



Stormwater Management Report

Green Cove Springs
Augusta Savage Arts & Community Center
Pickleball Courts

Green Cove Springs, Florida

GAI Project Number: R210955.02
February 2023

Prepared for:
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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 pedestrian access and 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 existing on-site drainage system, 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 one basin, designated as Pre Basin 1. 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
PRE BASIN A	0.87	5.5	91	20
PRE BASIN B	0.77	6.5	95	65

* 21.8 min through pre-developed basin XB-1, +12 min through previously developed area and drainage system to reach POA 1.

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 14,641 SF paved area and a supporting stormwater management system (SWMS). The SWMS consists of a dry pond, control structure, and conveyance to the downstream on-site existing stormwater pond (permit number 164967).

POST-DEVELOPMENT BASINS

The post-development area will consist of one new basin, PB 1. The previously developed area will keep the previously approved (permit number 164967) 3 basins: Basin A, Basin B, Basin C.

PB 1 the ball field portion of the site which contains 1.39 acres with an impervious ratio of 18%. Refer to attached Site, Grading, and Drainage Plan for a site and basin plan.

PB 1 will discharge to the new dry retention pond, Pond A. Discharge from Pond A will be to the existing downstream on-site 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	1.39	10	91	18
BASIN A	0.96	10	95	60
BASIN B	0.65	10	96	78
BASIN C	0.03	10	98	100

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 in 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 at the corner of Belle Avenue and Martin Luther King Jr. Blvd, where the previously approved development discharges. Therefore, no 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	22.35 25YR/24HR
EX POND A	Dry Ret	As approved	As approved	19.00	21.00	20.98 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	10.01	9.58
Total Site to POA 1	13.03	9.58

APPENDIX A-1 Location Map



**PROJECT
LOCATION**



North



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LOCATION MAP

**GREEN COVE SPRING
CLAY PICKLEBALL COURTS**

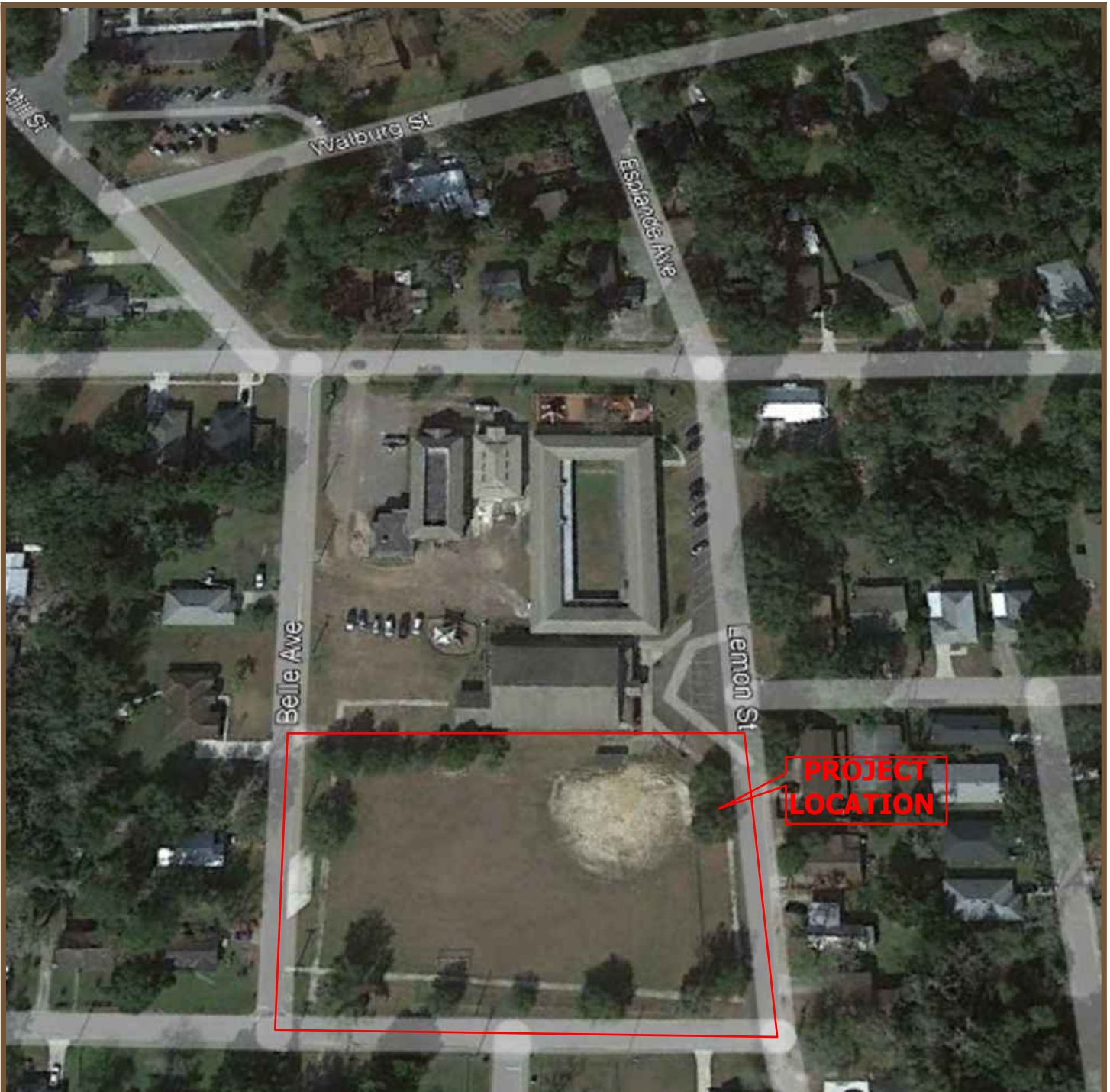
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SCALE: NTS

SHEET NO.: **A-1**

APPENDIX A-2 **Aerial Photography**



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AERIAL MAP

GREEN COVE SPRING CLAY PICKLEBALL COURTS

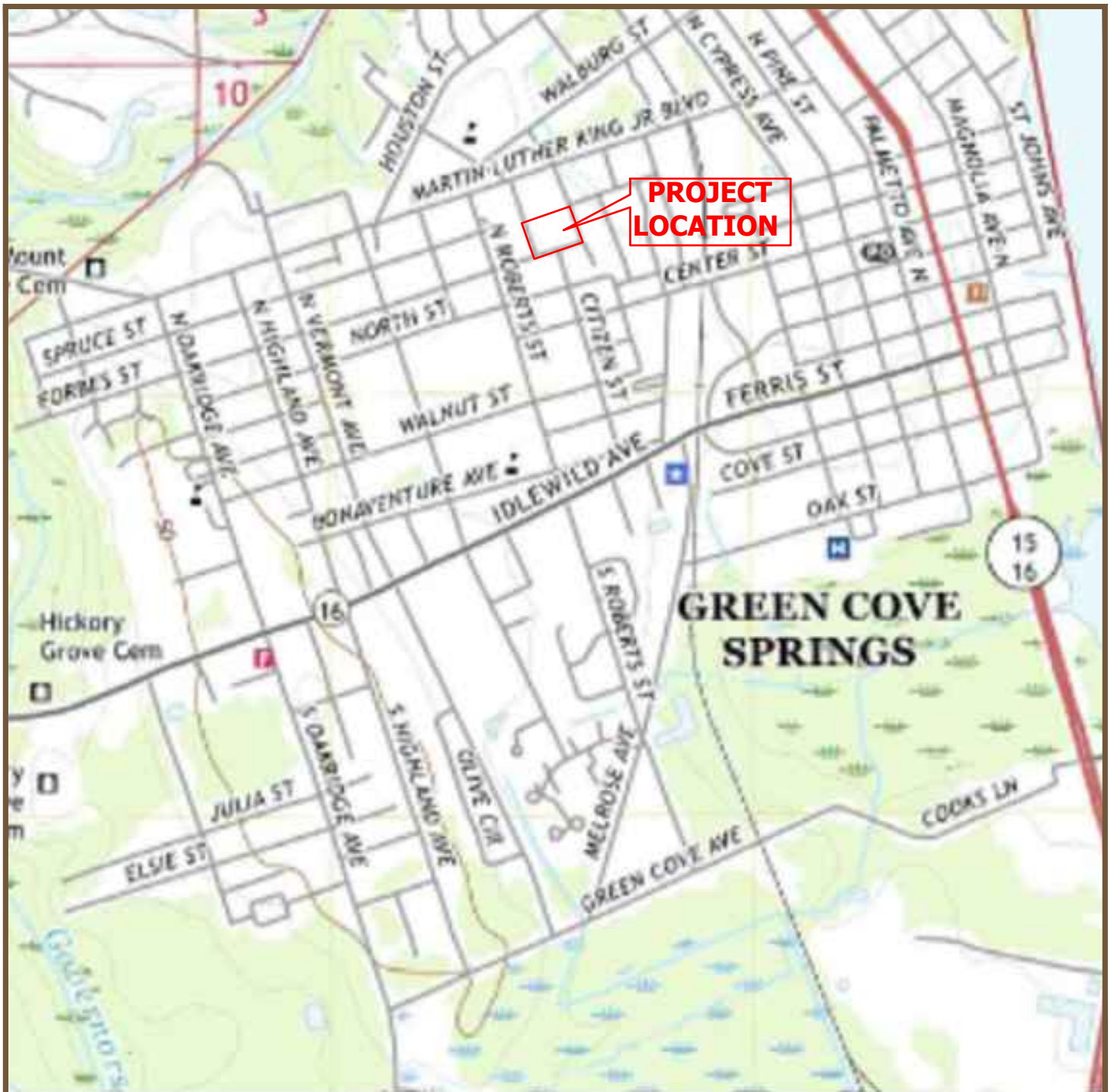
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APPENDIX A-3 USGS Quadrangle Map



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USGS QUADRANGLE MAP

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APPENDIX A-4 NRSCS Soils Map

Soil Map—Clay County, Florida



USDA Natural Resources Conservation Service

Web Soil Survey National Cooperative Soil Survey

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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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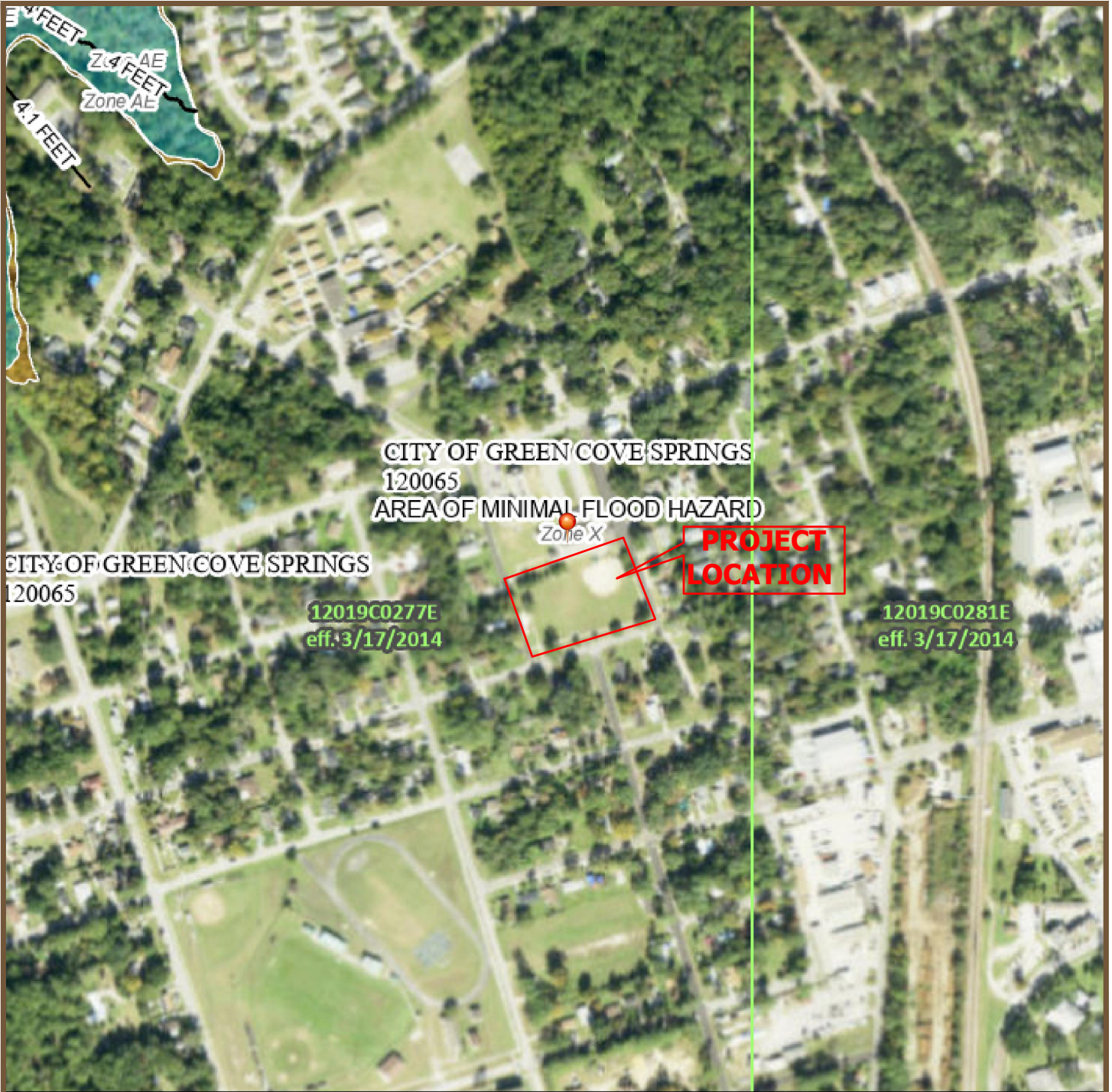
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APPENDIX A-5 FEMA Map



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FEMA FLOOD MAP

**GREEN COVE SPRING
 CLAY PICKLEBALL COURTS**

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SCALE: NTS

SHEET NO.: **A-5**

APPENDIX A-6 **Rainfall Distribution**



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, Geoffrey 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 (27.5-47.9)

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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RAINFALL DISTRIBUTION

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 CLAY PICKLEBALL COURTS**

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DATE: JULY 2022

SCALE: NTS

SHEET NO.: **A-6**

APPENDIX B-1 Water Quality Calculations

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): 1.39 (Including Pond)
 Project Coeff. of Runoff: 0.38
 Project % Impervious: 17.9% (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:

$$Vd = \text{Area(Ac)} \times 0.5" / 12" \text{ per foot}$$

$$Vd = 1.39 \times 0.5" / 12" \text{ per foot}$$

$$Vd = 0.06 \text{ Ac - Ft}$$

b. 1.25" Runoff from Impervious Area

$$Vi = \text{Imp Area(Project Area - Pond Area)} \times 1.25"/12" \text{ per foot}$$

$$Vi = 0.25 \times 1.25" / 12" \text{ per foot}$$

$$Vi = 0.03 \text{ Ac - Ft}$$

c. An Additional 0.5" Runoff from Drainage Basin for On-Line Detention:

$$Vd_2 = \text{Area(Ac)} \times 0.5" / 12" \text{ per foot}$$

$$Vd_2 = 1.39 \times 0.5" / 12" \text{ per foot}$$

$$Vd_2 = 0.06 \text{ Ac - Ft}$$

c. Total Treatment Volume:

$$Vt = (Vd \text{ or } Vi - \text{whichever is greater}) + Vd_2$$

$$Vt = 0.12 \text{ Ac - Ft}$$

2.No orifice - See dry pond recovery calculations

3. Set Elevation of Control Structure

Overflow Weir

Using Stage vs Storage Curve w/ Treatment

$$\text{Volume} = 0.12 \text{ Ac - Ft therefore Weir Elv} = 22.20 \text{ Ft (min.)}$$

$$\text{Design Weir ELv.} = 22.20 \text{ feet w/ volume} = 0.13 \text{ Ac-Ft}$$

$$\text{Initial Stage} = 22.20 - 22.00 = 0.20 \text{ Ft}$$

APPENDIX B-2

Dry Retention Pond Recovery Analysis

Sim	Node Name	Relative Time [hrs]	Stage [ft]
DRAWDOWN	POND A	0.0000	22.20
DRAWDOWN	POND A	0.0833	22.18
DRAWDOWN	POND A	0.1667	22.17
DRAWDOWN	POND A	0.2500	22.15
DRAWDOWN	POND A	0.3334	22.14
DRAWDOWN	POND A	0.4167	22.12
DRAWDOWN	POND A	0.5000	22.11
DRAWDOWN	POND A	0.5833	22.10
DRAWDOWN	POND A	0.6667	22.08
DRAWDOWN	POND A	0.7500	22.07
DRAWDOWN	POND A	0.8334	22.05
DRAWDOWN	POND A	0.9167	22.04
DRAWDOWN	POND A	1.0000	22.03
DRAWDOWN	POND A	1.0834	22.01
DRAWDOWN	POND A	1.1667	21.62
DRAWDOWN	POND A	1.2500	20.64

APPENDIX B-3 **Impervious Calculations**

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	1.39	1.14	0.25	0.00	18%
BASIN A	0.96	0.38	0.58	0.10	60%
BASIN B	0.65	0.14	0.51	0.00	78%
BASIN C	0.03	0.00	0.03	0.00	100%
Total	3.03	1.66	1.37	0.10	45%

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																				
<table style="width: 100%; border: none;"> <tr> <td style="width: 40%;">TOTAL BASIN AREA (AC) =</td> <td style="width: 20%; text-align: center;">1.39</td> <td style="width: 20%;">C=</td> <td style="width: 20%; text-align: center;">0.38</td> </tr> <tr> <td>TOTAL IMPERVIOUS AREA (AC) =</td> <td style="text-align: center;">0.25</td> <td>17.9</td> <td style="text-align: center;">%</td> </tr> <tr> <td>IMPERVIOUS AREA (AC) (DCIA) =</td> <td style="text-align: center;">0.25</td> <td>17.9</td> <td style="text-align: center;">%</td> </tr> <tr> <td>IMPERVIOUS AREA (AC) (NON-DCIA) =</td> <td style="text-align: center;">0.00</td> <td>0.0</td> <td style="text-align: center;">%</td> </tr> <tr> <td>Pond A</td> <td style="text-align: center;">0.00</td> <td>0.0</td> <td style="text-align: center;">%</td> </tr> </table>				TOTAL BASIN AREA (AC) =	1.39	C=	0.38	TOTAL IMPERVIOUS AREA (AC) =	0.25	17.9	%	IMPERVIOUS AREA (AC) (DCIA) =	0.25	17.9	%	IMPERVIOUS AREA (AC) (NON-DCIA) =	0.00	0.0	%	Pond A	0.00	0.0	%
TOTAL BASIN AREA (AC) =	1.39	C=	0.38																				
TOTAL IMPERVIOUS AREA (AC) =	0.25	17.9	%																				
IMPERVIOUS AREA (AC) (DCIA) =	0.25	17.9	%																				
IMPERVIOUS AREA (AC) (NON-DCIA) =	0.00	0.0	%																				
Pond A	0.00	0.0	%																				

APPENDIX B-4 **Impaired Water Calculations**

**Green Cove Springs Pickleball Courts
BMP Train Area and CN Calculations**

Pre-Developed Condition

Basin	Total Basin Area (ac)	DCIA		Imperv Area (ac)	Non-DCIA									Non-DCIA CN
		Imperv Area			Pervious									
		(ac)	%		Total Area (ac)	Soil A %	CN= 68 Area (ac)	Soil B %	CN= 79 Area (ac)	Soil C %	CN= 86 Area (ac)	Soil D %	CN= 89 Area (ac)	
XB 1	0.53	0.00	0.0%	0.00	0.53	0	0.00	0	0.00	0	0.00	100	0.53	89

Post Developed Condition

Basin	Total Basin Area (ac)	DCIA		Imperv Area (ac)	Non-DCIA									Non-DCIA CN
		Imperv Area			Pervious									
		(ac)	%		Total Area (ac)	Soil A %	CN= 68 Area (ac)	Soil B %	CN= 79 Area (ac)	Soil C %	CN= 86 Area (ac)	Soil D %	CN= 89 Area (ac)	
PB 1	0.53	0.34	63.0%	0.00	0.20	0	0.00	0	0.00	0	0.00	100	0.20	89

APPENDIX C-1 **Basin Summary**

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%
PRE BASIN A	0.87	0.70	0.17	0.00	20%
PRE BASIN B	0.77	0.27	0.50	0.00	65%
Total	3.03	2.11	0.91	0.00	30%

APPENDIX C-2

ICPR Pre Developed Summary Report

Sim	Basin Name	Node Name	Maximum Flow Rate [cfs]	Time to Maximum Flow Rate [hrs]
25YR-24HR	PRE BASIN A	XPOA 1	4.42	12.0333
25YR-24HR	PRE BASIN B	XPOA 1	4.03	12.0333
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
MEANYR-24HR	PRE BASIN A	XPOA 1	2.41	12.0333
MEANYR-24HR	PRE BASIN B	XPOA 1	2.29	12.0333
MEANYR-24HR	XB 1	XPOA 1	1.11	12.2667
MEANYR-24HR	XB 2	XPOA 2	0.11	12.0000
MEANYR-24HR	XB 3	XPOA 3	0.92	12.1333
MEANYR-24HR	XB 4	XPOA 4	0.60	12.1167

Simple Basin: PRE BASIN A

Scenario: ICPR3
Node: XPOA 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: UH323
Peaking Factor: 323.0
Area: 0.8700 ac
Curve Number: 91.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment: 5.5 MIN CALCULATED, USED MIN 10 MIN RECOMMENDED.

Simple Basin: PRE BASIN B

Scenario: ICPR3
Node: XPOA 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: UH323
Peaking Factor: 323.0
Area: 0.7700 ac
Curve Number: 95.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment: 6.5 MIN CALCULATED, USED MIN 10 MIN RECOMMENDED.

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

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. $T_t = \frac{L}{3600 * V}$	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. $T_t = \frac{L}{3600 * V}$	hr	0.00	0.00	
25. Total		0.00 hrs.		

Grand Total

0.36 hrs.

21.8 min*

* time to reach previously developed side of the property.

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. $T_t = \frac{L}{3600 * V}$	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. $T_t = \frac{L}{3600 * V}$	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. $T_t = \frac{L}{3600 * V}$	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. $T_t = \frac{L}{3600 * V}$	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. $T_t = \frac{L}{3600 * V}$	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. $T_t = \frac{L}{3600 * V}$	hr	0.00	0.00	
25. Total		0.00 hrs.		

Grand Total

0.30 hrs.
18.1 min

APPENDIX C-4 CN Calculations

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
PRE BASIN A	0.87	0.17	0.00	0.7	0.0	0.00	0.0	0.00	0.0	0.00	100.0	0.70	Y	91
PRE BASIN B	0.77	0.50	0.00	0.3	0.0	0.00	0.0	0.00	0.0	0.00	100.0	0.27	Y	95

APPENDIX D-1 **Basin Summary**

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	1.39	1.14	0.25	0.00	18%
BASIN A	0.96	0.38	0.58	0.10	60%
BASIN B	0.65	0.14	0.51	0.00	78%
BASIN C	0.03	0.00	0.03	0.00	100%
Total	3.03	1.66	1.37	0.10	45%

APPENDIX D-2

ICPR Post Developed Summary Report

Sim	Node Name	Maximum Total Inflow Rate [cfs]	Time to Maximum Total Inflow Rate [hrs]
25YR-24HR	POA 1	9.58	12.0506

Sim	Node Name	Warning Stage [ft]	Maximum Stage [ft]	Time to Maximum Stage [hrs]
25YR-24HR	EX POND A	21.00	20.98	12.0712
25YR-24HR	POND A	22.50	22.35	12.5850

Simple Basin: BASIN A

Scenario: ICPR3
Node: EX 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: 0.9600 ac
Curve Number: 95.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

Simple Basin: BASIN B

Scenario: ICPR3
Node: POA 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: UH323
Peaking Factor: 323.0
Area: 0.6500 ac
Curve Number: 96.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

Simple Basin: BASIN C

Scenario: ICPR3
Node: POA 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: UH323
Peaking Factor: 323.0
Area: 0.0300 ac
Curve Number: 98.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

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: 1.3860 ac
Curve Number: 91.0
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

APPENDIX D-3 CN Calculations

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)
Post	PB 1	1.39	0.25	0.00	1.14	0.0	0.00	0.0	0.00	0	0.00	100	1.14	Y	91
	BASIN A	0.96	0.58	0.10	0.28	0.0	0.00	0.0	0.00	0	0.00	100	0.28	Y	95
	BASIN B	0.65	0.51	0.00	0.14	0.0	0.00	0.0	0.00	0	0.00	100	0.14	Y	96
	BASIN C	0.03	0.03	0.00	0.00	0.0	0.00	0.0	0.00	0	0.00	100	0.00	Y	98

APPENDIX E

Input Reports

Simulation: MEANYR-24HR

Scenario: ICPR3
 Run Date/Time: 2/5/2023 10:21:03 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	0.5 dec		
Fact:			
dZ Tolerance:	0.0001 ft	Smp/Man Basin Rain	Global
		Opt:	
Max dZ:	1.0000 ft	OF Region Rain Opt:	Region Specification
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Flmod
		Rainfall Amount:	4.70 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	1 ft2	Min Node Srf Area	113 ft2
(2D):		(1D):	
Energy Switch (2D):	Energy	Energy Switch (1D):	Use Link Selection

Comment:

Simulation: 25YR-24HR

Scenario: ICPR3
 Run Date/Time: 2/5/2023 10:19:23 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	0.5 dec		
Fact:			
dZ Tolerance:	0.0001 ft	Smp/Man Basin Rain	Global
		Opt:	
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	1 ft2	Min Node Srf Area	113 ft2
(2D):		(1D):	
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: 19.25 ft
From Node:	POND A	Manning's N: 0.0110	Manning's N: 0.0110
To Node:	MH A	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