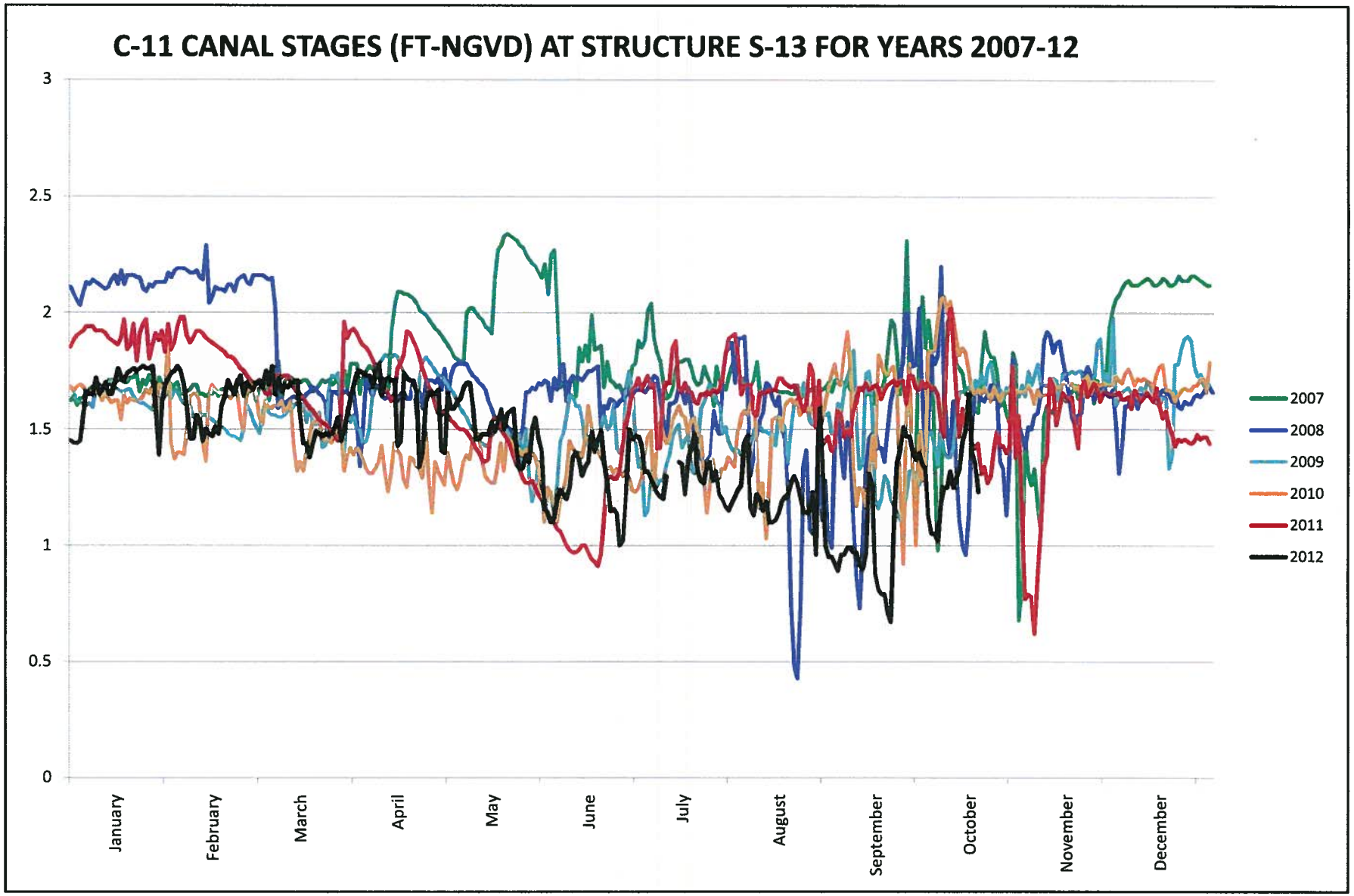
Chris Lips, P.E.
CRAVEN THOMPSON & ASSOCIATES
3563 NW 53 Street
Fort Lauderdale, FL 33309
954-739-6400 x 384
clips@craventhompson.com

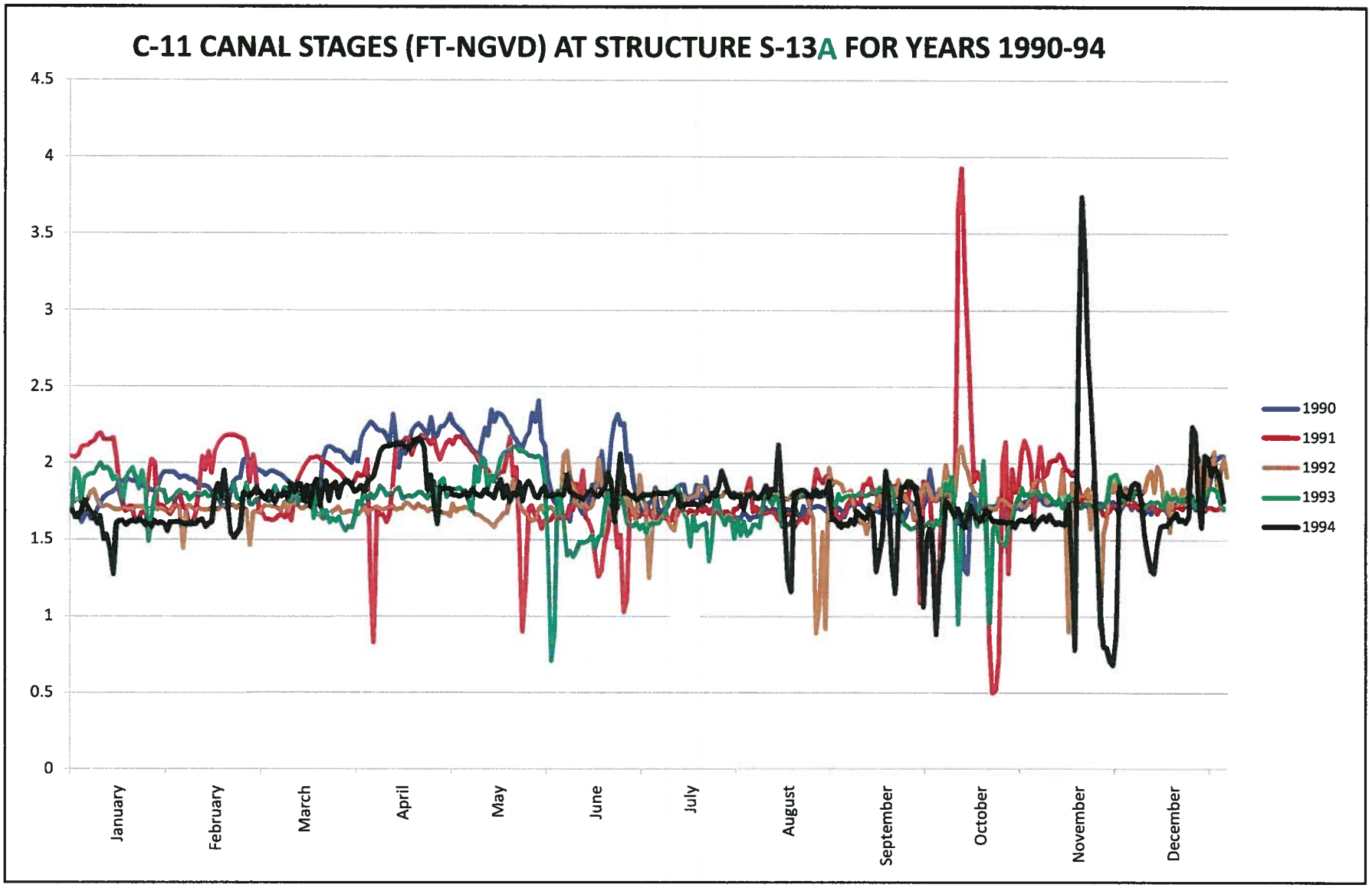

C-11 CANAL STAGES (FT-NGVD) OCTOBER 1999 AT STRUCTURES S-13 & S-13A
OCTOBER 1999 INCURRED A 100 YR- 3 DAY RAINFALL EVENT DURING
HURRICANE IRENE WHICH SHED 17.9 INCHES OF RAINFALL IN 3 DAYS
STAGE (FT-NGVD)
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
OCTOBER 1999
S13A
S13

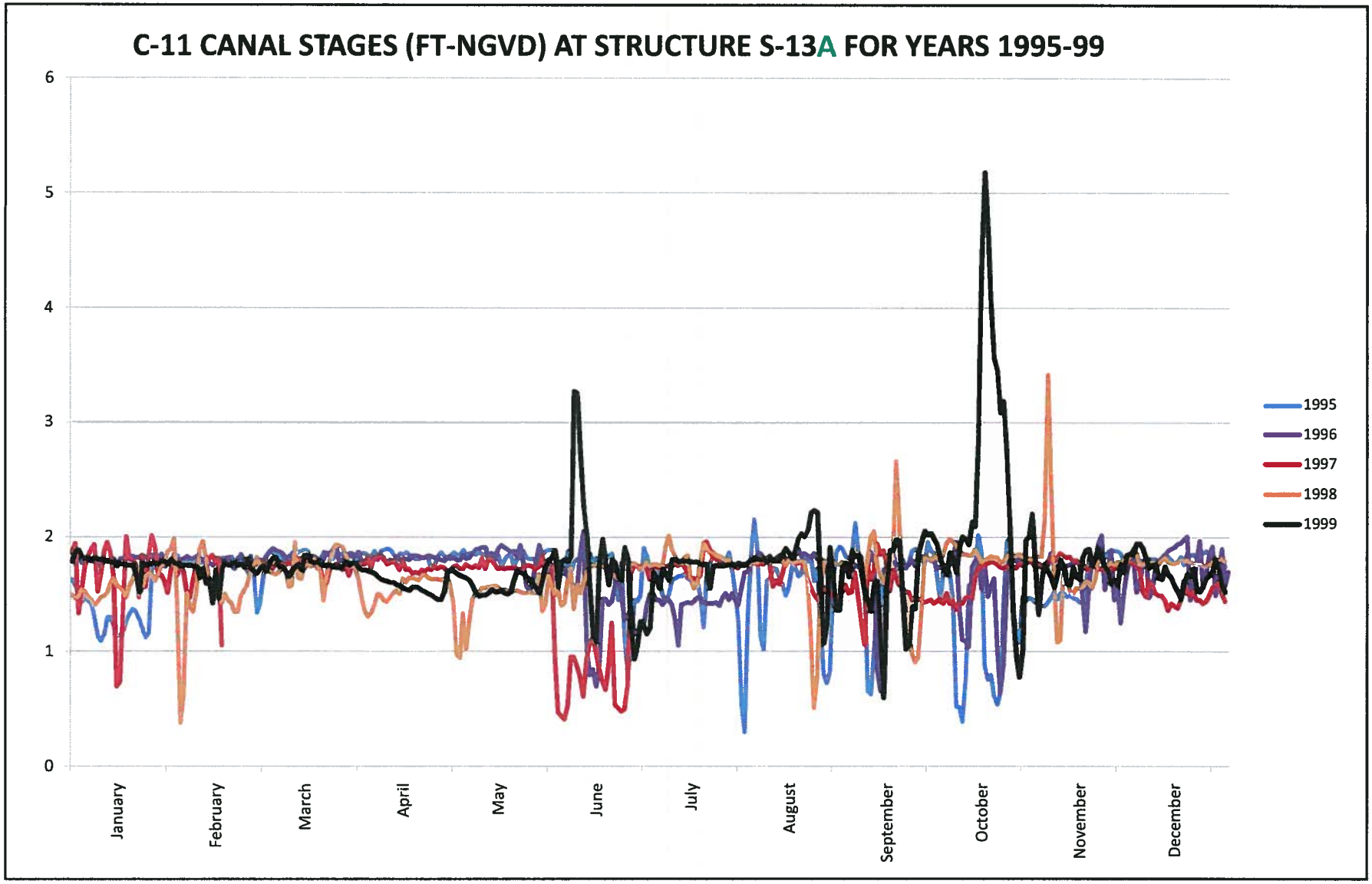

C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13 FOR YEARS 1990-94
4
3.5
3
2.5
2
1.5
1
0.5
0
January
February
March
April
May
June
July
August
September
October
November
December
1990
1991
1992
1993
1994

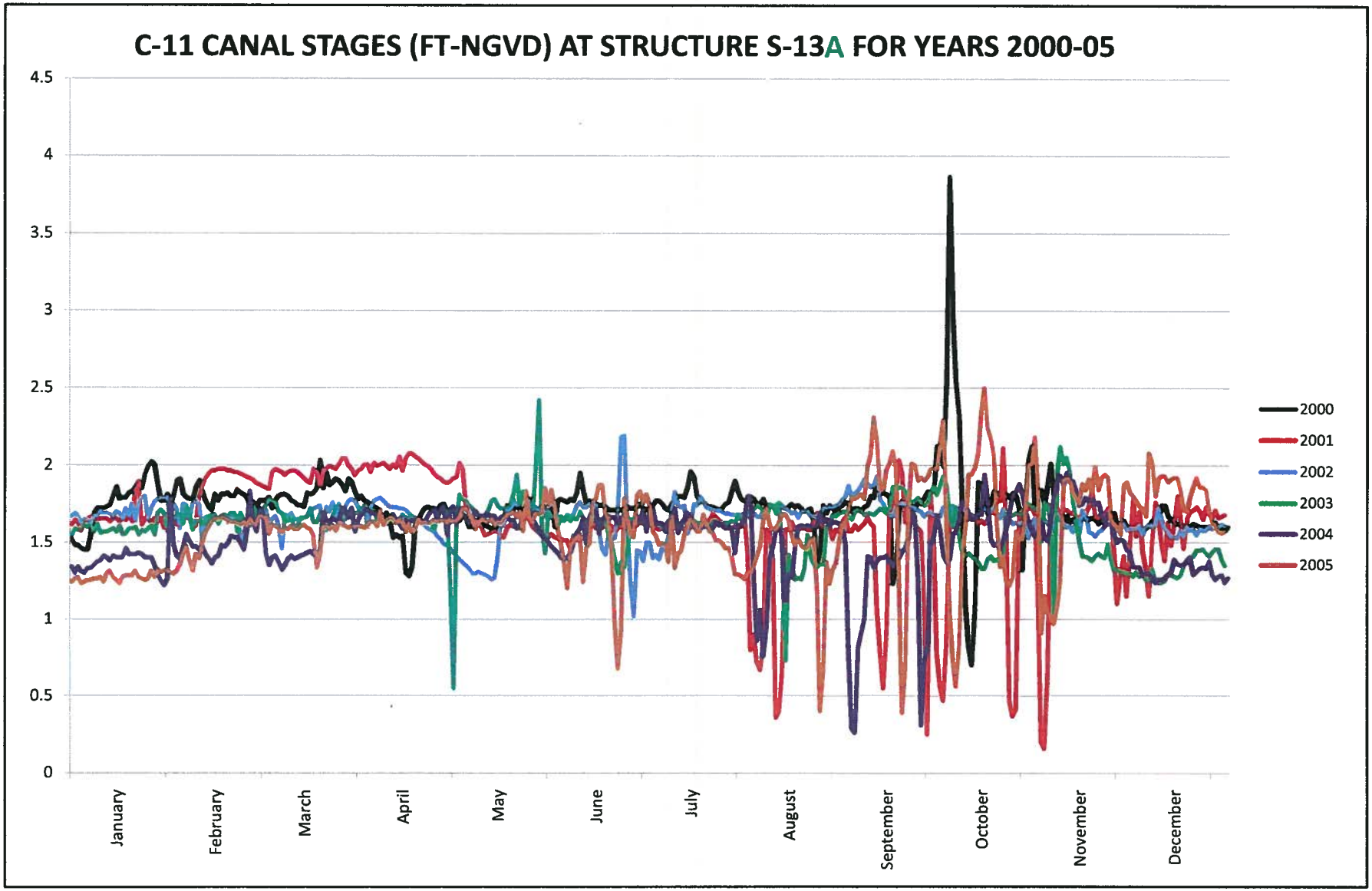

C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13 FOR YEARS 1995-99
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
January
February
March
April
May
June
July
August
September
October
November
December
1995
1996
1997
1998
1999


C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13 FOR YEARS 2000-06
3.5
3
2.5
2
1.5
1
0.5
0
January
February
March
April
May
June
July
August
September
October
November
December
2000
2001
2002
2003
2004
2005
2006


C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13 FOR YEARS 2007-12
3
2.5
2
1.5
1
0.5
0
January
February
March
April
May
June
July
August
September
October
November
December
2007
2008
2009
2010
2011
2012


C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13A FOR YEARS 1990-94
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
January
February
March
April
May
June
July
August
September
October
November
December
1990
1991
1992
1993
1994


C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13A FOR YEARS 1995-99
6
5
4
3
2
1
0
January
February
March
April
May
June
July
August
September
October
November
December
1995
1996
1997
1998
1999


C-11 CANAL STAGES (FT-NGVD) AT STRUCTURE S-13A FOR YEARS 2000-05
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
January
February
March
April
May
June
July
August
September
October
November
December
2000
2001
2002
2003
2004
2005

and a parking lot. The onsite storm water management system consisted of storm sewers that connected to an existing pipe that outfell into Lake Marinatha, which was located on the northeast edge of the applicant's property. That lake then discharged through the storm sewer system for Brian Piccolo Park, which ultimately discharged to S-19 canal. Mr. Gonzalez stated this was the one that had an enforcement action by the District earlier this year or late last year where there was some filling in of that smaller lake or pond at the eastern end of the applicant's property. The paving and drainage application request that the Commissioners had before them that night did not include that part of the property. It was a section of the property that was west of that existing lake that the applicant had requested a variance for. It met District criteria.

Mr. Bell stated he thought one of the concerns before was having to do with the lake in the back.

Mr. Dennis Mele was present to represent the applicant. Mr. Mike Gai, the project engineer, was also present.

Mr. Bell stated his understanding from the plans and review of what took place last time was that issue regarding the lake had gone away and was not an issue now.

Mr. Mele stated that was his understanding as well.

Mr. Bell inquired if there was a positive outfall for the project.

Mr. Mele stated yes.

ACTION: Mr. Fardelmann moved to approve. Mr. Donzella seconded the motion. In a voice vote, all voted in favor. (Motion carried 5-0)

7.B.2. Variance Request – Town of Davie Transit Oriented Corridor

Mr. Rodriguez stated this was a request by the Town of Davie to obtain a variance to lower the design water tables from 3.2. This was an area that was basically bounded by the Turnpike on the west side, State Road 7 on east side, 595 on the north side, and the C-11 canal on the south side. It was also adjacent to the Tindall Hammock Drainage District. Mr. Rodriguez stated this was the second time they had come before the Board. They were asking for a variance so they could come up for a master plan for this. They would still have to submit their master plan for approval and review to make sure everything complied. The reason for the request was to alleviate the impact on existing property owners that would have to then comply with the master plan to redevelop to a design at 3.

Mr. Bell stated just as some additional background, he had met with the engineers. He had also talked to the engineer for the Tindall Hammock Irrigation and Soil Conservation District and his opinion was that it appeared that this entire area would be best served to have a water elevation of 2.0 and he was recommending that the next

time they take up some criteria change for the District that they consider creating a third water elevation where they had 4.0 in the west and 3.0 in the east and perhaps make everything east of the Turnpike 2.0, which would make it compatible with the surrounding areas and compatible with Tindall Hammock. Mr. Bell stated it didn't appear to be any detriment plus the pump station for the C-11 canal was at that location so it was getting the first relief. In his opinion, it would be a positive thing to go forward with and he deferred to the engineer.

Mr. Chris Lips, Craven Thompson and Associates, stated Mr. Bell covered it pretty well. In their analysis when they were reviewing all of the existing properties, there was a balance of properties that were designed at 3, the District criteria; and there was a lot of other properties that were designed at 2. When they came in to master plan this they had to put in a control structure right before the C-11. That was going to hold back water all the way upstream and it was going to affect all of the existing properties whether it was designed at 2 or whether it was designed at 3. Mr. Lips stated with this master plan they were not trying to force anyone to redevelop, but if they raised it above where existing properties were designed, they would almost force them to redevelop or force the Town to purchase areas that otherwise could be avoided. That was really not the goal of this. The goal was just to try to create a drainage system that would benefit the bulk of all of the properties out there.

Mr. Bell stated one concern that he had was he was looking at another project where an elevation of 2 was apparently approved on December 13, 2006 and on that project Mr. Biederman stated that he felt bad for the residents that were going to get their streets and houses flooded because of the actions of the Board. Mr. Bell inquired of Mr. Crowley if that comment had come to fruition or if had turned out that was a bogus comment.

Mr. Crowley inquired which project Mr. Bell was referring to; he knew they granted the Turnpike those elevations.

Mr. Bell stated it was the minutes of December 13, 2006.

Mr. Lips stated it was the Turnpike widening.

Mr. Bell inquired if Mr. Lips had any comments on that particular comment.

Mr. Lips stated he was not familiar with that. He thought they were concerned with not putting in a perimeter berm if he remembered correctly, which was not really what they were trying to do now, but he thought the reason they couldn't put a berm in was because the existing properties flowed into the Turnpike so if they put a berm in they would actually hurt those properties.

Mr. Bell inquired if this was far south of the area they were talking about.

Mr. Lips stated this was basically from Griffin Road south so it was adjacent to the southern half of the TOC.

Mr. Bell stated but the TOC was primarily north of the Indian reservation so this really didn't apply and inquired if that would be a correct statement.

Mr. Lips stated that did not apply.

Mr. Bell inquired if that had ever happened.

Mr. Crowley stated no; not in that area. It was all commercial to start with, no residential.

Ms. Leto stated in reference to the applicant's letter and also he just mentioned a few minutes ago about a control structure. Ms. Leto inquired if they were going to put more than one in there.

Mr. Lips stated yes; there would be more than one. There would be one on the north side of the C-11 and also one for the south side. On the south side there currently was not a discharge so they would be creating a discharge for those properties.

Mr. Crowley stated these control structures that Mr. Lips was talking about were going to be the same structures that the District was designing right now for the N-11 and N-12 sub-basins. Those two were 99 percent designed. These structures would match that so they would have full telemetry control over it.

Mr. Bell inquired if Mr. Crowley saw any problem in draining these areas.

Mr. Crowley stated not at all. He was very familiar with this area. In the 22 years he had been with the District they have had a lot of storms. There was some minor street flooding. He thought doing this redevelopment would help put new infrastructure in that area and add more infrastructure.

Mr. Fardelmann inquired how many properties were involved that were designed to the lower level.

Mr. Lips stated he didn't know off hand.

Mr. Fardelmann inquired if they wanted to walk away from a higher standard or if there would be another way of handling this where these properties were grandfathered and have a flag attached to them that if they ever reached a level of improvements, like FEMA designated substantial improvement, then they would have to come up to the level. Mr. Fardelmann inquired if that would not better serve them to keep their standards high, yet allow them to exist as they were.

Mr. Lips stated if they put in a control structure and it was designed at an elevation 3.0, water would seek its own level and it would impact any property designed at elevation 2. By lowering it to 2 it wasn't necessarily a lower standard. They were not trying to compromise flood protection. They were not trying to compromise the 100 year finished floor. What they were trying to do was establish a water table that was agreeable to all the properties out there.

Mr. Fardelmann stated maybe a better way of what he was thinking was that they would grant this, but it was only a temporary thing. Somewhere it should contain the intent that over the years once those other properties were improved they would be required to come up to the 3.0. At that point the control structures would be modified to the 3.0. Mr. Fardelmann inquired if that made sense.

Mr. Rodriguez stated that would be tough. Once they approved to develop this master plan at 2.0, he thought they would have development at 2.0. No-one was going to design for 3 from then on.

Mr. Fardelmann inquired if both Mr. Rodriguez and the District Manager were agreeing that based on past history that didn't seem to be a big issue there; that it was not going to be a big problem.

Mr. Rodriguez stated that was correct.

Mr. Donzella inquired of Mr. Crowley is this area was surveyed after the no-name storm.

Mr. Crowley stated yes, it was; the whole District was surveyed.

Mr. Donzella inquired what the net result of that no-name storm affecting that area was.

Mr. Crowley stated during no-name and Irene there was a zero impact in that area because it was so close to the pump that they drained it almost to elevation 0 and they had enough storage in there that once it filled up the canals it was drawn right down because it was adjacent to the S-13 pump station.

Mr. Donzella inquired if there had been any development since the no-name storm and Irene that would negatively impact that same scenario would it happen that day.

Mr. Crowley stated the only development he was aware of off the top of his head was mostly in Tindall Hammock and outside of Tindall Hammock to the north. If they looked at the District map it actually was a small portion on the north side of Griffin. They could see how much more was north of that, which was Tindall Hammock and part of the county. Mr. Crowley stated there weren't any problems even up north from them where it still had to flow through their District. There was a new truck stop up there that they had recently built in Davie, but it was not within their District. He had never seen any problems in there.

Mr. Donzella inquired what year storm event the no-name was classified as.

Mr. Crowley stated in the east portion it was just under a 100 year event. Out west it almost hit the 100 year event.

Mr. Donzella inquired if, when Mr. Crowley said it was under the 100, it would be fair to say it was a 75 year event.

Mr. Crowley stated he would say 50 year; for Irene between 50 and 100.

Mr. Lips showed Mr. Donzella a water table for the Irene storm. Mr. Lips stated this property actually had a hydraulic advantage over everywhere else in the District, which was why Mr. Bell had indicated before that he felt this area could actually be a separate area within Central Broward that could be approved at 2, which was why they were asking for this variance in the first place. With the Turnpike and their proximity to the structure that area discharged quicker than anywhere else in the District. No matter what they said right now on what the water table was, South Florida Water Management District operated that canal, the C-11 canal, at about a 1.8. Right now everything in the TOC was hydraulically impacted by that 1.8 and realistically, if they went out there and checked water levels, it was around 2.0. If they put a control structure in, even if it was designed at 3, after a rainfall event it would be at 3 and it would go through the bleeder and eventually equalize at 3. Slowly, but surely, it would go back down to what the surrounding canals were. What they were trying to do was agree upon a level that suited all those factors and they were not going to impact anybody by keeping it at 2, because that was what it was today. By raising it to 3 that was when it would start impacting people. Mr. Lips stated this was the Town's project. They were not interested in hurting their residents.

Mr. Bell stated this was mostly commercial property.

ACTION: Ms. Bunce moved to approve. Ms. Leto seconded the motion. In a voice vote, all voted in favor. (Motion carried 5-0)

8. DISTRICT ATTORNEY'S REPORT

9. DISTRICT MANAGER'S REPORT

9.A. 2013 Meeting Schedule

Mr. Crowley stated they had a 2013 calendar before them with the District meetings. He had also supplied the holidays and he didn't see any conflict with the second and fourth Wednesdays for the year except for November and December.

Mr. Fardelmann stated it looked good to him; to drop off November 27 and December 25.

APPENDIX 3: GEOTECHNICAL REPORT OF PERMEABILITY TESTS CONDUCTED WITHIN THE TOC

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GEOTECHNICAL ENGINEERING / MATERIAL TESTING / INSPECTION SERVICES

BOREHOLE PERMEABILITY TESTS

Stormwater Master Plan
Town of Davie, Florida

TSF File No. 7111-11-217

PREPARED FOR

Craven Thompson & Associates
3563 NW 53rd Street
Ft. Lauderdale, FL 33309

August 10, 2011

2765 VISTA PARKWAY, SUITE 10 · WEST PALM BEACH, FLORIDA 33411
(561) 687-8539 · FAX (561) 687-8570
State of Florida Professional Engineers License #28073

tierra
SOUTH FLORIDA
GEOTECHNICAL ENGINEERING / MATERIAL TESTING / INSPECTION SERVICES

August 10, 2011

Craven Thompson & Associates.
3563 NW 53rd Street
Ft. Lauderdale, Florida 33309

Attn: Mr. Chris Lips, P.E.

Re: Borehole Permeability Tests
Stormwater Master Plan
Town of Davie, Florida
TSF File No. 7111-11-217

Dear Chris:

As requested, TIERRA SOUTH FLORIDA, Inc. (TSF) has completed ten (10) Borehole Permeability (BHP) tests at the above-referenced site. The BHP tests performed were conducted in accordance with South Florida Water Management Standards (SFWMD). The test locations were provided by Mr. Chris Lips of Craven Thompson & Associates.

The BHP tests were performed using the usual open-hole, constant head methodology. The holes were advanced to 10 feet deep. The borings were completed as open wells with gravel pack (6-20 silica sand). The well screen slot widths were 0.020 inches. Water from the drill rig tank was then pumped into the open wells, and the amount of water required maintaining constant head was recorded.

Results of our field permeability tests are attached.

2765 VISTA PARKWAY, SUITE 10 · WEST PALM BEACH, FLORIDA 33411
(561) 687-8539 · FAX (561) 687-8570
State of Florida Professional Engineers License #28073

If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Very truly yours,

TIERRA SOUTH FLORIDA, INC.

8/10/11

Raj Krishnasamy, P.E.
Principal Engineer
Florida Registration No. 53567

Attachments: BHP Results

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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-1	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30505.40	0.00
1	30506.20	0.80
2	30507.00	0.80
3	30507.70	0.70
4	30508.50	0.80
5	30509.30	0.80
6	30510.00	0.70
7	30510.70	0.70
8	30511.50	0.80
9	30512.30	0.80
10	30513.00	0.70
Constant Flow Rate (gpm)		0.75

Equation for K Value:

$$\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$$

k = 3.97E-05 cfs/ft^2

H2 = 5.50 ft GWT Depth

Soil profile:

0-4" Topsoil

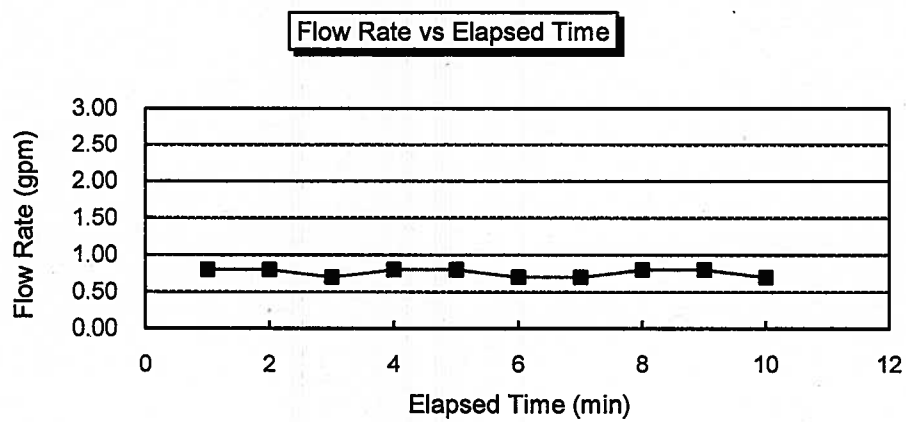
4"-5' Brown Sand with Limestone Fragm.

5'-10' Brown Sand with Trace of Shell Fragm.

Where:

Hydraulic conductivity

k= 3.97E-05 cfs/ft^2



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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-2	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30591.20	0.00
1	30595.30	4.10
2	30599.10	3.80
3	30603.10	4.00
4	30606.80	3.70
5	30610.90	4.10
6	30614.90	4.00
7	30618.80	3.90
8	30622.90	4.10
9	30626.80	3.90
10	30630.70	3.90
Constant Flow Rate (gpm)		3.98

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 1.84E-04 cfs/ft^2

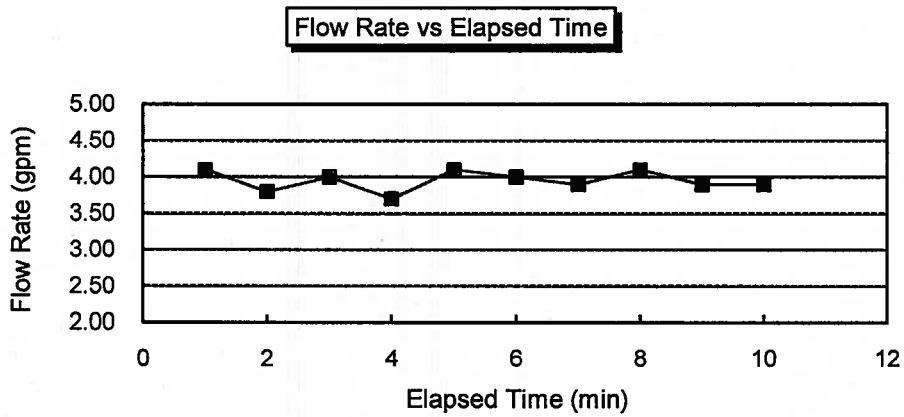
H2 = 7.00 ft GWT Depth

Soil profile:
- 0-4" Topsoil
- 4"-4' Brown Sand with Limestone Fragm.
- 4'-10' Brown Sand with Trace of Shell Fragm.

Where:

Hydraulic conductivity

k= 1.84E-04 cfs/ft^2



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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-3	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30547.40	0.00
1	30549.60	2.20
2	30551.70	2.10
3	30554.20	2.50
4	30556.90	2.70
5	30559.30	2.40
6	30561.70	2.40
7	30564.10	2.40
8	30566.40	2.30
9	30568.80	2.40
10	30571.20	2.40
Constant Flow Rate (gpm)		2.38

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 1.14E-04 cfs/ft^2

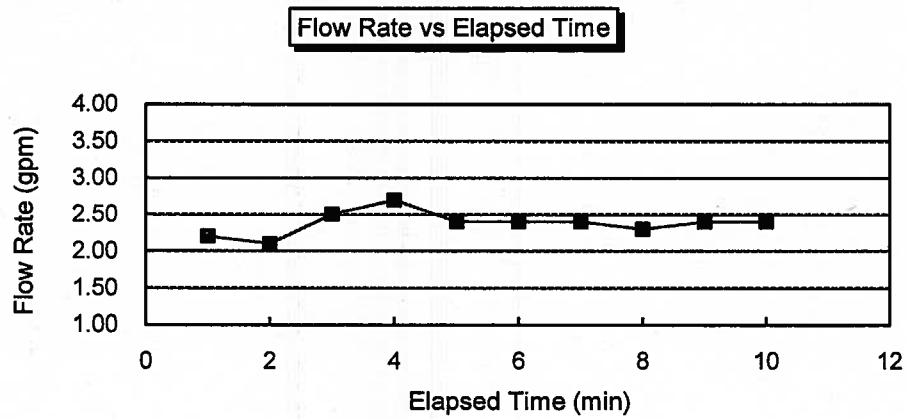
H2 = 6.50 ft GWT Depth

Soil profile:
- 0-4" Topsoil
- 4"-5' Brown Sand with Limerock Fragm.
- 5'-10' Brown Sand with Limestone Fragm.

Where:

Hydraulic conductivity

k= 1.14E-04 cfs/ft^2



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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-4	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30460.00	0.00
1	30463.20	3.20
2	30466.80	3.60
3	30470.20	3.40
4	30473.70	3.50
5	30477.00	3.30
6	30483.50	6.50
7	30486.90	3.40
8	30490.40	3.50
9	30493.80	3.40
10	30497.30	3.50
Constant Flow Rate (gpm)		3.93

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 2.08E-04 cfs/ft^2

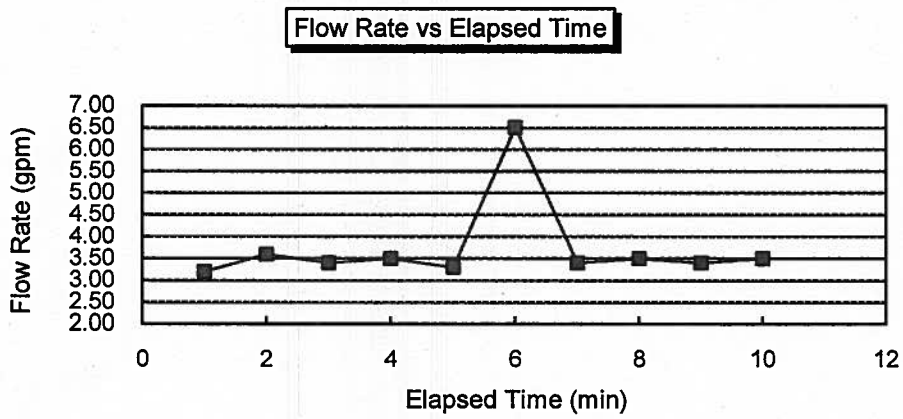
H2 = 5.50 ft GWT Depth

Soil profile:
0-5" Topsoil
5"-10' Brown Sand

Where:

Hydraulic conductivity

k= 2.08E-04 cfs/ft^2



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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-5	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30425.30	0.00
1	30427.00	1.70
2	30428.50	1.50
3	30430.10	1.60
4	30431.80	1.70
5	30433.30	1.50
6	30434.80	1.50
7	30436.40	1.60
8	30438.10	1.70
9	30439.80	1.70
10	30441.40	1.60
Constant Flow Rate (gpm)		1.60

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 7.68E-05 cfs/ft^2

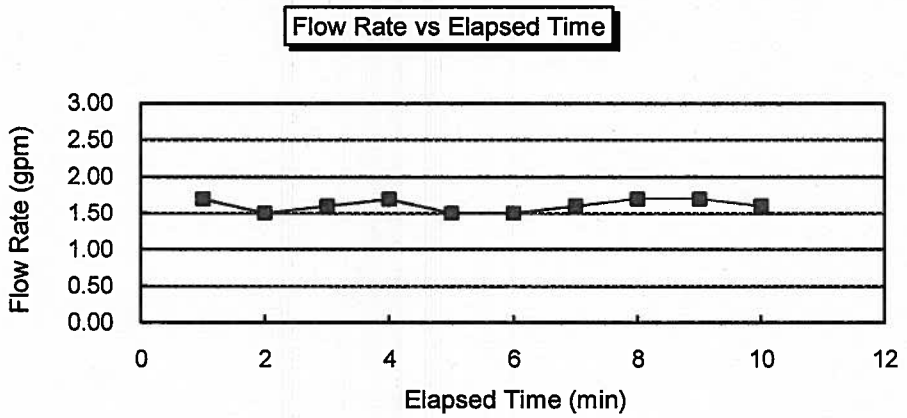
H2 = 6.50 ft GWT Depth

Soil profile:
0-4" Topsoil
4"-10' Brown Sand with trace of Limerock

Where:

Hydraulic conductivity

k= 7.68E-05 cfs/ft^2



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USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-6	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30308.60	0.00
1	30316.20	7.60
2	30323.70	7.50
3	30333.20	9.50
4	30342.80	9.60
5	30352.40	9.60
6	30361.90	9.50
7	30371.20	9.30
8	30380.60	9.40
9	30389.90	9.30
10	30399.30	9.40
Constant Flow Rate (gpm)		9.42

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 4.52E-04 cfs/ft^2

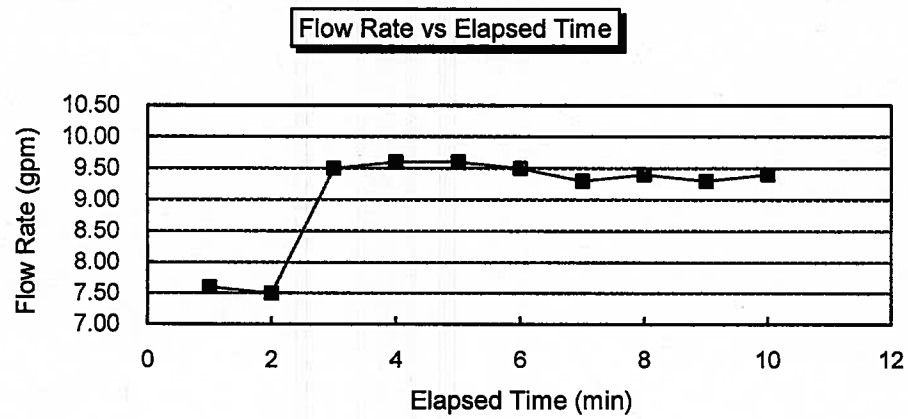
H2 = 6.50 ft GWT Depth

Soil profile:
- 0-4" Topsoil
- 4"-5' Brown Sand
- 5'-10' Brown Sand with Limestone Fragm.

Where:

Hydraulic conductivity

k= 4.52E-04 cfs/ft^2



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USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-7	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	303642.20	0.00
1	303644.50	2.30
2	303646.70	2.20
3	303649.00	2.30
4	303651.40	2.40
5	303653.70	2.30
6	303656.20	2.50
7	303658.60	2.40
8	303661.10	2.50
9	303663.80	2.70
10	303666.60	2.80
Constant Flow Rate (gpm)		2.53

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 1.27E-04 cfs/ft^2

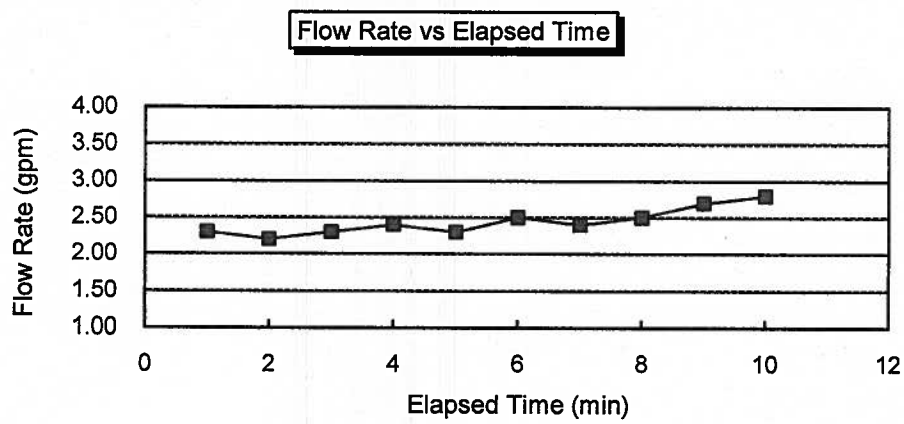
H2 = 6.00 ft GWT Depth

Soil profile:
- 0-4" Topsoil
- 4"-5' Brown Sand with Limerock Fragm.
- 5'-10' Brown Sand with Limestone Fragm.

Where:

Hydraulic conductivity

k= 1.27E-04 cfs/ft^2



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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-8	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30536.70	0.00
1	30538.70	2.00
2	30540.20	1.50
3	30541.90	1.70
4	30544.10	2.20
5	30545.80	1.70
6	30547.70	1.90
7	30549.80	2.10
8	30551.90	2.10
9	30554.10	2.20
10	30556.20	2.10
Constant Flow Rate (gpm)		2.02

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 8.49E-05 cfs/ft^2

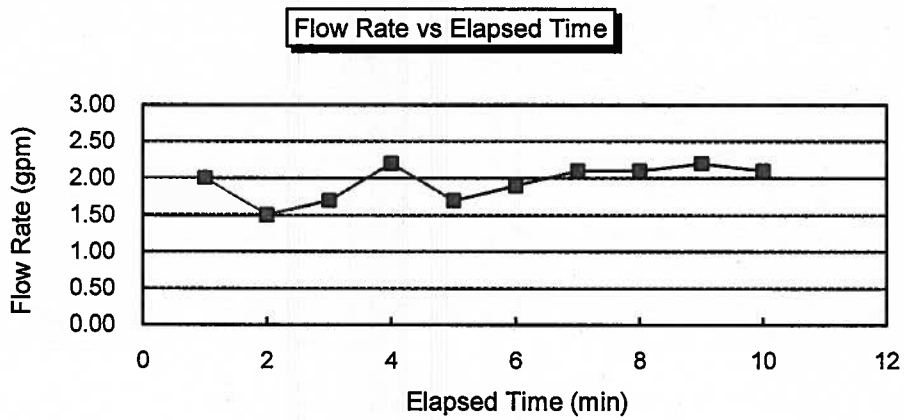
H2 = 9.50 ft GWT Depth

Soil profile:
- 0-4" Topsoil
- 4"-5' Brown Sandy Limerock
- 5'-10' Brown Sand with Limerock Fragm.

Where:

Hydraulic conductivity

k= 8.49E-05 cfs/ft^2



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GEOTECHNICAL ENGINEERING · MATERIAL TESTING · INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-9	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30092.20	0.00
1	30100.70	8.50
2	30109.00	8.30
3	30117.20	8.20
4	30125.60	8.40
5	30134.00	8.40
6	30142.50	8.50
7	30150.80	8.30
8	30159.00	8.20
9	30167.10	8.10
10	30175.40	8.30
Constant Flow Rate (gpm)		8.30

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 3.84E-04 cfs/ft^2

H2 = 7.00 ft GWT Depth

Where:

Hydraulic conductivity

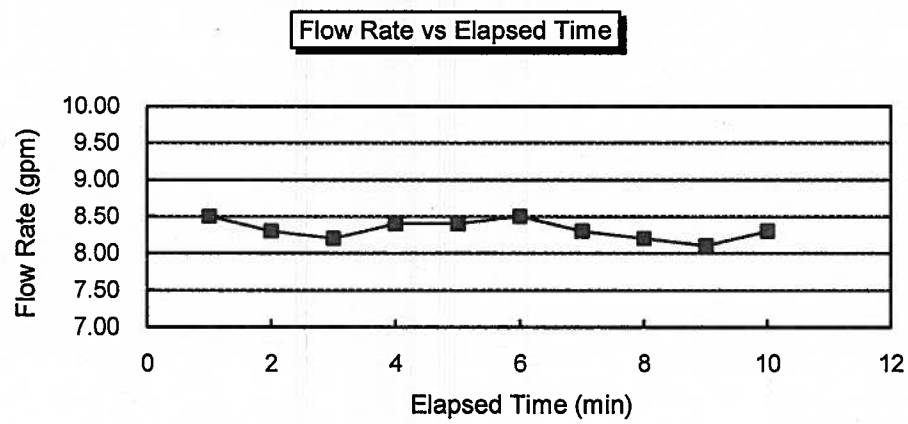
k= 3.84E-04 cfs/ft^2

Soil profile:

0-4" Topsoil

4"-5' Brown Sand with trace of Limerock

5'-10' Brown Sand with Limestone Fragm.



tierra SOUTH FLORIDA
GEOTECHNICAL ENGINEERING MATERIAL TESTING INSPECTION SERVICES

USUAL OPEN - HOLE TEST EVALUATION
SOUTH FLORIDA WATER MANAGEMENT METHOD

Client:	Craven Thompson	Test No.:	BHP-10	Date:	08/09/11
Project:	Stormwater Master Plan	Well Depth:	10.0 Feet	Analyst:	MM
Job No.:	7111-11-217	Location:	Davie, Florida		

Elapsed Time (min)		Flow Rate (gpm)
0	30191.00	0.00
1	30199.10	8.10
2	30207.10	8.00
3	30215.40	8.30
4	30223.70	8.30
5	30231.90	8.20
6	30239.80	7.90
7	30247.90	8.10
8	30256.10	8.20
9	30264.40	8.30
10	30272.50	8.10
Constant Flow Rate (gpm)		8.13

Equation for K Value: $\frac{4Q}{pi*d(2H2^2 + 4H2Ds + H2d)}$

k = 3.91E-04 cfs/ft^2

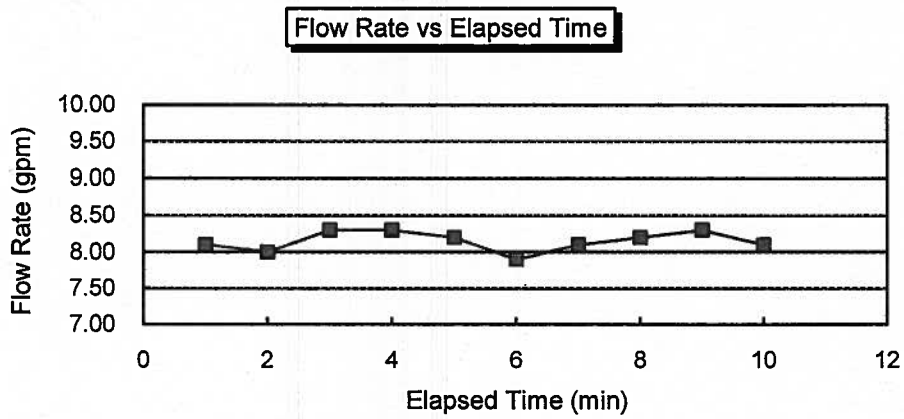
H2 = 6.50 ft GWT Depth

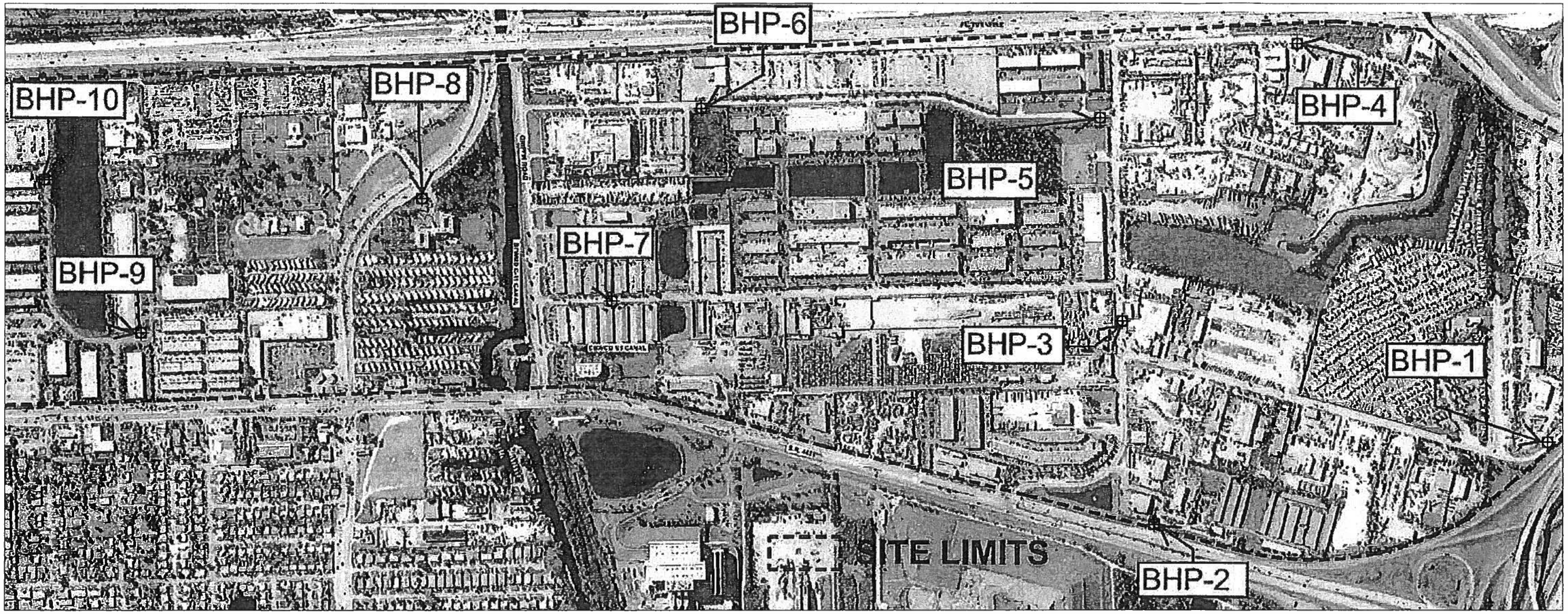
Soil profile:
- 0-4" Topsoil
- 4"-5' Brown Sand with Limerock Fragm.
- 5'-10' Brown Sand with Limestone Fragm.

Where:

Hydraulic conductivity

k= 3.91E-04 cfs/ft^2





BORHOLE PERMEABILITY TEST APPROXIMATE LOCATIONS

NOT TO SCALE

BORING LOCATION PLAN

DRAWN BY: MM CHECKED BY: JO	APPROVED BY: RK DATE: 8/10/2011	ENGINEER OF RECORD: RAJ KRISHNASAMY, P.E. FLORIDA LICENSE NO.: 53567	Tierra South Florida 2765 Vista Parkway Suite 9 West Palm Beach, Florida 33411 Phone: 561-687-8536 Fax: 561-687-8570 FL Cert. No.: 28073	SCALE: NTS	PROJECT NUMBER: 7111-11-217	GEOTECHNICAL ENGINEERING SERVICES Stormwater Master Plan for Transit Oriented Corridor DAVIE, FLORIDA	SHEET 1

APPENDIX 4: DRAINAGE CALCULATIONS & ICPR MODEL OF THE EXISTING CONDITIONS

APPENDIX 4 —DRAINAGE CALCULATIONS AND ICPR MODELING OF THE EXISTING CONDITIONS

A4.1 TIME OF CONCENTRATION

A4.2 DRAINAGE CALCULATIONS SEPARATED BY BASIN/SUB-BASIN
(LAND USE BREAK DOWN, GRADING PARAMETERS, STAGE-STORAGE RELATIONSHIP, SOIL STORAGE & CN CURVE NUMBER)

NORTHEND SUB-BASIN

NORTHEAST SUB-BASIN

NORTH CBWCD SUB-BASIN

THISCD BASIN

SOUTH C-11 BASIN

SOUTH BASIN

A4.3 ICPR MODEL NORTH OF THE C-11 CANAL

AERIAL MAP WITH THE ICPR NODAL DIAGRAM

ICPR RESULTS INCLUDING MAXIMUM STAGE AND MAXIMUM FLOW RATES

ICPR INPUT DATA

A4.4 ICPR MODEL SOUTH OF THE C-11 CANAL

AERIAL MAP WITH THE ICPR NODAL DIAGRAM

ICPR RESULTS INCLUDING MAXIMUM STAGE AND MAXIMUM FLOW RATES

ICPR INPUT DATA

A4.5 CD WITH ICPR FILES FOR THE EXISTING TOC CONDITIONS NORTH & SOUTH OF THE C-11

TIME OF CONCENTRATION

BY SCS LAG EQUATION

$$T_{C(overland)} = \frac{100L_o^{0.8}[(1000/CN)-9]^{.7}}{1900(S)^{0.5}}$$

WHERE: L_o=LONGEST OVERLAND FLOW PATH (FT)
CN=SCS RUNOFF CURVE NUMBER
S=AVERAGE WATERSHED SLOPE (%)

From Chow, Maidment, Mays Pg. 501.

BASIN	Total Flow Distance	L_O	CN	S	LENGTH OF PIPE	$T_{C(overland)}$	*$T_{c\ (pipe)}$	$T_{C(TOTAL)}$ (minutes)
NORTH OF C-11 CANAL								
N BASIN								
N15A	400	400	96	0.13	0	22.5	0.0	22
N15	450	200	85	0.22	0	15.8	0.0	16
N24A	500	500	86	0.20	0	33.4	0.0	33
N24	550	550	82	0.18	0	43.6	0.0	44
N23	450	450	96	0.33	0	15.5	0.0	16
N22	500	100	94	0.50	400	4.2	3.3	10
N21	500	500	98	0.20	0	19.3	0.0	19
N20	650	650	98	0.23	0	22.2	0.0	22
N25	350	350	98	0.29	0	12.1	0.0	12
N26	550	100	98	0.75	450	2.8	3.8	10
N27	600	600	92	0.25	0	27.2	0.0	27
SPUR	550	550	84	0.50	0	24.4	0.0	24
OLD84	300	300	84	0.50	0	15.1	0.0	15
N17	300	100	81	0.75	200	5.6	1.7	10
N2	630	200	95	0.25	430	9.8	3.6	13
N46	230	50	80	1.00	180	2.9	1.5	10
N47	235	235	87	0.20	0	17.6	0.0	18
N30	680	630	95	0.24	50	25.1	0.4	25
N10	1475	75	81	1.33	1400	3.4	11.7	15
W THISCD BASIN								
W7	875	125	91	0.60	750	5.2	6.3	11
W8 PH2	1500	250	85	0.20	1250	19.9	10.4	30
W8 PH3	640	640	89	0.23	0	33.9	0.0	34
W8 PH1	750	150	91	0.50	600	6.6	5.0	12
W9	200	200	90	1.50	0	5.0	0.0	10
W33	520	520	98	0.29	0	16.6	0.0	17
W34	580	200	98	0.63	380	5.2	3.2	10
W35	350	350	98	0.21	0	14.2	0.0	14
W36	400	300	91	0.25	100	16.3	0.8	17
W48	1000	1000	87	0.20	0	56.1	0.0	56
W49	900	900	64	0.22	0	97.3	0.0	97
W5	800	450	93	0.44	350	15.6	2.9	19
W5A	560	560	93	0.22	0	26.3	0.0	26
W28	2000	700	85	0.14	1300	54.1	10.8	65
WSPUR	1200	1200	80	0.10	0	116.3	0.0	116

BASIN	Total Flow Distance	L_O	CN	S	LENGTH OF PIPE	$T_{C(overland)}$	$*T_{c\ (pipe)}$	$T_{C(TOTAL)}$ (minutes)
M CBWCD BASIN								
M1	1700	800	91	0.25	900	35.8	7.5	43
M3	630	180	86	0.42	450	10.2	3.8	14
M3A	630	180	82	0.17	450	18.5	3.8	22
M6	1100	1100	85	0.07	0	109.9	0.0	110
M11PH1	1450	450	98	0.11	1000	24.0	8.3	32
M11PH2	1000	200	98	0.25	800	8.3	6.7	15
M12A	800	500	98	0.10	300	27.3	2.5	30
M12B	1300	1300	98	0.08	0	65.7	0.0	66
M12C	250	250	98	0.20	0	11.1	0.0	11
M12D	550	150	86	0.33	400	9.9	3.3	13
M14	1200	600	98	0.17	600	24.5	5.0	29
M31	400	400	98	0.13	0	20.5	0.0	20
M32	350	350	98	0.14	0	17.3	0.0	17
M37	375	75	88	0.67	300	3.7	2.5	10
M3839	500	500	86	0.20	0	33.4	0.0	33
M40	325	75	91	0.67	250	3.3	2.1	10
M41	325	75	98	0.67	250	2.3	2.1	10
M41A	800	200	98	0.50	600	5.9	5.0	11
M42	400	100	98	0.50	300	3.4	2.5	10
M42A	950	300	98	0.33	650	10.0	5.4	15
M43	1020	1020	76	0.40	0	57.6	0.0	58
SOUTH OF C-11 CANAL								
SOUTH C-11 BASIN								
SC1	175	75	89	1.33	100	2.5	0.8	10
SC2	200	200	88	0.75	0	7.7	0.0	10
SC3	325	75	92	2.00	250	1.8	2.1	10
SC4	750	750	92	0.20	0	36.4	0.0	36
SC5	500	500	90	0.30	0	23.4	0.0	23
SC6	900	900	92	0.17	0	46.1	0.0	46
SC7	575	175	74	1.14	400	8.8	3.3	12
SC8	500	500	98	0.20	0	19.3	0.0	19
SOUTH BASIN								
SS1	175	75	82	1.33	100	3.3	0.8	10
SS2	1000	300	95	0.67	700	8.3	5.8	14
SS3	675	675	92	0.15	0	38.6	0.0	39
SS4	750	250	90	0.75	500	8.5	4.2	13
SS5	450	200	90	0.75	250	7.1	2.1	10
SS6	550	350	95	0.43	200	11.7	1.7	13
SS7	500	400	89	0.25	100	22.3	0.8	23
SS8	125	125	76	1.60	0	5.4	0.0	10
SS9	870	170	90	0.60	700	7.0	5.8	13
SS10	2150	450	94	0.33	1700	17.2	14.2	31
SS11	625	325	80	0.46	300	19.1	2.5	22
SS12	700	700	60	0.14	0	110.5	0.0	111
SS13	580	580	82	0.26	0	37.8	0.0	38
SS14	250	250	94	0.60	0	8.0	0.0	10
SS15	250	250	94	0.20	0	13.8	0.0	14
SS16	325	325	98	0.43	0	9.3	0.0	10
SS17	325	325	97	0.46	0	9.6	0.0	10
S. ROAD	800	800	98	0.19	0	28.9	0.0	29
SW51st	50	50	93	1.00	0	1.8	0.0	10
441	2100	300	96	0.67	1800	7.9	15.0	23
GRIFFIN	2700	1200	90	0.21	1500	56.3	12.5	69

*Assumed pipe flow velocity = 2 ft/sec. ** Min. Tc=10 Minutes

NORTHERN MOST TOC BASIN PRE DEVELOPMENT							1/31/2013
	SITE AREAS (acres)						
Basin ID	**Total**	**Building**	**Pavement**	**Green**	**Dry Retention**	**Lake**	**Storage at Flood Encroachment El. (6.50' NGVD)**
North End 1	32.90	1.00	6.40	22.51	1.57	1.42	8.19
North End 2	3.28	0.32	2.25	0.72	0.00	0.00	1.50
North End 3	3.70	0.45	2.93	0.33	0.00	0.00	1.99
84 SPUR	5.16	0.00	2.06	3.10	0.00	0.00	0.10
Burris Rd NW Ext.	1.54	0.00	0.62	0.92	0.00	0.00	1.46
Total:	**46.58**	1.77	14.26	27.57	1.57	1.42	**13.23**
Total pre-development storage below 6.50' NGVD :							**13.23**

NORTH END 1 (32.90 ACRES)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		1.00	V	8.50	8.50	0.00
Pavement		6.40	L	6.25	8.25	2.00
Green		22.51	L	5.75	10.00	4.25
Retention Bot.		1.57	V	4.00	7.00	3.00
Lake		1.42	V	3.00	3.00	0.00
			L	0.00	0.00	0.00
		32.90				

STAGE (ft.)	Building	Pavement	Green	Retention Bot.	Lake	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.71	0.00	0.71
4.00	0.00	0.00	0.00	0.00	1.42	0.00	1.42
4.50	0.00	0.00	0.00	0.07	2.13	0.00	2.20
5.00	0.00	0.00	0.00	0.26	2.84	0.00	3.10
5.50	0.00	0.00	0.00	0.59	3.55	0.00	4.14
6.00	0.00	0.00	0.17	1.04	4.26	0.00	5.47
6.50	0.00	0.10	1.49	1.63	4.97	0.00	8.19
7.00	0.00	0.90	4.14	2.35	5.68	0.00	13.07
7.50	0.00	2.50	8.11	3.13	6.39	0.00	20.13
8.00	0.00	4.90	13.41	3.92	7.10	0.00	29.32
8.50	0.00	8.00	20.03	4.70	7.81	0.00	40.54
9.00	0.50	11.21	27.97	5.48	8.52	0.00	53.68

Soil Storage: **4.94**
Curve No. (CN): **67**

NORTH END 2 (3.28 ACRES)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.32	V	10.00	10.00	0.00
Pavement		2.25	L	5.50	7.00	1.50
Green		0.72	L	4.00	7.00	3.00
Retention Bot.		0.00	V	4.00	4.00	0.00
Lake		0.00	V	3.00	3.00	0.00
			L	0.00	0.00	0.00
		3.28				

STAGE (ft.)	Building	Pavement	Green	Retention Bot.	Lake	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.03	0.00	0.00	0.00	0.03
5.00	0.00	0.00	0.12	0.00	0.00	0.00	0.12
5.50	0.00	0.00	0.27	0.00	0.00	0.00	0.27
6.00	0.00	0.19	0.48	0.00	0.00	0.00	0.66
6.50	0.00	0.75	0.75	0.00	0.00	0.00	1.50
7.00	0.00	1.69	1.07	0.00	0.00	0.00	2.76
7.50	0.00	2.81	1.43	0.00	0.00	0.00	4.24
8.00	0.00	3.94	1.79	0.00	0.00	0.00	5.73
8.50	0.00	5.06	2.15	0.00	0.00	0.00	7.21
9.00	0.00	6.18	2.51	0.00	0.00	0.00	8.69

Soil Storage: **0.65**
Curve No. (CN): **94**

NORTH END 3 (3.70 ACRES)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.45	V	10.00	10.00	0.00
Pavement		2.93	L	5.00	7.00	2.00
Green		0.33	L	4.00	7.00	3.00
Retention Bot.		0.00	V	4.00	4.00	0.00
Lake		0.00	V	3.00	3.00	0.00
			L	0.00	0.00	0.00
		3.70				

STAGE (ft.)	Building	Pavement	Green	Retention Bot.	Lake	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.01	0.00	0.00	0.00	0.01
5.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05
5.50	0.00	0.18	0.12	0.00	0.00	0.00	0.31
6.00	0.00	0.73	0.22	0.00	0.00	0.00	0.95
6.50	0.00	1.65	0.34	0.00	0.00	0.00	1.99
7.00	0.00	2.93	0.49	0.00	0.00	0.00	3.42
7.50	0.00	4.39	0.65	0.00	0.00	0.00	5.04
8.00	0.00	5.86	0.82	0.00	0.00	0.00	6.67
8.50	0.00	7.32	0.98	0.00	0.00	0.00	8.30
9.00	0.00	8.78	1.14	0.00	0.00	0.00	9.92

Soil Storage: **0.26**
Curve No. (CN): **97**

84 SPUR (5.16 AC.)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.00	V	10.00	10.00	0.00
Pavement		2.06	L	7.50	10.00	2.50
Green		3.10	L	6.00	10.00	4.00
Retention Bot.		0.00	V	4.00	4.00	0.00
Lake		0.00	V	3.00	3.00	0.00
			L	0.00	0.00	0.00
		5.16				

STAGE (ft.)	Building	Pavement	Green	Retention Bot.	Lake	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.50	0.00	0.00	0.10	0.00	0.00	0.00	0.10
7.00	0.00	0.00	0.39	0.00	0.00	0.00	0.39
7.50	0.00	0.00	0.87	0.00	0.00	0.00	0.87
8.00	0.00	0.10	1.55	0.00	0.00	0.00	1.65
8.50	0.00	0.41	2.42	0.00	0.00	0.00	2.83
9.00	0.00	0.93	3.48	0.00	0.00	0.00	4.41

Soil Storage: **4.05**

Curve No. (CN): **71**

BURRIS ROAD NW EXTENTION (1.54 AC.)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.00	V	10.00	10.00	0.00
Pavement		0.62	L	6.00	7.00	1.00
Green		0.92	L	4.00	6.00	2.00
Retention Bot.		0.00	V	4.00	4.00	0.00
Lake		0.00	V	3.00	3.00	0.00
			L	0.00	0.00	0.00
		1.54				

STAGE (ft.)	Building	Pavement	Green	Retention Bot.	Lake	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.06	0.00	0.00	0.00	0.06
5.00	0.00	0.00	0.23	0.00	0.00	0.00	0.23
5.50	0.00	0.00	0.52	0.00	0.00	0.00	0.52
6.00	0.00	0.00	0.92	0.00	0.00	0.00	0.92
6.50	0.00	0.08	1.39	0.00	0.00	0.00	1.46
7.00	0.00	0.31	1.85	0.00	0.00	0.00	2.15
7.50	0.00	0.62	2.31	0.00	0.00	0.00	2.92
8.00	0.00	0.92	2.77	0.00	0.00	0.00	3.69
8.50	0.00	1.23	3.23	0.00	0.00	0.00	4.46
9.00	0.00	1.54	3.69	0.00	0.00	0.00	5.23

Soil Storage: **1.13**

Curve No. (CN): **90**

North-East Basin								
	SITE AREAS (acres)							
Basin ID	Total	Building	Pavement	Green	Dry Retention	Lake	Storage at Flood Encroachment El. (6.50' NGVD)	
N2	8.67	3.61	2.60	1.46	1.00	0.00	3.81	
N10	9.65	3.46	4.00	2.19	0.00	0.00	0.00	
N15	3.87	0.45	1.19	2.00	0.23	0.00	2.20	
N15A	2.20	0.29	1.11	0.77	0.03	0.00	2.94	
N17	4.27	0.35	1.78	1.74	0.40	0.00	2.13	
N20	8.57	0.69	7.56	0.32	0.00	0.00	10.72	
N21	4.21	0.87	2.57	0.71	0.06	0.00	3.97	
N22	2.00	0.41	1.42	0.17	0.00	0.00	0.25	
N23	5.00	0.77	4.10	0.13	0.00	0.00	1.41	
N24	5.83	0.07	2.10	3.66	0.00	0.00	0.50	
N24A	4.53	0.24	3.33	0.96	0.00	0.00	0.40	
N25	4.67	0.63	3.79	0.25	0.00	0.00	6.06	
N26	2.61	0.20	2.31	0.10	0.00	0.00	3.62	
N27	10.06	0.10	5.72	4.24	0.00	0.00	12.80	
N30	5.57	0.38	4.36	0.83	0.00	0.00	2.85	
N46	1.44	0.24	0.70	0.44	0.06	0.00	0.12	
N47	1.43	0.23	0.60	0.60	0.00	0.00	0.70	
BURRIS RD	4.15	0.00	3.55	0.60	0.00	0.00	2.60	
BURRIS RET	0.79	0.00	0.00	0.16	0.63	0.00	1.18	
441 RET	0.27	0.00	0.00	0.00	0.27	0.00	0.43	
OAKES 1-4	4.05	0.00	3.80	0.25	0.00	0.00	2.70	
OAKES RET	2.33	0.00	0.00	0.00	1.33	1.00	7.83	
N RETENTION	0.34	0.00	0.00	0.06	0.28	0.00	0.75	
O. SWALE	0.21	0.00	0.00	0.21	0.00	0.00	0.32	
Total:	**96.72**	12.99	56.59	21.85	4.29	1.00	**70.27**	**ac.ft**
Percentages:	100%	13%	59%	23%	4%	1%		

North-East Basin Outside CBWCD

Total:	**73.13**	**8.91**	**43.73**	**17.87**	**2.62**	**0.00**	**55.71**	**ac.ft**
Percentages:	100%	12%	60%	24%	4%	0%		

North-East Basin Inside CBWCD

Total:	**23.59**	**4.08**	**12.86**	**3.98**	**1.67**	**1.00**	**14.57**	**ac.ft**
Percentages:	100%	17%	55%	17%	7%	4%		

DATE: 4/4/2011
REV:
SFWMD Permit No: 06-00081-S
SFWMD Application No:

ICPR NODE DESIGNATION: CB N2
ICPR BASIN DESIGNATION: Basin CB N2

N2: SPACE PLUS

LAND USE BREAKDOWN			GRADING PARAMETERS	
LAND USE	AREA	PERCENT	FROM	TO
BUILDING	3.61	41.6%	8	N/A
PVMNT	2.60	30.0%	6	7.5
		0.0%	0	0
DRY RET.	1.00	11.5%	4	N/A
GREEN	1.46	16.8%	5	6.5
LAKE	0.00	0.0%	3	N/A
TOTAL	8.67	100%		

Exfiltration Trench

$V(ac\text{-}in) = L \times [K \times (H_2W + 2H_2D_u - D_u^2 + 2H_2D_s) + (1.39 \times 10^{-4})WD_u]$

= 0.0 = **0.000 ac-ft**

Trench Characteristics

L= 0
W= 4
K= 2.51E-04
H_2= 2.00
D_u= 2.00
D_s= 1

Trench Stage-Storage Calcs.	
Assuming Linear Progression	
Stage (ft)	Storage (ac-ft)
3	0.000
4	0.000
5	0.000

STAGE-STORAGE CALCULATIONS									
Assume Linear Progression for all Areas except Lake									
Stage	Area (acres)								Volume of
(ft-NGVD)	BUILDING	PVMNT	0	DRY RET.	GREEN	LAKE	0	Total	Storage (ac-ft)
4.00	0.00	0.00	0.00	1.00	0.00	0.000	0.00	1.00	0.00
4.50	0.00	0.00	0.00	1.00	0.00	0.000	0.00	1.00	0.50
5.00	0.00	0.00	0.00	1.00	0.00	0.000	0.00	1.00	1.00
5.50	0.00	0.00	0.00	1.00	0.49	0.000	0.00	1.49	1.62
6.00	0.00	0.00	0.00	1.00	0.97	0.000	0.00	1.97	2.49
6.50	0.00	0.87	0.00	1.00	1.46	0.000	0.00	3.33	3.81
7.00	0.00	1.73	0.00	1.00	1.46	0.000	0.00	4.19	5.69
7.50	0.00	2.60	0.00	1.00	1.46	0.000	0.00	5.06	8.01
8.00	0.00	2.60	0.00	1.00	1.46	0.000	0.00	5.06	10.54

Soil Storage Calculation

A. Total Pervious Area = 2.46 acres = 28.4%

B. Depth to Water Table = 2.0 feet

C. From SFWMD Permit Information Manual, Vol. IV, Figure E-1, For 'Developed Coastal', the Cumulative Available Soil Storage is:

Sp = ###### inches

D. Site Soil Storage(SSS)= Sp x (Pervious Area/Total Area)
= ###### inches

E. Curve Number (CN) = 1000 / (SSS +10)
= ######

Project Location Hydraulic Details

Design Water Level= 3.00
Allowable Discharge= 0.54 cfs

Control Structure Info: 0.50' Bleeder @ 3.0' NGVD via 30 lf of 15" CMP pipe

N10 FLEXSPACE (9.65 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		3.46	V	10.00	10.00	0.00
Pavement		4.00	L	7.00	8.00	1.00
Green		2.19	L	7.50	8.50	1.00
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
		9.65				

STAGE (ft.)	Building	0	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.50	0.00	0.00	0.50	0.00	0.00	0.00	0.50
8.00	0.00	0.00	2.00	0.27	0.00	0.00	2.27
8.50	0.00	0.00	4.00	1.10	0.00	0.00	5.10
9.00	0.00	0.00	6.00	2.19	0.00	0.00	8.19

Soil Storage: **1.86**

Curve No. (CN): **84**

Outfall: TWO OUTFALLS: ONE OUTFALL TO THE M RETENTION AREA WITH A BUBBLE-UP, RIM ELEVATION OF 4.50' NGVD, VIA A 42" PIPE. SECOND OUTFALL TO THE OAKES WET RETENTION WITH A CONTROL STRUCTURE, WITH A VERTICAL WEIR AT 5.00' NGVD, VIA A 36" RCP PIPE.

DATE: 4/4/2011
REV:
SFWMD Permit No:
SFWMD Application No:

ICPR NODE DESIGNATION: N15
ICPR BASIN DESIGNATION: BasinN15

N15: GOLD COAST INDUSTRIAL (3.87 AC.)

LAND USE BREAKDOWN			GRADING PARAMETERS	
LAND USE	AREA	PERCENT	FROM	TO
BUILDING	NA	#VALUE!	7.5	N/A
PVMNT	NA	#VALUE!	6	7.5
	NA	#VALUE!	0	0
DRY RET.	NA	#VALUE!	3	3
GREEN	NA	#VALUE!	4.5	7
LAKE	NA	#VALUE!	2	2
TOTAL	3.87	#VALUE!		

The stage/storage information is based on a Cascade input file, and will be entered as so shown below.

Exfiltration Trench

$V(ac\text{-}in) = L \times [K \times (H_2W + 2H_2D_u - D_u^2 + 2H_2D_s) + (1.39 \times 10^{-4})WD_u]$

= 0.0 = **0.000 ac-ft**

Trench Characteristics

L= 0
W= 4
K= 2.51E-04
H_2= 2.00
D_u= 2.00
D_s= 1

Trench Stage-Storage Calcs.	
Assuming Linear Progression	
Stage (ft)	Storage (ac-ft)
3	0.000
4	0.000
5	0.000

STAGE-STORAGE CALCULATIONS									
Assume Linear Progression for all Areas except Lake									
Stage	Area (acres)								Volume of
(ft-NGVD)	BUILDING	PVMNT	0	DRY RET.	GREEN	LAKE	0	Total	Storage (ac-ft)
3.00									0.00
3.50									0.10
4.00									0.12
4.50									0.16
5.00									0.24
5.50									0.32
6.00									1.08
6.50									2.20
7.00									3.50
7.50									4.95
8.00									6.58

Soil Storage Calculation

A. Total Pervious Area = NA acres = #VALUE!
B. Depth to Water Table = NA feet

C. From SFWMD Permit Information Manual, Vol. IV, Figure E-1, For 'Developed Coastal', the Cumulative Available Soil Storage is:

Sp = NA inches

D. Site Soil Storage(SSS)= Sp x (Pervious Area/Total Area)
= 3.54 inches

E. Curve Number (CN) = 1000 / (SSS +10)
= 74

Project Location Hydraulic Details

Design Water Level= 3.00
Allowable Discharge= 0.24 cfs

Control Structure Info:

Out-fall to the swale to the east, via 60 LF 24" pipe, and control structure w/ 36" weir (@ el. 6.55) and 3" bleeder (@ el. 3.0').

N15A (2.18AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.29	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		1.11	L	5.00	6.00	1.00
Green		0.77	L	4.00	5.00	1.00
Low Green		0.03	L	3.50	3.50	0.00
0		0.00	L	0.00	0.00	0.00
		2.20				

Add 0.20 ac.ft before 5' ngvd to account for any trenches 0.2

STAGE (ft.)	Building	Green	0	Pavement	Low Green	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
4.50	0.00	0.10	0.00	0.00	0.03	0.00	0.33
5.00	0.00	0.39	0.00	0.00	0.05	0.00	0.63
5.50	0.00	0.77	0.00	0.14	0.06	0.00	1.17
6.00	0.00	1.16	0.00	0.56	0.08	0.00	1.99
6.50	0.00	1.54	0.00	1.11	0.09	0.00	2.94
7.00	0.00	1.93	0.00	1.67	0.11	0.00	3.90
7.50	0.00	2.31	0.00	2.22	0.12	0.00	4.85
8.00	0.00	2.70	0.00	2.78	0.14	0.00	5.81
8.50	0.00	3.08	0.00	3.33	0.15	0.00	6.76
9.00	0.00	3.47	0.00	3.89	0.17	0.00	7.72

Soil Storage: **0.4**

Curve No. (CN): **96**

Outfall:

To the swale in the back (on the east side

N17 UNITED RENTAL (4.27 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.35	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		1.78	L	6.00	7.50	1.50
Green		1.74	L	5.00	7.50	2.50
Retention		0.40	L	3.50	3.50	0.00
0		0.00	L	0.00	0.00	0.00
		4.27				

STAGE (ft.)	Building	Green	0	Pavement	Retention	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.20	0.00	0.20
4.50	0.00	0.00	0.00	0.00	0.40	0.00	0.40
5.00	0.00	0.00	0.00	0.00	0.60	0.00	0.60
5.50	0.00	0.09	0.00	0.00	0.80	0.00	0.89
6.00	0.00	0.35	0.00	0.00	1.00	0.00	1.35
6.50	0.00	0.78	0.00	0.15	1.20	0.00	2.13
7.00	0.00	1.39	0.00	0.59	1.40	0.00	3.39
7.50	0.00	2.18	0.00	1.34	1.60	0.00	5.11
8.00	0.00	3.05	0.00	2.23	1.80	0.00	7.07
8.50	0.00	3.92	0.00	3.12	2.00	0.00	9.03
9.00	0.00	4.79	0.00	4.01	2.20	0.00	10.99

Soil Storage: **2.37**

Curve No. (CN): **81**

Outfall: OUTFALL TO CANAL ALONG THE WEST SIDE VIA CONTROL STRUCTURE.

N20 (8.46 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.69	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		7.56	L	4.25	6.00	1.75
Green		0.32	L	5.00	6.00	1.00
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
		8.57				

STAGE (ft.)	Building	Green	0	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.14	0.00	0.00	0.14
5.00	0.00	0.00	0.00	1.22	0.00	0.00	1.22
5.50	0.00	0.04	0.00	3.38	0.00	0.00	3.42
6.00	0.00	0.16	0.00	6.62	0.00	0.00	6.78
6.50	0.00	0.32	0.00	10.40	0.00	0.00	10.72
7.00	0.00	0.48	0.00	14.18	0.00	0.00	14.66
7.50	0.00	0.64	0.00	17.96	0.00	0.00	18.60
8.00	0.00	0.80	0.00	21.74	0.00	0.00	22.54
8.50	0.00	0.96	0.00	25.52	0.00	0.00	26.48
9.00	0.00	1.12	0.00	29.30	0.00	0.00	30.42

Soil Storage: **0.125**

Curve No. (CN): **98**

Outfall:

N21 (4.21 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.87	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		2.57	L	5.00	6.00	1.00
Green		0.71	L	4.00	5.50	1.50
Retention		0.06	L	4.00	4.00	0.00
0		0.00	L	0.00	0.00	0.00
		4.21				

STAGE (ft.)	Building	Green	0	Pavement	Retention	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.06	0.00	0.00	0.03	0.00	0.09
5.00	0.00	0.24	0.00	0.00	0.06	0.00	0.30
5.50	0.00	0.53	0.00	0.32	0.09	0.00	0.95
6.00	0.00	0.89	0.00	1.29	0.12	0.00	2.30
6.50	0.00	1.24	0.00	2.57	0.16	0.00	3.97
7.00	0.00	1.60	0.00	3.86	0.19	0.00	5.64
7.50	0.00	1.95	0.00	5.14	0.22	0.00	7.31
8.00	0.00	2.31	0.00	6.43	0.25	0.00	8.98
8.50	0.00	2.66	0.00	7.71	0.28	0.00	10.65
9.00	0.00	3.02	0.00	9.00	0.31	0.00	12.32

Soil Storage: **0.26**

Curve No. (CN): **97**

Outfall: No out-fall identified.

N22 (2.00 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.41	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		1.42	L	6.00	7.00	1.00
Green		0.17	L	5.00	7.50	2.50
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
		2.00				

STAGE (ft.)	Building	Green	0	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.01	0.00	0.00	0.00	0.00	0.01
6.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03
6.50	0.00	0.08	0.00	0.18	0.00	0.00	0.25
7.00	0.00	0.14	0.00	0.71	0.00	0.00	0.85
7.50	0.00	0.21	0.00	1.42	0.00	0.00	1.63
8.00	0.00	0.30	0.00	2.13	0.00	0.00	2.43
8.50	0.00	0.38	0.00	2.84	0.00	0.00	3.22
9.00	0.00	0.47	0.00	3.55	0.00	0.00	4.02

Soil Storage: **0.63**

Curve No. (CN): **94**

Outfall: No out-fall identified.

N23 (5.00 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.77	V	10.00	10.00	0.00
0			L	0.00	0.00	0.00
Pavement		4.10	L	5.50	7.00	1.50
Green		0.13	L	5.50	7.00	1.50
0			L	0.00	0.00	0.00
0			L	0.00	0.00	0.00
		5.00				

STAGE (ft.)	Building	Green	0	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.01	0.00	0.34	0.00	0.00	0.35
6.50	0.00	0.04	0.00	1.37	0.00	0.00	1.41
7.00	0.00	0.10	0.00	3.08	0.00	0.00	3.17
7.50	0.00	0.16	0.00	5.13	0.00	0.00	5.29
8.00	0.00	0.23	0.00	7.18	0.00	0.00	7.40
8.50	0.00	0.29	0.00	9.23	0.00	0.00	9.52
9.00	0.00	0.36	0.00	11.28	0.00	0.00	11.63

Soil Storage: **0.15**

Curve No. (CN): **99**

Outfall: No out-fall identified.

(N24) (5.83AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.07	V	10.00	10.00	0.00
Pavement		2.10	L	7.25	9.00	1.75
Green		3.66	L	8.00	10.00	2.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		5.83				

Add 0.50 ac.ft before 5 to account for any trenches 0.5

STAGE (ft.)	Building	0	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
7.50	0.00	0.00	0.04	0.00	0.00	0.00	0.54
8.00	0.00	0.00	0.34	0.00	0.00	0.00	0.84
8.50	0.00	0.00	0.94	0.23	0.00	0.00	1.67
9.00	0.00	0.00	1.84	0.92	0.00	0.00	3.25
9.50	0.00	0.00	2.89	2.06	0.00	0.00	5.45
10.00	0.00	0.00	3.94	3.66	0.00	0.00	8.10
10.50	0.04	0.00	4.99	5.49	0.00	0.00	11.01
11.00	0.07	0.00	6.04	7.32	0.00	0.00	13.93
11.50	0.11	0.00	7.09	9.15	0.00	0.00	16.84
12.00	0.14	0.00	8.14	10.98	0.00	0.00	19.76

Soil Storage: **5.22**

Curve No. (CN): **66**

Outfall: OUTFALLS TO NDITCH 6 AND N23 TO THE SOUTH

N24A (4.53 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.24	V	10.00	10.00	0.00
Pavement		3.33	L	6.50	9.00	2.50
Green		0.96	L	6.50	9.00	2.50
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		4.53				

Add 0.40 ac.ft before 5 to account for any trenches 0.4

STAGE (ft.)	Building	0	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.40
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.40
7.00	0.00	0.00	0.17	0.05	0.00	0.00	0.61
7.50	0.00	0.00	0.67	0.19	0.00	0.00	1.26
8.00	0.00	0.00	1.50	0.43	0.00	0.00	2.33
8.50	0.00	0.00	2.66	0.77	0.00	0.00	3.83
9.00	0.00	0.00	4.16	1.20	0.00	0.00	5.76

Soil Storage: **1.73**

Curve No. (CN): **85**

Outfall: No out-fall identified.

N25 (4.67 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.63	V	10.00	10.00	0.00
Pavement		3.79	L	4.50	5.50	1.00
Green		0.25	L	4.50	5.50	1.00
High Green		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		4.67				

STAGE (ft.)	Building	High Green	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.47	0.03	0.00	0.00	0.51
5.50	0.00	0.00	1.90	0.13	0.00	0.00	2.02
6.00	0.00	0.00	3.79	0.25	0.00	0.00	4.04
6.50	0.00	0.00	5.69	0.38	0.00	0.00	6.06
7.00	0.00	0.00	7.58	0.50	0.00	0.00	8.08
7.50	0.00	0.00	9.48	0.63	0.00	0.00	10.10
8.00	0.00	0.00	11.37	0.75	0.00	0.00	12.12
8.50	0.00	0.00	13.27	0.88	0.00	0.00	14.14
9.00	0.00	0.00	15.16	1.00	0.00	0.00	16.16

Soil Storage: **0.1**

Curve No. (CN): **99**

Outfall: No out-fall identified.

N26 (2.61 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.20	V	10.00	10.00	0.00
Pavement		2.31	L	4.50	5.50	1.00
Green		0.10	L	4.50	5.50	1.00
High Green		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		2.61				

STAGE (ft.)	Building	High Green	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.29	0.01	0.00	0.00	0.30
5.50	0.00	0.00	1.16	0.05	0.00	0.00	1.21
6.00	0.00	0.00	2.31	0.10	0.00	0.00	2.41
6.50	0.00	0.00	3.47	0.15	0.00	0.00	3.62
7.00	0.00	0.00	4.62	0.20	0.00	0.00	4.82
7.50	0.00	0.00	5.78	0.25	0.00	0.00	6.03
8.00	0.00	0.00	6.93	0.30	0.00	0.00	7.23
8.50	0.00	0.00	8.09	0.35	0.00	0.00	8.44
9.00	0.00	0.00	9.24	0.40	0.00	0.00	9.64

Soil Storage: **0.1**

Curve No. (CN): **99**

Outfall: No out-fall identified.

N27 (10.06AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.10	V	10.00	10.00	0.00
Pavement		5.72	L	5.00	5.75	0.75
Green		4.24	L	4.50	5.50	1.00
High Green		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		10.06				

STAGE (ft.)	Building	High Green	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.53	0.00	0.00	0.53
5.50	0.00	0.00	0.95	2.12	0.00	0.00	3.07
6.00	0.00	0.00	3.58	4.24	0.00	0.00	7.82
6.50	0.00	0.00	6.44	6.36	0.00	0.00	12.80
7.00	0.00	0.00	9.30	8.48	0.00	0.00	17.78
7.50	0.00	0.00	12.16	10.60	0.00	0.00	22.76
8.00	0.00	0.00	15.02	12.72	0.00	0.00	27.74
8.50	0.00	0.00	17.88	14.84	0.00	0.00	32.72
9.00	0.00	0.00	20.74	16.96	0.00	0.00	37.70

Soil Storage: **0.82**

Curve No. (CN): **92**

Outfall: No out-fall identified.

N30 (5.57AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.38	V	10.00	10.00	0.00
Pavement		4.36	L	5.00	7.50	2.50
Green		0.83	L	4.35	6.50	2.15
High Green		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		5.57				

STAGE (ft.)	Building	High Green	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.08	0.00	0.00	0.08
5.50	0.00	0.00	0.22	0.26	0.00	0.00	0.47
6.00	0.00	0.00	0.87	0.53	0.00	0.00	1.40
6.50	0.00	0.00	1.96	0.89	0.00	0.00	2.85
7.00	0.00	0.00	3.49	1.31	0.00	0.00	4.80
7.50	0.00	0.00	5.45	1.72	0.00	0.00	7.17
8.00	0.00	0.00	7.63	2.14	0.00	0.00	9.77
8.50	0.00	0.00	9.81	2.55	0.00	0.00	12.36
9.00	0.00	0.00	11.99	2.97	0.00	0.00	14.96

Soil Storage: **0.5**

Curve No. (CN): **95**

Outfall: OUTFALL: 1 CONCRETE WEIR TO OAKES 2 WIH INV. EL 5.50' NGVD.

N46 (1.44 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.24	V	10.00	10.00	0.00
Pavement		0.70	L	6.50	7.75	1.25
Retention		0.06	L	4.50	4.50	0.00
Green		0.44	L	6.75	8.00	1.25
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		1.44				

STAGE (ft.)	Building	Green	Pavement	Retention	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03
5.50	0.00	0.00	0.00	0.06	0.00	0.00	0.06
6.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
6.50	0.00	0.00	0.00	0.12	0.00	0.00	0.12
7.00	0.00	0.01	0.07	0.15	0.00	0.00	0.23
7.50	0.00	0.10	0.28	0.18	0.00	0.00	0.56
8.00	0.00	0.28	0.61	0.21	0.00	0.00	1.10
8.50	0.00	0.50	0.96	0.24	0.00	0.00	1.70
9.00	0.00	0.72	1.31	0.27	0.00	0.00	2.30

Soil Storage: **2.55**

Curve No. (CN): **80**

Outfall: OUTFALL TO N OAKES RETENTION

N47 (1.43AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.23	V	10.00	10.00	0.00
Pavement		0.60	L	6.00	7.00	1.00
Green		0.60	L	4.00	7.00	3.00
		1.43				

STAGE (ft.)	Building	0	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.03	0.00	0.00	0.03
5.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
5.50	0.00	0.00	0.00	0.23	0.00	0.00	0.23
6.00	0.00	0.00	0.00	0.40	0.00	0.00	0.40
6.50	0.00	0.00	0.08	0.63	0.00	0.00	0.70
7.00	0.00	0.00	0.30	0.90	0.00	0.00	1.20
7.50	0.00	0.00	0.60	1.20	0.00	0.00	1.80
8.00	0.00	0.00	0.90	1.50	0.00	0.00	2.40
8.50	0.00	0.00	1.20	1.80	0.00	0.00	3.00
9.00	0.00	0.00	1.50	2.10	0.00	0.00	3.60

Soil Storage: **1.43**

Curve No. (CN): **87**

Outfall: No out-fall identified.

BURRIS 1 (1.08 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavement		0.88	L	4.88	5.60	0.72
Green		0.20	L	5.38	5.85	0.47
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		1.08				

STAGE (ft.)	0	0	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
5.50	0.00	0.00	0.23	0.00	0.00	0.00	0.24
6.00	0.00	0.00	0.67	0.08	0.00	0.00	0.75
6.50	0.00	0.00	1.11	0.18	0.00	0.00	1.29
7.00	0.00	0.00	1.55	0.28	0.00	0.00	1.83
7.50	0.00	0.00	1.99	0.38	0.00	0.00	2.37
8.00	0.00	0.00	2.43	0.48	0.00	0.00	2.91
8.50	0.00	0.00	2.87	0.58	0.00	0.00	3.45
9.00	0.00	0.00	3.31	0.68	0.00	0.00	3.99

Soil Storage: **0.71**

Curve No. (CN): **93**

Outfall: TO BURRIS RETENTION

BURRIS 2 (1.24 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
						0.00
Pavement		1.00	L	4.40	7.17	2.77
Green		0.24	L	4.90	7.67	2.77
		1.24				

STAGE (ft.)	0	0	Pavement	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.06	0.00	0.00	0.00	0.07
5.50	0.00	0.00	0.22	0.02	0.00	0.00	0.23
6.00	0.00	0.00	0.46	0.05	0.00	0.00	0.51
6.50	0.00	0.00	0.80	0.11	0.00	0.00	0.91
7.00	0.00	0.00	1.22	0.19	0.00	0.00	1.41
7.50	0.00	0.00	1.72	0.29	0.00	0.00	2.01
8.00	0.00	0.00	2.22	0.41	0.00	0.00	2.63
8.50	0.00	0.00	2.72	0.53	0.00	0.00	3.25
9.00	0.00	0.00	3.22	0.65	0.00	0.00	3.87

Soil Storage: **1.1**

Curve No. (CN): **90**

Outfall: TO BURRIS RETENTION

BURRIS 3 (1.29 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		1.19	L	4.99	9.70	4.71
Green		0.10	L	5.49	9.66	4.17
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		1.29				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.03	0.00	0.00	0.00	0.03
6.00	0.00	0.00	0.13	0.00	0.00	0.00	0.13
6.50	0.00	0.00	0.29	0.01	0.00	0.00	0.30
7.00	0.00	0.00	0.51	0.03	0.00	0.00	0.54
7.50	0.00	0.00	0.80	0.05	0.00	0.00	0.84
8.00	0.00	0.00	1.14	0.08	0.00	0.00	1.22
8.50	0.00	0.00	1.56	0.11	0.00	0.00	1.66
9.00	0.00	0.00	2.03	0.15	0.00	0.00	2.18

Soil Storage: **0.63**

Curve No. (CN): **94**

Outfall: TO BURRIS RETENTION

BURRIS 4 (0.52 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		0.47	L	5.25	9.70	4.45
Green		0.05	L	5.75	10.25	4.50
		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.52				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03
6.50	0.00	0.00	0.08	0.00	0.00	0.00	0.09
7.00	0.00	0.00	0.16	0.01	0.00	0.00	0.17
7.50	0.00	0.00	0.27	0.02	0.00	0.00	0.28
8.00	0.00	0.00	0.40	0.03	0.00	0.00	0.43
8.50	0.00	0.00	0.56	0.04	0.00	0.00	0.60
9.00	0.00	0.00	0.74	0.06	0.00	0.00	0.80

Soil Storage: **0.78**

Curve No. (CN): **93**

Outfall: To Rentention

BURRIS RET (0.79)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
			V	0.00	0.00	0.00
Green		0.16	L	7.00	9.50	2.50
Ret Banks		0.27	L	4.00	7.00	3.00
Ret Bottom		0.36	L	4.00	4.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.79				

STAGE (ft.)	0	Ret Bottom	Green	Ret Banks	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.18	0.00	0.01	0.00	0.00	0.19
5.00	0.00	0.36	0.00	0.05	0.00	0.00	0.41
5.50	0.00	0.54	0.00	0.10	0.00	0.00	0.64
6.00	0.00	0.72	0.00	0.18	0.00	0.00	0.90
6.50	0.00	0.90	0.00	0.28	0.00	0.00	1.18
7.00	0.00	1.08	0.00	0.41	0.00	0.00	1.49
7.50	0.00	1.26	0.01	0.54	0.00	0.00	1.81
8.00	0.00	1.44	0.03	0.68	0.00	0.00	2.15
8.50	0.00	1.62	0.07	0.81	0.00	0.00	2.50
9.00	0.00	1.80	0.13	0.95	0.00	0.00	2.87

Soil Storage: **3.05**

Curve No. (CN): **77**

Outfall: No out-fall identified.

N441 SWALE RETENTION (0.27)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
			V	0.00	0.00	0.00
Green		0.00	L	0.00	0.00	0.00
Ret Banks		0.17	L	4.00	7.00	3.00
Ret Bottom		0.10	L	4.00	4.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.27				

STAGE (ft.)	0	Ret Bottom	Green	Ret Banks	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.05	0.00	0.01	0.00	0.00	0.06
5.00	0.00	0.10	0.00	0.03	0.00	0.00	0.13
5.50	0.00	0.15	0.00	0.06	0.00	0.00	0.21
6.00	0.00	0.20	0.00	0.11	0.00	0.00	0.31
6.50	0.00	0.25	0.00	0.18	0.00	0.00	0.43
7.00	0.00	0.30	0.00	0.26	0.00	0.00	0.56
7.50	0.00	0.35	0.00	0.34	0.00	0.00	0.69
8.00	0.00	0.40	0.00	0.43	0.00	0.00	0.83
8.50	0.00	0.45	0.00	0.51	0.00	0.00	0.96
9.00	0.00	0.50	0.00	0.60	0.00	0.00	1.10

Soil Storage: **2.32**

Curve No. (CN): **81**

Outfall: No out-fall identified.

N RETENTION (0.34)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
			V	0.00	0.00	0.00
Green		0.06	L	6.50	7.00	0.50
Ret Banks		0.13	L	3.00	6.50	3.50
Ret Bottom		0.15	L	3.00	3.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.34				

STAGE (ft.)	0	Ret Bottom	Green	Ret Banks	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.08	0.00	0.00	0.00	0.00	0.08
4.00	0.00	0.15	0.00	0.02	0.00	0.00	0.17
4.50	0.00	0.23	0.00	0.04	0.00	0.00	0.27
5.00	0.00	0.30	0.00	0.07	0.00	0.00	0.37
5.50	0.00	0.38	0.00	0.12	0.00	0.00	0.49
6.00	0.00	0.45	0.00	0.17	0.00	0.00	0.62
6.50	0.00	0.53	0.00	0.23	0.00	0.00	0.75
7.00	0.00	0.60	0.02	0.29	0.00	0.00	0.91
7.50	0.00	0.68	0.05	0.36	0.00	0.00	1.08
8.00	0.00	0.75	0.08	0.42	0.00	0.00	1.25
8.50	0.00	0.83	0.11	0.49	0.00	0.00	1.42
9.00	0.00	0.90	0.14	0.55	0.00	0.00	1.59

Soil Storage: **0.85**

Curve No. (CN): **92**

Outfall: NA

N OAKES RETENTION (2.33)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
			V	0.00	0.00	0.00
Green		0.00	L	0.00	0.00	0.00
Ret Banks		1.33	L	2.00	6.00	4.00
Ret Bottom		1.00	L	2.00	2.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		2.33				

STAGE (ft.)	0	Ret Bottom	Green	Ret Banks	0	0	TOTAL (ac.-ft.)
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	1.00	0.00	0.17	0.00	0.00	1.17
4.00	0.00	2.00	0.00	0.67	0.00	0.00	2.67
4.50	0.00	2.50	0.00	1.04	0.00	0.00	3.54
5.00	0.00	3.00	0.00	1.50	0.00	0.00	4.50
5.50	0.00	3.50	0.00	2.04	0.00	0.00	5.54
6.00	0.00	4.00	0.00	2.66	0.00	0.00	6.66
6.50	0.00	4.50	0.00	3.33	0.00	0.00	7.83
7.00	0.00	5.00	0.00	3.99	0.00	0.00	8.99
7.50	0.00	5.50	0.00	4.66	0.00	0.00	10.16
8.00	0.00	6.00	0.00	5.32	0.00	0.00	11.32
8.50	0.00	6.50	0.00	5.99	0.00	0.00	12.49
9.00	0.00	7.00	0.00	6.65	0.00	0.00	13.65

Soil Storage: **0.67**
Curve No. (CN): **94**

Outfall: na

OAKES 1 (1.32 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		1.25	L	5.66	7.45	1.79
Green		0.07	L	6.15	7.95	1.80
		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		1.32				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.04	0.00	0.00	0.00	0.04
6.50	0.00	0.00	0.25	0.00	0.00	0.00	0.25
7.00	0.00	0.00	0.63	0.01	0.00	0.00	0.64
7.50	0.00	0.00	1.18	0.04	0.00	0.00	1.22
8.00	0.00	0.00	1.81	0.07	0.00	0.00	1.87
8.50	0.00	0.00	2.43	0.10	0.00	0.00	2.53
9.00	0.00	0.00	3.06	0.14	0.00	0.00	3.19

Soil Storage: **0.4**

Curve No. (CN): **96**

Outfall: NA

OAKES 2 (0.95AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		0.95	L	5.66	6.71	1.05
Green		0.00	L	4.00	6.00	2.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.95				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05
6.50	0.00	0.00	0.32	0.00	0.00	0.00	0.32
7.00	0.00	0.00	0.77	0.00	0.00	0.00	0.77
7.50	0.00	0.00	1.25	0.00	0.00	0.00	1.25
8.00	0.00	0.00	1.72	0.00	0.00	0.00	1.72
8.50	0.00	0.00	2.20	0.00	0.00	0.00	2.20
9.00	0.00	0.00	2.67	0.00	0.00	0.00	2.67

Soil Storage: **0**

Curve No. (CN): **100**

Outfall: To Rentention

OAKES 3 (0.77 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		0.77	L	4.75	5.79	1.04
Green		0.00	L	0.00	0.00	0.00
		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.77				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02
5.50	0.00	0.00	0.21	0.00	0.00	0.00	0.21
6.00	0.00	0.00	0.56	0.00	0.00	0.00	0.56
6.50	0.00	0.00	0.95	0.00	0.00	0.00	0.95
7.00	0.00	0.00	1.33	0.00	0.00	0.00	1.33
7.50	0.00	0.00	1.72	0.00	0.00	0.00	1.72
8.00	0.00	0.00	2.10	0.00	0.00	0.00	2.10
8.50	0.00	0.00	2.49	0.00	0.00	0.00	2.49
9.00	0.00	0.00	2.87	0.00	0.00	0.00	2.87

Soil Storage: **0.78**

Curve No. (CN): **93**

Outfall: To Rentention

OAKES 4 (1.02 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		0.84	L	4.74	5.79	1.05
Green		0.18	L	5.24	6.29	1.05
		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		1.02				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03
5.50	0.00	0.00	0.23	0.01	0.00	0.00	0.24
6.00	0.00	0.00	0.62	0.05	0.00	0.00	0.67
6.50	0.00	0.00	1.04	0.13	0.00	0.00	1.17
7.00	0.00	0.00	1.46	0.22	0.00	0.00	1.68
7.50	0.00	0.00	1.88	0.31	0.00	0.00	2.19
8.00	0.00	0.00	2.30	0.40	0.00	0.00	2.70
8.50	0.00	0.00	2.72	0.49	0.00	0.00	3.21
9.00	0.00	0.00	3.14	0.58	0.00	0.00	3.72

Soil Storage: **0.74**

Curve No. (CN): **93**

Outfall: To Rentention

OAKES SWALE (0.21 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V			0.00
Pavment		0.00	L	0.00	0.00	0.00
Green		0.21	L	4.00	6.00	2.00
		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		0.21				

STAGE (ft.)	0	0	Pavment	Green	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.01	0.00	0.00	0.01
5.00	0.00	0.00	0.00	0.05	0.00	0.00	0.05
5.50	0.00	0.00	0.00	0.12	0.00	0.00	0.12
6.00	0.00	0.00	0.00	0.21	0.00	0.00	0.21
6.50	0.00	0.00	0.00	0.32	0.00	0.00	0.32
7.00	0.00	0.00	0.00	0.42	0.00	0.00	0.42
7.50	0.00	0.00	0.00	0.53	0.00	0.00	0.53
8.00	0.00	0.00	0.00	0.63	0.00	0.00	0.63
8.50	0.00	0.00	0.00	0.74	0.00	0.00	0.74
9.00	0.00	0.00	0.00	0.84	0.00	0.00	0.84

Soil Storage: **1.88**

Curve No. (CN): **84**

Outfall: To Rentention

North CBWCD Basin (N-1 Canal & Northwest Sub-basins)							
Basin ID	SITE AREAS (acres)						Storage (Ac-ft) at Flood Encroachment El. (6.50' NGVD)
	Total	Building	Pavement	Green	Dry Retention	Lake	
M3	3.40	0.37	2.18	0.85	0.00	0.00	1.31
M3A	3.03	0.53	1.37	1.00	0.13	0.00	0.53
M N1	1.80	0.00	0.00	1.20	0.00	0.60	4.80
M6	5.08	0.30	1.80	2.52	0.16	0.30	4.08
M 8 PH1	5.33	1.56	2.67	1.10	0.00	0.00	1.22
M11 PH1	27.29	10.00	16.29	1.00	0.00	0.00	5.56
M11 PH2	12.43	4.28	7.43	0.72	0.00	0.00	2.57
M11 LAKE	7.76	0.00	0.50	2.09	0.00	5.17	22.14
M12A	4.94	0.50	4.00	0.44	0.00	0.00	1.21
M12B	24.52	0.45	24.07	0.00	0.00	0.00	10.79
M12C	1.39	0.51	0.81	0.07	0.00	0.00	1.23
M12D	2.25	0.23	1.21	0.81	0.00	0.00	0.15
M14	8.81	1.00	6.11	1.00	0.70	0.00	5.89
M31	3.58	0.24	2.81	0.53	0.00	0.00	3.61
M32	4.04	1.74	2.02	0.28	0.00	0.00	0.42
M37	1.57	0.15	0.97	0.45	0.00	0.00	0.12
M3839	5.66	0.09	4.47	1.10	0.00	0.00	0.40
M40	2.17	0.45	1.46	0.26	0.00	0.00	0.00
M41	0.89	0.37	0.52	0.00	0.00	0.00	0.07
M41 LAKE	1.39	0.00	0.00	0.67	0.00	0.72	4.75
M41A	5.17	1.91	3.26	0.00	0.00	0.00	0.45
M42	2.53	1.36	1.17	0.00	0.00	0.00	0.42
M42 LAKE	2.48	0.00	0.00	1.11	0.00	1.37	8.66
M42A	7.91	3.00	4.91	0.00	0.00	0.00	3.44
M45	2.56	0.70	1.37	0.49	0.00	0.00	1.47
M SLOAN	8.58	0.50	5.44	2.64	0.00	0.00	11.83
M1	13.83	3.15	5.69	2.97	0.00	2.02	10.89
M43	3.80	0.00	0.78	3.02	0.00	0.00	5.28
M KEANE	1.54	0.00	1.00	0.54	0.00	0.00	2.85
M KEANE RET	0.41	0.00	0.00	0.00	0.41	0.00	1.32
ORANGE DR.	5.17	0.00	3.67	0.00	1.50	0.00	6.04
M47 AVE	5.97	0.00	4.60	1.37	0.00	0.00	6.25
Total:	**187.28**	33.39	112.58	28.23	2.90	10.18	**129.73**
Percentages:	100%	18%	60%	15%	2%	5%	
Total pre-development storage below 6.50' NGVD :							**129.73**

N-1 Canal Sub-Basin

Total:	**154.04**	29.44	97.87	16.54	2.33	7.86	**93.50**
Percentages:	100%	19%	64%	11%	2%	5%	

Northwest Sub-Basin

Total:	**33.24**	3.95	14.71	11.69	0.57	2.32	**36.23**
Percentages:	100%	12%	44%	35%	2%	7%	

M3 (South Florida Warehousing 3.40 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.37	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		2.18	L	5.15	6.80	1.65
Green		0.85	L	6.00	7.00	1.00
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
		3.40				

STAGE (ft.)	Building	Green	0	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.08	0.00	0.00	0.08
6.00	0.00	0.00	0.00	0.48	0.00	0.00	0.48
6.50	0.00	0.11	0.00	1.20	0.00	0.00	1.31
7.00	0.00	0.43	0.00	2.23	0.00	0.00	2.66
7.50	0.00	0.85	0.00	3.32	0.00	0.00	4.17
8.00	0.00	1.28	0.00	4.41	0.00	0.00	5.69
8.50	0.00	1.70	0.00	5.50	0.00	0.00	7.20
9.00	0.00	2.13	0.00	6.59	0.00	0.00	8.72

Soil Storage: **1.64**

Curve No. (CN): **86**

Outfall:

OUTFALL TO THE N-1 ONE CANAL VIA 4' WEIR AT EL. 6.80 NGVD AND 3" BLEEDER AT EL. 4.25. WITH 15 RCP PIPE INV. EL. 2.50' NGVD.
PER THE DESIGN PLANS, APPROXIMATELLY 1800 LF OF EXFILTRATION TRENCHES WERE CONSTRUCTED. THIS WILL BE REPRESENTED AS STORING 0.65 AC.FT AT ELEVATION 5.0' NGVD. THE 0.65 AC.FT IS EQUIVALENT TO 1800 LF OF TRENCH WITH H2 AND DU= 2', DS=1 AND A K PERCOLATION VALUE OF 0.0002

M3A (South Florida Warehousing 3.03 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.53	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		1.37	L	6.20	7.02	0.82
Green		1.00	L	6.00	7.00	1.00
Retention		0.13	L	4.00	4.00	0.00
0		0.00	L	0.00	0.00	0.00
		3.03				

STAGE (ft.)	Building	Green	0	Pavement	Retention	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.07	0.00	0.07
5.00	0.00	0.00	0.00	0.00	0.13	0.00	0.13
5.50	0.00	0.00	0.00	0.00	0.20	0.00	0.20
6.00	0.00	0.00	0.00	0.00	0.26	0.00	0.26
6.50	0.00	0.13	0.00	0.08	0.33	0.00	0.53
7.00	0.00	0.50	0.00	0.53	0.39	0.00	1.42
7.50	0.00	1.00	0.00	1.22	0.46	0.00	2.67
8.00	0.00	1.50	0.00	1.90	0.52	0.00	3.92
8.50	0.00	2.00	0.00	2.59	0.59	0.00	5.17
9.00	0.00	2.50	0.00	3.27	0.65	0.00	6.42

Soil Storage: **2.19**

Curve No. (CN): **82**

Outfall:

OUTFALL TO THE N-1 ONE CANAL VIA 4' WEIR AT EL. 6.82 NGVD AND 3" BLEEDER AT EL. 3.00. WITH 15 RCP PIPE INV. EL. 2.50' NGVD.
PER THE DESIGN PLANS, APPROXIMATELLY 585 LF OF EXFILTRATION TRENCHES WERE CONSTRUCTED. THIS WILL BE REPRESENTED AS STORING 0.21 AC.FT AT ELEVATION 5.0' NGVD. THE 0.21 AC.FT IS EQUIVALENT TO 1800 LF OF TRENCH WITH H2 AND DU= 2', DS=1 AND A K PERCOLATION VALUE OF 0.0002

M N1 BASIN (1.83 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Water		0.60	V	2.00	2.00	0.00
Green		1.20	L	3.50	6.00	2.50
		0.00	L	0.00	0.00	0.00
		0.00	L	0.00	0.00	0.00
		0.00	L	0.00	0.00	0.00
		0.00	L	0.00	0.00	0.00
		1.80				

STAGE (ft.)	Water	0	Green	0	0	0	TOTAL (ac.-ft.)
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.60	0.00	0.00	0.00	0.00	0.00	0.60
4.00	1.20	0.00	0.06	0.00	0.00	0.00	1.26
4.50	1.50	0.00	0.24	0.00	0.00	0.00	1.74
5.00	1.80	0.00	0.54	0.00	0.00	0.00	2.34
5.50	2.10	0.00	0.96	0.00	0.00	0.00	3.06
6.00	2.40	0.00	1.50	0.00	0.00	0.00	3.90
6.50	2.70	0.00	2.10	0.00	0.00	0.00	4.80
7.00	3.00	0.00	2.70	0.00	0.00	0.00	5.70
7.50	3.30	0.00	3.30	0.00	0.00	0.00	6.60
8.00	3.60	0.00	3.90	0.00	0.00	0.00	7.50
8.50	3.90	0.00	4.50	0.00	0.00	0.00	8.40
9.00	4.20	0.00	5.10	0.00	0.00	0.00	9.30

Soil Storage: **2.75**

Curve No. (CN): **78**

Outfall: BASIN ATTACHED TO CANAL NODE

M6 (5.08 Ac.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		0.30	V	10.00	10.00	0.00
Pavement		1.80	L	6.75	7.25	0.50
Lake		0.30	L	3.00	3.00	0.00
Green		2.52	L	4.00	7.00	3.00
Green Retention		0.16	L	4.00	4.00	0.00
			L	0.00	0.00	0.00
		5.08				

STAGE (ft.)	Building	Green	Pavement	Lake	Green Retention	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.15	0.00	0.00	0.15
4.00	0.00	0.00	0.00	0.30	0.00	0.00	0.30
4.50	0.00	0.11	0.00	0.45	0.08	0.00	0.64
5.00	0.00	0.42	0.00	0.60	0.16	0.00	1.18
5.50	0.00	0.95	0.00	0.75	0.24	0.00	1.94
6.00	0.00	1.68	0.00	0.90	0.32	0.00	2.90
6.50	0.00	2.63	0.00	1.05	0.40	0.00	4.08
7.00	0.00	3.78	0.11	1.20	0.48	0.00	5.57
7.50	0.00	5.04	0.90	1.35	0.56	0.00	7.85
8.00	0.00	6.30	1.80	1.50	0.64	0.00	10.24
8.50	0.00	7.56	2.70	1.65	0.72	0.00	12.63
9.00	0.00	8.82	3.60	1.80	0.80	0.00	15.02

Soil Storage: **1.74**

Curve No. (CN): **85**

Outfall: OUTFALL VIA CONCRETE AT EL 6.50' NGVD TO ORANGE DRIVE.

M8 PH1 (5.33 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		1.56	V	10.00	10.00	0.00
Pavement		2.67	L	5.75	7.00	1.25
0		0.00	L	0.00	0.00	0.00
Green		1.10	L	5.00	7.00	2.00
0		0.00	L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		5.33				

Assume 0.35 ac.ft stored in exfiltration trenches before 4.50' NGVD.

STAGE (ft.)	Building	Green	Pavement	0	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.07	0.00	0.00	0.00	0.00	0.07
6.00	0.00	0.28	0.07	0.00	0.00	0.00	0.34
6.50	0.00	0.62	0.60	0.00	0.00	0.00	1.22
7.00	0.00	1.10	1.67	0.00	0.00	0.00	2.77
7.50	0.00	1.65	3.00	0.00	0.00	0.00	4.65
8.00	0.00	2.20	4.34	0.00	0.00	0.00	6.54
8.50	0.00	2.75	5.67	0.00	0.00	0.00	8.42
9.00	0.00	3.30	7.01	0.00	0.00	0.00	10.31

Soil Storage: **1.02**

Curve No. (CN): **91**

Outfall: OUTFALL TO W8 LAKE VIA 583 LF OF 30" RCP PIPE AND 506 LF OF 36" RCP PIPE.

M11 LAKE

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
		0.00	V	0.00	0.00	0.00
Lake		5.17	L	3.00	3.00	0.00
Pavement		0.50	L	6.00	6.50	0.50
Green Banks		2.09	L	3.00	6.25	3.25
			L	0.00	0.00	0.00
			L	0.00	0.00	0.00
		7.76				

STAGE (ft.)	0	Green Banks	Lake	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.08	2.59	0.00	0.00	0.00	2.67
4.00	0.00	0.32	5.17	0.00	0.00	0.00	5.49
4.50	0.00	0.72	7.76	0.00	0.00	0.00	8.48
5.00	0.00	1.29	10.34	0.00	0.00	0.00	11.63
5.50	0.00	2.01	12.93	0.00	0.00	0.00	14.93
6.00	0.00	2.89	15.51	0.00	0.00	0.00	18.40
6.50	0.00	3.92	18.10	0.13	0.00	0.00	22.14
7.00	0.00	4.96	20.68	0.38	0.00	0.00	26.02
7.50	0.00	6.01	23.27	0.63	0.00	0.00	29.90
8.00	0.00	7.05	25.85	0.88	0.00	0.00	33.78
8.50	0.00	8.10	28.44	1.13	0.00	0.00	37.66
9.00	0.00	9.14	31.02	1.38	0.00	0.00	41.54

Soil Storage: **0.4**

Curve No. (CN): **96**

Outfall: OUTFALL TO N1 CANAL W/ RISER. SEE ASBUILT FOR RISER CONFIGURATION.

M11 PH1 (27.29 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		10.00	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		16.29	L	5.50	7.00	1.50
Green		1.00	L	6.00	7.00	1.00
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
		27.29				

STAGE (ft.)	Building	Green	0	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	1.36	0.00	0.00	1.36
6.50	0.00	0.13	0.00	5.43	0.00	0.00	5.56
7.00	0.00	0.50	0.00	12.22	0.00	0.00	12.72
7.50	0.00	1.00	0.00	20.36	0.00	0.00	21.36
8.00	0.00	1.50	0.00	28.51	0.00	0.00	30.01
8.50	0.00	2.00	0.00	36.65	0.00	0.00	38.65
9.00	0.00	2.50	0.00	44.80	0.00	0.00	47.30

Soil Storage: **0.23**

Curve No. (CN): **98**

Outfall: OUTAFALL TO M11 LAKE VIA 3 DIFFERENT PIPES

M11 PH2 (12.43 AC.)

(Data from aerials and Lidar)

1.

AREA		ACRES	V/L	START ELEV	END ELEV	CHANGE
Building		4.28	V	10.00	10.00	0.00
0		0.00	L	0.00	0.00	0.00
Pavement		7.43	L	5.50	7.00	1.50
Green		0.72	L	6.00	7.00	1.00
0		0.00	L	0.00	0.00	0.00
0		0.00	L	0.00	0.00	0.00
		12.43				

STAGE (ft.)	Building	Green	0	Pavement	0	0	TOTAL (ac.-ft.)
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.62	0.00	0.00	0.62
6.50	0.00	0.09	0.00	2.48	0.00	0.00	2.57
7.00	0.00	0.36	0.00	5.57	0.00	0.00	5.93
7.50	0.00	0.72	0.00	9.29	0.00	0.00	10.01
8.00	0.00	1.08	0.00	13.00	0.00	0.00	14.08
8.50	0.00	1.44	0.00	16.72	0.00	0.00	18.16
9.00	0.00	1.80	0.00	20.43	0.00	0.00	22.23

Soil Storage: **0.38**

Curve No. (CN): **96**

Outfall:

TWO OUTFALLS TO THE M11 LAKE (10 LF 30" RCP, INV. EL -1.00). WITH A WEIR OF 4.75' NGVD.
PER THE DESIGN PLANS, APPROXIMATELLY 860 LF OF EXFILTRATION TRENCHES WERE CONSTRUCTED. THIS WILL BE REPRESENTED AS STORING 0.31 AC.FT AT ELEVATION 4.75' NGVD.