PMTurkeyCOLNPEm Resource

From: Grossenbacher, Craig (DERM) [GrossC@miamidade.gov]
Sent: Friday, February 18, 2011 5:01 PM
To: Kugler, Andrew
Cc: Halloran, Katie (DP&Z); Woerner, Mark (DP&Z); Otero, Luis (DERM); Davis, Matthew (DERM); Hefty, Lee (DERM)
Subject: RE: Noted from DERM
Attachments: Hydrologic Study Overview.doc; Statement of Issue (2).doc

Sorry for the delay. Here are the documents.

The first document is what we gave to FPL to help them understand the kind of information we need to evaluate their project and the second document is what we discussed at the meeting which is an internal document which until now has not been shared with any agencies.

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From: Kugler, Andrew [mailto:Andrew.Kugler@nrc.gov]
Sent: Thursday, February 17, 2011 9:33 AM
To: Grossenbacher, Craig (DERM)
Subject: Noted from DERM

Craig

Just a friendly reminder to send me the electronic version of the paper you gave me at the meeting the other day. Thanks for meeting with me. The information you all are providing us will be very helpful as we work on addressing the impacts.

Andy

Hearing Identifier: TurkeyPoint_COL_NonPublic
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Statement of Issue (2).doc	31808	

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MIAMI-DADE COUNTY REQUIRED HYDROLOGIC STUDY

Pursuant to Condition 15 of Miami-Dade County Zoning Approval Z-56-07, a Hydrologic Study is required by Miami-Dade County because the project would impact surface and ground waters. The purpose of the hydrologic study is to generate the information and data needed by Miami-Dade County to evaluate the surface and groundwater impacts that would result from the proposed Units 6 & 7 Project in order to determine whether the proposed project meets the substantive requirements of Miami-Dade County Code and the Comprehensive Master Development Plan.

The hydrologic study shall be comprehensive in nature and designed to allow for a comparison of all hydrologic conditions and impacts from both the "with project" and "without project" perspectives. As part of the hydrologic study, a thorough hydro-stratigraphic framework of the area shall be prepared using best available technology and scientific information. This shall include: 1) site specific gradient information and direction(s) of surface water flow and groundwater flow in the area of the facility including the cooling canal system, 2) Interaction between ground and surface and waters in the areas around the facility, and 3) the fate of surface and ground water as it moves southeasterly towards the Turkey Point area and interacts with the hypersaline plume from the cooling canal system (CCS). The geotechnical information and water quality data being generated as a result of construction and initial sampling of the FPL Uprate Project monitoring wells as well as the pore water sampling in the area around Turkey Point shall also be used to develop the needed hydro-stratigraphic framework. In addition, tracer tests or their equivalent shall be included as part of the hydrologic study to determine the actual water source(s) (and volumes of each source of water) that would recharge the Biscayne Aquifer in the area during operation of the radial collectors and to ascertain the interactions between surface waters, fresh ground waters and saline ground waters and the hypersaline groundwater plume emanating from the cooling canals.

To date, the information provided in the SCA on impacts to water has largely focused on a narrow aspect of the proposed radial collector wells (whether the required volumes could be extracted from the aquifer in the area) with little or no information provided on the hydrologic impacts from operation of the radial collectors as well as the cumulative effects of current CCS operations, the permitted Uprate Project, and the proposed Units 6 & 7 project. Since at least a portion of the aquifer targeted by the radial collectors also currently provides water to the CCS through operation of the existing CCS recirculation pumps (according to FPL and its consultants), the study shall investigate the cumulative withdrawal of all water from the combined operation of the existing CCS intake and simultaneous operation of the radial collectors including the influences of the Uprate Project. The study should also determine on a daily or weekly basis the total volume of the groundwater currently being drawn into the CCS (from operation of the CCS intake pumps), what portion remains in the CCS and what the fate is of the remainder. To this end, a comprehensive salt budget as well as a water budget is required for both the "with project" and "without project" scenarios that includes the additional water consumption and salt effects of the Uprate project since it is scheduled to be on-line before Units 6 and 7 would become operational.

The groundwater plume emanating from the cooling canal system shall also be investigated as part of this study to include: the delineation of plume, fate and transport of industrial wastewaters entering the Biscayne Aquifer or nearby canals or other surface waters from the CCS, and how it will be impacted by operation of any alternative water source including the radial collector wells. Since the Uprate project is scheduled to be completed and operational prior to Units 6 & 7, the plume characteristics resulting from the Uprate project shall be included in the assessment of plume response to the Unit 6 & 7 Project including but not limited to the extent to which the plume would be affected by operation of any

proposed alternative water supply including the proposed radial collector wells. Will any of the plume be intercepted by the groundwater withdrawals? Will plume dynamics be impacted by groundwater withdrawals? Is the plume affecting the Model Lands, the Florida Keys National Marine Sanctuary, Biscayne National Park or the Biscayne Bay Aquatic Preserve? This study should evaluate not only the direct impacts in any areas of plume discharge to ground waters but also indirect impacts such as whether the plume has replaced or contaminated lower salinity (natural) water that the ecosystem depends on. The spatial extent of chloride and sodium contamination shall be identified.

Miami-Dade County has previously provided guidance relating to the information that would be required to allow an evaluation of the specific radial collector well feature including shortcomings of the Aquifer Performance Test (APT) and existing model. In addition, specific information is needed to evaluate the following:

- changes to surface water quality and/or quantity
- impacts to the Biscayne Aquifer including changes to ground water quality and/or quantity
- impacts to salt intrusion – a determination of salt intrusion attributable to natural causes and determination of salt intrusion due to existing operations to establish current conditions as well as impacts to surface and groundwater salinity changes in the area from proposed operations including cumulative impacts is needed. This aspect of the study should also examine whether the volumes and stages of freshwater in the areas west and north of the cooling canals are still adequate to prevent migration of high chloride water emanating from the CCS and if not, the required stages and volumes of additional water needed to prevent further migration landward within the Biscayne Aquifer from Turkey Point operations including the cumulative effects of all existing and proposed operations.
- site specific gradient information and direction(s) of groundwater flow in the area of the facility including the cooling canal system. Any changes in distribution of groundwater flow to surface waters that would result from operation of the radial collectors shall also be identified.
- volumetric and spatial determination for each source of water that would recharge the area of the Biscayne Aquifer when the well field is operational and identification of each recharge source and water quality characterization of each source
- impacts to wetlands (changes to water quality, quantity, stage and/or wetland hydroperiod)
- impacts to resources of Biscayne Bay, including protected areas such as the Aquatic Preserve, Biscayne National Park and the Florida Keys National Marine Sanctuary - for example, how will the benthic communities in these nearby areas be impacted by intermittent or extended draw-through of surface water into the substrate during operation of the radial collectors? This should include a characterization of current substrate water quality as well as a comparison to the projected water quality as surface water is drawn into the substrate during operation of the well field.
- water budget - a determination of total water consumption from ground and surface waters in the area around Turkey Point as a result of current permitted operations including the Uprate Project as well as a cumulative determination of total water consumption at Turkey Point as a result of all combined operations including existing and proposed - this should include the

rainfall volumes that will be lost to the area as a result of the reservoir as well as the open process tanks at the water treatment facility and other similar losses such as the current injection of wastewater into the Biscayne Aquifer that would be eliminated if the project is approved. A determination of the source(s) and quantities of the water consumed in the "with project" and "without project" scenarios in comparison with the amount of water projected to be delivered to the wetlands in the Turkey Point Model Lands area as a result of the CERP BBCW project is also needed as a component of this evaluation to determine consistency with the goals and objectives of the CERP BBCW project. A determination of: 1) the current volume of water being drawn into the CCS from under Biscayne Bay via operation of the CCS intake pumps, 2) the source(s) of this water including volumetric determination of each source, and 3) the cumulative volume (and sources) during operation of both systems (CCS pumps and radial collectors) will be an important aspect of the study.

The study shall not be limited to the impacts of proposed radial collector wellfield but shall be sufficient to evaluate the individual and cumulative impacts to ground and surface waters from each of FPL's proposed features and activities (including the existing and proposed activities and operations impacting water resources) that have the potential to impact surface or groundwater (including impacts to water quality, quantity, timing and distribution). The Study shall also be sufficient to support development of an appropriate surface/groundwater modeling effort with methodology approved by Miami-Dade County WASD as required pursuant to condition 5 of Z-56-07.

STATEMENT OF ISSUE

Monitoring data indicate that the cooling water intakes for nuclear units 3 and 4 at Turkey Point result in considerable stress to the surrounding portions of the Biscayne aquifer. The cooling water intakes create an unusually low surface water level in the northeastern portion of the cooling canals system (CCS). Recent bathymetric data obtained by SFWMD reveal that the portions of the CCS in this area exceed 30 feet in depth and it is therefore evident that this portion of the CCS is connected directly to the Biscayne Aquifer. This may include connection to high flow zones within this aquifer.

As a result of current CCS pumping, a large gradient is created at and near the pump intakes (which monitoring well data clearly indicate extends to nearby groundwaters). This results in significant amounts of groundwater that is being drawn into the CCS at this location (and possibly surface water from outside the CCS). Some of this water is believed to come from via the groundwater under Biscayne Bay and the rest comes via the groundwater to the west. The portion of freshwater that moves towards the coast in this area above the salt wedge is probably captured at least in part by this phenomena as well. However, it is the salt water that is being captured by CCS operations that is resulting in the contamination of the surrounding aquifer. The monitoring data being collected by the Uprate Monitoring Project show clear indications of this contamination including upgradient contamination of the Biscayne aquifer as a result of hypersaline water which leaves the CCS through the groundwater. This process appears to be density driven to a great extent and it is notable that the CCS water is now much denser than even the waters of Biscayne Bay and the Atlantic Ocean as a result of the continuous evaporation of CCS water since this facility became operational. Salinities have increased in the CCS from about 18 PSU to about 70 PSU currently and this trend is expected to continue and possibly accelerate due to the projected temperature (and therefore evaporation increases) once the proposed Units 3 and 4 Uprate Project is operational.

The saline groundwater that is captured by the CCS pumps is transferred via the CCS to locations over the Biscayne Aquifer on the order of 2 to 3 miles inland from the coast. Chlorides, sulfates and other constituents of the industrial wastewater are concentrated due to the high evaporation rate of the CCS water and the Uprate Monitoring has revealed that all conservative constituents of the

CCS water are found in the surrounding monitoring wells that are located within the CCS groundwater plume.

The well field that is proposed at Turkey Point as part of the Units 6 & 7 project would remove via radial collectors about 120 MGD from the same portion of the Biscayne Aquifer that is currently being drawn into the CCS intakes (and in relatively close proximity to these intakes). It should also be noted that the proposed volume of water that would be removed would make this one of the largest, if not the largest, well fields in Florida in terms of pumped volume (even without including the amount already being withdrawn by the existing CCS pumps). One question this raises is related to the CCS contaminant plume. Since the plume is believed to extend towards the proposed well field (if it does not extend directly into this portion of the Biscayne Aquifer), the impact of the radial collectors on the plume must be evaluated. If operation of the radial collectors could change the plume dynamics, which is a not an unlikely possibility*, the portion of the plume that is recaptured by the current CCS pumping would likely change as would the potential fate of the remainder of this plume. (tracer data from the Uprate Monitoring indicate some of the plume water does reach the bay benthos). Additionally, if more of the plume were to be captured by the CCS, this would result in the transport of additional salts and other plume constituents back onto the Model Lands landscape via the cooling canal system. A portion of these recaptured pollutants including chlorides would make its way into the westward portion of the existing contaminant plume. In other words, redistribution of the recaptured pollutants would create a mechanism whereby only a portion of the contaminants from under the portion of the aquifer below the bay was returned to that portion of the aquifer. The net result of this would be increased loading to other portions of the Biscayne aquifer.

FPL's current modeling effort in support of the radial collector wells is not adequate to evaluate any of the above concerns, nor is it able to simulate the combined effects of the existing operations and the proposed Uprate and Units 6 and 7 projects, although it is clear that both combined and cumulative impacts will result from these two yet to be built projects that will be in addition to current hydrologic impacts. One important aspect of this hydrologic question will be to determine how much of the current water consumption is replaced via fresh groundwater and how much is replaced via saline groundwater and to what extent this ratio of sources will change with combined operation of all proposed projects. If the ratio tips to more saline water, then further contamination via

salts entering the aquifer will occur. If the ratio tips to more freshwater, then the amount of freshwater (which is already inadequate in this area) will further decrease. These questions require a multi density hydrologic model with coupled surface and groundwater since the current groundwater model can't be used to examine these issues.

*Data submitted by FPL as part of the application to the State of Florida for the Units 6 and 7 project include aquifer performance testing (APT) in the area where the radial collectors are proposed. This includes data from the APT that was performed in April/May 2009. Water quality data collected during this APT reveal unusually high sulfate levels in the surface water samples. These levels were well in excess of concentrations expected in typical surface waters of the bay but were consistent with the levels found in the CCS plume. This indicates the possibility that the plume may have been impacted during the APT to a point where a portion of it directly entered surface waters in the location of sampling. Groundwater levels in monitoring well MW-5 decreased to a stage lower than -5.0 feet (NAV88) during and after the event. The data show a continual downward trend for several months and this trend starts well before the APT. Therefore these extraordinarily low groundwater levels cannot be attributed solely to the APT, if at all. If these data can be relied on, it is believed that the explanation is due to uptake by the CCS pumps of significant volumes of water from the surrounding portions of the aquifer. A similar decrease in water level was observed in the cooling canals with water levels quickly decreasing to stages well below sea level during the APT. Unusual and significant stresses to the aquifer are the most likely explanation.