



November 18, 2024

Sent via Electronic Mail

Mr. Nate Senn
Siting Coordination Office
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 5500
Tallahassee, FL 32399

Subject: Duke Energy Florida, LLC.
Citrus Combined Cycle Station
Conditions of Certification PA 77-09
Amendment Request for Installation of an Iron Filter Backwash Reclaim System

Dear Mr. Senn,

Duke Energy, Florida LLC (DEF) currently operates a process water treatment system at their Citrus Combined Cycle Station (CCCS) in Crystal River, Florida which treats groundwater using iron removal filters and reverse osmosis for use in site processes. Backwash from the iron filters is currently discharged to the permitted industrial wastewater percolation pond system. Downgradient compliance monitoring wells have shown increasing concentrations of manganese (Mn) since the commissioning of the iron filters, and investigations by CCCS show that the iron filter backwash is a concentrated Mn source to the percolation ponds.

CCCS is installing an Iron Filter Backwash Reclaim (IFBR) system to address the increasing Mn concentrations in accordance with the Florida Department of Environmental (FDEP) Administrative Order AO-050SWD22. The IFBR system will treat iron filter backwash water and return it to the process water influent stream. This system will eliminate backwash discharge and the associated Mn loading to the percolation pond. The system will also decrease the overall groundwater withdrawal for process water by reclaiming the water previously discharged with the backwash.

The new IFBR system will include construction of an approximate 50-foot by 50-foot covered concrete equipment pad. The new impervious area will be less than 4,000 square feet and the disturbed area will be less than 0.1 acre. The increase to stormwater flow to the existing stormwater pond is estimated to be negligible (approximately 0.01 to 0.02 cubic feet per second) and pond discharge would be unchanged. The attached Stormwater Report provides details for the anticipated effects to site stormwater by the IFBR system construction.

The following attachments are being included with this submittal in support of the amendment request:

- Attachment I: Industrial Wastewater Permit Application Forms
- Attachment II: Project Description
- Attachment III: Project Layout
- Attachment IV: Process Flow Diagram
- Attachment V: Stormwater Report



Should you have any questions regarding this submittal, please contact Ms. Ilia Balcom at (813) 362-5123, ilia.balcom@duke-energy.com. Please copy Ms. Balcom on all correspondence related to this submittal.

Sincerely,

A handwritten signature in black ink, appearing to read "Todd Pigeon". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Todd Pigeon
Station Manager

Attachments

cc: Bob Seller, FDEP Southwest District

Attachment I

Industrial Wastewater Permit Application
Forms



WASTEWATER FACILITY OR ACTIVITY PERMIT APPLICATION FORM 1 GENERAL INFORMATION

I IDENTIFICATION NUMBER:

Facility ID FLA964891

II CHARACTERISTICS:

INSTRUCTIONS: Complete the questions below to determine whether you need to submit any permit application forms to the Department of Environmental Protection. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the blank in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements. See Section B of the instructions. See also, Section C of the instructions for definitions of the terms used here.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a domestic wastewater facility which results in a discharge to surface or ground waters?		X	
B. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters?		X	
C. Does or will this facility (other than those describe in A. or B.) discharge process wastewater, or non-process wastewater regulated by effluent guidelines or new source performance standards, to surface waters?	X		
D. Does or will this facility (other than those described in A. or B.) discharge process wastewater to ground waters?		X	X
E. Does or will this facility discharge non-process wastewater, not regulated by effluent guidelines or new source performance standards, to surface waters?	X		
F. Does or will this facility discharge non-process wastewater to ground waters?			
G. Does or will this facility discharge stormwater associated with industrial activity to surface waters?		X	
H. Is this facility a non-discharging/closed loop recycle system?		X	
I. Is this facility a public water system whose primary purpose is the production of potable water for public consumption and which discharges demineralization concentrate to surface water or groundwater?		X	

III NAME OF FACILITY: (40 characters and spaces)

Citrus Combined Cycle PB1 & PB2

Facility ID FLA964891**IV FACILITY CONTACT:** (A. 30 characters and spaces)

A. Name and Title (Last, first, & title)	B. Phone (area code & no.)
Ilia Balcom, Senior Environmental Specialist	813-362-5123

V FACILITY MAILING ADDRESS: (A. 30 characters and spaces; B. 25 characters and spaces)

A. Street or P.O. Box: 14385 North Access Road		
B. City or Town: Crystal River	State: FL	Zip Code: 34428

VI FACILITY LOCATION: (A. 30 characters and spaces; B. 24 characters and spaces; C. 3 spaces (if known); D. 25 characters and spaces; E. 2 spaces; F. 9 spaces)

A. Street, Route or Other Specific Identifier: 14385 North Access Road		
B. County Name: Citrus	C. County Code (if known): 09	
D. City or Town: Crystal River	E. State: FL	F. Zip Code: 34428

VII SIC CODES: (4-digit, in order of priority)

1. Code #: 4911	(Specify) Steam Electric	2. Code #:	(Specify)
3. Code #:	(Specify)	4. Code #:	(Specify)

VIII OPERATOR INFORMATION: (A. 40 characters and spaces; B. 1 character; C. 1 character (if other, specify); D. 12 characters; E. 30 characters and spaces; F. 25 characters and spaces; G. 2 characters; H. 9 characters)

A. Name: Duke Energy Florida, LLC		B. Is the name in VIII A. the owner? ☒ Yes ☐ No	
C. Status of Operator: F = Federal; S = State; P = Private; O = Other; M = Public (other than F or S)	(code) P	(specify) Electric Utility	D. Phone No.: (352) 501-2237
E. Street or P. O. Box: 14385 North Access Road			
F. City or Town: Crystal River		G. State: FL	H. Zip Code: 34428

IX INDIAN LAND: Is the facility located on Indian lands?

☐ Yes

☒ No

Facility ID FLA964891

X EXISTING ENVIRONMENTAL PERMITS:

A. NPDES Permit No.	B. UIC Permit No.	C. Other (specify)	D. Other (specify)
FL0000159		PA 77-09 (COC)	

XI MAP: Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII NATURE OF BUSINESS (provide a brief description)

Steam Electric Generating Station

XIII CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Todd Pigeon

A. Name (type or print)

Station Manager-Citrus Combined Cycle Station

Official Title (type or print)



B. Signature

11/18/24

C. Date Signed



APPLICATION FOR A MINOR REVISION TO A WASTEWATER FACILITY OR ACTIVITY PERMIT

1. Instructions

- a. In accordance with Rule 62-620.325, F.A.C., this form must be submitted to the appropriate Department district office or approved local program when requests for minor revisions to a permit or minor modifications to a facility are made by a permittee, except for transfer of a permit to a new permittee and addition of a major user of reclaimed water to a Part III reuse system. Application for transfer of a permit to a new permittee shall be made on DEP Form 62-620.910(11). Application for addition of a major user of reclaimed water shall be made on DEP Form 62-610.300(4)(a)1.
- b. Each applicable item must be completed in full in order to avoid delay in processing of this form. Where attached sheets or other technical documentation are provided, indicate appropriate cross-references.
- c. Three (3) copies of this application with supporting documentation shall be submitted with this form.
- d. All information is to be typed or printed in ink. Dates are to be entered in MM/DD/YR format.
- e. This application and attachments shall be signed in accordance with Rule 62-620.305, F.A.C. Also, as applicable, this application and all attachments shall be signed and sealed by a professional engineer registered in Florida in accordance with Rule 62-620.310, F.A.C.

2. Facility Information

- | | | | |
|---------------------------|---|------------------------------------|-----------|
| a. Permit Number: | FLA964891 | b. Facility Identification Number: | FLA964891 |
| c. Project/Facility Name: | Iron Filter Backwash Reclamation System/Citrus Combined Cycle PB1 & PB2 | | |
| d. Contact Name: | Iliia Balcom | | |
| Number and Street: | 14385 North Access Road | | |
| City/State/Zip Code: | Crystal River, FL 34428 | | |
| Telephone | 813-362-5123 | | |

3. Type of Revision

- ☐ **Correct Typographical Errors¹** - Submit one copy of each page of the permit showing revisions being requested.
- ☐ **Change Improvement Schedule¹** - Provide a description of the improvement, a list of the dates to be revised, and a reason for the proposed change in each date.
- ☐ **Change Expiration Date of Permit¹** - Provide the current and proposed expiration dates for the permit and the reasons for the proposed change.
- ☐ **Change Staffing Requirements²** - Describe the proposed change and submit justification for the change in accordance with Chapter 62-699, F.A.C.

¹A processing fee is not required.

²A processing fee is required with the application in accordance with Rule 62-4.050, F.A.C.

☐ **Change Monitoring and Reporting Requirements²** - Describe the proposed change and submit justification for the change in accordance with Chapter 62-601, F.A.C.

☐ **Modify Approved Pretreatment Program¹** - Describe the proposed modification and provide the information required by Rule 62-625.540, F.A.C.

☐ **Delete Point Source Outfall¹** - Identify the outfall and explain why the outfall is being eliminated.

☐ **Modify or Expand Approved Residuals Land Application Sites²** - Attach a new or updated Agricultural Use or Dedicated Site Plan as required by Chapter 62-640, F.A.C.

☐ **Minor Modification to the Facility²** - Provide a description of the proposed modification. If applicable, attach any reports, plans, and specifications which have been developed to implement this modification.

☒ **Other²** - Provide appropriate documentation. Describe.

Construction of an Iron Filter Backwash Reclaim system. See attachments for additional information

4. Certifications

a. Applicant or Authorized Representative

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.


(Signature of Applicant or Authorized Representative³)

11/18/24
(Date)

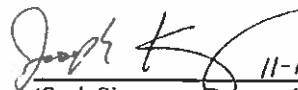
Name (please type) Todd Pigeon Company Name Duke Energy Florida, LLC
Title Station Manager Company Address: 14385 North Access Road
Phone: 352-501-2237 City/State/Zip Code: Crystal River, FL 34428
Email (optional): todd.pigeon@duke-energy.com

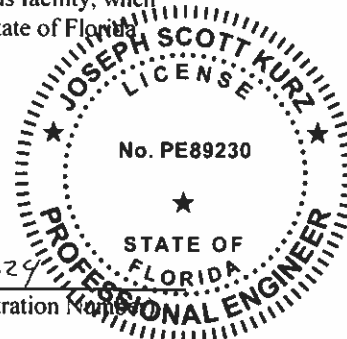
b. Professional Engineer Registered in Florida

I certify that the engineering features of this project have been (designed) (examined) by me and found to conform to engineering principles applicable to such projects. In my professional judgement, this facility, when properly constructed, operated, and maintained, will comply with all applicable statutes of the State of Florida and rules of the Department.

Name (please type): Joseph S. Kurz
Florida Registration Number: PE 89230
Company Name: WSP USA Environmental & Infrastructure Inc.
Company Address: 1075 Big Shanty Road, NW
City/State/Zip Code: Kennesaw, GA, 30144
Phone Number: 770-421-3400

Email (optional): scott.kurz@wsp.com

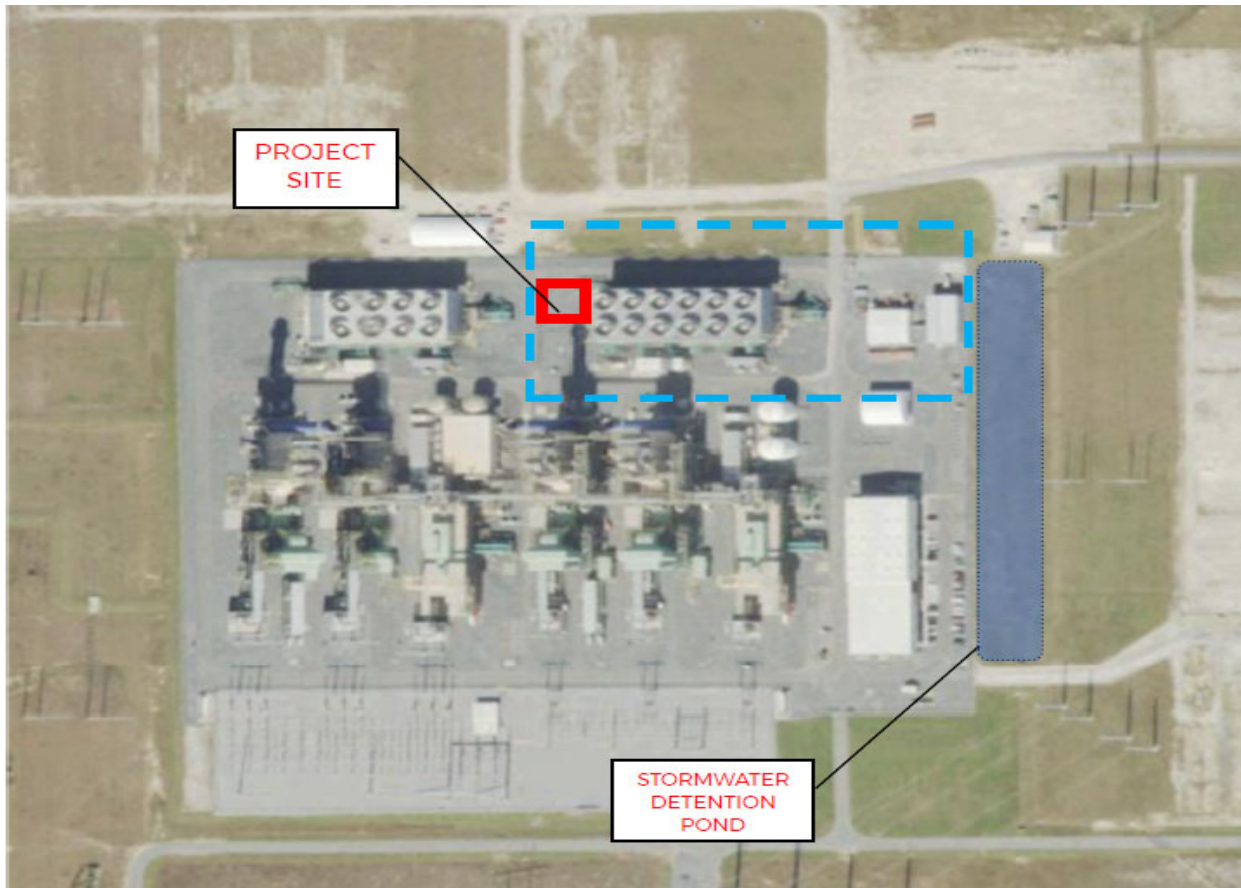
 11-14-2024
(Seal, Signature, Date, and Registration Number)



³If signed by the authorized representative, attach a letter of authorization in accordance Rule 62-620.305, F.A.C.

Attachment II

PROJECT DESCRIPTION



FACILITY BACKGROUND

Duke Energy Florida (DEF) owns and operates the Citrus Combined Cycle Station (CCCS) in Crystal River, Florida in Citrus County. CCC is located at 14385 North Access Road.

PROJECT DESCRIPTION

CCCS currently treats groundwater using iron removal filters and reverse osmosis for use in site processes. Backwash from the iron filters is currently discharged to the permitted industrial wastewater percolation pond system. Downgradient compliance monitoring wells have shown increasing concentrations of manganese (Mn) since the commissioning of the iron filters, and investigations by CCCS show that the iron filter backwash is a concentrated Mn source to the percolation ponds.

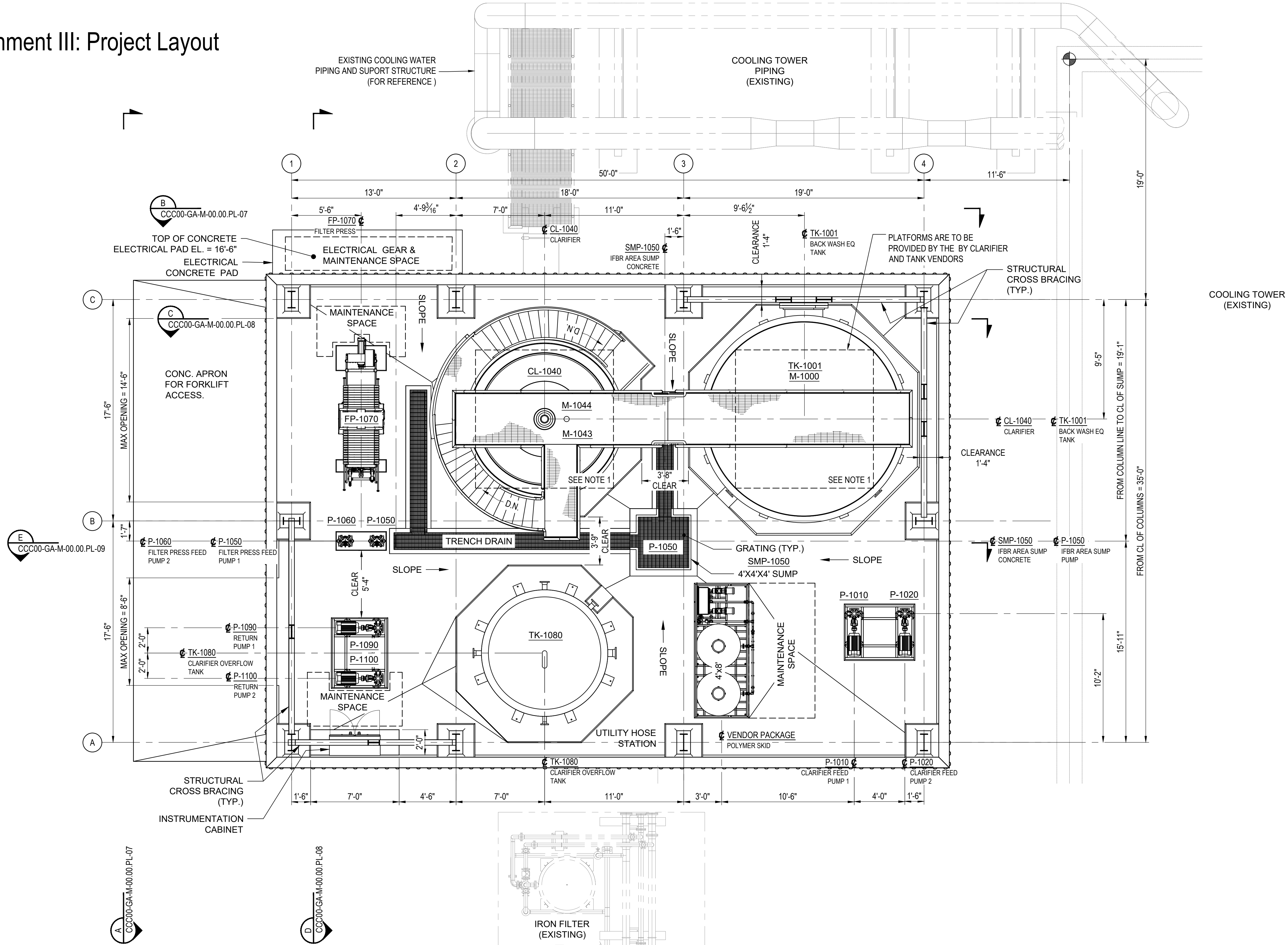
CCCS is installing an Iron Filter Backwash Reclaim (IFBR) system to address the increasing Mn concentrations in accordance with the Florida Department of Environmental (FDEP) Administrative Order AO-050SWD22. The IFBR system will treat iron filter backwash water and return it to the process water influent stream. This system will eliminate backwash discharge and the associated Mn loading to the percolation pond. The system will also decrease the

overall groundwater withdrawal for process water by reclaiming the water previously discharged with the backwash.

Iron filter backwash will be routed to a 27,300-gallon, mixed tank to equalize the intermittent flows. The equalized backwash will then be pumped at a constant rate to a 12-foot diameter solids-contact clarifier. A polymer flocculant will be added to the backwash as it enters the clarifier to increase solids floc size. The solids floc will settle in the clarifier removing manganese and other solids constituents (iron, etc.) from the backwash water. The clarified backwash water will overflow the clarifier to a 6,350-gallon overflow tank and be pumped back to the iron filter inlet piping. The settled solids in the clarifier will be pumped to a 10-cubic foot filter press for dewatering. The dewatered solids will be transported off site for disposal. Filtrate will be returned to the equalization tank to be reclaimed. The new IFBR system will include construction of an approximate 50-foot by 50-foot covered concrete equipment pad.



Attachment III: Project Layout



- NOTES:
1. REMOVABLE ROOF PANELS FOR EXTRACTING TANK AND CLARIFIER MIXER ASSEMBLIES WITH CRANE.
 2. EXISTING STRUCTURES AND EQUIPMENT HAVE BEEN PLACED RELATIVE TO SURVEY POINTS AND ARE FOR REFERENCE ONLY AND ARE NOT CERTIFIED AS-BUILT.

PLAN @ EL 40'-0"
1/4"=1'-0"

FOR REVIEW AND
APPROVAL
21-OCT-24

REV	DDMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP	REV	DDMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
C	21-OCT-24	ISSUED FOR CLIENT REVIEW (PER SITE SURVEY)							ZDM	MEJ	AMS	AWE					
B	28-AUG-24	ISSUED FOR CLIENT REVIEW							ZDM	MEJ	AMS	TWE					
A	15-AUG-24	ISSUED FOR CLIENT REVIEW							ZDM	MEJ							

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STAMP/SEAL	
3	CCC00-GA-M-00.00.PL-09
2	CCC00-GA-M-00.00.PL-08
1	CCC00-GA-M-00.00.PL-07
REF	NUMBER
	TITLE

A	APPROVED FOR _____			
	D. CHRISTENSEN		T. ENGLUND	
	CLIENT PROJECT MGR		PROJECT MGR	
PROJECT PHASE				
DETAILED ENGINEERING				
PROJECT NO.				
US-EI-27559_1_1.5552		DES	ZDM	15-AUG-24
SCALE		DRN	ZDM	21-OCT-24
		CHK	MEJ	21-OCT-24
		APP	AWE	21-OCT-24
1/4"=1'-0"				

DUKE ENERGY CITRUS COMBINED CYCLE STATION	
IRON FILTER BACKWASH RECLAIM SYSTEM	
MECHANICAL GENERAL ARRANGEMENT BACKWASH RECLAIM SYSTEM PLAN VIEW @ EL 45'-0"	

wsp	
Environment & Infrastructure, Inc. 1075 BIG SHANTY ROAD, NW, SUITE 100 KENNESAW, GA 30144 / TEL: (770) 421-3400	
CLIENT DWG NO.	CCC00-GA-M-00.00.PL-05
DRAWING NO.	CCC00-GA-M-00.00.PL-05
REV	C

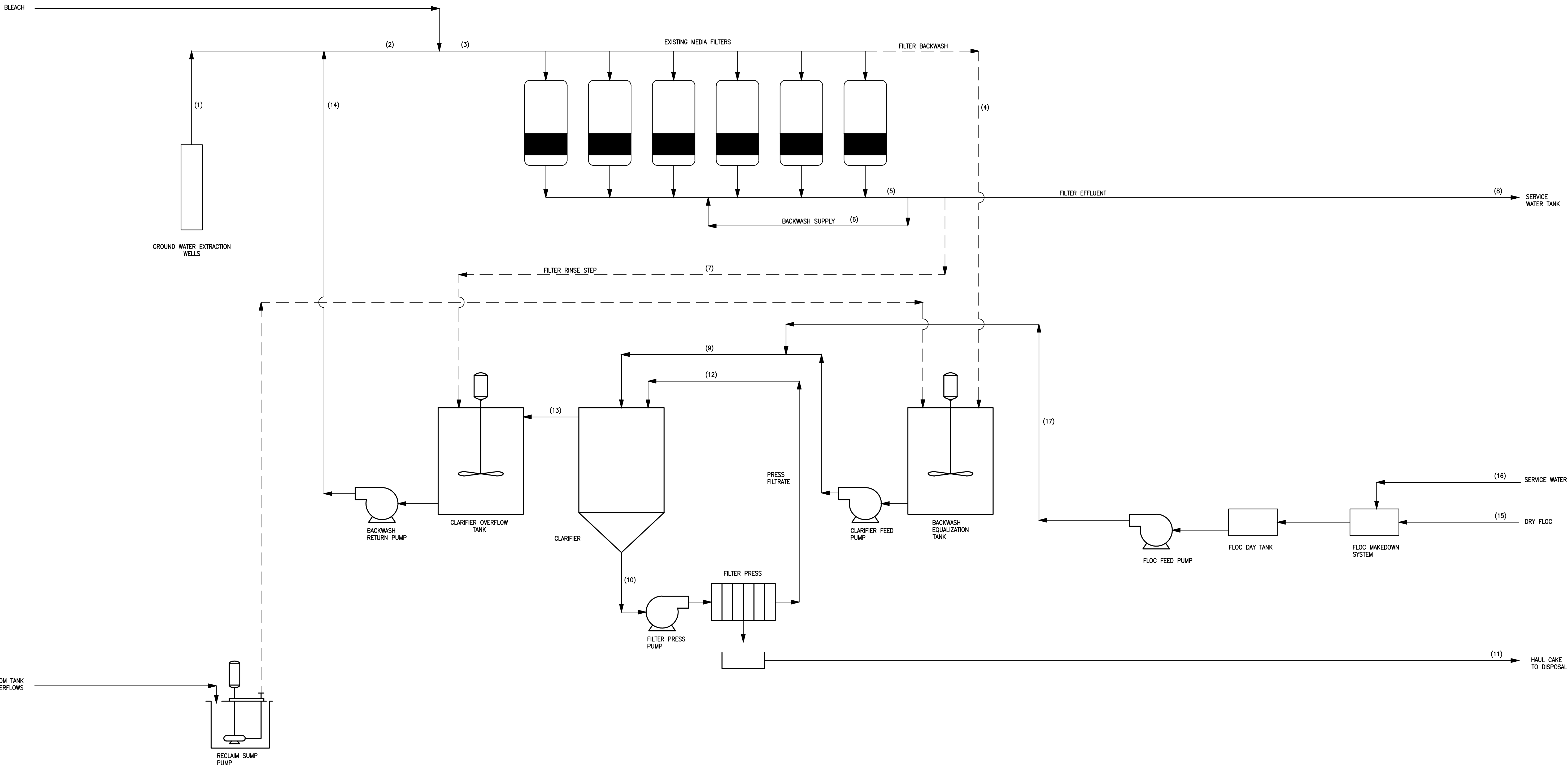
SAVED: 21-Oct-24 10:52 AM PLOTTED: 21-Oct-24 11:06 AM USER: MYERS, ZACHARY

Attachment IV: Process Flow Diagram

LEGEND

CONTINUOUS FLOWS

INTERMITTENT FLOWS



REV	DDMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP	APP	REV	DDMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP	REF	NUMBER	TITLE
B	30-AUG-24	ISSUED FOR CLIENT REVIEW								CG											
A	05-JAN-24	ISSUED FOR CLIENT REVIEW								VL	LT	TE									

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STAMP/SEAL		

APPROVED FOR _____		
D. CHRISTENSEN	T. GUDIPTY	T. ENGLUND
CLIENT PROJECT MGR	DEPARTMENT MGR	PROJECT MGR
PROJECT PHASE		
PROJECT NO.	US-EI-27559_1_15552	BY DES BK 05-JAN-24
SCALE	NTS	CHK DRN VL 05-JAN-24
		APP APP TE 05-JAN-24

DUKE ENERGY
CITRIS COMBINED
CYCLE STATION

IRON FILTER
BACKWASH
RECLAIM SYSTEM

DUKE ENERGY

PIPING
PROCESS FLOW DIAGRAM
BACKWASH RECLAIM SYSTEM

Environment & Infrastructure, Inc.
1075 BIG SHANTY ROAD, NW, SUITE 100
KENNESAW, GA 30144 / TEL: (770) 421-3400

AREA

CLIENT DWG NO.
CCC00-GA-P-IS.01.PL-00

DRAWING NO.
CCC00-GA-P-IS.01.PL-00

REV B

FOR REVIEW AND
APPROVAL
30-AUG-24

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Attachment V

Stormwater Report



DUKE ENERGY CITRUS COMBINED CYCLE STATION STORMWATER REPORT

CRYSTAL RIVER, FLORIDA

PROJECT NO.: US-EI-27559_1_1.5552

DATE: OCTOBER 18, 2024

WSP USA
1075 BIG SHANTY ROAD NW, SUITE 100
KENNESAW, GA 30144

T: +1 770-421-3400

F: +1 770-421-3486

wsp.com

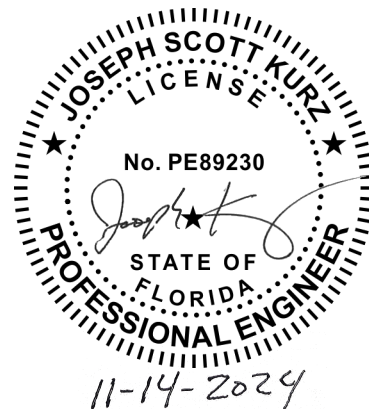




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4 DRAINAGE ANALYSIS.....	6

LIST OF APPENDICES

- A. SOIL SURVEY DATA
- B. NOAA PRECIPITATION DATA
- C. STORMWATER CALCULATIONS

REFERENCES:

- Citrus County Land Development Code, Chapter 6 Stormwater Management

1 PROJECT DESCRIPTION

The purpose of this narrative is to determine the development impacts due to construction of the Iron Filter Backwash and Reclaim System and verify the drainage system meets follows the local requirements referenced.

The project is located at the Crystal River Energy Complex, Citrus Combined Cycle Station for Duke Energy in Crystal River. The site development lies within Citrus County which is the governing locality. The project involves construction of a 50'x50' covered equipment concrete pad. The new impervious area will be less than 4,000 square feet and the disturbed area will be less than 0.1 acre. See **Figure 1**.

Site related activities will be performed with minimal disturbance as possible and with erosion and sediment control measures to protect downstream facilities. The site currently drains to the ditch system to the north and outfalls to an existing stormwater detention pond to the east. The existing drainage system has been designed to accommodate the current site.

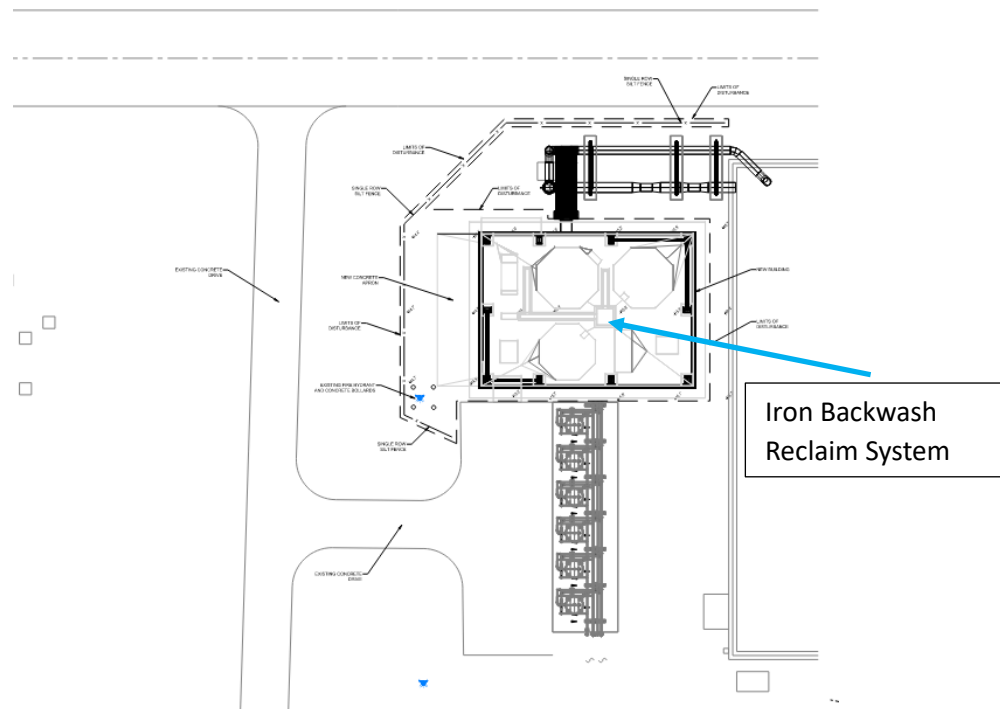


Figure 1 - SITE LAYOUT

2 SITE SUMMARY

Existing stormwater management systems exist on the site. The drainage pattern on site will remain the same after construction of the Iron Backwash Reclaim System. The drainage area impacted by the construction includes the east cooling tower that drains to the ditch system to the north and then to the existing detention pond. The area is approximately 0.06 acres of gravel that will be developed on a concrete equipment pad. See **Figure 2** below.

Because the drainage area within the site development is relatively small and other areas remain undisturbed, the limits of the analysis are focused only on this area. Runoff will be directed toward the grassed ditch before it reaches the detention pond. Silt fence protection around the perimeter of the new building and existing cooling tower piping foundations will provide temporary sediment control measures for the project

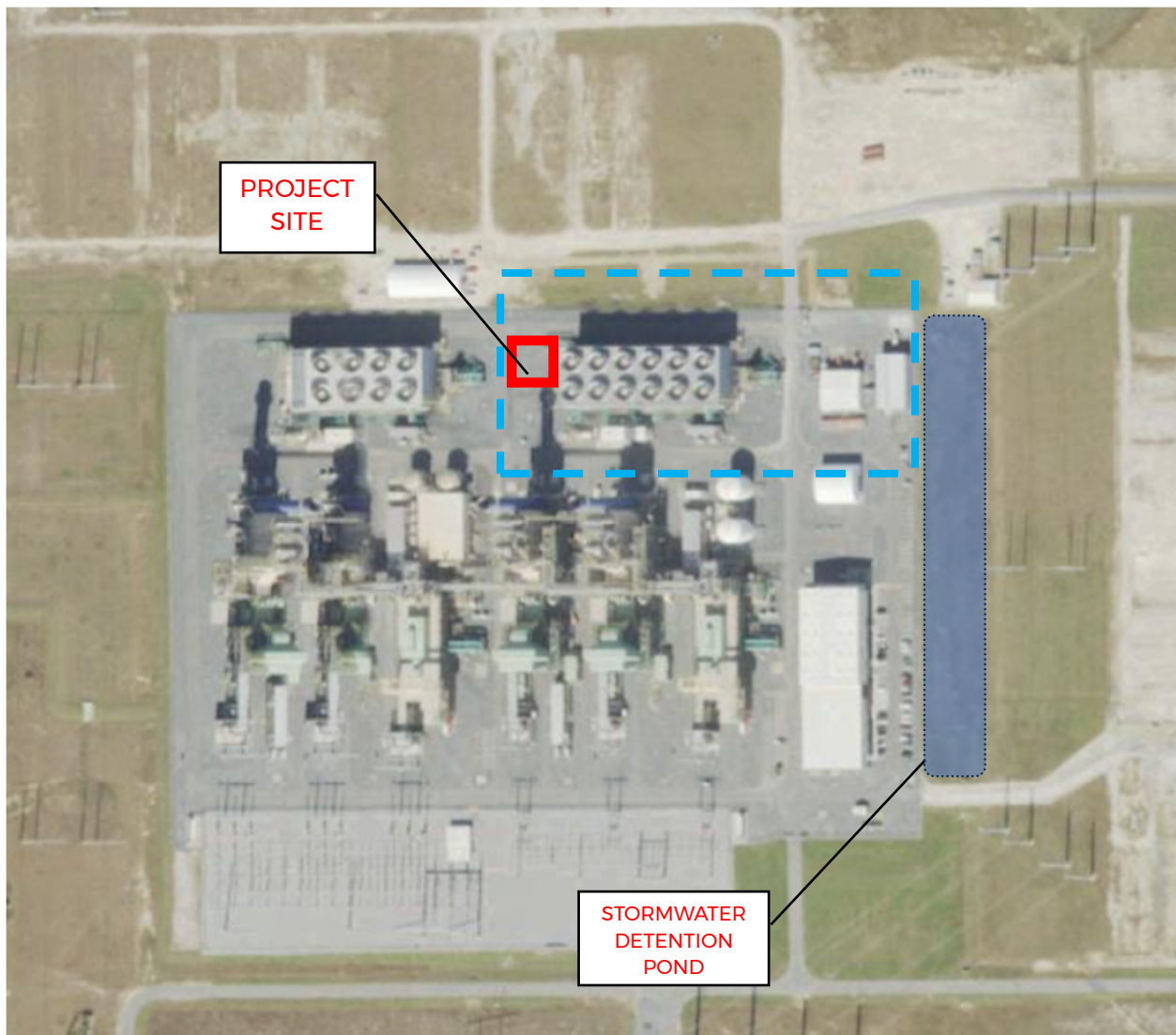


Figure 2 - Duke Energy, Citrus Combined Cycle Station

3 DESIGN PARAMETERS

Pre- and post development flows from the site were analyzed. The following parameters were used for the stormwater design.

- Peak runoff rates were estimated for the 1-yr, 2-yr, 10-yr, 25-yr and 100-yr storm for comparison
- Hydrographs were based on the NRCS Method SCS Unit Hydrograph, 24-hour storm duration
- The following rainfall depths were used:

Design Storm	Total Rainfall Depth (inches)
1-yr	4.0
2-yr	4.56
10-yr	7.39
25-yr	9.52
100-yr	13.5

- Curve numbers were used for runoff calculations:

Description	CN
Paved and Roof Areas	98
Gravel (Hydrologic Group D)	91

Method of Analysis

The peak flows for each event were calculated Win-TR55 for small watershed hydrology. This software utilizes the SCS runoff equation to determine peak runoff rates and tabular method for generation of runoff hydrographs. Delineation of drainage area was determined from existing GIS data. The time of concentration used a minimum of 5 minutes.

See **Appendices A & B** for soil survey and precipitation data.

4 DRAINAGE ANALYSIS

A summary of the pre- and post- development flows are listed below.

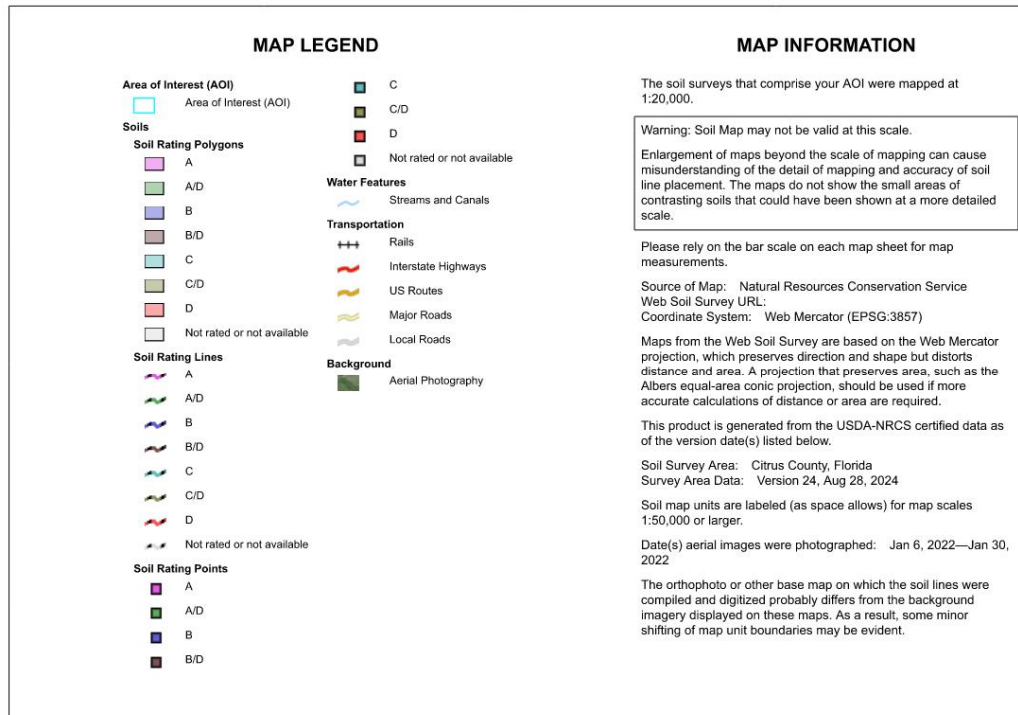
Design Storm	PRE (cfs)	POST (cfs)
1-yr	0.17	0.19
2-yr	0.20	0.22
10-yr	0.34	0.36
25-yr	0.45	0.46
100-yr	0.64	0.65

The design curve number increases from pre- to post development which results in a slight increase in flow however the flow is negligible, and stormwater flows will be contained during construction. See **Appendix C** for runoff calculations.

APPENDIX A



Hydrologic Soil Group—Citrus County, Florida
(Duke Energy CCC Plant - Citrus County, FL)





Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
51	Cypress Lake-Pineda, limestone substratum complex	C/D	21.8	7.9%
53	Cypress Lake fine sand, 0 to 2 percent slopes	C/D	245.8	88.8%
59	Cypress Lake fine sand, frequently ponded, 0 to 1 percent slopes	A/D	6.9	2.5%
60	Broward fine sand	A/D	2.3	0.8%
Totals for Area of Interest			276.9	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



APPENDIX B

10/18/24, 2:58 PM

Precipitation Frequency Data Server



NOAA Atlas 14, Volume 9, Version 2
Location name: Crystal River, Florida, USA*
Latitude: 28.9689°, Longitude: -82.6731°
Elevation: 14 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 & aeriels](#)

PF tabular

AMS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹									
Duration	Annual exceedance probability (1/years)								
	1/2	1/5	1/10	1/25	1/50	1/100	1/200	1/500	1/1000
5-min	0.586 (0.480-0.721)	0.721 (0.588-0.890)	0.822 (0.667-1.02)	0.955 (0.746-1.22)	1.06 (0.806-1.38)	1.15 (0.850-1.55)	1.25 (0.884-1.74)	1.38 (0.936-1.98)	1.48 (0.976-2.16)
10-min	0.858 (0.702-1.06)	1.06 (0.861-1.30)	1.20 (0.977-1.50)	1.40 (1.09-1.79)	1.54 (1.18-2.02)	1.69 (1.24-2.27)	1.83 (1.29-2.55)	2.02 (1.37-2.90)	2.16 (1.43-3.17)
15-min	1.05 (0.857-1.29)	1.29 (1.05-1.59)	1.47 (1.19-1.82)	1.71 (1.33-2.18)	1.88 (1.44-2.46)	2.06 (1.52-2.77)	2.24 (1.59-3.10)	2.46 (1.67-3.54)	2.64 (1.74-3.86)
30-min	1.57 (1.29-1.94)	1.93 (1.58-2.38)	2.20 (1.79-2.73)	2.56 (2.00-3.28)	2.83 (2.16-3.70)	3.11 (2.29-4.18)	3.38 (2.39-4.70)	3.74 (2.54-5.38)	4.02 (2.66-5.89)
60-min	2.04 (1.67-2.51)	2.50 (2.04-3.09)	2.86 (2.32-3.54)	3.33 (2.61-4.28)	3.70 (2.83-4.84)	4.07 (3.00-5.48)	4.44 (3.14-6.18)	4.94 (3.36-7.11)	5.33 (3.52-7.81)
2-hr	2.51 (2.06-3.06)	3.07 (2.52-3.77)	3.51 (2.86-4.33)	4.10 (3.23-5.24)	4.56 (3.51-5.94)	5.03 (3.73-6.73)	5.50 (3.92-7.62)	6.14 (4.20-8.78)	6.64 (4.42-9.67)
3-hr	2.75 (2.27-3.35)	3.39 (2.79-4.15)	3.90 (3.19-4.79)	4.61 (3.65-5.88)	5.16 (3.99-6.71)	5.74 (4.28-7.68)	6.33 (4.53-8.76)	7.15 (4.91-10.2)	7.80 (5.20-11.3)
6-hr	3.24 (2.69-3.92)	4.08 (3.38-4.96)	4.79 (3.94-5.85)	5.83 (4.67-7.47)	6.68 (5.21-8.69)	7.60 (5.72-10.2)	8.58 (6.19-11.8)	9.96 (6.91-14.2)	11.1 (7.45-16.0)
12-hr	3.87 (3.23-4.65)	5.01 (4.17-6.05)	6.04 (4.99-7.32)	7.60 (6.16-9.79)	8.94 (7.05-11.7)	10.4 (7.92-13.9)	12.0 (8.76-16.6)	14.4 (10.1-20.4)	16.3 (11.0-23.3)
24-hr	4.56 (3.83-5.45)	6.03 (5.04-7.22)	7.39 (6.14-8.90)	9.52 (7.80-12.3)	11.4 (9.05-14.8)	13.5 (10.3-18.0)	15.8 (11.6-21.7)	19.1 (13.5-27.1)	21.9 (14.9-31.2)
2-day	5.24 (4.42-6.22)	6.90 (5.80-8.21)	8.49 (7.09-10.2)	11.0 (9.10-14.2)	13.3 (10.6-17.2)	15.8 (12.2-21.0)	18.6 (13.8-25.5)	22.8 (16.2-32.1)	26.3 (18.0-37.1)
3-day	5.61 (4.74-6.63)	7.27 (6.13-8.62)	8.90 (7.46-10.6)	11.6 (9.60-14.8)	13.9 (11.2-18.0)	16.6 (12.9-22.1)	19.7 (14.6-26.9)	24.2 (17.2-34.0)	27.9 (19.2-39.3)
4-day	5.94 (5.04-7.00)	7.59 (6.42-8.98)	9.24 (7.77-11.0)	11.9 (9.96-15.3)	14.4 (11.6-18.6)	17.2 (13.4-22.7)	20.3 (15.1-27.7)	25.0 (17.9-35.0)	28.9 (19.9-40.6)
7-day	6.98 (5.94-8.18)	8.71 (7.40-10.2)	10.4 (8.80-12.3)	13.2 (11.0-16.8)	15.7 (12.7-20.1)	18.6 (14.5-24.4)	21.8 (16.3-29.5)	26.5 (19.1-37.0)	30.5 (21.2-42.6)
10-day	7.92 (6.77-9.25)	9.83 (8.37-11.5)	11.6 (9.85-13.7)	14.5 (12.1-18.2)	17.0 (13.8-21.5)	19.8 (15.5-25.8)	22.9 (17.2-30.8)	27.4 (19.8-38.0)	31.3 (21.8-43.5)
20-day	10.6 (9.08-12.3)	13.2 (11.3-15.3)	15.3 (13.0-17.9)	18.3 (15.1-22.4)	20.7 (16.7-25.7)	23.3 (18.2-29.7)	25.9 (19.4-34.2)	29.6 (21.4-40.4)	32.6 (22.8-45.0)
30-day	12.9 (11.1-14.9)	16.1 (13.9-18.7)	18.6 (15.9-21.7)	21.8 (18.0-26.2)	24.2 (19.6-29.7)	26.6 (20.8-33.6)	29.1 (21.8-37.9)	32.2 (23.3-43.5)	34.6 (24.4-47.7)
45-day	16.1 (13.9-18.5)	20.1 (17.3-23.2)	23.0 (19.7-26.6)	26.6 (21.9-31.6)	29.1 (23.5-35.4)	31.6 (24.7-39.5)	33.9 (25.4-43.9)	36.8 (26.6-49.2)	38.8 (27.4-53.3)
60-day	19.0 (16.5-21.8)	23.6 (20.4-27.2)	26.8 (23.1-31.0)	30.8 (25.4-36.5)	33.6 (27.2-40.7)	36.3 (28.4-45.1)	38.7 (29.1-49.8)	41.6 (30.1-55.4)	43.6 (30.9-59.7)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of annual maxima series (AMS). 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 annual exceedance probability) 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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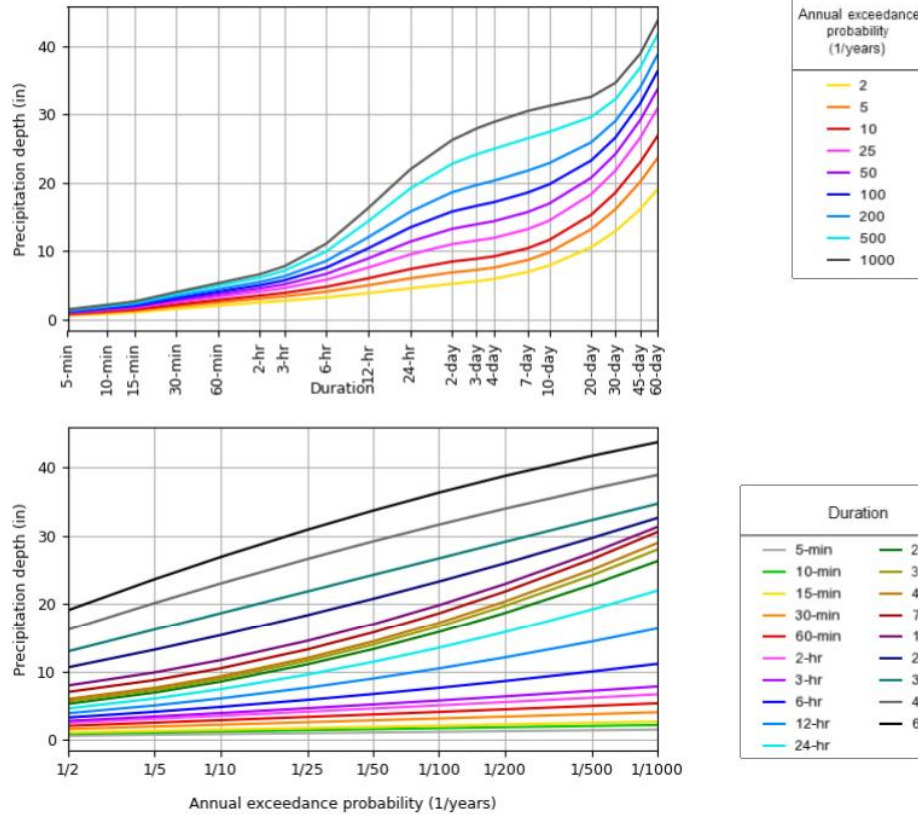
PF graphical



10/18/24, 2:58 PM

Precipitation Frequency Data Server

AMS-based depth-duration-frequency (DDF) curves
Latitude: 28.9689°, Longitude: -82.6731°

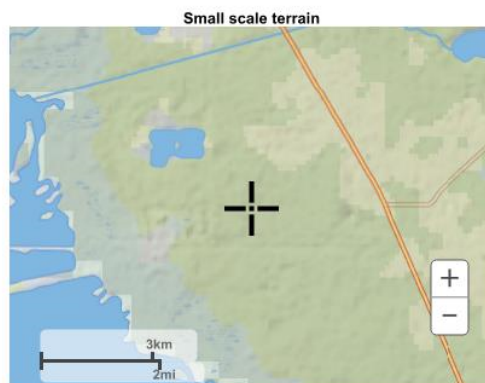


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Maps & aerals

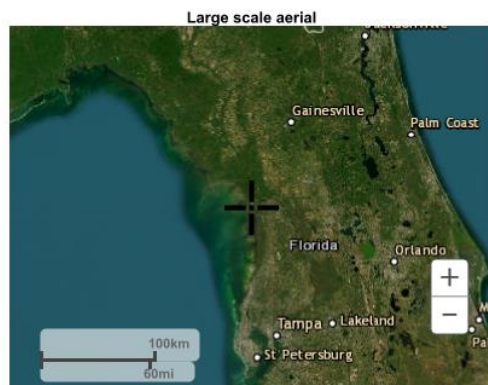


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Precipitation Frequency Data Server



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 1325 East West Highway
 Silver Spring, MD 20910
 Questions?: HDSC.Questions@noaa.gov

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APPENDIX C

WinTR-55 Current Data Description

--- Identification Data ---

User: cyl Date: 10/17/2024
Project: Duke Energy CCC Plant Units: English
SubTitle: Areal Units: Acres
State: Florida
County: Citrus
Filename: C:\Users\USCY720261\OneDrive - WSP 0365\Desktop\PROJECTS\DUKE\Duke Energy Citrus DE\Conc Pad.w55

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
PRE		Outlet	0.06	91	0.100
POST		Outlet	0.06	98	0.100

Total area: .12 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
4.56	6.03	7.39	9.52	11.4	13.5	4.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type III
Dimensionless Unit Hydrograph: <standard>



cyi

Duke Energy CCC Plant

Citrus County, Florida

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period				
	2-Yr (cfs) (hr)	10-Yr (cfs) (hr)	25-Yr (cfs) (hr)	100-Yr (cfs) (hr)	1-Yr (cfs) (hr)

SUBAREAS					
PRE	0.20 12.11	0.34 12.11	0.45 12.11	0.64 12.11	0.17 12.11
POST	0.22 12.11	0.36 12.10	0.46 12.11	0.65 12.11	0.19 12.10
REACHES					
OUTLET	0.42	0.70	0.91	1.30	0.36