



May 23, 2017

Ms. Cindy Mulkey, Program Administrator
Office of Siting Coordination
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 5500
Tallahassee, Florida 32399-2400

**Subject: Florida Power and Light Company West County Energy Center
Request for Modification to Site Certification (PA05-47) to
Adjust Upper Floridan Aquifer Secondary Water Withdrawal Schedule**

Dear Ms. Mulkey:

Pursuant to Section 403.516(1), Florida Statutes, and Section 62-17.211(1), Florida Administrative Code, Florida Power and Light Company ("**FPL**"), requests a modification to the Site Certification (PA05-47) Conditions of Certification ("**COC**") for the FPL West County Energy Center ("**WCEC**"). The purpose of this modification request is to authorize FPL to adjust the allowable days of secondary water withdrawals from the onsite upper Floridan aquifer wells. This modification is necessary to improve the adequacy and reliability of cooling water supply to FPL for the operation of WCEC.

The West County Energy Center

WCEC is a critical part of FPL's generation supply in Florida, with a capacity of 3,657 megawatts at summer peak, which equates to approximately 15 percent of FPL's summer peak load. WCEC power generation units 1, 2 and 3 use reclaimed water through a contract with Palm Beach County as the primary source for cooling, service, and process water. Palm Beach County Water Utilities delivers the reclaimed water to the WCEC via a 36" reclaimed water main from the East Central Regional Waste Water Facility ("**ECR**"), which is operated by the City of West Palm Beach. The reclaimed water system is designed to deliver an average of 22 million gallons per day ("**MGD**") and a peak of 27 MGD. WCEC utilizes an annual average of 14 MGD for cooling and process water with an average peak of 22 MGD during the summer months.

Starting in October of 2015, and continuing well into 2017 the ECR has experienced mechanical and operational issues resulting in significant recurring failures in its ability to deliver the required quantities and qualities of water for WCEC's reliable operation. During these events, WCEC has been forced to utilize secondary sources of water, and at times reduce generation at the plant.

FPL is currently pursuing resolution of reclaimed water supply issues with Palm Beach County and the ECR. However, given the unstable performance of the ECR for almost 2 years and concerns about the reliable supply of reclaimed water for the foreseeable future, FPL is reviewing backup options to ensure the necessary volumes of water are available for uninterrupted power generation and transmission grid reliability. A review of the COCs governing use of the existing upper Floridan aquifer wells on site identified one option which would provide significant backup advantages with no harm through a minor modification to the WCEC COCs

Florida Power & Light Company

700 Universe Boulevard, Juno Beach, FL 33408

The Upper Floridan Aquifer

Prior to the certification of WCEC Unit 3, Units 1 and 2 relied on treated upper Floridan aquifer water for cooling water. The COCs for WCEC originally allowed FPL a maximum monthly withdrawal of 605 MGM from the L10/L12 Canal and/or the upper Floridan aquifer. The Site Certification that authorized construction and operation of Unit 3, required the use of reclaimed water from the ECR for all three units at WCEC as a primary supply. Recognizing that there needed to be a backup supply of water in the event the ECR experienced short-term issues with water supply to WCEC, the COC's were also modified to authorize FPL to withdraw up to "29.28 MGD from the upper Floridan aquifer for Units 1, 2 and 3 as a temporary secondary water supply source for up to 90 days during a calendar year." (Condition XXXII.B.2.c.(4)). This limit represents a total authorized drawdown of up to 2.635 billion gallons (29.28 MGD for 90 days) envisioned by the COC provision. However, as written, the COC restriction is essentially limited to the number of days it is used, without regard to the actual volume consumed during that day.

When reclaimed water supply interruptions occur, FPL typically uses significantly less upper Floridan aquifer water than the authorized daily limit. For example, in 2016, during some reclaimed supply incidents, WCEC used as little as 0.05 MGD from the upper Floridan aquifer. However, under the current COCs, even if FPL were to withdraw only as little as 0.01 million gallons or less in one day, WCEC's 90 day limit would be reduced by a day. As an example, in calendar year 2016, FPL utilized approximately 5.6 million gallons per day of upper Floridan aquifer water when utilized as a secondary source of water, for a total of 61 days. This represents a total drawdown of 347million gallons, or approximately 13 percent of its annual equivalent volume authorization compared to a total authorized drawdown of 2.635 billion gallons. However, this reduced FPL's 90 available days by nearly 70 percent.

Given the significant concerns with the ECR's reclaimed water supply reliability, the COC governing use of the upper Floridan aquifer based on a total day limit unnecessarily restricts access, and therefore adds to the risk that FPL will be prevented from having access to a contemplated and authorized backup supply quantity. For this reason, FPL requests that COC XXXII.B.2.c.(4) be modified to remove the 90 day limit, while maintaining the daily volume limit, and adding the equivalent annual volume limit, to ensure that FPL does not utilize any greater upper Floridan aquifer volume in a calendar year than it is currently authorized. FPL proposes the following modification to COC XXXII.B.2.c.(4):

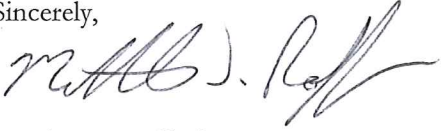
(4) After reclaimed water becomes the primary cooling, service, and process water source for Units 1, 2 and 3, there may be temporary interruptions in the delivery of reclaimed water supply to the plant site. Consequently, authorizing a reliable, secondary water supply source for the project is in the public interest and is consistent with the criteria set forth in Section 2.2 of the Basis of Review for Water Use Applications Within the SFWMD. Therefore, this Certification authorizes a maximum withdrawal of 29.28 MGD from the upper Floridan aquifer for Units 1, 2 and 3 as a temporary secondary water supply source not to exceed 2.635 million gallons during a calendar year.

FPL's daily average use will not exceed the approved cumulative volume authorization on an annual basis and therefore will not cause harm in accordance with the criteria as described in Chapter 40E-2.031 F.A.C.

Attached for your review is a site location map of the upper Floridan aquifer wells and a ground water modeling of project impacts assessment and report.

Thank you for your consideration. If you have any questions concerning this request, please contact Matthew Raffenberg, Senior Director, at (561) 691-2808 or Matthew.Raffenberg@fpl.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Matthew J. Raffenberg". The signature is fluid and cursive, with the first name "Matthew" being more prominent and the last name "Raffenberg" following in a similar style.

Matthew J. Raffenberg
Senior Director, FPL Licensing and Permitting

26 42' 20.80"N- 80 22' 34.08"W

FAW-4

FAW-1

26 42' 15"N- 80 22' 24" W

FAW-2

26 42' 03"N- 80 22' 35"W

FAW-3

26 41' 54"N- 80 22' 24" W

Re-use metering station

Groundwater Modeling of Projected Impacts West County Energy Center Project

Prepared for:

Florida Power and Light Company
700 Universe Blvd
Juno Beach, FL 33408

Prepared by:

Tetra Tech
1165 Sanctuary Parkway, Suite 270
Alpharetta, Georgia 30009

May 18, 2017



Peter F. Andersen, P.E.
Professional Registered Engineer No. 62133

SEAL:



1. Introduction

Florida Power & Light Company (FPL) is requesting a modification to their current groundwater allocation from the Upper Floridan Aquifer System (FAS) at the West County Energy Center (WCEC). The current allocation is for one 90-day period each year at a pumping rate of 29.28 mgd. FPL wishes to modify this allocation to extract an average of 7.32 mgd year-round (annual allocation of 2671.8 mg), with a maximum daily extraction rate of 29.28 mgd. This annual allocation is approximately equal to the current allocation, and the maximum rate equals the current 90-day allocation rate. This modification to the current pumping allocation is needed to provide a reliable year-round secondary source of cooling water for the existing power generation facility. The current source of cooling water is reclaimed water; however, there have been extended periods of water quality and quantity interruptions with the reclaimed water supply and more continual secondary groundwater is needed to ensure that the cooling water demand is met.

A condition for issuance of the water use aspects of the original power plant certification was for FPL to conduct an Aquifer Performance Test (APT) to demonstrate that hydrogeologic parameters used in their application were representative of site conditions and that there would be no impacts to existing legal users. JLA Geosciences (2008) conducted a 75-hour APT using one of the production wells at the site to withdraw water and the other two production wells as observation wells for the test. JLA Geosciences (2008) updated the hydrogeologic parameters through analysis of the test. Two technical memoranda (GeoTrans, 2008; GeoTrans, 2009) concluded that the potential impacts of the previously proposed pumping using the APT-based hydrogeologic parameters would not impact existing legal users. In the unlikely event that water is pumped at the maximum daily extraction rate for 90 days under the proposed modification, the drawdown impacts would be identical to those of the current allocation (GeoTrans, 2009). The analysis presented in this technical memorandum evaluates the impact of pumping 7.32 mgd for 365 days using the same model and methodology that was used in GeoTrans (2008) and GeoTrans (2009).

2. Model Configuration

The Hantush-Jacob (1955) analytical model was selected for this analysis because it is capable of representing the hydrologic system in a mathematical framework. The Hantush-Jacob model solves for drawdown in a pumped aquifer that is either underlain or overlain by another layer that transmits water into the aquifer. The model has several

assumptions; however none of these assumptions limit the model's use for predicting impact according the SFWMD specifications. JLA Geosciences (2008) found this model most accurately reproduced the drawdown response in the observation wells over the three-day APT that they conducted. This model is specifically mentioned in the SFWMD's latest guidance for water use permits (SFWMD, 2015).

JLA Geosciences (2008) determined two sets of aquifer properties: one based on analysis of drawdown in observation well FAW-1 and a second based on analysis of drawdown in observation well FAW-3. These values were then averaged to obtain a single set of properties that represent the best estimate of aquifer properties. The best estimate of properties is used in this impact assessment to represent the expected case. The lowest and highest values of properties determined from the test are also used to show the range of possible drawdown. Hydrogeologic properties used in the model are summarized in Table 1 and described below. The expected case model represents the Upper FAS with a transmissivity of 222,000 ft²/d (1,660,000 gpd/ft), a storage coefficient of 0.0004, and a leakance of $6.684 \times 10^{-3} \text{ d}^{-1}$ (0.05 gpd/ft³). Table 1 also shows two other sets of properties that bound the possible range in drawdown impact.

Table 1. Hydrogeologic parameters used in the groundwater flow model

Model Run/Property	Value	Units	Source of data
Best Estimate			
Transmissivity	222,000	ft ² /d	JLA Geosciences pg 30 APT value 1,660,000 gpd/ft converted to ft ² /d
Storage coefficient	0.0004	-	JLA Geosciences pg 30 APT value
Leakance	6.68e-3	/d	JLA Geosciences pg 30 APT value 0.05 gpd/ ft ³ converted to /d
High Drawdown			
Transmissivity	102,000	ft	JLA Geosciences Table 9 value 766,000 gpd/ft converted to ft ² /d
Storage coefficient	0.0002	-	JLA Geosciences Table 9
Leakance	1.47e-3	/d	JLA Geosciences Table 9 value 0.011 gpd/ ft ³ converted to /d
Low Drawdown			
Transmissivity	353,000	ft ² /d	JLA Geosciences Table 9 value 2,640,000 gpd/ft converted to ft ² /d
Storage coefficient	0.0008	-	JLA Geosciences Table 9
Leakance	1.15e-2	/d	JLA Geosciences Table 9 value 0.086 gpd/ ft ³ converted to /d

3. Model Simulation

The model simulates the projected drawdown impacts to the Upper FAS associated with the proposed groundwater withdrawal by FPL. The model does not compute existing water levels or flows, only the effect of the FPL wells. The drawdown calculated by the model may be subtracted from known potentiometric surface elevations to determine the potentiometric elevations in the Upper FAS that might result for the proposed withdrawal

under the prescribed conditions. These model simulations were executed to simulate a 365-day withdrawal period without recharge. Several other simplifying assumptions are made in the model including:

- The horizontal extent of the aquifer is assumed to be infinite and homogenous with regard to all of the modeled aquifer parameters;
- Discrete flow via fractures or other preferential pathways is not included in the model;
- Effects from other groundwater users are not considered; and
- The effect of fluid density differences within the model is not included.

Figure 1 shows the predicted drawdown in the Upper FAS after 365 days of pumping at 7.32 mgd by FPL. No other withdrawals are considered in this simulation, which therefore represents the independent drawdown impact by FPL. Three cases are considered: (1) the expected case, (2) high drawdown, and (3) low drawdown. These cases provide estimated upper and lower bounds on the range of possible impacts. The radius of this circular cone of depression, as defined by the 1 ft drawdown contour, is 1,634 feet (0.31 miles) for the expected case. This radius ranges from 653 feet (0.12 miles) to 5,865 feet (1.11 miles) for the low and high range drawdown cases. This information is summarized in Table 2. The low, expected, and high drawdown case cones of depression are all smaller than the respective values for the current permit (i.e. radii of 0.84, 1.2 and 2.7 miles, respectively; GeoTrans, 2009). Other existing legal users, as defined by water use permits for Floridan Aquifer withdrawals, are depicted on this figure using their water use permit number as a label. The well locations of the nearest existing legal user, the Seminole Improvement District, permit number 50-00021-W, are also shown on this figure. According to SFWMD's water use permit records, the nearest well of the nearest existing legal user is 4.66 miles from the FPL wells and 4.35 miles outside the FPL cone of depression as simulated for the expected case. The distance between the permitted withdrawals and the simulated FPL cone of depression indicates that the proposed FPL withdrawal will not impact any existing legal users.

Table 2. Results of model simulations.

Model Run	Distance to 1 ft drawdown contour (miles)	Distance from 1 ft drawdown contour to nearest existing legal user (miles)
Expected Case	0.31	4.35
High Drawdown	1.11	3.55
Low Drawdown	0.12	4.54

4. Water Quality

Water quality monitoring data from two production wells associated with the current allocation (FAW-1 and FAW-3) was analyzed to determine whether water quality has been degraded as a result of the current allocation. Chloride concentrations in these wells from before the permit was approved in 2009 through 2016 are shown in Figure 2. Chloride concentrations in both wells declined from 2007 through 2016, therefore there have been no negative effects of the current pumping with respect to water quality.

5. Conclusions

The impact analysis conducted following the West County Energy Center APT was modified to simulate the anticipated drawdown in the Upper FAS associated with pumping approximately the currently allotted annual amount (29.28 mgd for one 90-day period) over a period of one year (i.e. 7.32 mgd for 365 days). The requested amount is for continuous use as secondary cooling water for the existing WCEC power generation facility. The simulation indicates that the cone of depression (defined by the 1-ft drawdown contour in the Upper FAS) resulting from 365 days of pumping at 7.32 mgd, will extend approximately 1,634 feet (0.31 miles) from the pumping wells. This distance is smaller than the simulated 1 ft drawdown radius under the current permit (1.2 miles). There are no existing legal users within the simulated FPL cone of depression. The currently allocated pumping did not degrade water quality in the Upper FAS from 2009 through 2016, and it is unlikely that extracting the same amount of water over a longer time period will lead to a decline in water quality.

6. References

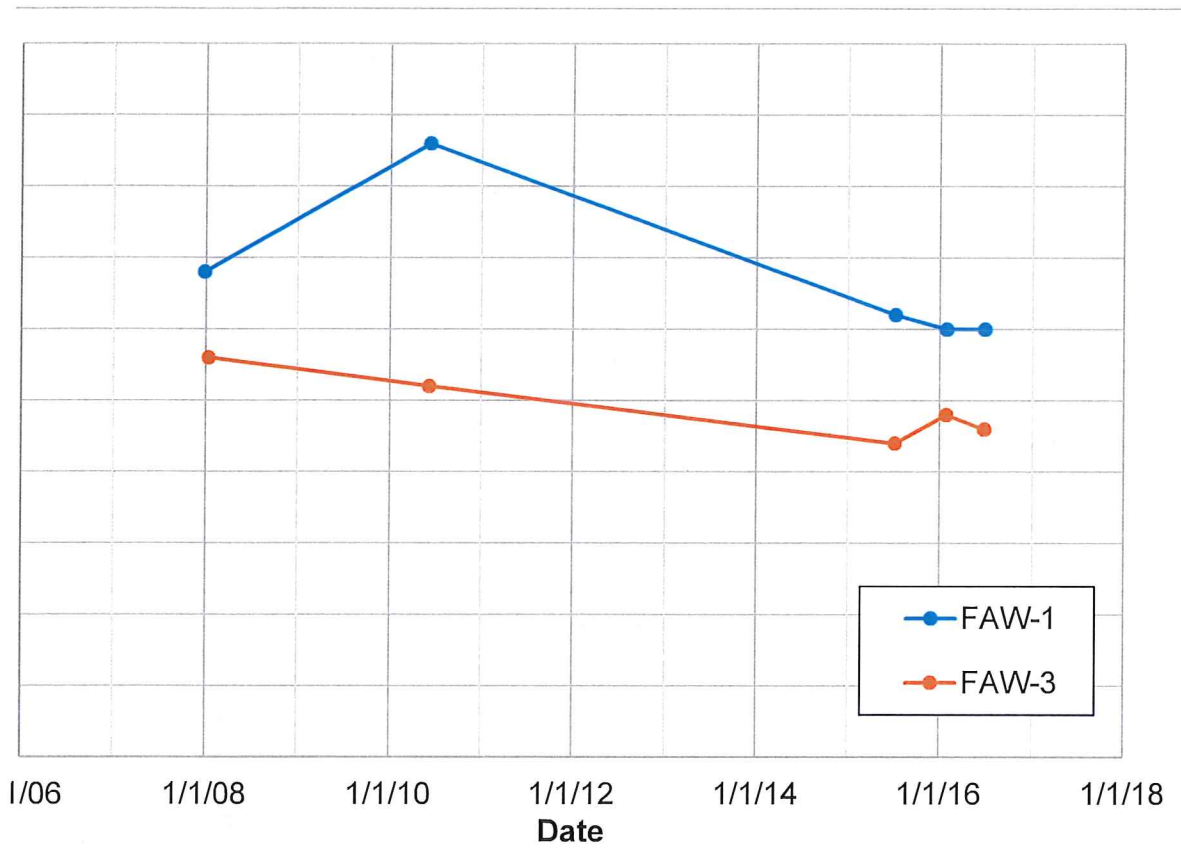
GeoTrans, 2008. Groundwater Modeling for Verification of Projected Impacts. Prepared for Florida Power & Light Company, October 24, 2008.

GeoTrans, 2009. Groundwater Modeling of Projected Impacts, West County Energy Center Project. Prepared for Florida Power & Light Company, May 4, 2009.

JLA Geosciences, 2008. Well Completion Report for Floridan Aquifer Wells FAW-1, FAW-2, and FAW-3 FPL West County Energy Center Projects (Units 1 & 2). Loxahatchee Florida. Prepared for West County Power Partners, LLC and Florida Power & Light Company.

Hantush, M.S. and C.E. Jacob, 1955. "Nonsteady radial flow in an infinite leaky aquifer." *Transactions of the American Geophysical Union*, 36, 95-100.

South Florida Water Management District (2015). Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District. Effective September 7, 2015.



TITLE: Observed Chloride Concentrations at Monitoring Wells FAW-1 and FAW-3 (2007-2016)		
LOCATION: West Palm Beach, FL		
 TETRA TECH	CHECKED:	PFA
	DRAFTED:	SCS
	PROJ:	117-2826037
	DATE:	5/17/17
		FIGURE: 2