

December 16, 2024

Submitted via Electronic Mail

Mr. Nate
Siting Coordination Office
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 5500
Tallahassee, FL 32399-2400

Subject: Duke Energy Florida, LLC
Crystal River Energy Complex and Citrus Combined Cycle Station
Conditions of Certification PA77-09U
Submittal of Petition for Modification

Dear Mrs. Mulkey:

Pursuant to Section B, Condition I.B.1.b of the above-referenced Conditions of Certification (COC), Duke Energy Florida (DEF) is petitioning for a modification of certification for a sodium water quality exemption. Enclosed is a copy of the Petition for Water Quality Criteria Exemption for Sodium. A wire transfer in the amount of \$10,000 for the modification application fee will be submitted to the Department upon receipt of this modification request and following instructions previously provided by the Department.

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

Sincerely,

David McAgy Digitally signed by David McAgy
Date: 2024.12.13 13:38:54 -05'00'

David McAgy
Station Manager
Crystal River North Plant & Fuel Operations

DM/ib

Enclosure

PETITION FOR A SODIUM WATER QUALITY CRITERIA EXEMPTION

Crystal River Energy Complex, Crystal River, Florida

Prepared for

Duke Energy Florida, Inc.
299 1st Avenue North
St. Petersburg, Florida 33701

Prepared by

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Project Number: FR10348
December 2024

PROFESSIONAL CERTIFICATION

**PROFESSIONAL GEOLOGIST LICENSED IN THE STATE OF FLORIDA
PETITION FOR A SODIUM WATER QUALITY CRITERIA EXEMPTION**

December 2024

Duke Energy Florida, Inc.
Crystal River Energy Complex
15760 West Powerline Street
Crystal River, Florida 34428



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12/9/2024

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1. INTRODUCTION

1.1 Terms of Reference

Groundwater monitoring is currently being conducted at the Duke Energy of Florida, Inc. (Duke) Crystal River Energy Complex (herein referred to as “CREC” or “site”) in accordance with the requirements described in Attachment H of the site’s Conditions of Certification (COC), PA77-09S. Groundwater monitoring requirements for the site were previously specified in the Florida Department of Environmental Protection (Department or FDEP) industrial wastewater permit (FLA016960) and were subsequently incorporated into the CREC’s COC in August 2012.

A sodium exemption was previously renewed by FDEP on July 14, 2020 and incorporated into the CREC’s Conditions of Certification (COC), DEP Case Number PA77-09U under Section B.IV.B. The COC currently requires the submittal of a new petition for a water quality criteria exemption every five years from the time of the original approval. The previous sodium exemption granted alternative compliance levels of sodium based well locations that are included in Attachment H of the COC. An alternative compliance level of 10,000 milligrams per liter (mg/L) for monitoring wells MWC-1R, MWC-16, MWC-27, MWC-28, MWC-29, and MWC-IF2, and 300 mg/L for compliance monitoring wells MWC-12E, MWC-21R, MWC-32 and MWC-33.

Geosyntec Consultants, Inc. (Geosyntec) was retained by Duke to conduct a sodium evaluation and prepared this petition for a water quality criteria exemption for this constituent in accordance with the requirements of Section B.IV.B of the COC.

1.2 Objectives

The objective of this document is to evaluate the presence of sodium in the surface water and groundwater at and around the CREC and to affirmatively demonstrate compliance with the requirements stated in Chapter 62-520.500 F.A.C. in support of a water quality criteria exemption for sodium.

2. SITE LOCATION AND HISTORY

2.1 Site Location

The CREC is located at 15760 West Powerline Street on the eastern shore of the Gulf of Mexico in Crystal River, Citrus County, Florida (**Figure 1**). The property is in Sections 28 through 36, Township 18, Range 16 with the center of the facility at approximately 28°28'2" north latitude and 82°41'49" west longitude. The property encompasses approximately 4,750 acres. Approximately 650 acres of the CREC have been developed with the remaining property consisting of saltwater marsh and coastal lowland areas.

2.2 Site Operational History

The CREC property was initially purchased by the Florida Power Corporation in 1964. Construction at Unit 1 began during 1964 with coal-fired commercial operations beginning in 1966. Construction of the intake and discharge canals that extend inland from the Gulf of Mexico was initiated in 1965 and completed in 1966. Unit 2 was placed into commercial coal-fired operations in 1969. During the early 1970s, Units 1 and 2 were converted from coal-fired steam to oil-fired operations. In 1976 and 1979, Units 1 and 2 reverted back to coal operation. The construction permit for the nuclear unit (Unit 3) was issued by the Atomic Energy Commission in 1968, construction commenced in 1969, and commercial operations were initiated in 1977. Units 4 and 5 were permitted in 1978 and began commercial coal-fired operation in 1982 and 1984, respectively. Construction of the concrete lined cooling tower make-up and blow-down canals, extending from the existing discharge canal towards Units 4 and 5, began in 1981 and was completed in 1982. In 2000, Carolina Power and Light merged with Florida Power Corporation to become Progress Energy, Inc. Duke Energy acquired the site from Progress Energy following the 2 July 2012 merger.

The CREC currently consists of two active coal-fired steam units (Units 4 and 5) on the northern portion of the site. Units 1 and 2 are retired coal-fired steam units located on the southern portion of the plant site, and Unit 3 is a retired nuclear power plant located just east of Units 1 and 2. Units 1 and 2 were removed from service in December 2018, coal combustion products (CCPs) are no longer generated, and both units are now decommissioned. Demolition of Unit 3 has begun and will continue until the process has been accomplished according to Duke's plan.

3. PRODUCT DESCRIPTIONS AND STORAGE

The following subsections identify the primary products used at the CREC, how these products are managed and stored, and available analytical data for sodium from product management areas.

3.1 Product Descriptions

CCPs and non-CCPs generated at Units 4 and 5 and the process by which these materials are managed in accordance to Duke's Coal Combustion Product/Solid Waste Materials Management Plan (CCP Plan) are described below.

3.1.1 Coal Combustion Products (CCPs)

The process by which coal combustion products are generated at Units 4 and 5 are described below.

- **Fly Ash** - Fly ash is an industrial byproduct of the coal combustion process that is captured from furnace flue gas and collected by electrostatic precipitators (ESPs);
- **Bottom Ash (Units 4 and 5)** - Units 4 and 5 bottom ash typically ranges from very fine to gravel sized ash and is brownish gray in color; and
- **Flue Gas Desulfurization Products** - flue gas desulfurization (FGD) units were constructed for Units 4 and 5 in 2009 and produce gypsum (calcium sulfate) and FGD blowdown filter cake.

3.1.2 Non-Coal Combustion Products

Non-coal combustion products are described below.

- **Cooling Tower Solids** - Units 4 and 5 employ natural hyperbolic cooling towers for water cooling, which generates solid materials (biological growth, shell material, etc.); and
- **Dredge Materials** - As part of ongoing maintenance to ensure proper function of the plant's water bodies, excavation or dredging of deposited solids is necessary in the intake/discharge canals, ditches, and industrial wastewater (IWW) ponds.

3.2 Product Management Unit Operational Descriptions

The following subsections describe the product management units at the facility (CCP Plan). **Table 1** provides a summary of coal combustion and/or non-coal combustion products, accumulation rates (as applicable), and end use. Primary current and former product management areas are depicted in **Figure 2**. The primary storm water conveyance features and sample points for water that comes in contact with site products is shown on **Figure 3**.

3.2.1 Ash Storage/Disposal Area

The ash storage/disposal area (AS/DA) is located in the northeast corner of the CREC and includes separate storage piles for fly ash and bottom ash. The AS/DA is not lined. Solid wastes that have been placed in the AS/DA area following receipt of Department approval include, but are not limited to, the following.

- Non-hazardous sand blast grit;
- Sediment/sludge from on-site domestic wastewater infiltration basin;
- Sediment/sludge from on-site industrial wastewater infiltration basin;
- Intake screenings and sediment from cooling towers;
- Non-petroleum contaminated soil;
- Percolation pond dredge material;
- Cooling tower solids;
- Mill scale; and
- FGD blowdown pond solids.

The primary units within the AS/DA include the following units.

3.2.1.1 Fly Ash Storage within the AS/DA

In general, the site's fly ash is transported from generation areas to storage areas where it is spread and compacted. Conditioned fly ash (moisture content approximately 20 percent) is transported to the AS/DA and deposited in the active disposal area and made available for reclamation. Fly ash is compacted and graded to control runoff and infiltration. Fly ash can be reclaimed from the AS/DA for off-site beneficial use.

3.2.1.2 Bottom Ash Storage in the AS/DA

Bottom ash that is not marketable is transported, spread, and compacted. The bottom ash with a moisture content of approximately 20% from Units 4 and 5 bottom ash silos is transported in trucks and deposited in the active disposal area for reclamation. The active disposal area is graded to direct storm water runoff into the ash storage area perimeter ponds and associated ditches. Bottom ash can be reclaimed from the pile for off-site beneficial use.

3.2.1.3 Gypsum Storage in the AS/DA

Both marketable and unmarketable gypsum may be stored or disposed in the AS/DA; however, practically all of gypsum produced at CREC is transported via conveyor directly to the adjacent gypsum facility (Holcim) or to the gypsum storage pad. Gypsum can be reclaimed from the AS/DA for off-site beneficial use.

3.2.2 Ash Storage Silos

Ash storage silos are used for fly ash and bottom ash for Units 4 and 5 prior to transport to the AS/DA or off-site beneficial use. Units 4 and 5 fly ash is pneumatically conveyed to respective storage silos prior to transportation to the ash storage area or off-site beneficial use. Units 4 and 5 fly ash is either loaded into pressure-differential trucks from the storage silo or it is conditioned to a moisture content of approximately 20% prior to being loaded into open trucks for transport.

In 2012, CREC completed a construction project that created a drainage sump/collection structure for ash-laden water draining away from Unit 4 and 5 ash silo areas. The structure was designed to allow re-use of the water in the system while ash material settles. The settled ash is periodically moved out of the catch basin into the adjacent drying slab. The drying slab is sloped to allow drainage of residual water back into the settling basin. When this material is dry enough to transport, the fly ash is loaded into dump trucks and transported to the on-site AS/DA. The bottom ash from Units 4 and 5 is conveyed with water to four storage silos (aka “dewatering bins”) prior to loading into trucks for transport to the ash storage area or off-site beneficial use. Water used to convey bottom ash is contained in a closed loop system and so, except for about 20% moisture content of the bottom ash, there is no water disposal.

3.2.3 Gypsum Handling Areas

The Units 4 and 5 FGD System gypsum handling management areas include the gypsum dewatering facility and the gypsum storage areas (**Figure 2**). The gypsum slurry from the Units 4 and 5 FGD System is dewatered in vacuum filter beds. The gypsum is dewatered and washed by the FGD vacuum filters to produce a gypsum cake (approximately 90% solids content by weight). The gypsum cake is then conveyed from the dewatering facility to the adjacent gypsum marketer or temporary storage area via conveyor. Filtrate from the vacuum filter beds is pumped to FGD filtrate tanks then from there it is routed back into the process as scrubber make-up water and to aid in limestone processing.

The temporary gypsum storage area consists of a dual-truck load out tower and a lined concrete storage pad. The gypsum cake produced by the dewatering facility that is not conveyed directly to the adjacent gypsum marketer is transported either to the truck load out tower or the storage pad via the conveyor. The temporary gypsum storage area is sized to temporarily store 32,000 tons of gypsum. Off specification gypsum is stored in a separate pile on the lined storage pad. Gypsum is transported from the temporary storage area for off-site beneficial use or to the AS/DA for additional storage prior to beneficial use or onsite/off-site disposal.

Gypsum is stored on its temporary storage pad and in the AS/DA. Both marketable and unmarketable gypsum are transported to the AS/DA where it is stored pending beneficial use or disposal.

3.2.4 Former Flue Gas Desulfurization Pond System

The former FGD Blowdown Pond System (**Figure 3**) consisted of two lined ponds, the Primary Pond and Backup Pond, that received FGD blowdown wastewater from the Units 4 and 5 FGD units. The ponds were designed to manage wastewater from the FGD process and allow for the settling of suspended solids. The FGD Blowdown Pond System was taken out of service in February 2019 when the wastewater treatment system began operations. Pond solids from the Primary Pond and Backup Pond were excavated and transported to the AS/DA for disposal and certified closed in December 2019.

3.2.5 Coal Yard Units 4 & 5 Stacker System

The Units 4 and 5 coal storage area or coal stacker system is located to south of the gypsum handling areas (**Figure 2**). As part of upgrades to this area in 2010, a geomembrane liner was installed beneath the coal yard to contain storm water runoff and soils in the area were removed and staged during liner installation. Once the liner was installed, the native soils were placed on top of the completed liner.

Runoff from the coal stacker system is currently treated (pH adjustment and polymer addition) in the lined coal storage and limestone storage treatment ponds and then pumped to the Units 4 and 5 northern percolation ponds. Following the installation of the lined collection system, runoff from the coal pile and stacker system is collected and sent to treatment ponds where the pH is adjusted. The treated water is discharged into the coal storage area runoff collection ditch adjacent to the coal pile (**Figure 3**).

3.3 Water Conveyance Systems

3.3.1 North Percolation Pond (Units 4 and 5 Percolation Pond)

The north percolation pond is located south of Unit 4 and 5 cooling towers (**Figure 3**). The sources of wastewater to this pond include Units 4 and 5 low volume wastes (demineralizer regeneration, cooling tower basin cleaning wastes, floor drainage, sample drains and similar wastes), metal cleaning wastes (including preheater and fireside wash), boiler blowdown and overflow or maintenance flows from the bottom ash dewatering system. Adjacent to the north percolation pond is a smaller pond that receives treated effluent from the sewage treatment plant.

3.3.2 South Wastewater Percolation Ponds (Former South Ash Pond)

The south wastewater percolation ponds are located between the main intake and discharge canals (**Figure 3**). The area was formerly used as the south ash pond in the mid-1990s and previously accepted slurried fly and bottom ash from Units 1 and 2. The south ash pond was replaced by the current south wastewater percolation ponds in the mid 1990s. The percolation pond network consisted of three ponds (Pond 1, Pond 2, and Pond 3) and an overflow area called the “South Pond Expansion”. However, Ponds 1 and 2 no longer

receive wastewater and only Pond 3 remains active with the South Pond Expansion. Pond 3 receives treated FGD blowdown wastewater from the FGD wastewater treatment plant.

3.3.3 Ash Storage Area Runoff Management

Storm water runoff management for the product management areas in the fly ash storage areas consists of procedures for sloping product as material is transferred and compacted, and the use of a storm water retention and conveyance system (ash storage area runoff ditch). The ash storage area runoff ditch drains runoff from the fly ash storage pile, Units 4 and 5 bottom ash storage pile, commingled material storage pile, and gypsum handling areas. The ditch was designed and constructed to contain a 10 year, 24-hour rainfall event (approximately 8.34 inches) where it is removed by evaporation and percolation (KBN, 1987). The NPDES permit authorizes discharge of combined runoff collection systems (Outfalls I-CHO and I-C40) and runoff collection system overflow (Outfall-I0CO) to the site discharge canal.

3.3.4 Units 4 and 5 Intake and Discharge Canals

The cooling tower makeup and blowdown intake and discharge canals for Units 4 and 5 were constructed in 1980. The Units 4 and 5 canals are connected to the main discharge canal just south the former FGD blowdown ponds (**Figure 3**). The makeup and blowdown canals were installed up to 3 feet below original land surface and range from 20 to 25 feet wide. Both canals are concrete lined, reinforced with a 6-inch welded wire fabric, and constructed with $\frac{3}{4}$ -inch sealed expansion joints in order to reduce leakage from the canals into the subsurface (Black and Veatch, 1979). Water from the intake canal is chlorinated and used as non-contact cooling water in the natural draft hyperbolic cooling towers. Reused blowdown and augmentation water from the Citrus Combined Cycle Plant as well as water collected from the intake structure located in the discharge canal are used as makeup water for Units 4 and 5. The cooling tower blowdown is dechlorinated and returned to the blowdown canal and routed to the main discharge canal extending into the Gulf of Mexico.

3.3.5 Units 4 and 5 Runoff Collection System

The Units 4 and 5 runoff collection system is located to the north and west of Units 4 and 5 and collects stormwater runoff from the main plant area and infrequent runoff from internal outfalls I-CHO and I-C40 (**Figure 3**). The runoff collection system is designed to contain the 10 year, 24-hour storm event. If overflow from the runoff collection system occurs, the overflow will discharge into the Units 4 and 5 cooling tower blowdown canal via an overflow weir denoted as I-0CO as detailed in the NPDES Permit FL0036366 (FDEP, 2023).

3.4 Monitoring and Other Activities

Sodium data has been collected to characterize the soil, ash products, surface water, and groundwater at the CREC. The following subsections provide a summary of recent activities performed to characterize the surface water and groundwater in the product management area.

3.4.1 Plant IWW Routine Monitoring

Duke currently operates several percolation ponds located on the western portion of the site (**Figure 3**). The percolation ponds consist of the north percolation pond and the south percolation pond system. Pond 3 of the south percolation pond system receives wastewater as described in Section 3.3.2.

To satisfy conditions of the COC, IWW effluent is sampled quarterly for total sodium and other parameters listed in Appendix H of the COC. Effluent samples are collected from the northern percolation pond (EFF-4), which receives wastewater from various site operations (described in Section 3.3.1), and from the FGD treatment system, which discharges into percolation pond 3 of the south percolation pond system (EFF-2). Sampling locations are shown in **Figure 3**. The reported sodium concentrations from 2007 to 2024 are presented in **Table 2**.

3.4.2 Groundwater Monitoring

Groundwater quality at the CREC is currently monitored via 14 permanent wells and five temporary wells according to Attachment H of the COC. Monitoring well MWC-1 and temporary well TWI-3 were abandoned in 2021 and replaced with MWC-1R and TWI-3, respectively. Monitoring well MWC-31 was removed from the Groundwater Monitoring Plan (GWMP) with a COC amendment issued on September 21, 2023 and is no longer part of the CREC monitoring network. Given that MWC-31 was part of the GWMP since the last sodium exemption renewal in 2020 until 2023, data for this well are presented in this report for reference. **Table 3** lists monitoring wells, monitoring location description, and well construction details. Monitoring well locations are shown on **Figure 4**.

3.4.3 Maintenance Dredging

Dredging is performed on an as-needed basis to ensure proper function of the intake canal, percolation ponds, and settling ponds. The intake canal is dredged approximately every five years. The South IWW Percolation Pond is excavated/dredged approximately every four years and the North IWW Percolation Pond is excavated/dredged approximately every eight years. Dredged material from the canals and percolation ponds are typically transported off-site for disposal or stored on-site at the AS/DA. Material from the storm water ponds are either excavated/dredged for on-site reuse or transported for off-site beneficial reuse. Intake canal dredge spoils and cooling tower basin solids have historically been disposed in the AS/DA or off-site.

4. GEOLOGY, HYDROGEOLOGY AND WATER QUALITY

Several reports detailing the geology, hydrogeology, and water quality at the CREC facility have been previously generated. The discussion provided herein was developed based on information provided in the following reports.

- Baseline Hydrology Study for Crystal River Units 4 and 5 Ash Landfill (Environmental Science and Engineering, Inc. [ESE], 1981);
- Proposed Ground Water Monitoring Plan for Crystal River Power Plant (ESE, 1984);
- Groundwater Monitoring Plan (Dames and Moore, 1995);
- Groundwater Monitoring Plan and Monitor Well Completion Report (Golder, 2008);
- Arsenic and Radionuclide Plan of Study (Geosyntec 2011); and
- Arsenic and Radionuclide Plan of Study Addendum (Geosyntec 2013).

A summary of the regional and CREC geology, hydrogeology, and water quality are provided in the following subsections.

4.1 Regional Setting

4.1.1 Geology and Hydrogeology

The CREC lies within the Coastal Swamps physiographic region and near the boundary of the Gulf Coastal Lowland physiographic region (Knochenmus and Yobi, 2001). The general hydrogeologic units that form the hydrogeologic framework in the region include the discontinuous, siliciclastic Surficial Aquifer System (SAS) and the limestone and dolostone of the Upper Floridan Aquifer System (UFAS).

Sediments within the SAS are characterized as undifferentiated surficial deposits (USDs) and are comprised of a discontinuous veneer of sands, clayey sands, and shell. Thicknesses vary considerably due to the irregular surface of the underlying limestone (Spencer, 1984). A component of the USDs is comprised of residual and reworked Hawthorn formation derived from the fluctuation of sea level (Faulkner, 1973).

Regionally, the UFAS is comprised of (in descending order) the Suwannee Limestone, the Ocala Group Limestone (including the Crystal River, Williston, and Inglis Formations), and the Avon Park Limestone (Spencer, 1984). A generalized regional geologic section is provided as **Figure 5**.

Groundwater in the area occurs in the unconsolidated SAS and porous limestone of the UFAS. The UFAS at the CREC is unconfined due to the absence of well developed, low permeability sediments between the SAS and UFAS (Spencer, 1984). **Appendix A** provides a regional potentiometric surface map for the Floridan Aquifer that demonstrates

that the predominant regional groundwater flow is generally from northeast to southwest toward the Gulf of Mexico with variability attributable to topography and lithology.

4.1.2 Regional Groundwater Quality

Historic withdrawal of groundwater within the UFAS has resulted in saltwater intrusion along much of Florida's Gulf Coast (Guvanasen, 2000). Prior data from two USGS wells located at the site indicates that the upper transmissive zone of the Inglis Formation has a higher concentration of chlorides (200 to 1,800 milligrams per liter [mg/L]) than the lower transmissive zone (approximately less than 20 mg/L) (ESE, 1984) providing some evidence of saltwater encroachment at the CREC. Data from USGS Ocala/Avon Park monitoring wells located in Citrus, Hillsborough, and Manatee counties shows that over the past ten years, approximately 25% of these monitoring wells show a significant increase in chloride concentration (SWFWMD, 2005), with at least 5 of these wells within a 10-mile radius of the site. The USGS summarized that saltwater intrusion was the main contributor.

4.2 Site Geology and Hydrogeology

The geologic and hydrogeologic units, in order of increasing depth below land surface, at the CREC are summarized below.

- *Undifferentiated Surficial Deposits (USDs)* - The USDs are comprised of a brown sandy clay with muck and occasional fill ranging in thickness from 0 up to 20 ft below land surface (BLS) (ESE, 1981 and Florida Testing Laboratories, 1972). The thickness of the USDs is variable due to the irregular surface of the underlying limestone. Due to the limited extent of the USDs, the SAS is only locally present at the CREC where saturated unconsolidated sediments are present.
- *Inglis Formation of the Ocala Group* - Encountered between land surface and 20 ft. BLS, this white, fossiliferous, and friable limestone is the uppermost hydrogeologic unit of the UFAS. The Inglis Formation is cavernous with solution channels and cavities. Permeable zones within the Inglis Formation are present at depths of less than 30 ft. BLS and between 40 and 60 ft BLS (the base of the Inglis Formation). The upper permeable zone was identified as the more transmissive zone at the site (ESE, 1984).
- *Avon Park Formation* - Encountered between 45 and 70 ft BLS, the Avon Park Formation is comprised of an occasionally dolomitized limestone and well indurated limestone (ESE, 1981 and Spencer, 1984). The Avon Park Formation was noted by an abrupt increase in hardness and numerous small voids (ESE, 1981). The Avon Park Formation is the formation utilized for water supply for CREC operations.

The UFAS and the SAS (where present) have similar flow patterns with groundwater predominantly flowing from northeast to southwest at the CREC which is consistent with regional groundwater flow. As detailed in 2013 Annual Groundwater Contour Plan

(Geosyntec 2013), the direction and magnitude of groundwater flow are dictated spatially and temporally by the complex subsurface character of the UFAS caused by solution cavities, tidal fluctuations, and surface water features (e.g., intake and discharge canals and storm water ponds) (ESE, 1981 and ESE, 1984). A representative set of site wide groundwater contours from 2015 (low and high tide) are shown on **Figures 6a** and **6b**, respectively. Water level data from 1999 to 2024 are provided in **Appendix B**.

Historically, the predominant groundwater flow direction at the site is from the northeast to southwest across the north-eastern portion of the site with local variability resulting from tidal cycles, surface water features, and karst geology (ESE, 1981). On the western side of the site, groundwater flow is dictated by the intake and discharge canals.

Most wells exhibit water level elevation variability that is likely associated with tidal influence from nearby surface water bodies (ditches or canals). Water levels for the three monitoring wells located at the most inland point of the CREC (MWC-21R, MWI-2R2, and MWI-7R), generally track together. The well closest to the discharge canal (MWC-16) has the largest variability in water level elevations reported during the period of record.

Hydraulic conductivity of SAS and UFAS formation materials have been documented in previous monitoring plans as follows (ESE, 1984):

Management Area	Hydraulic Testing Methodology	Results
Former South Ash Pond Area	Constant Head Permeability	4×10^{-5} to 6×10^{-5} cm/sec
Northeastern Storage Area	Slug Test	5×10^{-3} to >50 cm/sec
Power Generation Area (Unit 2 Foundation)	Lab Permeability Test	Horizontal: 1×10^{-3} to 7×10^{-3} cm/sec Vertical: 1×10^{-3} to 3×10^{-2} cm/sec

4.3 Site Groundwater Quality

Previous investigations and reports (identified at the beginning of Section 5.0) have indicated impacts from saltwater intrusion at the site. The western portion of the site is subject to frequent and prolonged flooding, which affects sodium levels in groundwater (ESE, 1984). Groundwater quality on the western portion of the CREC is also tidally influenced, with observed sodium concentrations fluctuating during high and low tide events. The construction of the intake and discharge canals have also allowed saltwater to intrude further inland compared to existing site conditions (ESE, 1984). Sodium trends and suspected associations are discussed in the following subsections.

4.3.1 Sodium Distribution

A summary of sodium concentrations in groundwater from 1999 to 2024 is provided in **Table 4** for current site monitoring wells. Sodium levels exceeding the EPA Primary

Drinking Water Standard (PDWS) of 160 milligrams per liter (mg/L) were consistently observed in wells MWC-1, MWC-16, MWC-27, MWC-28, MWC-29, MWC-31, and MWC-IF2 and sporadically in wells MWI-2R2, MWC-32, MWC-33. In accordance with 62-520-500(1) F.A.C., Duke proposed an alternative compliance level for sodium of 10,000 mg/L for wells MWC-1, MWC-16, MWC-27, MWC-28, MWC-29, MWC-31 and MWC-IF2 (west side of site) and of 300 mg/L for all other wells (east side of site) in its petition for a sodium water quality criteria exemption renewal of 2020. These alternative compliance levels were approved by FDEP on July 14, 2020.

Since 2020, sodium concentrations in MWC-1 (now MWC-1R), MWC-16, MWC-27, MWC-28, MWC-29, MWC-31, and MWC-IF2, located in the western portion of the site, were below the alternative compliance level of 10,000 mg/L (**Table 4**). It is important to note that monitoring well MWC-31 was removed from the GWMP on September 21, 2023 and is no longer part of the CREC monitoring network. All these wells are located on the western portion of the CREC in proximity to the intake and discharge canals and elevated sodium concentrations in these wells are generated by saltwater intrusion via the canals. Due to the karst geology documented at the CREC, groundwater at these locations is typically hydraulically connected to the intake and discharge canals and the adjacent saltwater marsh (the western boundary of the CREC). Groundwater quality at these locations is also susceptible to inundation of saltwater during high tides and storm events. Sodium concentrations have historically remained stable in all wells and indicate no sodium loading to groundwater from CREC operations over time. The only exceptions are MWC-27 and MWC-29, which are discussed in greater detail below.

MWC-27 experienced an increase in sodium levels starting in 2017 but has remained stable since 2020. The increase in sodium concentrations observed coincides with a 70% reduction in the industrial wastewater discharge to the pond system that occurred in 2018 (discharge data was included in Attachment 3 of the response to comments from FDEP for the previous sodium exemption renewal in 2020) as a result of the permanent shutdown of Units 1 and 2 at the CREC. A decrease in the volume of wastewater (with lower sodium) being discharged to the south wastewater percolation ponds has likely facilitated saltwater intrusion near MWC-27. The evidence for this phenomenon is clear: the current sodium concentration (5,300 mg/L) reported in MWC-27 is consistent with that in MWC-16 (5,500 mg/L), which is also located adjacent to the seawater discharge canal.

MWC-29 experienced an increase in sodium levels starting in early 2024 but has remained stable for the past two sampling events. Water quality at MWC-29 is likely influenced by freshwater infiltrating in the runoff collection system of former Units 1 and 2 coal yard located adjacent to this well. The runoff collection system is dry following coal yard decommission. The lack of freshwater inputs has reduced the introduction of low sodium water, and groundwater quality is affected more by saltwater intrusion from the intake canal and from the saltwater marsh nearby.

Sodium/chloride (Na/Cl) ratios of groundwater in wells MWC-16, MWC-27, and MWC-29 were compared to that of seawater [0.56 (e.g. Möller, 1990; Freeze and Cherry, 1979)] to evaluate whether the sodium levels at these wells are influenced by seawater impacts (**Appendix C**). Groundwater exhibiting Na/Cl ratios similar to that of seawater would

indicate that the source of sodium (and chloride) is primarily the result of saltwater intrusion and independent of fluctuating concentrations. The Na/Cl ratios at wells MWC-16, MWC-27, and MWC-29 were similar to that of seawater over time, indicating that the high levels of sodium measured at these wells is related to saltwater intrusion. At wells MWC-27 and MWC-29, further discussion is provided below regarding recent concentration trends.

- The Na/Cl ratio observed at MWC-27 has tracked with that of seawater since approximately July 2007. The ratio remained similar even though the concentrations increased following the decrease in wastewater discharge to the pond system, also indicating that the sodium levels at this location are related to saltwater intrusion.
- The Na/Cl ratio at MWC-29 fluctuates significantly in short periods of time from values similar to that of seawater to higher values. These ratio fluctuations confirm that the groundwater quality is locally characterized by wet season inputs of freshwater from the runoff collection system that diminishes the influence of saltwater intrusion to dry season periods with minimal freshwater input such that saltwater intrusion is more pronounced. In early 2024, coinciding with the increase in sodium concentrations, the Na/Cl ratio stabilized with values similar to that of seawater, indicating that the sodium levels at this location are also related to saltwater intrusion.

In contrast, groundwater sodium levels at monitoring wells located further inland and on the eastern side of the site (MWB-1, MWI-2R2, MWI-7R, MWC-12R, MWC-21R, MWB-30R, MWC-32, and MWC-33) have remained below the alternative compliance level of 300 mg/L. These wells are less susceptible to saltwater intrusion due to their distance from surface water sources of seawater (e.g., the intake and discharge canals, marshes) and regional saltwater wedge. Of note is that MWC-12R, MWI-2R2, MWI-7R, MWB-30R, and MWC-32 experienced an anomalous increase in sodium concentrations during the November 2024 event due to seawater flooding in the area during hurricane Helene on September 26, 2024 (**Table 4**). This event provides further evidence of the dynamic role of groundwater-surface water interaction and its effect on groundwater geochemistry.

Figure 7 provides a groundwater sodium distribution map for the July 2024 sampling event. Sodium concentrations in monitoring wells are plotted from 2010 to 2024 in comparison to the alternative compliance levels of 300 mg/L and 10,000 mg/L in **Figure 8**.

4.3.2 Specific Conductance and TDS Distribution

Specific conductance and total dissolved solids (TDS) from 1999 to 2024 are summarized in **Tables 5** and **6** and **Figures 9** and **10**. Generally, specific conductance and TDS concentrations follow temporal trends similar to those of sodium, also fluctuating in response to saltwater intrusion. These data provide additional evidence of saltwater intrusion in locations close to the intake and discharge canals and the saltwater marsh where elevated specific conductance and TDS (and sodium) would be expected.

4.3.3 Data Summary

Sodium concentrations in monitoring wells increase from east to west across the site. Seawater contains approximately 10,500 mg/L of sodium (Alabama Cooperative Extension System, 1995 and Freeze and Cherry, 1979), which strongly supports a natural source of elevated sodium concentrations in groundwater in areas near the coast. Elevated groundwater sodium concentrations are limited to wells adjacent to the canals and saltwater marsh areas and can be attributed to saltwater intrusion.

5. SUMMARY

5.1 Risk Evaluation

Sodium is not established as a National Primary Drinking Water Standard (NPDWS), nor a National Secondary Drinking Water Standard (NSDWS) set by the US EPA. In accordance with Chapter 62-550, F.A.C., the FDEP identified a drinking water standard for sodium to, “protect individuals that are susceptible to sodium-sensitive hypertension or diseases that cause difficulty in regulating body fluid volume.” Currently, there are no permitted consumptive use wells used for drinking water supply between the CREC and the Gulf of Mexico (**Figure 11**), thus eliminating the exposure to groundwater that is potentially elevated above the sodium standard established by Chapter 62-550, F.A.C. Furthermore, Duke obtains most of its supply water and all its drinking water from production wells over 3.5 miles to the east of CREC in part due to the naturally poor quality of groundwater in this area. The data from the past five years demonstrates that sodium concentrations have been stable on a well-by-well basis across the site with notable exceptions (MWC-27 and MWC-29) due to decommissioning/demolition processes that previously dampened the response of saltwater intrusion (**Figure 8**).

The economic, environmental, and social costs for treating sodium along the Gulf Coast far outweigh the benefits of compliance. The cost of a treatment system Preliminary Design Review (PDR), permitting, final designs, and system construction is estimated to be extensive with no benefit derived as the water quality of the local aquifer downgradient of the site is considered brackish and as such is not currently being used as a groundwater source.

5.2 Future Potable Water Sources

Geosyntec reviewed the “Withlacoochee Regional Water Supply Authority (WRWSA), Regional Water Supply Plan Update – 2019” dated November 2019 and the “Southwest Florida Water Management District (SWFWMD), 2020 Regional Water Supply Plan, Northern Planning Region”, dated November 2020 to evaluate any intended future water supply development use in Citrus County and specifically in the vicinity of the CREC. The “Withlacoochee Regional Water Supply Authority, Regional Water Supply Plan Update – 2019” is the most up to date plan from 2020 to 2040 and details were already presented in the previous sodium water quality criteria exemption report of 2020.

The “SWFWMD, 2020 Regional Water Supply Plan, Northern Planning Region” is an assessment of projected water demands and potential sources of water (specifically in Citrus County and surrounding areas) to meet these demands for the period from 2020 through 2040.

The general Citrus County water source areas were identified because their locations are in or near current/future demand areas and they were placed with reasonably equidistant spacing away from environmentally sensitive areas, such as stressed lakes, springs, and coastal swamps (**Figure 5-6 of Appendix D**). The proposed water supply projects were not

placed to the west of U.S. Highway 19 due to the potential impacts to large coastal springs (e.g., Homosassa Springs, Chassahowitzka Springs, etc.) and coastal swamps that cover the area. In addition, water quality concerns such as high concentrations of chlorides and total dissolved solids are prevalent in coastal areas west of U.S. Highway 19.

Water supply development options identified by the SWFWMD in the Northern Planning Region include surface water/stormwater, reclaimed water, brackish groundwater and seawater desalination and fresh groundwater. According to this document, numerous options are being evaluated for the development of surface water/stormwater, reclaimed and fresh groundwater water sources. Because of the significant availability of fresh groundwater and reclaimed water in the Planning Region and the District's policy to aggressively promote water conservation strategies to reduce demand, project options for developing brackish groundwater were not developed for the Northern Planning Region. Additionally, the development of a seawater desalination plant was also being evaluated. However, due to the retirement of the nuclear and coal-fired power generation units (Units 1, 2 and 3) at the Crystal River Power Station, the once-through cooling water flow associated with the units will no longer be available to provide dilution of concentrate for a future seawater desalination facility. Therefore, the WRWSA is de-emphasizing the investigation of seawater desalination as a future water supply source. Additionally, fresh groundwater sources in the Northern Planning Region are being evaluated in Sumter, Citrus and Marion Counties and as a regional water supply framework.

This information does not indicate any intended future groundwater water supply development and use in the immediate area of the requested G-II sodium exemption.

6. CONCLUSIONS

Chapter 62-520.500 F.A.C. states that the exemption will be granted if the petitioner affirmatively demonstrates each of the following:

- Granting the exemption is clearly in the public interest (62-520.500(1)(a):

The economic, environmental, and social costs for treating sodium along the Gulf Coast far outweigh the benefits of compliance. The cost of a treatment system would have no benefit, as the ambient water quality of the aquifer downgradient of the site is deemed brackish and is not currently being utilized to benefit the community.

- Compliance with such criteria is unnecessary for the protection of present and future potable water supplies (62-520.500(1)(b):

Currently, there are no permitted consumptive use wells used for drinking water supply between the site and the receiving waters of the Gulf of Mexico. Water supply development options identified by the Northern Planning Region and the Pasco County Utilities Fiscal Services state that proposed well fields will not be placed west of U.S. Highway 19 due to several factors including water quality concerns such as high concentrations of chlorides and total dissolved solids that are prevalent in coastal areas west of U.S. Highway 19 (**Figure 5-6 of Appendix D**).

- Granting the exemption will not interfere with existing uses or the designated use of the waters or of contiguous water (62-520.500(1)(c):

Granting an exemption from the G-II standard for sodium will not interfere with the existing or designated use of the receiving groundwater, contiguous surface waters or the Gulf of Mexico. The SWFWMD Regional Water Supply Plan has designated groundwater regionally along the coast in the area of the site as brackish and therefore non-potable (**Figure 4-4 of Appendix D**).

Groundwater in the surficial aquifer at the site ultimately discharges to the Gulf of Mexico. There is no surface water standard for sodium in the Gulf of Mexico. The waters of the Gulf of Mexico are seawater with a typical sodium concentration of approximately 10,000 mg/L (Alabama Cooperative Extension System, 1995 and Freeze and Cherry, 1979). The minimal amount of groundwater discharged to the Gulf of Mexico in the vicinity of CREC will not have any measurable impact on the Gulf's sodium concentration.

- The economic, environmental, and social costs of compliance with the criteria outweigh the economic, environmental and social benefits of compliance (62-520.500(1d):

The cost of a treatment system, preliminary design review, permitting, final designs, and system construction is estimated to be extensive with no benefit derived to the community.

- An adequate monitoring program approved by the Department is established to ascertain the location and approximate dimensions of the discharge plume, to detect any leakage of contaminants to other aquifers or surface waters, and to detect any adverse effect on underground geologic formations or waters (62-520.500(1e):

Groundwater is monitored quarterly through the FDEP approved Groundwater Monitoring Plan and plant discharge to the IWW pond system is also monitored quarterly (EFF-4) and monthly (EFF-2) in accordance with the COC.

- The exemption will not present a danger to the public health, safety or welfare (62-520.500(1)(f):

Sodium is a naturally occurring constituent that is not established as a NPDWS or a NSDWS set by the US EPA. The regional aquifer along the coast in the area of the Site has been designated as brackish and non-potable by SWFWMD and there are no permitted consumptive use wells in the general vicinity of the site. Any water with potentially elevated sodium concentrations discharging to the receiving waters of the Gulf of Mexico will not negatively affect either the receiving water or any existing groundwater use in the area. Considering the operations that are conducted at the site, the groundwater quality and plant discharge data that has been collected, and the regional groundwater quality in respect to sodium concentrations, the granting of an exemption for this constituent will not present a danger to public health, safety or welfare.

- As specified in 62-520.500(1) the exemption petition shall include alternative compliance levels for the parameters from which an exemption is being sought.

Based upon the historical groundwater sodium concentrations measured at the CREC we recommend continuing to apply the same alternative compliance levels included in the previous exemption renewal:

- 10,000 mg/L for wells MWC-1R, MWC-16, MWC-27, MWC-28, MWC-29, MWC-31 and MWC-IF2.
- 300 mg/L for wells MWB-1, MWI-2R2, MWI-7R, MWC-12R, MWC-21R, MWB-30R, MWC-32, and MWC-33.

Conditions at the site have not deviated from the previous conditions when the previous sodium exemption was approved and continue to meet the requirements for the requested exemption under Chapter 62-520.500 F.A.C.

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TABLES

Table 1
SUMMARY OF PRODUCT MANAGEMENT AREAS
Duke Energy Florida Crystal River Energy Complex
15760 West Power Line Street, Crystal River, Florida

	Type		Generation		Source	Storage Location	Material Type		Rationale for Material Type Designation
Material	CCP	Non-CCP Solid	Active	Inactive			Industrial byproduct	Solid Waste	
Fly Ash	X		X		Unit 4 and 5	Ash Storage/Disposal Area	X		Several potential beneficial end uses
Bottom Ash	X		X		Unit 4 and 5	Ash Storage/Disposal Area	X		Potential beneficial end uses
Gypsum	X		X		Unit 4 and 5	Temporary gypsum Storage Pad	X		Benefical use off-site
						FGD filter cake disposal		X	On-site disposal
						Gypsum storate AS / DA	X		Benefical use off-site, off-site disposal, on-site disposal
FGD Pond Solids	X			X	Unit 4 and 5	FGB Blowdown Ponds		X	On-site disposalor Off-site disposal
Dredge Spoils - Fly Ash Ponds	X	X	X		Stormwater ponds (2) SW Side of fly ash pile	None		X	Off- site disposal/on-site disposal
Dredge Spoils - Percolation Ponds		X	X		Three percolation ponds: Two ponds in South Percolations Pond System One pond in North Percolation Pond	None		X	Off- site disposal/on-site disposal
Dredge Spoils - Ditches and Canals		X	X		Drainage ditches and canals throughout plant	None		X	Off- site disposal/on-site disposal
Dredge Spoils - Stormwater Ponds		X	X		Stormwater ponds (2) near Units 4 & 5 coal yard	None		X	Benificial use of on-site, beneficial use off-site or off-site disposal
Truck Wash Solids		X	X		Truck wash	None	X		Assumed non-contaminated - beneficial use as landfill cover
Cooling Tower Sludge - 4 & 5		X	X		Cooling tower for Units 4 & 5	None		X	On-site disposal
Units 4 & 5 Coal Yard Soil		X		X	Soil excavation for coal yard liner	Units 4 and 5 coal yard	X		Beneficial use off-site
Contaminated Soil		X	X		Throughout Plant	None		X	Contaminated and would require treatment and disposal

Table 2 : CREC Effluent Monitoring - Sodium Results
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Monitoring Location	EFF-1	EFF-2	EFF-4
	Southern Percolation Ponds (mg/L)		North Percolation Pond (mg/L)
2nd Quarter 2007	28	-	-
3rd Quarter 2007	11	-	-
4th Quarter 2007	19	-	-
1st Quarter 2008	16	-	-
2nd Quarter 2008	12	-	-
3rd Quarter 2008	18	-	-
4th Quarter 2008	32	-	-
1st Quarter 2009	60	-	-
2nd Quarter 2009	48	-	-
3rd Quarter 2009	95	-	-
4th Quarter 2009	24	-	-
1st Quarter 2010	26	-	-
2nd Quarter 2010	29	-	-
3rd Quarter 2010	50	110	-
4th Quarter 2010	29	210	-
1st Quarter 2011	21	350	-
2nd Quarter 2011	28	320	-
3rd Quarter 2011	26	310	-
4th Quarter 2011	18	140	-
1st Quarter 2012	69	320	-
2nd Quarter 2012	78	570	-
3rd Quarter 2012	48	270	-
4th Quarter 2012	44	570	520
1st Quarter 2013	30	480	738
2nd Quarter 2013	23	499	802
3rd Quarter 2013	65	577	584
4th Quarter 2013	100	766	793
1st Quarter 2014	227	704	549
2nd Quarter 2014	44	798	474
3rd Quarter 2014	147	718	401
4th Quarter 2014	38	645	614
1st Quarter 2015	203	579	492
2nd Quarter 2015	13	758	855
3rd Quarter 2015	41	809	855
4th Quarter 2015	43	700	852
1st Quarter 2016	37	699	542
2nd Quarter 2016	35	777	636
3rd Quarter 2016	24	956	153
4th Quarter 2016	27	596	645
1st Quarter 2017	52	1,140	1,060
2nd Quarter 2017	46	1,210	626
3rd Quarter 2017	116	920	885
4th Quarter 2017	356	1,280	610
1st Quarter 2018	31	1,110	528
2nd Quarter 2018	50	1,350	734
3rd Quarter 2018	22	1,200	704
4th Quarter 2018	27	1,310	834
1st Quarter 2019	23	947	505
2nd Quarter 2019	17	778	1,170
3rd Quarter 2019	23	1,190	739
4th Quarter 2019	271	1,110	661
1st Quarter 2020	54	310	128
2nd Quarter 2020	74	378	307
3rd Quarter 2020	1200	1,320	534
4th Quarter 2020	665	250	747
1st Quarter 2021	-	1,190*	431
2nd Quarter 2021	-	820*	785
3rd Quarter 2021	39	1,310*	735
4th Quarter 2021	66	1,100*	900
1st Quarter 2022	18	1,231*	480
2nd Quarter 2022	18	1,140*	758
3rd Quarter 2022	-	735*	706
4th Quarter 2022	-	915*	624
1st Quarter 2023	-	1,105*	513
2nd Quarter 2023	-	767*	101
3rd Quarter 2023	-	1,313*	584
4th Quarter 2023	-	1,130*	812
1st Quarter 2024	-	524*	238
2nd Quarter 2024	-	403*	377
3rd Quarter 2024	-	1,009*	723
4th Quarter 2024	-	1,080	2,480

Notes:

mg/L - milligrams per liter

IWW - industrial waste water

- indicates the location was not sampled

* Monthly results were averaged during these quarter events

** EFF-2 not sampled because that system was not operational after hurricane Helene

Table 3 : Monitoring Well Construction Details
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

WELL	Monitoring Well Designation	Total Depth (ft bls)	Screen Interval (ft bls)	Unit Monitored	Monitor Well Use
MWB-1	Background Well (Also Background Well for Citrus Combined Cycle Plant- Facility ID FLA964891)	25	15-25	UFA	IWW Background Well
MWB-30R	Background Well	20	10-20	UFA	Solid Waste Well - Ash Landfill background well
MWC-1	Compliance Monitoring Well / MWC-1 was abandoned in 2021	20	15-20	UFA	IWW Well Units 4 & 5
MWC-1R	Compliance Monitoring Well	20	10-20	UFA	IWW Well Units 4 & 5
MWI-2R2	Intermediate Monitoring Well	20	10-20	UFA	Solid Waste Well - Ash Landfill
MWI-7R	Intermediate Monitoring Well	20	10-20	UFA	IWW Well Units 4 & 5
MWC-12R	Compliance Monitoring Well	20	10-20	UFA	Solid Waste Well - Ash Landfill
MWC-16	Compliance Monitoring Well	21	6-21	UFA	IWW Well FGD Ponds
MWC-21R	Compliance Monitoring Well	20	10-20	UFA	IWW Well
MWC-27	Compliance Monitoring Well	33	3-13	UFA	IWW Well Ponds 1, 2 & 3
MWC-28	Compliance Monitoring Well	20	10-20	UFA	IWW Well
MWC-29	Compliance Monitoring Well	20	14-24	UFA	IWW Well South Coal Field
MWC-31	Compliance Monitoring Well / MWC-31 was removed from the GWMP in 2023	20	15.5-25.5	UFA	IWW Well FGD Ponds
MWC-32	Compliance Monitoring Well Northern Boundary of the Property	20	10-20	UFA	IWW Well
MWC-33	Compliance Monitoring Well Northern Boundary of the Property	20	10-20	UFA	IWW Well
MWC-IF2	Compliance Monitoring Well	14	6-16	UFA	IWW Well Ponds Units 1, 2 & 3
TWI - 1R	Temporary Intermediate Monitoring Well	22	10-20	UFA	Solid Waste Well - Ash Landfill
TWI - 2R	Temporary Intermediate Monitoring Well	24	10-20	UFA	Solid Waste Well - Ash Landfill
TWI - 3	Temporary Intermediate Monitoring Well / TWI-3 was abandoned in 2021	20	10-20	UFA	Solid Waste Well - Ash Landfill
TWI - 3R	Temporary Intermediate Monitoring Well	20	10-20	UFA	Solid Waste Well - Ash Landfill
TWI - 4	Temporary Intermediate Monitoring Well	20	10-20	UFA	Solid Waste Well - Ash Landfill
TWI - 5	Temporary Intermediate Monitoring Well	20	10-20	UFA	Solid Waste Well - Ash Landfill

Notes:

ft bls - Feet below land surface

UFA - Upper Floridan Aquifer

IWW - Industrial Waste Water

GWMP - Groundwater Monitoring Plan

Table 4 : Sodium Concentrations in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site) Alternative compliance sodium level: 300 mg/L								Wells affected by saltwater intrusion (western portion of site) Alternative compliance sodium level: 10,000 mg/L							
		Units: mg/L								Units: mg/L							
1st Quarter 1999	Jan-99		47	20	42	25	-	-	-	377	-	6160	370	1480	65	689	-
2nd Quarter 1999	Apr-99		63	19	34	26	-	-	-	522	-	6420	439	1560	37	696	-
3rd Quarter 1999	Jul-99		47	17	35	23	-	-	-	243	-	6520	404	1490	32	714	-
4th Quarter 1999	Oct-99		53	21	27	26	-	-	-	462	-	7180	389	1330	26	622	-
1st Quarter 2000	Jan-00	-	43	20	25	26	-	-	-	506	-	6100	457	1300	33	701	-
2nd Quarter 2000	Apr-00	-	47	22	31	26	-	-	-	439	-	6470	410	1320	50	743	-
3rd Quarter 2000	Jul-00	-	39	21	25	24	-	-	-	379	-	7960	356	1310	52	734	-
4th Quarter 2000	Oct-00	-	35	22	19	21	-	-	-	426	-	7140	353	1300	31	676	-
1st Quarter 2001	Jan-01	-	29	23	14	24	-	-	-	533	-	6720	389	1250	63	692	-
2nd Quarter 2001	Apr-01	-	38	22	17	20	-	-	-	396	-	6740	384	1390	37	676	-
3rd Quarter 2001	Jul-01	-	35	23	16	20	-	-	-	399	-	6900	401	1260	41	665	-
4th Quarter 2001	Oct-01	-	33	24	20	20	-	-	-	548	-	6730	478	1380	17	660	-
1st Quarter 2002	Jan-02	-	27	24	25	22	-	-	-	528	-	6550	418	1280	45	648	-
2nd Quarter 2002	Apr-02	-	36	23	22	20	-	-	-	680	-	6920	449	1270	33	615	-
3rd Quarter 2002	Jul-02	-	36	23	30	15	-	-	-	304	-	6780	461	1280	24	627	-
4th Quarter 2002	Oct-02	-	38	24	33	16	-	-	-	383	-	6490	236	1290	17	559	-
1st Quarter 2003	Jan-03	-	43	24	34	18	-	-	-	294	-	6320	335	2890	17	616	-
2nd Quarter 2003	Apr-03	-	42	26	27	18	-	-	-	426	-	6030	336	1330	22	609	-
3rd Quarter 2003	Jul-03	-	49	25	28	17	-	-	-	250	-	6500	356	1380	26	518	-
4th Quarter 2003	Oct-03	-	45	26	39	18	-	-	-	337	-	6180	286	1250	24	430	-
1st Quarter 2004	Jan-04	-	41	26	34	20	-	-	-	264	-	5580	316	1380	23	473	-
2nd Quarter 2004	Apr-04	-	52	27	26	18	-	-	-	486	-	6470	323	1270	28	457	-
3rd Quarter 2004	Jul-04	-	46	30	29	21	-	-	-	400	-	7600	310	1300	33	430	-
4th Quarter 2004	Oct-04	-	55	26	38	20	-	-	-	250	-	6500	370	1300	14	260	-
1st Quarter 2005	Jan-05	-	46	28	34	20	-	-	-	420	-	6700	260	1300	18	410	-
2nd Quarter 2005	Apr-05	-	50	27	38	14	-	-	-	230	-	6000	320	1200	31	240	-
3rd Quarter 2005	Jul-05	-	53	25	55	12	-	-	-	220	-	6600	330	1300	25	140	-
4th Quarter 2005	Oct-05	-	47	26	71	17	-	-	-	490	-	6400	340	1300	27	270	-
1st Quarter 2006	Jan-06	-	52	26	84	17	-	-	-	450	-	6700	580	1500	37	320	-
2nd Quarter 2006	Apr-06	-	50	28	71	16	-	-	-	560	-	6600	370	1100	71	390	-
3rd Quarter 2006	Jul-06	-	43	22	61	11	-	-	-	300	-	8000	440	1300	38	270	-
4th Quarter 2006	Oct-06	-	47	19	73	14	-	-	-	390	-	7200	310	1400	37	330	-
1st Quarter 2007	Jan-07	-	45	20	74	11	-	-	-	230	-	6300	350	1200	40	290	-
2nd Quarter 2007	Apr-07	-	31	23	63	13	-	-	-	380	-	5700	300	1000	39	270	-
3rd Quarter 2007	Jul-07	-	48	19	41	8.6	82	-	-	480	-	6100	750	1200	72	320	-
4th Quarter 2007	Oct-07	-	42	18	76	8.3	63	-	-	310	-	5900	480	1100	42	280	-

Table 4 : Sodium Concentrations in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site) Alternative compliance sodium level: 300 mg/L								Wells affected by saltwater intrusion (western portion of site) Alternative compliance sodium level: 10,000 mg/L							
		Units: mg/L								Units: mg/L							
1st Quarter 2008	Jan-08	-	44	26	53	11	64	-	-	400	-	6700	200	1100	42	250	-
2nd Quarter 2008	Apr-08	-	34	20	44	5.9	45	-	-	300	-	6000	270	1200	29	230	-
3rd Quarter 2008	Aug-08	-	40	17	36	10	61	-	-	260	-	5800	270	1200	28	230	-
4th Quarter 2008	Oct-08	-	42	22	33	11	47	-	-	430	-	5100	320	1200	41	260	-
1st Quarter 2009	Jan-09	-	49	19	130	12	58	-	-	540	-	6800	290	1400	90	250	-
2nd Quarter 2009	Apr-09	-	41	21	140	8.3	85	-	-	480	-	5900	340	1100	97	250	-
3rd Quarter 2009	Jul-09	-	43	18	160	8.2	97	-	-	270	-	6600	280	1100	74	200	-
4th Quarter 2009	Oct-09	-	39	13	200	8.7	92	-	-	380	-	7400	230	1100	66	330	-
1st Quarter 2010	Jan-10	-	41	21	120	8.8	75	-	-	480	-	6100	200	1200	61	310	-
2nd Quarter 2010	Apr-10	-	31	14	140	9.2	50	-	-	390	-	5000	200	990	37	200	240
3rd Quarter 2010	Jul-10	-	42	<15	<75	<10	58	-	-	410	-	5500	<240	<1,200	<59	<270	<780
4th Quarter 2010	Oct-10	-	40	<20	<35	<8.9	72	-	-	500	-	5800	<570	<1,100	<48	<260	<570
1st Quarter 2011	Jan-11	-	40	19	47	7.9	65	-	-	320	-	6100	280	1000	55	280	840
2nd Quarter 2011	Apr-11	-	29	22	63	7.2	57	-	-	440	-	6400	180	1100	42	200	930
3rd Quarter 2011	Jul-11	-	36	22	110	7.6	48	-	-	280	-	6600	360	1100	52	140	940
4th Quarter 2011	Oct-11	-	40	19	99	8.2	44	-	-	550	-	7100	410	1200	50	250	810
1st Quarter 2012	Jan-12	-	38	20	85	6.1	48	-	-	660	-	6800	250	1200	34	230	1400
2nd Quarter 2012	Apr-12	-	37	21	96	7.6	54	-	-	670	-	5900	630	1100	65	320	990
3rd Quarter 2012	Jul-12	-	36	19	75	6.4	3.8	-	-	230	-	6300	1900	1100	41	170	650
4th Quarter 2012	Oct-12	-	41	24	60	6.3	4.9	110	73	330	-	6300	550	1100	44	240	630
1st Quarter 2013	Jan-13	-	39	26	64	6.6	-	117	78	579	-	6110	303	1210	85	379	1140
2nd Quarter 2013	Apr-13	-	38	29	54	6.3	4.9	116	86	641	-	5780	143	1160	115	390	1220
3rd Quarter 2013	Jul-13	-	40	19	60	6.1	9.8	102	70	280	-	6550	532	1130	87	303	758
4th Quarter 2013	Oct-13	-	41	26	63	4.8	4.5	121	64	370	-	6630	422	1090	53	274	555
1st Quarter 2014	Jan-14	-	43	27	145	5.5	3.7	-	-	458	-	7770	216	1190	50	326	713
2nd Quarter 2014	Apr-14	-	47	28	109	5.6	3.4	138	78	250	-	6610	209	1240	70	254	528
3rd Quarter 2014	Jul-14	-	44	28	166	5.6	3.6	172	107	226	-	6320	166	1120	54	248	423
4th Quarter 2014	Oct-14	-	48	24	120	5.1	3.4	162	91	202	-	6460	257	1080	29	290	317
1st Quarter 2015	Jan-15	-	-	30	-	4.6	3.9	130	83	261	-	5720	276	1110	30	288	442
2nd Quarter 2015	Apr-15	-	48	35	123	5.3	3.8	158	98	549	-	6550	442	1220	42	357	417
3rd Quarter 2015	Jul-15	-	47	41	87	5.0	3.6	186	112	668	-	6620	1060	1100	84	374	454
4th Quarter 2015	Oct-15	-	48	38	51	4.6	3.7	149	94	275	-	7030	363	1100	43	360	186
1st Quarter 2016	Jan-16	-	50	43	62	5.2	3.6	176	82	739	-	6850	683	1100	67	371	408
2nd Quarter 2016	Apr-16	-	49	46	26	4.5	3.2	172	83	454	-	7090	192	1120	55	403	394
3rd Quarter 2016	Jul-16	-	43	43	36	4.3	3.4	181	103	617	-	6420	369	1100	71	393	302
4th Quarter 2016	Oct-16	-	51	45	32	4.5	3.2	103	73	287	-	7180	672	1260	55	479	273

Table 4 : Sodium Concentrations in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site) Alternative compliance sodium level: 300 mg/L								Wells affected by saltwater intrusion (western portion of site) Alternative compliance sodium level: 10,000 mg/L							
		Units: mg/L								Units: mg/L							
1st Quarter 2017	Jan-17	-	49	47	61	4.6	3.1	180	79	612	-	6420	972	1170	92	440	459
2nd Quarter 2017	Apr-17	-	47	51	129	4.7	13.9	162.5*	111	625	-	6865*	1070	1140	98	424	532
3rd Quarter 2017	Jul-17	-	49	33	110	5.0	137	130	101	413	-	6500	1310	1160	91	426	332
4th Quarter 2017	Oct-17	-	53	20	74	4.0	115	209	135	623	-	6520	4400	1110	78	424	421
1st Quarter 2018	Jan-18	-	50	23	146	4.5	172	229	131	766	-	5610	1880	1210	83	486	681
2nd Quarter 2018	Apr-18	-	44	33	85	5.0	91	196	150	768	-	6540	1150	1110	96	421	765
3rd Quarter 2018	Jul-18	5.5	44	20	20	5.8	75	124	143	492	-	6300	1260	1120	94	467	558
4th Quarter 2018	Oct-18	6.8	45	21	<0.270	5.2	53	192	107	457	-	5980	1530	1250	55	477	304
1st Quarter 2019	Jan-19	6.3	50	21	175	4.9	109	156	101	297	-	6200	2440	1030	46	448	394
2nd Quarter 2019	Apr-19	5.0	45	45	111	4.9	48	193	135	480	-	5610	2650	1240	68	478	494
3rd Quarter 2019	Jul-19	147	50	32	142	5.2	57	156	103	552	-	6740	3790	1260	51	514	422
4th Quarter 2019	Oct-19	5.3	48	38	127	4.8	16	163	99	648	-	5580	5630	1280	43	466	187
1st Quarter 2020	Jan-20	5.1	49	30	126	4.9	12	80	105	620	-	5660	4670	1380	39	449	433
2nd Quarter 2020	Apr-20	4.6	46	42	137	5.0	-	167	126	738	-	5880	4530	1390	47	427	648
3rd Quarter 2020	Jul-20	4.8	48	35	131	4.8	-	109	115	368	-	6490	5530	1440	58	396	564
4th Quarter 2020	Oct-20	5.3	50	23	170	4.6	-	123	91	242	-	5520	4600	1180	26	411	422
1st Quarter 2021	Jan-21	5.8	50	31	182	5.9	5.6	108	108	359	-	5800	6250	1340	51	446	737
2nd Quarter 2021	Apr-21	5.4	-	33	-	5.2	-	129	131	453	-	6250	5520	1350	71	411	871
3rd Quarter 2021	Jul-21	5.0	-	16	-	5.4	10.6	37	84	-	392	5540	3490	1110	65	346	221
4th Quarter 2021	Oct-21	3.8	42	14	168	3.8	15.2	142	78	-	450	5100	6020	1210	19	339	237
1st Quarter 2022	Jan-22	4.0	49	25	184	4.8	9.8	177	96	-	701	5640	5580	1410	41	403	409
2nd Quarter 2022	Apr-22	4.0	45	19	153	3.8	-	102	93	-	396	5050	3920	1310	26	339	352
3rd Quarter 2022	Jul-22	4.9	49	17	136	3.9	-	168	88	-	590	6130	6260	1420	32	382	253
4th Quarter 2022	Oct-22	5.5	52	-	133	-	-	147	99	-	497	-	-	1540	-	-	-
1st Quarter 2023	Jan-23	5.0	47	23	161	4.3	4.5	115	91	-	565	5250	6900	1250	68	339	355
2nd Quarter 2023	Apr-23	5.7	47	21	161	4.3	8.6	94	121	-	679	5700	6740	1280	81	358	456
3rd Quarter 2023	Jul-23	5.5	48	14	111	4.7	3.6	46	92	-	628	5090	6200	1300	76	355	450
4th Quarter 2023	Oct-23	6.4	55	11	266	3.8	2.7	164	155	-	658	4750	6680	1650	279	416	356
1st Quarter 2024	Jan-24	6.1	54	17	190	4.3	2.7	174	160	-	564	4710	6640	1480	537	461	494
2nd Quarter 2024	Apr-24	4.6	45	21	216	3.7	2.2	152	197	-	537	5480	6750	1410	620	463	316
3rd Quarter 2024	Jul-24	5.2	50	19	187	4.3	2.7	57	229	-	639	5370	6490	1380	660	467	270
4th Quarter 2024	Nov-24	5.2	196	31	409	433	34	263	151	-	370	5500	5300	1510	1130	642	-

Note:
mg/L = milligrams per liter
umhos/cm = microhms per centimeter
IWW = industrial waste water
TDS=total dissolved solids
- = not sampled

* Results were averaged between two separate sampling events during this quarter
MWC-31 was removed from the Groundwater Monitoring Plan in 2023

Table 5 : TDS Concentrations in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site)								Wells affected by saltwater intrusion (western portion of site)							
		Units: mg/L								Units: mg/L							
1st Quarter 1999	Jan-99	-	389	462	403	371	-	-	-	1551	-	19960	-	-	1579	4151	-
2nd Quarter 1999	Apr-99	-	400	452	382	345	-	-	-	2014	-	20424	-	-	1604	3924	-
3rd Quarter 1999	Jul-99	-	399	458	380	360	-	-	-	1163	-	21540	-	-	1663	4145	-
4th Quarter 1999	Oct-99	-	387	558	325	363	-	-	-	1754	-	23184	-	-	1803	3518	-
1st Quarter 2000	Jan-00	-	381	460	335	367	-	-	-	1929	-	20886	1796	4633	1910	3660	-
2nd Quarter 2000	Apr-00	-	398	467	359	378	-	-	-	1747	-	20875	1714	4551	1913	3662	-
3rd Quarter 2000	Jul-00	-	391	467	377	385	-	-	-	1587	-	24713	1475	4562	1978	3689	-
4th Quarter 2000	Oct-00	-	345	452	331	351	-	-	-	1725	-	21821	1451	4742	1716	3415	-
1st Quarter 2001	Jan-01	-	334	484	320	344	-	-	-	1973	-	21280	1713	4448	1306	3397	-
2nd Quarter 2001	Apr-01	-	371	497	337	342	-	-	-	1590	-	22582	1682	4868	1642	3443	-
3rd Quarter 2001	Jul-01	-	351	468	332	338	-	-	-	2197	-	22357	1685	4487	1555	3259	-
4th Quarter 2001	Oct-01	-	369	487	346	334	-	-	-	1940	-	20190	1889	4564	1152	3270	-
1st Quarter 2002	Jan-02	-	326	488	373	345	-	-	-	1975	-	20889	1769	4356	1387	3193	-
2nd Quarter 2002	Apr-02	-	372	505	387	336	-	-	-	2480	-	22517	1850	4570	1325	3105	-
3rd Quarter 2002	Jul-02	-	384	482	437	318	-	-	-	1388	-	22558	1945	4518	1257	3095	-
4th Quarter 2002	Oct-02	-	377	514	413	316	-	-	-	1523	-	21891	1259	4600	1220	2891	-
1st Quarter 2003	Jan-03	-	403	530	387	308	-	-	-	1234	-	20919	1822	4821	1301	3265	-
2nd Quarter 2003	Apr-03	-	406	505	359	309	-	-	-	1715	-	20314	1714	4867	1407	3491	-
3rd Quarter 2003	Jul-03	-	440	500	420	330	-	-	-	1200	-	22000	1600	4800	1500	4200	-
4th Quarter 2003	Oct-03	-	400	510	440	330	-	-	-	1500	-	21000	1500	4900	1700	3500	-
1st Quarter 2004	Jan-04	-	410	513	420	340	-	-	-	1900	-	18800	1700	4520	1700	3000	-
2nd Quarter 2004	Apr-04	-	400	520	390	320	-	-	-	1860	-	21200	1630	4720	1430	2680	-
3rd Quarter 2004	Jul-04	-	420	540	400	320	-	-	-	1600	-	22900	1400	4700	1600	3000	-
4th Quarter 2004	Oct-04	-	470	500	450	320	-	-	-	1100	-	21400	1600	4600	1600	4100	-
1st Quarter 2005	Jan-05	-	360	500	400	310	-	-	-	1600	-	21300	1200	4500	1700	2700	-
2nd Quarter 2005	Apr-05	-	450	540	440	310	-	-	-	1000	-	21000	1400	4500	1600	3700	-
3rd Quarter 2005	Jul-05	-	510	520	540	300	-	-	-	940	-	21000	1400	4300	1600	3400	-
4th Quarter 2005	Oct-05	-	440	510	540	300	-	-	-	1800	-	22000	1500	4100	1700	3100	-
1st Quarter 2006	Jan-06	-	410	520	640	330	-	-	-	1600	-	20000	2100	4200	1800	2600	-
2nd Quarter 2006	Apr-06	-	360	550	500	290	-	-	-	1900	-	21000	690	630	10	2600	-
3rd Quarter 2006	Jul-06	-	420	500	560	200	-	-	-	1300	-	21000	1500	4500	1700	3200	-
4th Quarter 2006	Oct-06	-	420	460	490	280	-	-	-	1300	-	21000	1100	4300	1900	3000	-
1st Quarter 2007	Jan-07	-	390	480	600	290	-	-	-	980	-	20000	1300	4400	2100	2800	-
2nd Quarter 2007	Apr-07	-	420	520	670	290	-	-	-	1700	-	20000	1500	4300	2200	2700	-
3rd Quarter 2007	Jul-07	-	440	480	480	400	480	-	-	1900	-	21000	3000	4200	2000	2300	-
4th Quarter 2007	Oct-07	-	400	510	660	380	430	-	-	1260	-	21300	1940	4330	2130	2350	-

Table 5 : TDS Concentrations in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site)								Wells affected by saltwater intrusion (western portion of site)							
		Units: mg/L								Units: mg/L							
1st Quarter 2008	Jan-08	-	410	570	560	390	440	-	-	1700	-	21000	1000	4400	2300	2200	-
2nd Quarter 2008	Apr-08	-	410	540	560	360	420	-	-	1300	-	20000	1300	4300	2300	2300	-
3rd Quarter 2008	Aug-08	-	340	480	440	320	360	-	-	1000	-	21000	1200	4300	2000	2200	-
4th Quarter 2008	Oct-08	-	500	570	490	410	440	-	-	1800	-	18000	1500	4400	2100	2200	-
1st Quarter 2009	Jan-09	-	410	470	890	350	400	-	-	1900	-	17000	1400	4300	1800	2200	-
2nd Quarter 2009	Apr-09	-	390	502	1030	350	530	-	-	1900	-	21000	1600	4300	2200	1700	-
3rd Quarter 2009	Jul-09	-	410	450	1100	340	570	-	-	1200	-	21000	1300	4400	2300	2080	-
4th Quarter 2009	Oct-09	-	380	410	1100	320	470	-	-	1600	-	24000	1000	4200	2300	1900	-
1st Quarter 2010	Jan-10	-	380	500	900	380	490	-	-	1800	-	21000	980	4200	2500	2200	-
2nd Quarter 2010	Apr-10	-	340	490	960	350	380	-	-	1600	-	17000	1000	4300	2500	2600	1400
3rd Quarter 2010	Jul-10	-	370	<830	<700	<420	350	-	-	1700	-	29820	<1,100	<3,900	<2,600	<2,700	<2,500
4th Quarter 2010	Oct-10	-	420	<510	<610	<420	470	-	-	2000	-	20000	<2,400	<4,200	<2,700	<3,000	<2,200
1st Quarter 2011	Jan-11	-	360	520	660	380	430	-	-	1300	-	21000	1400	4100	2700	3100	3400
2nd Quarter 2011	Apr-11	-	360	510	750	380	390	-	-	1700	-	21000	1100	4100	2800	3500	3700
3rd Quarter 2011	Jul-11	-	350	520	850	360	350	-	-	1200	-	22000	1500	4100	2600	3400	3300
4th Quarter 2011	Oct-11	-	380	380	820	350	300	-	-	2100	-	22000	2000	4100	2600	4000	3100
1st Quarter 2012	Jan-12	-	330	500	750	310	380	-	-	2300	-	21000	1200	4000	2700	4200	4400
2nd Quarter 2012	Apr-12	-	330	520	800	330	410	-	-	2300	-	21000	2300	3900	2700	4800	3700
3rd Quarter 2012	Jul-12	-	350	510	800	330	210	-	-	1100	-	20000	6600	3900	2400	3800	2800
4th Quarter 2012	Oct-12	-	420	520	710	340	180	780	500	1400	-	21000	2200	4000	2800	4000	2300
1st Quarter 2013	Jan-13	-	388	555	723	353	-	764	519	2000	-	20000	1540	4160	2800	5330	3800
2nd Quarter 2013	Apr-13	-	393	580	1220	360	520	826	583	2260	-	18900	826	4030	2900	5990	3980
3rd Quarter 2013	Jul-13	-	592	515	787	354	252	737	535	1180	-	21200	2200	4000	2970	5280	3000
4th Quarter 2013	Nov-13	-	401	593	732	337	176	-	-	2000	-	17900	1470	3730	2740	4300	2420
1st Quarter 2014	Jan-14	-	350	538	1060	343	219	776	518	1780	-	22200	1540	3680	3000	12800	2510
2nd Quarter 2014	Apr-14	-	466	628	1030	369	178	918	492	934	-	15700	946	4010	2730	5030	2300
3rd Quarter 2014	Jul-14	-	454	602	1440	420	155	964	634	930	-	22400	1080	4160	3040	5010	1850
4th Quarter 2014	Oct-14	-	435	585	1050	345	189	978	579	920	-	18700	1180	3980	2420	3900	1410
1st Quarter 2015	Jan-15	-	-	568	-	330	185	860	554	1070	-	16100	1390	1950	2460	4570	2110
2nd Quarter 2015	Apr-15	-	485	725	950	329	196	1690	591	2090	-	21200	1910	4000	2430	6430	2290
3rd Quarter 2015	Jul-15	-	416	668	658	340	187	956	660	2400	-	21300	4300	4010	2570	7210	2010
4th Quarter 2015	Oct-15	-	441	630	611	325	150	928	597	1160	-	20800	1660	3760	2280	5680	1040
1st Quarter 2016	Jan-16	-	425	711	685	357	184	908	521	2660	-	22300	2680	4220	2660	7630	1960
2nd Quarter 2016	Apr-16	-	465	688	670	310	197	1010	572	1660	-	17600	936	3460	2350	5390	1620
3rd Quarter 2016	Jul-16	-	414	665	676	318	171	946	596	2100	-	19500	1440	3530	2430	6060	1420
4th Quarter 2016	Oct-16	-	430	657	694	300	183	814	583	1030	-	17100	5810	3770	1930	5560	1200

Table 5 : TDS Concentrations in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site)								Wells affected by saltwater intrusion (western portion of site)							
		Units: mg/L								Units: mg/L							
1st Quarter 2017	Jan-17	-	438	732	773	333	207	978	599	2330	-	23500	6920	4570	2520	8460	1880
2nd Quarter 2017	Apr-17	-	476	664	1280	297	282	992	822	2310	-	22700	5980	4000	2410	6620	2320
3rd Quarter 2017	Jul-17	-	438	543	1,420	293	680	946*	702*	1,230	-	18400*	5,240	4,070	2,140	5,760	1,480
4th Quarter 2017	Oct-17	-	391	469	1030	266	722	1010	812	2220	-	20100	14700	3870	2090	6800	1720
1st Quarter 2018	Jan-18	-	424	521	1030	200	476	894	580	2330	-	17700	9600	3690	1950	5940	2540
2nd Quarter 2018	Apr-18	-	476	654	1100	290	525	1100	790	2600	-	20800	5390	3490	2180	6640	2830
2nd Quarter 2018	May-18	-	-	634	-	383	-	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2018	Jul-18	311	451	518	734	353	454	854	754	1730	-	20700	4160	3920	2070	7600	2130
4th Quarter 2018	Oct-18	361	436	494	690	330	631	1080	704	1480	-	20200	5420	3320	1430	7000	1360
1st Quarter 2019	Jan-19	840	469	474	1170	302	402	992	604	1440	-	18900	8120	4940	1260	6020	1640
2nd Quarter 2019	Apr-19	342	425	633	876	354	407	1070	818	1800	-	20200	9380	4510	1530	6040	2150
3rd Quarter 2019	Jul-19	369	506	548	1020	348	289	976	640	1990	-	20100	12000	4680	1250	5660	1640
4th Quarter 2019	Oct-19	636	460	593	856	343	400	1030	702	2570	-	19700	17500	4880	1080	5520	1020
1st Quarter 2020	Jan-20	442	470	544	940	350	280	592	644	2400	-	19700	16500	5080	1020	5430	2040
2nd Quarter 2020	Apr-20	329	464	615	1010	353	-	1040	806	2700	-	18200	16200	4940	1190	5380	2560
3rd Quarter 2020	Jul-20	320	498	577	974	334	286	754	700	1460	-	20300	20200	5060	1270	5820	2300
4th Quarter 2020	Oct-20	322	517	459	1100	349	-	780	587	2240	-	20400	17900	4870	1140	4810	1780
1st Quarter 2021	Jan-21	318	1903	547	232	342	232	764	624	1460	-	17800	19900	5010	1170	5360	2730
2nd Quarter 2021	Apr-21	390	-	605	-	358	-	876	776	1890	-	19700	17900	6940	1400	6260	3240
3rd Quarter 2021	Jul-21	328	-	412	-	336	236	604	654	-	1750	19500	10900	4630	1300	5190	1030
4th Quarter 2021	Oct-21	335	480	400	1230	-	260	1060	600	-	1900	-	-	4780	-	-	-
1st Quarter 2022	Jan-22	322	451	506	1240	349	194	994	620	-	2180	17400	18900	4400	1060	4770	1640
2nd Quarter 2022	Apr-22	307	495	447	1270	323	-	796	738	-	1700	18600	14900	5458	878	4880	1470
3rd Quarter 2022	Jul-22	326	478	457	1170	355	-	1050	638	-	2120	18600	21300	5220	922	4600	1190
4th Quarter 2022	Oct-22	321	954	-	1080	-	-	886	636	-	1750	-	-	4960	-	-	-
1st Quarter 2023	Jan-23	342	473	448	1290	332	207	860	636	-	2000	16800	23000	4560	1040	4630	1450
2nd Quarter 2023	Apr-23	338	469	454	1490	324	254	734	718	-	2330	18000	21200	4420	1170	4810	1810
3rd Quarter 2023	Jul-23	295	549	371	1150	338	204	610	606	-	1860	18400	23200	4340	1060	5660	2010
4th Quarter 2023	Oct-23	313	486	369	1740	371	199	974	780	-	1980	17700	24600	4660	1970	5240	1520
1st Quarter 2024	Jan-24	324	494	440	1130	341	194	1070	858	-	1700	17100	21600	5560	2780	5320	1960
2nd Quarter 2024	Apr-24	351	496	497	1700	345	221	1030	976	-	1900	17200	18800	5660	3150	5560	1500
3rd Quarter 2024	Jul-24	351	474	431	1400	345	190	596	1110	-	2170	18400	22200	5220	3040	6000	1310
4th Quarter 2024	Nov-24	325	480	467	2110	1600	313	1320	598	-	1350	18400	18600	5720	4690	6760	-

Note:

mg/L = milligrams per liter

umhos/cm = microhms per centimeter

IWW = industrial waste water

TDS=total dissolved solids

- = not sampled

* Results were averaged between two separate sampling events during this quarter

MWC-31 was removed from the Groundwater Monitoring Plan in 2023

Table 6 : Specific Conductance in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site)								Wells affected by saltwater intrusion (western portion of site)							
		Units: µmhos/cm								Units: µmhos/cm							
1st Quarter 1999	Jan-99	-	750	810	650	650	-	-	-	2790	-	26600	-	-	1840	5800	-
2nd Quarter 1999	Apr-99	-	890	830	660	710	-	-	-	3870	-	30100	-	-	1930	5900	-
3rd Quarter 1999	Jul-99	-	780	800	610	650	-	-	-	2070	-	31000	-	-	1880	6000	-
4th Quarter 1999	Oct-99	-	800	800	560	650	-	-	-	3070	-	33000	-	-	1920	4690	-
1st Quarter 2000	Jan-00	-	670	740	448	620	-	-	-	2860	-	24400	2370	7300	1670	4030	-
2nd Quarter 2000	Apr-00	-	760	820	544	670	-	-	-	3130	-	32900	2620	8100	2140	5700	-
3rd Quarter 2000	Jul-00	-	750	850	610	700	-	-	-	2930	-	37800	2180	8500	2300	4900	-
4th Quarter 2000	Oct-00	-	710	850	580	640	-	-	-	3200	-	34500	2220	8800	1990	5300	-
1st Quarter 2001	Jan-01	-	650	820	504	640	-	-	-	3380	-	29600	2330	1400	1980	4420	-
2nd Quarter 2001	Apr-01	-	750	850	600	650	-	-	-	3010	-	24700	2420	8700	1920	4880	-
3rd Quarter 2001	Jul-01	-	970	1060	840	870	-	-	-	3080	-	34100	2130	9200	2100	4800	-
4th Quarter 2001	Oct-01	-	700	850	610	610	-	-	-	3650	-	31000	2830	8300	1430	4710	-
1st Quarter 2002	Jan-02	-	640	810	610	610	-	-	-	3020	-	28700	2440	6700	1620	4300	-
2nd Quarter 2002	Apr-02	-	730	790	640	570	-	-	-	4480	-	34700	2750	8300	1710	4470	-
3rd Quarter 2002	Jul-02	-	740	850	710	590	-	-	-	2550	-	35200	2920	8420	1630	4620	-
4th Quarter 2002	Oct-02	-	730	890	690	600	-	-	-	2780	-	33900	1780	8600	1480	4200	-
1st Quarter 2003	Jan-03	-	840	940	720	640	-	-	-	2300	-	38200	2590	6700	1630	4720	-
2nd Quarter 2003	Apr-03	-	756	890	650	519	-	-	-	3030	-	28200	2320	7800	1620	4380	-
3rd Quarter 2003	Jul-03	-	860	920	680	590	-	-	-	2130	-	32100	2560	8500	1850	5700	-
4th Quarter 2003	Oct-03	-	750	900	750	600	-	-	-	2570	-	33500	2220	8300	1930	4110	-
1st Quarter 2004	Jan-04	-	740	890	690	530	-	-	-	3500	-	28700	2380	8300	1970	3980	-
2nd Quarter 2004	Apr-04	-	830	890	660	560	-	-	-	3300	-	32100	2390	8500	1860	4010	-
3rd Quarter 2004	Jul-04	-	820	940	720	620	-	-	-	3100	-	36000	2280	8530	1950	4070	-
4th Quarter 2004	Oct-04	-	839	898	735	579	-	-	-	1984	-	31530	2412	7970	1817	4522	-
1st Quarter 2005	Jan-05	-	727	881	694	568	-	-	-	2906	-	36500	1879	7610	1895	3724	-
2nd Quarter 2005	Apr-05	-	732	840	690	494	-	-	-	1735	-	27560	2012	6570	1771	3852	-
3rd Quarter 2005	Jul-05	-	825	871	845	525	-	-	-	1837	-	31430	2269	6995	1832	3529	-
4th Quarter 2005	Oct-05	-	705	879	970	537	-	-	-	3470	-	32050	2119	7450	1916	3541	-
1st Quarter 2006	Jan-06	-	674	803	968	498	-	-	-	2876	-	25220	2933	6580	1815	3173	-
2nd Quarter 2006	Apr-06	-	765	893	936	529	-	-	-	3984	-	29940	2122	7180	2050	3396	-
3rd Quarter 2006	Jul-06	-	795	929	983	551	-	-	-	2555	-	32320	2700	7756	2029	3940	-
4th Quarter 2006	Oct-06	-	689	759	887	485	-	-	-	2572	-	26879	1768	6850	1936	3499	-
1st Quarter 2007	Jan-07	-	715	828	10	485	-	-	-	1859	-	25710	2079	7090	2238	3324	-
2nd Quarter 2007	Apr-07	-	757	838	1016	479	-	-	-	3027	-	24000	2318	6740	2219	3174	-
3rd Quarter 2007	Jul-07	-	754	889	790	763	901	-	-	3589	-	32010	5421	7540	2584	3342	-
4th Quarter 2007	Oct-07	-	703	814	1077	726	742	-	-	2341	-	31670	5190	7240	2342	3098	-

Table 6 : Specific Conductance in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site)								Wells affected by saltwater intrusion (western portion of site)							
		Units: µmhos/cm								Units: µmhos/cm							
1st Quarter 2008	Jan-08	-	728	944	913	721	784	-	-	3008	-	32610	1724	7250	2486	2996	-
2nd Quarter 2008	Apr-08	-	725	910	922	693	736	-	-	2450	-	29640	2241	7180	2400	2976	-
3rd Quarter 2008	Aug-08	-	668	757	757	595	689	-	-	1900	-	29330	2218	6790	2140	2649	-
4th Quarter 2008	Oct-08	-	696	819	695	606	664	-	-	3208	-	23600	2343	6850	2222	2812	-
1st Quarter 2009	Jan-09	-	699	769	1402	613	716	-	-	3699	-	23490	2062	6940	2496	2622	-
2nd Quarter 2009	Apr-09	-	679	777	1611	602	976	-	-	3194	-	28520	2964	6700	2559	2431	-
3rd Quarter 2009	Jul-09	-	685	699	1660	597	939	-	-	1932	-	30270	2796	6540	2367	2586	-
4th Quarter 2009	Oct-09	-	749	748	1933	684	933	-	-	2718	-	34070	2209	6710	2540	2817	-
1st Quarter 2010	Jan-10	-	664	783	1365	683	856	-	-	3180	-	28160	1663	6640	2556	3067	-
2nd Quarter 2010	Apr-10	-	638	784	1514	695	700	-	-	2976	-	25090	1869	7100	2656	3285	2615
3rd Quarter 2010	Jul-10	-	924	<830	<1,237	<840	652	-	-	3467	-	29820	<2,248	<7,220	<2,915	<3,762	<4,960
4th Quarter 2010	Oct-10	-	786	<851	<960	<777	891	-	-	3942	-	30310	<4,198	<6,750	<2,849	<4,080	<3,401
1st Quarter 2011	Jan-11	-	640	792	961	657	747	-	-	2123	-	28540	2309	6470	2679	4197	5910
2nd Quarter 2011	Apr-11	-	658	877	1103	683	716	-	-	3204	-	28410	1893	6970	2768	4223	6640
3rd Quarter 2011	Jul-11	-	669	878	1224	676	640	-	-	2350	-	31570	3001	7010	2709	4105	5640
4th Quarter 2011	Oct-11	-	723	916	1187	685	742	-	-	4242	-	33950	3943	6790	2803	5530	6270
1st Quarter 2012	Jan-12	-	697	868	1156	646	758	-	-	4206	-	33090	1994	6922	2940	6098	8221
2nd Quarter 2012	Apr-12	-	694	856	1176	658	799	-	-	4361	-	31370	4433	6679	2901	7287	6505
3rd Quarter 2012	Jul-12	-	657	817	1193	606	321	-	-	1845	-	29330	12360	6580	2547	4640	7657
4th Quarter 2012	Oct-12	-	730	915	1004	631	334	1320	880	2997	-	33920	4235	6869	2952	5393	6210
1st Quarter 2013	Jan-13	-	729	929	1026	675	-	1264	909	3601	-	31070	2669	6294	3305	7440	7498
2nd Quarter 2013	Apr-13	-	893	1088	1218	816	637	1499	1116	4760	-	31186	1748	6963	3746	9408	8196
3rd Quarter 2013	Jul-13	-	720	911	1118	688	494	1234	934	2075	-	32093	4290	4178	3102	6274	4910
4th Quarter 2013	Oct-13	-	787	1268	1110	703	715	1499	964	2913	-	32485	4386	6856	3164	6158	3486
1st Quarter 2014	Jan-14	-	832	976	1486	665	393	1449	917	3184	-	36597	2514	6769	3066	6243	5536
2nd Quarter 2014	Apr-14	-	791	984	1421	672	346	1551	1062	1956	-	32346	2091	7053	2973	5606	2225
3rd Quarter 2014	Jul-14	-	802	965	1699	659	320	1552	976	1656	-	33344	1870	1652	2699	5242	3276
4th Quarter 2014	Oct-14	-	821	946	1500	657	356	1540	1019	1705	-	32793	2318	6586	2523	5930	2635
1st Quarter 2015	Jan-15	-	-	983	-	621	371*	1577	1043	2143	-	27656	2152	6733	2660	5785	4185
2nd Quarter 2015	Apr-15	-	806	1038	1358	641	329	1681	1099	3455	-	31543	3560	6573	2668	7,225*	3145
3rd Quarter 2015	Jul-15	-	825	1096	1008	646	367	1557	1072	4345	-	32928	7090	6601	3006	7986	3633
4th Quarter 2015	Oct-15	-	896	1149	971	719	362	1867	1097	2840	-	33947	3550	7140	2585	8150	2216
1st Quarter 2016	Jan-16	-	844	1135	1028	684	359	1795	1056	4744	-	33355	5022	6732	2757	8490	3663
2nd Quarter 2016	Apr-16	-	975	1167	1201	655	685	1734	1180	3277	-	34101	1976	6689	3110	8376	3164
3rd Quarter 2016	Jul-16	-	808	1104	968	636	344	1385	1037	4177	-	31658	2860	6583	2744	8136	2807
4th Quarter 2016	Oct-16	-	811	1050	996	570	352	1667	1040	1978	-	33576	8277	6710	2196	7896	2177

Table 6 : Specific Conductance in Groundwater
Duke Energy Florida Crystal River Energy Complex
15760 West Powerline Street, Crystal River, Florida

Sample Quarter	Sample Date	MWB-1	MWC-12R	MWC-21R	MWI-2R2	MWI-7R	MWB-30R	MWC-32	MWC-33	MWC-1	MWC-1R	MWC-16	MWC-27	MWC-28	MWC-29	MWC-IF2	MWC-31
		Wells not affected by saltwater intrusion (eastern portion of site)								Wells affected by saltwater intrusion (western portion of site)							
		Units: µmhos/cm								Units: µmhos/cm							
1st Quarter 2017	Jan-17	-	739	1008	1018	528	328	1480	970	3776	-	30563	8190	6135	2401	7599	3196
2nd Quarter 2017	Apr-17	-	746	1023	1499	532	491	1528	1204	3698	-	30432	8127	6159	2474	7752	3629
3rd Quarter 2017	Jul-17	-	741	842	1423	518	1160	1302	1049	2405	-	31434	9720	6201	2151	8039	2640
3rd Quarter 2017	Aug-17	-	-	-	-	-	1186	-	-	-	-	-	-	-	-	-	-
4th Quarter 2017	Oct-17	-	-	830	-	556	1418	1940	1382	4072	-	31582	24888	6676	2441	8491	3212
1st Quarter 2018	Jan-18	-	733	768	1542	536	903	1819	1205	4422	-	31346	13396	6201	2127	7634	4193
2nd Quarter 2018	Apr-18	-	759	899	1353	586	806	1642	1313	4399	-	25380	8120	6063	2188	8420	4573
2nd Quarter 2018	May-18	-	-	855	-	590	-	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2018	Jul-18	-	-	774	-	577	-	-	-	-	-	31483	-	-	-	-	-
3rd Quarter 2018	Jul-18	766	736	-	865	-	686	1345	1290	2875	-	30096	7282	5917	2109	8542	3527
4th Quarter 2018	Oct-18	613	792	811	944	591	1090	1746	1131	2909	-	31059	9641	7066	1751	9002	2474
1st Quarter 2019	Jan-19	650	838	822	1610	619	699	1730	1160	2445	-	31017	14231	8286	1503	8141	3045
2nd Quarter 2019	Apr-19	632	809	1058	1266	636	780	1887	1387	3279	-	30928	15508	7506	1909	8806	3844
3rd Quarter 2019	Jul-19	623	900	993	1409	657	483	1658	1154	3782	-	32317	20018	7926	1610	8610	3253
4th Quarter 2019	Oct-19	657	853	1027	1364	639	768	1796	1175	4771	-	30426	27100	8336	1443	8042	1950
1st Quarter 2020	Jan-20	621	860	928	1345	656	441	1047	1167	4341	-	31395	26310	9002	1386	8010	3817
2nd Quarter 2020	Apr-20	591	836	1055	1422	653	-	1777	1306	4744	-	30486	25560	8466	1564	7516	4851
3rd Quarter 2020	Jul-20	577	849	973	1332	657	490	1293	1205	2271	-	31231	30474	8627	1437	7195	4183
4th Quarter 2020	Oct-20	601	897	8303	1850	641	-	1388	1055	1836	-	30949	29064	8303	1426	7540	3508
1st Quarter 2021	Jan-21	592	869	917	1903	631	383	1304	1126	2279	-	27407	30049	8198	1580	7524	4646
2nd Quarter 2021	Apr-21	595	-	928	-	644	-	1393	1306	2826	-	31081	28134	8294	1784	7785	5570
3rd Quarter 2021	Jul-21	576	-	741	-	638	408	896	1079	-	2692	29703	30810	7663	1660	6853	1938
4th Quarter 2021	Oct-21	627	816	723	1810	596	447	1590	1036	-	2540	28330	26395	7908	1192	6891	2033
1st Quarter 2022	Jan-22	591	830	848	1928	606	373	1725	1089	-	3348	28946	30271	8658	1335	6969	3771
2nd Quarter 2022	Apr-22	599	860	825	1820	628	-	1208	1121	-	2421	29165	24240	8905	1221	7219	3776
3rd Quarter 2022	Jul-22	586	849	741	1682	627	-	1658	1058	-	3274	29703	32354	8404	1229	6853	2049
4th Quarter 2022	Oct-22	615	904	-	1731	-	-	1623	1181	-	2984	-	-	9320	-	-	-
1st Quarter 2023	Jan-23	580	818	695	1847	-	371	1365	1093	-	3197	-	36879	7933	1460	6375	3145
2nd Quarter 2023	Apr-23	610	863	852	1932	640	429	1347	1363	-	3796	30738	36915	8562	1759	7339	3697
3rd Quarter 2023	Jul-23	615	927	752	1758	661	374	1108	1222	-	3250	30888	37109	8572	1636	7593	3703
4th Quarter 2023	Oct-23	609	913	706	2821	641	377	1748	1503	-	3335	28104	37716	9212	3105	7887	2974
1st Quarter 2024	Jan-24	601	904	785	2838	632	366	1839	1615	-	2909	28103	36215	10087	4689	7843	3648
2nd Quarter 2024	Apr-24	623	898	870	2667	637	368	1771	1989	-	3019	28649	30691	10233	5340	8810	3893
3rd Quarter 2024	Jul-24	635	669	804	1556	625	340	938	1938	-	3101	28861	34251	8695	4936	4803	2598
4th Quarter 2024	Nov-24	601	841	819	3617	2863	592	2360	1216	-	2102	28907	30271	9534	7911	9302	-

Note:

mg/L = milligrams per liter

µmhos/cm = microhms per centimeter

IWW = industrial waste water

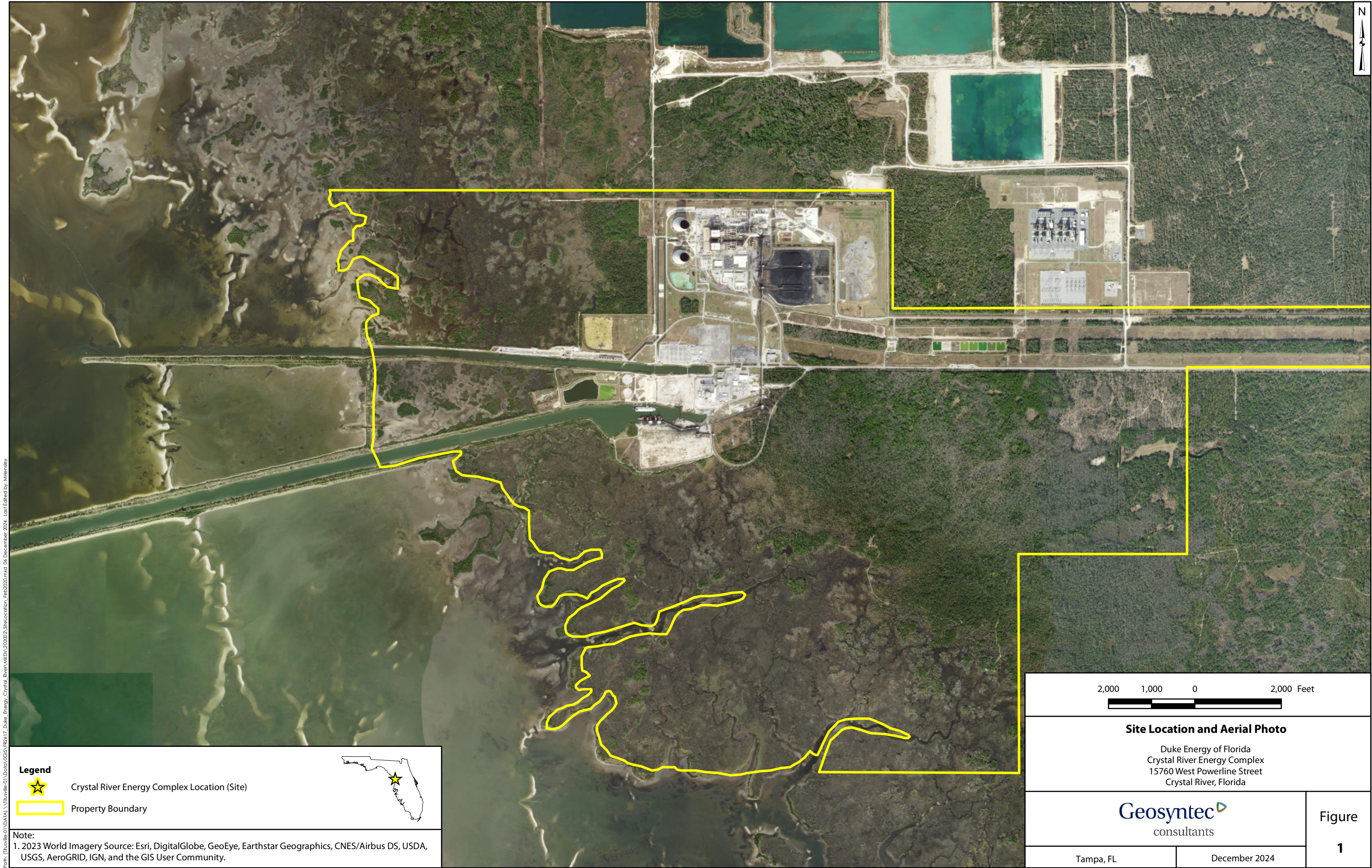
TDS=total dissolved solids

- = not sampled

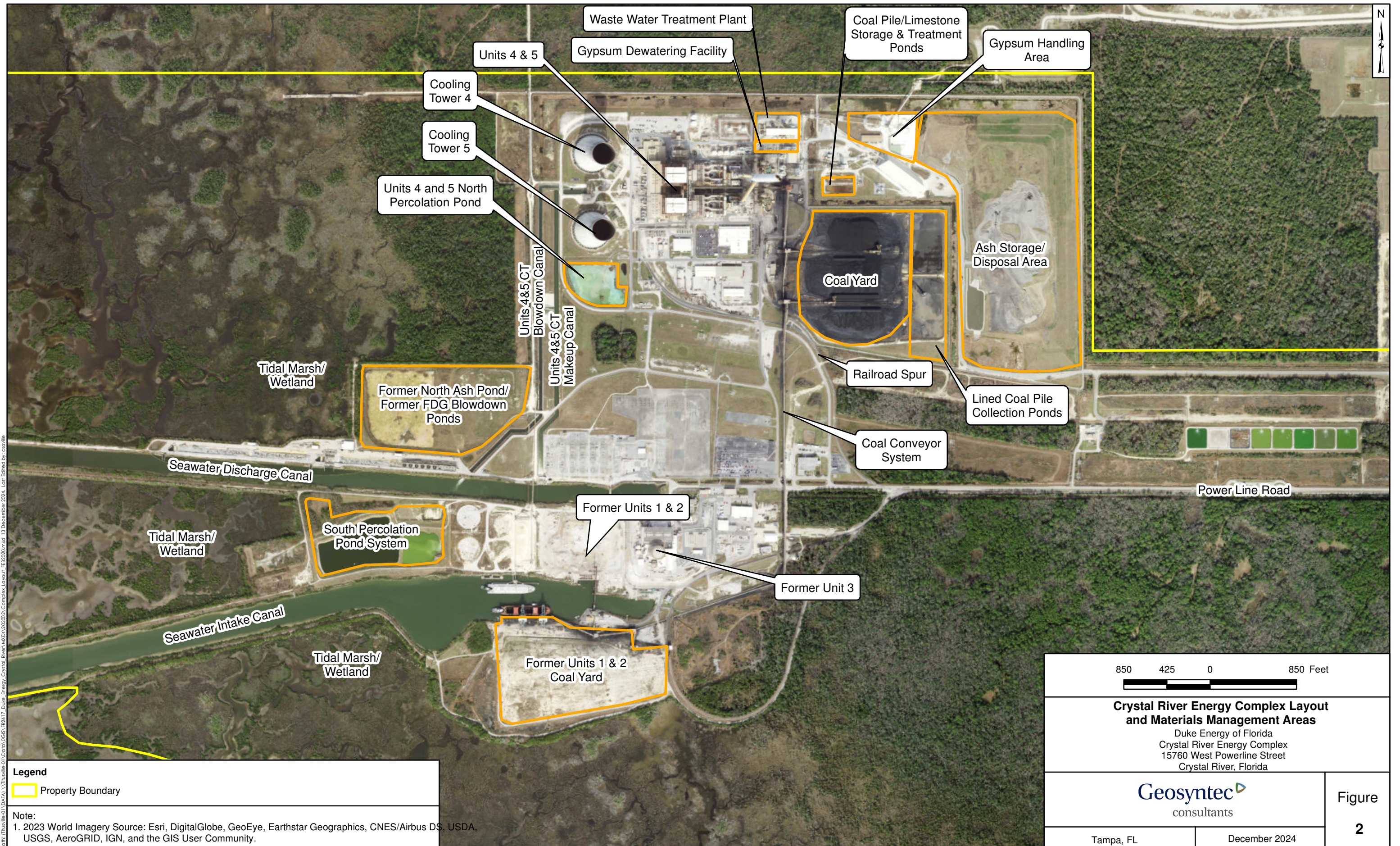
* Results were averaged between two separate sampling events during this quarter

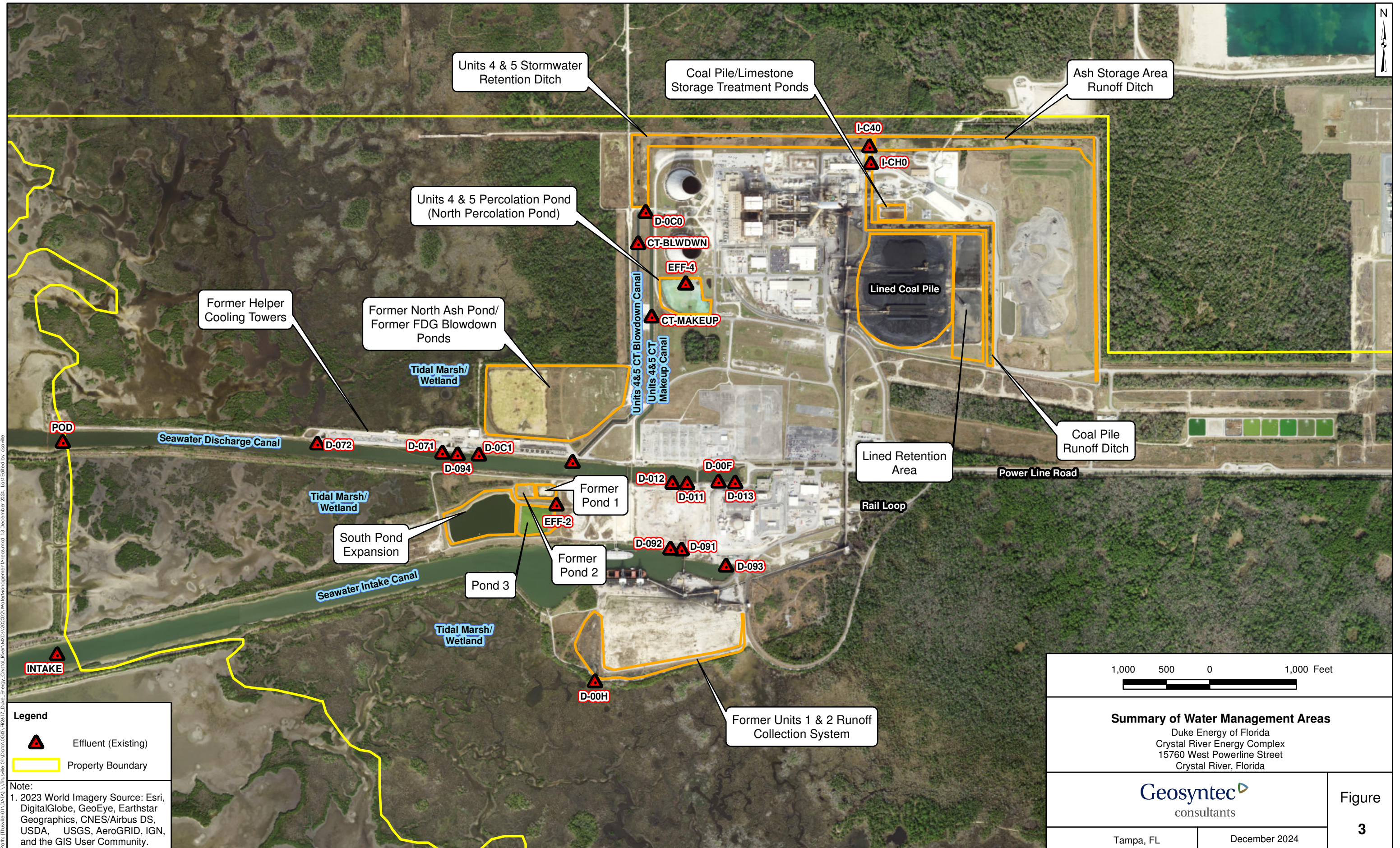
MWC-31 was removed from the Groundwater Monitoring Plan in 2023

FIGURES



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SURFACE BEDS	Era	System	Series	Formation
SUB-SURFACE BEDS	Cenozoic	Quaternary	Recent	Sand, peat and clay, unnamed
			Pleistocene	Lake Flirt marl, of late Wisconsin glacial stage
				Pamlico formation, of Peorian age
				Wicomico formation, of Sangamon age
				Okefenokee formation, of Yarmouth age
				Coharie formation, of Aftonian age
		Tertiary	Miocene	Alachua formation Terrestrial
				? — ? — Hawthorn formation Marine
			Oligocene	Suwannee limestone
			Eocene	Ocala limestone, of Jackson age
				Moody Branch formation Jackson age
				Williston member
				Inglis member
				Avon Park limestone, of Claiborne age
				Lake City limestone, of Claiborne age
				Oldsmar limestone, of Wilcox age
			Paleocene	Cedar Keys formation, of Midway age
				Lawson limestone, of Navarro age
	Mesozoic	Cretaceous	Gulf	Beds of Taylor age
				Beds of Austin age
				Atkinson formation
				Beds of Eagle Ford age
				Beds of Woodbine age
			Comanche?	Undifferentiated shale and sand, "red beds"
			Triassic?	Quartz diabase, possible sill?
			Lower Devonian or Upper Silurian or Lower Ordovician	Possible fault contact

Vernon, R.O. 1951. Geology of Citrus and Levy Counties, Florida. US Geological Survey Bulletin No. 33:17, 186-224.

System	Series	Stratigraphic Unit	General Lithology	Hydrogeologic Unit	
Quaternary	Holocene and Pleistocene	Alluvium and terrace deposits	Sands and clays	Surficial aquifer system	
Tertiary	Pliocene	Alachua Formation	Phosphatic sands and clays	(Of limited areal extent in study area)	
	Miocene	Hawthorn ¹ Group	Phosphatic sands, and clays		
	Eocene	Ocala Limestone	Limestone, fossiliferous to micritic	Floridan aquifer system	Upper Floridan aquifer
		Avon Park Formation	Upper part, limestone and dolostone		Middle confining unit
			Lower part, dolomite with intergranular gypsum; some bedded gypsum, peat and chert		
		Oldsmar Formation	Limestone and dolomite; some evaporites and chert		Lower Floridan aquifer
	Paleocene	Cedar Keys Formation	Dolomite with evaporites		

¹ Based on nomenclature of Scott (1988)

■ Typical open intervals of shallow (S) and deep (D) wells

Sacks, L.A. 1995. Geochemical and Isotopic Composition of Ground Water with Emphasis on Sources of Sulfate in the Upper Floridan Aquifer in Parts of Marion, Sumter, and Citrus Counties, Florida. US Geological Survey Water-Resources Investigations Report 95-4251.

Regional Hydrogeologic Framework

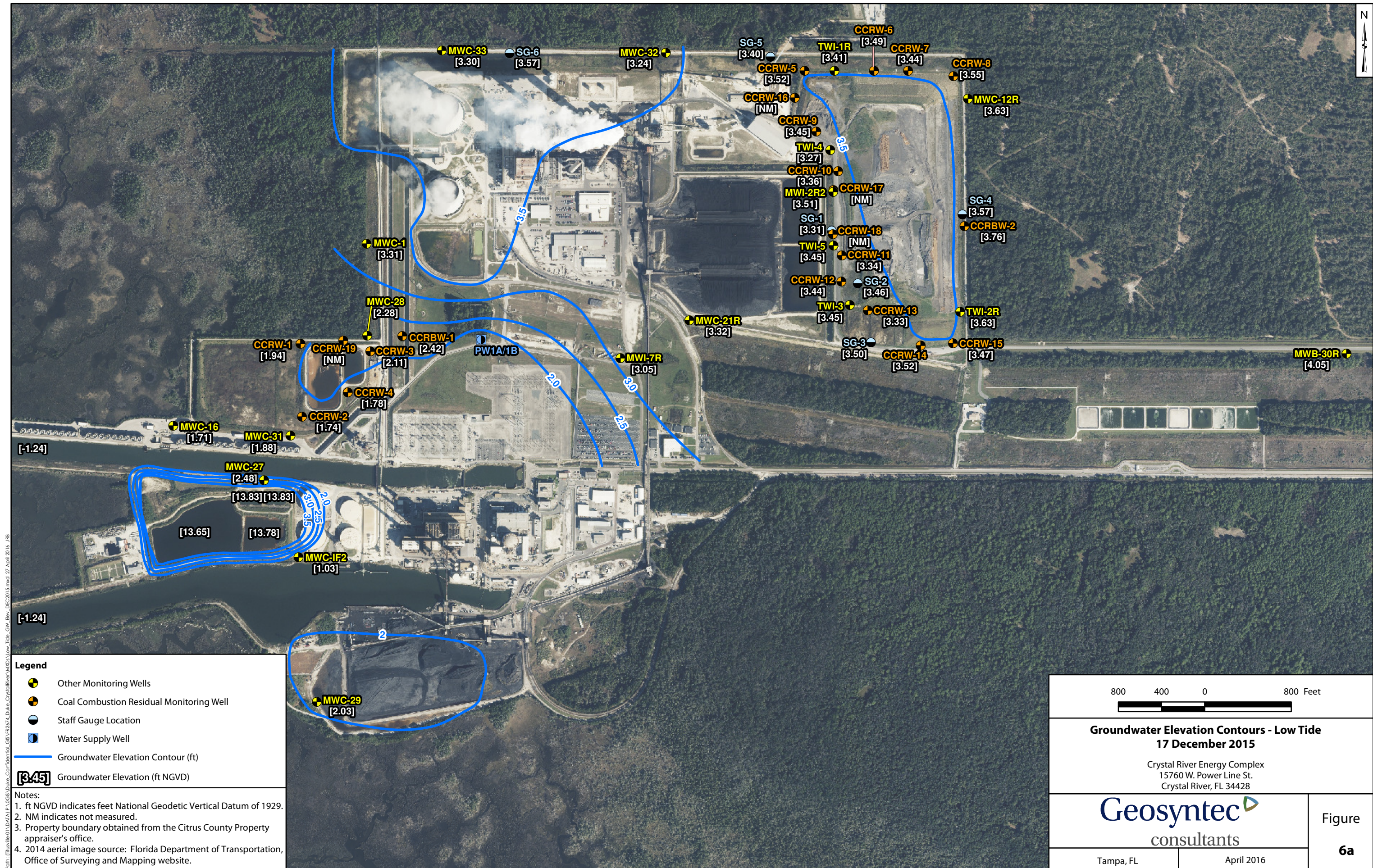
Duke Energy of Florida
Crystal River Energy Complex
15760 West Powerline Street
Crystal River, Florida

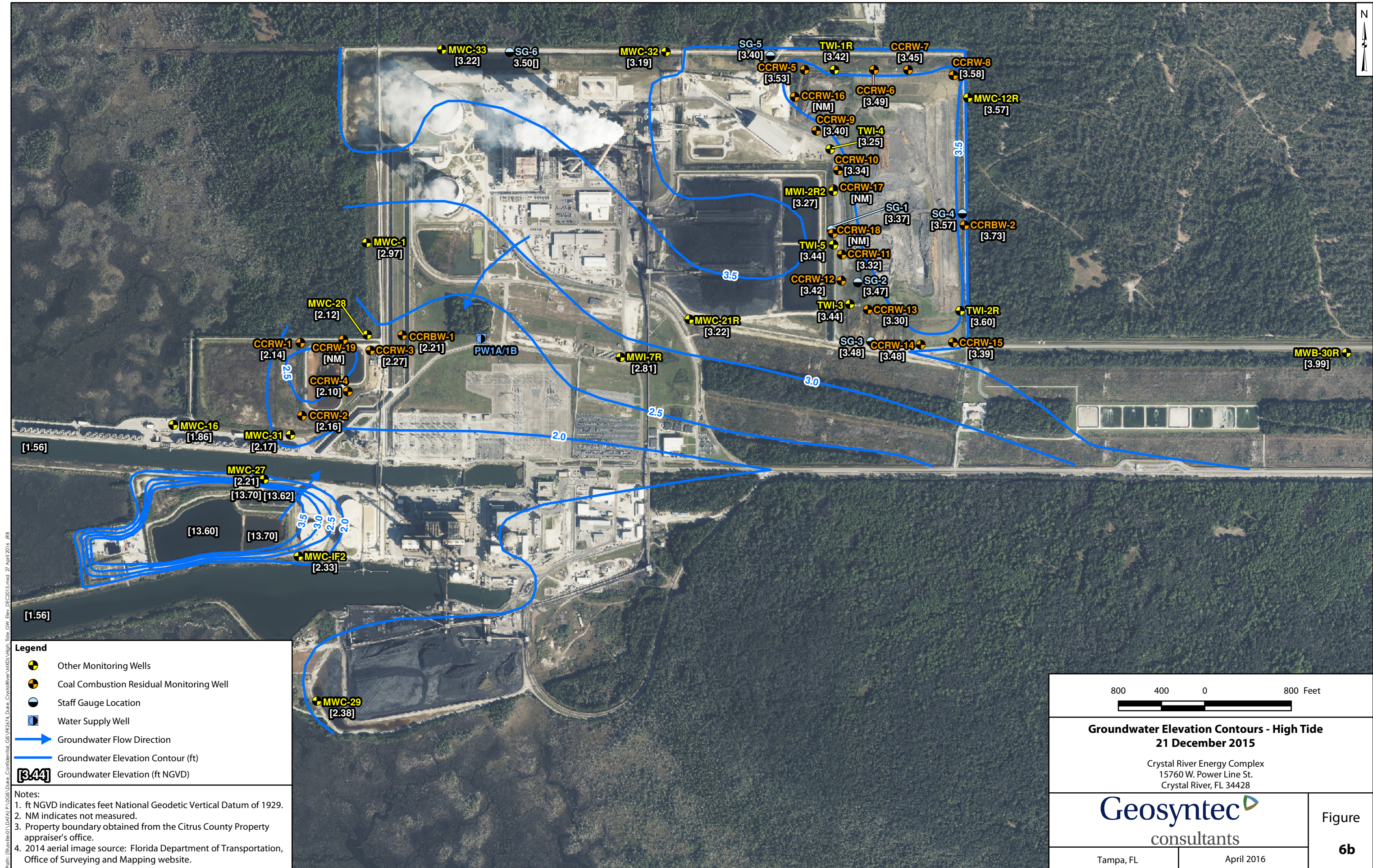
Geosyntec
consultants

Tampa, FL

Figure
5

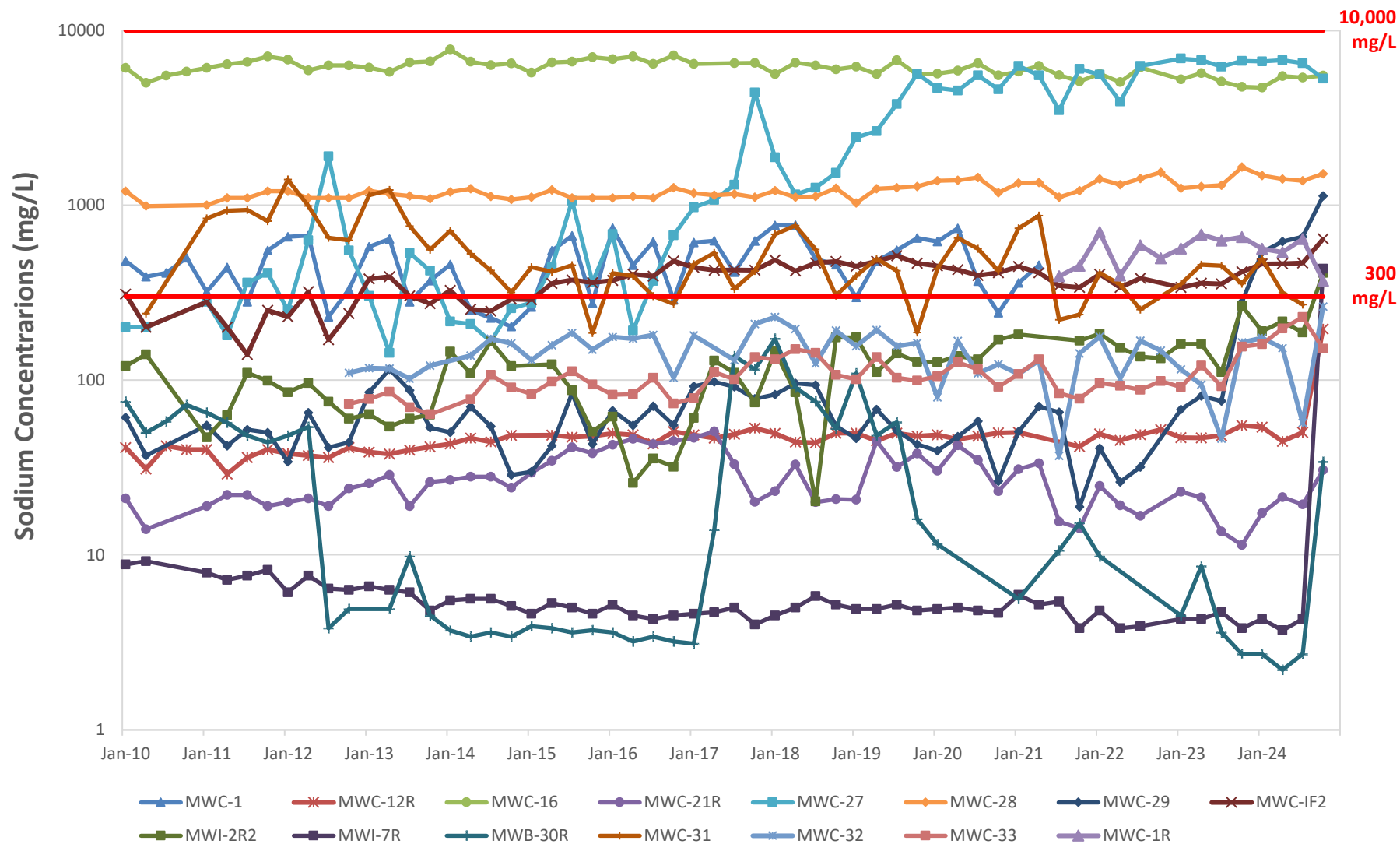
December 2024







Sodium Concentrations Vs. Time



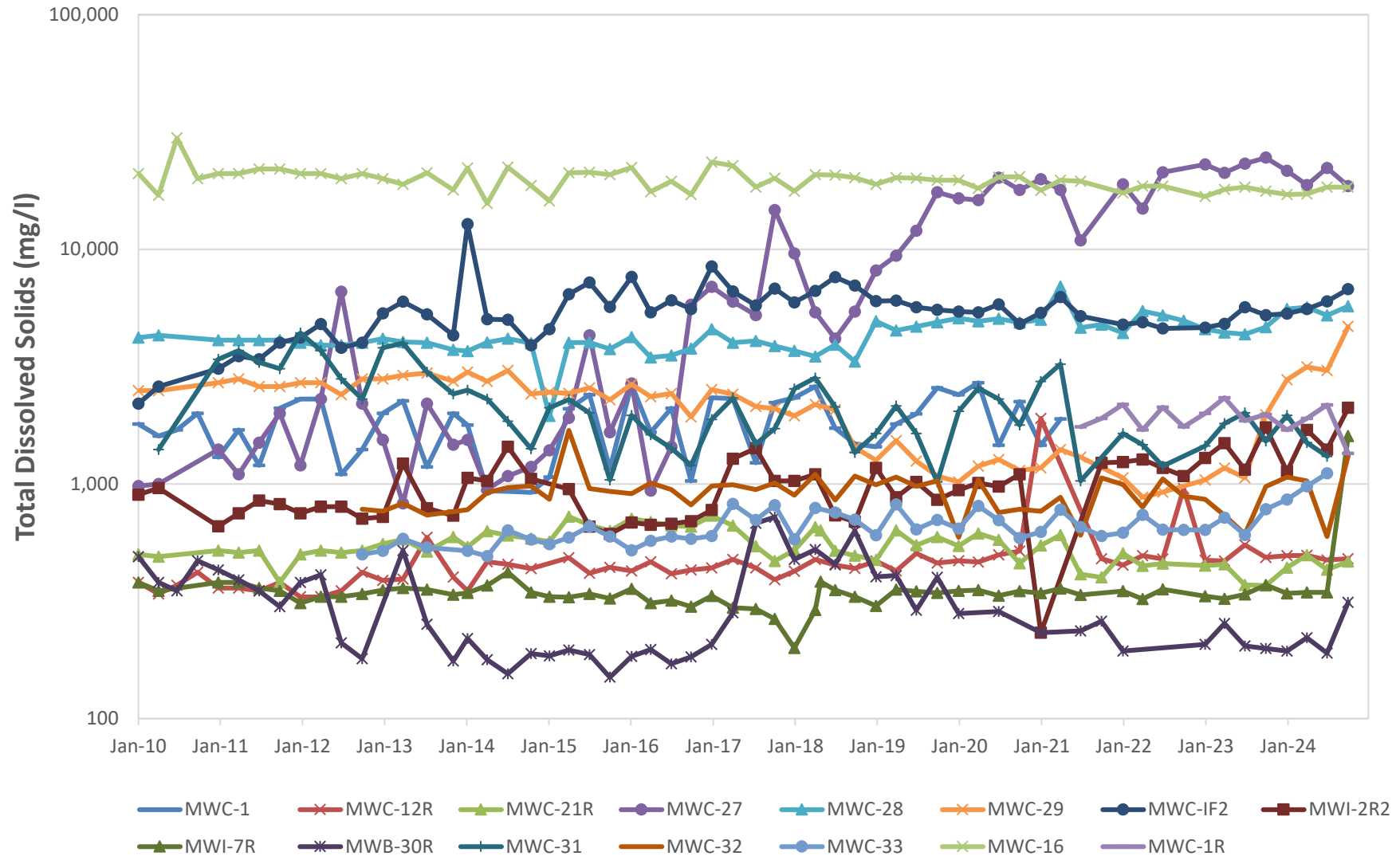
Specific Conductance Vs. Time – 2010 - 2024
DEF - Crystal River Energy Complex

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Temple Terrace, Florida 33637

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December 2024

FIGURE
8

Total Dissolved Solids Vs. Time



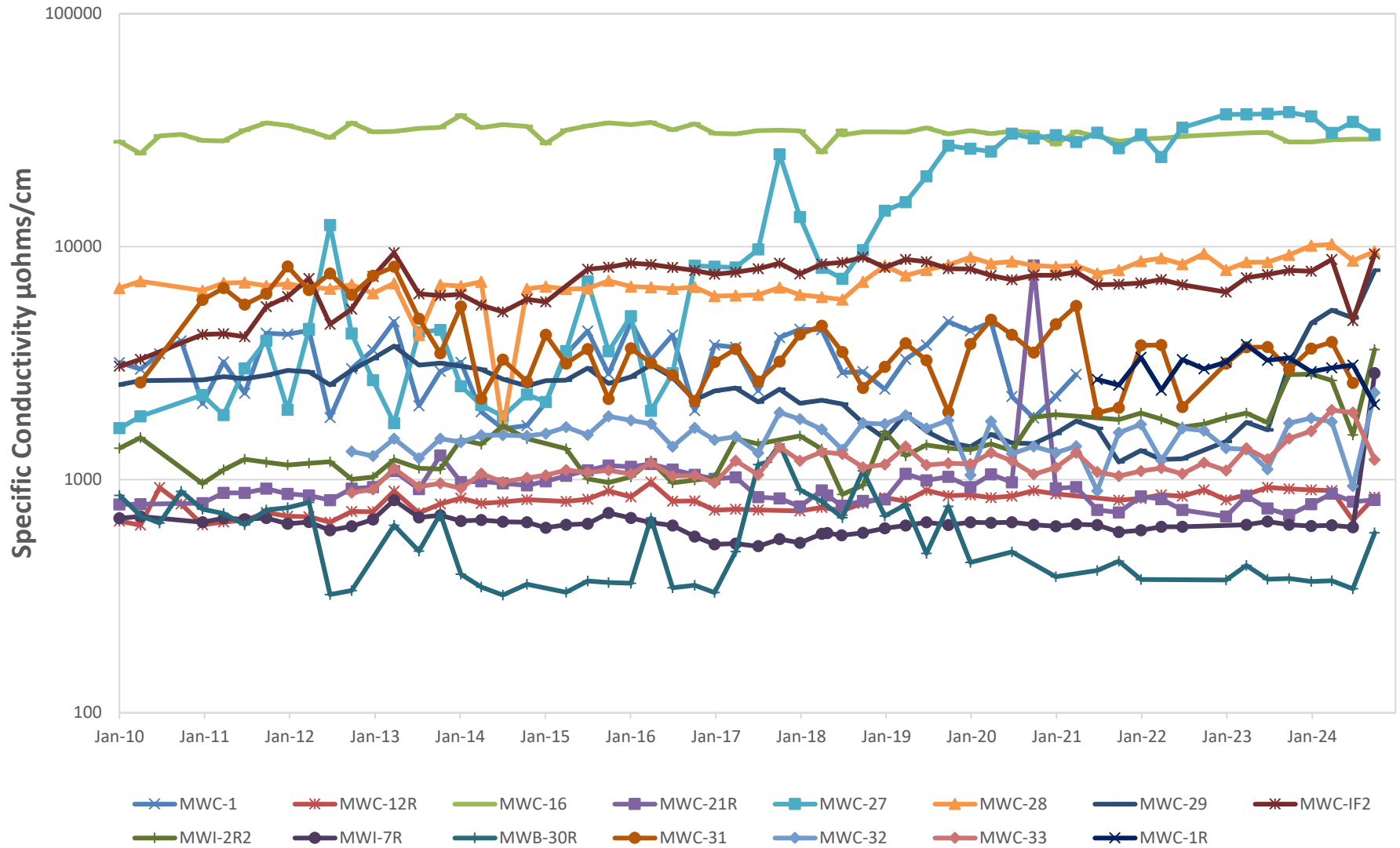
Specific Conductance Vs. Time – 2010 - 2024
DEF - Crystal River Energy Complex

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Temple Terrace, Florida 33637

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FIGURE
9

Specific Conductivity Vs. Time

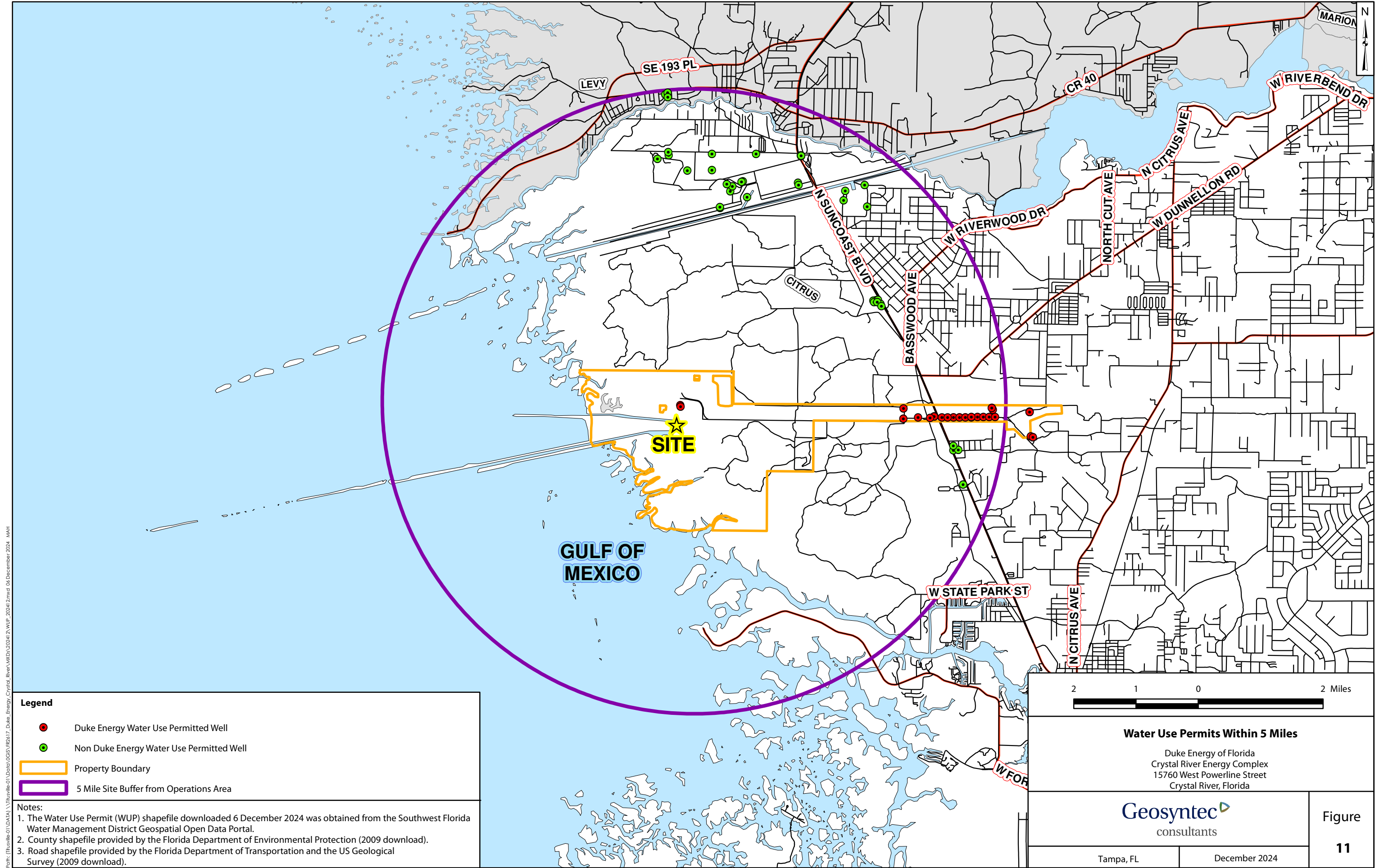


Specific Conductance Vs. Time – 2010 - 2024
DEF - Crystal River Energy Complex

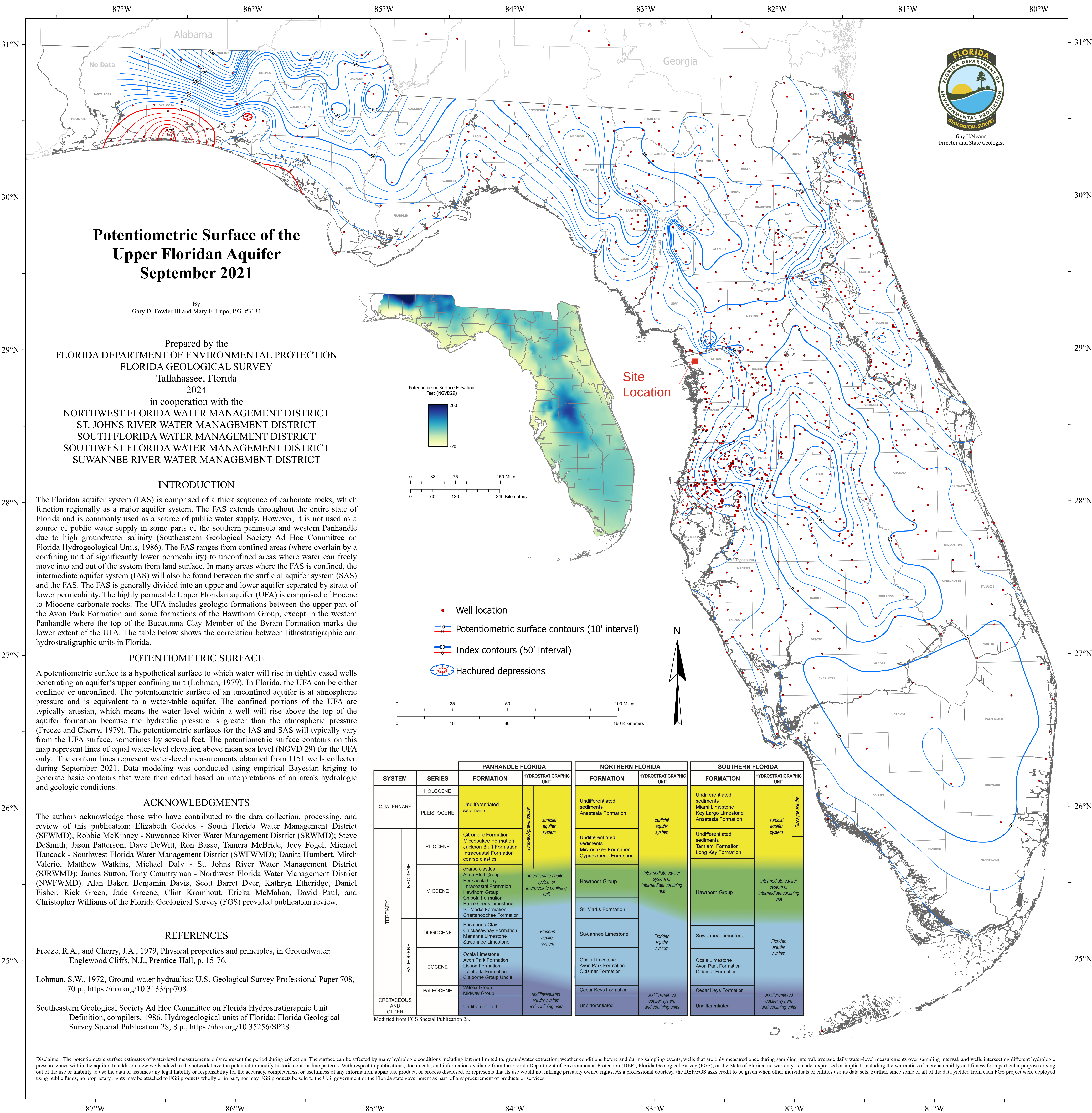
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Temple Terrace, Florida 33637

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FIGURE
10



APPENDIX A
Potentiometric
Surface of the Upper Floridan Aquifer
(Florida Department of Environmental
Protection, Florida Geological Survey,
2021)



Disclaimer: The potentiometric surface estimates of water-level measurements only represent the period during collection. The surface can be affected by many hydrologic conditions including but not limited to, groundwater extraction, weather conditions before and during sampling events, wells that are only measured once during sampling interval, average daily water-level measurements over sampling interval, and wells intersecting different hydrologic pressure zones within the aquifer. In addition, new wells added to the network have the potential to modify historic contour line patterns. With respect to publications, documents, and information available from the Florida Department of Environmental Protection (DEP), Florida Geological Survey (FGS), or the State of Florida, no warranty is made, expressed or implied, including the warranties of merchantability and fitness for a particular purpose arising out of the use or inability to use the data or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. As a professional courtesy, the DEP/FGS asks credit to be given when other individuals or entities use its data sets. Further, since some or all of the data yielded from each FGS project were deployed using public funds, no proprietary rights may be attached to FGS products wholly or in part, nor may FGS products be sold to the U.S. government or the Florida state government as part of any procurement of products or services.

APPENDIX B

Potentiometric Data 1999 - 2024

Appendix B
Potentiometric Data 1999 - 2024
Sodium Evaluation - Crystal River Energy Complex
Crystal River, Florida

Quarter	Date	MWB-1	MWC-1	MWC-1R	MWC-12R	MWC-16	MWC-21R	MWC-27	MWC-28	MWC-29	MWC-IF2	MWI-2R2	MWI-7R	MWB-30R	MWC-31	MWC-32	MWC-33	TWI-1R	TWI-2R	TWI-3	TWI-3R	TWI-4	TWI-5
Ft. NGVD 1929																							
1st Quarter 1999	Jan-99	-	-	-	2.81	0.00	3.15	1.33	1.19	0.52	-	3.22	2.99	-	-	-	-	-	-	-	-	-	-
2nd Quarter 1999	Apr-99	-	-	-	2.52	0.00	2.97	1.38	1.54	1.26	-	3.02	2.74	-	-	-	-	-	-	-	-	-	-
3rd Quarter 1999	Jul-99	-	-	-	3.93	0.96	4.23	1.80	2.43	2.09	-	4.19	4.02	-	-	-	-	-	-	-	-	-	-
4th Quarter 1999	Oct-99	-	-	-	2.80	1.60	3.20	2.30	2.50	2.80	-	3.30	3.00	-	-	-	-	-	-	-	-	-	-
1st Quarter 2000	Jan-00	-	-	-	2.30	0.00	2.80	1.20	1.10	1.10	0.00	2.90	2.60	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2000	Apr-00	-	-	-	2.70	0.00	3.20	1.40	1.50	0.90	0.00	3.20	2.90	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2000	Jul-00	-	-	-	3.10	0.40	3.50	1.60	2.10	1.80	0.00	3.60	3.30	-	-	-	-	-	-	-	-	-	-
4th Quarter 2000	Oct-00	-	-	-	3.50	0.20	3.70	1.50	2.00	1.40	1.50	3.70	3.40	-	-	-	-	-	-	-	-	-	-
1st Quarter 2001	Jan-01	-	-	-	2.10	0.00	2.60	0.90	0.90	0.30	0.00	2.70	2.40	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2001	Apr-01	-	-	-	4.10	0.40	4.10	1.60	1.60	1.90	1.60	4.20	3.90	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2001	Jul-01	-	-	-	3.40	1.00	3.70	1.70	2.20	2.30	2.10	3.70	3.50	-	-	-	-	-	-	-	-	-	-
4th Quarter 2001	Oct-01	-	-	-	3.50	0.00	3.60	1.20	1.30	1.20	0.30	3.60	3.40	-	-	-	-	-	-	-	-	-	-
1st Quarter 2002	Jan-02	-	-	-	2.30	0.00	2.80	1.20	1.00	0.70	0.10	2.80	2.50	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2002	Apr-02	-	-	-	2.80	0.40	3.10	1.60	2.00	1.50	0.60	3.00	2.80	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2002	Jul-02	-	-	-	3.50	0.90	4.20	1.70	2.40	2.30	1.90	4.10	4.00	-	-	-	-	-	-	-	-	-	-
4th Quarter 2002	Oct-02	-	-	-	2.70	1.50	3.70	2.30	2.40	2.70	2.60	3.70	3.50	-	-	-	-	-	-	-	-	-	-
1st Quarter 2003	Jan-03	-	-	-	2.80	-0.40	4.40	1.60	1.80	1.40	-0.30	4.40	4.20	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2003	Apr-03	-	-	-	2.60	-1.00	4.00	1.20	0.80	0.70	-0.10	4.10	0.80	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2003	Jul-03	-	-	-	3.20	1.00	5.80	2.00	2.90	2.60	1.40	5.70	5.50	-	-	-	-	-	-	-	-	-	-
4th Quarter 2003	Oct-03	-	-	-	2.80	0.80	4.00	1.90	2.20	1.70	0.70	4.00	3.80	-	-	-	-	-	-	-	-	-	-
1st Quarter 2004	Jan-04	-	-	-	2.30	-1.20	3.60	1.20	0.80	0.50	-0.50	3.20	2.90	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2004	Apr-04	-	-	-	2.50	0.40	3.60	1.80	1.50	1.60	1.20	3.60	3.60	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2004	Jul-04	-	-	-	2.50	1.20	3.10	2.00	2.00	2.30	2.40	3.00	3.20	-	-	-	-	-	-	-	-	-	-
4th Quarter 2004	Oct-04	-	-	-	2.90	1.40	4.90	1.90	2.20	1.60	0.20	5.00	5.10	-	-	-	-	-	-	-	-	-	-
1st Quarter 2005	Jan-05	-	-	-	2.60	5.00	3.50	1.90	1.60	1.20	0.60	3.50	3.60	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2005	Apr-05	-	-	-	2.80	1.10	3.40	2.10	1.10	2.10	0.10	4.50	4.60	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2005	Jul-05	-	-	-	3.20	1.10	5.00	2.60	2.80	2.80	2.60	5.10	5.10	-	-	-	-	-	-	-	-	-	-
4th Quarter 2005	Oct-05	-	-	-	2.80	1.80	3.30	3.90	2.10	1.70	1.70	3.30	3.30	-	-	-	-	-	-	-	-	-	-
1st Quarter 2006	Jan-06	-	-	-	2.74	6.65	3.45	2.04	1.55	1.42	0.36	3.35	3.49	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2006	Apr-06	-	-	-	2.58	1.23	2.88	2.13	2.03	2.21	1.65	2.79	2.93	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2006	Jul-06	-	-	-	2.72	1.89	3.41	2.18	2.40	2.45	2.57	3.30	3.47	-	-	-	-	-	-	-	-	-	-
4th Quarter 2006	Oct-06	-	-	-	2.69	1.38	3.42	2.04	2.06	3.20	0.50	3.30	3.46	-	-	-	-	-	-	-	-	-	-
1st Quarter 2007	Jan-07	-	-	-	2.79	0.42	4.13	1.97	2.21	1.85	0.62	4.14	4.24	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2007	Apr-07	-	-	-	2.44	0.13	3.27	1.73	1.44	1.35	0.48	3.25	3.34	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2007	Jul-07	-	-	-	2.33	0.82	2.47	2.14	1.88	2.25	1.70	2.28	1.56	-	-	-	-	-	-	-	-	-	-
4th Quarter 2007	Oct-07	-	-	-	2.86	1.23	3.03	2.16	2.40	1.85	1.00	3.13	2.99	-	-	-	-	-	-	-	-	-	-
1st Quarter 2008	Jan-08	-	-	-	2.43	1.24	2.94	1.85	2.06	2.33	2.31	2.90	2.75	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2008	Apr-08	-	-	-	2.67	0.29	3.90	1.81	1.65	1.75	1.36	3.95	4.29	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2008	Aug-08	-	-	-	2.97	1.67	4.03	2.51	2.64	2.50	3.27	3.55	3.86	-	-	-	-	-	-	-	-	-	-
4th Quarter 2008	Oct-08	-	-	-	2.75	0.00	3.18	1.69	1.59	0.74	0.09	2.27	3.21	-	-	-	-	-	-	-	-	-	-
1st Quarter 2009	Jan-09	-	-	-	2.57	0.00	1.36	1.67	1.28	1.13	0.00	0.00	0.69	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2009	Apr-09	-	-	-	1.09	0.71	2.33	2.04	2.06	1.49	1.20	0.36	1.58	-	-	-	-	-	-	-	-	-	-
3rd Quarter 2009	Jul-09	-	-	-	2.94	2.05	3.68	2.89	2.76	2.96	2.23	2.26	2.26	-	-	-	-	-	-	-	-	-	-
4th Quarter 2009	Oct-09	-	-	-	2.84	1.53	3.11	2.66	2.24	1.99	0.61	1.83	2.17	-	-	-	-	-	-	-	-	-	-
1st Quarter 2010	Jan-10	-	-	-	2.97	0.15	3.75	1.89	1.53	1.37	-0.05	2.84	2.46	-	-	-	-	-	-	-	-	-	-
2nd Quarter 2010	Apr-10	-	-	-	2.66	-0.22	4.20	1.54	1.29	0.87	-0.40	3.45	-0.16	-	0.37	-	-	-	-	-	-	-	-
3rd Quarter 2010	Jul-10	-	-	-	2.97	0.73	<4.050	<2.260	<2.160	<2.590	<1.700	<3.140	<2.760	2.84	<1.530	-	-	-	-	-	-	-	-
4th Quarter 2010	Oct-10	-	-	-	2.98	0.48	<3.620	<1.930	<2.110	<1.550	<0.830	<2.710	<2.420	2.43	<1.130	-	-	-	-	-	-	-	-
1st Quarter 2011	Jan-11	-	-	-	3.84	0.57	3.02	1.34	1.60	0.23	0.01	2.20	1.67	1.95	1.12	-	-	-	-	-	-	-	-
2nd Quarter 2011	Apr-11	-	-	-	3.58	0.75	3.76	1.86	1.94	1.73	1.73	2.91	2.22	2.84	1.53	-	-	-	-	-	-	-	-
3rd Quarter 2011	Jul-11	-	-	-	3.63	2.45	3.86	2.04	2.16	1.81	0.51	3.10	2.41	2.78	2.14	-	-	-	-	-	-	-	-
4th Quarter 2011	Oct-11	-	-	-	1.74	1.64	3.13	2.59	2.21	3.31	1.57	1.42	1.72	2.12	2.00	-	-	-	-	-	-	-	-

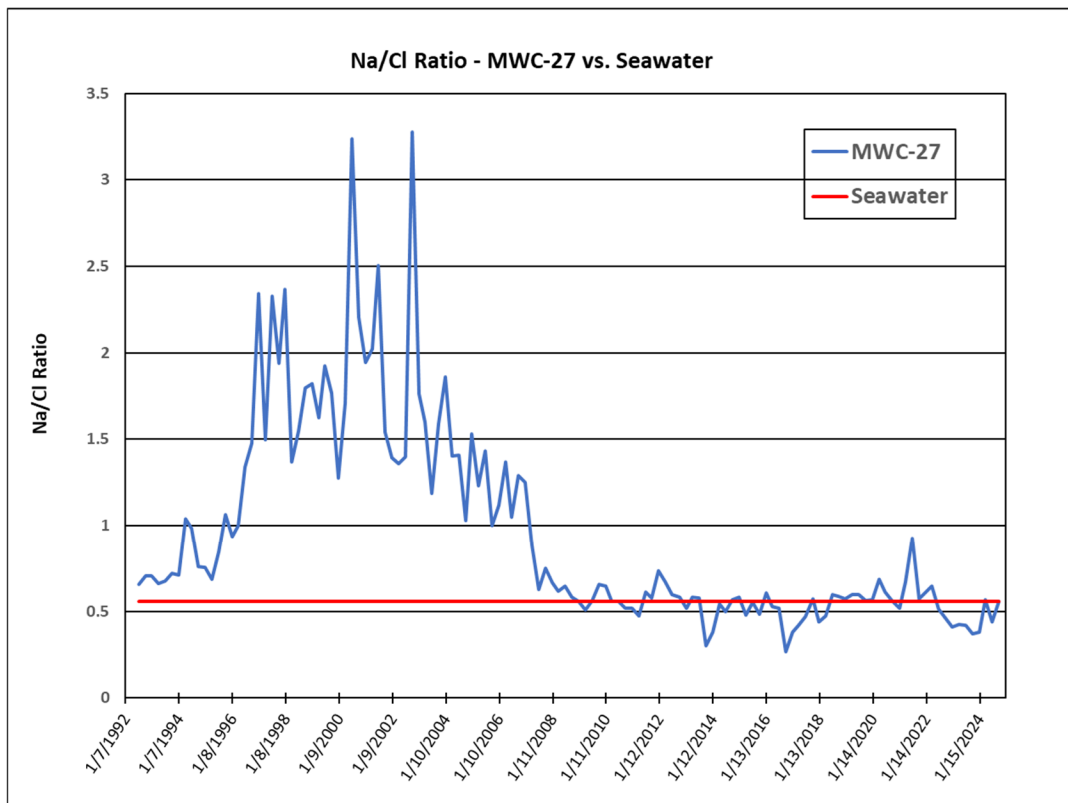
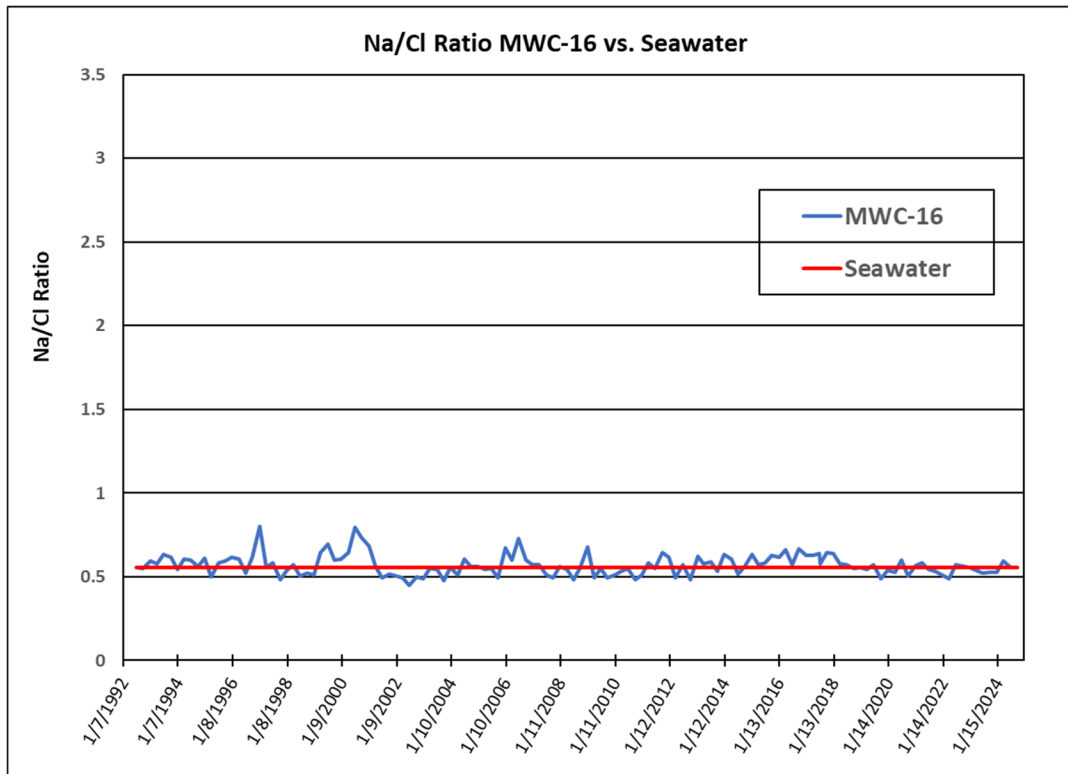
Appendix B
Potentiometric Data 1999 - 2024
Sodium Evaluation - Crystal River Energy Complex
Crystal River, Florida

Quarter	Date	MWB-1	MWC-1	MWC-1R	MWC-12R	MWC-16	MWC-21R	MWC-27	MWC-28	MWC-29	MWC-IF2	MWI-2R2	MWI-7R	MWB-30R	MWC-31	MWC-32	MWC-33	TWI-1R	TWI-2R	TWI-3	TWI-3R	TWI-4	TWI-5
Ft. NGVD 1929																							
1st Quarter 2012	Jan-12	-	-	-	1.57	0.30	2.27	1.51	0.36	1.05	1.10	1.42	1.17	1.22	1.00	-	-	-	-	-	-	-	-
2nd Quarter 2012	Apr-12	-	-	-	1.15	0.33	2.15	1.81	1.56	1.61	0.72	0.94	1.11	0.72	1.10	-	-	-	-	-	-	-	-
3rd Quarter 2012	Jul-12	-	-	-	5.41	0.74	5.07	2.08	2.59	2.86	3.52	3.69	3.82	3.02	1.43	-	-	-	-	-	-	-	-
4th Quarter 2012	Oct-12	-	-	-	4.47	1.26	4.04	1.96	2.24	1.93	1.10	3.30	2.97	2.73	0.92	1.70	1.59	-	-	-	-	-	-
1st Quarter 2013	Jan-13	-	-	-	2.99	0.20	3.34	1.94	1.30	1.87	1.72	1.08	2.06	-	0.92	1.02	0.89	-	-	-	-	-	-
2nd Quarter 2013	Apr-13	-	-	-	2.29	-	-	-	-	-	-	1.51	-	1.58	-	-	-	-	-	-	-	-	-
3rd Quarter 2013	Jul-13	-	-	-	5.17	4.53	4.52	2.14	2.52	2.46	1.26	2.77	1.85	3.62	1.32	2.08	1.79	-	-	-	-	-	-
4th Quarter 2013	Oct-13	-	-	-	4.17	1.97	3.86	2.36	2.28	2.67	1.02	2.17	2.45	-	1.92	1.08	1.63	-	-	-	-	-	-
1st Quarter 2014	Jan-14	-	-	-	3.77	-0.26	3.84	1.76	0.93	1.19	0.83	1.78	2.49	2.36	0.64	1.46	1.36	-	-	-	-	-	-
2nd Quarter 2014	Apr-14	-	-	-	4.26	0.85	4.31	2.15	2.32	1.82	0.94	2.13	2.85	-	1.62	1.89	1.71	-	-	-	-	-	-
3rd Quarter 2014	Jul-14	-	-	-	3.99	1.75	4.61	2.46	2.42	2.15	1.96	2.04	3.30	2.44	2.73	2.16	1.89	-	-	-	-	-	-
4th Quarter 2014	Oct-14	-	-	-	4.44	0.83	4.44	2.28	2.08	1.70	1.26	2.31	3.07	3.03	1.03	1.93	1.69	-	-	-	-	-	-
1st Quarter 2015	Jan-15	-	-	-	4.84	-1.59	3.99	1.77	1.50	0.75	-1.10	2.44	2.54	3.38	-0.26	1.56	1.43	-	-	-	-	-	-
2nd Quarter 2015	Apr-15	-	-	-	3.42	-0.32	3.53	1.76	1.65	1.38	0.26	1.44	2.23	3.21	0.81	1.15	0.97	-	-	-	-	-	-
3rd Quarter 2015	Jul-15	-	-	-	2.09	-1.05	2.38	2.08	5.41	4.53	0.85	0.47	-0.77	1.99	1.84	-0.01	-0.19	-	-	-	-	-	-
4th Quarter 2015	Oct-15	-	-	-	4.39	1.80	4.19	2.50	2.53	2.07	2.59	4.11	2.86	2.85	2.72	1.66	1.54	-	-	-	-	-	-
1st Quarter 2016	Jan-16	-	-	-	3.46	0.36	3.56	2.10	1.97	2.15	0.51	3.31	2.37	2.03	0.95	1.31	1.19	-	-	-	-	-	-
2nd Quarter 2016	Apr-16	-	-	-	3.73	-0.08	3.91	1.88	2.01	1.03	-0.09	3.73	2.54	0.93	0.99	1.46	1.32	-	-	-	-	-	-
3rd Quarter 2016	Jul-16	-	-	-	2.29	0.04	2.77	2.20	1.15	2.25	1.14	2.21	1.76	8.20	1.24	0.58	0.52	-	-	-	-	-	-
4th Quarter 2016	Oct-16	-	-	-	3.79	0.087	4.44	2.22	2.19	2.57	1.44	3.79	2.61	2.41	1.24	1.69	1.69	-	-	-	-	-	-
1st Quarter 2017	Jan-17	-	-	-	3.54	0.92	2.77	2.15	1.75	2.55	1.42	3.56	1.68	1.94	1.37	0.65	0.52	-	-	-	-	-	-
2nd Quarter 2017	Apr-17	-	-	-	2.89	0.80	2.67	1.94	1.68	1.90	1.81	2.99	1.63	-	1.84	0.38	0.29	-	-	-	-	-	-
3rd Quarter 2017	Aug-17	-	-	-	3.37	1.53	2.97	2.25	2.18	2.16	2.56	2.71	2.31	3.18	2.24	1.23	1.09	-	-	-	-	-	-
4th Quarter 2017	Oct-17	-	-	-	3.79	1.37	3.81	2.55	2.85	3.00	1.44	3.56	2.58	3.99	1.72	1.63	1.59	-	-	-	-	-	-
1st Quarter 2018	Jan-18	-	-	-	3.38	-2.20	3.26	1.65	1.40	0.13	-1.81	3.11	1.97	2.20	0.28	1.08	0.97	-	-	-	-	-	-
2nd Quarter 2018	May-18	10.22	-	-	3.39	0.57	3.02	2.07	2.32	1.77	0.84	3.21	1.97	2.05	1.56	0.79	0.71	-	-	-	-	-	-
3rd Quarter 2018	Jul-18	4.85	-	-	3.49	0.72	3.79	2.18	2.20	1.98	1.30	3.41	2.61	2.42	1.62	1.28	1.19	-	-	-	-	-	-
4th Quarter 2018	Oct-18	5.57	-	-	4.04	0.83	3.96	2.15	2.38	2.44	1.67	3.71	2.74	2.41	2.54	1.83	1.71	-	-	-	-	-	-
1st Quarter 2019	Jan-19	6.34	-	-	4.84	0.78	4.34	1.83	2.08	1.38	0.64	4.28	2.95	3.16	1.72	2.13	1.69	-	-	-	-	-	-
2nd Quarter 2019	Apr-19	4.49	-	-	3.71	0.95	3.43	1.85	1.50	1.57	0.99	3.41	2.15	2.20	1.99	1.25	1.07	-	-	-	-	-	-
3rd Quarter 2019	Jul-19	5.44	-	-	4.32	1.70	4.04	2.00	2.26	1.95	1.62	4.36	2.83	2.78	2.79	1.83	1.64	-	-	-	-	-	-
4th Quarter 2019	Oct-19	5.19	-	-	3.94	1.54	3.79	2.42	2.30	3.25	2.67	3.68	2.66	2.41	2.14	1.63	1.52	-	-	-	-	-	-
1st Quarter 2020	Jan-20	4.98	3.00	-	-	1.34	3.97	1.95	1.78	2.73	2.14	3.77	2.70	-	1.94	1.98	1.58	4.47	4.09	3.97	-	3.95	3.69
2nd Quarter 2020	Apr-20	3.47	-	-	2.64	0.79	-	8.94	-	1.70	1.04	2.61	1.93	-	1.33	-	-	3.00	-	3.17	-	2.77	2.53
3rd Quarter 2020	Jul-20	3.28	-	1.86	2.71	0.74	2.32	1.95	0.83	1.99	1.13	2.85	2.03	0.42	1.29	0.77	-	2.14	3.41	3.03	-	2.97	2.83
4th Quarter 2020	Oct-20	-	-	2.11	2.71	-	3.78	-	2.05	-	-	3.83	2.61	-	-	1.50	1.39	2.14	-	3.03	-	2.97	2.83
1st Quarter 2021	Jan-21	3.37	-	-	3.43	-	-	-	-	-	-	2.60	-	1.58	-	-	-	3.27	3.29	2.80	-	2.76	2.25
2nd Quarter 2021	Apr-21	3.85	-	1.76	-	1.08	3.37	1.98	2.05	1.75	0.98	-	2.22	-	1.92	1.10	0.93	-	-	2.64	-	-	-
3rd Quarter 2021	Jul-21	7.18	-	3.00	-	-	5.35	9.00	2.49	9.05	10.31	-	2.71	5.10	5.10	3.17	2.69	-	-	-	-	-	-
4th Quarter 2021	Oct-21	7.31	-	2.53	5.04	1.25	4.44	2.05	2.35	2.03	0.54	4.29	3.26	7.31	1.18	2.31	2.02	5.22	-	-	6.17	4.45	4.25
1st Quarter 2022	Jan-22	4.35	-	1.61	3.49	-0.17	3.39	1.70	1.25	0.95	0.19	3.19	2.18	2.18	0.69	1.23	1.19	3.85	3.70	-	5.09	3.25	3.11
2nd Quarter 2022	Apr-22	7.64	-	2.36	4.64	1.14	4.73	1.13	1.72	2.82	1.96	3.31	3.53	-	1.67	2.41	2.11	5.10	-	-	6.21	4.45	4.21
3rd Quarter 2022	Jul-22	4.42	-	2.20	4.32	1.83	3.79	1.88	2.48	2.20	2.37	3.13	1.66	-	2.87	1.61	1.53	4.49	-	-	-	-	-
4th Quarter 2022	Oct-22	3.40	-	2.05	3.27	-	-	-	2.08	-	-	1.80	-	-	-	1.13	1.04	3.66	-	-	4.94	3.25	3.06
1st Quarter 2023	Jan-23	4.35	-	-	-	-	-	-	-	-	-	-	-	7.10	-	-	-	-	2.74	-	-	-	-
2nd Quarter 2023	Apr-23	-	-	-	1.73	0.25	2.29	1.87	1.56	1.54	0.84	1.80	1.33	0.13	1.06	0.01	-	2.17	11.70	-	3.57	1.97	1.43
3rd Quarter 2023	Jul-23	3.77	-	2.35	5.47	1.02	3.78	1.96	2.82	2.57	1.97	6.91	2.67	6.58	1.34	-	1.33	4.62	9.45	-	6.44	8.85	7.44
4th Quarter 2023	Oct-23	4.54	-	2.17	3.63	-0.05	3.48	1.84	2.00	1.74	1.37	3.33	-	2.18	0.40	-	1.26	3.99	3.67	-	5.15	3.49	3.27
1st Quarter 2024	Jan-24	5.10	-	2.30	4.09	0.49	6.39	1.60	2.19	1.90	1.39	6.78	2.53	2.77	1.14	1.68	1.48	4.00	4.28	-	5.67	3.96	3.80
2nd Quarter 2024	Apr-24	4.80	-	2.30	3.84	1.04	3.99	1.90	2.30	1.69	1.31	3.60	2.62	2.47	2.04	1.78	1.59	4.22	4.02	-	5.35	3.67	3.50
3rd Quarter 2024	Jul-24	3.60	-	2.30	3.71	1.23	3.5	1.79	2.29	1.63	1.24	3.61	2.43	2.08	2.34	1.28	1.18	4.64	9.61	-	5.56	3.71	3.56
4th Quarter 2024	Oct-24	5.75	-	2.13	4.81	0.90	4.53	1.99	2.83	1.94	1.44	3.47	2.42	2.27	-	1.42	1.99	4.21	-	-	5.24	4.41	3.40

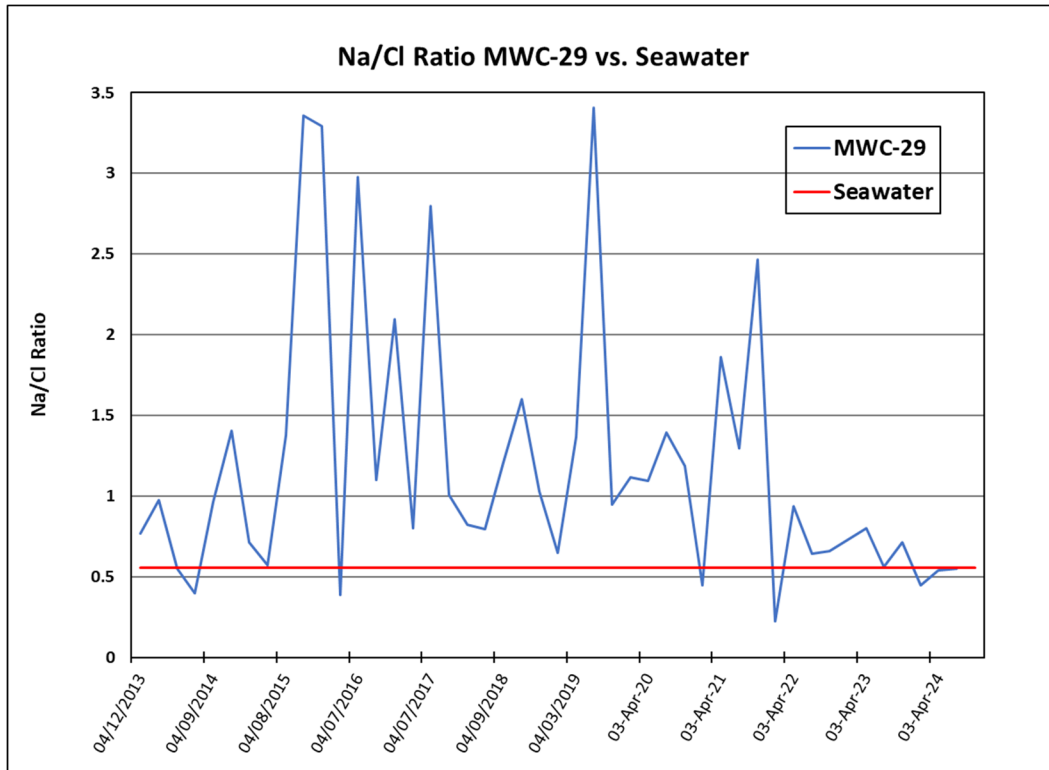
APPENDIX C

Sodium/Chloride Ratios at Select Wells

Appendix C
Na/Cl Ratio Graphs
Duke Energy Florida – Crystal River Energy Complex
Crystal River, Florida



Appendix C
Na/Cl Ratio Graphs
Duke Energy Florida – Crystal River Energy Complex
Crystal River, Florida



Appendix C
Na/CL Ratio Data
Duke Energy Florida – Crystal River Energy Complex
Crystal River, Florida

Sample Quarter	Sample Date	MWC-16			MWC-27			MWC-29		
		Sodium (mg/L)	Chloride (mg/L)	Ratio	Sodium (mg/L)	Chloride (mg/L)	Ratio	Sodium (mg/L)	Chloride (mg/L)	Ratio
1st Quarter 1999	Jan-99	6160	12101	0.51	370	203	1.82	65	-	
2nd Quarter 1999	Apr-99	6420	10000	0.64	439	270	1.63	37	-	
3rd Quarter 1999	Jul-99	6520	9400	0.69	404	210	1.92	32	-	
4th Quarter 1999	Oct-99	7180	12000	0.60	389	220	1.77	26	-	
1st Quarter 2000	Jan-00	6100	10033	0.61	457	358	1.28	33	-	
2nd Quarter 2000	Apr-00	6470	10000	0.65	410	240	1.71	50	-	
3rd Quarter 2000	Jul-00	7960	10000	0.80	356	110	3.24	52	-	
4th Quarter 2000	Oct-00	7140	9700	0.74	353	160	2.21	31	-	
1st Quarter 2001	Jan-01	6720	9800	0.69	389	200	1.95	63	-	
2nd Quarter 2001	Apr-01	6740	12000	0.56	384	190	2.02	37	-	
3rd Quarter 2001	Jul-01	6900	14000	0.49	401	160	2.51	41	-	
4th Quarter 2001	Oct-01	6730	13000	0.52	478	310	1.54	17	-	
1st Quarter 2002	Jan-02	6550	13000	0.50	418	300	1.39	45	-	
2nd Quarter 2002	Apr-02	6920	14000	0.49	449	330	1.36	33	-	
3rd Quarter 2002	Jul-02	6780	15000	0.45	461	330	1.40	24	-	
4th Quarter 2002	Oct-02	6490	13000	0.50	236	72	3.28	17	-	
1st Quarter 2003	Jan-03	6320	13000	0.49	335	190	1.76	17	-	
2nd Quarter 2003	Apr-03	6030	11000	0.55	336	210	1.60	22	-	
3rd Quarter 2003	Jul-03	6500	12000	0.54	356	300	1.19	26	-	
4th Quarter 2003	Oct-03	6180	13000	0.48	286	180	1.59	24	-	
1st Quarter 2004	Jan-04	5580	10000	0.56	316	170	1.86	23	-	
2nd Quarter 2004	Apr-04	6470	12600	0.51	323	230	1.40	28	-	
3rd Quarter 2004	Jul-04	7600	12600	0.60	310	220	1.41	33	-	
4th Quarter 2004	Oct-04	6500	11600	0.56	370	360	1.03	14	-	
1st Quarter 2005	Jan-05	6700	12000	0.56	260	170	1.53	18	-	
2nd Quarter 2005	Apr-05	6000	11000	0.55	320	260	1.23	31	-	
3rd Quarter 2005	Jul-05	6600	12000	0.55	330	230	1.43	25	-	
4th Quarter 2005	Oct-05	6400	13000	0.49	340	340	1.00	27	-	
1st Quarter 2006	Jan-06	6700	10000	0.67	580	520	1.12	37	-	
2nd Quarter 2006	Apr-06	6600	11000	0.60	370	270	1.37	71	-	
3rd Quarter 2006	Jul-06	8000	11000	0.73	440	420	1.05	38	-	
4th Quarter 2006	Oct-06	7200	12000	0.60	310	240	1.29	37	-	
1st Quarter 2007	Jan-07	6300	11000	0.57	350	280	1.25	40	-	
2nd Quarter 2007	Apr-07	5700	10000	0.57	300	340	0.88	39	-	
3rd Quarter 2007	Jul-07	6100	12000	0.51	750	1200	0.63	72	-	
4th Quarter 2007	Oct-07	5900	12000	0.49	480	640	0.75	42	-	
1st Quarter 2008	Jan-08	6700	12000	0.56	200	300	0.67	42	-	
2nd Quarter 2008	Apr-08	6000	11000	0.55	270	440	0.61	29	-	
3rd Quarter 2008	Aug-08	5800	12000	0.48	270	420	0.64	28	-	
4th Quarter 2008	Oct-08	5100	9200	0.55	320	550	0.58	41	-	
1st Quarter 2009	Jan-09	6800	10000	0.68	290	520	0.56	90	-	
2nd Quarter 2009	Apr-09	5900	12000	0.49	340	670	0.51	97	-	
3rd Quarter 2009	Jul-09	6600	12000	0.55	280	500	0.56	74	-	
4th Quarter 2009	Oct-09	7400	15000	0.49	230	350	0.66	66	-	
1st Quarter 2010	Jan-10	6100	12000	0.51	200	310	0.65	61	-	
2nd Quarter 2010	Apr-10	5000	9400	0.53	200	360	0.56	37	-	
3rd Quarter 2010	Jul-10	5500	10000	0.55	240	430	0.56	<59	-	
4th Quarter 2010	Oct-10	5800	12000	0.48	570	1100	0.52	<48	-	
1st Quarter 2011	Jan-11	6100	12000	0.51	280	540	0.52	55	-	
2nd Quarter 2011	Apr-11	6400	11000	0.58	180	380	0.47	42	-	
3rd Quarter 2011	Jul-11	6600	12000	0.55	360	590	0.61	52	-	
4th Quarter 2011	Oct-11	7100	11000	0.65	410	710	0.58	50	-	

Appendix C
Na/CL Ratio Data
Duke Energy Florida – Crystal River Energy Complex
Crystal River, Florida

Sample Quarter	Sample Date	MWC-16			MWC-27			MWC-29		
		Sodium (mg/L)	Chloride (mg/L)	Ratio	Sodium (mg/L)	Chloride (mg/L)	Ratio	Sodium (mg/L)	Chloride (mg/L)	Ratio
1st Quarter 2012	Jan-12	6800	11000	0.62	250	340	0.74	34	-	
2nd Quarter 2012	Apr-12	5900	12000	0.49	630	940	0.67	65	-	
3rd Quarter 2012	Jul-12	6300	11000	0.57	1900	3200	0.59	41	-	
4th Quarter 2012	Oct-12	6300	13000	0.48	550	950	0.58	44	-	
1st Quarter 2013	Jan-13	6110	9800	0.62	303	584	0.52	85	111	0.77
2nd Quarter 2013	Apr-13	5780	10000	0.58	143	246	0.58	115	118	0.97
3rd Quarter 2013	Jul-13	6550	11100	0.59	532	926	0.57	87	158	0.55
4th Quarter 2013	Oct-13	6630	12500	0.53	422	1410	0.30	53	133	0.40
1st Quarter 2014	Jan-14	7770	12300	0.63	216	567	0.38	50	52	0.97
2nd Quarter 2014	Apr-14	6610	10900	0.61	209	387	0.54	70	50	1.41
3rd Quarter 2014	Jul-14	6320	12200	0.52	166	332	0.50	54	76	0.71
4th Quarter 2014	Oct-14	6460	11500	0.56	257	452	0.57	29	50	0.57
1st Quarter 2015	Jan-15	5720	9030	0.63	276	474	0.58	30	22	1.38
2nd Quarter 2015	Apr-15	6550	11400	0.57	442	921	0.48	42	13	3.36
3rd Quarter 2015	Jul-15	6620	11400	0.58	1060	1920	0.55	84	26	3.29
4th Quarter 2015	Oct-15	7030	11200	0.63	363	753	0.48	43	111	0.39
1st Quarter 2016	Jan-16	6850	11100	0.62	683	1130	0.60	67	22	2.98
2nd Quarter 2016	Apr-16	7090	10700	0.66	192	364	0.53	55	50	1.10
3rd Quarter 2016	Jul-16	6420	11200	0.57	369	715	0.52	71	34	2.09
4th Quarter 2016	Oct-16	7180	10800	0.66	672	2510	0.27	55	69	0.80
1st Quarter 2017	Jan-17	6420	10200	0.63	972	2570	0.38	92	33	2.80
2nd Quarter 2017	Apr-17	6865	11000	0.62	1070	2560	0.42	98	97	1.01
3rd Quarter 2017	Jul-17	6500	11200	0.58	1310	2790	0.47	91	111	0.82
4th Quarter 2017	Oct-17	6520	10100	0.65	4400	7730	0.57	78	98	0.80
1st Quarter 2018	Jan-18	5610	8760	0.64	1880	4310	0.44	83	68	1.21
2nd Quarter 2018	Apr-18	6540	11300	0.58	1150	2440	0.47	96	60	1.60
3rd Quarter 2018	Jul-18	6300	11000	0.57	1260	2110	0.60	94	91	1.03
4th Quarter 2018	Oct-18	5980	10900	0.55	1530	2600	0.59	55	84	0.65
1st Quarter 2019	Jan-19	6200	11200	0.55	2440	4270	0.57	46	34	1.36
2nd Quarter 2019	Apr-19	5610	10300	0.54	2650	4460	0.59	68	20	3.41
3rd Quarter 2019	Jul-19	6740	11800	0.57	3790	6380	0.59	51	54	0.95
4th Quarter 2019	Oct-19	5580	11400	0.49	5630	10000	0.56	43	38	1.11
1st Quarter 2020	Jan-20	5660	10500	0.54	4670	8270	0.56	39	36	1.09
2nd Quarter 2020	Apr-20	5880	11100	0.53	4530	8570	0.53	47	34	1.39
3rd Quarter 2020	Jul-20	6490	10800	0.60	5530	10600	0.52	58	49	1.19
4th Quarter 2020	Oct-20	5520	10900	0.51	4600	9810	0.47	26	59	0.45
1st Quarter 2021	Jan-21	5800	10200	0.57	6250	11200	0.56	51	27	1.86
2nd Quarter 2021	Apr-21	6250	10700	0.58	5520	9320	0.59	71	54	1.30
3rd Quarter 2021	Jul-21	5540	10200	0.54	3490	5990	0.58	65	27	2.47
4th Quarter 2021	Oct-21	5100	9600	0.53	6020	8950	0.67	19	85	0.22
1st Quarter 2022	Jan-22	5640	-	-	5580	-	-	41	44	0.94
2nd Quarter 2022	Apr-22	5050	10300	0.49	3920	7850	0.50	26	41	0.64
3rd Quarter 2022	Jul-22	6130	10700	0.57	6260	12000	0.52	32	48	0.66
4th Quarter 2022	Oct-22	-	-	-	-	-	-	-	-	-
1st Quarter 2023	Jan-23	5250	9440	0.56	6900	12800	0.54	68	84	0.80
2nd Quarter 2023	Apr-23	5700	10600	0.54	6740	13400	0.50	81	144	0.56
3rd Quarter 2023	Jul-23	5090	9800	0.52	6200	12100	0.51	76	106	0.72
4th Quarter 2023	Oct-23	4750	9040	0.53	6680	12800	0.52	279	624	0.45
1st Quarter 2024	Jan-24	4710	8910	0.53	6640	12400	0.54	537	997	0.54
2nd Quarter 2024	Apr-24	5480	9220	0.59	6750	9660	0.70	620	1130	0.55
3rd Quarter 2024	Jul-24	5370	9690	0.55	6490	12300	0.53	660	-	-
4th Quarter 2024	Nov-24	5500	9890	0.56	5300	9910	0.53	-	-	-

Note:
mg/L = milligrams per liter
- = not sampled
Seawater ratio = 0.56

APPENDIX D

Water Supply Authority Plan Information

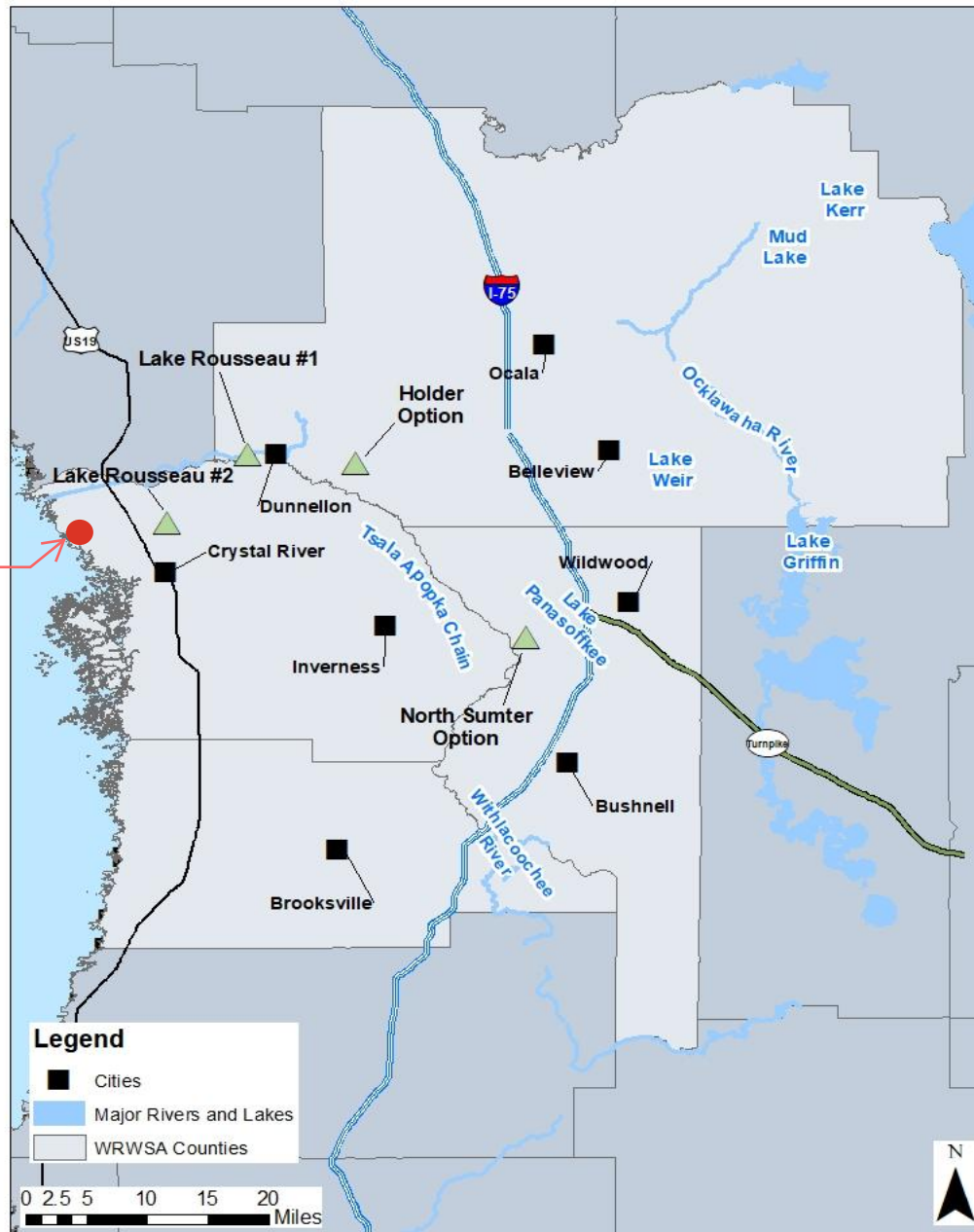


Figure 5-6. Proposed Location of the Withlacoochee River Water Supply Project Options.

Three criteria were utilized to determine specific locations for the facilities:

- public ownership to limit land acquisition costs;
- site of sufficient size to accommodate facilities necessary for supply from the particular river reach (treatment plant, reservoir, etc.); and,
- site in close proximity to the raw water intake and have road access.

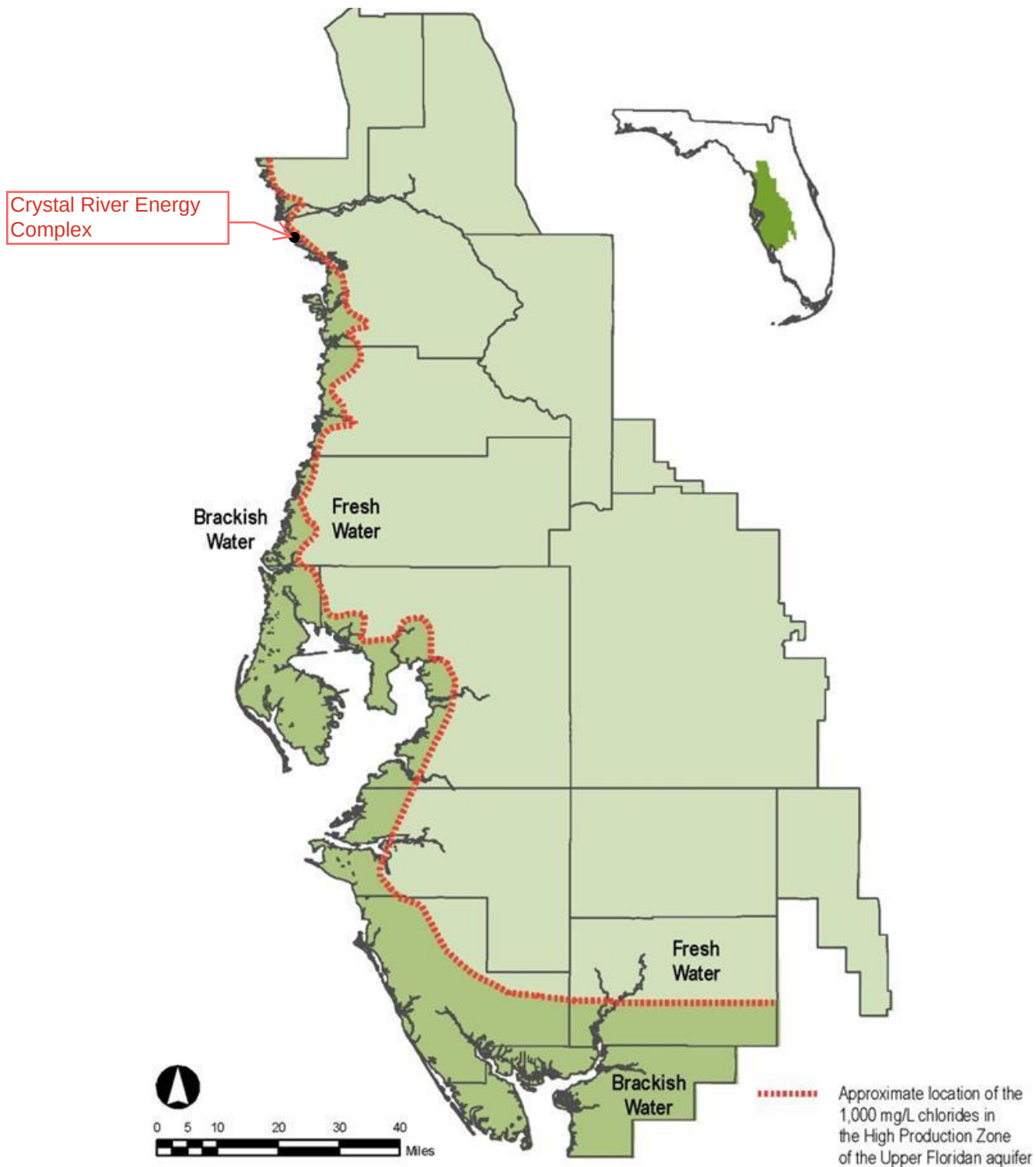


Figure 4-4. Generalized location of the freshwater/saltwater interface in the District