FPL

September 5, 2014

Mr. Justin Green
Program Administrator
Siting Coordination Office
Florida Department of Environmental Protection
3900 Commonwealth Blvd.
Tallahassee, FL 32399-3000

RE: Florida Power & Light Company
Turkey Point Plant PA 03-45D
Unit 3 and 4 Nuclear Plant; Unit 5 Combined Cycle Plant
Request for Site Certification Modification
Additional Consumptive Use

Dear Mr. Green:

Florida Power & Light Company (FPL) is pleased to submit to the Florida Department of Environmental Protection (FDEP), a petition for modification of the Site Certification associated with the Turkey Point Plant. This request is being made pursuant to Section 403.516, Florida Statutes, and Rule 62-17.211, of the Florida Administrative Code (F.A.C.).

FPL is submitting this petition for modification of the Site Certification to allow, three system improvement projects. The three projects include: 1) installation of up to six new production wells that will discharge approximately 14 MGD of Upper Floridan Aquifer water into the CCS, 2) utilize one of the new production wells (as described above) as a dual purpose well to comply with the Nuclear Regulatory Commission (NRC) Order EA-12-049 (Fukushima); requiring nuclear generating facilities to comply with additional requirements to mitigate beyond-design-basis external events, and 3) re-allocation of authorized water withdrawn from the Upper Floridan Aquifer associated with an existing Unit 5 well (No.3).

FPL is requesting modification to South Florida Water Management District conditions:

- Condition XII, B. Water Use Authorizations
- Condition XII, C. Site Specific Design Authorizations

The petition for modification describes the Project, the proposed modifications and addresses the environmental aspects by presenting information on the existing natural and human environments and the impacts of the installation of the new wells. This modification provides the required information and is formatted in a similar manner as the Turkey Point Uprate Site Certification Application (SCA), dated January 18, 2008. The information has also been reviewed for consistency and in accordance with the FDEP's draft Application Instruction Guide: Electrical Power Plant Sites and Associated Facilities Electrical Transmission Lines".

Thank you for your attention to and consideration of FPL's request to modify the Site Certification for the FPL Turkey Point Plant. If you have any questions regarding this submittal, please do not hesitate to contact me at (561) 691-2808 or Stacy Foster at 561-691-7065.

Sincerely,
Florida Power & Light Company

Matthew J. Raffenberg
Director, Environmental Licensing and Permitting

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1.0 NEED FOR THE PROPOSED FACILITIES

Florida Power & Light Company (FPL) is seeking to modify the site certification (PA 03-45D) for the Turkey Point Plant (Plant). This section of the petition for modification to the site certification provides an overview of the Project(s).

1.1 Facility Introduction

The five existing generation units and support facilities occupy approximately 9,400 acres of the Plant property. The existing Plant consists of one nominal 400-megawatt (MW) natural gas/oil steam electric generating unit (Unit 1), which has operated under existing state and local environmental permits since 1967; Unit 2, which currently operates in a synchronous condenser mode (to provide voltage support for the transmission system); two (approximately 825 MW each) nuclear units (Units 3 and 4) that have been in service since 1972 and 1973 and were certified in October 2008; and a nominal 1,150-MW natural gas-fired combined-cycle unit (Unit 5) that has been in operation since 2007 and was certified in February 2005 (Figure 1.1-1).

Support facilities include service buildings, an administration building, fuel oil tanks, water treatment facilities, circulating water intake and outfall structures, wastewater treatment basins, and a system substation. The cooling canal system (CCS) occupies approximately 5,900 acres. The CCS is used by Units 1 through 4 for condenser and auxiliary cooling and by all five existing units for wastewater treatment (also referred to as the permitted industrial wastewater [IWW] facility). Unit 5 has mechanical draft cooling towers for the steam generation cycle that uses water from three Upper Floridan Aquifer wells for makeup water. Cooling tower blowdown water is routed to the CCS. The heated water in the CCS travels southward along the distribution canals on the west side of the CCS and northward back to the Plant along the return canals on the east side of the CCS. Primarily, water is cooled by evaporation and mixing with inflowing water. CCS water loses include evaporation and seepage; inputs include process water, rainfall, stormwater runoff, ground water inflow, and periodic pumpage from the interceptor ditch system. Although outside of a certified boundary, the closed-loop CCS is an integral component of the existing Plant and is an associated facility under the existing Site Certification and Conditions of Certification.

1.2 The Applicant

FPL is the largest electric utility in the state of Florida. FPL served approximately 4.6 million customer accounts in all or parts of 35 Florida counties during 2013. The existing FPL generating resources are located at 14 generating sites distributed geographically around the FPL service territory (Figure 1.2-1), plus one site in Georgia (partial FPL ownership of one unit) and one unit in Jacksonville, Florida (partial FPL ownership of two units). The current electrical generating facilities consist of four nuclear units, three coal units, 16 combined cycle units, five fossil steam units, 48 combustion gas turbines, two simple cycle combustion turbines, and two photovoltaic facilities. FPL's total system firm generation capability is 24,239 MW. This diverse mix of generating technologies allows FPL to meet the needs of its customers and provides operating reliability, flexibility, and the opportunity to minimize fuel costs, by being less reliant on any single source of fuel.

1.3 Overview of the Project(s)

FPL is proposing three system improvement projects that will reflect in modifications to the Site Certification and Conditions of Certification associated with the Turkey Point Power Plant. The three projects include: 1) installation of up to six new production wells that will discharge approximately 14 MGD of Upper Floridan Aquifer water into the CCS, 2) utilize one of the new production wells (as described above) as a dual purpose well to comply with the NRC Order EA-12-049 (Fukushima); requiring nuclear generating facilities to comply with additional requirements to mitigate beyond-design-basis external events, and 3) re-allocation of authorized water withdrawn from the Upper Floridan Aquifer associated with an existing Unit 5 well (No.3).

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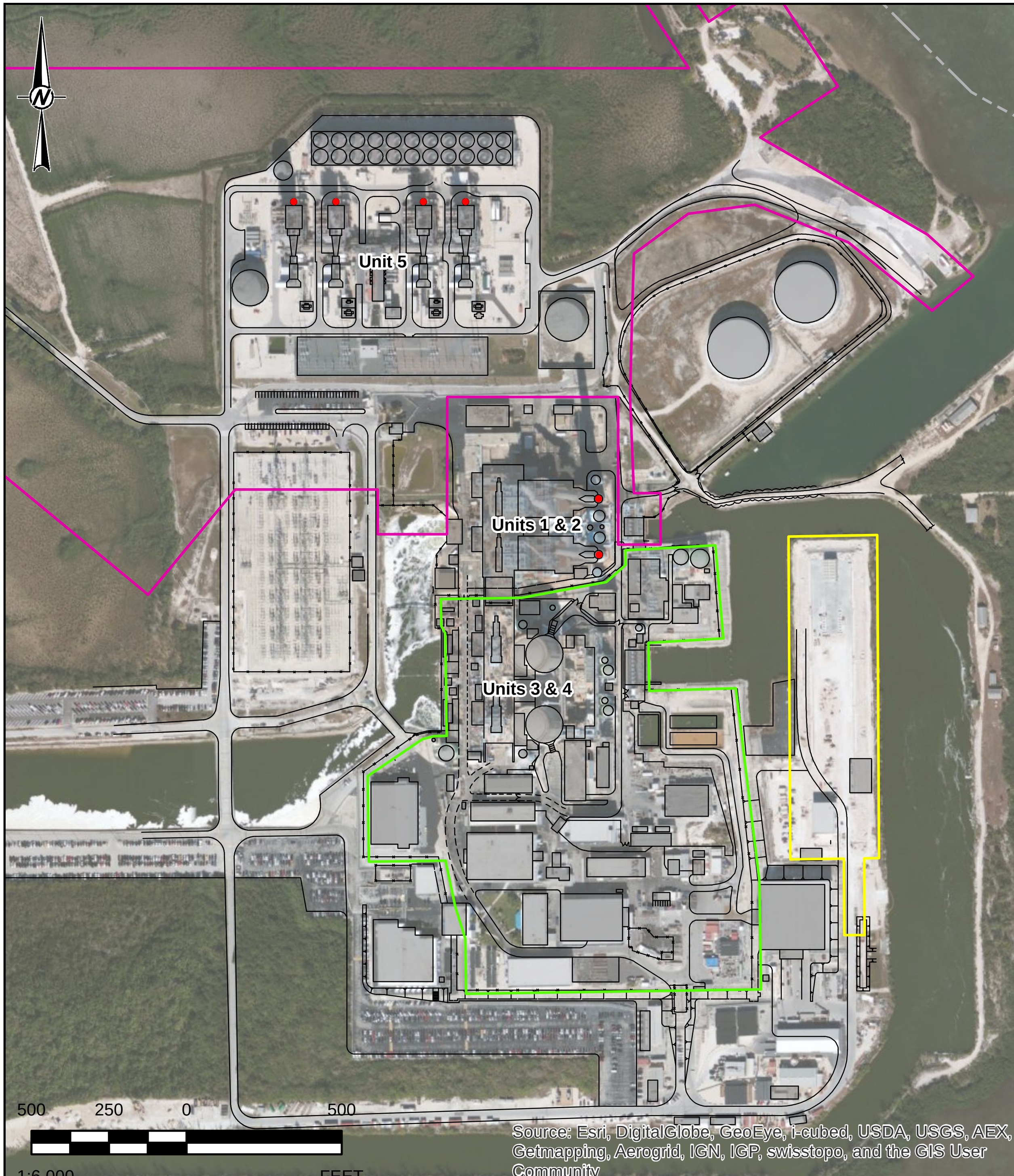

LEGEND

- Stack Locations
- Facility Layout
- Turkey Point Plant Property Boundary
- ISFSI Storage Building Certified Area
- Unit 5 Certified Area
- Units 3 & 4 Certified Area

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
EXISTING FACILITY LAYOUT

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A003	0	1.1-1

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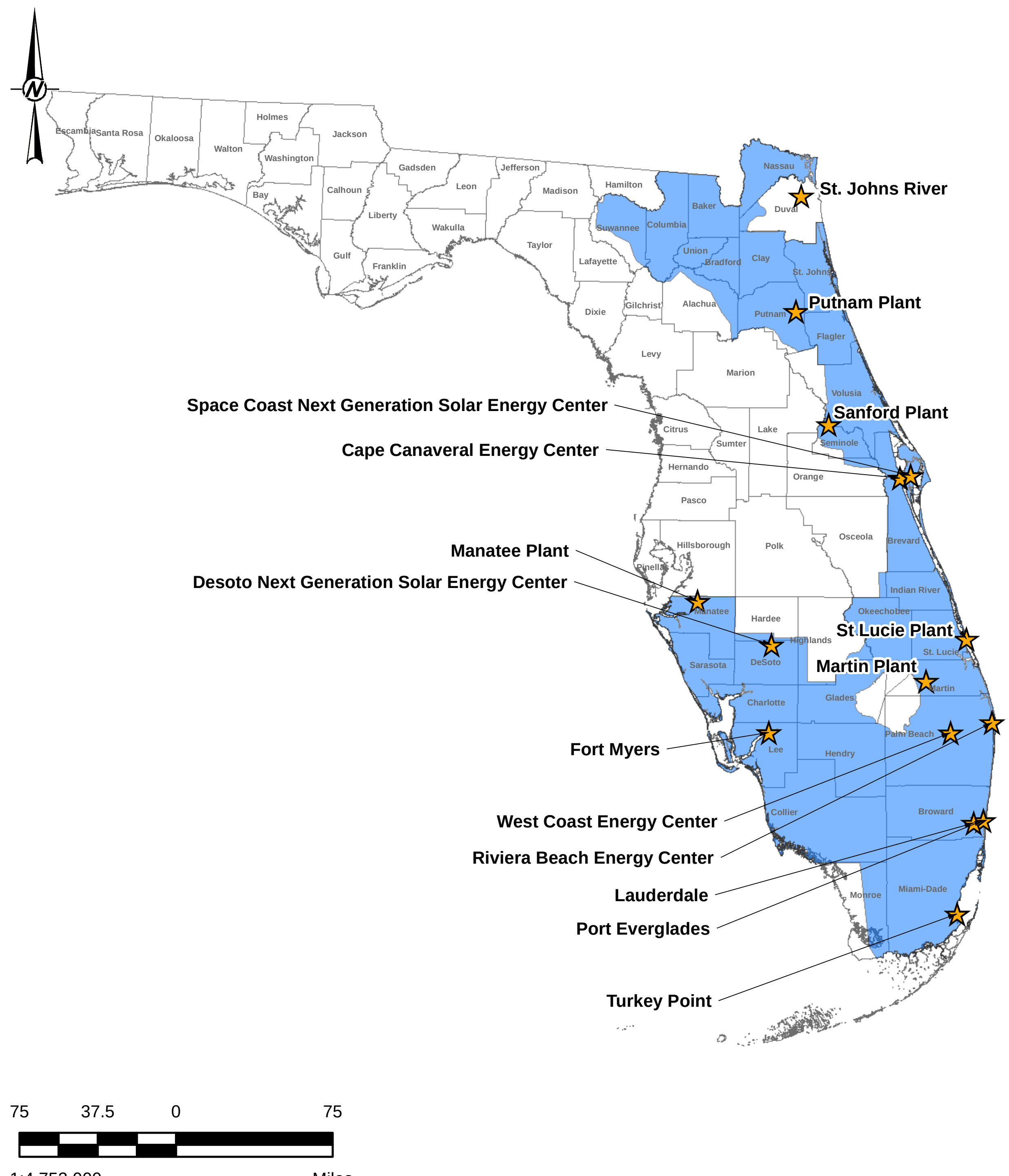

LEGEND

★ FPL Power Plants

FPL Distribution Area

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
FPL SERVICE TERRITORY AND PLANT FACILITIES

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-13
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A003	0	**1.2-1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

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1.3.1 Salinity Reduction Plan

The FPL Turkey Point Power Plant CCS salinity management plan will include the installation of up to six new production wells that will discharge approximately 14 MGD of Upper Floridan Aquifer water into the CCS. The wells will be artesian flow, between 1,000 and 1,250 feet deep, and spaced approximately 1,900 feet apart, generally along the northernmost canal of the CCS and along the west side of the CCS, east of the interceptor ditch (Figure 1.3-1).

Due to the evaporative process, which is facilitated by the elevated temperature of the water within the CCS, a portion of the water from the CCS is lost to the atmosphere while leaving dissolved solids behind. This has produced a hypersaline condition within the CCS with salinity concentrations that exceeds those generally associated with sea water. In order to abate the contribution of hypersaline water to the underlying Biscayne Aquifer, FPL has evaluated remedial alternatives to reduce the salinity of water in the CCS (Tetra Tech, 2014; provided in Appendix A).

Within the past 10 years the salinity in the CCS has been recorded to range between 42 and 69 practical salinity units (PSU). With a continuous addition of approximately 14 MGD of water, a reduction of CCS salinity to approximately 34 PSU has been predicted. Modelling results have also predicted that the additional water to the CCS will raise the average stage in the CCS by approximately 0.25 feet (Tetra Tech, 2014). This rise was simulated by the CCS water balance model that was developed for the FPL Turkey Point Uprate Project. See Appendix A for further details on the determination of water use for the Project.

1.3.2 Fukushima Compliance

Following the earthquake and tsunami at near the Fukushima Dai-ichi nuclear power plant, the United States Nuclear Regulatory Commission (NRC) has conducted a systematic and methodical review of NRC regulations and processes to determine if safety improvements are necessary. NRC Order EA-12-049, *Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis-External-Events* and NEI 12-06 *'Diverse and Flexible Coping Strategies (FLEX) Implementation Guide'* identifies additional requirements to mitigate beyond-design-basis external events and imposes guidance and strategies pertaining to pipelines used to transport water must be designed to withstand seismic loads, high wind loads (hurricane & tornado), be above the Plant's flood maximum flood elevation as well as be protected from high wind generated missiles (NRC, 2012). Therefore, one of the proposed production wells will serve a dual purpose to comply with NRC Order EA-12-049.

1.3.3 Unit 5 Well Water Re-allocation

FPL is proposing to install a new water supply line to provide nuclear process water for Units 3 and 4. Currently, nuclear process water is supplied from Miami-Dade. Under this Project, FPL would re-allocate approximately 2.9 MGD (2,000 gpm) of Upper Floridan Aquifer water from Well No. 3 associated with Unit 5. FPL has authorization under the Site Certification for an average daily withdrawal of 14.06 MGD and an average annual withdrawal of 4,599 MGY for cooling water for Unit 5 and process water for Units 1, 2, and 5. The Project would include a 2,000 foot long (above-ground) water line that would originate from the existing Unit 5 well location (north of the fossil fuel oil tanks) and connect to the existing water treatment plant at Unit 3. Trenching would be required for road crossing (approximately 25 feet in length, total); at a depth not to exceed 3 feet. The Project will provide a new alternate water source, keeping the existing Miami-Dade connection in service to allow FPL the opportunity to better manage water costs for supplying nuclear process water.

1.4 Conditions of Certification

The installation of up to six new wells within the Plant property boundary; the addition of new water withdrawals; the addition of water to the CCS; and, the re-allocation of authorized water withdrawals, will require FPL to seek modification of the Site Certification for the Plant, under the Florida Power Plant Siting Act (PPSA), Chapter 403, Part II, Florida Statutes (FS).

Path:

LEGEND

Aquifer Well

Turkey Point Plant Property Boundary

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
AERIAL WITH WELL SITES

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-13
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
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Pursuant to Section 403.516(1)(c), FS and Rule 62-17.211, Florida Administrative Code (FAC), FPL must submit a petition to Florida Department of Environmental Protection (FDEP) that sets forth a concise statement of the proposed modification; the factual reasons asserted for the modification, including the changes in circumstances which justify the modification; and a statement of whether, and if so, how the proposed modification if approved would affect the Conditions of Certification; the Site layout or design as depicted in the current version of the application; and the anticipated environmental effects of the proposed modification.

In 2008, Units 3 and 4 received Site Certification for increasing the steam electric capacity of each unit by approximately 100 MW (referred to as the Turkey Point Uprate Project) (FDEP, 2008). The Conditions of Certification also apply to Unit 5, which was certified in 2005. The Conditions of Certification were signed by Secretary Sole of the FDEP on October 29, 2008 (PA 03-45A2). The latest revision of the Conditions of Certification was signed on June 19, 2009 (PA 03-45D). The Conditions of Certification specific to the Project(s), which modification is being requested under this petition involve:

- Condition XII, B. Water Use Authorizations
- Condition XII, C. Site Specific Design Authorizations

This petition for modification provides the required information and is formatted in a similar manner as the Turkey Point Uprate Site Certification Application (SCA), dated January 18, 2008. The information presented herein reflects the revisions or updates to that SCA necessary to address the Project(s). If no changes or updates to a particular section of the SCA are required, either a brief summary is provided or those sections have been omitted.

1.5 Need for the Project

FDEP is anticipated to issue an Administrative Order to seek a plan from FPL to reduce the hypersalinity of the CCS and to lessen the westward movement of CCS groundwater into groundwaters of the State (FDEP, 2014). The goal of the plan is to reduce and maintain the average annual salinity of the CCS at 34 PSU and to monitor the salinity utilizing existing groundwater monitoring wells.

In March 2012, NRC issued Order EA-12-049 that requires nuclear generating facilities to comply with additional requirements to mitigate beyond-design-basis external events. Specifically, FPL must successfully demonstrate that a firm capacity of water can be provided from a designated source, regardless of the service option; water quality parameters of the firm capacity can be met; the availability of the source is in place by the required time period (June 2015); and safety measures for the existing facility and surrounding area can be achieved and maintained.

Site and infrastructure improvements are often conducted at the FPL Turkey Point Power Plant and identifying, evaluating, and implementing cost-saving measures are an important part of FPL operations. To provide an alternative to the existing nuclear make-up water for Units 3 and 4, FPL will be installing a new water supply line to utilize approximately 2.9 MGD of Upper Floridan Aquifer water from Well No. 3 associated with Unit 5. The alternate source of make-up water will enable FPL to reduce its Miami-Dade water costs by approximately $1 million annually. With the existing operational practices underutilizing the 14.06 MGD allowance, this option provides flexibility as well as cost-savings to FPL.

1.6 Summary of Public Outreach Program

As part of the preparation process for the petition, FPL has had discussions with the FDEP and the SFWMD to introduce the Project(s); the scope of work required to implement the Project(s); the applicable county, state and federal codes and regulations that govern the Project(s) activities, and; the plan to modify the Turkey Point Plant Site Certification and applicable Conditions of Certification.

2.0 SITE AND VICINITY CHARACTERISTICS

2.1 Site and Associated Facilities Delineation

2.1.1 Site Location

The Project area is located in portions of Sections 27, 28, 29, 32, and 33 of Township 57 South, Range 40 East. All of the site improvement areas are located on FPL property. Production well site F-1 is located within the Protected Area and within the certification boundary for Units 3 and 4. The remaining well sites (F-2, F-3, F-4, F-5, and F-6) are located along the northernmost canal of the CCS and along the west side of the CCS east of the interceptor ditch; outside of the Protected Area. The proposed water supply line will originate within the certificated boundary for Unit 5, but outside of the Protected Area, and will end at the wastewater treatment plant at Unit 3; within the certified boundary for Unit 3 and 4 and within the Protected Area. The Project area is depicted in Figure 1.3-1. The well sites are identified in Figures 2.1-1A through 2.1-1F. The proposed water supply line is identified in Figure 2.1-2.

In the vicinity of the Project area are Units 3 and 4; Unit 1 and Unit 2; and Unit 5. The CCS is located south, west, and east of Units 3 and 4. Figure 1.3-1 depicts the Project area.

The Federal Emergency Management Agency map indicates that the proposed water supply line and well site F-1 through well site F-4 are within Zone A. Well site F-5 and well site F-6 are within Zone AE as depicted in Figure 2.1-3.

2.2 Socio-Political Environment

2.2.1 Governmental Jurisdictions

The Project area is situated within the Plant property that is located in unincorporated Miami-Dade County, Florida. The Plant property occupies approximately 9,400 acres approximately 3.3 miles east of Florida City, and 1.5 miles east of the southeastern municipal limits of Homestead, Florida. The Plant is adjacent to FPL's approximately 13,000-acre Everglades Mitigation Bank. Biscayne Bay is to the east of the Plant.

2.2.2 Zoning and Land Use Plans

2.2.2.1 Future Land Use

Miami-Dade County has adopted a Comprehensive Development Master Plan (CDMP) to meet the requirements of the Florida Local Government Comprehensive Planning and Land Development Regulation Act (the Community Planning Act).

The Miami-Dade County CDMP Future Land Use Element indicates that necessary electrical generation and transmission facilities, associated with the Plant are permitted within the Institutions, Utilities, and Communications designation as well as the Environmental Protection designation.

2.2.2.2 Zoning

The Miami-Dade County Land Development Code has been adopted to implement the policies and objectives of the Miami-Dade CDMP and to regulate land development within the unincorporated portions of Miami-Dade County. The Miami-Dade County Land Development Code incorporates a zoning map that depicts the zoning categories of lands lying within unincorporated Miami-Dade County.

The areas where the proposed water supply line and well site F-1 will be located are both zoned as Industrial Unlimited Manufacturing District (IU-3). The areas where well sites F-2, F-3, F-4, F-5, and F-6 will be located are zoned as Interim District (GU). The installation of infrastructure improvements are an

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LEGEND

- Aquifer Well
- Discharge Line
- Floating Silt Boom
- Containment Area

REFERENCE

AQUIFER WELL LOCATIONS, JLA GEOSCIENCES, 2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
WELL SITE AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A002	0	2.1-1A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A
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LEGEND

- Aquifer Well
- Contour
- Discharge Line
- Discharge Pipe
- Floating Silt Boom
- Silt Fence
- Containment Area
- Rip Rap
- Well Site

REFERENCE

AQUIFER WELL LOCATIONS, JLA GEOSCIENCES, 2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
WELL SITE AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A002	0	2.1-1B

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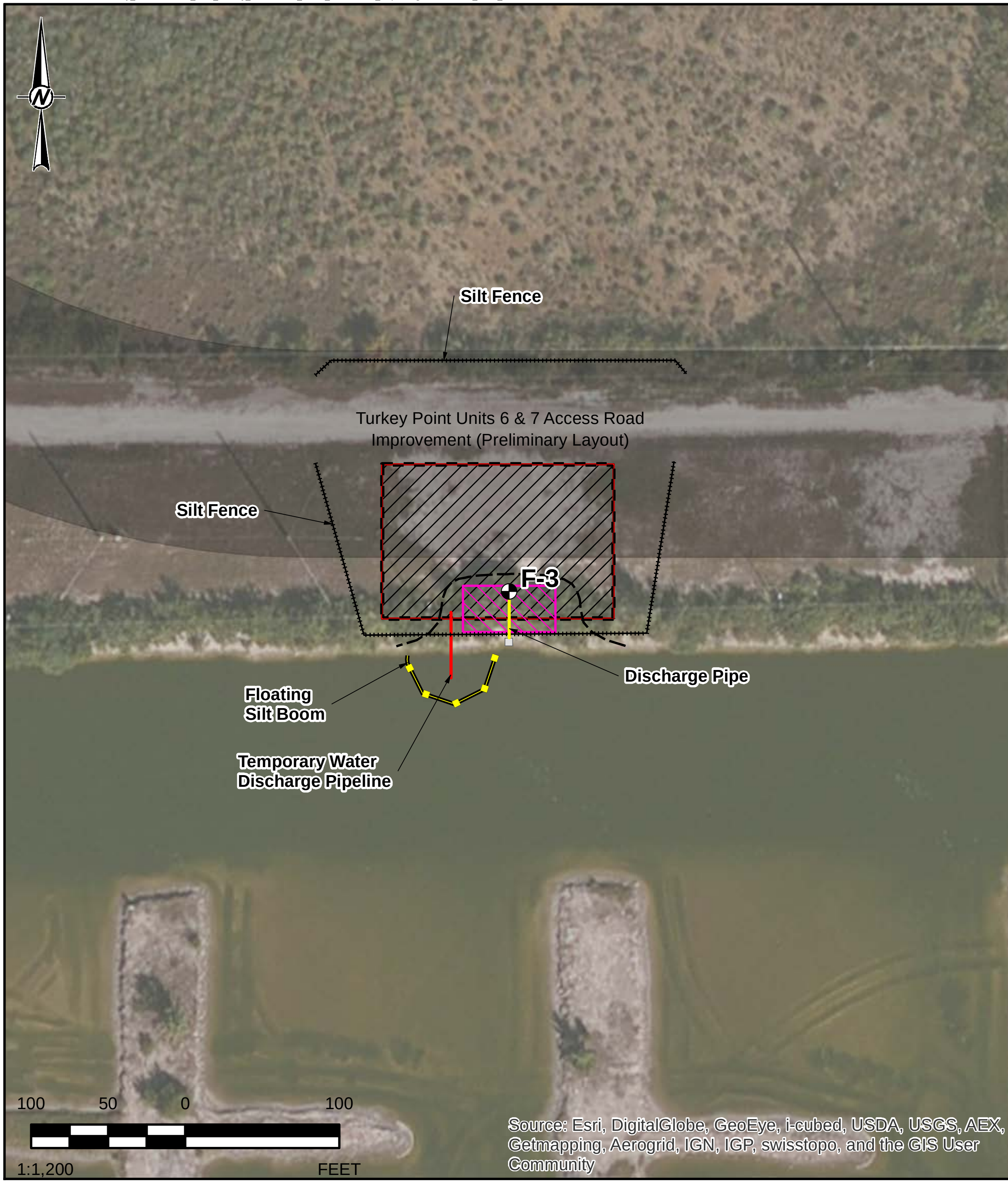

LEGEND

- Aquifer Well
- Contour
- Discharge Line
- Discharge Pipe
- Floating Silt Boom
- Silt Fence
- Containment Area
- Rip Rap
- Well Site

REFERENCE

AQUIFER WELL LOCATIONS, JLA GEOSCIENCES, 2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
WELL SITE AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A002	0	**2.1-1C**

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LEGEND

- Aquifer Well
- Contour
- Discharge Line
- Discharge Pipe
- Floating Silt Boom
- Silt Fence
- Containment Area
- Rip Rap
- Well Site

REFERENCE

AQUIFER WELL LOCATIONS, JLA GEOSCIENCES, 2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
WELL SITE AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A002	0	**2.1-1D**

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LEGEND

- Aquifer Well
- Contour
- Discharge Line
- Discharge Pipe
- Floating Silt Boom
- Silt Fence
- Containment Area
- Rip Rap
- Well Site

REFERENCE

AQUIFER WELL LOCATIONS, JLA GEOSCIENCES, 2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
WELL SITE AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
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LEGEND

- Aquifer Well
- Contour
- Discharge Line
- Discharge Pipe
- Floating Silt Boom
- Silt Fence
- Containment Area
- Rip Rap
- Well Site

REFERENCE

AQUIFER WELL LOCATIONS, JLA GEOSCIENCES, 2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
WELL SITE AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-09-05
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A002	0	2.1-1F

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Path:

LEGEND

- Existing Freshwater Well
- Proposed HDPE Water Supply Line Route
- Water Treatment Area

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
HDPE WATER SUPPLY LINE ROUTE

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-07-07
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A003	0	2.1-2

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LEGEND

- Aquifer Well
- Turkey Point Plant Property Boundary
- Flood Hazard Zones

A: Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown.

AE: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. BFEs are shown within these zones. (Zone AE is used on new and revised maps in place of Zones A1–A30.)

Open Water: A body of open water, such as a large pond, lake, bay, ocean, etc., located within a community's jurisdictional limits that have no defined flood hazard.

VE: Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. BFEs derived from detailed hydraulic coastal analyses are shown within these zones. (Zone VE is used on new and revised maps in place of Zones V1–V30.)

X: Minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. (Zone X (unshaded) is used on new and revised maps in place of Zone C.)

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
FEMA FLOOD HAZARD ZONES

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-13
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A003	0	2.1-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

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associated use of the existing Plant and are an allowed use in the Industrial, Unlimited Manufacturing (IU-3) and Interim District (GU).

2.3 Bio-Physical Environment

2.3.1 Geohydrology

Information in this section of the SCA on the geology, lithology and foundation bearing strength has not changed significantly since it was submitted in January, 2008. Additional studies associated with the groundwater, surface water and ecological monitoring has been conducted; therefore, additional information has been provided, where appropriate.

2.3.2 Subsurface Hydrology

Information in this section of the Units 3 and 4 Uprate SCA on subsurface hydrology and karst hydrogeology has not changed significantly since Units 3 and 4 Uprate SCA was submitted in January, 2008. There are three major components to the subsurface hydrogeologic framework of southern Florida: the unconfined surficial aquifer including the Biscayne Aquifer System; the confined Upper Floridan Aquifer System; and Intermediate Confining Unit that includes the sediments of the Hawthorn Group, which separates the two aquifers. The subsurface hydrology is discussed in Section 2.3.2.1 of the Units 3 and 4 Uprate SCA. Since the 2008 Uprate, additional study was performed in the Project area associated with the Turkey Point Power Plant Groundwater, Surface Water and Ecological Monitoring Plan (JLA Geosciences, 2010). This study included drilling, rock coring, geophysical logging and monitor well installations at various sites in the vicinity of the Plant and the CCS. From the study, zones of high permeability within the Biscayne Aquifer were identified including the likely thickness of karst features in the Project area.

In summary, the micro karst condition, rock voids or solution cavities identified were relatively small. Observed voids were generally less than two feet in diameter, and the maximum void observed was approximately five feet. Generally, voids of any size encountered during drilling were at least partially filled with unconsolidated sand. These rock void features provide the Biscayne Aquifer with its highly permeable condition, but are not of the size or physical characteristics needed to generate significant sinkhole formation.

The production wells will penetrate the surficial aquifer, Intermediate Confining Unit, and the Upper Floridan Aquifer to an approximate depth of 1,250 feet. The production well drilling plan includes a construction sequence to address the expected voids in the Biscayne Aquifer. The well construction design includes multiple strings of outer steel pit and surface casings to isolate the Biscayne Aquifer and any associated voids from the deeper drilling process. The production wells will not affect or promote sinkhole formation in the Project area.

The installation of the proposed water supply line will not require ground penetration exceeding 3 (nominal) feet and therefore, will not result in the disruption of or impact to the subsurface hydrology of the Project area.

2.3.3 Site Water Budget and Area Uses

The Plant is located on the western shore of Biscayne Bay, about 25 miles south of Miami, Florida. The hydrologic descriptions of the Plant and surrounding areas including Biscayne Bay and the CCS provided in Section 2.3.4.1 of the Uprate SCA (January, 2008) are still applicable.

Operational and service water that is, and will be, utilized at the FPL Turkey Point Power Plant include:

- Miami Dade County provides potable water for general plant service, fire protection, and process water for Units 1 through 5.
- The Upper Floridan Aquifer is used as the source of cooling water for Unit 5.

- The CCS is used for cooling Units 1 through 4.
- CCS water loses include evaporation and seepage; inputs include process water, rainfall, stormwater runoff, ground water inflow, and periodic pumpage from the interceptor ditch system.
- Under the proposed Units 6 and 7 project, reclaimed water from the WASD South District Wastewater Treatment Facility will serve as the primary source of makeup water for the Units 6 and 7 circulating water cooling system.

Under the CCS Salinity Reduction Project, up to six production wells will be installed to extract low salinity water from the Upper Floridan Aquifer and added to the CCS for the purpose of reducing the salinity levels within the CCS. Under the Fukushima Project, one of the new production wells will serve a dual purpose to meet the beyond-design-basis external events as required under the NRC Order EA-12-049. The use of the Upper Floridan Aquifer was selected because the water quantity and quality can meet the Project requirements without adversely impacting the environment, the resource or other permitted nearby users. See Appendix A for further details on the determination of water use for the Project.

Under the Unit 5 well water re-allocation Project, approximately 2.9 MGD of Upper Floridan Aquifer water will be directed to the existing water treatment plant at Unit 3. When the new alternate water supply source is used this will eliminate the 0.3 MGD allocation from the Miami-Dade supply source. FPL has an existing permitted water authorization of 14.06 MGD of which approximately 10 MGD is utilized. Therefore the re-allocation of 2.9 MGD will meet the existing permitted amount, but will result in a change of the use of the water.

2.3.4 Surficial Hydrology

Stormwater runoff from the Plant, including the Project locations, generally drains overland flow discharging into the CCS.

2.3.5 Vegetation/Land Use

The vegetation/land use descriptions of the Plant and surrounding areas provided in Section 2.3.5 of the Uprate SCA (January, 2008) are still applicable. Characteristic vegetative communities/land uses within the Project area were classified utilizing the Florida Land Use, Cover, and Forms Classification System (FLUCFCS) (Florida Department of Transportation, 1999). The Project area is limited to previously developed areas of the existing Plant property, consisting of storage and parking facilities, devoid of natural vegetative communities. The Project area is currently classified as electrical utility facilities (FLUCFCS 831), as depicted on Figure 2.3-1.

2.3.6 Ecology

2.3.6.1 Species-Environmental Relationships

The following subsections include descriptions of the current land use and classification of the Project area and the immediately adjacent area. No state or federally listed flora or fauna have been documented within the Project area, as it consists of primarily existing filled, paved, and unpaved equipment laydown, parking, and storage areas with minimal ecological value. As a result, no impacts are anticipated to occur as a result of the Project. The descriptions below follow the FLUCFCS-Level III codes.

Vegetative Communities within the Project Locations

Electrical Power Facilities (FLUCFCS 831)

The proposed alternate water supply line route and well site F-1 as well as the immediately surrounding area is predominantly paved and provides poor habitat for wildlife, due to the lack of cover, forage species of vegetation, and disturbance. The proposed alternate water supply line route and well site F-1

Path:

LEGEND

- Aquifer Well
- Turkey Point Plant Property Boundary

LandUse

- Commercial
- Upland Forest
- Upland Hardwood Forest
- Streams and Waterways
- Reservoirs
- Bays and Estuaries
- Mangrove Swamp
- Wetland Forested Mixed
- Freshwater Marshes
- Non-Vegetated Wetlands
- Disturbed Lands
- Roads and Highways
- Utilities

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
LAND USE MAP

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-13
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A003	0	**2.3-1**

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is classified as electrical power facilities (FLUCFCS 831), containing previously cleared areas equipment laydown, supporting parking, and storage areas.

Canals (FLUCFCS 512)

Well sites F-2 through F-6 as well as the immediately surrounding area are adjacent to man-made cooling water canals. The existing Plant uses the CCS, to cool and recirculate cooling water for existing Units 1 through 4, and to receive blowdown from the Unit 5 cooling tower. Vegetation in the cooling canals include submerged, rooted marine plants, primarily widgeon grass (*Ruppia maritima*) and marine algae, as well as terrestrial woody vegetation along the berms such as Brazilian pepper (*Schinus terebinthifolius*), red mangrove (*Rhizophora mangle*), seagrape (*Cocoloba uvifera*), Australian pine (*Casuarina equisetifolia*), wild sage (*Lantana involucrata*), and buttonwood (*Conocarpus erectus*).

Vegetative Communities in the Vicinity of the Project Locations

Electrical Utilities (FLUCFCS 831)

Units 1 through 5, access roads, and ancillary facilities located on the eastern side of the Project area are also identified as FLUCFCS 831.

Canals (FLUCFCS 512)

The well sites are largely surrounded by man-made cooling water canals. The existing Plant uses the CCS, to cool and recirculate cooling water for existing Units 1 through 4, and to receive blowdown from the Unit 5 cooling tower. Vegetation in the cooling canals include submerged, rooted marine plants, primarily widgeon grass (*Ruppia maritima*) and marine algae, as well as terrestrial woody vegetation along the berms such as Brazilian pepper (*Schinus terebinthifolius*), red mangrove (*Rhizophora mangle*), seagrape (*Cocoloba uvifera*), Australian pine (*Casuarina equisetifolia*), wild sage (*Lantana involucrata*), and buttonwood (*Conocarpus erectus*).

Mangrove Swamp (FLUCFCS 612)

Coastal mangrove swamp occurs to the east of the existing Unit 5 well (located near the picnic area) and the well sites along the shoreline of Biscayne Bay. These areas are dominated by red and black mangroves (*Avicennia germinans*), with subdominant species including white mangrove (*Laguncularia racemosa*) and buttonwood, as well as occasional Brazilian pepper, Australian pine, and sea grape.

Mangrove Swamp/Willow (FLUCFCS 612/618)

An area of isolated mangrove swamp and coastal plain willow (*Salix caroliniana*) occur on the north side of the northernmost return cooling canal, surrounded by parking lots and roadways. Dominant species include red, white, and black mangrove, buttonwood, Brazilian pepper, coastal plain willow, sea grape, Australian pine, poisonwood (*Metopium toxiferum*), leather fern (*Acrostichum daneifolium*), cankerberry (*Solanum bahamense*), rubber vine (*Rhabdadenia biflora*), Peruvian primrose willow (*Ludwigia peruviana*), and cocoplum (*Chrysobalanus icaco*).

Terrestrial Ecology Systems — Fauna

The existing Unit 5 well (located near the picnic area) and well site F-1 consists of existing filled and paved equipment laydown, storage, and parking areas devoid of natural wildlife habitat. Well sites F-2 through F-6 consist of sparsely vegetated shoreline of the adjacent northernmost discharge canal and offer limited foraging opportunities for species of wading birds.

Aquatic Ecology Systems — Fauna

The proposed alternate water supply line route and the well sites do not provide any habitat for aquatic biota. The surrounding CCS is limited in diversity and abundance of fish species. The fish community within the cooling canals is dominated by forage fishes such as sheephead minnow (*Cyprinodon variegates)* and marsh killifish (*Fundulus confluentus),* and also contains limited numbers of mullet (*Mugil* sp.), needlefish (*Strongyluru* sp.), and tarpon (*Megalops atlanticus).*

Threatened and Endangered Species — Flora and Fauna

Plant and animal species designated by the U.S. Fish and Wildlife Service (USFWS), the Florida Fish and Wildlife Conservation Commission (FWC), and the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened, species of special concern, commercially exploited, or under review (listed species), were included in this category.

No listed species occur within the proposed alternate water supply line route and the well sites due to lack of natural vegetative communities or aquatic habitat and the highly disturbed industrial nature of the areas immediately surrounding the Project area. A variety of threatened and endangered species are known to occur in the surrounding vicinity, as described below.

<u>Plant and Animal Surveys</u>

Flora: Review of databases and previous reports did not result in the identification of any occurrences of listed plant species on or near the proposed alternate water supply line route and the well sites. Three plants classified as threatened by the FDACS are known to occur upon disturbed roadsides and upland spoils within the surrounding Plant: locustberry (*Byrsonima lucida*), mullein nightshade (*Solanum donianum*), and West Indian trema (*Trema lamarckiana*).

Fauna: No listed animal species have been documented within the proposed alternate water supply line route and the well sites. Listed species known to occur outside of the well sites within and adjacent to the Plant property are discussed below.

American crocodile (Crocodylus acutus)

The American crocodile is classified as threatened by both the FWC and USFWS. American crocodiles were first observed at the Plant in 1976 and nesting was first documented upon berms within the cooling canals in 1978 (Mazzotti and Brandt, 1994). As a result, FPL developed a crocodile management plan, which focused on the creation and enhancement of habitats for crocodile nesting, as well as monitoring the reproductive success, growth, and survival of hatchlings. FPL's efforts have resulted in a significant increase in the number of crocodile nests and hatchlings in the cooling canals over nearly three decades, from 2 nests and 30 hatchlings in the late 1970s to 28 known nests and 509 hatchlings in 2008 and 25 known nests and 429 hatchlings in 2013.

The area of well site F-1 is currently paved or filled with limerock and used for equipment laydown, parking, and storage in association with the Plant. The area of proposed alternate water supply line route and well sites F-2, F-3, F-4, F-5, and F-6 are currently filled with limerock and serve as areas adjacent to internal roadways. Historical monitoring of the crocodile population within the Plant boundary indicates that these locations are not utilized by crocodiles for nesting, foraging, or basking due to the lack of suitable habitat.

American alligator (Alligator mississippiensis)

The American alligator is listed as a species of special concern by the FWC and is considered a threatened species by the USFWS due to its similarity in appearance to the threatened American crocodile. American alligators occasionally occur within freshwater canals and wetlands west of the L-31E

Canal. According to the Florida Natural Areas Inventory (FNAI) database, an American alligator was documented approximately 0.5 mile west of the proposed alternate water supply line route and the well sites (FNAI, 2003).

No suitable habitat for the American alligator occurs along the proposed alternate water supply line route or at the well sites, and no alligators have been documented on or adjacent to these Project locations.

Eastern indigo snake (Drymarchon couperi)

The eastern indigo snake is classified as threatened by both the FWC and USFWS. Although no indigo snakes have been observed along the proposed alternate water supply line route or at the well sites, they are known to exist on the Plant property; south of the CCS. FPL has recorded 12 indigo snake sightings within the Everglades Mitigation Bank south and southern edge of the CCS since 2008, typically on tree islands, spoil berms, or roads. According to the FNAI database, two occurrences of the eastern indigo snake were documented in 1981 within upland rockland hammock areas adjacent to SW 344th Street/Palm Drive (FNAI, 2003).

The proposed alternate water supply line route and the well sites do not provide suitable habitat for the eastern indigo snake, and no indigo snakes have been documented along the proposed alternate water supply line route or at the well sites. As a result, construction activities within these Project locations will not result in an impact to the eastern indigo snake.

West Indian manatee (Trichechus manatus)

The Florida or West Indian manatee is classified as endangered by both the FWC and the USFWS. They are known to occur in Biscayne Bay, but do not occur within the Project area or the surrounding CCS, as the isolated CCS does not connect to the Bay. The Plant utilizes the closed loop recirculating cooling canal facility for cooling needs, and does not contribute any thermal discharge into the Bay that could attract manatees during winter months.

Bald eagle (Haliaeetus leucocephalus)

No bald eagles or eagle nests have been observed on or near the proposed alternate water supply line route or the well sites. The FWC's bald eagle nest locator database (https://public.myfwc.com/FWRI/EagleNests/nestlocator.aspx) was queried and resulted in no known bald eagle nests in the vicinity of the Project locations. According to the FWC's database, no bald eagle nests are located within 25 miles of the Project locations.

Least tern (Sterna antillarum)

The least tern is classified as threatened by the FWC, but is not listed federally by the USFWS. Preferred habitats are coastal areas throughout Florida, including beaches, lagoons, bays, and estuaries. The least tern is known to occur upon upland berms within the CCS, as well as within the nearby Biscayne National Park.

Portions of the proposed alternate water supply line route and the well sites contain limited areas of gravel habitat suitable for least tern nesting. However, no least tern nesting has been observed along the proposed alternate water supply line route or at the well sites, likely due to the effects of ongoing human disturbances associated with the adjacent nuclear facility.

Wading birds

No listed wading birds have been documented along the proposed alternative water supply line route or at the well sites. Six species of wading birds classified by the FWC as species of special concern but not listed by the USFWS have been observed within the CCS. These include the little blue heron (*Egretta* *caerulea*), reddish egret (*Egretta rufescens*), white ibis (*Eudocimus albus*), snowy egret (*Egretta thula*), roseate spoonbill (*Platalea ajaja*), and tricolored heron (*Egretta tricolor*). In addition, the federally endangered wood stork (*Mycteria americana*) is known to occasionally forage within the CCS.

The proposed alternative water supply line route and the well sites avoid wetlands or wading bird habitat. No wading bird nesting or roosting areas have been documented along the proposed alternative water supply line route, at the well sites, or along the CCS shoreline.

White-crowned pigeon (Patagioenas leucocephala)

The white-crowned pigeon is listed as threatened by FWC and is not listed by USFWS. The white-crowned pigeon forages in tropical hardwood hammocks on poisonwood and other native fruit-bearing trees in the Florida Keys and very southern mainland. Although the white-crowned pigeon has been observed on the Plant property, it has not been documented along the proposed alternative water supply line route or at the well sites, and no white-crowned pigeon habitat or foraging vegetation is present at these Project locations.

2.3.7 Pre-existing Stresses

The greatest pre-existing stress to terrestrial systems along the proposed alternative water supply line route or at the well sites and surrounding area is the result of past development activity. The natural topography, soils, and hydrology has been altered as a result of filling and paving. The existing Plant was constructed upon mangrove-covered tidal marsh. Natural surface water drainage features have been modified through filling, road building, and the CCS. Therefore, the proposed improvements are not anticipated to result in significant impacts.

Aquatic systems/wetlands within the Project locations: There are no aquatic systems located at either of the Project locations.

Aquatic systems/wetlands within the CCS: The disturbed shoreline of the CCS is sparsely vegetated with mangroves, Brazilian pepper, seagrape, and buttonwood. No impacts are proposed to occur outside the Project locations and best management practices as identified in Section 3.8 (Site Drainage) of this petition will be utilized adjacent to the shoreline to minimize turbidity in, and near, the CCS.

2.3.7.1 Measurement Programs

Terrestrial Ecology

Terrestrial ecological resources along the proposed alternative water supply line route and at the well sites were evaluated through previous studies, literature searches, field visits, and aerial photography.

Threatened and Endangered Species

Literature review, previous studies, and survey reports were undertaken to determine the threatened and endangered species that could potentially be present along the proposed alternative water supply line route and at the well sites. Primary sources of information are the FNAI database; Florida Committee on Rare and Endangered Plants and Animals reports; Preservation of Native Flora of Florida Law, Rule Chapter 5B-40, F.A.C., and the Regulated Plant Index (Rule 5B-40.0055, F.A.C.). In addition, previous reports of surveys conducted along the proposed alternative water supply line route and near the well sites were reviewed.

2.3.8 Meteorological and Ambient Air Quality

There is one meteorological station near the center of the CCS (referred to as TPM-1) that includes instrumentation to measure solar radiation, wind speed, wind direction, air temperature, relative humidity, and rainfall. There are also four rainfall gauging stations installed around the CCS. Data is collected from these stations at 15-minute intervals.

Between July 27, 2010 and June 30, 2012, 121 inches of rain was observed at TPM-1. The greatest monthly rainfall totals were observed in September 2010 (13.5 inches), followed by October 2011 (13.3 inches), and April 2012 (12 inches). There were a total of 430 rainfall days with 39 days having recorded totals in excess of one inch in a calendar day. The number of rain days and the amount of rainfall was generally greatest during the wet season (May to November), with the driest months from December to February. The least amounts of rain in a month were observed in February 2011 (0.2 inches), November 2011 (0.3 inches) and December 2010 (0.5 inches).

Air temperatures (at 15 feet above ground) in the middle of the CCS (at TPM-1) ranged from 37°F (2.8°C) to 92.8°F (33.8°C) for the period of record, with an average of 77.9°F (25.5°C). The minimum temperature was observed on December 14, 2010, during the morning hours of a cold front passing through the area. The warmest temperature was observed on July 11, 2011, as July through September (monthly average > 84.2°F [29°C]) are usually the warmest months of the year. Comparatively, the winter months of 2010/2011 (November to February) were colder than the similar time period of the following year.

Relative humidity at TPM-1 was an average of 71% during the period of recordkeeping. The patterns, however, were more variable in the winter months compared to the warmer months of April through June. Diurnal humidity patterns were influenced by broader seasonal patterns; for example, continued rainfall over several days in late September 2010 resulted in a few days (September 28 to 30) of 90% humidity while the passage of cold fronts (e.g., December 15, 2010) resulted in a humidity drop from 75% to 21% in 3.5 hours.

The prevailing wind directions from July 2010 through June 2012 were from the east and east southeast (i.e., predominantly onshore). Average wind speed for the whole period, at five meters above ground, was 10 miles per hour (mph). The lull wind speeds averaged six mph, but several instances of strong wind gusts were observed, some in excess of 60 mph. The highest wind speed recorded at TPM-1 was observed during the passage of a frontal boundary on October 13, 2011, when a 134 mph wind gust was recorded. Similarly, wind speeds > 60 mph were seen on July 13, 2011, and April 26, 2012, with the approach of storm fronts. Forty-four percent of the time, the winds were between seven to 11 meters per second.

2.3.8.1 Ambient Air Quality

The Plant is located in a rural area of unincorporated Miami-Dade County. Miami-Dade County has adopted Ambient Air Quality Standards for sulfur dioxide (SO_2), Miami-Dade County is designated as an area that meets ambient air quality standards (i.e., an area with air quality that meets all AACS) (Rule 62-204.340, FAC).

Miami-Dade County is classified as a Class II area (Rule 62-204.340, F.A.C.) since it is an attainment area for all pollutants. The nearest Class I area to the proposed alternative water supply line route and well sites is the Everglades National Park located about 21 km (13 miles) to the southwest.

Air monitoring data are collected in the County for SO_2, PM_{10}, O_3, NO_2, and CO. A summary of the maximum pollutant concentrations measured in Miami-Dade County indicates that the maximum air quality concentrations measured in Miami-Dade County are in compliance with applicable standards for all pollutants.

2.3.9 Noise

Ambient noise monitoring was recently conducted in June 2008 to obtain baseline noise measurements associated with the Plant. SPLs and octave band data were collected at six locations in June 2008 (Figure 2.3-2). Six of the eight monitoring locations (Sites 1, 4, 5, 6, 7, and 8; designated as S1, S4, S5, S6, S7, and S8) were selected to measure the existing baseline ambient noise levels at or near the Plant property boundary, at the nearest permanent private residence, the FPL daycare center, and at the nearest public receptors (i.e. potential noise receptors). Additionally, Sites 2 and 3 were selected to measure the existing noise levels in the proximity of the existing generating units closest to the Project

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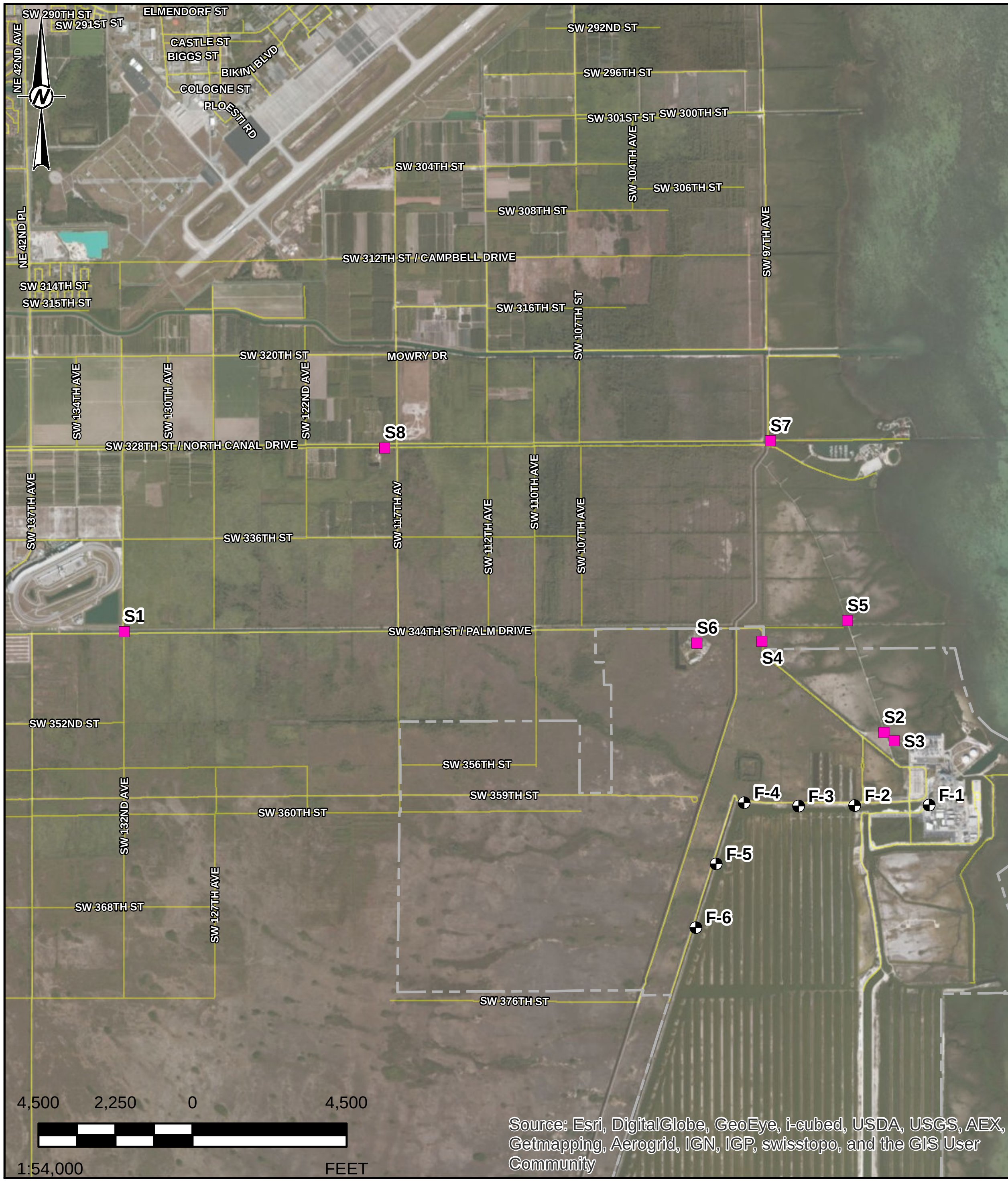

LEGEND

- Aquifer Well
- Noise Monitoring Locations
- Turkey Point Plant Property Boundary

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
NOISE MONITORING LOCATIONS

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-13
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
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area. These noise monitoring sites were closest to the operating units at the Plant and in the direction of the nearest public receptors.

The ambient daytime Leq noise levels observed in June 2008 reflected that the influence of the operating units on observed noise levels within the Plant property boundary demonstrate the minor contribution of the existing Plant operation to noise levels at locations outside the Plant property boundary. While there are no quantitative noise limits applicable to the proposed alternative water supply line route or the well sites, the observed L90 noise levels that exclude transient noise sources at the monitoring locations beyond FPL's property (Sites 1, 5, 7, and 8) are well below 55 dBA, a typical nighttime noise limit established by municipalities (EPA, 1974).

3.0 THE PLANT AND DIRECTLY ASSOCIATED FACILITIES

This section provides a description of the Project(s), including the Project locations, equipment, as well as a description on the water allocation and stormwater management.

3.1 Background

FDEP is anticipated to issue an Administrative Order to seek a plan from FPL to reduce the hypersalinity of the CCS and to lessen the westward movement of CCS groundwater into groundwaters of the State (FDEP, 2014). The FPL Turkey Point CCS Salinity Management Plan will implement measures to reduce the hypersalinity of the CCS and will work to lessen the westward movement of CCS groundwater into groundwaters of the State. Specifically, FPL will install up to six new production wells that will discharge approximately 14 MGD of Upper Floridan Aquifer water into the CCS. The wells will be artesian flow, between 1,000 and 1,250 feet deep, and spaced approximately 1,900 feet apart, generally along the northernmost canal of the CCS and along the interceptor ditch (Figure 1.3-1 and Figure 3.1-1).

One of the wells (F-1) will serve a dual purpose and assist FPL in complying with Nuclear Regulatory Commission (NRC) order EA-12-049 for nuclear Units 3 and 4. Under NRC Order EA-12-049, FPL must successfully demonstrate that a firm capacity of flow can be provided from a designated source, regardless of service option; ensure that water quality parameters of the firm capacity can be met; ensure that the availability of the source is in place by the required time period (June 2015); and ensure safety measures for the existing facility and surrounding area can be achieved and maintained.

Site and infrastructure improvements are often conducted at the FPL Turkey Point Power Plant and identifying, evaluating, and implementing cost-saving measures are an important part of FPL operations. To provide an alternative to the existing nuclear make-up water for Units 3 and 4, FPL will be installing a new water supply line to utilize approximately 2.9 MGD of Upper Floridan Aquifer water from Unit 5 Well No. 3. The alternate source of make-up water will enable FPL to reduce its Miami-Dade water costs by approximately $1 million annually. With the existing operational practices underutilizing the 14.06 MGD allowance, this option provides flexibility as well as cost-savings to FPL.

3.2 Project Components

3.2.1 Production Well Description

Each of the production wells will be located directly adjacent to the CCS. The production well casing will be 20-inch inside diameter fiberglass reinforced plastics (FRP). Pit and surface well casings will be 48-inch and 36-inch diameter steel well casings. The production wells completion interval is anticipated to be between 1,000 feet (FRP casing depth) and 1,250 feet (total depth) below land surface, but may vary depending on specific site conditions (Figure 3.2-1). Discharge outfalls for each of the wells will be directly into the CCS. Construction sequencing will include rotary drilling of pilot holes, geophysical logging, casing installation, casing grouting, reverse air drilling of completion intervals, acid treatment, pump development and pump testing, wellhead assembly, and restoration of the well sites.

The water that is generated during drilling activities will be routed through a formation water treatment and disposal system. The drilling water will be pumped to settling tanks to clarify the water prior to release to the CCS. Drilling mud will be recycled and when the construction activities are complete the drilling mud and drill solids will be dried and stored (elsewhere) as fill material. Construction activities are anticipated to take between 4 to 6 months for each well with two drill rig teams and drilling support crews working simultaneously.

3.2.2 Cooling Canal System

The CCS is a closed cycle recirculating canal system used by the existing components of the Plant for cooling and wastewater treatment. The cooling canals occupy an area approximately 2 miles wide by 5 miles long (approximately 5,900 acres). The discharge canal receives heated water from the Plant and distributes flow into 32 feeder canals. Water in the feeder canals flows south into a single collector canal

Path:

LEGEND

- Aquifer Well
- Turkey Point Plant Property Boundary
- Canals

REFERENCE

FACILITY LAYOUT, GOLDER ASSOCIATES INC., 2009-2014

CLIENT
FPL
MIAMI-DADE COUNTY, FLORIDA

PROJECT
FPL TURKEY POINT CCS SALINITY REDUCTION PROJECT

TITLE
INTERCEPTOR DITCH LOCATION

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-05-13
PREPARED	NRL
DESIGN	NRL
REVIEW	KJK
APPROVED	KFK

PROJECT No.	CONTROL	Rev.	FIGURE
1303064	A003	0	3.1-1

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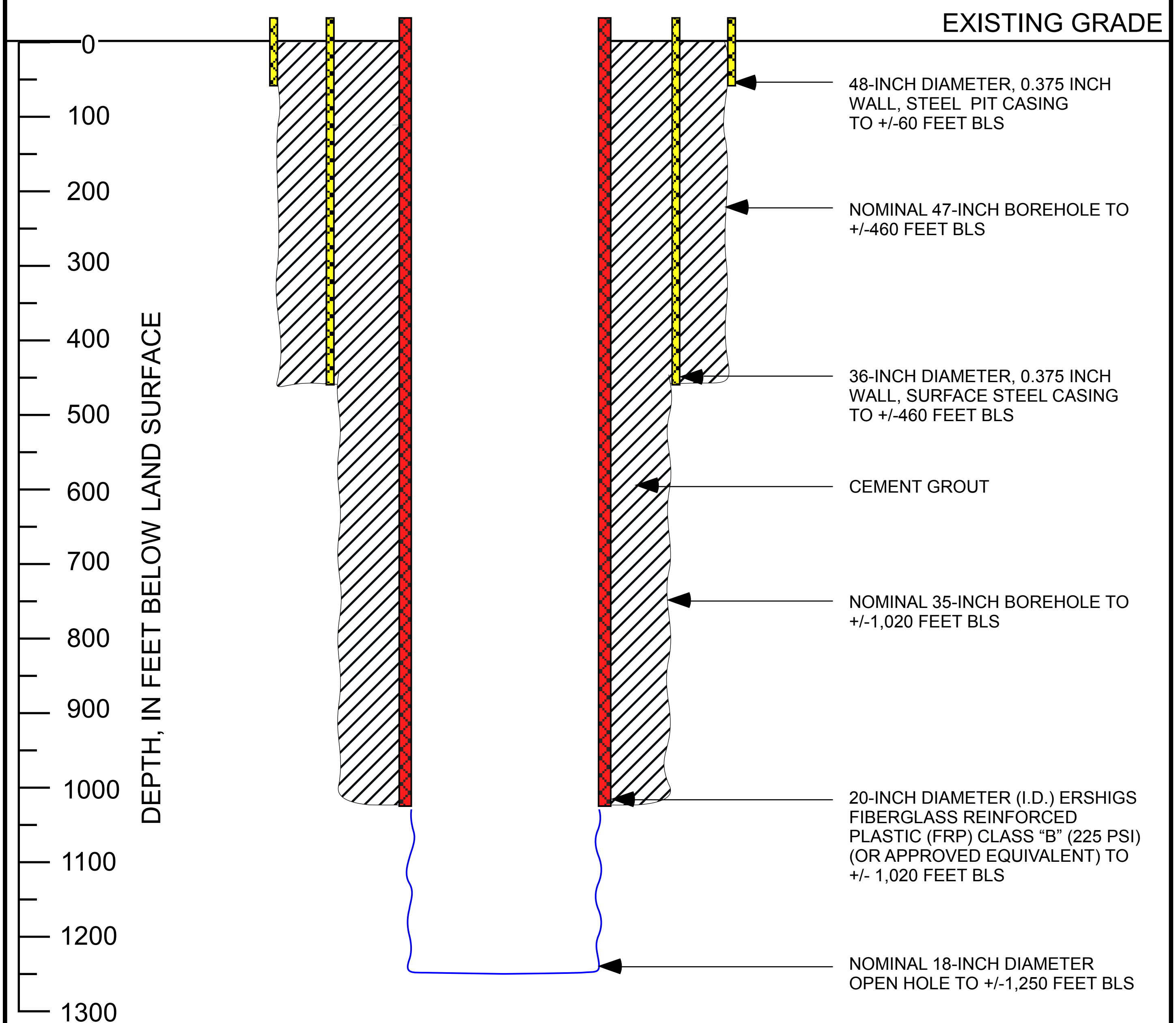

JLA Geosciences, Inc.

LEGEND:
CEMENT GROUT
FRP WELL CASING
STEEL WELL CASING
OPEN HOLE

SCALE: AS SHOWN	DATE: 02/14/2014	
DRAWN BY: RKS	DWG #:	
PROJECT SITE: FLORIDA POWER AND LIGHT TURKEY POINT CCS FRESHENING PROJECT UPPER FLORIDAN AQUIFER WELLS F-1, F-2, F-3, F-4, & F-5	PROJECT NO: 14-001	
FIGURE TITLE: WELL CONSTRUCTION DIAGRAM	FIGURE NO: 3.2-1	

that distributes water to seven return canals. Water in the return canals flows north to the intakes that serve Units 1 through 4. The feeder and return canals are shallow, generally 1 to 3 feet deep, with the exception of the westernmost return canal (the Grand Canal) and a portion of the easternmost return canal which extend to a depth of approximately 18 feet. The feeder (i.e., distribution) canal and the collector canal extend to a depth of approximately 5 to 18 feet.

An interceptor ditch was constructed with the CCS and is located just west of and adjacent to the CCS, and east of the L-31E Canal and levee (see Figure 3.1-1). The purpose of the interceptor ditch is to keep cooling canal water from influencing shallow groundwater (i.e., upper 15 to 18 feet) west of the CCS. This is accomplished by pumping water as necessary from the interceptor ditch to keep the water level or head in the interceptor ditch lower than that in the L-31E Canal. This causes shallow groundwater movement to be seaward in the area between the L-31E Canal and the interceptor ditch.

The CCS does not directly discharge to fresh or marine surface waters; however, because the canals are not lined, groundwater does interact with water in the CCS. Makeup water for the CCS comes from process water, rainfall, stormwater runoff, and groundwater infiltration to replace evaporative and seepage losses. Consequently, the water in the canals is currently hypersaline due to the effects of evaporation, with salinity concentrations greater than seawater.

Water added to the CCS by this Project will reduce the salinity in the CCS over time to levels commensurate with the Biscayne Bay. See Appendix A for further details on the determination of water use for the Project.

3.2.3 Permitted Water Withdrawals

FPL is authorized to withdrawal water from the Upper Floridian Aquifer with an average daily withdrawal of 14.06 MGD and an average annual withdrawal of 4,599 MGY. Water is withdrawn from one of four wells, each rated at 5,000 gpm. Three wells are used to supply water during operation with one well serves as backup. This water is treated – to remove scale-causing chemicals (e.g. calcium, magnesium and sulfate) - and is used as make-up to the recirculating heat dissipation system. Generally plant service water, fire protection water, and process water is provided by Miami-Dade potable water supply system. Based on recent operation practices, FPL utilizes approximately 10 MGD of the permitted 14.06 MGD.

The only other permitted users of the Upper Floridan Aquifer located within approximately 10 miles of this area are the Ocean Reef and Card Sound Golf Clubs, the Florida Keys Aqueduct Authority and the Miami-Dade Water and Sewage Department South Miami Heights Wellfield. Each of these permitted users is located approximately 9 to 10 miles from the Turkey Point Power Plant.

3.3 Site Layout

3.3.1 Production Wells

Each of the six production well sites is on property owned by FPL and currently used for activities associated with electric power generation. The wells will be spaced approximately 1,900 feet apart, generally along the northernmost and westernmost canals of the CCS (Figure 3.1-1). The well sites are currently relatively flat, consisting of a paved or gravel surface and are currently used principally as equipment laydown (F-1) or areas adjacent to CCS service roadways (F-2, F-3, F-4, F-5, and F-6).

In the area of well site F-1 there are permanent buildings associated with Units 3 and 4. The areas around well sites F-2, F-3, F-4, F-5, and F-6 do not contain buildings, these areas are generally undeveloped, but there are monitoring stations and miscellaneous equipment associated with the power Plant and CCS. Following construction, the above-ground appearance, at each well site, will consist of a concrete pad, well head, isolation valve, flow meter, and associated piping (Figure 2.1-1 (a-f)). The embankment slopes, in the area of the discharge points, will be surfaced with slope protection (i.e., fabric-formed concrete or similar material). Well site F-1 is within the Protected Area and the remaining well sites are within the Owner Controlled Area of the Plant; therefore, nuisance fencing will not be constructed.

3.3.2 Alternative Water Supply Line

The alternative water supply line will be on property owned by FPL and is currently used for activities associated with electric power generation. The water supply line will originate at the existing Unit 5 well located north of the fossil fuel oil tanks and extend approximately 2,000 feet to the existing water treatment plant at Unit 3 (Figure 2.1-2). The water supply line will avoid the fuel oil retention basin and the existing above-ground pipeline and infrastructure. The water supply line will be an above-ground infrastructure with pipeline supports to secure the pipeline. Underground trenches (approximately 3 feet) will be used across roadways (approximately 25 feet in total). Roadway crossings will be covered with concrete for protection from heavy haul trailers.

The water supply line route is currently relatively flat, consisting of a paved or gravel surface and currently contains other infrastructure and equipment associated with electric power generation. Where the water supply line begins there are no buildings, with the only structures being the fuel oil tanks and associated pipelines. The water supply line will end at the water treatment plant at Unit 3, this area is heavily developed with infrastructure and equipment associated with Unit 3 and 4.

Following construction, the above-ground conveyance, will consist of a new 12-inch diameter, High Density Poly-Ethelyne (HDPE) piping. Water withdrawals will be controlled by isolation valves and a flanged connection will be installed to assist in managing the operations between nuclear and fossil fuel withdrawals.

3.4 Fuel

Diesel fuel with an ultra-low sulfur content of 0.05 percent is used in a number of emergency generators at the Plant. Diesel fuel is delivered to the Plant by truck, as needed, and stored in tanks with secondary containment.

A diesel engine driven portable pump will be utilized as necessary to meet Fukushima coping strategy requirements associated with well site F-1 only. The pump will be stored within a building located within the Protected Area. The pump will have 750 gallons per minute capacity.

3.5 Air Emission and Controls

Well site F-1 will have a diesel engine pump that will require a nominal 350 horsepower (hp) diesel engine. This equipment will be portable mounted on a trailer or skid in the event their use is necessary (e.g., power loss by external event, such as hurricane, tornado, etc.).

The diesel engine would be tested periodically for maintenance and to assure operability. This operation is not anticipated to exceed a few hours per month. The air emissions resulting from testing and maintenance are estimated to be less than 0.5 tons/year for all regulated air pollutants. This level of emission is much less than FDEP's criteria for exempt emission units in Rule 62-210.300(3)(b)1 FAC that exempt emission unit emitting 5 tons/year of any single regulated pollutant. No significant changes in the air emissions will result from the Project.

3.6 Plant Water Use

The new production wells, including the dual purpose well, will withdraw approximately 14 MGD of water from the Upper Floridan Aquifer. The water withdrawn by these wells will be released to the CCS to minimize the groundwater makeup flow from the saline to salt water aquifer under Biscayne Bay. By replacing highly saline groundwater with slightly saline well water from the Upper Floridan Aquifer, the average salinity of the CCS will decrease over time (Tetra Tech, 2014). Based on water quality modeling of the CCS, the new equilibrium salinity in the CCS should be approximately equal to the salinity of

Biscayne Bay within two years. The evaluations associated with the required amount of water and the associated drawdown in the Upper Floridan Aquifer is discussed in Appendix A and B.

FPL will maintain the connection from Miami-Dade County for general plant service water, fire protection water, process water, and potable water. Process water uses include demineralizer regeneration, steam cycle makeup, and general service water use for wash-downs. These water connections and uses, as well as site storm water drainage from the Plant, will not significantly change as a result of the Project(s).

The alternate source of make-up water from the Unit 5 well will enable FPL to reduce its Miami-Dade water costs by approximately $1 million annually. With the existing operational practices underutilizing the 14.06 MGD allowance, this option provides flexibility as well as cost-savings.

3.7 Chemical and Biocide Waste

There are no anticipated wastewaters to be generated by the operation of the Project(s). Contact area stormwater will continue to be treated through oil/water separators and released to the CCS. Consistent with the current practice, all well water, wastewater and stormwater, will be released to the CCS. There will be no off-site discharge from the Project(s).

3.8 Solid and Hazardous Waste

All non-hazardous and hazardous wastes associated with the Plant are managed according to applicable regulations. The Project(s) will not significantly change the amount or type of solid or hazardous wastes generated.

3.9 Site Drainage

Runoff from the well sites currently drains northwest at well site F-1, south at well sites F-2, F-3, and F-4, and east at well sites F-5 and F-6 via overland flow to the discharge or distribution canal of the CCS. After the wells are constructed, stormwater will continue to be released in the same area. Runoff from the area along the alternative water supply line is non-contact stormwater other stormwater drainage from the Plant is also released to the CCS.

As industrial wastewater the contact stormwater runoff is routed through an oil/water separator prior to release to the CCS. Stormwater runoff from the potentially oil-contaminated areas (containment areas for transformers, and other oil-containing or handling equipment) is also routed through an oil/water separator prior to release to the CCS. No significant changes in the site drainage will result from the Project(s).

The SFWMD design rainfall event, based on a 100-year, 72-hour storm, is less than 14 inches. The existing CCS provides adequate storage capacity to support the Project(s) and will continue to meet the requirements of the Plant's existing industrial discharge permit.

3.10 Materials Handling

3.10.1 Construction Materials and Equipment

Construction materials and equipment will be delivered to the Project area by existing roads, both inside and outside the Plant property. Existing Plant access roads will be used during construction and operation of the Project(s). Construction trucks will travel to the Plant via SW 344th Street (Palm Drive), and the existing Plant access roads. These existing access roads were used during construction of the existing Plant, and continue to be used for operational and maintenance purposes. From the existing access roads, construction trucks will be directed to the construction areas. Access roads consist of both paved and unpaved surfaces; unpaved surfaces will be sprayed by water, as required, to control dust due to traffic.

Construction materials for the new production wells will include: steel pit casings, carbon steel surface casing, fiberglass reinforced plastics (FRP) casing, centralizers (casing centering guides), grout, wellhead, drilled solids, cuttings, drilling mud, drilling additives, salt, bentonite, hydrochloric acid, and sodium bicarbonate.

Drilling solids and liquid wastes associated with the new production wells will be reused, disposed of or recycled. The drilling solids will consist predominantly of sand, shell and limestone fragments, will be managed and stockpiled on the north berm area of the CCS in proximity to well sites F-3 and F-4. The drill solids storage area will be graded and bermed to contain stormwater for percolation until the solids are used as clean fill. Waste drilling fluids, such as silt and clay will be contained with berms along the eastern edge of the CCS approximately two miles south of well site F-2. As with the drill solids, the mud containment area will be graded, bermed, and maintained to contain stormwater.

Construction materials for the alternative water supply line will include: High Density Poly-Ethelyne piping, prefabricated spool piece, prefabricated supports, silt fences, isolation valve, and flanged connector. The installation of the alternative water supply line will result in approximately 50 cubic yards of excavation material. These materials, consisting primarily of organic deposits, will be transported to designated spoil areas on Plant property. Material will be transported by truck via existing designated internal roads.

Materials unsuitable for re-use will be removed from the Project area. These materials, consisting primarily of organic deposits, will be transported to designated spoil areas on Plant property. Material will be transported by truck via existing designated internal roads.

4.0 ENVIRONMENTAL EFFECTS OF SITE PREPARATION AND CONSTRUCTION

The purpose of this section is to describe the environmental effects related to the site preparation and construction.

4.1 Land Impacts

4.1.1 Production Wells

The construction site areas for each of the production wells will consist of designated areas that will contain drill rig, support trailer, mud system, shale tank, and frac tank. The designated areas will be as follows:

- F-1: 150’ by 60’ (refer to Figure 2.1-1A)
- F-2: 150’ by 100’ (refer to Figure 2.1-1B)
- F-3: 150’ by 100’ (refer to Figure 2.1-1C)
- F-4: 290’ by 90’ (refer to Figure 2.1-1D)
- F-5: 320’ by 40’ (refer to Figure 2.1-1E)
- F-6: 320’ by 40’ (refer to Figure 2.1-1F)

These areas are predominantly undeveloped and are existing areas associated with electric power generation. Parking of equipment, trucks, and material storage will all be situated within these designated construction site areas or within predetermined laydown areas.

4.1.2 Alternative Water Supply Line

The construction site area will be approximately 2,000 feet in length with a width of approximately 14 feet, which includes staging areas. The water supply line will avoid the fuel oil retention basin and the existing above-ground pipeline and infrastructure. The water supply line will be an above-ground infrastructure with pipeline supports to secure the pipeline. Underground trenches (approximately 3 feet) will be used across roadways (approximately 25 feet in total). Roadway crossings will be covered with concrete for protection from heavy haul trailers.

The water supply line route is currently relatively flat, consisting of a paved or gravel surface and currently contains other infrastructure and equipment associated with electric power generation.

4.1.2.1 General Construction Impacts

The construction site area for well site F-1 is predominately paved and used for equipment laydown. The construction site areas for well sites F-2 through F-6 are predominantly undeveloped service road areas adjacent to the CCS. The equipment list will include: a drill rig; a dog house (or drill rig office); a support trailer with dry materials and equipment storage; a mud system that includes a series of vibratory screens, sand, and silt centrifuges; drilling fluid (bentonite slurry); and, water storage tanks. Each construction site area will typically have at least one front-end loader and (potentially) a track back hoe to support the movement of materials, a boom truck or small crane, tanker and dump trucks for hauling out mud and drill cuttings waste, and a tanker for drilling water supply.

Within the construction site areas, laydown areas will be utilized for storing new casings, drill pipe, working tubing, bits, subs, numerous miscellaneous pumps, and steel components for fabrication. All fuels and regulated materials will be stored either inside enclosures or within secondary containment. Cementing equipment, which includes a tractor trailer-sized cementing rig and bulk dry cement storage either will be stored in a semi-trailer or in a 30-feet tall silo. Power will be made available by a portable and temporary (ultra-low sulfur) diesel powered generator or secure shore power from FPL.

The construction workforce is anticipated to average approximately 4-6 workers per drill rig, with two anticipated drill rigs teams on-site for the Project the total estimated workforce will be 10.

During construction, the construction labor force will use existing sanitary facilities or portable chemical toilets. A licensed contractor will pump all sanitary sewage from the portable toilets and holding tanks as needed and will transport the waste to an approved off-site treatment facility. Potable water for consumption during construction will be obtained from the Plant's potable water system or bottled potable water.

Solid waste materials generated during construction will be disposed of in accordance with applicable rules and regulations. Liquids collected during the drilling activities will be collected; materials will be separated and clarified before water is discharged. Drilling mud will be recycled in the drilling process and the waste product will be disposed of as appropriate. Precautions and measures will be taken to avoid spills during construction and testing of the wells.

4.1.3 Alternative Water Supply Line

Within the 2,000 linear feet construction area (with a width of approximately 14 feet) will be designated staging areas for construction equipment such as a temporary trailer, portable toilets, containers for storage, vehicles and equipment will be stored. The area along the route is currently paved or graveled and has infrastructure and pipeline equipment associated with the existing Plant operations. Parking of equipment, trucks, and material storage will all be situated within these designated construction site areas or within predetermined laydown areas. The equipment list will include: temporary trailer, portable toilets, and containers for storage, vehicles and miscellaneous construction equipment.

Any fuels and regulated materials will be stored either inside enclosures or within secondary containment. Power will be made available by a portable and temporary (ultra-low sulfur) diesel powered generator or secure shore power from FPL. The construction labor force will use portable chemical toilets. A licensed contractor will pump all sanitary sewage from the portable toilets and holding tanks as needed and will transport the waste to an approved off-site treatment facility. Potable water for consumption during construction will be obtained from the Plant's potable water system or bottled potable water. Solid waste materials generated during construction will be disposed of in accordance with applicable rules and regulations. Any liquids collected during the drilling activities will be collected; materials will be separated and clarified before water is discharged.

The construction workforce is anticipated to average approximately 15 workers (including a field supervisor) over the anticipated three month construction timeframe.

4.1.4 Roads and Slip

Primary access to the Plant is provided via SW 344th Street (Palm Drive), which connects the Plant with SW 117th Avenue, U.S. Highway 1, and SW 137th Avenue. This will serve as the primary access for construction activities.

Existing paved and unpaved roads within the Plant boundary will be utilized for movement of construction materials. Construction materials may be brought in from off-site via the public roadway system. Therefore, no significant changes will result from construction-related traffic on these existing roadways.

4.1.5 Flood Zones

The Project area has an average elevation of about 6 feet (MLW). Drainage from the Project area will be directed to the CCS, which is capable of containing the water volume of a 100-year, 72-hour storm. As a result, construction activities associated with the Project(s) will not adversely impact flood elevations for adjacent areas and will not cause any adverse flooding or related impacts to off-site property.

4.1.6 Topography and Soils

Elevations of the land surface during construction activities will be approximately the same as the area surrounding each of the Project locations. As a result, no significant changes in topography will be observable from off-site locations. The structures associated with the construction activities will be temporary. Therefore, no effects on the aesthetics or viewshed are anticipated due to changes in the topography.

4.2 Impact on Surface Water Bodies and Uses

All activities associated with construction of the production wells will be conducted within the perimeter containment of the CCS. All stormwater and produced well water will be controlled to minimize turbidity within the CCS; therefore, no adverse impacts are anticipated on adjacent areas or off-site. Residual bentonite drilling fluid within the casing will be circulated out of the casing and properly disposed of prior to well water discharge to the CCS. Potable water or water from the Upper Floridan Aquifer will be used to displace the drilling fluid. The solids management setup will be a closed system that will minimize the brackish Upper Floridan Aquifer water from being discharged to the ground surface at the construction site areas. Each construction site area will have secondary containment system, installed prior to rig and mud system mobilization that will consist of a compacted limerock pad and containment earthen berm will enclose the drilling area. Discharge water and collected storm water will, initially, discharge to a frac-tank system until pH and turbidity are acceptable to discharge formation water directly to the outfall line, which flows into the CCS. The outfall will be surrounded by a floating turbidity barrier.

All activities associated with the installation of the alternative water supply line will be conducted within a controlled area. Silt fences will be installed along the perimeter of the route to minimize and control runoff within the construction area; therefore, no adverse impacts are anticipated on adjacent areas or off-site.

There is currently no surface discharge from the CCS to any waters of the state; and there will be no surface discharge associated with these Project(s). Consequently, there will be no adverse impacts to surface water bodies from construction of the Project(s).

4.2.1 Impact Assessment

The potential for on-site Project construction activities to impact off-site aquatic systems will be minimized through the use of appropriate construction techniques to control erosion, sedimentation, and surface runoff. Stormwater and produced well water collected during the construction period will be handled using best management practices (including silt fences, hay bales and settling tanks) and routed to the CCS.

4.2.2 Measuring and Monitoring Program

There will be no construction impacts to off-site surface water bodies from the Project(s); therefore, no new measuring and monitoring programs are proposed.

During construction, the well sites, not within the containment berms, will discharge stormwater to the CCS via sheet flow. In addition, discharge water that is generated during drilling activities will be routed through the formation water disposal system and will be pumped to settling tanks to clarify the water prior to release to the CCS. Stormwater collected along the alternative water supply line will be collected and management as existing stormwater within the Project location; directed to an existing stormwater pond with controlled discharges made to the CCS.

Prior to beginning any earth disturbing activities, silt fences will be installed along the perimeter of Project locations for construction, laydown, parking, and trailers. There will be no runoff to off-site areas. The silt fences will filter sediments from construction runoff. A floating turbidity barrier will be placed within the CCS around the release point to contain turbidity from entering the CCS, if needed at the discharge location. Further discussion on proposed conservation measures is discussed in Appendix C.

4.3 Groundwater Impacts

No adverse groundwater impact will occur as a result of construction activity.

4.4 Ecological Impacts

4.4.1 Impact Assessment

Due to the proposed locations of the Project locations; within previously-disturbed areas and surrounding the CCS, adverse impacts to ecological resources or threatened or endangered species are not anticipated to occur as a result of the construction of the Project(s). Potential impacts will be avoided prior to and during construction activities.

4.4.2 Measuring and Monitoring Programs

There are no impacts to aquatic/wetland systems or threatened and endangered species anticipated from construction of the Project(s); therefore, no new measuring and monitoring programs are proposed.

4.5 Air Impacts

Construction activities may result in the generation of fugitive particulate matter (PM) emissions and vehicle exhaust emissions. Fugitive PM emissions will result primarily from vehicular travel over existing paved roads and unpaved areas within the Plant property. Vehicular traffic will include heavy-equipment traffic and traffic due to construction workers entering and leaving the Plant property. Construction personnel and equipment will enter the Plant exclusively via SW 344th Street (Palm Drive) and the existing entrance roadway. Vehicle traffic for any fill material brought to the construction site areas using the berms of the CCS will use reasonable precautions as prescribed in FDEP Rule 62-296.320(4)(c).

4.5.1 Control Measures

The possibility of wind erosion is negligible due to the nature of construction activities. Most of the areas used for construction parking and laydown are paved or graveled, which will minimize fugitive emissions. A number of wind erosion control measures will be implemented, as necessary per Rule 62-296.320(4)(c), FAC, during the construction period in order to minimize air emissions and potential impacts. The entrance roads and parking are paved, which minimizes dust emissions from vehicles entering the Plant. Watering on unpaved roadways, construction site areas and laydown areas will be undertaken as necessary. As a result, the estimated fugitive air emissions during construction are not anticipated to significantly affect air quality.

Combustion-related emissions will result from on-site construction equipment and on-site vehicle traffic. Construction equipment could produce emissions of PM_{10}, nitrogen oxide (NO_x), SO_2, CO, and volatile organic compounds (VOCs). There will be no change in the operation of the existing on-site diesel engines due to the construction of the Project(s). Given the short-term nature of the construction activities of the Project(s), adverse impacts to air quality in the vicinity of the Plant are not anticipated.

4.6 Impact on Human Populations

4.6.1 Construction Noise Impacts

The construction equipment for the production wells will include two teams that will be moved from well site to well site. However, it should be noted that these activities will be extremely intermittent and transitory. The construction equipment for the alternative water supply line will include 15 workers that will start and end the 2,000 feet line.

The maximum noise impacts will be less than or equal to existing ambient conditions. Therefore, construction activities associated with the Project(s) will not change the character of observed noise levels in the vicinity of the Plant.

There are no State of Florida noise regulations that are applicable for the construction and operation of the Project(s). There is a “nuisance” noise ordinance for Miami-Dade County. Section 21-28, “Noises; unnecessary and excessive prohibited,” states: “It shall be unlawful for any person to make, continue, or cause to be made or continued any unreasonably loud, excessive, unnecessary or unusual noise (Code of Miami-Dade County, Part III Code of Ordinances; Article IV Miscellaneous). Maximum noise levels outside of the Plant are predicted to be less than 50 dBA. Therefore, construction of the Project(s) will not produce any unreasonably loud, excessive, unnecessary, or unusual noise and will comply with the applicable Miami-Dade County noise ordinance.

5.0 EFFECTS OF PLANT OPERATION

5.1 Impacts on Water Supplies

5.1.1 Production Wells

Monitoring of the CCS water and salt balance components has indicated that changes in CCS salinity are strongly correlated to precipitation; with large precipitation events followed by appreciable reductions in the salinity of the CCS. This observation led to investigation of other means of supplying low salinity water to the CCS for the purpose of permanently lowering the salinity of the CCS. Modeling results estimate a continuous addition of approximately 14 MGD of water with a much lower salinity than the CCS will reduce CCS salinity to approximately 34 PSU.

The addition of 14 MGD from the Upper Floridan Aquifer would be required to meet this average reduction, with less withdrawal amounts needed during the wet season, while more may be required during the dry season when less precipitation is being naturally added. Modeling results have estimated that the additional water to the CCS will raise the average stage in the CCS by 0.25 ft. This rise was simulated by the CCS water balance model that was developed for the FPL Turkey Point Uprate Project. See Appendix A for further details on the determination of water use for the Project.

The evaluation of drawdown due to pumping at the proposed salinity reduction wells was based on the ECFAS2 model developed for the SFWMD. This model was subsequently adapted to site-specific conditions and re-calibrated to two Aquifer Performance Tests (APTs) performed at the Plant. The resulting regional calibrated groundwater flow model provides assessment of drawdown at nearby existing Upper Floridan Aquifer water users.

The proposed pumping of 14 MGD is projected to result in a maximum Upper Floridan Aquifer drawdown of 15.1 feet at the Plant for a scenario involving the continuous discharge of 14 MGD from well sites F-1 through F-6. The extent of drawdown, as defined by the 1-ft drawdown contour encompasses five existing legal users. Overall, the impacts to off-site permitted wells are minor. The maximum drawdown due to the proposed salinity reduction wells experienced by the nearest (non-FPL) user is 2.23 feet and occurs at the Card Sound Golf Club and Ocean Reef Club wells, located approximately 8.8 miles away. The drawdown at these locations is approximately equal to that estimated by SFWMD (2013) and comprises approximately 23% of the cumulative drawdown simulated at this site. The drawdown contribution by the proposed salinity reduction wells is a conservative estimate (greater than would actually be experienced), since the drawdown in the wellbore at each nearby user due to localized pumping is under-simulated by the model.

In addition to a demonstration of minimal drawdown induced at wells of permitted users within the 1-ft drawdown contour, the SFWMD Basis of Review for water use permitting also stipulates that the proposed pumping not impact the saltwater interface, as defined by the 250 mg/L isochlor. As the quality of Upper Floridan Aquifer water in this area already exceeds such a concentration, and no saltwater interface exists, this stipulation does not apply to the Project. Moreover, the operation of the salinity reduction well is not expected impact Upper Floridan Aquifer water quality in a regional sense. Local changes in water quality are expected to be minor, as demonstrated for other Upper Floridan Aquifer water use in the region (SFWMD, 2012). See Appendix B for further details on the Evaluation of Drawdown in the Upper Floridan Aquifer Due to Proposed Salinity Reduction-based Withdrawals.

5.1.2 Alternative Water Supply Line

The installation and operation of the alternative water supply line will have no impact on any existing users because there is not additional water authorization being requested. The proposed water use is a re-allocation of an existing authorization for Unit 5.

5.1.3 Leachate and Runoff

Stormwater runoff from the well sites will be via sheet flow, with all discharges being routed to the CCS. Embankment slopes and adjacent areas will be graded with moderate slopes for effective drainage. Embankments will be protected from erosion with fabric-formed concrete or equivalent-type protection.

Stormwater runoff from the area along the alternative water supply line is a non-contact stormwater that will be routed to the CCS, as is currently done for this area. No significant changes in the site drainage will result from the Project.

There is currently no surface discharge from the CCS to any waters of the state; and there will be no surface discharge associated with the Project(s). Consequently, there will be no adverse impacts to surface water bodies from operation of the Project(s).

5.1.4 Measurement Programs

No new or modified measurement or monitoring programs are proposed for the Project(s).

5.2 Sanitary and Other Waste Discharges

The Project(s) will not significantly increase the generation of solid waste at the Plant; therefore, no impact to the municipal solid waste facilities is anticipated. The Project(s) will have no impact on hazardous waste handling and/or disposal at the Plant. The operation of the Project(s) will not generate solid or hazardous waste and there will not be any materials stored at any of the Project locations. Therefore, the Project(s) will comply with applicable Conditions of Certification and applicable rules and regulations.

During operation, runoff from the Project locations will continue to be routed as in current conditions. The well sites will include embankment slopes and adjacent areas will be graded with moderate slopes for effective drainage via sheet flow to the CCS. Embankments will be protected from erosion with fabric-formed concrete or equivalent-type protection. The alternative water supply line will be situated above-ground and similar to other existing pipeline and infrastructure in the area.

5.3 Air Quality Impacts

The Project(s) will not have any associated emission units except for the backup diesel engine driven pump associated with well site F-1, which will only be used during an extended loss of power from an external event. The emission will only be tested on a periodic basis for maintenance and testing with annual emissions rates much less than FDEP's criteria for insignificant emission units in Rule 62-210.300(3)(b)1 FAC. The unit will also be portable (i.e., trailer or skid mounted) and would be considered portable engines under EPA's guidance and not considered non-road engines under 40 CFR 1068.30. As such, there are no emission limitations or other regulatory requirements such as 40 CFR Part 60 Subpart IIII or 40 CFR Part 63 Subpart ZZZZ. Nonetheless, the engine would likely meet the requirements of 40 CFR Part 60 Subpart IIII since they will be recently purchased new equipment.

5.4 Noise Impacts

The Project(s) will not result in a discernible increase in off-site noise levels. The only operational noise impacts will be when the emergency pump (associated with well site F-1) is operated for maintenance testing (e.g. about 1- 2 hours per month) and during emergency situations. As a result, the noise impacts associated with the Project are anticipated to fully comply with the Miami-Dade County nuisance ordinance and no significant impact is anticipated.

5.5 Ecological Impacts

Due to the existing developed nature of the Project locations, adverse impacts to ecological resources, including threatened and endangered species or their habitat, are not anticipated to occur as a result of the Project(s).

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APPENDICES

APPENDIX A

EVALUATION OF REQUIRED FLORIDAN WATER FOR SALINITY REDUCTION IN THE COOLING CANAL SYSTEM, TETRA TECH, TECHNICAL MEMORANDUM (5/9/2014)

TETRA TECH

TECHNICAL MEMORANDUM

From: Peter F. Andersen and James L. Ross, Tetra Tech

To: Rory Rahming, Florida Power & Light Company

Date: May 9, 2014

Subject: Evaluation of Required Floridan Water for Salinity Reduction in the Cooling Canal System

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Introduction

This technical memorandum describes the water and salt balance modeling of the proposed salinity reduction in the Florida Power & Light (FPL) Cooling Canal System (CCS), located at the Turkey Point Nuclear Power Plant. The modeling was conducted to provide an assessment of the volume of Floridan water that would be required to add to the CCS in order to reduce the hypersalinity of CCS water to salt concentrations commensurate with seawater.

Two spreadsheet-based water and salt balance models were employed for this analysis: 1) a steady state balance model based on long-term average flows to/from the CCS, and 2) a transient balance model calibrated to 22 months of hydrologic and water quality data collected as a part of FPL comprehensive pre-uprate monitoring (Ecology and Environment, 2012). These models were collectively used to provide estimates of the amount of Floridan water required to achieve the desired CCS salinity reductions and the corresponding changes to canal stage within the CCS.

Background

The CCS is a constructed surface water body that receives heated water from Turkey Point Nuclear Units 3 and 4. As the heated water travels southward along the discharge canals and northward back to the plant along return canals, it is cooled by evaporation and mixing with inflowing water from the Biscayne Aquifer. Due to the evaporative process, which is facilitated by the elevated temperature of the water, a portion of the water from the CCS is lost to the atmosphere, leaving dissolved solids behind in the CCS and producing hypersaline conditions in the CCS. Hypersaline water exhibits salinities greater than that of seawater, which has a salinity of approximately 35 g/L. Salinity in the CCS has ranged between 42 and 69 g/L over the past 10 years.

In order to mitigate the contribution of hypersaline water to the underlying Biscayne Aquifer, FPL has evaluated remedial alternatives to reduce the salinity of water in the CCS to seawater levels. In the course of that evaluation, an inspection of 22 months of pre-uprate monitoring data revealed a correlation between daily rainfall on the CCS and CCS salinity, where rainfall events were generally followed by short term reductions in CCS salinity. The visual comparison between daily precipitation and daily averaged CCS salinities in Figure 1 illustrates this relationship. Two phenomena are evident in this figure: 1) CCS salinities generally reduce during rainy months (June through September); 2) significant rainfall events produce notable reductions in CCS salinity. The latter phenomenon is effectively illustrated by a large (> 7 inches) rainfall event in late-September 2010 that induced an approximate 10 g/L drop in the average CCS salinity.

Because precipitation events are simply freshwater inflows to the CCS, they effectively dilute the water and reduce salinity. Based on the effectiveness of these freshwater inflows in reducing salinity, a remedial alternative was proposed wherein low salinity water would be added to the CCS on a sustained basis. The Floridan Aquifer was identified as the source of added water due to the low salinity and long term availability of groundwater.

Balance Modeling

In order to evaluate the effectiveness of reducing CCS salinity with added Floridan water, as well as the associated volume of water that would be needed, two balance models were employed. First, a simple, uncalibrated water and salt balance model of the CCS was developed. This balance model is based on a conceptual understanding of the inflows to and outflows from the CCS; it was employed as a screening model to provide a broad assessment of the efficacy of the proposed remedial alternative.

Subsequent to analysis with the steady state balance model, a transient water and salt balance model of the CCS system was configured to provide estimates of impacts to the CCS caused by the remedial alternative, including canal stage changes, changes in salinity, and time required to reduce salinity to the desired concentration. This transient model, which has been accepted by South Florida Water Management District, is calibrated to 22 months of CCS hydrologic and water quality data, such that it effectively replicates historical responses of the CCS to changes in inflows and outflow; as such, this transient model is capable of evaluating a wide range of climatic and operational conditions.

Steady State Balance Model

In order to determine the volume of Floridan water required to reduce CCS salinity to approximately 35 g/L, a steady state water and salt balance model of the CCS was developed. This balance model was based on a conceptual model of CCS equilibrium where inflows to the CCS are equal to and offset by outflows from the CCS, such that the volume of water in the CCS is invariant. The components of inflow are:

- Inflow from Nuclear Units 3 and 4,
- Precipitation,
- Seepage of groundwater, and
- Blowdown from other nuclear units.

Outflows from the CCS are comprised of:

- Outflow to nuclear Units 3 and 4 (assumed equal to the inflow from these units),
- Evaporation, and
- Seepage to groundwater.

Based on measurements and estimates of many of the flow components and associated salinities, the steady state water and salt balance effectively defines equilibrium flows into and out of the CCS, as well as the resulting salinity of the water within the CCS (Table 1a).

An additional inflow component was considered in the balance model with an assumed concentration of approximate 2 g/L, based on recent measurements of Floridan water. Using the balance model, the volume of the additional inflow was adjusted until the equilibrium concentration of CCS water reached approximately 35 g/L; the minimum additional inflow was derived to be 14 million gallons per day (mgd), which reduced the CCS salinity to 34.4 g/L (Table 1b).

Transient Balance Model

As a necessary component of FPL’s pre-uprate monitoring, a transient water and salt balance model was constructed for the CCS and calibrated to 22-months of hydrologic and salinity data from September 2010 through May 2012 (Ecology and Environment, 2012). Though the model considers the same CCS inflows and outflows as the steady state model, it calculates these inflows and outflows on a daily basis using 15-minute water level, salinity, and meteorological data measured throughout the Biscayne Aquifer, Biscayne Bay, the CCS, and nearby canals. The model uses these daily inflows and outflows to effectively simulate daily changes in CCS water and salt storage. The quality of the model is illustrated by the accurate simulation of daily changes in average CCS water levels and salinity between over the 22-month period (Figure 1). It should be noted that the model correctly simulates the reduction in salinity resulting from the addition of precipitation. The ability to match the response of salinity to addition of a known quantity and quality of water provides confidence that the model is capable of predicting a similar cause and response situation with the addition of Floridan water.

Transiently modeling the impacts of the proposed remedial alternative was a two-step process, wherein two predictive versions of the transient balance model were configured. The first model configuration, called the *unconstrained* model, predicted water levels in the CCS considering the addition of 14 mgd of Floridan water. This model was used to determine the increase in canal stage that would likely result from the added inflow: an average of 0.25 ft due to the Floridan-based inflow. Salinity changes were not assessed with this model due to the compounding error associated with predicting both hydrologic and water quality data.

The second model configuration, referred to as the *constrained* model, added the calculated 0.25 ft stage increase to the 22 months of observed CCS stages, and predicted the change in CCS salinity likely to result from the contribution of low salinity (2 g/L) Floridan water to the CCS. This model predicted a 41.3% reduction in CCS salinity from 60 g/L to approximately 35 g/L within 1 year of the initiation of the remedial action (Figure 2). Figure 2 also suggests that the quantity of added Floridan water could be optimally managed to obtain CCS salinities that are close to seawater. Note that less than 14 mgd may be required during the wet season while more may be required during the dry season when less precipitation is being added naturally.

The estimated flow of water for salinity reduction (14 mgd) appears low relative to the volume of the CCS (approximately 4.2×10^{9} gallons); the key to remedial success, however, is the significantly low salinity in the Floridan relative to the salinity observed in the CCS. This difference between Floridan and CCS salinities may become less pronounced over time as the quality of the Floridan aquifer will likely vary and may degrade with continued stress on the aquifer. As such, two additional evaluations were performed with the transient model in order to determine the requisite increases in Floridan-based inflows to the CCS should the associated salinity increase by 50% (3 g/L) and 100% (4 g/L). Based on these analyses, it was determined that:

- If Floridan water were to degrade to 3 g/L, 14.5 mgd would be required to reduce the CCS salinity to 35.2 g/L; and
- If Floridan water were to degrade to 4 g/L, 15 mgd would be required to reduce the CCS salinity to 35.3 g/L.

As in the base remediation scenario, the relative difference between the CCS and the Floridan aquifer groundwater is critical to successful salinity reduction.

Summary

Changes in salinity in the CCS appear to be strongly correlated to precipitation: large precipitation events are followed by appreciable reductions in the salinity of the CCS. This observation led to exploration of the effect of adding on a continuous basis a source of water with a much lower salinity than the CCS. A simple steady state water balance and a more complex transient water balance were used in this evaluation. In order to abate the hypersaline conditions within the CCS, water and salt balance modeling determined that an average 14 mgd of Floridan water with a salinity of 2 g/L would need to be added to the CCS. Both models estimated that the addition of the Floridan water would reduce CCS concentrations to approximately 35 g/L. The transient model indicates that reduction of CCS salinity to that of seawater will take less than one year using an average addition of 14 mgd. Sensitivity analysis on the salinity of the added water indicates that the required quantities to reduce CCS concentration to approximately 35 g/L are 14.5 and 15 mgd for assumed Floridan aquifer salinities of 3 and 4 g/L, respectively. The transient model also indicates that the added water will raise the average stage in the CCS by 0.25 ft. This rise is accounted for in the water balance that is used for computations of CCS salinity and water budget components.

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Table 1a. Steady State Water and Salt Balance Model for the CCS (Base Case)

Inflows	Flow (mgd)	Salinity (g/L)
Precipitation	24.7	0
Blowdown	7.9	7
Groundwater Inflow to CCS	35.9	40
Total Inflow	68.5	

Outflows	Flow (mgd)	Salinity (g/L)
Evaporation	43.7	0
Seepage to Groundwater from CCS	24.8	60
Total Outflow	68.5	
	CCS Salinity (g/L):	**60**

Table 1b. Steady State Water and Salt Balance Model for the CCS (with Added Floridan Water)

Inflows	Flow (mgd)	Salinity (g/L)
Precipitation	24.7	0
Blowdown	7.9	7
Added Water	14	2
Groundwater Inflow to CCS	28.9	35
Total Inflow	75.5	

Outflows	Flow (mgd)	Salinity (g/L)
Evaporation	43.7	0
Seepage to Groundwater from CCS	31.8	34.4
Total Outflow	75.5	
	CCS Salinity (g/L):	**34.4**

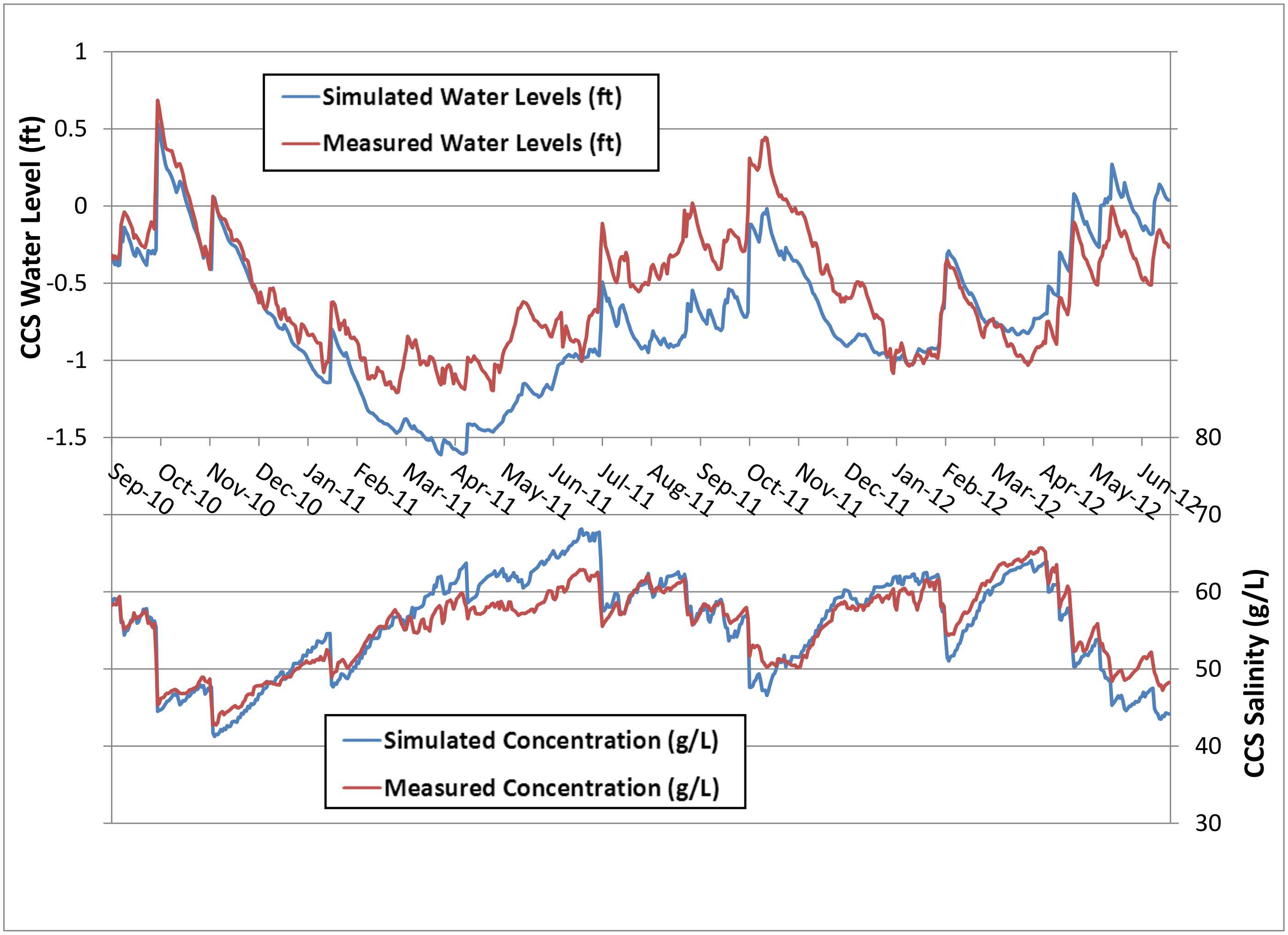

Figure 1. Comparison of observed daily average CCS water levels and salinity to those simulated by the calibrated 22-month transient water and salt balance model

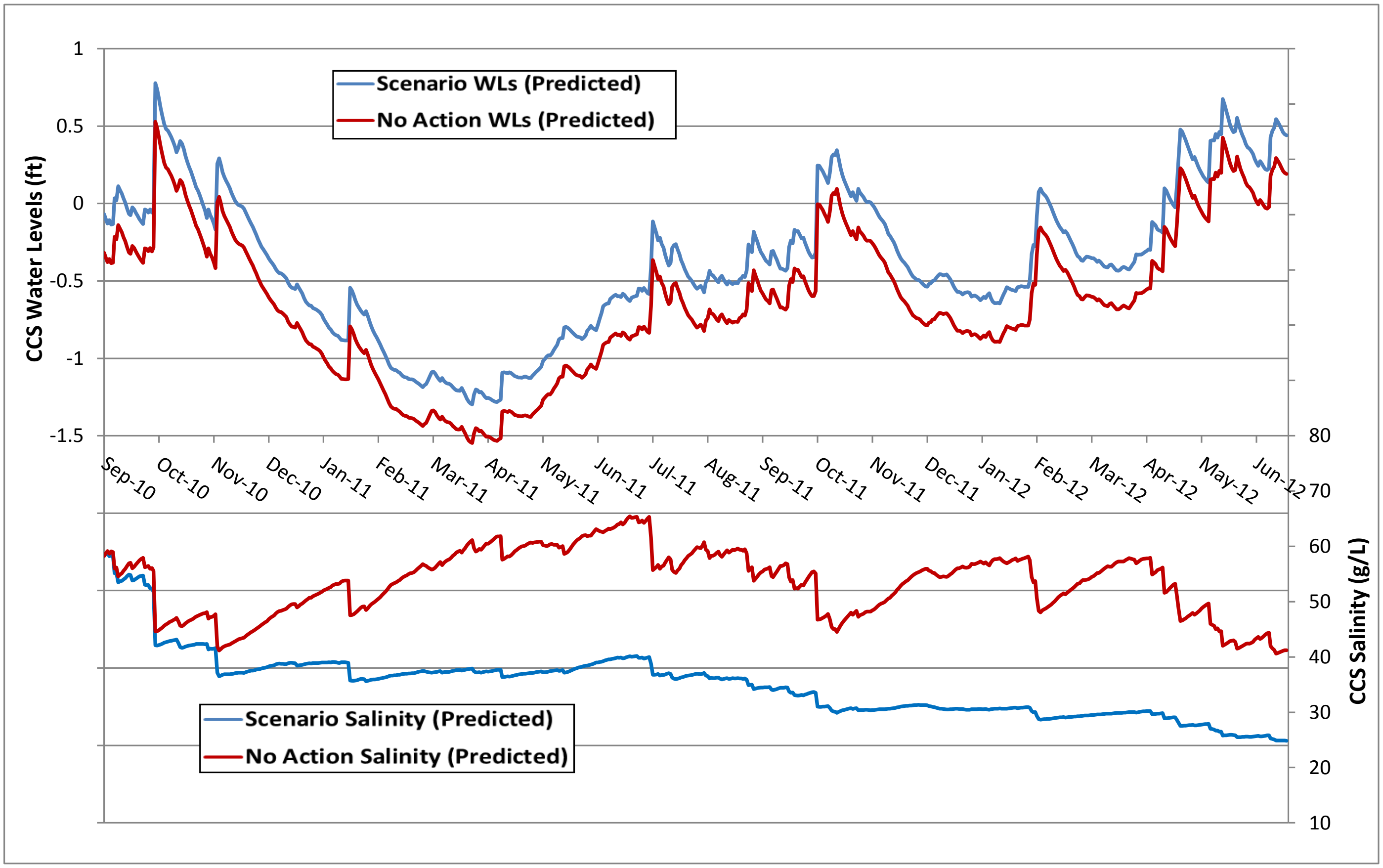

Figure 2. Predicted CCS stage and salinity in response to the additional inflow of Floridan water at a rate of 14 mgd and salinity of 2 g/L

APPENDIX B

EVALUATION OF DRAWDOWN THE UPPER FLORIDAN AQUIFER DUE TO PROPOSED SALINITY REDUCTION-BASED WITHDRAWALS, TETRA TECH, TECHNICAL MEMORANDUM (5/13/2014)

TETRA TECH

TECHNICAL MEMORANDUM

From: Peter F. Andersen and James L. Ross, Tetra Tech

To: Rory Rahming, Florida Power & Light Company

Date: May 13, 2014

Subject: Evaluation of Drawdown in the Upper Floridan Aquifer Due to Proposed Salinity Reduction-based Withdrawals

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1 INTRODUCTION

1.1 Background

Florida Power & Light Company (FPL) is in the process of applying for a modification to site certification to reflect the proposed reduction of salinity of cooling canal system (CCS) waters at the Turkey Point Power Plant, located near Florida City, Florida. A component of this project is a series of 1000-1200 foot deep wells that will extract low salinity water from the Upper Floridan Aquifer and discharge it into the CCS for the purpose of reducing the salinity of CCS water to levels commensurate with Biscayne Bay. As a step in the site certification process, FPL must demonstrate the feasibility of withdrawing approximately 14 million gallons per day (MGD) of Upper Floridan Aquifer water without adversely impacting the wells of existing legal users of the Floridan Aquifer. This memorandum describes the calibration and simulation of a groundwater flow model of the Floridan Aquifer system that is used to determine potential groundwater level (drawdown) changes resulting from the use of the Floridan Aquifer as a source of water for CCS salinity reduction.

1.2 Scope

The scope of this analysis is to calibrate a regional groundwater flow model of the Upper Floridan Aquifer, as defined from regional hydrogeologic data, including two documented Floridan Aquifer Performance Tests (APTs). The modeling shall meet the minimum requirements of the South Florida Water Management District (SFWMD) Basis of Review (BOR) for water use permitting. Once calibrated, the model will be used to evaluate the anticipated drawdown of the Upper Floridan Aquifer potentiometric surface at the plant site and regional settings. The drawdown information will be used to assess the likely impacts to the wells of existing legal users.

1.3 Report Organization

Following this introduction, the memorandum provides a summary of the existing regional groundwater model developed by the SFWMD that was modified and re-calibrated. This existing model is referred to as the East Coast Floridan Aquifer System Model - Phase 2 (ECFAS2). The calibration to the two APTs is then discussed, including changes that were made to the ECFAS2 model and the resulting quality of calibration. Predictive regional simulations and corresponding results follow.

2 METHODOLOGY

2.1 General

The methodology for conducting this study follows standard groundwater modeling protocols. As outlined in Anderson and Woessner (1992) the steps involved with model application include:

- Definition of purpose
- Conceptual model development
- Code selection
- Model design
- Calibration / verification
- Prediction
- Presentation of results

2.2 Regional Model

The primary purpose of the regional model analysis is to assess potential regional drawdown resulting from pumping water from the Upper Floridan Aquifer as a source of low-salinity water for the CCS. Some of the early steps in the modeling process, most notably conceptual model development, model design, and, to some degree, calibration, were abbreviated in this application because the ECFAS2 model (Golder Associates, 2008) was available to use as the framework for the analysis. The abbreviated relevant steps are summarized in this section. The resulting revised model marks an FPL adaptation to the ECFAS2 model, and is herein referred to as the Adapted Floridan model.

The conceptual model of the natural system is consistent with that described in the existing ECFAS2 model documentation (Golder Associates, 2008). Additional data to modify the hydraulic parameters are available from site specific data collection and testing. Two APTs performed at the site are documented in JLA Geosciences (2006) and Dames and Moore (1975) and serve to supplement the conceptual model presented in the existing ECFAS2 model documentation (Golder Associates, 2008).

The design of the original model was generally unchanged. However, the modeled domain was truncated in the north such that the longitudinal extent of the revised model is less than that of the original. Additionally, the finite difference grid spacing was modified to account for well locations used in the APTs that are simulated in the model re-calibration. Grid modifications are described in Section 3.2. Additionally, since relative changes in flow conditions (i.e. drawdowns) are the focus of both model calibration and predictions, only the groundwater flow component of the original model is evaluated and employed, herein. Logistically, this decision facilitated efficient model calibration and predictive simulations, as consideration of density-dependent flow and transport resulted in very long run times. The original groundwater flow and transport model was calibrated to regional water levels and saltwater concentrations. To account for site-specific conditions, the model was re-calibrated to two APTs conducted at the site.

3 Regional Model Simulations

3.1 ECFAS2 Model

The SFWMD, through contractors, developed a density-dependent groundwater flow and saltwater transport model of the East Coast of Florida in two phases. The first phase, ECFAS1 (HydroGeologic, 2006), simulated the southern half of the study area (the Lower East Coast of Florida); the second phase (ECFAS2) expanded the model domain northward to include more of the East Coast of Florida (Golder Associates, 2008). Both phases of the ECFAS model are available from the SFWMD; only the former has been peer-reviewed. Nevertheless, these models represent the best available framework from which to base a permitting-level analysis of regional Floridan Aquifer impacts resulting from pumping.

The ECFAS2 model encompasses the ECFAS1 region and represents a revision to the earlier work. Consequently, the ECFAS2 model was used as the framework for this analysis. The ECFAS2 model covers the much of the East Coast of Florida, from southern Indian River County to the Florida Keys. This area is discretized into uniform 2400 by 2400 ft cells. Vertically, the model extends from land surface to the Boulder Zone, a depth of approximately 3000 ft. The vertical section is discretized into 14 layers, with the Upper Floridan Aquifer represented as 2 layers. Boundary conditions are specified to represent flow into and out of the model domain, usually along the perimeter of the study area. Both flow (hydraulic heads) and saltwater transport (TDS concentrations) are simulated and are dependent upon one another (density-dependent flow and transport). Field data from numerous borings were used to establish the structure of the model layering, which represents the hydrostratigraphic layers. In addition, field data from APTs were used to guide the initial choice of hydraulic parameters that were used in the model calibration. The model was calibrated to both hydraulic heads and concentrations. Even though the model was calibrated, Golder Associates (2008) found that the model's size resulted in exceptionally long run times such that the scope of the calibration had to be reduced from what was originally envisioned.

3.2 Adapted Floridan Model

The ECFAS2 model was not usable in its available state because it covers a very large area and does not provide the resolution required to accurately assess site-specific features and impacts. Several structural modifications were made to the model and are described herein. Modifications to the calibration of the model are discussed in this section. As previously mentioned, only the groundwater flow capabilities of the ECFAS2 model were germane to the analyses of drawdown described herein, as regional changes in water quality attributable to the proposed wells, as well as the impact of such changes on drawdown, are anticipated to be negligible. Moreover, model run times were dramatically reduced by eliminating the density-dependence.

Since the Adapted Floridan model simulates groundwater flow and is adapted from the SEAWAT-based ECFAS2 model, the USGS simulation software MODFLOW-2000 (Harbaugh, et al, 2000), a commonly applied groundwater flow model, was used to simulate the regional model. MODFLOW-2000 is capable of addressing the requirements of the SFWMD BOR inasmuch as it:

- simulates groundwater flow,

- is capable of addressing multiple hydrostratigraphic layers and subdividing these layers such that drawdown can be computed at multiple levels within each layer, and
- is in the public domain, peer-reviewed, and widely used.

The most significant structural change to the model was the grid spacing, which was originally set at 2400 ft. For calibration purposes, the grid was refined in the immediate vicinity of the Turkey Point APTs, such that the well spacing for the APTs could be accurately represented and changes in head over small distances resolved. The revised grid spacing in the model for the calibration is shown in **Figure 1a**. The minimum grid spacing used in the Adapted Floridan model, near pumping and monitoring wells, is as little as 1.5 ft. The original model grid spacing, shown in **Figure 1b**, was used in subsequent predictive runs because it was adequate for assessment of impacts at the desired scale and was practical from a run-time perspective.

The original model layering was retained because it appeared to be generally appropriate for the level of detail required. The Intermediate Confining Unit (ICU), which overlies the Upper Floridan, was represented using a single layer.

The additional pumping wells that were included as a part of the calibration of the Adapted Floridan model also represent modifications to ECFAS2. The well locations and rates are described in the calibration and model results sections below. The time stepping of the models was also modified to provide adequate resolution for the duration of the APTs and to account for intermittent pumping (Section 3.2.1.1 and 3.2.1.2).

3.2.1 Additional calibration of model

Although the ECFAS2 model may represent the regional conditions fairly well, it may not represent site-specific conditions particularly well. This hypothesis was tested by running the model using documented pumping stresses on the system and comparing the modeled response to that which was observed during the test. In general, as discussed below, the comparison was not good. In order to obtain a reasonable representation of site-specific conditions, two additional calibrations, one to a short-term APT and another to a longer term APT, were performed. The ability to match aquifer system response to these APTs provides confidence that the model can predict the response to future proposed pumping. Modeled water levels were checked to ensure that the match to regional calibration targets had not been degraded as a result of the local changes. The methodology and results of each of the additional calibrations are described below.

3.2.1.1 JLA APT

JLA Geosciences (2006) conducted an APT in support of the Unit 5 site certification. Floridan water supply well PW-1 was pumped for 72 hours and drawdown was measured in two other water supply wells and a shallow observation well. The drawdown response documented during this test was believed to represent a good series of targets to match as a part of a calibration because it was local to the area of proposed pumping and was conducted under quality-controlled conditions. However, it was recognized that the short duration of the test and extent of monitoring points would provide data that may only be representative of a relatively small area.

Simulation of the APT was accomplished using the revised model grid. Well PW-1 was represented with a single well pumping at a rate of 4500 gpm in model layers 3 and 4, which represent the Upper Floridan Aquifer, in the cell at row 166, column 143 Timestepping ranged from a minimum of 5 to a maximum of 567 minutes, Drawdown response was noted in wells PW-3 (layers 3 and 4, row 168, column 171), PW-4 (layers 3 and 4, row 180, column 157), and OBS-1 (layer 2, row 166, column 143) at distances of 3036, 1686, and 0 feet, respectively from the pumped well. Note that OBS-1 is co-located with the pumping well, but is screened near the base of the Biscayne Aquifer and did not experience drawdown in response to the APT.

Comparison of modeled to observed conditions for the original model, prior to adjustment, was not good, with a residual standard deviation of greater than 100 ft. However, as shown in **Figure 2**, this match improved considerably (residual standard deviation of 0.36 ft) after adjustment of hydraulic parameters as a part of the calibration. In general, hydraulic conductivities were increased from their original values during calibration. Goodness-of-fit calibration metrics are shown in **Table 1** and indicate that the model provides a reasonable fit to observed data.

Table 1. Goodness of fit metrics for the JLA APT calibration.

Metric	Numerical Value
Mean Error, ft	0.22
Mean Absolute Error, ft	0.33
Residual Standard Deviation, ft	0.36
Range of Targets, ft	6.36
Residual Standard Deviation / Range *100	5.6%

Note that this calibration was conducted iteratively with the Dames and Moore APT described below and hence the calibrations strike a balance between matching the results of both APTs with the same set of parameters.

3.2.1.2 Dames and Moore APT

Dames and Moore (1975) conducted an APT in support of a feasibility study for using Floridan Aquifer water to cool the original Turkey Point nuclear units. Floridan Aquifer production test well (PTW) was pumped for 90 days and drawdown was measured in eight monitoring wells at various distances from the pumped well and depths in the aquifer. The drawdown response documented during this test was believed to represent a good series of targets to match as a part of a calibration because of its long duration and use of monitoring points that were distant from the pumping well. Thus, this test was complementary to the shorter duration, more local JLA APT described above.

As in the simulation of the JLA APT, the simulation of the Dames and Moore APT was accomplished using the refined model grid. Well PTW was represented with a single well pumping at a rate of 5000 gpm in cell layers 3 and 4, row 220, and column 97. Timestepping ranged from a minimum of 73 minutes to a maximum of 11.8 days. Drawdown response was noted in wells OW-A (row 229, column 108), OW-B (row 238, column 120), OW-C (row 207,column 82), and OW-D (row 258, column 181) at distances of 100 feet, 500 feet, 2000 feet, and 48,000 feet, respectively from the pumped well. Drawdown was recorded in the Upper and Middle Floridan aquifers at each of the four observation well sites, which are represented by layers 3 and 4, and 7 and 8, respectively

Comparison of modeled to observed conditions for the original model, prior to adjustment, was not good (residual standard deviation in excess of 10 ft), as was the case for the JLA APT. As shown in **Figure 3**, this match also improved considerably (with a residual standard deviation of

0.77 ft) after adjustment of hydraulic parameters as a part of the calibration. Goodness-of-fit calibration metrics are shown in **Table 2** and indicate that the model provides a reasonable fit to observed data.

Table 2. Goodness of fit metrics for the Dames and Moore APT calibration

Metric	Numerical Value
Mean Error, ft	-0.30
Mean Absolute Error, ft	0.66
Residual Standard Deviation, ft	0.77
Range of Targets, ft	11.8
Residual Standard Deviation / Range * 100	6.5%

Though the wells shown in **Figure 3** are not an exhaustive representation of the calibration targets, they are a microcosm of the quality of the model match to this APT. The lateral and vertical proximity to the pumping well precluded a reasonable match to the observed drawdown at well OW-A (Upper); as such, this well was omitted from the calibration.

3.2.1.3 Adjustments to the calibration

The primary parameters that were changed as a result of the additional calibration were hydraulic conductivities of the Upper Floridan Aquifer (UFA), ICU, Middle Confining Unit (MCU), and the Middle Floridan Aquifer (MFA). These parameters were all raised from their original values, as shown in **Table 3**.

Note that the parameter changes were made within zones that were near the Turkey Point site and mostly in areas potentially affected by drawdown from proposed salinity reduction wells, as shown in **Figure 4**, **5**, and **6**.

The changes made to the hydraulic properties in the Adapted Floridan model are not expected to significantly impact the quality of the model match to the water level and water quality targets employed in the calibration of the ECFAS2 model. The changes made to the Adapted Floridan model were generally minor, and the preponderance of the ECFAS2 model calibration targets are located outside of the Adapted Floridan model domain.

Table 3. Parameter changes resulting from calibration of the Adapted Floridan model.

Hydrologic Unit	Model Layers	Aquifer Parameter	ECFAS2 model (original)	FPL Floridan Model (recalibrated)
			magnitude	magnitude
ICU	2	Kz (ft/d)	0.0006	0.001
			0.000075	0.001
		Kh (ft/d)	0.000075	0.001
UFA	3,4	Kz (ft/d)	5.2	100
			9	15
			72.5	225
			0.33	225
		Kh (ft/d)	52	100
			90	150
			725	330
			3.33	330
		Ss	5.25E-07	8.00E-07
MCU	5,6	Kz (ft/d)	0.000002	0.004 0.003 0.08 0.4
			0.002	0.003 0.08
		Kh (ft/d)	0.00001	0.02 0.08 0.4 0.03
MFA	7,8	Kz (ft/d)	5.2	30
		Kh (ft/d)	450	900
			300	600
			180	1200
			52	600
MC2	9,10,11	Kz (ft/d)	0.0015	0.01
			0.0002	0.02

3.3 Predictive Simulations

Once calibration of the regional Floridan model was confirmed, equilibrium flow conditions were established by running the model, holding all flow boundaries (e.g. specified heads, pumping) constant until changes in the simulated flow field in the Floridan Aquifer System were negligible. This equilibrated state formed the initial conditions for ensuing predictive simulations. Equilibrated regional water levels, especially near Turkey Point, were generally lower than observed water levels; this is due to the exclusion of salt transport and the associated density-dependent flow. However, given that purpose of this model is to provide estimates of *relative* changes in water level, the low simulated water levels were deemed irrelevant. Since the focus of the salinity reduction well evaluation is regional drawdown, the original 2400-ft grid spacing was employed for predictive simulations.

According the SFWMD BOR, predictive evaluations made with the calibrated model must be conducted using monthly stress periods that simulate average annual groundwater withdrawals subject to rainfall that alternates between average and 1-in-10 year draught conditions. Given that the model simulates groundwater withdrawals from the Upper Floridan Aquifer and evaluates *relative* water level changes (i.e. drawdown) at nearby Floridan users, the consideration of drought conditions would have no impact on results. As such, the predictive models are conducted using annual stress periods and simulate permitted groundwater withdrawals without any variation in rainfall.

Additionally, the BOR stipulates that the 1-ft drawdown contour associated with the proposed pumping be simulated and the impacts to existing legal users' wells within that contour be evaluated. The process by which this was accomplished is described below.

3.3.1 Proposed Salinity Reduction Well Operation

There are six proposed salinity reduction wells. At any one time, five of these wells will collectively pump 14 MGD of low salinity water from the Upper Floridan aquifer. The six wells will be spaced approximately 1900 ft apart, along the northernmost canal of the Cooling Canal System and along the Interceptor Ditch (**Figure 7**). In the model, the 14 MGD of pumping is distributed evenly amongst the five active wells and is assumed to be a constant rate of pumping over the course of the 25-year simulation. Two alternative pumping scenarios are considered in this modeling analysis and differ in the allocation of pumping to wells F-2 and F-6. The base scenario simulates pumping at wells F-1 through F-5 (no pumping at F-6); the alternative scenario simulates pumping at wells F-1 and F-3 through F-6 (no pumping at F-2).

The salinity reduction wells were simulated, starting from an equilibrium flow field, in which nearby legal users' wells were simulated at their permitted withdrawals. Their operation over a period of 25 years encompasses the time from which the wells are anticipated to begin pumping through to the time 5 years beyond the decommissioning of Turkey Point Power Plant Nuclear Units 3 and 4 (at which point the CCS would no longer function in its current capacity). At the conclusion of the 25-year simulation, the simulated drawdowns in the regional model are those attributable only to the five proposed salinity reduction wells. **Figure 8a** illustrates these regional drawdowns associated with the base pumping scenario. In this base simulation, the drawdowns at a distance from the site are affected by variations in hydraulic conductivity; this is evident upon inspection of the 1-ft drawdown contour, which generally has an oblong shape, whose major axis is oriented north-to-south. Nearer to the site, the drawdown contours radiate outward from the wells in a more uniform manner, where the maximum drawdown is approximately 15.1 ft, near well F-3. In the alternative scenario, the maximum drawdown is approximately 14.4 ft, near well F-5.

As previously mentioned, the SFWMD BOR dictates that drawdown at permitted users' wells encircled by the 1-ft drawdown contour be determined. As illustrated in **Figure 8a,** the following permitted users fall within the 1-ft drawdown contour:

- Card Sound Golf Club,
- Ocean Reef Club,
- the Floridan Keys Aqueduct Authority (FKAA),
- Miami-Dade Water and Sewage Department South Miami Heights Wellfield, and
- FPL Unit 5 Wells.

Predicted drawdowns at Floridan wells of these existing legal users are presented in **Table 4**. These drawdowns are calculated at the center of the model grid cells in which the respective wells are simulated. In addition to drawdowns attributable to the proposed wells for the base pumping allocation scenario, cumulative drawdowns at nearby wells due to both pumping at permitted and proposed wells are provided in **Table 4.** These cumulative drawdowns are also illustrated in **Figure 8b** for the base pumping scenario. Withdrawals by nearby users were simulated at their respective permitted rates.

Table 4. Predicted drawdown at nearby users for the proposed Salinity Reduction Wells due to the base pumping scenario.

Facility	Location (L,R,C)	Permitted Withdrawal (MGD)	Distance from well F-2 (miles)	Base Scenario Drawdown at 25 Years (ft)	Base Scenario Cumulative Drawdown (ft)
Card Sound Golf Club (WUP 44-00001)	(3-4,173,93)	0.58	8.8	2.22	9.79
Ocean Reef Club (WUP 44-00002)	(3-4,173,93)	1.42	8.8	2.22	9.79
FKAA (WUP 13-00005)	(3-4,155,61)	9.70	10.3	2.16	15.06
South Miami Hts (WUP 13-00017)	(3-4,133-135,79)	3.00	10.3	2.27	11.39
FPL Unit 5 Well (PW-1)	(3-4,156,85)	14.3	< 1.0	11.87	32.61

A second evaluation was conducted in which the alternative pumping allocation (wells F-1 and F-3 through F-6) for the salinity reductions wells was simulated. The resulting simulated drawdowns at legal users within the 1-ft drawdown contour are provided in **Table 5**; cumulative drawdowns are also tabulated. Inspection of the drawdowns in **Table 5** reveals that they are not significantly different from those produced by the base pumping allocation.

In addition to the above two evaluations, the cumulative drawdown solely due to permitted pumping by existing legal Floridan water users (i.e. no pumping was simulated at the proposed salinity reduction wells) was also assessed. The cumulative drawdown due to permitted pumping is illustrated in **Figure 9**. The cumulative drawdowns in this figure are not significantly different than those produced by the combination of proposed and permitted withdrawals (**Figure 8b**). This suggests that the proposed pumping of Floridan water by the salinity reduction wells will not significantly exacerbate drawdowns in the Upper Floridan aquifer beyond those induced by existing permitted pumping.

Table 5. Predicted drawdown at nearby users for the proposed Salinity Reduction Wells due to the alternative pumping scenario.

Facility	Location (L,R,C)	Distance from well F-2 (miles)	Alternative Scenario Drawdown at 25 Years (ft)	Alternative Scenario Cumulative Drawdown (ft)
Card Sound Golf Club (WUP 44-00001)	(3-4,173,93)	8.8	2.23	9.80
Ocean Reef Club (WUP 44-00002)	(3-4,173,93)	8.8	2.23	9.80
FKAA (WUP 13-00005)	(3-4,155,61)	10.3	2.19	15.09
South Miami Hts (WUP 13-00017)	(3-4,133-135,79)	10.3	2.25	11.37
FPL Unit 5 Well (PW-1)	(3-4,156,85)	< 1.0	10.36	31.10

4 Conclusions

The evaluation of drawdown due to pumping at the proposed salinity reduction wells is based on the ECFAS2 model developed for the SFWMD. This model was subsequently adapted to site-specific conditions and re-calibrated to two APTs performed at Turkey Point. The resulting regional calibrated groundwater flow model provides assessment of drawdown at nearby existing Floridan water users.

In a regional sense, the proposed pumping of 14 MGD is projected to result in a maximum Upper Floridan Aquifer drawdown ranging between 14.4 ft (alternative scenario) and 15.1 ft (base scenario) at the Turkey Point site; simulated drawdowns at a distance from Turkey Point are not significantly different between the two pumping scenarios. The extent of drawdown, as defined by the 1-ft drawdown contour encompasses four existing legal users. Overall, the impacts to off-site permitted wells are minor. The maximum drawdown due to the proposed salinity reduction wells experienced by the nearest (non-FPL) users is 2.23 ft and occurs at the Card Sound Golf Club and Ocean Reef Club wells, located approximately 8.8 miles away. The drawdown at these wells is approximately equal to that estimated by SFWMD (2013) and comprises approximately 23% of the cumulative drawdown simulated at this site. The drawdown contribution by the proposed salinity reduction wells is a conservative estimate (greater than would actually be experienced), since the drawdown in the wellbore at each nearby user due to localized pumping is undersimulated by the coarse-gridded regional model.

In addition to a demonstration of minimal drawdown induced at wells of permitted users within the 1-ft drawdown contour, the BOR also stipulates that the proposed pumping not impact the saltwater interface, as defined by the 250 mg/L isochlor. As the quality of Upper Floridan Aquifer water in this area already exceeds such a concentration, and no saltwater interface exists, this stipulation does not apply to the proposed project. Moreover, the operation of the salinity reduction well is not expected impact Upper Floridan water quality in a regional sense. Local changes in water quality are expected to be minor, as demonstrated by other Upper Floridan water users in the region (SFWMD, 2012).

5 References

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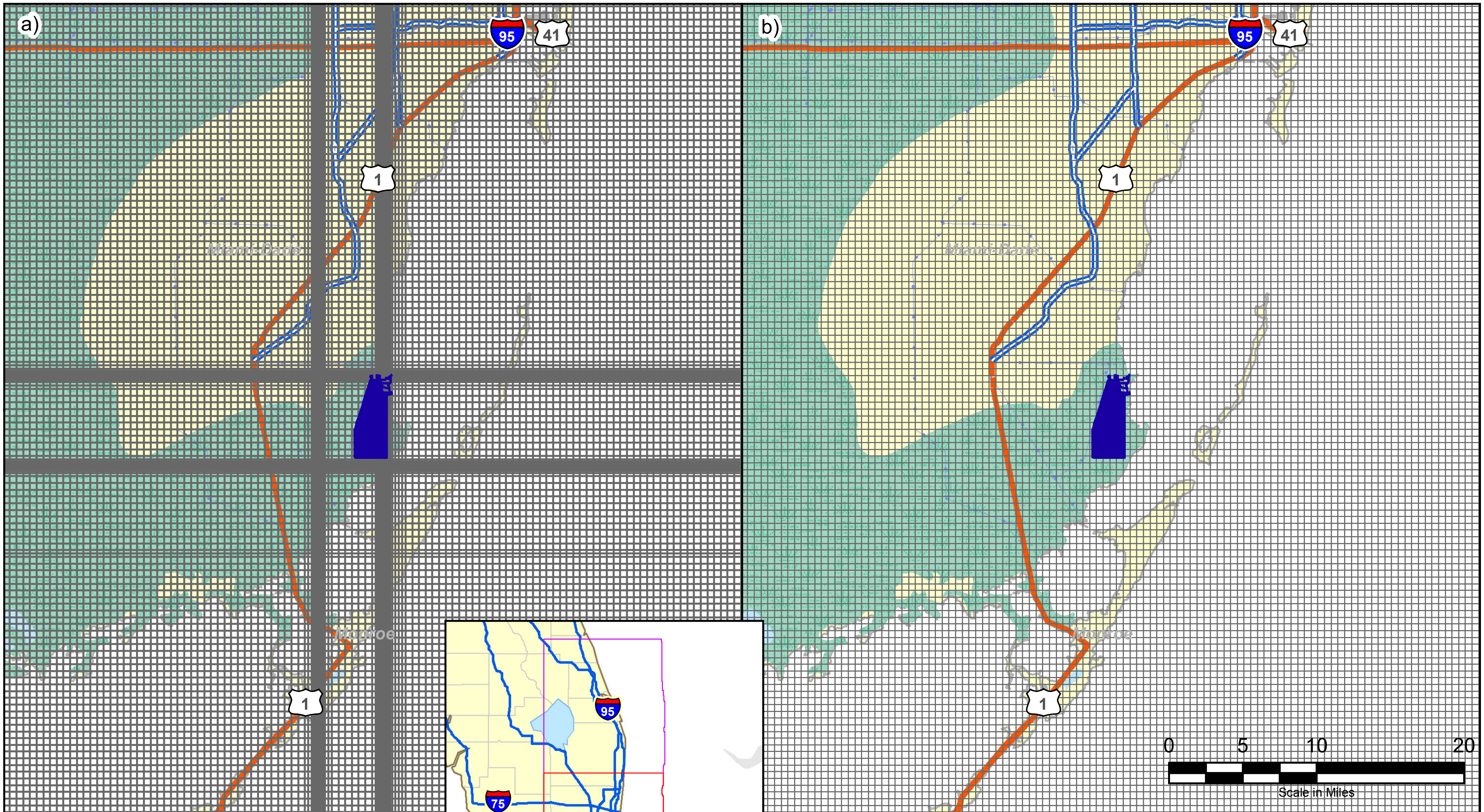

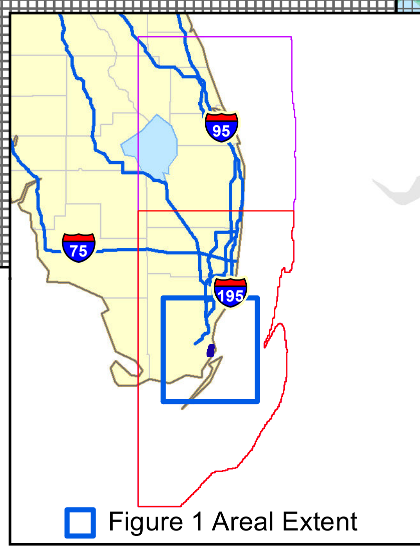

Legend

- Calibration Model Extent
- Original Model Extent
- Cooling Canals
- Model Grid

TITLE:	Model Grid Spacing in the Vicinity of Turkey Point for a) Calibration Model and b) Predictive Models
LOCATION:	Turkey Point, Florida

TETRA TECH

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DATE	03/10/2014	

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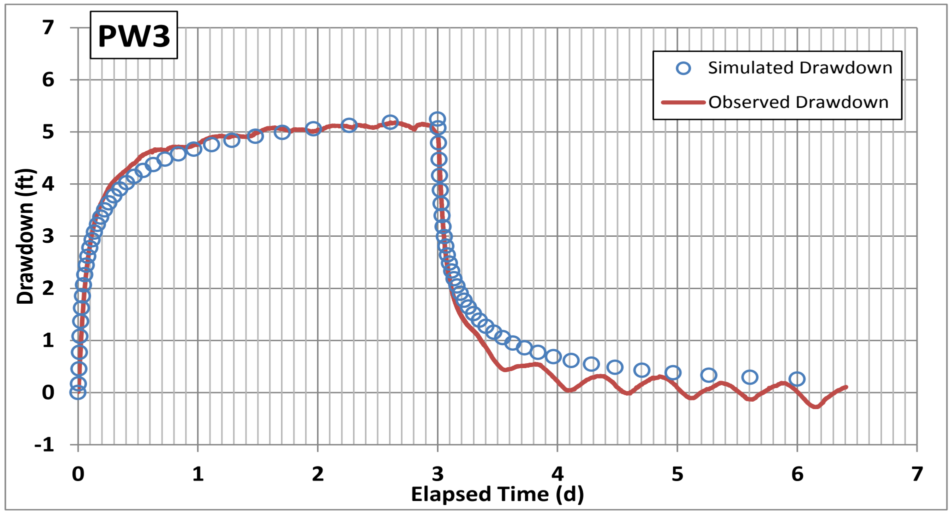

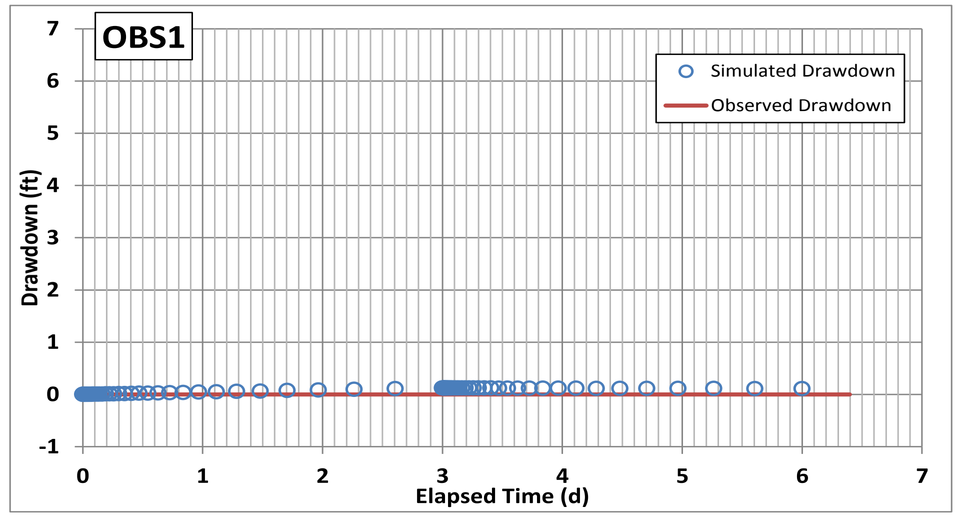

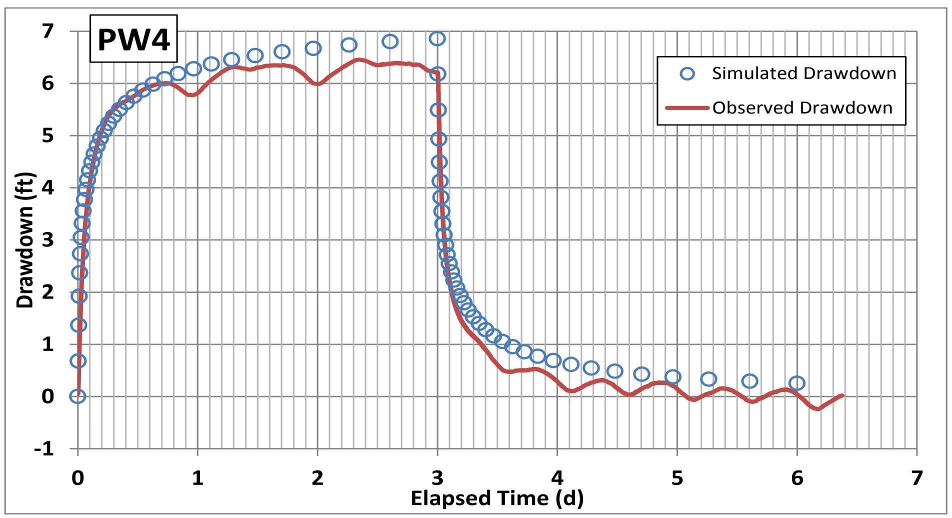

TITLE: **Modeled vs observed drawdown for the JLA APT - Calibrated Adapted Floridan Model**

LOCATION: **Turkey Point, Florida**

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DATE:	03/09/2014	

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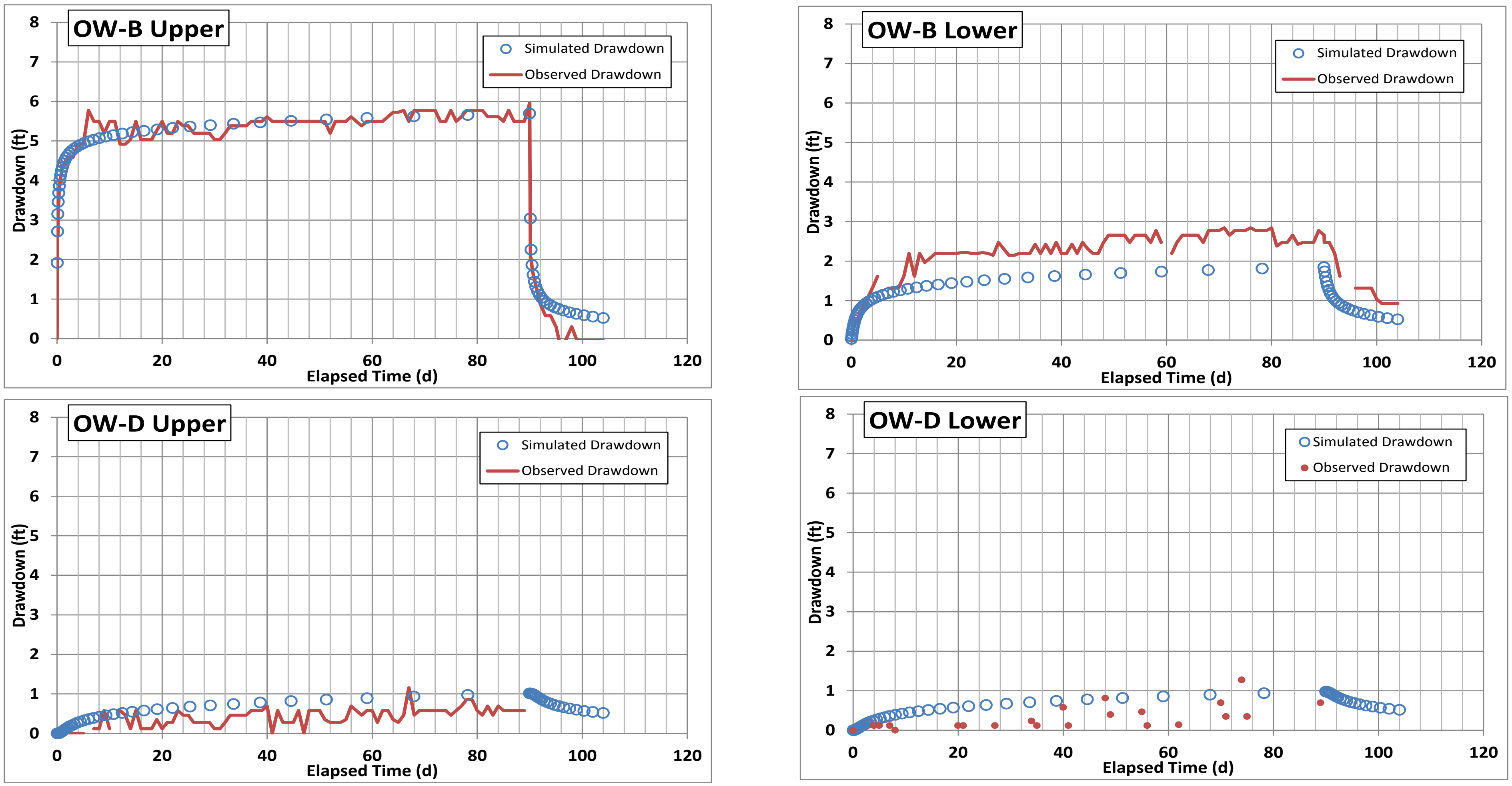

TITLE: **Modeled vs observed drawdown for the Dames and Moore APT - Adapted Floridan Model**

LOCATION: **Turkey Point, Florida**

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DATE:	03/09/2014	

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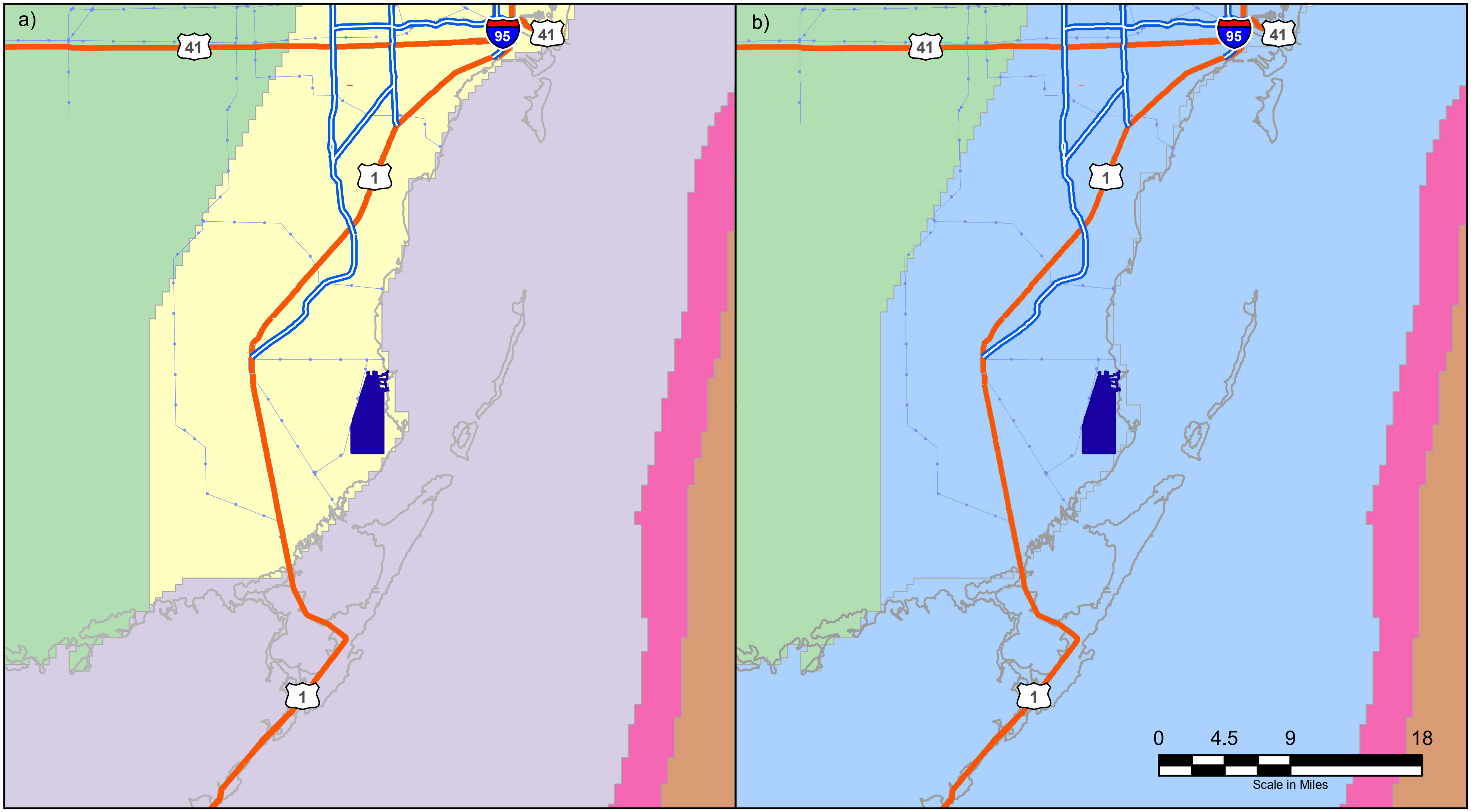

Legend

Original Conductivity — Cooling Canals

- 3.0E-06 ft/d
- 7.5E-05 ft/d
- 6.0E-04 ft/d
- 2.5E-03 ft/d
- 9.5E-03 ft/d

Calibrated Conductivity

- 3.0E-06 ft/d
- 6.0E-04 ft/d
- 1.0E-03 ft/d
- 2.5E-03 ft/d
- 9.5E-03 ft/d

TITLE: Distribution of Vertical Hydraulic Conductivity in the Intermediate Confining Unit a) Original Model, Prior to Additional Calibration and b) After Additional Calibration

LOCATION: Turkey Point, Florida

TETRA TECH

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FIGURE: 4

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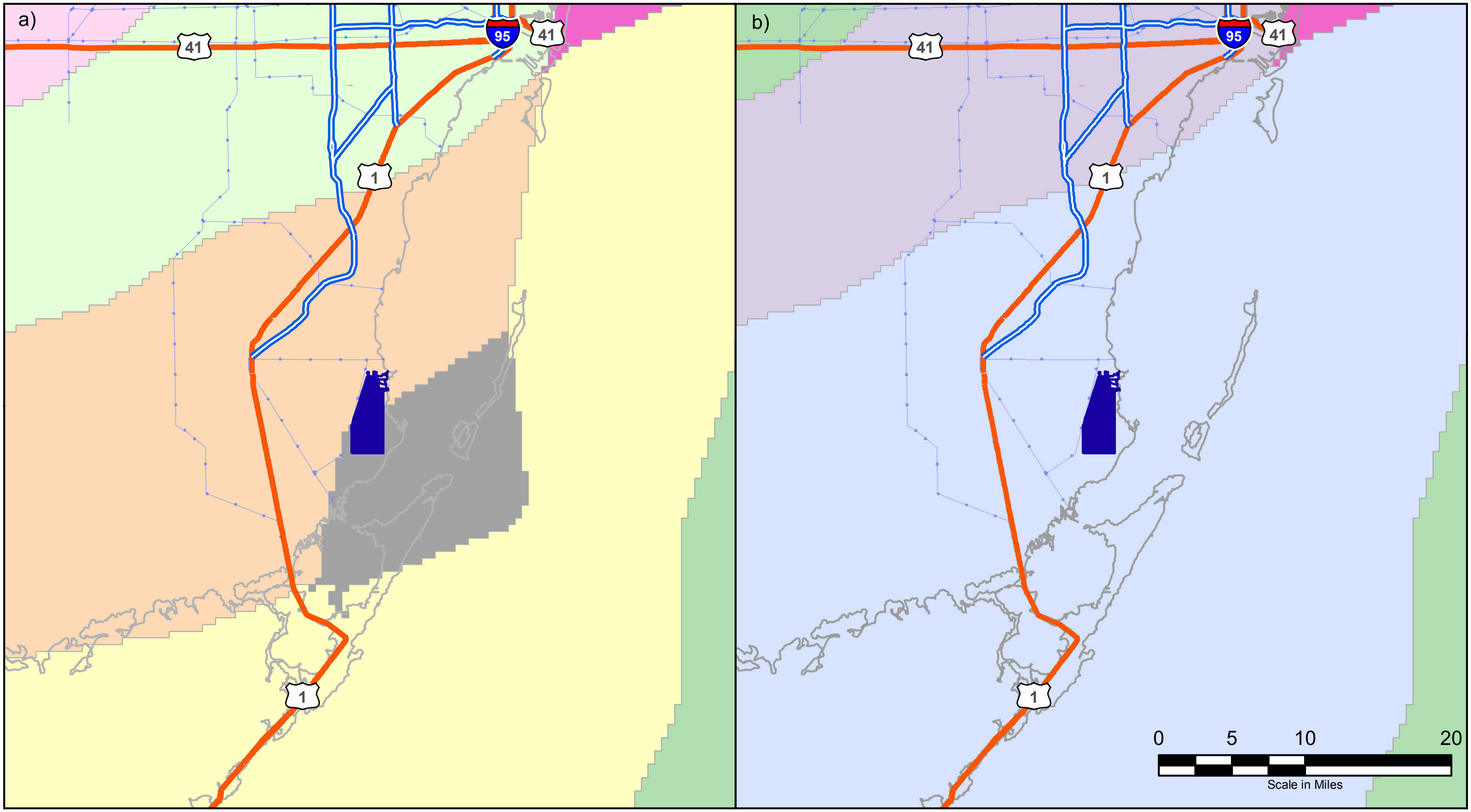

Legend

Original Conductivity

- 725 ft/d
- 224.995 ft/d
- 100 ft/d
- 90 ft/d
- 55 ft/d
- 52 ft/d
- 3.33 ft/d
- Cooling Canals

Calibrated Conductivity

- 330 ft/d
- 150 ft/d
- 100 ft/d
- 55 ft/d

TITLE:
Distribution of Hydraulic Conductivity in the Upper Floridan Aquifer
a) Original Model, Prior to Additional Calibration and b) After Additional Calibration

LOCATION:
Turkey Point, Florida

TETRA TECH

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PROJ	117-2826019	
DATE	03/10/2014	

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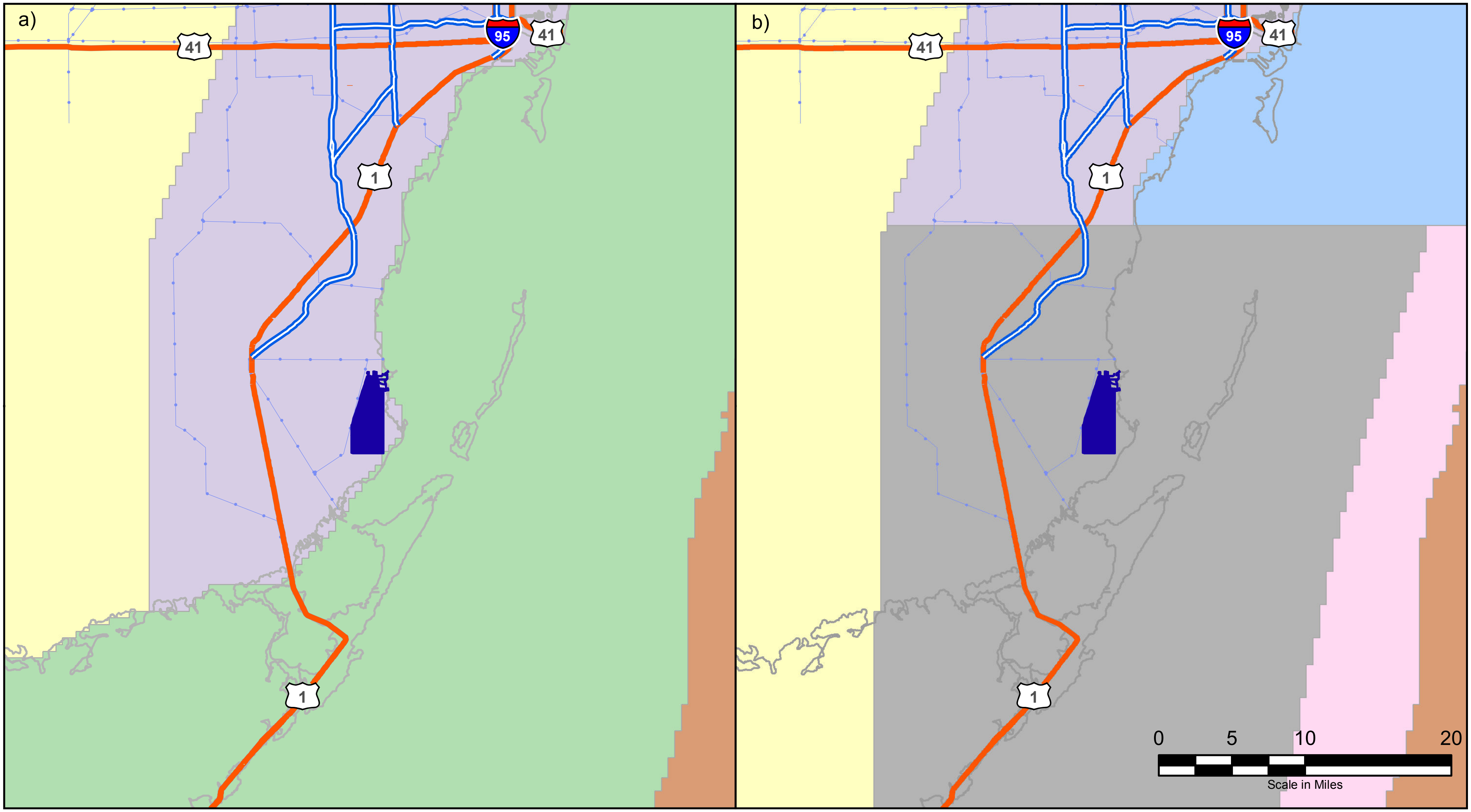

Legend

Original Conductivity — Cooling Canals

- 2.0E-06 ft/d
- 2.0E-03 ft/d
- 4.0E-03 ft/d
- 5.0E-03 ft/d
- 1.5E-02 ft/d

Calibrated Conductivity

- 2.0E-03 ft/d
- 3.0E-03 ft/d
- 4.0E-03 ft/d
- 1.5E-02 ft/d
- 8.0E-02 ft/d
- 4.0E-01 ft/d

TITLE: Distribution of Vertical Hydraulic Conductivity in the Middle Confining Unit
a) Original Model, Prior to Additional Calibration and b) After Additional Calibration

LOCATION: Turkey Point, Florida

TETRA TECH

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PROJ	117-2826019
DATE	03/10/2014

FIGURE: 6

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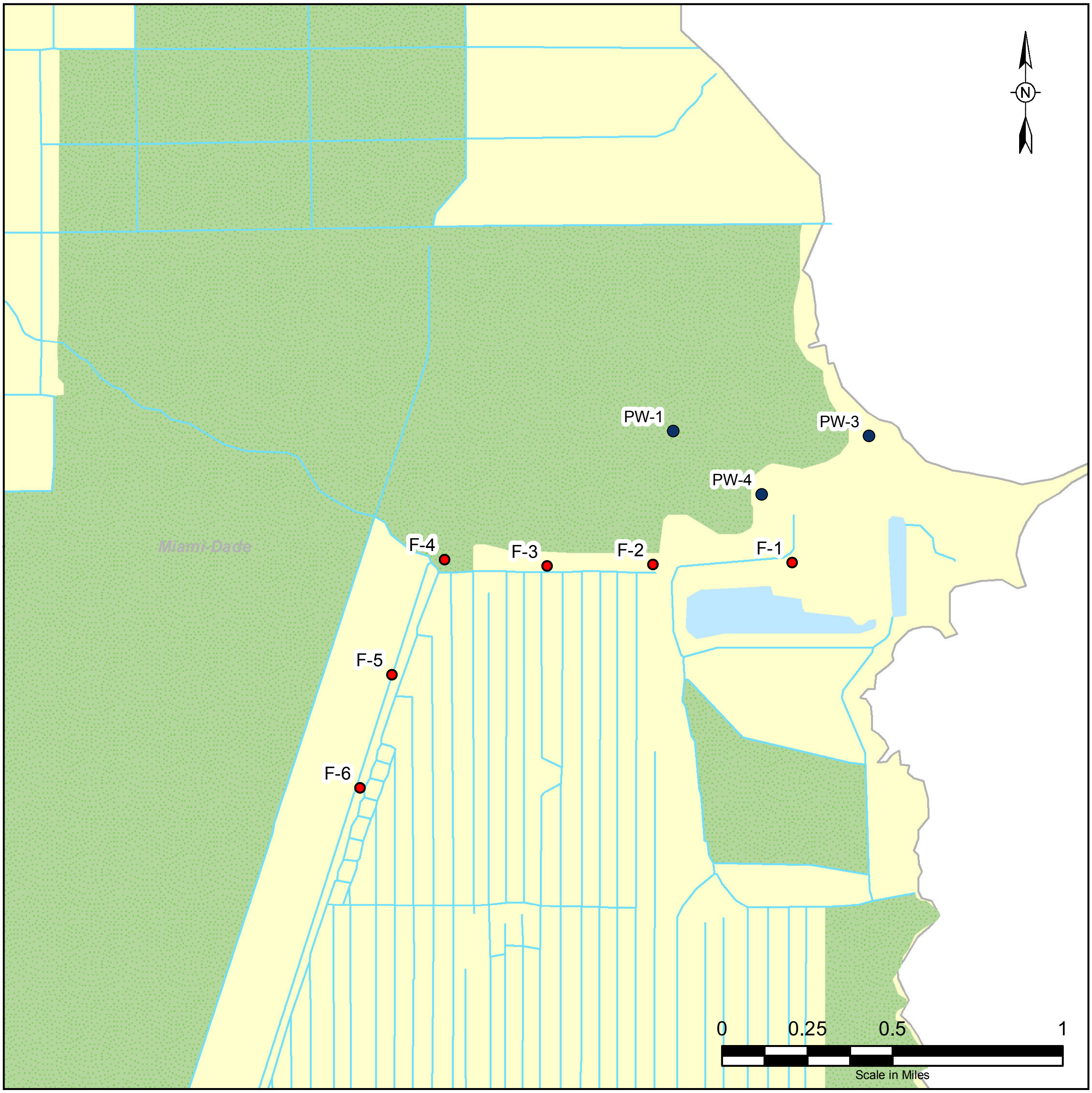

Legend

- Proposed Wells
- Existing Unit 5 Wells

TITLE:	Location of Proposed Salinity Reduction Wells Screened in the Upper Floridan Aquifer
LOCATION:	Turkey Point, Florida

TETRA TECH

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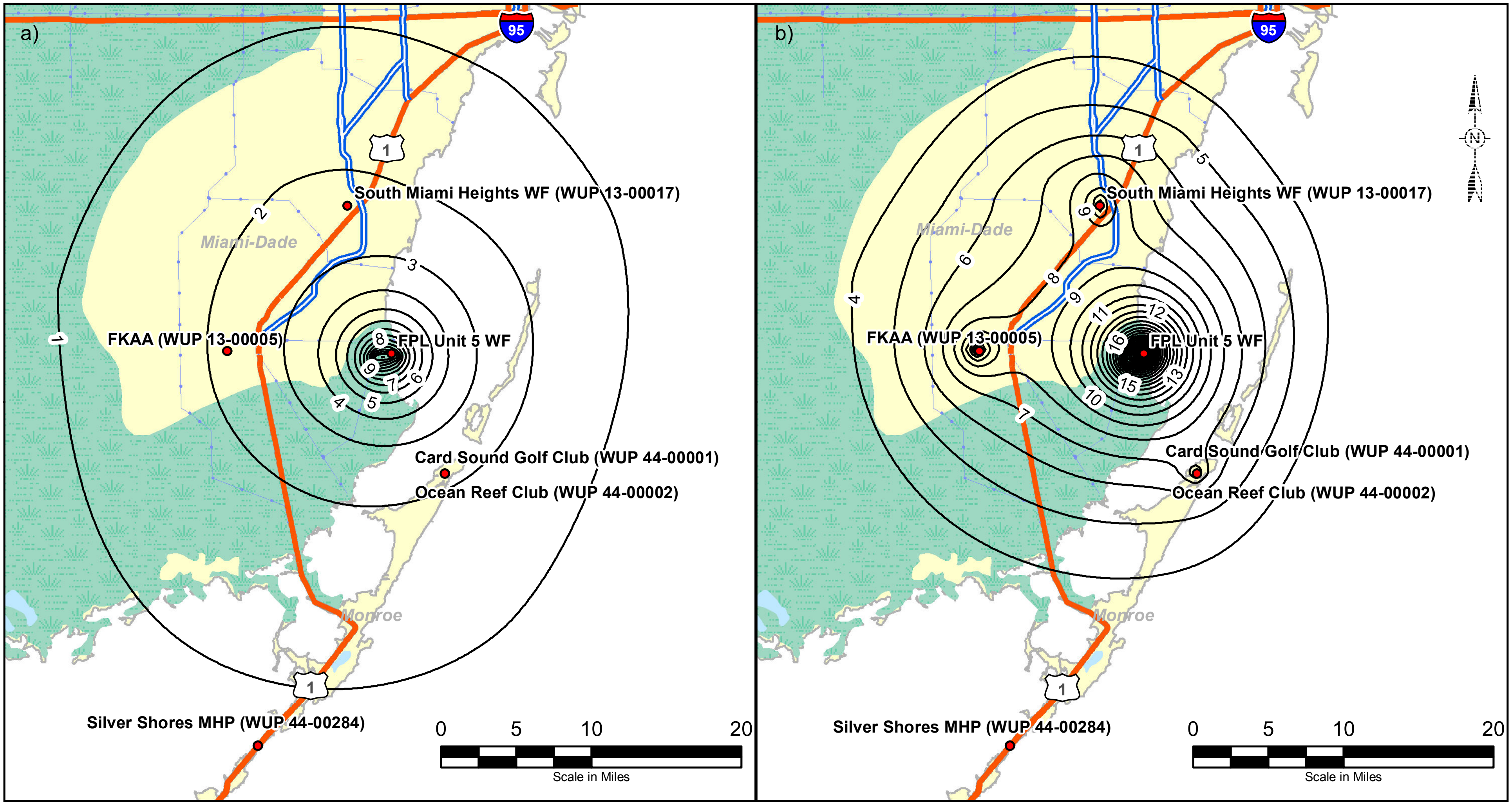

Legend

- Existing User Wells
- Drawdown Contours (1 ft)

TITLE:	a) Predicted UFA Drawdown Due to Proposed Wellfield, and b) Cumulative UFA Drawdown Due to Permitted and Proposed Wellfields
LOCATION:	Turkey Point, Florida

TETRA TECH

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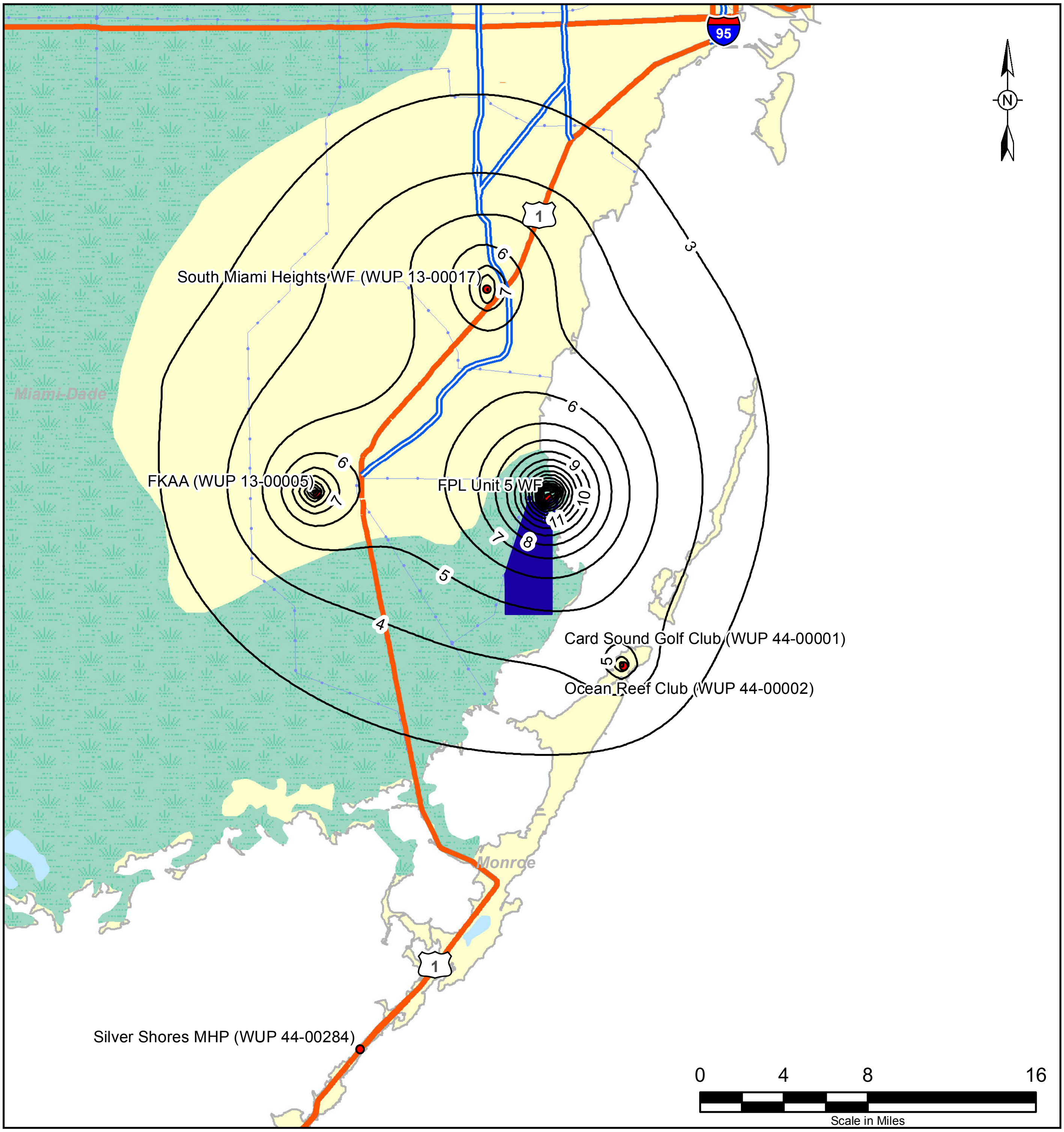

Legend

- Drawdown Contours
- Cooling Canals
- Existing User Wells

TITLE:	Simulated Equilibrium Drawdown in Upper Floridan Aquifer due to Permitted Pumping
LOCATION:	Turkey Point, Florida

TETRA TECH

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PROJ	117-2826019	
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APPENDIX C

WATER CONSERVATION PLAN

Water Conservation Plan
Turkey Point Power Plant

The existing Turkey Point Power Plant facility is located near Homestead, Florida. There are currently five operating units at the site. The two existing 400 MW (nominal) fossil fuel fired steam electric generation units have been in service since 1967 (Unit 1) and 1968 (Unit 2). Unit 2 is currently operating in a synchronous condenser mode (to provide voltage support for the transmission system). The two existing 800 MW (nominal) nuclear units have been in service since 1972 (Unit 3) and 1973 (Unit 4). These units use water from the onsite closed loop cooling canal system (CCS). They do not operate under a consumptive use permit, and therefore do not have a formal water conservation plan associated with them. However, all stormwater from these facilities is directed to the CCS for treatment and reuse as cooling water makeup.

Unit 5 has four combustion turbines, four heat recovery steam generators, and a steam turbine creating a "four-on-one" combined cycle unit. Commercial operation started in May 2007. Unit 5 uses a closed-cycle recirculating cooling tower system for heat dissipation. Floridan Aquifer water, obtained from three pumping wells, is used as makeup water for the cooling towers to replace evaporation and blowdown. The heat dissipation system has been designed and constructed to minimize the unnecessary loss of water, including the use of highly efficient mist eliminators in the cooling towers. Blowdown from the cooling towers and other industrial wastewaters, including stormwater from equipment areas, are routed through an oil-water separator and released to the CCS for further treatment and reuse. The wells are designed, constructed, and piped to operate efficiently. Process water for Unit 5 (combustion turbine inlet air evaporative cooling, NOx injection water, power augmentation, and steam cycle make-up) and Units 1 and 2 is supplied from the Floridan Aquifer wells. An in-service leak test of the system was performed during commissioning.

Service water is supplied from the Miami-Dade potable water supply, and the existing Turkey Point facility does not exceed the capacity of the potable water system.

All systems at the Turkey Point Power Plant facility that involve the use of water are designed and commissioned to minimize water losses. This includes an in-service leak test, inspection, or hydrostatic test to ensure the system is leak tight. Other features of the water system design include, when practical:

- Automatic shutoff valves,
- Use of flow restrictors,
- Use of low volume sanitary facilities, and
- Use of low maintenance landscape designs.

After the new wells that are requested by this modification are commissioned, procedures will be in place to ensure that the well systems are inspected on a regular basis and that a repair program is in place to repair leaks in an appropriately timely manner.

The plant will implement an awareness program for operations employees at the time of commercial operation (when construction and testing is complete and FPL begins to operate the unit) which is expected in the second quarter of 2015. The awareness program will educate employees on water conservation methods, techniques and the requirements of In-place construction and operation procedures.

Procedures will be reviewed on an annual basis, with the first review occurring in approximately June 2016, one year after expected commercial operation date. In accordance with South Florida Water Management District (SFWMD) Basis of Review Section 2.4.1, an audit of the amount of water needed in the operational processes will be conducted and submitted to the SFWMD during the second year of operations.

The Water Conservation Plan will be updated as necessary.