UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)		
	)	Docket Nos.	52-029-COL
Progress Energy Florida, Inc.	)		52-030-COL
(Combined License Application for	)		
Levy Nuclear Plant, Units 1 and 2)	)	ASLBP No.	09-879-04-COL

PRE-FILED REBUTTAL TESTIMONY OF MITCHELL L. GRIFFIN, PH.D.
ADDRESSING INTERVENORS' DIRECT TESTIMONY REGARDING PASSIVE DEWATERING,
ACTIVE DEWATERING DURING CONSTRUCTION, AND SALTWATER INTRUSION

Please state your name, address and provide your qualifications.

1. I am Mitchell Lee Griffin, 3011 S.W. Williston Road, Gainesville, Florida. This is my office address.
2. I am a Principal Technologist in Water Resources with CH2M HILL, Inc., an engineering company providing consulting services to Progress Energy Florida, Inc. (PEF) for the proposed Levy Nuclear Plant, Units 1 and 2 (LNP).[1]
3. I previously provided sworn direct testimony in this proceeding, Pre-Filed Direct Testimony of Mitchell L. Griffin, PH.D., Regarding Passive Dewatering And Active Dewatering During Construction (PEF001).

What is the purpose of your rebuttal testimony?

4. The purpose of my rebuttal testimony is to address certain portions of the Pre-Filed Testimonies of David Still (INT201R) and Dr. Sydney Bacchus (INT301R) concerning issues related to passive dewatering, active dewatering during construction, and saltwater intrusion.

[1] Exhibit PEF023 updates PEF002 which defines select acronyms used in my testimony as a convenient reference.

PEF016
July 31, 2012

Mr. Still is critical of the Staff's use of historical rainfall averages in the Final Environmental Impact Statement (FEIS), noting that the region's mean annual precipitation of 53 inches has not been received in the past six years. (INT201R, pp. 3-4). Do you agree with Mr. Still that the use of a 5-, 10-, or 15-year moving average for annual precipitation would be more representative of current and future conditions?

5. The recent weather pattern in north Florida has been dry. However, recent annual rainfall totals do not represent the lowest historic values, and are in fact within natural variations in weather patterns in this area. Although the source of the precipitation data presented by Mr. Still in INT204 was not identified, Dr. Bacchus stated that it came from the Southwest Florida Water Management District (SWFWMD) web site. (INT301R, p. 35). To provide the Board these same data in a more readily accessible format I downloaded these rainfall data from the SWFWMD website (http://www.swfwmd.state.fl.us/data/wmdbweb/rainfall_data_summaries.php) and plotted annual rainfall as well as the 5-, 10-, and 15-year moving averages for precipitation in the two counties (Levy County and Citrus County) closest to the LNP site (PEF017, p. 1). Even without the benefit of a rigorous statistical analysis of the data in PEF017, it appears that very dry periods occur every 20 years or so and that the 1960s through the 1970s was a period of relatively higher rainfall. (PEF017, p. 1). Although the recent 6-year dry spell does make the end of the 10- and 15-year moving average for each county drop, this period does not contain the lowest annual recorded rainfall. In fact, annual rainfall levels over this 6-year period are about the same as those in the 1920s. I have also presented summary statistics for the monthly and annual precipitation for Levy and Citrus Counties which indicate that even in the driest years on record in each county, there were still 35.6 inches of rainfall within Levy County, and 32.12 inches of rainfall in Citrus County. (PEF017, p. 2). There is no real long-term trend to justify any expectation of an impending long-term drought. This year's tropical storms have essentially brought the 2012 year-to-date rainfall total closer to normal values in north central Florida (30 inches through July 12 in Gainesville), and it is only the beginning of the wet

season. Therefore, another dry year is not likely, but possible, as Florida weather is highly variable and annual rainfall in Levy and Citrus Counties has ranged between 32 and 85 inches per year since 1912. (PEF017, p. 2).

6. In another project in which I was involved, CH2M HILL conducted a time-series analysis of potential water supply from the Alafia River near Tampa Bay Water's intake and determined statistically significant cycles of low flow occur at 3, 4, and 14 years. Sometimes these cycles overlap and the low flows are worse than normal. Typically, every 3 to 5 years significant reductions in flow occur and these correlate to low precipitation years. There are longer cycles that could be found if the rainfall records were reviewed over an even longer period of record. The SWFWMD scientists have demonstrated that river flow changes across Florida also match a step-function cycle that appears to shift every 20 or so years as a result of the rainfall patterns that vary from an Atlantic Multidecadal Oscillation (AMO) of sea surface temperatures.[2] The National Oceanic and Atmospheric Administration (NOAA) reports that this cycle seems to follow a 20- to 40-year period but there is not enough long-term data to verify this. The major precipitation patterns plotted in PEF017, p. 1, generally correspond to the AMO cycle with no other consistent trends either up or down during recent history. So, Mr. Still's opinion that rainfall data is best reviewed in 5-, 10-, or 15-year moving averages would not capture the AMO cycle well and this appears to be the most dominant cycle revealed by the data. At the other extreme, a 5-year moving average would only show the shortest rainfall cycles and is not meaningful in long-term trend analysis.

How do you respond to Dr. Bacchus's criticism that the use of rainfall averages is inappropriate because averages fail "to address two critical aspects that would result in LARGE adverse hydroperiod impacts: 1) evaporative loss exceeds rainfall during the entire dry season of every year and 2) evaporative loss exceeds rainfall during droughts?" (INT301R, pp. 29-30).

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[2] NOAA has a good summary of the AMO cycle online at: http://www.aoml.noaa.gov/phod/amo_faq.php#faq_4.

7. Dr. Bacchus's assertion that rainfall in dry months never exceeds evaporation is incorrect. In the monthly rainfall summary in PEF017 for Levy and Citrus Counties, I included the minimum, maximum and average precipitation data for each month. Most of the dry months (December through May) have maximum rainfall values exceeding 10 inches. In contrast, the University of Florida's agricultural extension service predicts the 95th percentile (high) monthly potential evapotranspiration (PET) rate at just less than 7 inches (in May) for two large municipalities (Orlando and Tampa) near the LNP site.[3] (PEF024, pp. 18-19). If on the other hand, Dr. Bacchus was referring to average precipitation values when she says rainfall in the dry months never exceeds evaporation, her statement would still be factually incorrect, as there are months (i.e., December and January) in which mean precipitation values in Levy County are typically higher than their respective monthly 95th percentile PET rates at Orlando (PEF024, p. 18) and Tampa (January only, PEF024, p. 19). Additionally, I would refer the Board back to the discussion of evaporative loss in the stormwater ponds in my direct testimony. (PEF001, p. 22-23). Actual evapotranspiration (ET) and evaporation rates depend on a number of environmental factors that vary widely on a daily, monthly, and yearly basis including: rainfall; radiation level, wind; cloud cover; and plant type, size and health. Dr. Bacchus's assertion is an unsupportable overstatement, but I would agree that evaporation can exceed rainfall during droughts.
8. I have also prepared a table (PEF018) to show the range of reported Florida evaporation values found in literature, and the list is specific to north Florida in the vicinity of the LNP site unless otherwise noted in the comments. Potential ET (PET) is a maximum computed value and is normally related to a well-watered reference crop, like grass. ET from a varied natural landscape is normally less than

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[3] University of Florida, Institute of Food and Agricultural Sciences. IFAS, 1984a. Potential Evapotranspiration Probabilities and Distributions for Florida. Bulletin 205. Contributing authors: A.G. Smajstrala, G.A. Clark, S.F. Shih, F.Z. Zazueta, and D.S. Harrison. 1984. (PEF024). Evapotranspiration (ET) is the combined water loss to atmosphere through transpiration from the plants (i.e., water vapor) and evaporation of water from the plants or ground surfaces, including open water bodies. Potential ET (PET) represents a maximum water loss from a well-watered reference crop like pasture grass or alfalfa. PET is a computed value and there is no one accepted standard equation.

PET because of the variety of native plants, plant densities, and available moisture. Pan evaporation is a common type of measurement method using a standard-sized, open metal pan filled with water. The recorded evaporation results tend to be high when compared to long-term average evaporation from a natural water body. Lake evaporation is normally an estimated value based on water balance computations and is expected to be closer to the long-term average evaporation from a natural water body. (PEF001, p. 24). The references Dr. Bacchus uses in her direct testimony (INT301R, pp. 31, 60) are included in the list as the last two entries and one can see that the ET values to which she refers are high when compared to other relevant north Florida data.

9. From the data shown in PEF018, the average annual lake evaporation in the area in the vicinity of the LNP site is 48 to 53 inches per year. The annual precipitation at the LNP site is 53 inches per year. (NRC001, pp. 2-21). Direct precipitation on the ponds will offset lake evaporation on average, and additional runoff from the approximately 175 acre raised power block will provide additional stormwater runoff volume for percolation, especially when the groundwater levels are below natural landscape grade. Therefore, in my professional opinion (and apparently those of the NRC Staff, see NRCTEST, p. 54), the series of stormwater ditches that direct stormwater from the LNP power plant to the three stormwater ponds will be a source of net recharge to the aquifer most of the year and cannot reasonably be foreseen to cause net passive dewatering.

10. Dr. Bacchus's analysis of additional loss from the ponds depends on an assumption of unsupportable high evaporation values for open water to assert net passive dewatering by evaporation. The open mine pit average annual evaporation rate used in INT363 was 63 inches per year. The Swancar et al. (2000) analysis (INT433) was limited to two lakes in Central Florida where groundwater seepage was a significant component of the water balance. The Swancar et al. study estimated evaporation indirectly from a water balance computation to compare different equations to predict lake evaporation and validate the equations over a very limited time period (two years). There are no broader regional conclusions about passive dewatering in their report that can be applied beyond the focus of that study.

Mr. Still expresses confusion regarding the FEIS's discussion of stormwater management for the LNP. (INT201R, pp. 4-6). Please identify the passages of his testimony that reflect his misunderstanding.

11. Mr. Still states that the FEIS is confusing in its treatment of stormwater management and I agree that the NRC Staff does not really describe the operation of the ponds in much detail. The NRC Staff describes the ponds in terms of their general function – as both retention and infiltration ponds (NRCTEST, pp. 52-54, and at other locations in NRC Staff Testimony) — and not in the same way that Florida regulations describe the ponds. These terms (retention and detention) have specific meaning in Florida regulations[4] and refer to different types of best management practices. For example, the NRC Staff stated that the ponds retain the runoff from the power plant for the 25-year storm. Although the dikes do hold back this storm's runoff without discharging over the spillway (synonymous to retaining), the smaller pipes dewater the ponds back down to the seasonal high groundwater table for all storms that stage up above the natural ground elevation. Because the ponds will be excavated somewhat below the natural ground level, and the seasonal high groundwater table is higher than the excavated bottoms, these ponds are classified as wet detention ponds in Florida regulations — not retention ponds. Retention ponds in Florida are normally dry ponds that have their bottom above the groundwater table. The NRC Staff also refers to the "bottom of the pond" being higher or lower than the water table elevation at different times; apparently they were referring to the water level in the pond and not the excavated bottom of the pond. I have provided more detailed descriptions of the stormwater ponds and their operation in my Pre-Filed Direct Testimony. (PEF001, pp. 14-16).

12. Mr. Still states that the stormwater system should have been designed for the entire storm. The stormwater ponds were designed to manage all of the storms through the 100-year storm (11 to 12

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[4] Stormwater system definitions are in SWFWMD Basis of Review, Section 1.7 (PEF006, pp. 2-4). SWFWMD Basis of Review, Section 4.5 is entitled "Minimum Drainage" and provides an example of how the difference between stormwater and retention ponds is important in defining treatment capacity. (PEF006, p. 34).

inches in 24 hours). When rainfall exceeds the 25-year storm (8 to 9 inches in 24 hours), runoff will stage up and flow over the broad crested spillways, such that adequate room (freeboard) will be available under the top of the dikes to manage stormwater up to the 100-year storm.

13. Mr. Still states that the stormwater system should not have been designed to pump stormwater to the cooling system. Mr. Still's argument rests on a misinterpretation of the 4.5 million gallons per day (mgd) of stormwater that appears in the water balance. Neither the operation of the stormwater ponds nor the overall drainage functions of the LNP site require the 4.5 mgd of pumping. The 4.5 mgd of stormwater shown in the water balance diagram was included only to provide a contingency for stormwater management. The Florida Department of Environmental Protection (FDEP) requires all discharges to be shown in the water balance for the Federal National Pollutant Discharge Elimination System (NPDES) permit for the cooling tower blowdown from LNP to discharge at the Crystal River Energy Complex (CREC). PEF wanted the option to be able to pump the ponds lower in anticipation of an imminent emergency condition like a hurricane or tropical storm. It is also possible that during persistent wet weather, when several large storms may occur in a short period and the ponds cannot drain quickly by gravity, PEF may wish to pump the ponds' contents offsite. The 4.5 mgd was proposed as an optional back-up provision.

14. In my direct testimony in response to Dr. Bacchus's similar statements, I have extensively addressed Mr. Still's opinion that an unlined stormwater pond dewaters the surficial aquifer. (PEF001, p. 22). Although the NRC Staff does not describe the pond using the same language that appears in Florida regulations, the NRC Staff's analysis and conclusions are accurate: "The staff concludes that most of the time during a normal year the stormwater ponds would recharge the surficial aquifer." (NRCTEST, p. 54).

Please address Dr. Bacchus's assertions that the stormwater ponds "cannot compensate for altered historic sheet-flow and natural hydroperiods because by their very nature, they will be passively dewatering the local area." (INT301R, p. 30).

15. Dr. Bacchus, the NRC Staff, and I would all agree that at the LNP construction site there will be changes to the historic stormwater flow paths (see NRCTEST, p. 27; PEF001, pp. 12-13). However, Dr. Bacchus's statement that the stormwater ponds are replacing 105 acres of wetlands is inaccurate. The LNP site and the surrounding area are characterized by an integrated complex of wetlands and uplands that have been altered and fragmented by silvicultural activities over a period of decades. Vegetation, soils, and localized natural drainage patterns have previously been disturbed through clearing, logging, road development, ditching, grading, bedding, and replanting to the point where references to "historic sheet-flow" and "natural hydroperiods" in connection with wetlands on the LNP site and the surrounding area are largely meaningless. That being said, the stormwater ponds were designed specifically to minimize impacts to the wetlands on and off the LNP site. The stormwater ponds will provide water quality treatment of runoff from the plant and capture more water to replace displaced floodplain storage. The FEIS and NRCTEST testimony describe these functions in detail. (NRC001, pp. 4-19 to 4-20); NRCTEST, pp. 57-59). As I described in my direct testimony (PEF001, p. 20), CH2M HILL's analysis relied on detailed topographic mapping (1-foot contours) to evaluate the natural flow paths, and the proposed diversions (channel and pipes) were designed to let water flow back to the same wetlands "downstream" of the new LNP facilities. Because the new facilities occupy a small fraction of the 3,105 acres in the North Property and are centered on the property, there is a large buffer between the new facilities and offsite property. Stormwater will return to its "historic" flow path onsite except for runoff from the LNP facilities where it will be sent to the ponds for capture (and retention, as available), treatment, and typically slow release. Furthermore, the proposed stormwater system manages and compensates for a variety of potential offsite and surficial aquifer effects of the LNP project, such as increased peak runoff rates, water quality from the active power block, and loss of historic floodplain storage. The NRC Staff acknowledged that the terrestrial impacts would be SMALL to MODERATE and the water use surface water issues would be SMALL. (NRC001, pp. 5-135 and 5-136).

Are you aware of wetlands in proximity to stormwater ponds that exhibited LARGE adverse impacts from hydroperiod alterations related to those stormwater ponds, as asserted by Dr. Bacchus? (INT301R, p. 32).

16. Dr. Bacchus notes in her direct testimony (INT301R, p. 32) that in her experience as a permitting specialist she has observed that wetlands adjacent to developments exhibit large impacts to hydroperiods. As I described in my direct testimony (PEF001, p. 11), developers often try to design for the lowest justifiable groundwater table to improve drainage by passive dewatering and this can "dry up" some areas. This criticism cannot be made of the LNP project. Here, PEF assumed the seasonal high groundwater level at the surface and conservatively designed LNP facilities to rest on a platform elevated above the surrounding landscape. With this in mind, the LNP project minimizes alterations to onsite hydroperiods by planning on a conservatively high groundwater table elevation.

Will the stormwater ponds cause sinkholes to collapse at LNP, as suggested by Dr. Bacchus, with subsequent passive dewatering of the aquifer system and re-opening of relict sinkholes? (INT301R, pp. 11-12, 18-20, 32 – 33).

17. Although Dr. Bacchus implies that there are many relict sinkholes on the LNP site because of the many depressional wetlands on the LNP site and surrounding area, this appears to be an overstatement made without adequate factual basis. Not all depressional wetlands are in relict sinkholes.[5] Florida flatwoods have subtle variations in the landscape elevations and low areas form wetlands when the soils are hydric (wet). The fact that there are no known sinkholes on the LNP site also argues against the conclusion that the depressional wetlands on the LNP site are formed from relict sinkholes. As explained in greater detail in the rebuttal testimony of Dr. Paul Rizzo (PEF700),

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[5] Dr. B.F. Beck of the Florida Sinkhole Research Institute and W.C. Sinclair made this point emphatically in an introductory text about sinkholes in Florida, under a section entitled: "Is All Local Land Settlement in Florida Due to Sinkholes?" Their response was "Absolutely not!" (see PEF019, p. 14). Beck, B.F. and W.C. Sinclair. 1986. Sinkholes in Florida: An Introduction. Report 85-86-4. Published by the University of Central Florida in cooperation with the U.S. Geologic Survey. Orlando, FL. 24 p. (PEF019).

the geological characteristics of the LNP site inhibit the creation of sinkholes. Indeed, the FDEP has developed a database of sinkhole zones in Florida (which I have mapped in PEF020 for north central Florida) because there are different types of sinkhole formations depending on the soil cover and limestone of a particular area. Type III areas have the most numerous sinkholes, while Types I, II, and IV areas have less numerous and more slowly-developing sinkholes. The references to sinkholes forming in western Alachua County (i.e., near Jonesville) (INT201R, p. 7) and south near Brooksville (i.e., by the Sunshine Parkway) (INT301R, p. 32) are in Type III areas. The LNP project is located in a Type I area (see PEF020) that has the lowest potential for sinkhole development.

18. Dr. Bacchus states that stormwater ponds cause sinkhole collapses resulting from increased weight and recharge. (INT301R, p. 32). Sinkholes cannot be caused by the increased weight of water in shallow ponds because water weighs a lot less than soil. Water weighs 62.4 pounds per cubic foot, or 62.4 pounds per square foot per foot of water depth ($lb/ft^2/ft$ depth), and sandy soil weighs between 100 (dry) to 120 (moist) pounds per cubic foot. Let's assume moist sand is about 120 $lb/ft^2/ft$ depth. The ratio of water to moist sand is 0.52 (62.4/120); so water is about half as heavy as soil. The pond will be excavated to an average depth no greater than 6 to 8 feet deep and replaced with lighter water. The dikes surrounding the ponds are only about 6 feet tall (see PEF007, Berm and Weir Detail) so the staged water in the pond could only be about 2 times deeper at the maximum depth (i.e., about the same weight as the displaced soil). The normal spillway is only 1 foot above the ground surface so the staged stormwater normally is only 7 to 8 feet deep if the pond is excavated to an average 6 feet deep. Using the numbers above, 8 feet times 62.4 $lb/ft^2/ft$ depth equals 499 lb/ft^2 of stormwater during a normal large storm. The 6 feet of soil that exists at that location now weighs 6 feet times 120 $lb/ft^2/ft$ depth, or 720 lb/ft^2. The weight of soil is much more than the stormwater in the ponds and, as discussed previously, the limestone at this site is not prone to rapid sinkhole formation by recharge (seepage).

Do you agree with the assertion of Mr. Still that the FEIS does not account for the cumulative impacts of LNP's groundwater withdrawals and the withdrawals by other existing users because it did not account for groundwater withdrawals associated with Environmental Resource Permits? (INT201R, p. 20-21).

19. Mr. Still states that the FEIS should have evaluated the impacts of Environmental Resource Permits (ERPs) related to mining and other land use changes in considering the cumulative impacts of the LNP (INT201R, pp. 20-21). His criticism appears based on the same assumption that Dr. Bacchus promotes — that mining and stormwater management passively dewater the aquifers – and which I have already explained is incorrect. The NRC Staff in preparing the FEIS did assess the direct and indirect impacts of dewatering on groundwater and the aquifers and other environmental impacts during construction and operation of the LNP and took into account the cumulative impacts from other uses, including local mining, that also affect the groundwater and aquifers. (NRC001, pp. 4-10, 4-22 to 4-24, and 5-8 [i.e., "adjacent permitted users"]).

Do you agree with the assertion of Dr. Bacchus that the wetlands on and surrounding the LNP site are directly connected hydrologically to the Wacasassa River, Withlacoochee River, Withlacoochee Bay, and the Cross-Florida Barge Canal? (INT301R pp. 18-20).

20. No, this is an oversimplification. As explained in greater detail above, the karstic characteristics vary across Florida and are not homogenous. The surficial aquifer (near surface groundwater) is part of the overall hydrology of the LNP site, but only through the relatively slow percolation and seepage through the soil to the Upper Floridan Aquifer are wetlands connected to distant water bodies in the surrounding area. There are no known direct groundwater connections to the north other than through the Upper Floridan Aquifer, which is flowing mostly to the west; so the Waccasassa River and Bay are not affected except by the SMALL reduction in spring flows noted in the FEIS. The direction of surface flow is supported by detailed topography obtained by LiDAR (Light Detection and Ranging), an aerial survey method used to generate the 1-foot contour data. Aerial photographs also show the surface water paths across the LNP site and they corresponded to the LiDAR data. I already

described the flow paths on LNP in detail in my direct testimony. (PEF001, pp. 7 – 9). Based on the physical data, the NRC Staff and I concluded that the wetlands are not connected directly to all water bodies in the region. (NRC001, pp. 2-21 and 5-4).

21. The NRC Staff Initial Statement of Position (p. 40) and NRC Testimony at A151 and A152 (NRCTEST, pp. 128 and 129) demonstrates that the NRC Staff did consider the connection between wetlands and the groundwater system and did consider that the potential effects to nearshore waters away from the LNP site are incorporated in the modeling assessments.

Are there inconsistencies between the FEIS and the Conditions of Certification (COC) with respect to the number of permitted groundwater wells as asserted by Mr. Still? (INT201R, p. 13).

22. Mr. Still notes that the SWFWMD Water Use Permit (WUP) File of Record Report from the SWFWMD's database of groundwater users listed five wells, the four production wells and another one located at the plant site. (INT215). This observation is correct. PEF plans to have a temporary well for incidental water supply during construction. The amount of water to be used from this construction well is below the threshold for requiring a permit; but it was included in the WUP application for completeness. The NRC Staff was provided the entire Site Certification Application, which included the water use well information. As stated in NRC Testimony (NRCTEST, p. 50), relatively small short duration withdrawals during construction will be bounded by the operational impacts of the well system and a separate discussion was not needed.

Do you agree with the assertions of Dr. Bacchus that groundwater withdrawals associated with the LNP will eliminate the freshwater discharge to the coastal waters, or will result in the potential for saltwater intrusion into the aquifer referred to in numerous places by Mr. Still? (INT301R, pp. 11, 18-23). (INT201R, pp. 3, 4, 8, 9, 12, 18).

23. No. First, the reports of saltwater issues that several small coastal communities have experienced in their water supply wells (Cedar Key, Taylor Beach, Horseshoe Beach, and Suwannee), offered in Mr.

Still's testimony as evidence that saltwater intrusion is a danger in the vicinity of the LNP site, are not relevant. These communities are small and are located on the relatively limited high ground adjacent to the Gulf of Mexico (Gulf) north of the LNP location in the Suwannee River Water Management District (SRWMD). These communities typically have a few wells (maybe 2 to 4 wells), and the wells are located further inland than the towns - searching for freshwater. Cedar Key's and Horseshoe Beach's wells in particular are still only about a mile from the nearest coastal tidal flats, even after they were moved inland. The available freshwater in the ground at these areas is thin and, while the Floridan Aquifer is present immediately adjacent to the Gulf, even a small use can cause the saltier water present at lower elevations to mix with the freshwater to a point of causing high salinity in the drinking water. As Mr. Still illustrated, there is a fine line between freshwater and saltwater impacts in many coastal communities. I find it curious that the SRWMD, where these communities reside, would permit 44 million gallons per day of new groundwater withdrawal in late 2011 without considering groundwater resources (INT201R, p. 16). This is definitely not the case at LNP with the NRC, FDEP, and SWFWMD – each having reviewed the groundwater withdrawals associated with the LNP project. Extensive analysis and discussion about the groundwater resources in the region is included in the record summarized in my direct testimony and developed by Florida agencies in connection with the Site Certification Application (SCA) and the NRC and Army Corps of Engineers for the FEIS. (PEF001, pp. 32-34). Most saltwater intrusion issues cited in the region are from activities related to the existing and proposed mines located closer to the coastal residents, or by the changes already caused by the Cross Florida Barge Canal (CFBC). While there are always justified concerns by Florida residents near the coast about the availability of freshwater in their shallow wells, the proposed LNP project's wellfield has been evaluated not to generate new saltwater intrusion impacts and the FEIS characterizes the potential water use quantity impacts as SMALL. (NRC001, p. 5-16).

24. There are several items that I will address related to Dr. Bacchus' direct testimony about the salinity in the region. CH2M HILL collected a year's worth of data in the CFBC and the near-coastal waters in Withlacoochee Bay and provided that data to the Florida Fish and Wildlife Conservation Commission (FFWCC) and the NRC for their use in evaluating the application. I have provided in PEF021 a figure showing the sampling locations, as well as a plot of CFBC salinity results.[6] In addition, we obtained over 11 years of salinity and nutrient data from the water quality sampling conducted in this part of the Gulf under Project COAST by the University of Florida and FDEP staff. The project is funded through SWFWMD's Surface Water Improvement and Management program and Coastal Rivers Basin Board, and the State's Water Quality Assurance Trust Fund (Frazer et al., 2001[7]). As part of Project COAST, monthly water quality monitoring has been conducted since 1997 at an array of stations along the Gulf coast extending from southern Levy County through Citrus, Hernando, and Pasco counties and into northern Pinellas County. CH2M HILL analyzed a subset of these data near the LNP project for the FFWCC (locations of the entire dataset and the subset are shown in PEF022 on pp. 1 and 2, respectively). CH2M HILL's staff is familiar with the salinity conditions in this region. I have relied on these data to form my opinions of the salinity-related water quality in the region.

25. The surficial and Upper Floridan Aquifers meet the natural ground at the Gulf coast all along the Big Bend region (the region is roughly south of Tallahassee to Cedar Key) down to Pasco County. Freshwater from the groundwater aquifer discharges into the Gulf and causes somewhat lower salinity conditions near the coastline than at locations further out in the Gulf. The white triangles along the

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[6] CH2M HILL. 2010. Technical Memorandum 338884-TMEM-087. Aquatic Ecology Sampling Report, Levy Nuclear Plant. January 2009. Revised April 6, 2010 to conform with State requirements for special activities license. NRC001 refers to this document when discussing salinity changes. (NRC001, pp.2-197, 4-140, 5-139).

[7] Frazer, T.K., S.E. Blitch, M.V. Hoyer, S.K. Notestein, J.A. Hale, and D.E. Canfield, Jr. 2001. Water Quality Characteristics of the Nearshore Gulf Coast Waters Adjacent to Citrus, Hernando, and Levy Counties, Project COAST – 2000. Submitted to Southwest Florida Water Management District, Surface Water Improvement and Management Program, Tampa, FL. August 2001. PEF022 contains figures showing the location of the data sampling points and the locations near the LNP project.

coast showing seeps in INT343 are an illustration of this natural condition. Obvious new seeps surfaced when the CFBC was excavated into the top of the surfacing rock formation and seeps occur along the length of the canal (Figure 5-4 of the FEIS [NRC001, p. 5-11] implies all of this seepage is from the locks but it is distributed along the canal). There are also known seeps by the Inglis dam (which forms Lake Rousseau) at the beginning of the remnant Withlacoochee River. During wet weather and at low tide, seepage from the surficial aquifer into the CFBC is also apparent along the banks. It is not clear if the sampling locations identified by Dr. Bacchus's survey (the blue triangles shown in INT343) were really groundwater, surface water, or if they were just canal water seeping out of the banks after a high tide event. The FEIS described the contribution of freshwater into the CFBC well, and Dr. Bacchus quotes part of this section (NRC001, pp. 5-10 through 5-14), so the FEIS does include an assessment of the salinity in the CFBC and near shore region.

26. Water with salinity greater than about 2.5 on the practical salinity scale (pss) (same unit as parts per thousand) is considered brackish, not freshwater. None of our data from the CFBC illustrated freshwater conditions along its entire reach. The only consistent freshwater in the system is right below the dam in the remnant river where there is a known large spring (locations CFBC 9 and CFBC 10 are freshwater in PEF021, p. 3) and that keeps a freshwater layer near the top of the old river segment (see line for location CREC 8, in PEF021, p. 3). This gradient in salinity only exists in the remnant river because the 2+ feet of tidal cycle sloshes salty near-coastal Gulf water up and down the CFBC twice a day keeping it brackish and well mixed. When operational, the LNP withdrawal of cooling water will draw more of the Gulf water into the CFBC and the brackish water will get saltier. The salinity profile in the remnant Withlacoochee River will increase at the interface of the river and canal somewhat as a result of removing water from the CFBC, but the large freshwater spring near the dam (USGS reports this to discharge about 70 cubic feet per second) will keep the remnant river water fresh below the dam. The contents of the CFBC can become fresh on occasion, but only when there is a large flood in the Withlacoochee River and the water management district opens the flood

gates at the dam. These water quality data and USGS flow records at the dam were summarized and provided to the NRC Staff for their use in developing the FEIS. These salinity impacts are discussed extensively in the FEIS (NRC001, pp. 5-10 to 5-14, 5-48, and 5-55).

27. Dr. Bacchus also refers to the freshwater "lens" in the CFBC and tidal creeks. (INT301R, pp. 21-22). While there may be a small gradient in salinity between the top and bottom of the water body, freshwater is not floating on top of the water column in the CFBC because of the dispersed seeps from the bottom and constant tidal mixing. The tidal flats in the Gulf are shallow and are normally well-mixed by the wind and tidal action. All of the Gulf data along the entire coastline has salinities in the mid-20s pss, and then get saltier until about 2 to 3 miles offshore (see the locations of these data on PEF022, p. 1). Salinity values near the LNP project ranged from 3 to 37 pss over the approximately 11 years of data from Project COAST (locations shown on PEF022, p. 2). Most of the data along the coast exhibited similar salinity values, which illustrates the broad influence of the Upper Floridan Aquifer discharges. The locations with different salinity were the data collected in front of a river discharge, like at the Withlacoochee River mouth (location WITH-6 on PEF022, p. 2) or by Crystal River's discharge (CB-2 on PEF022, p. 2). Data collected at the mouth of the Withlacoochee River (147 data points) averaged 13.4 pss and ranged from 0.9 (storm flows) to 30.1 pss. The fifth lowest percentile of the salinity data at the mouth of the Withlacoochee River was 2.9 pss, which means that 95 percent of the data were considered brackish or saltwater. The available water along the coastline nearest the LNP project is brackish and fed freshwater primarily by the Withlacoochee River and Upper Floridan Aquifer. The LNP project will not significantly alter the freshwater surface water discharges from the Withlacoochee River watershed, including releases of flood water from the dam. The removal of brackish water from the CFBC is expected to cause the brackish water within the canal to increase in salinity somewhat, but that will not alter the habitat to change from one type to another. The positive gradient of groundwater to the coast will not be affected significantly from the withdrawals of groundwater for the LNP project as has been discussed

by other experts and the NRC Staff. The NRC Staff has reviewed these data and determined the withdrawals as small and the potential impacts to both surface water and groundwater as SMALL. (NRC001, p. 5-16).

I, Mitchell Lee Griffin, swear under penalties of perjury that the foregoing testimony is true and correct to the best of my knowledge and belief.

Mitchell Lee Griffin

Signature

July 31, 2012

Date