DRAINAGE DESIGN REPORT
FOR
GUSTAFSON PARK

PREPARED FOR

D.R. Horton, Inc.
4220 Race Track Road
Saint Johns, FL, 32259

PREPARED BY

Halff Associates, Inc.
9995 Gate Parkway North, Suite 200
Jacksonville, FL 32246
(904) 730-9360

DRAINAGE DESIGN REPORT
FOR
GUSTAFSON PARK

PROJECT INFORMATION

Parcel in Section 38, Township 6 South, Range 26 East
County Road 15A,
Green Cove Springs, Florida 32043
Project No. 37756.094

SUBMITTED BY

Halff Associates, Inc.
9995 Gate Parkway North, Suite 200
Jacksonville, FL 32246
Ph. (904) 730-9360
www.Halff.com
FL Cert. Nos. CA 33380 * LC 26000645

COMPUTER PROGRAMS USED

Streamline Technologies, Inc. ICPR v4.0701
Autodesk AutoCAD Civil 3D 2020
WinTR-55
Flowmaster
BMP Trains_4_3_5

ENGINEER

Cody B. Smith, PE (#81393 FL)

ENGINEER'S SEAL:

Cody B. Smith, State of Florida, Professional Engineer, License No. 81393

This item has been digitally signed and sealed by Cody B. Smith on the date indicated here.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

CODY B SMITH
Digitally signed by CODY B SMITH
Date: 2024.02.14 13:27:00 -05'00'

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APPENDIX LIST

1.0 EXECUTIVE SUMMARY

The project site is located in Green Cove Springs, Clay County, FL, southeast of the intersection of Green Cove Avenue and County Road 15A. The project site is currently partially developed as part of the previous cattle farming operations associated with the old Gustafson Farm. The proposed project includes one prefabricated restroom building, two tennis courts, an entrance roadway, a parking lot, and associated infrastructure. The project site includes one parcel (#38-06-26-016515-008-01) totaling approximately 21.89 acres. Off-site downstream drainage improvements are also proposed on the adjacent parcel (#38-06-26-016515-002-00) which is under the same ownership.

Stormwater management design for the project includes one wet detention pond (WP-1) for stormwater treatment and attenuation. WP-1 discharges into an existing on-site ditch, then north through the proposed off-site ditch to an existing wetland. It appears this wetland drains northeast to the St. Johns River. The applicable criteria from the St. Johns River Water Management District (SJRWMD) and the City of Green Cove Springs were utilized to design the stormwater management facilities and the stormwater conveyance system. A summary of the pre- and post-development peak discharge rates, stormwater management facility maximum stage, and detailed calculations and modeling results is provided in the Appendix.

2.0 PRE-DEVELOPMENT DRAINAGE CONDITION

2.1 DRAINAGE CONDITION SUMMARY

The project site generally slopes east to west to an existing on-site ditch, which drains east towards the railroad right of way and ultimately to the St. Johns River. Existing elevations (NAVD 88) range from approximately 32 feet at the southeast end down to 29 feet at the northwest end of the project site. The project site is part of the larger historical cattle farming operation associated with Gustafson Farm, which has an extensive man-made ditch system throughout the property.

2.2 LAND USE

The project site is part of the larger historical cattle farming operation associated with Gustafson Farm, which is no longer on operation. The site also includes a mix of wetlands and uplands, with the uplands dominated by brush. The site is bound to the east by Pearce Boulevard, to the west by County Road 15A, to the north of future Gustafson Regional Park and to the south by Rookery Amenity Center Phase 1 and Future Phase 2 Rookery Amenity Center Area.

2.3 SOILS

Review of a Soil Resource Report generated from the United States Department of Agriculture (USDA) National Resource Conservation Service (NRCS) indicates the project site consists primarily of Sapelo fine sand. The soil report describes Sapelo fine sands as somewhat poorly drained with a Hydrologic Soil Group (HSG) classification of B/D. A copy of the soil report is included in the Appendix.

A site-specific geotechnical investigation was conducted for the project by ECS Florida, LLC to assess the soil profile, groundwater elevations, and wet detention pond design parameters. The

findings were documented in a geotechnical report dated January 29, 2021. According to the report, seasonal high groundwater levels in the project area are generally within 5' from existing ground. A copy of the geotechnical report is provided under separate cover.

According to the USDA NRCS National Engineering Handbook, Part 630 Hydrology, Chapter 7 Hydrologic Soil Groups, dual hydrologic soil groups are assigned when the water table is within 24-inches of the surface, even though the saturated hydraulic conductivity may be favorable for water transmission. Due to the site-specific Geotech report findings which indicate the seasonal-high water table is generally within a few feet the ground surface, the project site soils were considered to be in HSG D in both the pre- and post-development conditions for the purposed of stormwater design calculations.

2.4 FLOODWAYS AND FLOODPLAINS

The project site lies primarily in zone "A" according to FEMA FIRM Panels 12019C0281E effective March 17, 2014. Flood zones rated "A" include areas inside of the 100-year floodplain with an undetermined base flood elevation. A copy of the FEMA FIRMette is included in the Appendix.

2.5 WETLANDS AND OTHER SURFACE WATERS

Wetlands are present on the site, generally to the west of the proposed development area. There are also existing manmade ditches and ponds on the site.

2.6 DRAINAGE BASIN AND RECEIVING WATERBODIES

The site appears to lie in the St. Johns River basin, a hydraulically open basin. According to the Florida Department of Environmental Protection (FDEP) Basin 411 website lists the St. Johns River as a Class 3F waterbody with a TMDL for total phosphorous and nitrogen.

2.7 EXISTING PERMITS

Based on review of the St. Johns River Water Management District's E-permitting website the project is adjacent to ERPs associated with Gustafson Farms and later the Rookery residential subdivision (#142441 various sequences); however, the project site is excluded from any proposed stormwater management systems.

3.0 POST-DEVELOPMENT DRAINAGE CONDITION

3.1 DRAINAGE CONDITION SUMMARY

In the post-developed condition, the developed portion project site will be served by proposed wet detention pond WP-1. Runoff from the project site will be collected and conveyed through swales to WP-1 for treatment and attenuation, which discharges through a control structure into the existing on-site ditch. The existing on-site ditch is proposed to be extended off-site to the north to daylight to an existing wetland to provide positive drainage. A portion of the existing on-site ditch is proposed to be filled upstream of the proposed development, since this ditch is]proposed to be filled further upstream with the Rookery subdivision.

WP-1 has 4H:1V side slopes with a slope break at 4' below the normal water level, with 2H:1V side slopes to the pond bottom. Detailed basin characteristics and wet detention pond calculations are provided in the appendix.

3.2 WATER QUALITY TREATMENT CRITERIA

Stormwater quality criteria will be met using on-line wet detention. A summary of the applicable design criteria is included below.

SJRWMD

- Treatment volume: First 1" of runoff or 2.5" of runoff from the impervious area (excluding waterbodies, whichever is greater
- Treatment volume recovery time: The outfall structure shall be designed to drawdown one-half the required treatment volume within 24 and 30 hours following a storm event, but no more than one-half of this volume will be discharged within the first 24 hours.
- A nutrient loading analysis for net improvement of phosphorus and nitrogen was performed

3.3 ATTENUATION CRITERIA

Stormwater quantity criteria will be met using on-line wet detention. The project lies in an open basin, therefore peak discharge rates were compared only and not total discharge volume. The post-development discharge rate was designed not to exceed the pre-development discharge rate for the required storm events provided below. Since the site is previously developed the mean annual 24-hour storm event does not apply.

SJRWMD and City of Green Cove Springs Discharge Rate Criteria

- 25-Year 24-Hour Storm Event

3.4 CONVEYANCE CRITERIA

The on-site stormwater conveyance system was designed for the 5-year 24-hour storm event using the FDOT Zone 4 intensity-duration-frequency curves.

3.5 METHODOLOGY

SCS TR-55 hydrology procedures and the SCS Type II Florida Modified rainfall distribution were used for pre- and post-development peak discharge calculations. Rainfall amounts were obtained from SJRWMD technical publications. Curve Numbers and Time of Concentration values were calculated in accordance with SCS TR-55. Streamline Technologies, Inc.'s ICPR v4.0701 software was used for peak discharge and routing modeling. Supporting calculations and modeling inputs/outputs are provided in the Appendix.

The stormwater conveyance system was designed using the Modified Rational Method. Runoff coefficients were calculated in accordance with the FDOT Drainage Handbook. The stormwater

pipe network was modeled using Autodesk AutoCAD Civil 3D's Hydraflow Storm Sewers Extension v12. Swales and ditches were sized using Bentley Flowmaster. Supporting calculations and modeling inputs/outputs are provided in the Appendix.

3.6 TAILWATER JUSTIFICATION

For post-development routing modeling the following tailwater elevations were used:

- On-site ditch: Seasonal high water level
- Wetland: existing ground elevation at the wetland limits

3.7 FLOODWAY AND FLOODPLAIN IMPACTS

The project site lies in a Flood Zone A with an undetermined Base Flood Elevation. A flood study is being prepared by others for the overall Rookery subdivision. Compensating cut/fill calculations were not completed for the project. There are no proposed floodway impacts.

3.8 WETLAND AND OTHER SURFACE WATER IMPACTS

There are no wetland impacts proposed. Proposed surface water impacts include the partial filling of the existing on-site ditch. See environmental report for details.

3.9 HYDROLOGY AND ROUTING CALCULATION RESULTS

The stormwater management facilities and conveyance system maintain post-development peak discharge rates below the pre-development level for the required design storm events. Wet detention pond maintains a minimum 12-inches of freeboard during the 25-yr, 24-hr storm event. Treatment requirements are met with the proposed wet detention pond. Detailed drainage calculations and modeling results are provided in the Appendix.

3.10 STORMWATER MANAGEMENT FACILITY OWNERSHIP AND MAINTENANCE

The wet detention pond lies on a tract which will be owned and maintained by the City of Green Cove Springs. The following is a summary of minimum recommended maintenance activities associated with wet detention ponds. Reference the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual for additional information.

Inspections

All stormwater systems should be routinely inspected to ensure that they are functioning properly. Major inspections should be conducted semiannually, and brief inspections should always be conducted following storms with over 1 inch (25 mm) of rainfall. It is also advisable to ensure that vegetation (sod) is growing well and that all construction is according to approved design.

Safety

All permanent impoundments and structures should be inspected periodically by a Florida

registered professional engineer to ensure that they remain structurally sound and mechanically efficient. An annual safety inspection is recommended where the potential for downstream damage and loss of life due to impoundment failure is high. Look for signs of burrowing animals, especially on or near embankments. All structures should also be inspected for scour, erosion, settlement, and structural failure following major storms. Many jurisdictions require fences around impoundments with side slopes of 3:1 or steeper. Fencing, gates, and locks should be inspected quarterly, and a list of key holders should be kept.

Public Health

Precautions should be taken to minimize the production of fast-breeding insects in and around ponded areas. Possible control measures include controlling the growth of vegetation at shorelines.

Routine Maintenance - Turf

Turf is used for erosion protection, water treatment, velocity reduction, and aesthetics. Regular mowing and occasional fertilization are required to maintain desired growth. Avoid cutting turf too short; as this may damage the plant, reduce the desirable friction in channels, and reduce the protection to soil. A lack of mowing can lead to invasion by weeds. In areas that impound or convey stormwater, clippings should be bagged and removed to reduce the organic loading.

Routine Maintenance – Inlets

Pipe inlets should be inspected for clogging and/or structural integrity after each major storm, and accumulated debris and sediment should be removed as required. Trash racks should be cleaned and should be replaced if missing.

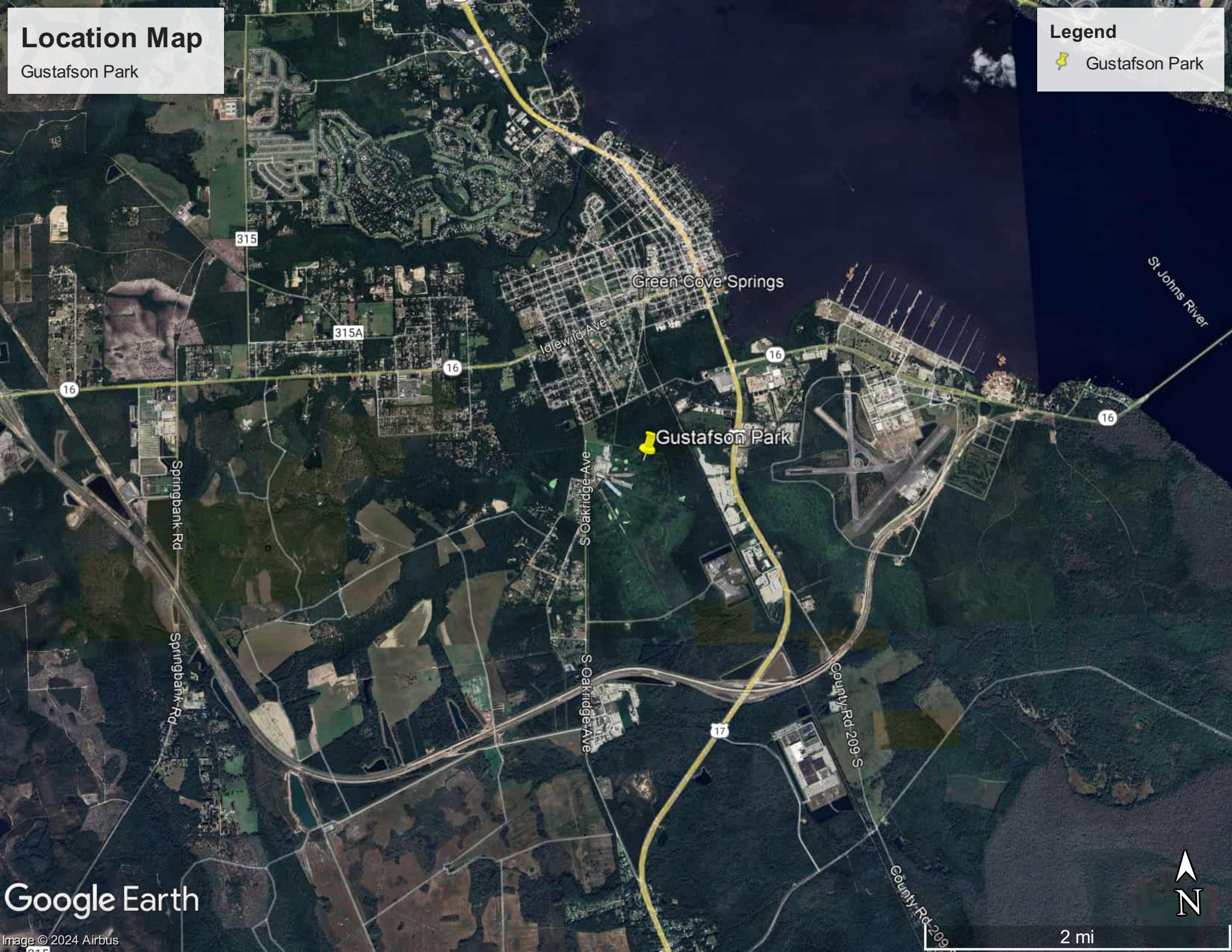
Routine Maintenance - Control Structures

In addition to inlets and outlets, many stormwater management facilities have control structures to regulate the rate and/or water level in the facility. These structures must be inspected frequently for sediment and debris. Control structures should be checked annually by the design engineer for structural integrity.

Routine Maintenance - Outlet Protection

Outlets should be inspected after every major storm. Outlet pipes should be in sound structural condition and free of sediment accumulation. Energy dissipators, splash pads, and riprap aprons should be kept free of debris. Look for scour below the outlet. Wherever such erosion is detected, effective measures should be taken quickly to stabilize and protect the affected area.

I. Location Map


Location Map
Gustafson Park
Legend
Gustafson Park
315
315A
16
Idlewild Ave
Green Cove Springs
St Johns River
Gustafson Park
Springbank Rd
S Oakridge Ave
17
County Rd 209 S
N
2 mi
Google Earth
Image © 2024 Airbus

II. Results Summary

GUSTAFSON PARK
STORMWATER ROUTING RESULTS SUMMARY

POND SUMMARY

Pond	Pond Type	Bottom (ft)	Top of Bank (ft)	Normal Water Level (ft)	Weir (ft)	Peak Stage			
						25-yr 24-hr (ft)	25-yr 24-hr (ft)	5-yr 24-hr (ft)	Mean Annual (ft)
WP-1	Wet Det.	15.00	30.00	27.00	27.60	N/A	28.80	28.40	28.09

Notes:

1. Peak stage data from ICPR results, see report Section 8 for detailed results.

PRE VS POST DISCHARGE RATES

Outfall Location	25-yr 24-hr (cfs)		5-yr 24-hr (cfs)		Mean Annual (cfs)	
	Pre	Post	Pre	Post	Pre	Post
Outfall	29.55	26.68	N/A	N/A	N/A	N/A

Notes:

1. Data from ICPR results. See report section 8 for detailed results.

III. Pre-Development Drainage Plan

LEGEND

PROPERTY LINE

BASIN LINE

32 EXISTING CONTOUR

TIME OF CONCENTRATION LINE

APPROXIMATE LOCATION OF POWER LINE AS SHOWN ON AERIAL MAP OBTAINED FROM LABINS, DATED 2017

PEARCE BLVD

PRE OUTFALL

BASIN PRE-1
A = 7.28 AC
CN = 80
TC = 18 MIN.

25.2
27.83
25.36
78.86
32.00

N

0 80' 160'

SCALE: 1" = 80'

PROJECT NAME
GUSTAFSON PARK

PREPARED FOR
CITY OF GREEN COVE SPRINGS

halff
9995 GATE PARKWAY N. SUITE 200
JACKSONVILLE, FLORIDA USA 32246
PHONE 904.730.9360 WWW.HALFF.COM
FL CA 33380 FL LC 26000645

REVISIONS

NO.	DATE	DESCRIPTION

SEAL

CODY B. SMITH, P.E #81393

PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NO.:	037756.094
ISSUED:	2/08/2024
DRAWN BY:	NTD
CHECKED BY:	CBS
SCALE:	1" = 30'

PRE DEVELOPMENT DRAINAGE MAP

C-006

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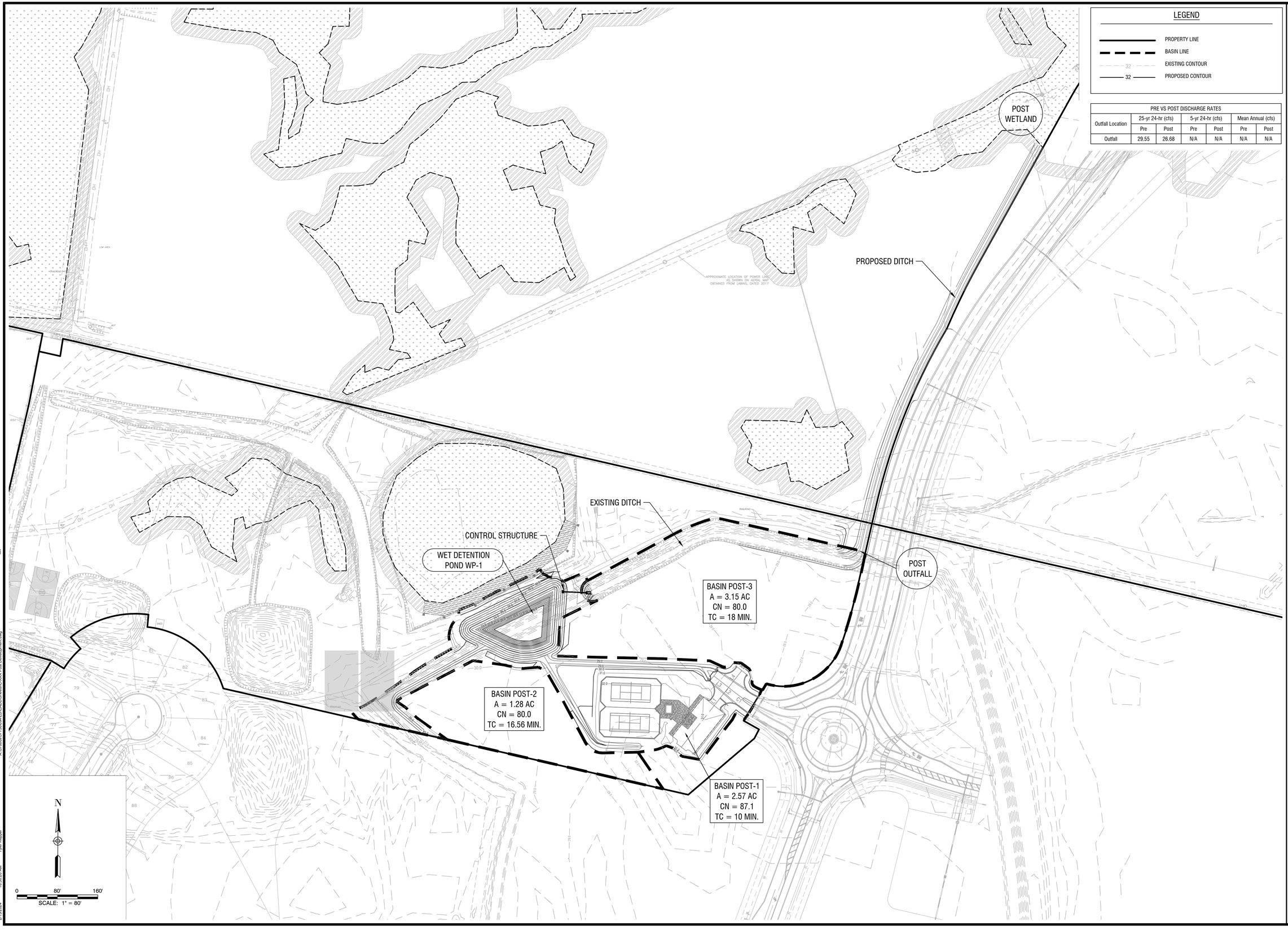
IV. Post-Development Drainage Plan



LEGEND

- PROPERTY LINE
- BASIN LINE
- 32 EXISTING CONTOUR
- 32 PROPOSED CONTOUR

PRE VS POST DISCHARGE RATES

Outfall Location	25-yr 24-hr (cfs)		5-yr 24-hr (cfs)		Mean Annual (cfs)	
	Pre	Post	Pre	Post	Pre	Post
Outfall	29.55	26.68	N/A	N/A	N/A	N/A

PROJECT NAME
GUSTAFSON PARK

PREPARED FOR
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ISSUED:	2/08/2024
DRAWN BY:	NTD
CHECKED BY:	CBS
SCALE:	1" = 30'

POST DEVELOPMENT DRAINAGE MAP

C-007

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V. Pre-Development Basin Characteristics

GUSTAFSON PARK
PRE DEVELOPMENT CURVE NUMBER CALCULATIONS

Basin Pre-1

Land Use	HSG	Area		Impervious	CN		
		(SF)	(AC)	%	Pervious	Impervious	Weighted
Open Space (Good Cond.)	D	317,115	7.28	0%	80	98	80.0
-	-	0	0.00	0%	80	98	80.0
-	-	0	0.00	0%	80	98	80.0
Total		**317,115**	**7.28**	**0.0%**			**80.0**

Time of Concentration (Tc)	0.3 hr	**18 min**

Note: Tc calculated using WinTR-55. See WinTR-55 output for details.

37756.094
GUSTAFSON PARK
CLAY County, Florida

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Pre-1							
SHEET	100	0.0327	0.130				0.104
SHALLOW	568	0.0025	0.050				0.196
						Time of Concentration	0.300

VI. Post-Development Basin Characteristics

GUSTAFSON PARK
POST DEVELOPMENT CURVE NUMBER CALCULATIONS

Basin Post-1

Land Use	HSG	Area (SF)	Area (AC)	Impervious %	CN Pervious	CN Impervious	CN Weighted
Asphalt Pavement	B/D	4,935	0.11	100%	80	98	98.0
Gravel Parking Lot	B/D	5,591	0.13	100%	80	98	98.0
Concrete Sidewalk	B/D	2,142	0.05	100%	80	98	98.0
Pond NWL	B/D	17,300	0.40	0%	98	98	98.0
Building	B/D	344	0.01	100%	80	98	98.0
Tennis Courts	B/D	14,000	0.32	100%	80	98	98.0
Open Space (Good Cond.)	B/D	67,434	1.55	0%	80	98	80.0
-	-	0	0.00	0%	80	98	80.0
-	-	0	0.00	0%	80	98	80.0
-	-	0	0.00	0%	80	98	80.0
Total		**111,746**	**2.57**	**24.2%**			**87.1**

Time of Concentration (Tc) 0 hr **10 min**

Note: Minimum Tc of 10 minutes used

Basin Post-2

Land Use	HSG	Area (SF)	Area (AC)	Impervious %	CN Pervious	CN Impervious	CN Weighted
Open Space (Good Cond.)	B/D	55,778	1.28	0%	80	98	80.0
	-	0	0.00	0%	80	98	80.0
	-	0	0.00	0%	80	98	80.0
Total		**55,778**	**1.28**	**0.0%**			**80.0**

Time of Concentration (Tc) 0.276 hr **16.56 min**

Note: Tc calculated using WinTR-55. See WinTR-55 output for details.

Basin Post-3

Land Use	HSG	Area (SF)	Area (AC)	Impervious %	CN Pervious	CN Impervious	CN Weighted
Open Space (Good Cond.)	B/D	137,382	3.15	0%	80	98	80.0
	-	0	0.00	0%	80	98	80.0
	-	0	0.00	0%	80	98	80.0
Total		**137,382**	**3.15**	**0.0%**			**80.0**

Time of Concentration (Tc) 0.3 hr **18 min**

Note: Tc calculated using WinTR-55. See WinTR-55 output for details.

37756.094
GUSTAFSON PARK
CLAY County, Florida

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Post-2							
SHEET	100	0.0310	0.130				0.107
SHALLOW	392	0.0016	0.050				0.169
						Time of Concentration	.276

VII. Stormwater Management Facility Calculations

GUSTAFSON PARK
WET DETENTION POND CALCULATIONS

Prepared by: TGK

WP-1

Drainage Area

Area	On-Site	Off-Site	Total
Pervious (ac)	1.95	0.00	1.95
Impervious (ac)	0.22	0.00	0.22
Pond NWL (ac)	0.40	0.00	0.40
Total (ac)	2.57	0.00	2.57

On-Site % Impervious (Excludes Pond Area): 10.3%

Runoff Coefficient	Basin 1	Off-Site	Total
Pervious	0.30	0.30	-
Impervious	0.95	0.95	-
Pond NWL	1.00	1.00	-
Weighted Average	0.46	0.00	0.46

Pond Data

Description	Elevation (ft)	Area (ft^2)	Area (ac)	Cumulative Volume (ac-ft)	Cumulative Permanent Pool Volume (ac-ft)	Cumulative Storage Volume (ac-ft)
Bottom	15.00	3,869.00	0.09	-	2.45	-
Grade Change	23.00	9,494.00	0.22	1.23	1.22	-
	24.00	11,284.00	0.26	1.47	0.98	-
	25.00	13,188.00	0.30	1.75	0.70	-
	26.00	15,194.00	0.35	2.07	0.37	-
NWL	27.00	17,300.00	0.40	2.45	-	-
Weir	28.00	19,506.00	0.45	2.87	-	0.42
	29.00	21,813.00	0.50	3.34	-	0.90
Top of Bank	30.00	24,221.00	0.56	3.87	-	1.43

Design Tailwater Elevation 27.00 ft *Ditch SHWL*
Discharge Location Ditch

GUSTAFSON PARK
WET DETENTION POND CALCULATIONS

Treatment Volume

1" Runoff Over Entire Drainage Area:	0.21	ac-ft
2.5" Runoff Over Impervious Area:	0.05	ac-ft
Required Treatment Volume:	**0.21**	**ac-ft**
Minimum Weir Elevation:	27.51	ft
Use Weir Elevation:	27.60	ft
Provided Treatment Volume:	**0.25**	**ac-ft**

Permanent Pool Volume

Wet Season Rainfall Depth:	30	in
Length of Wet Season:	153	days (June-October)
Littoral zone:	No	yes/no
Residence time:	21	days
Required Permanent Pool Volume:	**0.41**	**ac-ft**
Provided Permanent Pool Volume:	**2.45**	**ac-ft**

Pond Configuration

Pond Length 2x Width:	Yes	(yes/no)	
Pond Average Depth:	6.2	ft	(Between 2-ft and 8-ft required)

Orifice Sizing

Treatment Volume Depth:	0.60	ft		
1/2 Treatment Volume Depth:	0.30	ft		

Average Discharge Rate to Drawdown 1/2 Provided Treatment Volume:

t = 24 hours:	0.06	cfs
t = 30 hours:	0.05	cfs

Orifice Area at Given Q and Average Depth (@ Invert):

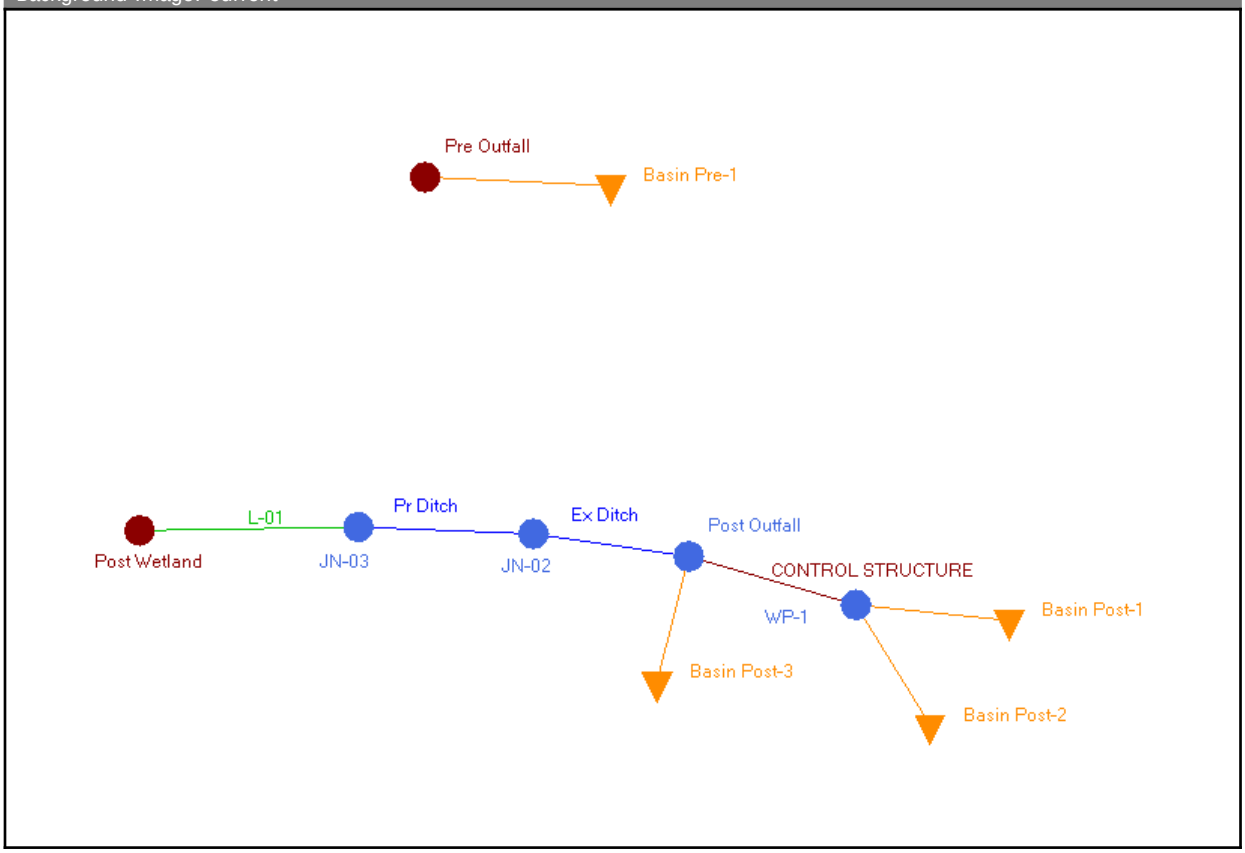
t = 24 hours:	0.02	ft^2	2.85	in^2
t = 30 hours:	0.02	ft^2	2.28	in^2

Orifice Diameter:

t = 24 hours:	1.90	in
t = 30 hours:	1.70	in
Use:	1.75	in

VIII. ICPR Model Results and Inputs

Background Image: Current



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]
JN-02	25-Yr, 24-Hr	28.00	27.28	0.0010	24.11	21.01	15037
JN-03	25-Yr, 24-Hr	26.70	26.35	0.0009	21.01	20.87	6745
Post Outfall	25-Yr, 24-Hr	28.00	27.38	0.0010	26.68	24.11	6642
Post Wetland	25-Yr, 24-Hr	26.00	26.00	0.0000	20.87	0.00	0
Pre Outfall	25-Yr, 24-Hr	28.00	26.00	0.0000	29.55	0.00	0
WP-1	25-Yr, 24-Hr	30.00	28.80	0.0010	20.92	11.39	21334
JN-02	5-Yr, 24-Hr	28.00	26.91	0.0010	14.25	12.16	13187
JN-03	5-Yr, 24-Hr	26.70	26.14	0.0004	12.16	12.13	5803
Post Outfall	5-Yr, 24-Hr	28.00	26.99	-0.0010	16.23	14.25	5996
Post Wetland	5-Yr, 24-Hr	26.00	26.00	0.0000	12.13	0.00	0
Pre Outfall	5-Yr, 24-Hr	28.00	26.00	0.0000	19.25	0.00	0
WP-1	5-Yr, 24-Hr	30.00	28.40	0.0010	14.23	7.00	20480
JN-02	Mean Annual, 24-hr	28.00	26.57	0.0010	7.42	6.16	11579
JN-03	Mean Annual, 24-hr	26.70	26.05	0.0001	6.16	6.16	5247
Post Outfall	Mean Annual, 24-hr	28.00	26.62	-0.0010	8.69	7.42	5394
Post Wetland	Mean Annual, 24-hr	26.00	26.00	0.0000	6.16	0.00	0
Pre Outfall	Mean Annual, 24-hr	28.00	26.00	0.0000	12.37	0.00	0
WP-1	Mean Annual, 24-hr	30.00	28.09	0.0010	9.67	3.35	19793

Simple Basin Runoff Summary [Scenario1]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
Basin Post-1	25-Yr, 24-Hr	15.91	12.0167	9.00	7.46	2.5700	87.1	0.00	0.00
Basin Post-2	25-Yr, 24-Hr	5.38	12.1000	9.00	6.59	1.2800	80.0	0.00	0.00
Basin Post-3	25-Yr, 24-Hr	15.89	12.0833	9.00	6.58	3.1500	80.0	0.00	0.00
Basin Pre-1	25-Yr, 24-Hr	29.55	12.1167	9.00	6.58	7.2800	80.0	0.00	0.00
Basin Post-1	5-Yr, 24-Hr	10.98	12.0167	6.50	5.02	2.5700	87.1	0.00	0.00
Basin Post-2	5-Yr, 24-Hr	3.51	12.1000	6.50	4.25	1.2800	80.0	0.00	0.00
Basin Post-3	5-Yr, 24-Hr	10.40	12.1000	6.50	4.24	3.1500	80.0	0.00	0.00
Basin Pre-1	5-Yr, 24-Hr	19.25	12.1167	6.50	4.24	7.2800	80.0	0.00	0.00
Basin Post-1	Mean Annual, 24-hr	7.59	12.0167	4.80	3.40	2.5700	87.1	0.00	0.00
Basin Post-2	Mean Annual, 24-hr	2.26	12.1167	4.80	2.73	1.2800	80.0	0.00	0.00
Basin Post-3	Mean Annual, 24-hr	6.73	12.1000	4.80	2.72	3.1500	80.0	0.00	0.00
Basin Pre-1	Mean Annual, 24-hr	12.37	12.1167	4.80	2.73	7.2800	80.0	0.00	0.00

Link Min/Max Conditions [Scenario1]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
CONTROL STRUCTURE - Pipe	25-Yr, 24-Hr	11.39	0.00	-0.02	0.00	0.00	0.00
CONTROL STRUCTURE - Weir: 1	25-Yr, 24-Hr	11.32	0.00	-0.01	3.24	3.24	3.24
CONTROL STRUCTURE - Weir: 2	25-Yr, 24-Hr	0.09	0.00	0.00	0.00	0.00	0.00
CONTROL STRUCTURE - Weir: 3	25-Yr, 24-Hr	0.00	0.00	0.00	0.00	0.00	0.00
Ex Ditch	25-Yr, 24-Hr	24.11	0.00	-0.07	0.74	0.85	0.79
L-01	25-Yr, 24-Hr	20.87	0.00	0.04	2.49	2.49	2.49
Pr Ditch	25-Yr, 24-Hr	21.01	0.00	0.03	0.89	2.62	1.74
CONTROL STRUCTURE - Pipe	5-Yr, 24-Hr	7.00	0.00	-0.02	0.00	0.00	0.00
CONTROL STRUCTURE - Weir: 1	5-Yr, 24-Hr	6.91	0.00	-0.01	2.87	2.87	2.87
CONTROL STRUCTURE - Weir: 2	5-Yr, 24-Hr	0.09	0.00	0.00	0.00	0.00	0.00
CONTROL STRUCTURE - Weir: 3	5-Yr, 24-Hr	0.00	0.00	0.00	0.00	0.00	0.00
Ex Ditch	5-Yr, 24-Hr	14.25	0.00	-0.06	0.60	0.69	0.64
L-01	5-Yr, 24-Hr	12.13	0.00	0.02	2.08	2.08	2.08
Pr Ditch	5-Yr, 24-Hr	12.16	0.00	0.03	0.73	2.09	1.41
CONTROL STRUCTURE - Pipe	Mean Annual, 24-hr	3.35	0.00	0.01	0.00	0.00	0.00
CONTROL STRUCTURE - Weir: 1	Mean Annual, 24-hr	3.27	0.00	0.01	2.23	2.23	2.23
CONTROL STRUCTURE - Weir: 2	Mean Annual, 24-hr	0.08	0.00	0.00	0.00	0.00	0.00
CONTROL STRUCTURE - Weir: 3	Mean Annual, 24-hr	0.00	0.00	0.00	0.00	0.00	0.00
Ex Ditch	Mean Annual, 24-hr	7.42	0.00	-0.03	0.43	0.49	0.46
L-01	Mean Annual, 24-hr	6.16	0.00	0.01	1.25	1.25	1.25

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Pr Ditch	Mean Annual, 24-hr	6.16	0.00	0.02	0.54	1.25	0.89

Simple Basin: Basin Post-1

Scenario:	Scenario1
Node:	WP-1
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	10.0000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH484
Peaking Factor:	484.0
Area:	2.5700 ac
Curve Number:	87.1
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: Basin Post-2

Scenario:	Scenario1
Node:	WP-1
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	16.5600 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	1.2800 ac
Curve Number:	80.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: Basin Post-3

Scenario:	Scenario1
Node:	Post Outfall
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	18.0000 min
Max Allowable Q:	0.00 cfs

Time Shift:	0.0000 hr
Unit Hydrograph:	UH484
Peaking Factor:	484.0
Area:	3.1500 ac
Curve Number:	80.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: Basin Pre-1

Scenario:	Scenario1
Node:	Pre Outfall
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	18.0000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	7.2800 ac
Curve Number:	80.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Node: JN-02

Scenario:	Scenario1
Type:	Stage/Area
Base Flow:	0.00 cfs
Initial Stage:	26.00 ft
Warning Stage:	28.00 ft

Comment:

Node: JN-03

Scenario: Scenario1
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 26.00 ft
Warning Stage: 26.70 ft

Comment:

Node: Post Outfall

Scenario: Scenario1
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 26.00 ft
Warning Stage: 28.00 ft

Comment:

Node: Post Wetland

Scenario: Scenario1
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 26.00 ft
Warning Stage: 26.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	26.00
0	0	0	9999.0000	26.00

Comment:

Node: Pre Outfall

Scenario: Scenario1
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 26.00 ft
Warning Stage: 28.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	26.00
0	0	0	9999.0000	26.00

Comment:

Node: WP-1

Scenario: Scenario1
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 27.00 ft
Warning Stage: 30.00 ft

Stage [ft]	Area [ac]	Area [ft2]
27.00	0.4000	17424
28.00	0.4500	19602
29.00	0.5000	21780
30.00	0.5600	24394

Comment:

Drop Structure Link: CONTROL STRUCTURE

Scenario: Scenario1
From Node: WP-1
To Node: Post Outfall
Link Count: 1
Flow Direction: Both
Solution: Combine
Increments: 0
Pipe Count: 1
Damping: 0.0000 ft
Length: 55.00 ft
FHWA Code: 0
Entr Loss Coef: 0.00
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Bend Location: 0.00 dec
Energy Switch: Energy

Upstream Pipe		Downstream Pipe	
Invert:	25.56 ft	Invert:	25.40 ft
Manning's N:	0.0130	Manning's N:	0.0130
Geometry: Circular		Geometry: Circular	
Max Depth:	1.50 ft	Max Depth:	1.50 ft
Bottom Clip			
Default:	0.00 ft	Default:	0.00 ft
Op Table:		Op Table:	
Ref Node:		Ref Node:	
Manning's N:	0.0000	Manning's N:	0.0000
Top Clip			
Default:	0.00 ft	Default:	0.00 ft
Op Table:		Op Table:	
Ref Node:		Ref Node:	
Manning's N:	0.0000	Manning's N:	0.0000

Pipe Comment:

Weir Component

Weir: 1
Weir Count: 1
Weir Flow Direction: Both

Bottom Clip
Default: 0.00 ft
Op Table:

Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	27.60 ft
Control Elevation:	27.60 ft
Max Depth:	1.30 ft
Max Width:	3.00 ft
Fillet:	0.00 ft

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: SLOT

Weir Component

Weir:	2
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Circular
Invert:	27.00 ft
Control Elevation:	27.00 ft
Max Depth:	0.15 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: ORIFICE

Weir Component

Weir:	3
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Horizontal
Geometry Type:	Rectangular
Invert:	28.90 ft
Control Elevation:	28.90 ft
Max Depth:	3.00 ft
Max Width:	4.50 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: TYPE "E" INLET TOP

Drop Structure Comment:

Simulation: 25-Yr, 24-Hr

Scenario: Scenario1
Run Date/Time: 2/13/2024 10:01:40 AM
Program Version: ICPR4 4.07.01

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	5.0000

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	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set: 25-yr 24-hr
Extern Hydrograph Set:
Curve Number Set:
Green-Ampt Set:
Vertical Layers Set:
Impervious Set:
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 Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~FLMOD
		Rainfall Amount:	9.00 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 (2D):	100 ft2	Min Node Srf Area (1D):	100 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

Simulation: 5-Yr, 24-Hr

Scenario:	Scenario1
Run Date/Time:	2/13/2024 10:03:55 AM
Program Version:	ICPR4 4.07.01

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	5.0000

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	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set: 5-yr 24-hr
Extern Hydrograph Set:
Curve Number Set:
Green-Ampt Set:
Vertical Layers Set:
Impervious Set:
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
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 (2D): 100 ft2
Energy Switch (2D): Energy

IA Recovery Time: 24.0000 hr
ET for Manual Basins: False
Smp/Man Basin Rain Opt: Global
OF Region Rain Opt: Global
Rainfall Name: ~FLMOD
Rainfall Amount: 6.50 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: Mean Annual, 24-hr

Scenario: Scenario1
Run Date/Time: 2/13/2024 10:06:01 AM
Program Version: ICPR4 4.07.01

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	5.0000

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	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set: Mean Annual
Extern Hydrograph Set:
Curve Number Set:
Green-Ampt Set:
Vertical Layers Set:
Impervious Set:
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 Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~FLMOD
		Rainfall Amount:	4.80 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 (2D):	100 ft2	Min Node Srf Area (1D):	100 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

IX. BMPTrains Modeling Results and Inputs

Complete Report (not including cost) Ver 4.3.5

Project: Gustafson Park
Date: 2/14/2024 11:02:35 AM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	Basin 1
Rainfall Zone	Florida Zone 2
Annual Mean Rainfall	50.00

Pre-Condition Landuse Information

Landuse	Agricultural - General: TN=2.800 TP=0.487
Area (acres)	2.57
Rational Coefficient (0-1)	0.11
Non DCIA Curve Number	80.00
DCIA Percent (0-100)	0.00
Nitrogen EMC (mg/l)	2.800
Phosphorus EMC (mg/l)	0.487
Runoff Volume (ac-ft/yr)	1.189
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	4.104
Phosphorus Loading (kg/yr)	0.714

Post-Condition Landuse Information

Landuse	Low-Intensity Commercial: TN=1.13 TP=0.188
Area (acres)	2.57
Rational Coefficient (0-1)	0.26
Non DCIA Curve Number	80.00
DCIA Percent (0-100)	21.80
Wet Pond Area (ac)	0.28
Nitrogen EMC (mg/l)	1.130
Phosphorus EMC (mg/l)	0.188
Runoff Volume (ac-ft/yr)	2.512
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000

Nitrogen Loading (kg/yr)	3.500
Phosphorus Loading (kg/yr)	0.582

Catchment Number: 1 Name: Basin 1

Project: Gustafson Park
Date: 2/14/2024

User Defined BMP Design

Contributing Catchment Area (acres)	2.290
Provided Nitrogen Treatment Efficiency (%)	43
Provided Phosphorus Treatment Efficiency (%)	65

Watershed Characteristics

Catchment Area (acres)	2.57
Contributing Area (acres)	2.290
Non-DCIA Curve Number	80.00
DCIA Percent	21.80
Rainfall Zone	Florida Zone 2
Rainfall (in)	50.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	
Provided TN Treatment Efficiency (%)	43
Required TP Treatment Efficiency (%)	
Provided TP Treatment Efficiency (%)	65

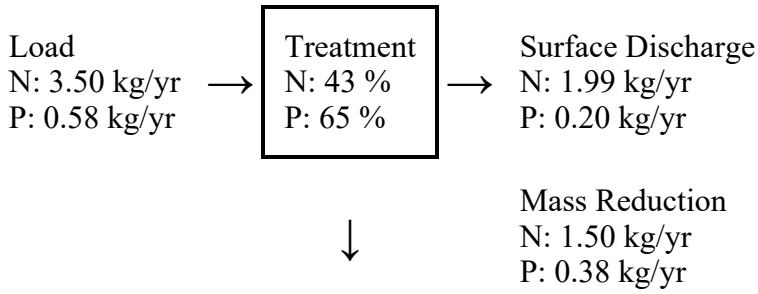
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

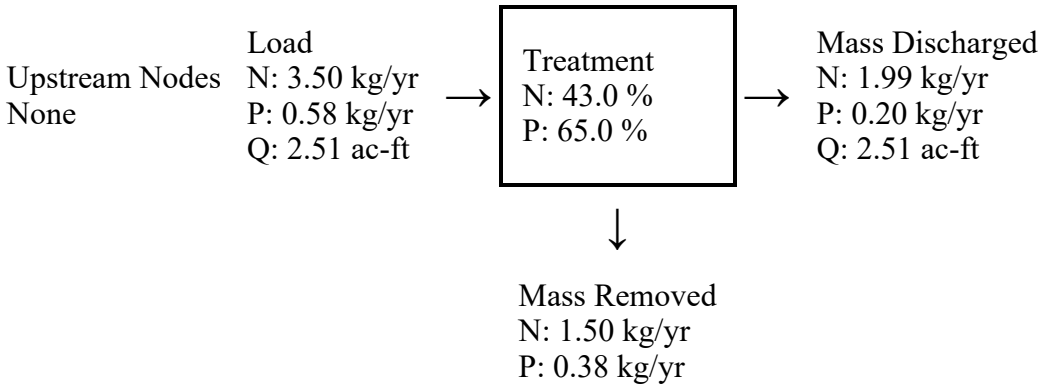
Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for User Defined BMP (stand-alone)



Load Diagram for User Defined BMP (As Used In Routing)



Summary Treatment Report Version: 4.3.5

Project: Gustafson Park

Analysis Type: Net Improvement Date:2/14/2024

BMP Types:

Catchment 1 - (Basin 1) User Defined **Routing Summary**

BMP Catchment 1 Routed to Outlet

Based on % removal values to the nearest percent

Total nitrogen target removal met? **Yes**

Total phosphorus target removal met? **Yes**

Summary Report

Nitrogen

Surface Water Discharge

Total N pre load	4.1 kg/yr
Total N post load	3.5 kg/yr

Target N load reduction	%	
Target N discharge load	4.1 kg/yr	
Percent N load reduction	43 %	
Provided N discharge load	1.99 kg/yr	4.4 lb/yr
Provided N load removed	1.5 kg/yr	3.32 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	.714 kg/yr	
Total P post load	.582 kg/yr	
Target P load reduction	%	
Target P discharge load	.714 kg/yr	
Percent P load reduction	65 %	
Provided P discharge load	.204 kg/yr	.45 lb/yr
Provided P load removed	.378 kg/yr	.834 lb/yr

X. Flowmaster Modeling Results and Inputs

Worksheet for North Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.050
Channel Slope	0.003 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	5.00 ft
Discharge	4.61 cfs

Results	
Normal Depth	7.9 in
Flow Area	5.0 ft²
Wetted Perimeter	10.4 ft
Hydraulic Radius	5.8 in
Top Width	10.28 ft
Critical Depth	3.3 in
Critical Slope	0.060 ft/ft
Velocity	0.91 ft/s
Velocity Head	0.01 ft
Specific Energy	0.67 ft
Froude Number	0.230
Flow Type	Subcritical

Swale Depth = 12"
7.9" < 12"
Therefore swale contains flow and is adequate

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.9 in
Critical Depth	3.3 in
Channel Slope	0.003 ft/ft
Critical Slope	0.060 ft/ft

Swale Flowrate:
Q=CiA
=(.89)(6.4 in/hr)(0.81 ac)
= 4.61 cfs

Note: Precipitation rate "i" obtained from FDOT IDF curves for Zone 4, 5-year storm event, in accordance with City of Green Cove Springs requirements for on-site conveyance.

Worksheet for South Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.050
Channel Slope	0.003 ft/ft
Left Side Slope	6.000 H:V
Right Side Slope	6.000 H:V
Discharge	2.23 cfs

Results	
Normal Depth	8.5 in
Flow Area	3.0 ft²
Wetted Perimeter	8.6 ft
Hydraulic Radius	4.2 in
Top Width	8.52 ft
Critical Depth	4.6 in
Critical Slope	0.064 ft/ft
Velocity	0.74 ft/s
Velocity Head	0.01 ft
Specific Energy	0.72 ft
Froude Number	0.218
Flow Type	Subcritical

Swale Depth = 12"
8.5" < 12"
Therefore swale contains flow and is adequate

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.5 in
Critical Depth	4.6 in
Channel Slope	0.003 ft/ft
Critical Slope	0.064 ft/ft

Swale Flowrate:
Q=CiA
=(.87)(6.4 in/hr)(0.40 ac)
= 2.23 cfs

Note: Precipitation rate "i" obtained from FDOT IDF curves for Zone 4, 5-year storm event, in accordance with City of Green Cove Springs requirements for on-site conveyance.

XI. NRCS Soils Map and Hydrologic Soil Group Map


81° 41' 18" W
81° 41' 1" W
29° 58' 31" N
29° 58' 21" N
433580
433620
433660
433700
433740
433780
433820
433860
433900
433940
433980
434020
3316240
3316200
3316160
3316120
3316080
3316040
3316000
3315960
17
8
17
Soil Map may not be valid at this scale.
Map Scale: 1:2,090 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 30 60 120 180
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:24,000.

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:
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: Clay County, Florida
Survey Area Data: Version 20, Aug 28, 2023

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

Date(s) aerial images were photographed: Jan 6, 2022—Feb 10, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Sapelo fine sand	B/D	13.3	88.0%
17	Plummer fine sand	A/D	1.8	12.0%
Totals for Area of Interest			**15.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

XII. FEMA FIRMette

National Flood Hazard Layer FIRMette

FEMA

81°41'21"W 29°58'42"N

81°40'44"W 29°58'11"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/29/2024 at 11:31 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.