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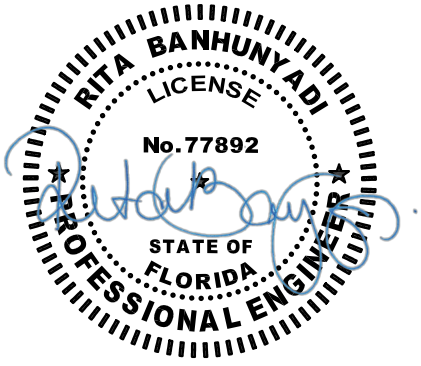
Stormwater Management Report

Green Cove Springs
Augusta Savage Arts & Community Center
Pickleball Courts

Green Cove Springs, Florida

GAI Project Number: R210955.02
March 2023

Prepared for:
St Johns River Water Management District
7775 Baymeadows Way, Suite 102
Jacksonville, FL 32256



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& Clay County Engineering Department
477 Houston Street
Green Cove Springs, FL 32043

Table of Contents

1.0 Introduction

Purpose and Scope

Clay County proposes to construct 6 pickleball courts located at the existing Augusta Savage Arts & Community Center open space at the corner of Belle Avenue and Forbes Street, in Green Cove Springs, Florida.

The site is mostly developed with approximately 1-acre open space at the southwest quadrant of the property. Refer to *Appendix A-1* for the location map.

The project will provide a stormwater management system for the courts.

This submittal will be for the approval of a SJRWMD ERP as a permit modification of 164967-1 approved on November 17, 2020.

2.0 Existing Conditions

Existing Drainage Features

The site has an average slope of 0.3% across this area. The site is generally drains to the northeast corner of the project area. The previously developed part of the site has an existing drainage system which includes a dry pond with an outfall structure.

From the site, the stormwater eventually reaches the Governor's Creek Basin which flows into the Lower St. Johns River. These water bodies are currently impaired for N and P. Therefore, the BMP Trains are required.

The project area consists of four basins, designated as Pre Basins 1 through 4. Per the NRCS, the soils consist of Leon Fine Sand (A/D) and Meggett Fine Sandy Loam (C/D). Please refer to *Appendix A-4* for soils map. The pre-development surface cover is described as open space in poor condition for drainage calculations.

PRE-DEVELOPMENT BASINS

Pre-developed basin XB 1 drain towards the northwest, to the existing on-site stormwater management system adjacent to Belle Avenue and eventually to a drainage ditch north of Martin Luther King Jr. Blvd. Basin XB 2 and XB 3 drains towards Forbes Street, and XB 4 drains towards Lemon Street.

Table 2.1.
Pre-Development Basins.

Basin Name	Total Area (ac)	Time of Concentration (Min)	CN	% of Imperviousness
XB 1	**0.66**	**33.8**	**90**	**14**
XB 2	**0.04**	**3.9**	**92**	**28**

XB 3	**0.43**	**19.5**	**90**	**9**
XB 4	**0.26**	**18.1**	**92**	**39**

Existing Storm Water Management System

The northern half of the property was developed with a stormwater management system consists of a dry retention pond, conveyance swales, and an outfall structure. This system discharges through a 48" pipe to a drainage ditch North of Martin Luther King Jr. Blvd. From there the stormwater eventually reaches the Governor's Creek Basin which flows into the Lower St. Johns River.

Geotechnical Analysis

Geotechnical engineering services was provided by Jackson Geotechnical Engineering, LLC for the previous side development in 2020 and the findings were applied to the current work.

According to the report, the seasonal high-water table is approximately 2.8-3.0 feet below the existing ground surface throughout the site. At our new pond area at approximate elevation 20'.

3.0 Proposed Conditions

Description

The project consists of 6 pickleball courts on a 10,800 SF paved area and a supporting stormwater management system (SWMS). The SWMS consists of a dry pond, control structure, and conveyance to the city owned and maintained Belle Street ROW curb inlet and drainage system.

POST-DEVELOPMENT BASINS

The post-development area will consist of one new basin, PB 1.

PB 1 the ballfield potion of the site which contains 1.244 acres with an impervious ratio of 20%. Refer to attached Site, Grading, and Drainage Plan for a site and basin plan.

PB 1 will drain to the new dry pond, Pond A. Discharge from Pond A will be to the existing City owned and maintained Belle Street ROW curb inlet and drainage system. The pond will be required to maintain the post developed flows to pre-developed rates for the 25year/24hour storm.

Recovery of Pond A will be through a bleed down orifice. The treatment volume will be recovered within the required 72 hours. Refer to Appendix B-2 for Dry Retention Pond Recovery Analysis.

Basin Characteristics Table

Table 3.1.
Post-Development Basins.

Basin Name	Total Area (ac)	Time of Concentration (min)	CN	% of Imperviousness
PB 1	**1.244**	**10**	**91**	**20**

4.0 Stormwater Management System

Description

The Stormwater Management Facility (SWMF) has been designed and configured to meet SJRWMD requirements to provide stormwater treatment and attenuation for the site area. The SWMF will consist of one dry retention pond.

Treatment Volume Calculations

Treatment of the stormwater will be provided by a dry retention system. The dry retention pond shall retain the first 0.5" of runoff from the entire basin or 1.25" over the impervious area plus 0.5" over the entire site, whichever is greater. Refer to *Appendix B-1* for *Water Quality Calculations*.

Recovery Analysis

Recovery of the dry retention treatment volume will be by an orifice located within the control structure. The orifice will be sized to recover the treatment volume within 72 hours. Refer to *Appendix B-2 for Dry Retention Pond Recovery Analysis.*

Stormwater Quantity and Attenuation Requirements

For flood attenuation pre-developed and post-developed conditions were modeled using ICPR modeling software. The post development discharge rate was limited to be less than pre-developed conditions for the 25-year, 24-hour storm event. Refer to *Appendix C-2 and D-2* and The ICPR Summary Table 4.2.

Tailwater

The outfall will have free flow to the drainage structure on Belle Street, therefore, not tailwater condition was assumed.

Storm Water Management System Summary Table

Table 4.1.
Retention Pond Summary Table.

	SWMF Type	Water Quality Volume Required/Provided (Acft)	Volumetric Requirement	Pond Bottom Elev	Top of Bank	Design High Water Elev
POND A	Dry Det	0.12/0.13	None	22.00	22.50	22.26 25YR/24HR

ICPR Results Summary Table

Table 4.2
ICPR Results Summary Table – 25YR/24HR Peak Discharge

Outfall Location	Pre Flow (cfs)	Post Flow (cfs)
POA 1 Only	2.07	1.88
Total Site	5.09	1.88

APPENDIX A-1
Location Map

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LOCATION MAP

GREEN COVE SPRING CLAY PICKLEBALL COURTS

PROJECT NO.: R210955.02

DATE: JULY 2022

SCALE: NTS

SHEET NO.: A-1

APPENDIX A-2
Aerial Photography

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AERIAL MAP

GREEN COVE SPRING CLAY PICKLEBALL COURTS

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SHEET NO.: A-2

APPENDIX A-3
USGS Quadrangle Map

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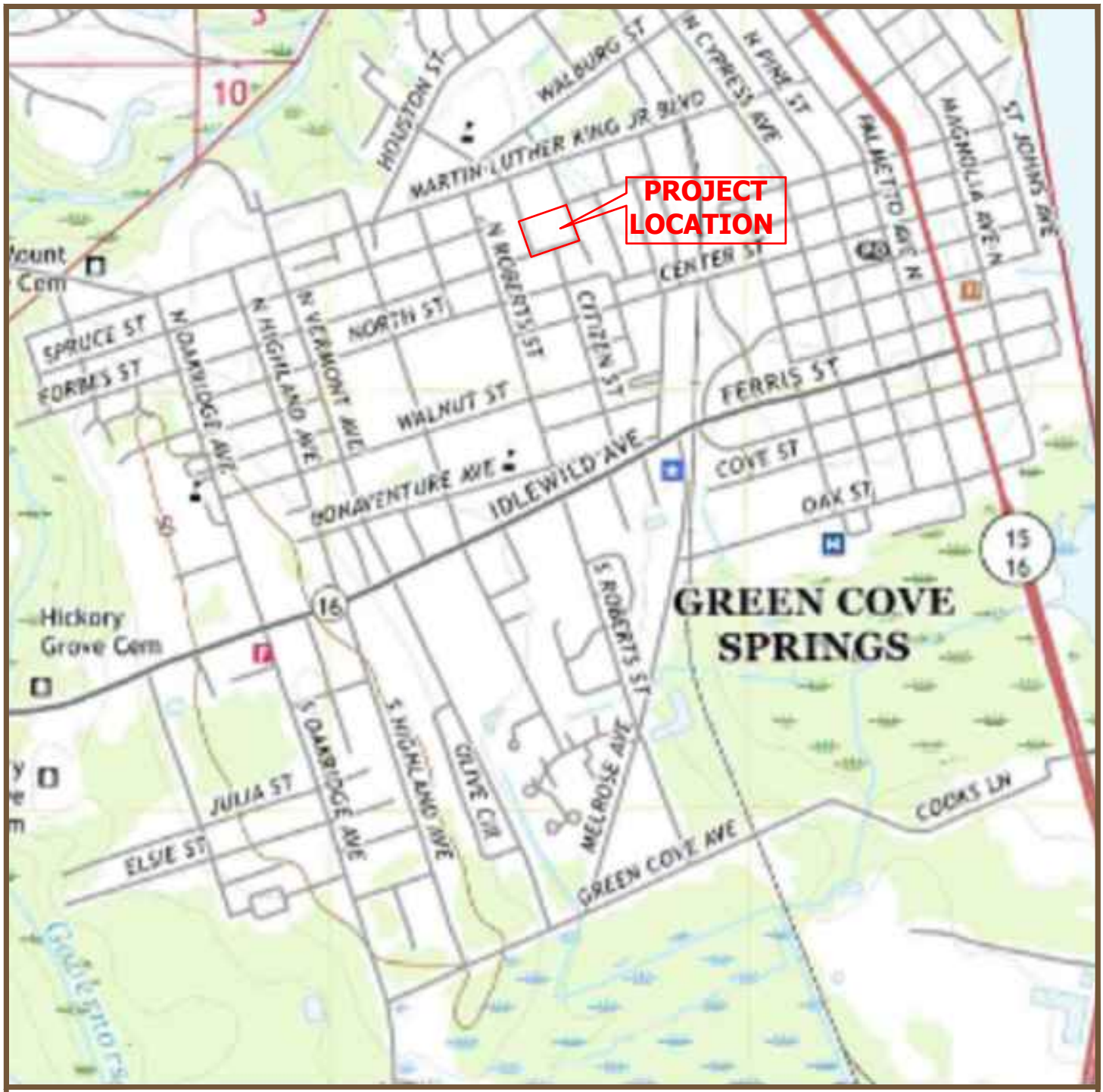

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USGS QUADRANGLE MAP

GREEN COVE SPRING CLAY PICKLEBALL COURTS

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APPENDIX A-4
NRSCS Soils Map

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
9	Leon fine sand, 0 to 2 percent slopes	1.8	90.4%
13	Meggett fine sandy loam	0.2	9.6%
Totals for Area of Interest		**2.0**	**100.0%**

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NRSCS SOILS MAP

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APPENDIX A-5
FEMA Map

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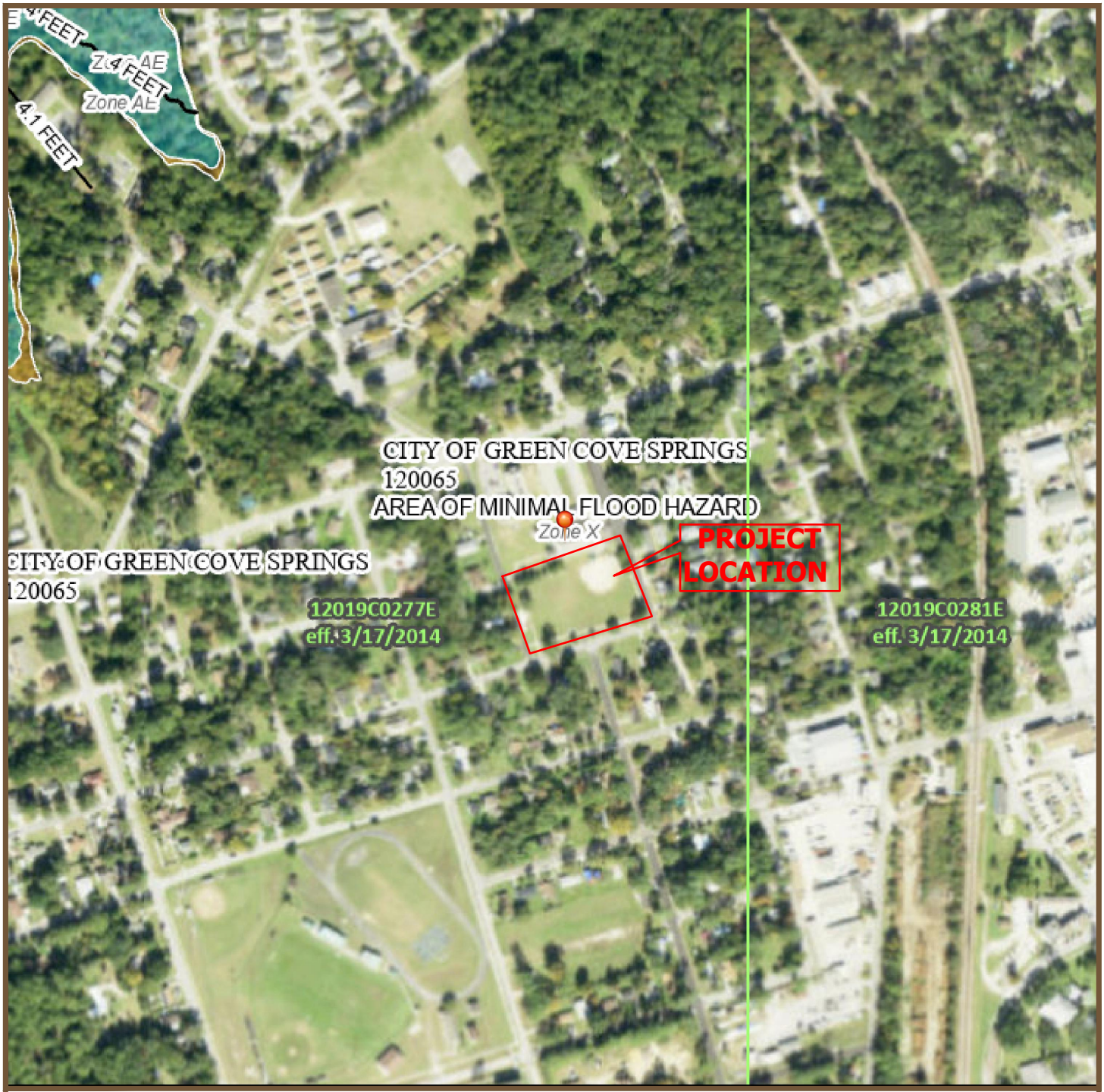

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FEMA FLOOD MAP

GREEN COVE SPRING
CLAY PICKLEBALL COURTS

PROJECT NO.: R210955.02

DATE: JULY 2022

SCALE: NTS

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APPENDIX A-6
Rainfall Distribution

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NOAA Atlas 14, Volume 9, Version 2
Location name: Green Cove Springs, Florida, USA*
Latitude: 29.995°, Longitude: -81.6892°
Elevation: 22.48 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.507 (0.408-0.632)	0.576 (0.463-0.719)	0.685 (0.549-0.857)	0.773 (0.617-0.969)	0.889 (0.685-1.13)	0.975 (0.736-1.25)	1.06 (0.774-1.38)	1.14 (0.802-1.51)	1.24 (0.843-1.68)	1.32 (0.874-1.80)
10-min	0.742 (0.598-0.926)	0.843 (0.678-1.05)	1.00 (0.805-1.25)	1.13 (0.903-1.42)	1.30 (1.00-1.65)	1.43 (1.08-1.83)	1.55 (1.13-2.02)	1.67 (1.17-2.21)	1.82 (1.23-2.46)	1.93 (1.28-2.64)
15-min	0.905 (0.729-1.13)	1.03 (0.827-1.28)	1.22 (0.981-1.53)	1.38 (1.10-1.73)	1.59 (1.22-2.02)	1.74 (1.32-2.23)	1.89 (1.38-2.46)	2.03 (1.43-2.70)	2.22 (1.51-2.99)	2.35 (1.56-3.22)
30-min	1.40 (1.13-1.75)	1.60 (1.29-2.00)	1.92 (1.54-2.39)	2.16 (1.73-2.71)	2.49 (1.92-3.17)	2.73 (2.06-3.51)	2.97 (2.17-3.86)	3.19 (2.24-4.23)	3.47 (2.35-4.68)	3.67 (2.44-5.03)
60-min	1.83 (1.48-2.28)	2.10 (1.69-2.62)	2.54 (2.04-3.17)	2.90 (2.32-3.64)	3.41 (2.64-4.36)	3.81 (2.88-4.91)	4.20 (3.08-5.50)	4.61 (3.25-6.14)	5.15 (3.50-6.98)	5.56 (3.69-7.62)
2-hr	2.26 (1.83-2.80)	2.59 (2.10-3.21)	3.16 (2.55-3.92)	3.64 (2.93-4.53)	4.33 (3.38-5.52)	4.88 (3.72-6.26)	5.44 (4.02-7.10)	6.03 (4.29-8.00)	6.83 (4.68-9.22)	7.45 (4.98-10.1)
3-hr	2.46 (2.00-3.03)	2.83 (2.30-3.49)	3.47 (2.82-4.29)	4.04 (3.26-5.01)	4.88 (3.84-6.23)	5.57 (4.28-7.16)	6.30 (4.69-8.22)	7.08 (5.07-9.39)	8.16 (5.63-11.0)	9.03 (6.06-12.3)
6-hr	2.85 (2.34-3.49)	3.27 (2.68-4.01)	4.04 (3.30-4.95)	4.75 (3.85-5.84)	5.84 (4.65-7.45)	6.76 (5.25-8.68)	7.77 (5.84-10.1)	8.87 (6.41-11.7)	10.4 (7.27-14.1)	11.7 (7.92-15.8)
12-hr	3.34 (2.76-4.06)	3.81 (3.14-4.63)	4.69 (3.86-5.71)	5.53 (4.52-6.75)	6.84 (5.50-8.71)	7.98 (6.25-10.2)	9.22 (6.99-12.0)	10.6 (7.72-14.0)	12.6 (8.83-16.9)	14.2 (9.67-19.1)
24-hr	3.88 (3.22-4.67)	4.44 (3.69-5.36)	5.50 (4.56-6.65)	6.51 (5.36-7.89)	8.09 (6.55-10.2)	9.45 (7.45-12.0)	10.9 (8.35-14.1)	12.6 (9.24-16.5)	15.0 (10.6-19.9)	16.9 (11.6-22.5)
2-day	4.45 (3.73-5.33)	5.18 (4.33-6.20)	6.51 (5.43-7.81)	7.76 (6.43-9.33)	9.67 (7.88-12.1)	11.3 (8.97-14.2)	13.1 (10.0-16.7)	15.0 (11.1-19.5)	17.9 (12.7-23.6)	20.1 (13.9-26.6)
3-day	4.90 (4.12-5.83)	5.70 (4.78-6.79)	7.16 (5.99-8.55)	8.52 (7.09-10.2)	10.6 (8.66-13.2)	12.4 (9.85-15.5)	14.3 (11.0-18.2)	16.4 (12.1-21.2)	19.4 (13.8-25.5)	21.9 (15.1-28.8)
4-day	5.29 (4.46-6.29)	6.13 (5.16-7.28)	7.64 (6.42-9.10)	9.05 (7.56-10.8)	11.2 (9.18-13.9)	13.0 (10.4-16.3)	15.0 (11.6-19.0)	17.2 (12.8-22.2)	20.3 (14.5-26.6)	22.9 (15.9-30.0)
7-day	6.34 (5.37-7.48)	7.19 (6.09-8.49)	8.74 (7.38-10.3)	10.2 (8.54-12.1)	12.4 (10.2-15.2)	14.2 (11.4-17.6)	16.2 (12.6-20.4)	18.4 (13.7-23.5)	21.5 (15.5-28.0)	24.0 (16.8-31.4)
10-day	7.26 (6.18-8.53)	8.14 (6.92-9.57)	9.72 (8.24-11.5)	11.2 (9.41-13.2)	13.3 (11.0-16.3)	15.2 (12.2-18.6)	17.1 (13.3-21.4)	19.2 (14.4-24.5)	22.2 (16.0-28.8)	24.7 (17.3-32.1)
20-day	9.88 (8.47-11.5)	11.0 (9.40-12.8)	12.8 (10.9-15.0)	14.4 (12.2-16.9)	16.6 (13.7-20.0)	18.4 (14.8-22.3)	20.2 (15.8-24.9)	22.1 (16.6-27.8)	24.7 (17.9-31.7)	26.8 (18.9-34.6)
30-day	12.1 (10.4-14.1)	13.4 (11.6-15.6)	15.6 (13.4-18.1)	17.4 (14.8-20.3)	19.8 (16.3-23.5)	21.6 (17.4-25.9)	23.4 (18.3-28.6)	25.2 (18.9-31.4)	27.6 (20.0-35.0)	29.3 (20.7-37.7)
45-day	15.0 (13.0-17.3)	16.7 (14.4-19.3)	19.3 (16.6-22.3)	21.4 (18.3-24.8)	24.1 (19.9-28.3)	26.0 (21.1-31.0)	27.9 (21.9-33.8)	29.7 (22.3-36.7)	31.9 (23.1-40.2)	33.4 (23.7-42.8)
60-day	17.5 (15.2-20.2)	19.5 (16.9-22.5)	22.6 (19.5-26.0)	24.9 (21.4-28.9)	28.0 (23.1-32.7)	30.1 (24.4-35.7)	32.1 (25.2-38.7)	33.9 (25.6-41.7)	36.0 (26.2-45.2)	37.5 (26.7-47.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

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GREEN COVE SPRING
CLAY PICKLEBALL COURTS

PROJECT NO.: R210955.02

DATE: JULY 2022

SCALE: NTS

SHEET NO.: A-6

APPENDIX B-1
Water Quality Calculations

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PROJECT: Green Cove Springs Pickleball Courts

Dry Retention Calculations:

Land Use:	Residential Site	
Receiving Waters:	Class III	
Pond Designation	Pond A	(Dry)
Basin Area (Ac):	1.24	(Including Pond)
Project Coeff. of Runoff:	0.39	
Project % Impervious:	19.9%	(Not Including Pond)

Stage-Area-Volume relationship:

Stage (ft)	Stage Desc	Area (sf)	Area (Ac)	Vol. (Ac-Ft)
22.00	TOS	28159	0.646	0.00
22.10	ELEV	28834	0.662	0.07
22.20	TV	29514	0.678	0.13
22.30	ELEV	30201	0.693	0.20
22.40	ELEV	30894	0.709	0.27
22.50	TOB	31611	0.726	0.34

1. Required Treatment Volumes:

a. 0.5" Runoff from Drainage Basin:
Vd = Area(Ac) x 0.5" / 12" per foot
Vd = 1.24 x 0.5" / 12" per foot
Vd = 0.05 Ac - Ft

b. 1.25" Runoff from Impervious Area
Vi = Imp Area(Project Area - Pond Area) x 1.25"/12" per foot
Vi = 0.25 x 1.25" / 12" per foot
Vi = 0.03 Ac - Ft

c. An Additional 0.5" Runoff from Drainage Basin for On-Line Detention:
Vd_2 = Area(Ac) x 0.5" / 12" per foot
Vd_2 = 1.24 x 0.5" / 12" per foot
Vd_2 = 0.05 Ac - Ft

c. Total Treatment Volume:
Vt = (Vd or Vi - whichever is greater) + Vd_2
Vt = 0.10 Ac - Ft

2.No orifice - See dry pond recovery calculations

3. Set Elevation of Control Structure

Overflow Weir

Using Stage vs Storage Curve w/ Treatment
Volume = 0.10 Ac - Ft therefore Weir Elv = 22.20 Ft (min.)
Design Weir ELv.= 22.20 feet w/ volume = 0.13 Ac-Ft
Initial Stage = 22.20 - 22.00 = 0.20 Ft

APPENDIX B-2
Dry Retention Pond Recovery Analysis

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Sim	Node Name	Relative Time [hrs]	Stage [ft]
DRAWDOWN	POND A	0.0000	22.20
DRAWDOWN	POND A	0.2504	22.15
DRAWDOWN	POND A	0.5002	22.10
DRAWDOWN	POND A	0.7504	22.04
DRAWDOWN	POND A	1.0000	20.35
DRAWDOWN	POND A	1.2501	19.56
DRAWDOWN	POND A	1.5002	19.53

APPENDIX B-3
Impervious Calculations

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Green Cove Springs Pickleball Courts
Basin Area Calculations

Post-Development Basins					
Basin Name	**Total Area (ac)**	**Pervious Area (ac)**	**Imperv. Area (ac)**	**Pond TV Area (ac)**	**% Impervious (Excludes TV)**
PB 1	1.24	1.00	0.25	0.00	20%
Total	**1.24**	**1.00**	**0.25**	**0.00**	**20%**

Green Cove Springs Pickleball Courts
Post Development Impervious Area Calculations

DCIA Calculated using Roadway, cul-de-sac, driveway, 25% of Rooftop and Comm/Amenity DCIA
NON-DCIA Calculated using sidewalk, recreation area, 75% Rooftop and Comm/Amenity Non-DCIA
c=0.25 for flat (0-2%) pasture, grass, and farmland per SJRWMD ERP Handbook VOL II

BASIN PB 1			
Type	Area (AC)	DCIA	Non-DCIA
Courts Pavement	0.248	0.248	n/a
Sidewalks	0.000	n/a	0.000
Lots	0.000	0.000	0.000
Amenity	0.000	0.000	0.000
Pond TV	0.000	n/a	0.000
TOTAL	0.248	0.248	0.000

TOTAL BASIN AREA (AC) =	**1.24**	**C=**	**0.39**
TOTAL IMPERVIOUS AREA (AC) =	**0.25**	**19.9**	**%**
IMPERVIOUS AREA (AC) (DCIA) =	**0.25**	**19.9**	**%**
IMPERVIOUS AREA (AC) (NON-DCIA) =	**0.00**	**0.0**	**%**
Pond A	**0.00**	**0.0**	**%**

APPENDIX B-4
Impaired Water Calculations

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Summary Treatment Report Version: 4.3.5

Project: Green Cove Springs
Pickleball Courts

Analysis Type: Net Improvement

Date:8/12/2022

BMP Types:

Catchment 1 - (Basin 1)
Retention
Based on % removal values to the nearest percent

Routing Summary
Catchment 1 Routed to Outlet

Total nitrogen target removal met? **Yes**
Total phosphorus target removal met? **Yes**

Summary Report

Nitrogen

Surface Water Discharge

Total N pre load	.71 kg/yr	
Total N post load	1.87 kg/yr	
Target N load reduction	62 %	
Target N discharge load	.71 kg/yr	
Percent N load reduction	85 %	
Provided N discharge load	.29 kg/yr	.64 lb/yr
Provided N load removed	1.58 kg/yr	3.49 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	.118 kg/yr	
Total P post load	.311 kg/yr	
Target P load reduction	62 %	
Target P discharge load	.118 kg/yr	
Percent P load reduction	85 %	
Provided P discharge load	.048 kg/yr	.11 lb/yr
Provided P load removed	.263 kg/yr	.58 lb/yr

Complete Report Ver 4.3.5

Project: Green Cove Springs Pickleball Courts
Date: 3/2/2023 11:11:06 AM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	Basin 1
Rainfall Zone	Florida Zone 2
Annual Mean Rainfall	47.60

Pre-Condition Landuse Information

Landuse	Low-Intensity Commercial: TN=1.13 TP=0.188
Area (acres)	1.39
Rational Coefficient (0-1)	0.27
Non DCIA Curve Number	91.00
DCIA Percent (0-100)	0.00
Nitrogen EMC (mg/l)	1.130
Phosphorus EMC (mg/l)	0.188
Runoff Volume (ac-ft/yr)	1.513
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	2.108
Phosphorus Loading (kg/yr)	0.351

Post-Condition Landuse Information

Landuse	Low-Intensity Commercial: TN=1.13 TP=0.188
Area (acres)	1.24
Rational Coefficient (0-1)	0.38
Non DCIA Curve Number	91.00
DCIA Percent (0-100)	20.00
Wet Pond Area (ac)	0.00
Nitrogen EMC (mg/l)	1.130
Phosphorus EMC (mg/l)	0.188
Runoff Volume (ac-ft/yr)	1.874
Groundwater N (kg/yr)	0.000
Groundwater P (kg/yr)	0.000
Nitrogen Loading (kg/yr)	2.611
Phosphorus Loading (kg/yr)	0.434

Catchment Number: 1 Name: Basin 1

Project: Green Cove Springs Pickleball Courts
Date: 3/2/2023

Retention Design

Retention Depth (in)	0.500
Retention Volume (ac-ft)	0.052

Watershed Characteristics

Catchment Area (acres)	1.24
Contributing Area (acres)	1.240
Non-DCIA Curve Number	91.00
DCIA Percent	20.00
Rainfall Zone	Florida Zone 2
Rainfall (in)	47.60

Surface Water Discharge

Required TN Treatment Efficiency (%)	19
Provided TN Treatment Efficiency (%)	56
Required TP Treatment Efficiency (%)	19
Provided TP Treatment Efficiency (%)	56

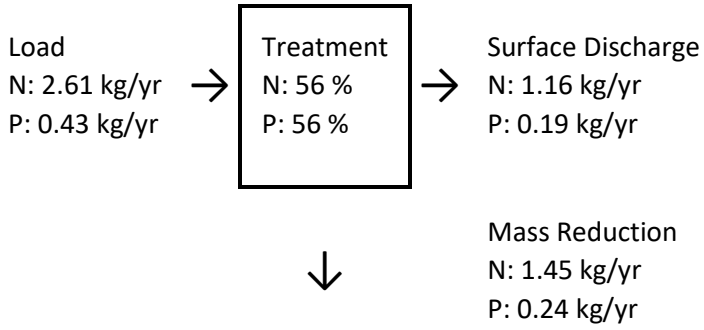
Media Mix Information

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

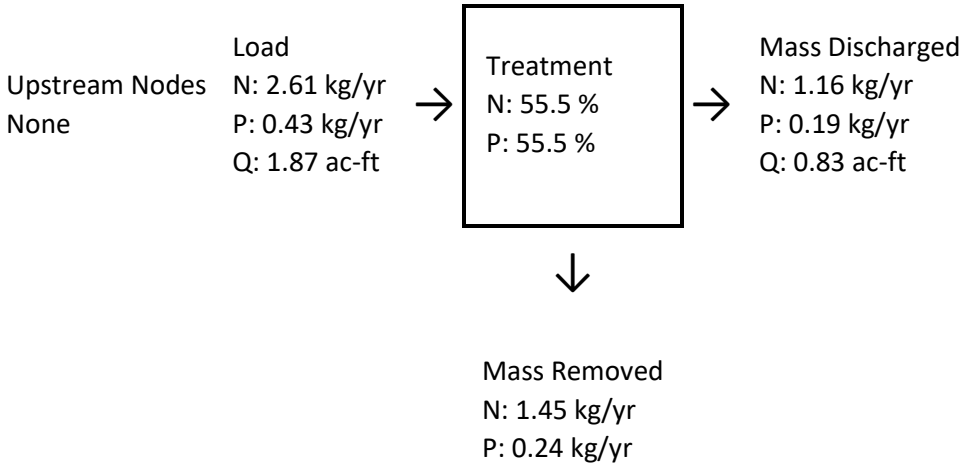
Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	1.450
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.241
TP Concentration (mg/L)	0.000

Load Diagram for Retention (stand-alone)



Load Diagram for Retention (As Used In Routing)



APPENDIX C-1
Basin Summary

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Green Cove Springs Pickleball Courts
Basin Area Calculations

Pre-Development Basins					
Basin Name	**Total Area**	**Pervious Area**	**Imperv. Area**	**Wetland NWL**	**% Impervious**
XB 1	0.66	0.56	0.09	0.00	14%
XB 2	0.04	0.03	0.01	0.00	28%
XB 3	0.43	0.39	0.04	0.00	9%
XB 4	0.26	0.16	0.10	0.00	39%
Total	**1.39**	**1.14**	**0.24**	**0.00**	**18%**

APPENDIX C-2
ICPR Pre Developed Summary Report

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Sim	Basin Name	Node Name	Maximum Flow Rate [cfs]	Time to Maximum Flow Rate [hrs]
25YR-24HR	XB 1	XPOA 1	2.07	12.2667
25YR-24HR	XB 2	XPOA 2	0.21	12.0000
25YR-24HR	XB 3	XPOA 3	1.71	12.1333
25YR-24HR	XB 4	XPOA 4	1.10	12.1167

Simple Basin: XB 1

Scenario:	ICPR3
Node:	XPOA 1
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	31.8000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	0.6560 ac
Curve Number:	90.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: XB 2

Scenario:	ICPR3
Node:	XPOA 2
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	3.9000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	0.0350 ac
Curve Number:	92.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: XB 3

Scenario:	ICPR3
Node:	XPOA 3
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	19.5000 min
Max Allowable Q:	0.00 cfs

Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	0.4320 ac
Curve Number:	90.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: XB 4

Scenario:	ICPR3
Node:	XPOA 4
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	18.1000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	0.2630 ac
Curve Number:	92.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

APPENDIX C-3
Time of Concentration Calculations

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Green Cove Springs Pickleball Courts
Time of Concentration Calculations

Pre-Development
XB 1

Sheet Flow

1.	Segment ID		1.1		
2.	Surface Description		Short Grass Prairie		
3.	Manning's Roughness Coefficient, n		0.15	(TR-55 Second Ed. 1986 Table 3-1)	
4.	Flow Length, L	ft	100		
5.	Two-yr 24-hr rainfall, P_2	in	4.44		
6.	Land Slope, s	ft/ft	0.002		
7.	$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	hr	0.35	0.00	0.00
8.	Total			0.35 hrs.	

Shallow Concentrated Flow

9.	Segment ID (paved or unpaved)		1.2		
10.	Surface Description (paved or unpaved)		Unpaved		
11.	Flow Length, L	ft	102		
12.	Watercourse Slope, s	ft/ft	0.0127		
			1.82		
			2.29		
13.	Average Velocity, V	ft/s	1.82		
14.	$Tt = \frac{L}{3600*V}$	hr	0.02	0.00	0.00
15.	Total			0.02 hrs.	

Channel Flow

16.	Segment ID		--	--	
17.	Cross Sectional Flow Area, a	ft^2	0.0	0.00	
18.	Wetted Perimeter, pw	ft	0.00	0.00	
19.	Hydraulic Radius, r = a/pw	ft	0.00	0.00	
20.	Channel Slope, s	ft/ft	0.000	0.000	
21.	Mannings Roughness Coeff., n		0.013	0.013	
22.	$V = (1.49\ r^{2/3}s^{1/2})/n$	ft/s	0.00	0.00	
23.	Flow Length, L	ft	0	0	
24.	$Tt = \frac{L}{3600*V}$	hr	0.00	0.00	
25.	Total			0.00 hrs.	

Grand Total **0.36 hrs.**

21.8 min

Green Cove Springs Pickleball Courts
Time of Concentration Calculations

Pre-Development
XB 2

Sheet Flow

1.	Segment ID		2.1		
2.	Surface Description		Short Grass Prairie		
3.	Manning's Roughness Coefficient, n		0.15	(TR-55 Second Ed. 1986 Table 3-1)	
4.	Flow Length, L	ft	43.5		
5.	Two-yr 24-hr rainfall, P_2	in	4.44		
6.	Land Slope, s	ft/ft	0.025		
7.	$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	hr	0.06	0.00	0.00
8.	Total			0.06 hrs.	

Shallow Concentrated Flow

9.	Segment ID (paved or unpaved)		--		
10.	Surface Description (paved or unpaved)		Unpaved		
11.	Flow Length, L	ft	0.00		
12.	Watercourse Slope, s	ft/ft	0.0000		
			0.00		
			0.00		
13.	Average Velocity, V	ft/s	0.00		
14.	$Tt = \frac{L}{3600*V}$	hr	0.00	0.00	0.00
15.	Total			0.00 hrs.	

Channel Flow

16.	Segment ID		--		
17.	Cross Sectional Flow Area, a	ft^2	0.0		
18.	Wetted Perimeter, pw	ft	0.00		
19.	Hydraulic Radius, r = a/pw	ft	0.00		
20.	Channel Slope, s	ft/ft	0.000		
21.	Mannings Roughness Coeff., n		0.035	Earth channel - weedy	
22.	$V = (1.49\ r^{2/3}s^{1/2})/n$	ft/s	0.00		
23.	Flow Length, L	ft	0.00		
24.	$Tt = \frac{L}{3600*V}$	hr	0.00		
25.	Total			0.00 hrs.	

Grand Total	**0.06 hrs.**
	3.9 min

Green Cove Springs Pickleball Courts
Time of Concentration Calculations

Pre-Development
XB 3

Sheet Flow

1.	Segment ID		3.1		
2.	Surface Description		Short Grass Prairie		
3.	Manning's Roughness Coefficient, n		0.15	(TR-55 Second Ed. 1986 Table 3-1)	
4.	Flow Length, L	ft	100		
5.	Two-yr 24-hr rainfall, P_2	in	4.44		
6.	Land Slope, s	ft/ft	0.003		
7.	$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	hr	0.32	0.00	0.00
8.	Total			0.32 hrs.	

Shallow Concentrated Flow

9.	Segment ID (paved or unpaved)		3.2		
10.	Surface Description (paved or unpaved)		Unpaved		
11.	Flow Length, L	ft	38.00		
12.	Watercourse Slope, s	ft/ft	0.0092		
			1.55		
			1.95		
13.	Average Velocity, V	ft/s	1.55		
14.	$Tt = \frac{L}{3600*V}$	hr	0.01	0.00	0.00
15.	Total			0.01 hrs.	

Channel Flow

16.	Segment ID		--	--	
17.	Cross Sectional Flow Area, a	ft^2	0.0	0.00	
18.	Wetted Perimeter, pw	ft	0.00	0.00	
19.	Hydraulic Radius, r = a/pw	ft	0.00	0.00	
20.	Channel Slope, s	ft/ft	0.000	0.000	
21.	Mannings Roughness Coeff., n		0.013	0.013	
22.	$V = (1.49\ r^{2/3}s^{1/2})/n$	ft/s	0.00	0.00	
23.	Flow Length, L	ft	0	0	
24.	$Tt = \frac{L}{3600*V}$	hr	0.00	0.00	
25.	Total			0.00 hrs.	

Grand Total **0.33 hrs.**

19.5 min

Green Cove Springs Pickleball Courts
Time of Concentration Calculations

Pre-Development
XB 4

Sheet Flow

1.	Segment ID		3.1		
2.	Surface Description		Short Grass Prairie		
3.	Manning's Roughness Coefficient, n		0.15	(TR-55 Second Ed. 1986 Table 3-1)	
4.	Flow Length, L	ft	100		
5.	Two-yr 24-hr rainfall, P_2	in	4.44		
6.	Land Slope, s	ft/ft	0.003		
7.	$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}s^{0.4}}$	hr	0.30	0.00	0.00
8.	Total			0.30 hrs.	

Shallow Concentrated Flow

9.	Segment ID (paved or unpaved)		3.2		
10.	Surface Description (paved or unpaved)		Unpaved		
11.	Flow Length, L	ft	34.00		
12.	Watercourse Slope, s	ft/ft	0.0088		
			1.51		
			1.91		
13.	Average Velocity, V	ft/s	1.51		
14.	$Tt = \frac{L}{3600*V}$	hr	0.01	0.00	0.00
15.	Total			0.01 hrs.	

Channel Flow

16.	Segment ID		--	--	
17.	Cross Sectional Flow Area, a	ft^2	0.0	0.00	
18.	Wetted Perimeter, pw	ft	0.00	0.00	
19.	Hydraulic Radius, r = a/pw	ft	0.00	0.00	
20.	Channel Slope, s	ft/ft	0.000	0.000	
21.	Mannings Roughness Coeff., n		0.013	0.013	
22.	$V = (1.49\ r^{2/3}s^{1/2})/n$	ft/s	0.00	0.00	
23.	Flow Length, L	ft	0	0	
24.	$Tt = \frac{L}{3600*V}$	hr	0.00	0.00	
25.	Total			0.00 hrs.	

Grand Total **0.30 hrs.**

18.1 min

APPENDIX C-4
CN Calculations

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Green Cove Springs Pickleball Courts
Runoff Curve Number Calculations

Basin	Total Area (ac)	Imperv. Area (ac) CN=98	Wetland (ac) CN=98	Pervious CN TR-55 Second Edition, June 1986 (Open Space (Poor Condition)											Weighted CN
				Total Area (ac)	Soil A CN= 68		Soil B CN= 79		Soil C CN= 86		Soil D CN= 89				
					%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)			
XB 1	0.66	0.09	0.00	0.6	0.0	0.00	0.0	0.00	0.0	0.00	100.0	0.56	Y	90
XB 2	0.04	0.01	0.00	0.0	0.0	0.00	0.0	0.00	0.0	0.00	100.0	0.03	Y	92
XB 3	0.43	0.04	0.00	0.4	0.0	0.00	0.0	0.00	0.0	0.00	100.0	0.39	Y	90
XB 4	0.26	0.10	0.00	0.2	0.0	0.00	0.0	0.00	0.0	0.00	100.0	0.16	Y	92

APPENDIX D-1
Basin Summary

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Green Cove Springs Pickleball Courts
Basin Area Calculations

Post-Development Basins					
Basin Name	**Total Area (ac)**	**Pervious Area (ac)**	**Imperv. Area (ac)**	**Pond TV Area (ac)**	**% Impervious (Excludes TV)**
PB 1	1.24	1.00	0.25	0.00	20%
Total	**1.24**	**1.00**	**0.25**	**0.00**	**20%**

APPENDIX D-2
ICPR Post Developed Summary Report

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Sim	Node Name	Maximum Total Inflow Rate [cfs]	Time to Maximum Total Inflow Rate [hrs]
25YR-24HR	EX INLET	1.88	12.5634

Sim	Node Name	Warning Stage [ft]	Maximum Stage [ft]	Time to Maximum Stage [hrs]
25YR-24HR	POND A	22.50	22.26	12.5552

Simple Basin: PB 1

Scenario:	ICPR3
Node:	POND A
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:	UH323
Peaking Factor:	323.0
Area:	1.2400 ac
Curve Number:	91.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

APPENDIX D-3
CN Calculations

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Green Cove Springs Pickleball Courts
Runoff Curve Number Calculations

	Basin	Total Area (ac)	Imperv. Area (ac) CN=98	Pond Area (ac) CN=98	Pervious											Weighted CN
					Total Area (ac)	Soil A CN= 68		Soil B CN= 79		Soil C CN= 86		Soil D CN= 89				
						%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)			
Pd	PB 1	1.24	0.25	0.00	1.00	0.0	0.00	0.0	0.00	0	0.00	100	1.00	Y	91	

APPENDIX E
Input Reports

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Simulation: 25YR-24HR

Scenario: ICPR3
Run Date/Time: 3/2/2023 10:52:03 AM
Program Version: ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	100.0000

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

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
0	0	0	10.0000	5.0000
0	0	0	20.0000	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: ICPR3
Reference ET Folder:
Unit Hydrograph Folder: ICPR3

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: ICPR3
Green-Ampt Set: ICPR3
Vertical Layers Set:
Impervious Set: ICPR3
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:	0.0001 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Region Specification
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Flmod
		Rainfall Amount:	8.09 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
Dflt Damping (2D):	0.0100 ft	Dflt Damping (1D):	0.0100 ft
Min Node Srf Area (2D):	1 ft2	Min Node Srf Area (1D):	113 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Use Link Selection

Comment:

Drop Structure Link: DS 1		Upstream Pipe		Downstream Pipe	
Scenario:	ICPR3	Invert:	19.50 ft	Invert:	18.25 ft
From Node:	POND A	Manning's N:	0.0110	Manning's N:	0.0110
To Node:	EX INLET	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	1.50 ft	Max Depth:	1.50 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Split	Default:	0.00 ft	Default:	0.00 ft
Pipe Count:	1	Op Table:		Op Table:	
Damping:	0.0000 ft	Ref Node:		Ref Node:	
Length:	113.50 ft	Manning's N:	0.0000	Manning's N:	0.0000
FHWA Code:	0	Top Clip			
Entr Loss Coef:	1.00	Default:	0.00 ft	Default:	0.00 ft
Exit Loss Coef:	0.50	Op Table:		Op Table:	
Bend Loss Coef:	0.50	Ref Node:		Ref Node:	
Bend Location:	0.00 dec	Manning's N:	0.0000	Manning's N:	0.0000
Energy Switch:	Energy				

Pipe Comment:

Weir Component		Bottom Clip	
Weir:	1	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	Top Clip	
Weir Type:	Sharp Crested Vertical	Default:	0.20 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	22.20 ft	Ref Node:	
Control Elevation:	22.20 ft	Discharge Coefficients	
Max Depth:	0.60 ft	Weir Default:	3.200
Max Width:	3.00 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment: WEIR PLATE INSIDE 36" NYLOPLAST DRAIN BASIN WITH SOLID TOP

Weir Component		Bottom Clip	
Weir:	2	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	Top Clip	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	19.50 ft	Ref Node:	
Control Elevation:	19.50 ft	Discharge Coefficients	
Max Depth:	0.25 ft	Weir Default:	3.200
Max Width:	1.00 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment: 12" x 3" BLEED DOWN OPENING

Drop Structure Comment: MODIFIED TYPE C INLET WITH STEEL GRATE