

STORMWATER MANAGEMENT REPORT

FOR

Culvers Restaurant

**2000 N. State Road 7,
Margate, FL 33063**

April 1st, 2019

Justin Thompson, P.E.

Florida License No. 84595

Bowman Consulting Group, LTD.

Board of Professional Engineers –
Certificate of Authorization No. 30462

PROJECT #010594-01-001

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Introduction

Project Information

The project consists of one (1) lot located on the Southwest corner of W. Copans Road and NW 55th Avenue in the municipal boundaries of the City of Margate, FL. The lot folio number is 4842-30-05-0020, located in the jurisdiction of the City of Margate and is currently zoned Transit Oriented Corridor (TOC-G). The lot contains 3.62 acres in total, of which approximately 1.96 acres is developed as a convenience store with a gas station. The remaining 1.64 acres proposes the construction of a four thousand four hundred forty-three (4,443) square foot restaurant and a four thousand (4,000) square foot general retail. The parcel to the west will be incorporated into the design and calculations to treat this area as one large system. This is to provide adequate water quality treatment and attenuation for both parcels. To distinguish between the parcels the Wawa Site will be referred to as the “West Site” and the proposed Culver’s Site will be referred to as the “East Site”. The required storage volume to provide the 5 year – 1 hour level of service for the parking lot area will be stored in an underground detention system.

Site Conditions

Existing Conditions

The existing 3.62-acre west site is currently a gas station/convenience store with two (2) existing driveways providing access to both State Road 7 and Copans Road, there is currently cross access driveways providing access between the west site and the east site. The site is approximately Forty-nine percent (49%) impervious and fifty one percent (51%) pervious. The existing 1.67-acre east parcel is currently vacant with a driveway connecting the property to the west to NW 55th Avenue. The site is approximately ninety one percent (91%) pervious and nine percent (9%) impervious. There is currently (1) existing driveway along NW 55th Avenue, which is a two-way North Bound (NB) arterial.

Proposed Conditions

The proposed improvements include the construction of a four thousand four hundred forty-three (4,443) square foot restaurant and a four thousand (4,000) square foot general retail. The existing accessway from NW 55th Avenue to the property on the west side will be demolished and

incorporated into the proposed construction. Under proposed conditions, the site will be seventy-three (73%) percent impervious and twenty-seven (27%) percent pervious grass and open space.

Water Table

Due to tailwater conditions, the control elevation and groundwater table elevation have been set at 8.00 ft, NAVD88, as discussed with Broward County during preliminary meetings in July and August of 2018. This is above the 7.0 elevation in the published water table map and above the 6.5 elevation of the Broward County future groundwater conditions map. The Cocomar Water Control District maintains the canal system at 7.00 ft, NAVD88 during wet season and 8.00 ft, NAVD88 during the dry season.

Exfiltration Rates

The proposed storm water improvements associated with this project will incorporate the use of exfiltration trenches. Geotechnical borings were performed and tests based on constant head exfiltration test was used to estimate the “K” value. Based on the field data, a “K” value of 12.5×10^{-4} cfs/sqft-ft and 4.33×10^{-4} cfs/sqft-ft of head was used in the design of the exfiltration trenches for this project. Please refer to attached geotechnical report.

Flood Elevations

The FEMA FIRM map 12011C0165H indicates the site to be in a 0.2% Flood Hazard. FEMA panel number 12011C0165H has been enclosed for reference.

Land Use Calculations

Existing Conditions

Total Site (West + East)		
Area Description	Square Feet	Acreage
Building	5,943	0.14
Sidewalk / Paving	71,351	1.64
Grass / Open Area	80,201	1.84
Total Area	157,495	3.62

Proposed Conditions

Total Site (West + East)		
Area Description	Square Feet	Acreage
Building	14,386	0.33
Sidewalk / Paving	111,606	2.57
Grass / Open Area	31,503	0.72
Total Area	157,495	3.62

Soil Storage and Runoff Calculations:

Existing Conditions

The existing soils are comprised of Pompano Fine Sand and Margate Fine Sand; therefore, flatwoods soils will be used. According to the SFWMD Manual, Page F-1, and the approved SWL Permit #SWML2016-045-2 the depth to water table is 2.0' corresponding to developed available storage of 1.58".

$$\% \text{Impervious} = \frac{1.78}{3.62}$$

$$\% \text{Impervious} = 0.49$$

$$S = S_{\text{Comp}}(1 - \% \text{Impervious})$$

$$S = 1.58"(1 - 0.49)$$

$$\therefore S = 0.80$$

$$CN = \frac{1000}{S + 10}$$

$$CN = \frac{1000}{(0.80 + 10)}$$

$$\therefore CN = 92.593$$

Proposed Conditions

The existing soils are comprised of Pompano fine sand and Margate fine sand; therefore, flatwoods soils will be used. According to the SFWMD Manual, Page F-1, the depth to water table is 2.0' corresponding to developed available storage of 1.58".

$$\% \text{Impervious} = \frac{2.85}{3.62}$$

$$\% \text{Impervious} = 0.79$$

$$S = S_{\text{Comp}}(1 - \% \text{Impervious})$$

$$S = 1.58"(1 - 0.79)$$

$$\therefore S = 0.33"$$

$$CN = \frac{1000}{S + 10}$$

$$CN = \frac{1000}{(0.33 + 10)}$$

$$\therefore CN = 96.805$$

Stage Storage Tabulation

Proposed

WSEL	West Site			East Site				Total Volume (ac-ft)
	Surface (ac-ft)	Trench (ac-ft)	Total West	Surface (ac-ft)	Trench (ac-ft)	Tank (ac-ft)	Total East	
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.00	0.51	0.51	0.00	0.44	0.32	0.76	1.27
9.43	0.00	0.51	0.51	0.00	0.58	0.50	1.08	1.59
9.50	0.00	0.51	0.51	0.00	0.67	0.50	1.17	1.68
10.00	0.02	0.51	0.53	0.00	0.67	0.50	1.17	1.70
11.00	0.44	0.51	0.95	0.19	0.67	0.50	1.36	2.31
12.00	1.60	0.51	2.11	1.48	0.67	0.50	2.65	4.76
12.50	2.42	0.51	2.93	2.31	0.67	0.50	3.48	6.41
13.00	3.33	0.51	3.84	3.51	0.67	0.50	4.68	8.52
14.00	5.12	0.51	5.63	3.84	0.67	0.50	5.01	10.64

METHODOLOGY

Water Quality

Per South Florida Water Management District design criteria for commercial properties, water quality treatment is required for wet detention areas. The wet detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5 inches times the percentage of imperviousness, whichever is greater. The required water quality volume of 0.57 ac-ft will be met in the proposed exfiltration trench and concrete vault on site which provides 0.57 ac-ft. of storage combined.

- **1 in. x Site**

$$\left(1 \text{ in.} \times 3.62 \text{ ac.} \div 12 \frac{\text{in}}{\text{ft}}\right) = 0.30 \text{ ac.-ft}$$

∴ 0.30 ac.-ft. Required Water Quality

- **2.5 in. x (% Impervious)**

- Site Area for Water Quality Calculations
= (Total Site – Roof Area)
= (3.62 ac – 0.49 ac)
= 3.13 ac
- Impervious Area for Water Quality Calculations
= (Site Area for Water Quality – Pervious)
= (3.13 ac – 0.77 ac)
= 2.36 ac
- Percentage of Impervious for Water Quality Calculations
= (Impervious Area for WQ / Site Area for WQ) × 100%
= (2.36 ac. ÷ 3.13 ac) × 100% = 75%
= (2.5 in. × 0.75) = 1.88 inches to be treated

$$\begin{aligned} &\circ \text{ Inches to Be Treated} \times \text{Total Site Area} = \text{Treatment Volume} \\ &= (1.88 \text{ in.} \times 3.62 \text{ ac.}) = 6.81 \text{ ac.} - \text{in.} \\ &= \left(6.81 \text{ ac.} - \text{in.} \div 12 \frac{\text{in}}{\text{ft}} \right) = 0.57 \text{ ac.} - \text{ft} \end{aligned}$$

$\therefore$ 0.57 ac.-ft. Required Water Quality

- 0.57 ac.-ft. > 0.30 ac.-ft.
0.57 ac.-ft ← Controls

Water Quality Treatment Required = 0.57 ac-ft

Water Quality Treatment Provided = 0.57 ac-ft

Dry Pre-treatment

Per South Florida Water Management District design criteria, dry pre-treatment is required for 0.5 inches times the entire project area. The required dry pre-treatment volume of 0.15 ac-ft will be met within the proposed exfiltration trench system onsite and a Concrete Vault. The proposed exfiltration system provides a total storage volume of 0.67 ac-ft. The 0.15 ac-ft requirement will be provided in the exfiltration trench.

$$= (0.5'' \times 3.62\text{-acres} / 12 = 0.15 \text{ ac-ft})$$

Dry Pre-Treatment Required = 0.15 ac-ft

Dry Pre-Treatment Provided = 0.57 ac-ft

Peak Stage Analysis

A peak stage analysis has been performed to model the proposed conditions and compare it to the previously approved permit conditions. Please see Appendix B for the ICPR calculations and outputs.

Rainfall Used for Modeling Purposes

Storm Event	Rainfall (Inches)
5-year, 1-hour	3.28
10-year, 1-day	10
25-year, 3-day	17.7
100-year, 3-day	24.5

Maximum Stage

Storm Event	Approved (NAVD)	Proposed (NAVD)
5-year – 1-hour	9.90'	8.25'
10-year - 1-day	NA	10.13'
25-year - 3-day	11.50'	11.40'
100-year – 3day	12.50'	*12.46'

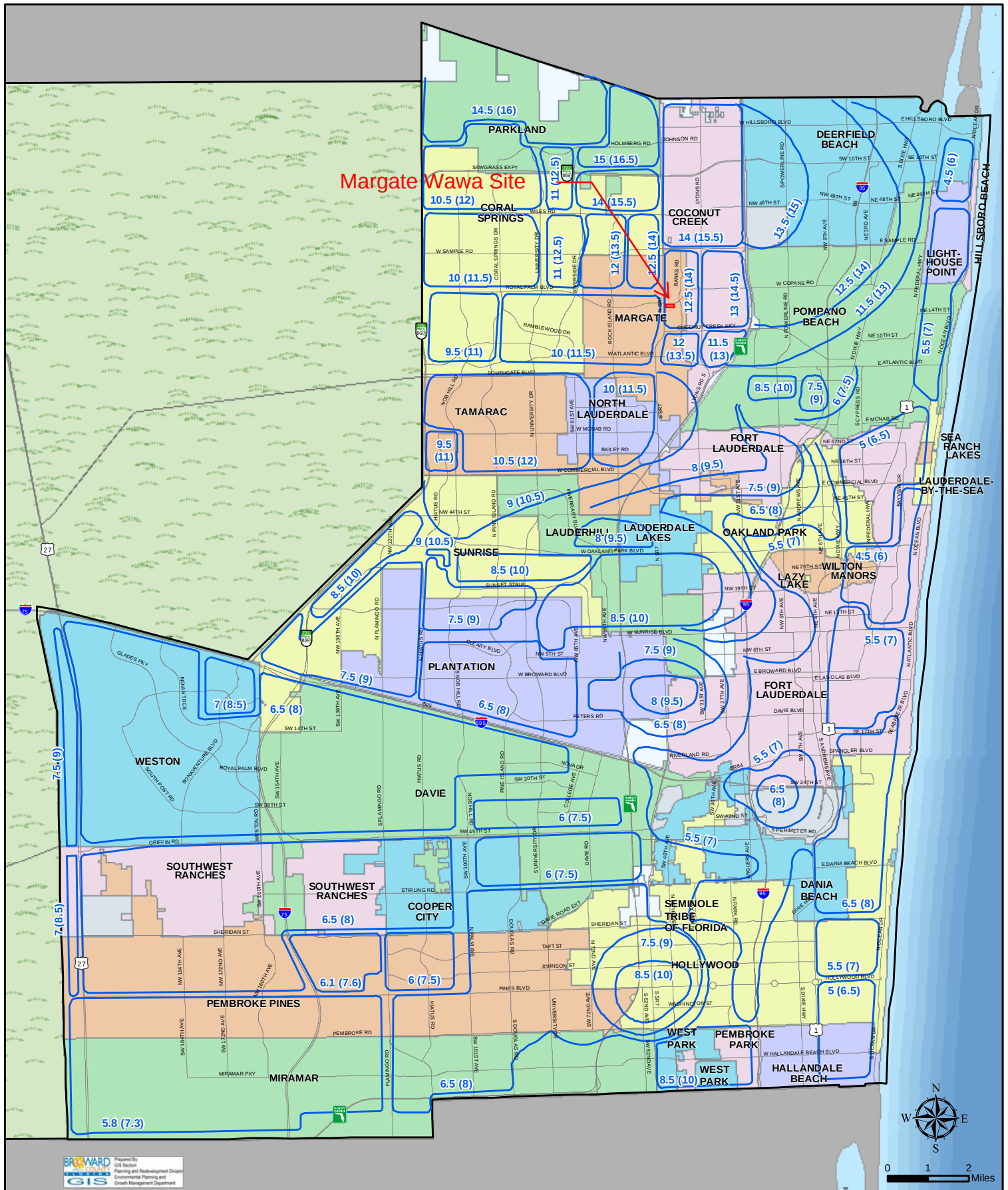
*zero discharge condition

CONCLUSION

In summary, the proposed stormwater system of surface storage, exfiltration trench and underground storage, will provide adequate storm water management to construct the proposed Culvers Restaurant and General Retail. Dry pre-treatment volume is being met within the 0.67 ac-ft of storage volume in the exfiltration trench. Water quality volume is being met by providing 0.67 ac-ft of storage volume in the exfiltration trench. The required storage volume to provide the 5 year – 1 hour level of service for the parking lot area will be met which will improve the existing flooding issue on the Wawa Parcel. In addition, the 100-year water surface elevation has also been demonstrated that it is below the WAWA finished floor elevation of 12.50' and the proposed Culver's elevation of 13.00'.

Appendix A





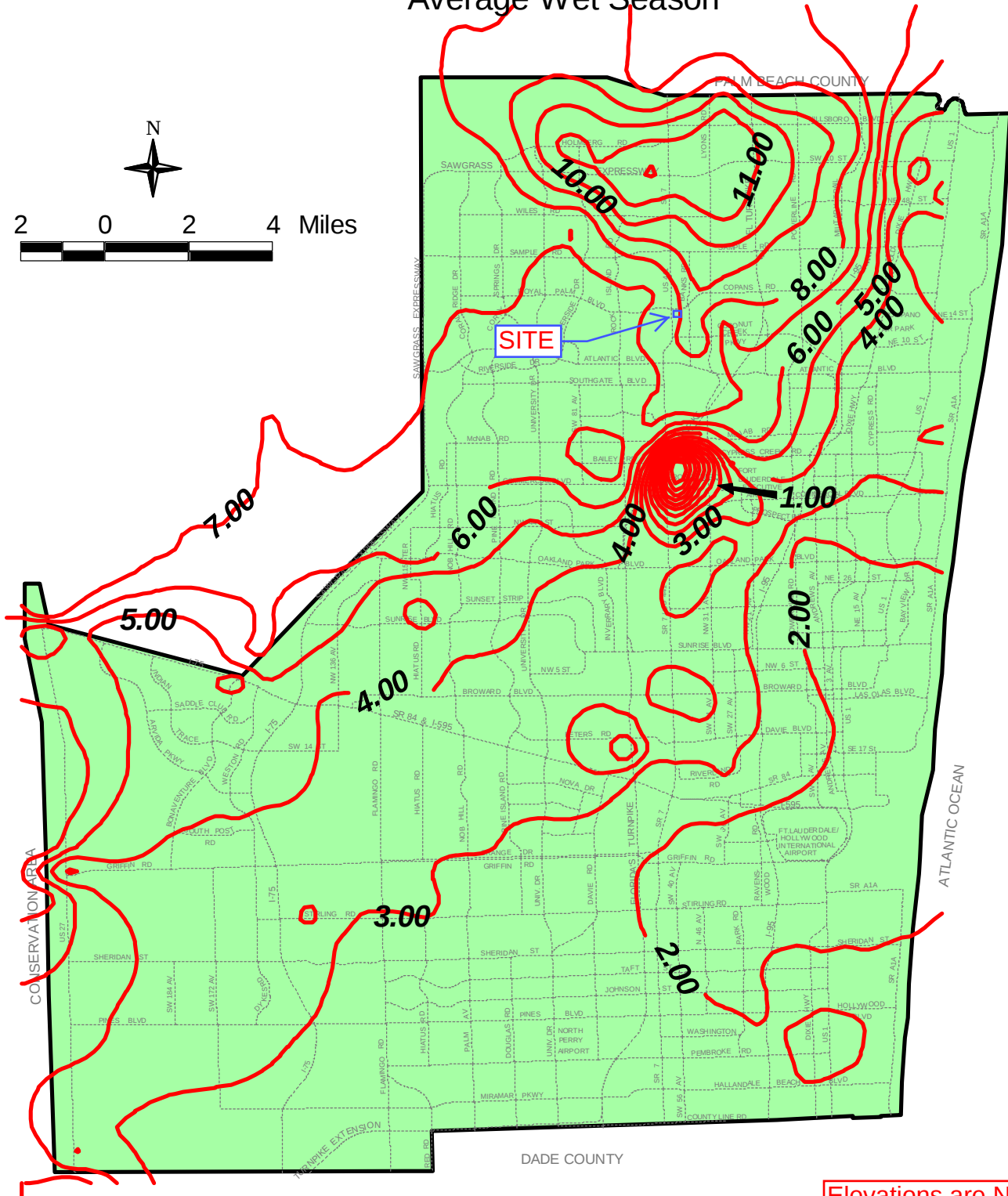
100 Year Flood Contours NAVD (NGVD)
Example: 6.5 (8)

This map is for conceptual purposes only and should not be used for legal boundary determinations.

Elevations converted from NGVD to NAVD using the FEMA approved conversion factor for Broward County of (-)1.5, based on 1997 FEMA Flood Data

WATER TABLE MAP

Average Wet Season



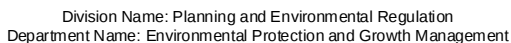
Elevations are NGVD29



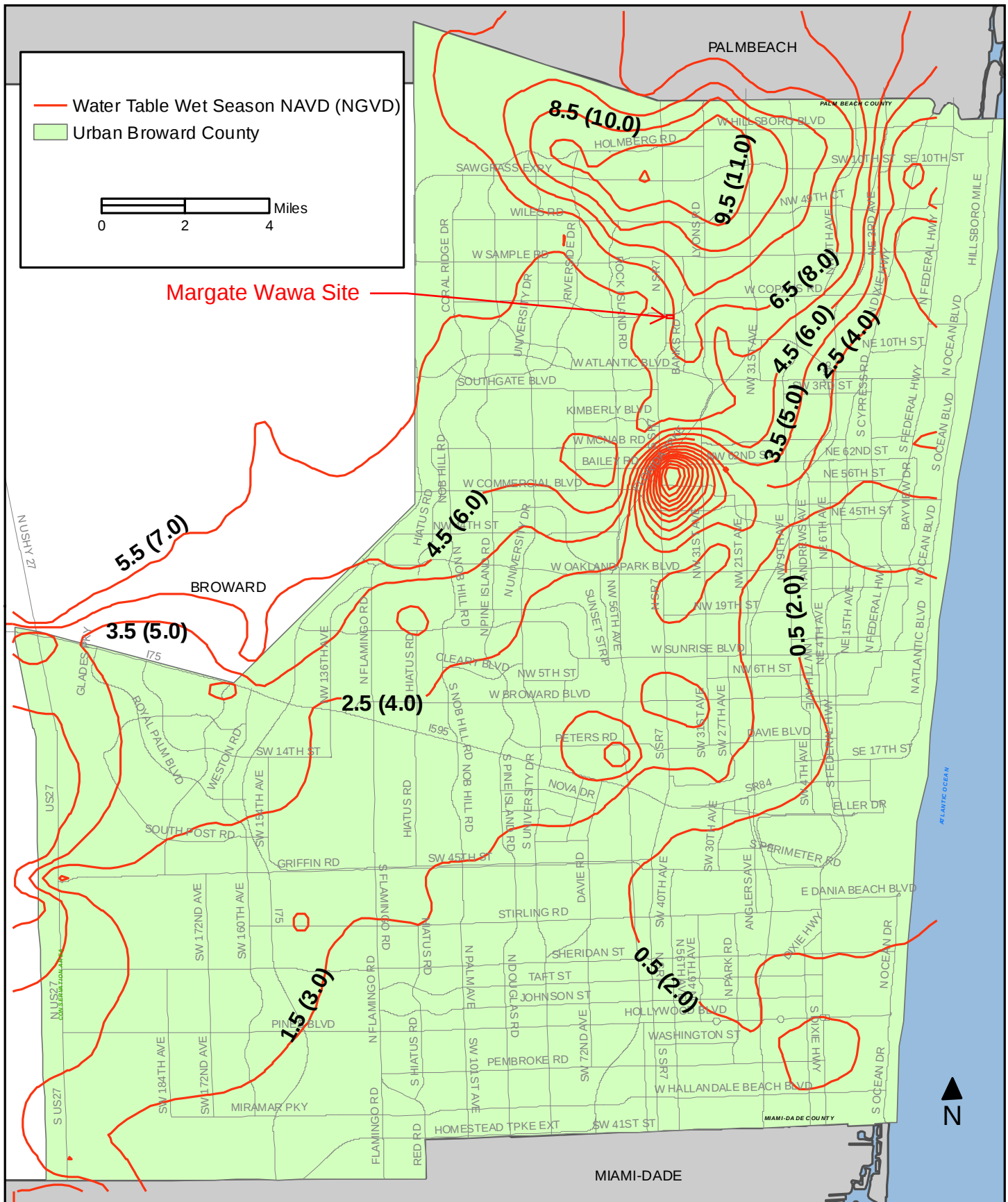
Broward County Office of
Environmental Services
Water Management Division

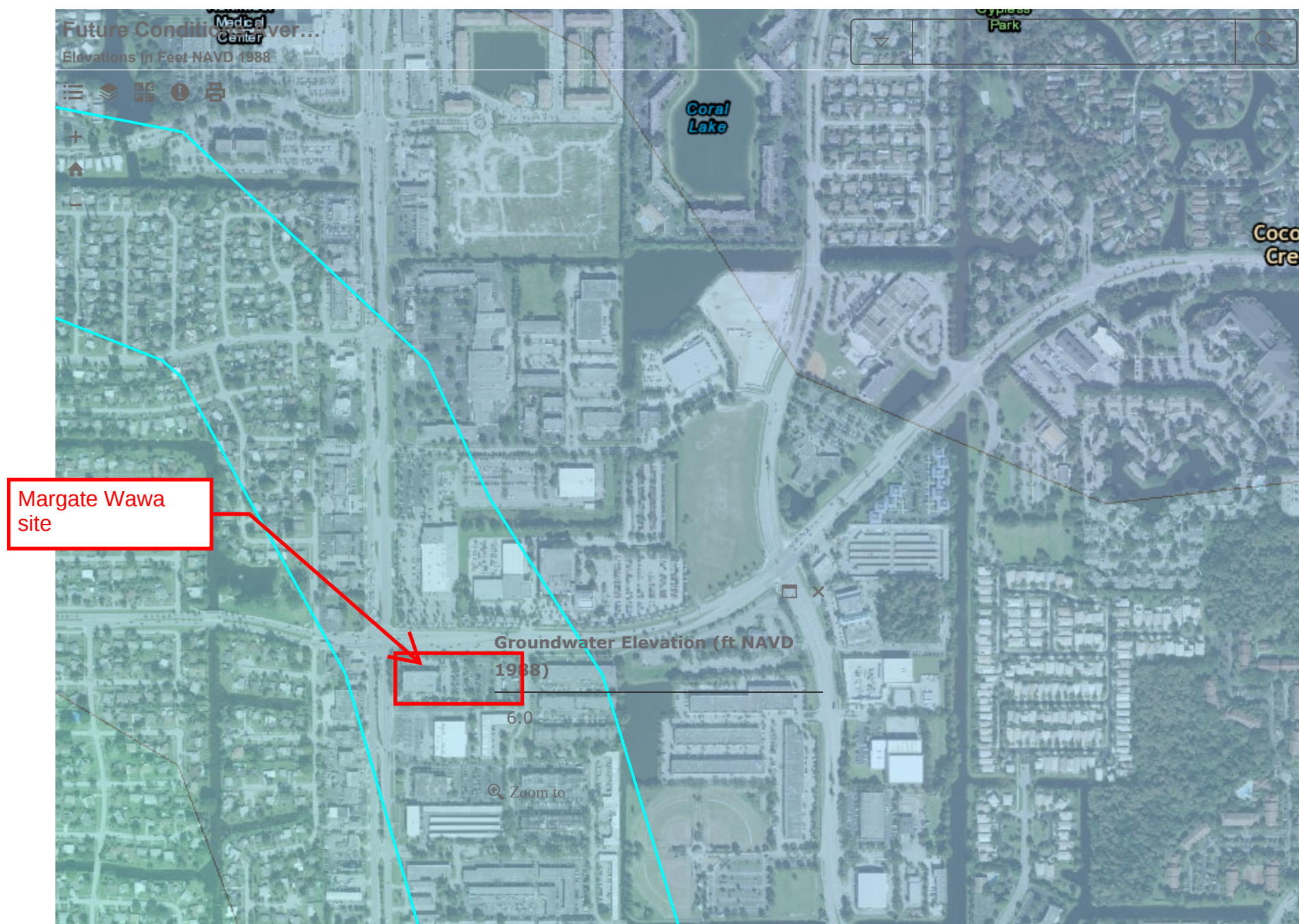
February 17, 2000

averagewet.apr

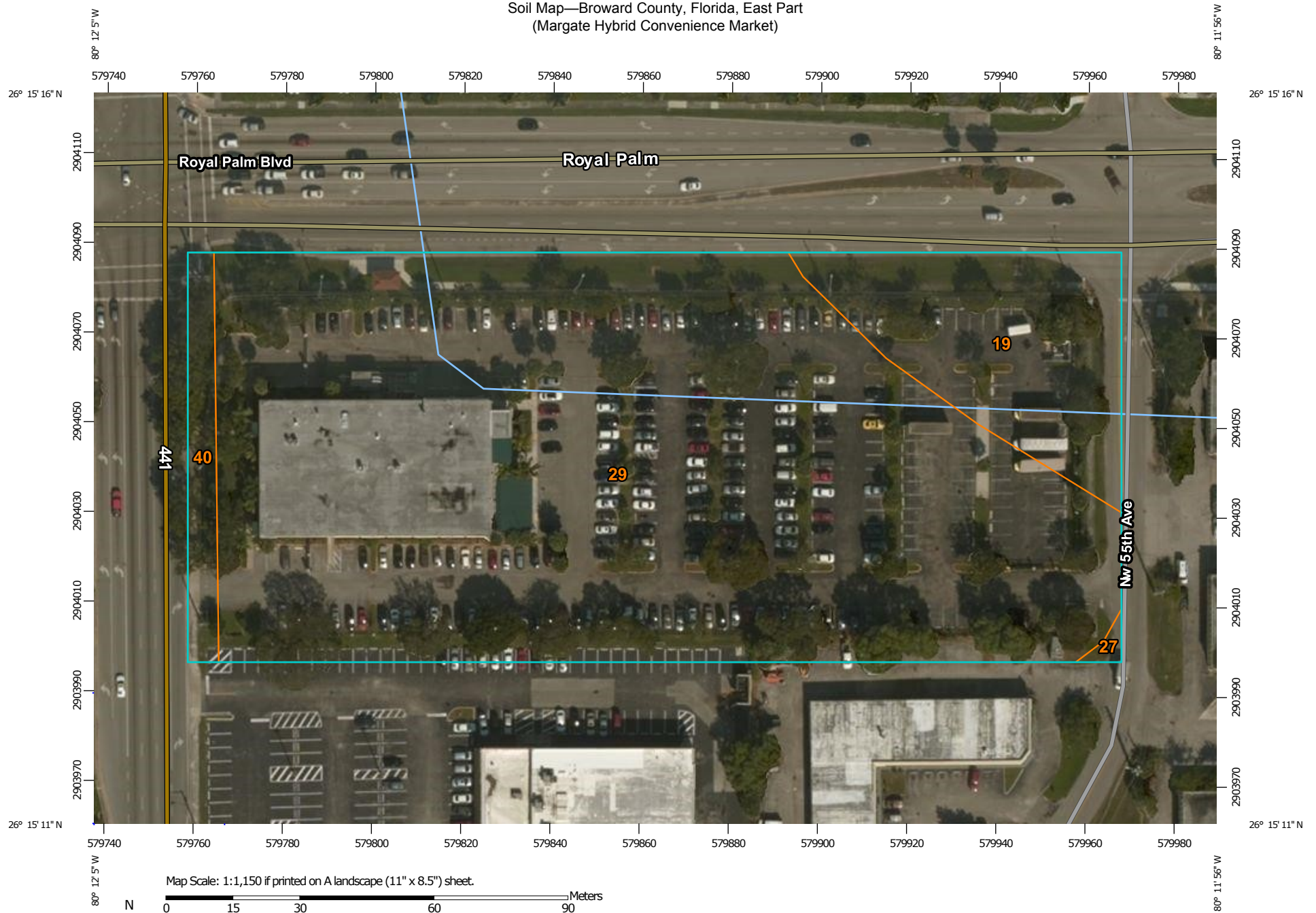


This map is for conceptual purposes only and should not be used for legal boundary determinations.
Elevation converted from NGDV to NAVD using the FEMA approved conversion factor for Broward County of (-) 1.5

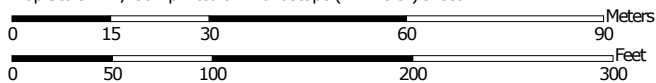




Soil Map—Broward County, Florida, East Part
(Margate Hybrid Convenience Market)



Map Scale: 1:1,150 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

4/21/2016
Page 1 of 3

Soil Map—Broward County, Florida, East Part
(Margate Hybrid Convenience Market)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Broward County, Florida, East Part
Survey Area Data: Version 11, Nov 19, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 17, 2014—Feb 11, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

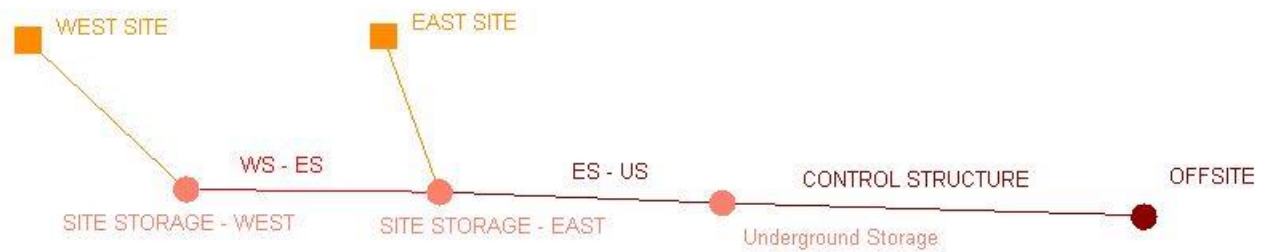
Map Unit Legend

Broward County, Florida, East Part (FL606)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Margate fine sand	0.6	12.9%
27	Plantation muck	0.0	0.2%
29	Pompano fine sand, 0 to 2 percent slopes	4.0	83.8%
40	Urban land	0.1	3.1%
Totals for Area of Interest		4.7	100.0%

Appendix B

ICPR4 Input Data

ICPR4 NETWORK DIAGRAM



Note:

In the 100-year zero discharge model, the flow from Drop Structure Link “CONTROL STRUCTURE” has been set to “None”.

Manual Basin: EAST SITE

Scenario: Scenario1
 Node: SITE STORAGE - EAST
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 9999.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coeficient Zone	Reference ET Station
1.2800	Impervious	D			
0.4000	Pervious	D			

Comment:

Manual Basin: WEST SITE

Scenario: Scenario1
 Node: SITE STORAGE - WEST
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 99999.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coeficient Zone	Reference ET Station
1.6200	Impervious	D			
0.3200	Pervious	D			

Comment:

Node: OFFSITE

Scenario: Scenario1
 Type: Time/Stage
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 8.00 ft
 Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	8.00
0	0	0	999.0000	8.00

Comment:

Node: SITE STORAGE - EAST

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 14.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
8.00	0.00	0
9.00	0.76	33106
9.43	1.08	47045
9.50	1.17	50965
10.00	1.17	50965
11.00	1.36	59242
12.00	2.65	115434
12.50	3.48	151589
13.00	4.68	203861
14.00	5.01	218236

Comment:

Node: SITE STORAGE - WEST

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 14.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
8.00	0.00	0
8.50	0.26	11326
9.00	0.51	22216
10.00	0.53	23087
11.00	0.95	41382
12.00	2.11	91912
12.50	2.93	127631
13.00	3.84	167270
14.00	5.63	245243

Comment:

Node: Underground Storage

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 8.25 ft
 Warning Stage: 14.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
8.25	0.00	0
9.00	0.32	13939
9.43	0.50	21780
9.50	0.50	21780
10.00	0.50	21780
11.00	0.50	21780
12.00	0.50	21780
12.50	0.50	21780
13.00	0.50	21780
14.00	0.50	21780

Comment:

Drop Structure Link: CONTROL
STRUCTURE

Scenario: Scenario1
 From Node: Underground
 Storage
 To Node: OFFSITE
 Link Count: 1
 Flow Direction: Both
 Solution: Combine
 Increments: 10
 Pipe Count: 1
 Damping: 0.0000 ft
 Length: 19.00 ft
 FHWA Code: 1
 Entr Loss Coef: 0.50
 Exit Loss Coef: 1.00
 Bend Loss Coef: 0.00
 Bend Location: 0.00 ft
 Energy Switch: Energy

Upstream Pipe

Invert: 8.00 ft
 Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.00 ft

Downstream Pipe

Invert: 8.00 ft
 Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.00 ft

Bottom Clip

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Top Clip

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Pipe Comment:

Weir Component

Weir: 1
 Weir Count: 1
 Weir Flow Direction: Both
 Damping: 0.0000 ft

Bottom Clip

Default: 0.00 ft
 Op Table:
 Ref Node:

Weir Type: Sharp Crested Vertical
 Geometry Type: Circular
 Invert: 8.00 ft
 Control Elevation: 8.00 ft
 Max Depth: 0.25 ft

Top Clip

Default: 0.00 ft

Op Table:

Ref Node:

Discharge Coefficients

Weir Default: 3.200

Weir Table:

Orifice Default: 0.600

Orifice Table:

Weir Comment:

Weir Component

Weir: 2

Weir Count: 1

Weir Flow Direction: Both

Damping: 0.0000 ft

Weir Type: Horizontal

Geometry Type: Rectangular

Invert: 11.50 ft

Control Elevation: 11.50 ft

Max Depth: 1.00 ft

Max Width: 4.08 ft

Fillet: 0.00 ft

Bottom Clip

Default: 0.00 ft

Op Table:

Ref Node:

Top Clip

Default: 0.00 ft

Op Table:

Ref Node:

Discharge Coefficients

Weir Default: 3.200

Weir Table:

Orifice Default: 0.600

Orifice Table:

Weir Comment:

Drop Structure Comment:

Drop Structure Link: ES - US		Upstream Pipe	Downstream Pipe
Scenario:	Scenario1	Invert: 8.00 ft	Invert: 8.00 ft
From Node:	SITE STORAGE - EAST	Manning's N: 0.0120	Manning's N: 0.0120
To Node:	Underground Storage	Geometry: Circular	Geometry: Circular
Link Count:	2	Max Depth: 1.50 ft	Max Depth: 1.50 ft
Flow Direction:	Both	Bottom Clip	
Solution:	Combine	Default: 0.00 ft	Default: 0.00 ft
Increments:	10	Op Table:	Op Table:
Pipe Count:	1	Ref Node:	Ref Node:
Damping:	0.0000 ft	Manning's N: 0.0120	Manning's N: 0.0120
Length:	60.00 ft	Top Clip	
FHWA Code:	1	Default: 0.00 ft	Default: 0.00 ft
Entr Loss Coef:	0.50	Op Table:	Op Table:
Exit Loss Coef:	1.00	Ref Node:	Ref Node:
Bend Loss Coef:	0.00	Manning's N: 0.0120	Manning's N: 0.0120

Bend Location: 0.00 ft

Energy Switch: Energy

Pipe Comment:

Weir Component	
Weir: 1	Bottom Clip
Weir Count: 1	Default: 0.00 ft
Weir Flow Direction: Both	Op Table:
Damping: 0.0000 ft	Ref Node:
Weir Type: Horizontal	Top Clip
Geometry Type: Rectangular	Default: 0.00 ft
Invert: 9.50 ft	Op Table:
Control Elevation: 9.50 ft	Ref Node:
Max Depth: 1.50 ft	Discharge Coefficients
Max Width: 4.08 ft	Weir Default: 3.200
Fillet: 0.00 ft	Weir Table:
	Orifice Default: 0.600
	Orifice Table:

Weir Comment:

Drop Structure Comment:

Pipe Link: WS - ES		Upstream	Downstream
Scenario: Scenario1		Invert: 8.00 ft	Invert: 8.00 ft
From Node: SITE STORAGE - WEST		Manning's N: 0.0120	Manning's N: 0.0120
To Node: SITE STORAGE - EAST		Geometry: Circular	Geometry: Circular
		Max Depth: 1.50 ft	Max Depth: 1.50 ft
Link Count: 1		Bottom Clip	
Flow Direction: Both		Default: 0.00 ft	Default: 0.00 ft
Damping: 0.0000 ft		Op Table:	Op Table:
Length: 190.00 ft		Ref Node:	Ref Node:
FHWA Code: 1		Manning's N: 0.0000	Manning's N: 0.0000
Entr Loss Coef: 0.50		Top Clip	
Exit Loss Coef: 1.00		Default: 0.00 ft	Default: 0.00 ft
Bend Loss Coef: 0.00		Op Table:	Op Table:
Bend Location: 0.00 ft		Ref Node:	Ref Node:
Energy Switch: Diff Wave		Manning's N: 0.0000	Manning's N: 0.0000

Comment:

Simulation: 10Y-24H

Scenario: Scenario1

Run Date/Time: 3/31/2019 12:12:26 PM

Program Version: ICPR4 4.03.02.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000
	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]	
Min Calculation Time:	60.0000	0.1000	900.0000	
Max Calculation Time:		30.0000		

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	360.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: 1

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: 1
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching: SAOR	IA Recovery Time: 24.0000 hr
Max Iterations: 6	ET for Manual Basins: False
Over-Relax Weight 0.5 dec	
Fact:	
dZ Tolerance: 0.0010 ft	Manual Basin Rain Opt: Global
Max dZ: 1.0000 ft	OF Region Rain Opt: Global
Link Optimizer Tol: 0.0001 ft	Rainfall Name: Scsiii
	Rainfall Amount: 10.00 in
Edge Length Option: Automatic	Storm Duration: 24.0000 hr
Dflt Damping (2D): 0.0050 ft	Dflt Damping (1D): 0.0050 ft
Min Node Srf Area 1 ft2	Min Node Srf Area 113 ft2
(2D):	(1D):
Energy Switch (2D): Energy	Energy Switch (1D): Energy

Comment:

Simulation: 25Y-72H

Scenario: Scenario1
Run Date/Time: 3/31/2019 12:12:38 PM
Program Version: ICPR4 4.03.02.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	96.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		30.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	360.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: 1

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: 1
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight: 0.5 dec
Fact:
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

Dflt Damping (2D): 0.0050 ft
Min Node Srf Area: 1 ft2
(2D):
Energy Switch (2D): Energy

IA Recovery Time: 24.0000 hr
ET for Manual Basins: False

Manual Basin Rain Opt: Global
OF Region Rain Opt: Global
Rainfall Name: Scsiii
Rainfall Amount: 17.70 in
Storm Duration: 72.0000 hr

Dflt Damping (1D): 0.0050 ft
Min Node Srf Area: 113 ft2
(1D):
Energy Switch (1D): Energy

Comment:

Simulation: 5Y-1HR

Scenario: Scenario1
Run Date/Time: 3/31/2019 12:13:26 PM
Program Version: ICPR4 4.03.02.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000
	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]	
Min Calculation Time:	60.0000	0.1000	900.0000	
Max Calculation Time:		30.0000		

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	360.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: 1

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: 1
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6	ET for Manual Basins:	False
Over-Relax Weight	0.5 dec		
Fact:			
dZ Tolerance:	0.0010 ft	Manual Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Scsiii
		Rainfall Amount:	3.28 in
Edge Length Option:	Automatic	Storm Duration:	1.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area	1 ft2	Min Node Srf Area	113 ft2
(2D):		(1D):	
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

Manual Basin: EAST SITE

Scenario: Scenario1
 Node: SITE STORAGE - EAST
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 9999.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
1.2800	Impervious	D			
0.4000	Pervious	D			

Comment:

Manual Basin: WEST SITE

Scenario: Scenario1
 Node: SITE STORAGE - WEST
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 99999.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
1.6200	Impervious	D			
0.3200	Pervious	D			

Comment:

Node: OFFSITE

Scenario: Scenario1
 Type: Time/Stage
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 8.00 ft
 Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	8.00
0	0	0	999.0000	8.00

ICPR4 Input Data

100 year-3 day

Zero Discharge

Manual Basin: EAST SITE

Scenario: Scenario1
 Node: SITE STORAGE - EAST
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 9999.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
1.2800	Impervious	D			
0.4000	Pervious	D			

Comment:

Manual Basin: WEST SITE

Scenario: Scenario1
 Node: SITE STORAGE - WEST
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 99999.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
1.6200	Impervious	D			
0.3200	Pervious	D			

Comment:

Node: OFFSITE

Scenario: Scenario1
 Type: Time/Stage
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 8.00 ft
 Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	8.00
0	0	0	999.0000	8.00

Comment:

Node: SITE STORAGE - EAST

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 14.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
8.00	0.00	0
9.00	0.76	33106
9.43	1.08	47045
9.50	1.17	50965
10.00	1.17	50965
11.00	1.36	59242
12.00	2.65	115434
12.50	3.48	151589
13.00	4.68	203861
14.00	5.01	218236

Comment:

Node: SITE STORAGE - WEST

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 8.00 ft
 Warning Stage: 14.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
8.00	0.00	0
8.50	0.26	11326
9.00	0.51	22216
10.00	0.53	23087
11.00	0.95	41382
12.00	2.11	91912
12.50	2.93	127631
13.00	3.84	167270
14.00	5.63	245243

Comment:

Node: Underground Storage

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 8.25 ft
 Warning Stage: 14.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
8.25	0.00	0
9.00	0.32	13939
9.43	0.50	21780
9.50	0.50	21780
10.00	0.50	21780
11.00	0.50	21780
12.00	0.50	21780
12.50	0.50	21780
13.00	0.50	21780
14.00	0.50	21780

Comment:

Drop Structure Link: CONTROL
STRUCTURE

Scenario: Scenario1
 From Node: Underground
 Storage
 To Node: OFFSITE
 Link Count: 1
 Flow Direction: None
 Solution: Combine
 Increments: 10
 Pipe Count: 1
 Damping: 0.0000 ft
 Length: 19.00 ft
 FHWA Code: 1
 Entr Loss Coef: 0.50
 Exit Loss Coef: 1.00
 Bend Loss Coef: 0.00
 Bend Location: 0.00 ft
 Energy Switch: Energy

Upstream Pipe

Invert: 8.00 ft
 Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.00 ft

Downstream Pipe

Invert: 8.00 ft
 Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.00 ft

Bottom Clip

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Top Clip

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0120

Pipe Comment:

Weir Component

Weir: 1
 Weir Count: 1
 Weir Flow Direction: Both
 Damping: 0.0000 ft

Bottom Clip

Default: 0.00 ft
 Op Table:
 Ref Node:

Weir Type: Sharp Crested Vertical
 Geometry Type: Circular
 Invert: 8.00 ft
 Control Elevation: 8.00 ft
 Max Depth: 0.25 ft

Top Clip

Default: 0.00 ft

Op Table:

Ref Node:

Discharge Coefficients

Weir Default: 3.200

Weir Table:

Orifice Default: 0.600

Orifice Table:

Weir Comment:

Weir Component

Weir: 2

Weir Count: 1

Weir Flow Direction: Both

Damping: 0.0000 ft

Weir Type: Horizontal

Geometry Type: Rectangular

Invert: 11.50 ft

Control Elevation: 11.50 ft

Max Depth: 1.00 ft

Max Width: 4.08 ft

Fillet: 0.00 ft

Bottom Clip

Default: 0.00 ft

Op Table:

Ref Node:

Top Clip

Default: 0.00 ft

Op Table:

Ref Node:

Discharge Coefficients

Weir Default: 3.200

Weir Table:

Orifice Default: 0.600

Orifice Table:

Weir Comment:

Drop Structure Comment:

Drop Structure Link: ES - US		Upstream Pipe	Downstream Pipe
Scenario:	Scenario1	Invert: 8.00 ft	Invert: 8.00 ft
From Node:	SITE STORAGE - EAST	Manning's N: 0.0120	Manning's N: 0.0120
To Node:	Underground Storage	Geometry: Circular	Geometry: Circular
Link Count:	2	Max Depth: 1.50 ft	Max Depth: 1.50 ft
Flow Direction:	Both	Bottom Clip	
Solution:	Combine	Default: 0.00 ft	Default: 0.00 ft
Increments:	10	Op Table:	Op Table:
Pipe Count:	1	Ref Node:	Ref Node:
Damping:	0.0000 ft	Manning's N: 0.0120	Manning's N: 0.0120
Length:	60.00 ft	Top Clip	
FHWA Code:	1	Default: 0.00 ft	Default: 0.00 ft
Entr Loss Coef:	0.50	Op Table:	Op Table:
Exit Loss Coef:	1.00	Ref Node:	Ref Node:
Bend Loss Coef:	0.00	Manning's N: 0.0120	Manning's N: 0.0120

Bend Location: 0.00 ft

Energy Switch: Energy

Pipe Comment:

Weir Component	
Weir: 1	Bottom Clip
Weir Count: 1	Default: 0.00 ft
Weir Flow Direction: Both	Op Table:
Damping: 0.0000 ft	Ref Node:
Weir Type: Horizontal	Top Clip
Geometry Type: Rectangular	Default: 0.00 ft
Invert: 9.50 ft	Op Table:
Control Elevation: 9.50 ft	Ref Node:
Max Depth: 1.50 ft	Discharge Coefficients
Max Width: 4.08 ft	Weir Default: 3.200
Fillet: 0.00 ft	Weir Table:
	Orifice Default: 0.600
	Orifice Table:

Weir Comment:

Drop Structure Comment:

Pipe Link: WS - ES		Upstream	Downstream
Scenario: Scenario1		Invert: 8.00 ft	Invert: 8.00 ft
From Node: SITE STORAGE - WEST		Manning's N: 0.0120	Manning's N: 0.0120
To Node: SITE STORAGE - EAST		Geometry: Circular	Geometry: Circular
		Max Depth: 1.50 ft	Max Depth: 1.50 ft
Link Count: 1		Bottom Clip	
Flow Direction: Both		Default: 0.00 ft	Default: 0.00 ft
Damping: 0.0000 ft		Op Table:	Op Table:
Length: 190.00 ft		Ref Node:	Ref Node:
FHWA Code: 1		Manning's N: 0.0000	Manning's N: 0.0000
Entr Loss Coef: 0.50		Top Clip	
Exit Loss Coef: 1.00		Default: 0.00 ft	Default: 0.00 ft
Bend Loss Coef: 0.00		Op Table:	Op Table:
Bend Location: 0.00 ft		Ref Node:	Ref Node:
Energy Switch: Diff Wave		Manning's N: 0.0000	Manning's N: 0.0000

Comment:

Simulation: 100Y-72H

Scenario: Scenario1

Run Date/Time: 3/31/2019 12:09:13 PM

Program Version: ICPR4 4.03.02.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	96.0000
	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]	
Min Calculation Time:	60.0000	0.1000	900.0000	
Max Calculation Time:		30.0000		

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	360.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: 1

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: 1
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6	ET for Manual Basins:	False
Over-Relax Weight	0.5 dec		
Fact:			
dZ Tolerance:	0.0010 ft	Manual Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Scsiii
		Rainfall Amount:	24.50 in
Edge Length Option:	Automatic	Storm Duration:	72.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area	1 ft2	Min Node Srf Area	113 ft2
(2D):		(1D):	
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

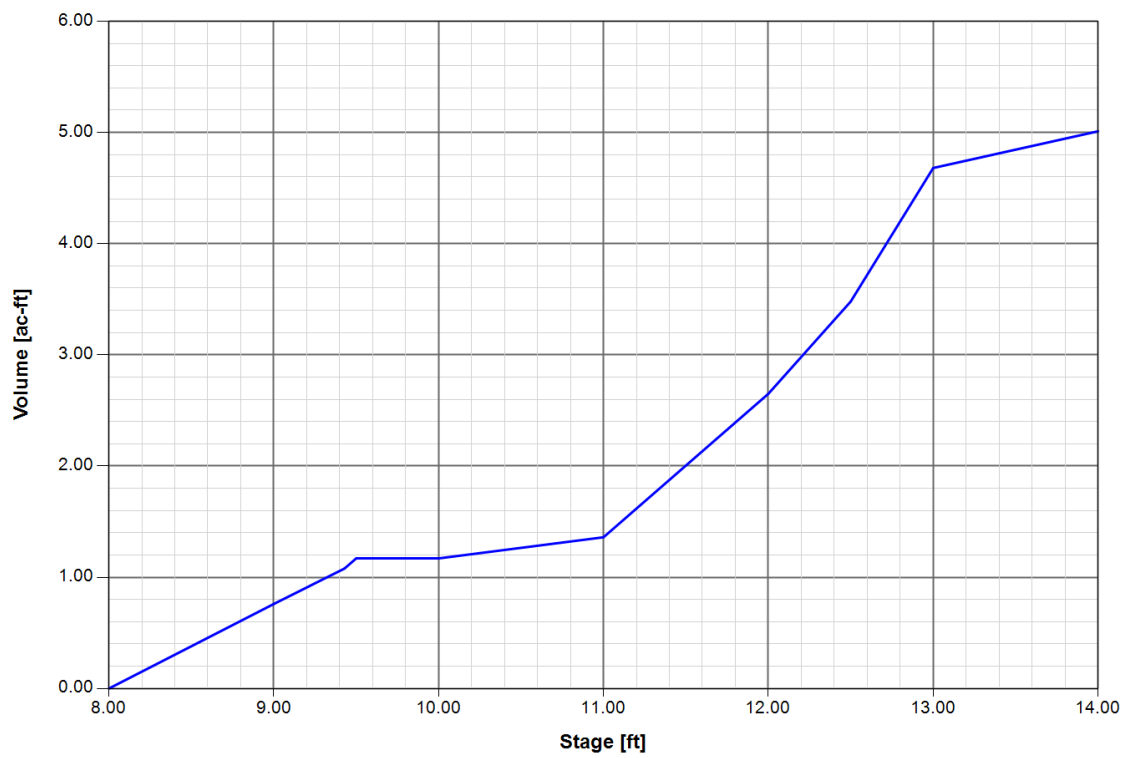
ICPR4 Output Data

Node Max Conditions [Scenario1]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
OFFSITE	100Y-72H	8.00	8.00	0.0000	0.00	0.00	0
SITE STORAGE - EAST	100Y-72H	14.00	12.46	0.0010	12.59	8.55	86433
SITE STORAGE - WEST	100Y-72H	14.00	12.46	0.0010	10.82	3.88	74182
Underground Storage	100Y-72H	14.00	12.46	0.0071	8.55	0.08	18761
OFFSITE	10Y-24H	8.00	8.00	0.0000	0.31	0.00	0
SITE STORAGE - EAST	10Y-24H	14.00	10.13	0.0010	15.81	4.18	44200
SITE STORAGE - WEST	10Y-24H	14.00	10.13	0.0010	12.88	5.68	23087
Underground Storage	10Y-24H	14.00	10.13	0.0012	4.18	0.31	18761
OFFSITE	25Y-72H	8.00	8.00	0.0000	0.41	0.00	0
SITE STORAGE - EAST	25Y-72H	14.00	11.41	0.0010	11.68	11.28	45295
SITE STORAGE - WEST	25Y-72H	14.00	11.41	0.0010	7.76	4.99	45324
Underground Storage	25Y-72H	14.00	11.40	0.0083	11.28	0.41	18761
OFFSITE	5Y-1HR	8.00	8.00	0.0000	0.05	0.00	0
SITE STORAGE - EAST	5Y-1HR	14.00	8.65	0.0010	18.41	0.00	33473
SITE STORAGE - WEST	5Y-1HR	14.00	8.83	0.0010	21.98	1.37	23087
Underground Storage	5Y-1HR	14.00	8.25	0.0008	0.00	0.05	113

Node: SITE STORAGE - EAST

Scenario: Scenario1



Node: SITE STORAGE - WEST

Scenario: Scenario1

