Progress Energy

Serial: NPD-NRC-2009-111
June 15, 2009

10CFR52.79

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

LEVY NUCLEAR POWER PLANT, UNITS 1 AND 2
DOCKET NOS. 52-029 AND 52-030
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 038 RELATED TO POTENTIAL DAM FAILURES

Reference: Letter from Brian C. Anderson (NRC) to Garry Miller (PEF), dated May 15, 2009, "Request for Additional Information Letter No. 038 Related to SRP Section 2.4.4 for the Levy County Nuclear Plant, Units 1 and 2 Combined License Application"

Ladies and Gentlemen:

Progress Energy Florida, Inc. (PEF) hereby submits our response to the Nuclear Regulatory Commission's (NRC) request for additional information provided in the referenced letter.

A response to the NRC request is addressed in the enclosure. The enclosure also identifies changes that will be made in a future revision of the Levy Nuclear Power Plant Units 1 and 2 application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (919) 546-6107.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 15, 2009.

Sincerely,

Garry D. Miller
General Manager
Nuclear Plant Development

Enclosure/Attachments

cc : U.S. NRC Region II, Regional Administrator
Mr. Brian C. Anderson, U.S. NRC Project Manager

Progress Energy Carolinas, Inc.
P.O. Box 1551
Raleigh, NC 27602

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NRO

Levy Nuclear Power Plant Units 1 and 2
Response to NRC Request for Additional Information Letter No. 036, May 15, 2009,
Related to SRP Section 2.4.4 for the Combined License Application

NRC RAI #	Progress Energy RAI #	Progress Energy Response
02.04.04-1	L-0220	Response enclosed – see following pages
02.04.04-2	L-0221	Response enclosed – see following pages
02.04-04-3	L-0222	Response enclosed – see following pages

NCR Letter No.: LNP-RAI-LTR-038

NRC Letter Date: May 15, 2009

NRC Review of Final Safety Analysis Report

NRC RAI #: 02.04.04-1

Text of NRC RAI:

To meet the requirements of GDC 2, 10 CFR 52.17, 10 CFR Part 100, and 10 CFR 100.23(d), an appropriate configuration of the cascade of dam failures and its potential to produce the largest flood adjacent to the plant site is needed. Flood waves produced by postulated dam failure scenarios should be routed to the proposed plant site to conservatively estimate the most severe floodwater surface elevation that may affect SSC important to safety. Please describe the process followed to determine the conceptual models for flood waves from severe breaching of upstream dams, domino-type or cascading failures of dams, dynamic effects on safety-related SSCs, loss of safety-related water supplies, sediment deposition and erosion, and failure of on-site water control or storage structures to ensure that the most conservative of plausible conceptual models has been identified.

PGN RAI ID #: L-0220

PGN Response to NRC RAI:

The LNP safety-related structures are positioned entirely in the Waccasassa River Basin and are not located directly on or near a water body in that river basin. As described in FSAR Section 2.4.1.2.9, there are no known water control structures in the Waccasassa River Basin (FSAR Figure 2.4.1-212). Therefore, no potential hazard to the LNP site or safety-related structures exists within the Waccasassa River Basin that could occur as a result of flood waves from severe breaching of upstream dams or domino-type or cascading failures of dams. The nearest water control structures to the LNP site are present in the adjacent Withlacoochee River Basin which is hydrologically separate from the Waccasassa River Basin.

Water control structures within the Withlacoochee River Basin are discussed in FSAR Subsection 2.4.1.2.7, FSAR Subsection 2.4.1.2.8, and in the response to FSAR RAI 02.04.04-2. Potential impacts from the failure of water control structures associated with Lake Rousseau (Inglis Dam and Spillway and Inglis Lock) are discussed in FSAR Subsection 2.4.4. This analysis conservatively assumes a downstream water elevation equal to the 10 percent exceedance high tide and a probable maximum flood (PMF) event. The results of this analysis indicate that the maximum water surface elevation in the Lower Withlacoochee River associated with a postulated failure of the Inglis Dam during a PMF is 24.65 ft. NGVD29. As described in LNP FSAR Subsection 2.4.1.1, the NGVD29 datum at the LNP site is approximately (averaged across the site) 1 ft. higher than the NAVD88 datum; therefore, 24.65 ft. NGVD29 is approximately equivalent to 23.65 ft. NAVD88. The nominal plant grade floor elevation for the LNP site is 15.5 m (51 ft.) NAVD88, which is over 27 ft. higher than the maximum water surface elevation in the Lower Withlacoochee River.

The remaining dams and water control structures in the Withlacoochee River Basin are not considered to be potential hazards since topographic relief is low in this part of the state and any flood wave would spread into marshlands adjacent to the river channel. These dams and water control structures are discussed in more detail in the response to FSAR RAI 02.04.04-2.

Based on the analyses described above, severe breaching of upstream dams and domino-type or cascading failures of dams will not affect safety-related structures or processes at the LNP site. No dynamic water forces associated with high water levels will occur because the finished plant grade is higher than the surrounding area.

As stated in LNP FSAR Subsection 2.4.8, safety systems for the AP1000 are designed to function without safety-related support systems such as component cooling water and service water. None of the safety-related equipment requires cooling water to effect a safe shutdown or mitigate the effects of design basis events. Therefore, a loss of water supplies will not affect the safety-related processes associated with LNP 1 and LNP 2.

As described in LNP FSAR Subsection 2.4.1, brackish water from the Central Florida Barge Canal (CFBC) will be used to supply cooling water to LNP 1 and LNP 2. The brackish water from the CFBC will be pumped north to the LNP site from an intake structure located on the berm that forms the north side of the canal. Under conditions of CFBC failure, LNP 1 and LNP 2 will use a passive core cooling system to provide emergency core cooling without the use of active equipment such as pumps and alternating current (ac) power sources. Therefore, sediment deposition and erosion within the CFBC will not affect the safety-related structures or processes associated with LNP 1 and LNP 2.

As discussed in LNP FSAR Subsection 2.4.1, LNP 1 and LNP 2 are located in the central portion of the plant site. Stormwater on the LNP site will drain by a stormwater sewer system and the peripheral areas of the LNP site will drain through open ditches and culverts to stormwater retention ponds. Stormwater from the retention ponds may at times be pumped to the cooling tower water basins. If the drainage system becomes blocked or fails, the LNP site can be drained by overland flow directly to the Lower Withlacoochee River or the Gulf of Mexico. Failure of on-site water control or storage structures will not affect safety-related structures.

Associated LNP COL Application Revisions:

None.

Attachments/Enclosures:

None.

NRC Letter No.: LNP-RAI-LTR-038

NRC Letter Date: May 15, 2009

NRC Review of Final Safety Analysis Report

NRC RAI #: 02.04.04-2

Text of NRC RAI:

To meet the requirements of GDC 2, 10 CFR 52.17, 10 CFR Part 100, and 10 CFR 100.23(d), an appropriate configuration of the cascade of dam failures and its potential to produce the largest flood adjacent to the plant site is needed. Please clarify the description of all existing and proposed water retaining and water control structures both upstream and downstream relative to the LNP site location and justify why failure of these may not affect flood elevations near the LNP site.

PGN RAI ID #: L-0221

PGN Response to NRC RAI:

The LNP site is located entirely in the Waccasassa Drainage Basin and is not on or near a water body that could potentially result in flooding of the site. As described in FSAR Subsection 2.4.1.2.9, there are no water control structures in the Waccasassa Drainage Basin (see Figure 2.4.1-212). Therefore, there are no potential hazards to the LNP site or its associated safety-related structures exist that could occur as a result of a failure of any upstream and downstream water control structures. The nearest water control structures to the LNP site are located in the Withlacoochee Drainage Basin, which is hydrologically separate from the Waccasassa Drainage Basin (see Attachment 02.04.04-2A).

The National Inventory of Dams (NID) is a listing of dams identified through record searches and feature extractions from aerial imagery (Reference RAI 02.04.04-2 01). This dataset includes information on all dams in the United States that meet at least one of the following criteria:

1) High hazard classification - loss of one human life is likely if the dam fails,

2) Significant hazard classification - possible loss of human life and likely significant property or environmental destruction if the dam fails,

3) Dam equals or exceeds 25 ft. in height and impoundment exceeds 15 acre-feet (ac.-ft.) of storage,

4) Dam exceeds 6 ft. in height and impoundment equals or exceeds 50 ac.-ft. of storage.

This dataset was reviewed to determine characteristics of dams within the Withlacoochee Drainage Basin. The NID does not have the capability to directly identify dams by drainage basin. For this reason, GIS coverages for dams were obtained from the Florida Geographic Data Library. A GIS query was performed on the USGS Geographic Names Information System (GNIS), USGS Major Dams, and the USEPA Permitted Dam Location datasets to identify those dams that are within the Withlacoochee Drainage Basin. These dams and their

hydrologic characteristics are described in Table 1 and shown on Figure 1 (see Attachment 02.04.04-2A).

Potential impacts attributable to the failure of water control structures associated with Lake Rousseau (Inglis Dam and Spillway, Inglis Lock, and Inglis Bypass Spillway) are discussed in FSAR Subsections 2.4.1.2.6 and 2.4.1.2.7. There is a vertical difference of 24 ft. between the operating pool elevation of Lake Rousseau (28 ft. NGVD29) and the nominal plant grade floor elevation of the LNP safety-related structures (51 ft. NAVD88). As described in LNP FSAR Subsection 2.4.1.1, the NGVD29 datum at the LNP site is approximately (averaged across the site) 1 ft. higher than the NAVD88 datum; therefore, 28 ft. NGVD29 is approximately equivalent to 27 ft. NAVD88.

In addition, the Lake Rousseau water control structures and other dams in the Withlacoochee Drainage Basin are not considered to be a potential hazard since the Withlacoochee Drainage Basin is hydrologically separate from the Waccasassa Drainage Basin where the site is located and the topographic relief is low in this part of the state. Therefore, any flood wave associated with a dam failure would spread into marshlands adjacent to the river channel as opposed to the LNP site.

For much of its length, the Withlacoochee River meanders through a broad flat plain with very little change in elevation. A less than 1 meter change in elevation is seen through large parts of Sumter and Citrus counties (see Attachment 02.04.04-2B). The Tsala Apopka chain of lakes is an extensive water feature in the central part of the Withlacoochee Drainage Basin, which is comprised of swampland, marshes, ponds, and lakes. Features within the Tsala Apopka system are grouped into three pools: Hernando, Inverness, and Floral City. These are controlled to maintain minimum and maximum levels as described in the *Minimum and Guidance Levels for Tsala Apopka Lake in Citrus County, Florida* (Reference RAI 02.04.04-2 02).

Based on the NID, the Tsala Apopka water control structures have the largest maximum storage capacities in the Withlacoochee Drainage Basin. These structures regulate flow between an extensive river basin and the different associated pools. The Floral City Pool is maintained at the highest elevation, with a high level of 41.8 ft. National Geodetic Vertical Datum of 1929 (NGVD29) and a 10-year Flood Guidance level of 43.4 ft. NGVD29. The Hernando Pool and Inverness Pool have 10-year Flood Guidance levels of 40.5 ft. NGVD29 and 41.8 ft. NGVD29, respectively. The broad expanse of the Tsala Apopka chain of lakes and the distribution of surface water in marsh, pond, and lake areas effectively prevents the development of a large flood wave. In the event of a dam break, the volume immediately above the dam would be released into the Withlacoochee River, but any flood wave greater than 1 meter (about 3.3 ft.) would quickly overtop the river banks and spread into the floodplain. Other areas controlled by the failed dam would also release stored water to the river but more slowly as each pond and wetland area reaches equilibrium with the naturally occurring high water table.

Three of the Saddle Creek Settling Areas have storage capacities greater than 10,000 ac-ft., but all the Settling Areas are hydrologically disconnected from the Withlacoochee River and are approximately 80 miles upstream of the LNP site. Failure of the dams controlling the Settling Areas could result in localized flooding near Lakeland, Florida, but no impacts would occur at the Inglis Dam or other associated control structures. Any flood wave greater than 1 meter (about 3.3 ft.) would quickly overtop the river banks and spread into the extensive floodplain once the Tsala Apopka chain of lakes was reached.

A number of other dams were identified in the Withlacoochee Basin, but they are at least 19 miles upstream of the LNP site and their storage volumes are extremely small. Any releases caused by dam breaks from these remaining impoundments would be dispersed and absorbed by the lowlands within the Tsala Apopka chain of lakes.

A review of the above information has resulted in the following conclusions:

- The LNP site and safety-related structures are located entirely in the Waccasassa Drainage Basin, which has no known water control structures.
- The Waccasassa Drainage Basin is hydrologically separate from the Withlacoochee Drainage Basin.
- The nearest water control structures to the LNP safety-related structures are completely contained within the Withlacoochee Drainage Basin.
- The nearest water body (Lake Rousseau) and associated water control structures are approximately 3 miles south of the LNP site and safety-related structures which are located in a separate drainage basin.
- There is a vertical difference of 24 ft. between the operating pool elevation of Lake Rousseau and the nominal plant grade floor elevation of the LNP safety-related structures.
- Much of the Withlacoochee Drainage Basin is characterized by a wide, flat floodplain that would allow for the dissipation of any flood wave caused by a dam break upstream of the LNP site.

These conclusions suggest that there will be no potential hazard to the LNP site or its safety-related facilities that could result from the failure (singular, simultaneous, or domino) of the water control structures located within the Waccasassa Drainage Basin (no water control structures are present in the basin) or the adjacent Withlacoochee Drainage Basin.

TABLE 1
Dams in the Withlacoochee Drainage Basin

Dam Name	NID ID	County	Height (ft)	Normal Storage (ac-ft)	Max Storage (ac-ft)	Surface Area (ac)
Brogden Bridge – Lake Tsala Apopka	FL18001	Citrus	17	29,700	29,700	4,950
Golf Course Bridge – Lake Tsala Apopka	FL18002	Citrus	13	21,533	41,333	4,950
Structure 353 Bridge – Lake Tsala Apopka	FL18003	Citrus	17.5	60,000	60,000	5,500
Inglis Spillway & Dam	FL00142	Citrus	43	33,600	33,600	4,060
Inglis Lock and Dam	FL00141	Levy/Citrus	21	33,600	Not Specified	35,000
Slush Pond	FL00604	Hernando	50	51	51	Not Specified
Saddle Creek Settling Area No -1	FL00565	Polk	26	10,815	10,815	Not Specified
Saddle Creek Settling Area No -2	FL00564	Polk	24	15,770	15,770	Not Specified
Saddle Creek Settling Area No -3	FL00561	Polk	19	3,710	3,710	Not Specified
Saddle Creek Settling Area No -4	FL00568	Polk	24	2,432	2,432	Not Specified
Saddle Creek Settling Area No 5	FL00178	Polk	55	3,930	10,280	Not Specified
Saddle Creek Settling Area No -6	FL00632	Polk	45	51	51	Not Specified
Saddle Creek Settling Area No -7	FL00560	Polk	16	10,080	10,080	Not Specified
Gant Lake Dam	FL00146	Sumter	12	528	528	Not Specified
Rufe Wysong Dam	FL00431	Sumter	15	800	1,300	Not Specified

Source: Reference RAI 02.04.04-2 02

References

Reference RAI 02.04.04-2 01

Southwest Florida Water Management District, "Minimum and Guidance Levels for Tsala Apopka Lake in Citrus County, Florida", Southwest Florida Water Management District, FL, 2007.

Reference RAI 02.04.04-2 02

United States Army Corps of Engineers. "National Inventory of Dams," Website, //rsgis.crrel.usace.army.mil/apex/f?p=397:1:1319703724552878, accessed on April 28, 2009.

Associated LNP COL Application Revisions:

None.

Attachments/Enclosures:

Attachment 02.04.04-2A; Attachment 02.04.04-02B

NRC Letter No.: LNP-RAI-LTR-038

NRC Letter Date: May 8, 2009

NRC Review of Final Safety Analysis Report

NRC RAI #: 02.04.04-3

Text of NRC RAI:

To meet the requirements of GDC 2, 10 CFR 52.17, 10 CFR Part 100, and 10 CFR 100.23(d), an appropriate configuration of the cascade of dam failures and its potential to produce the largest flood adjacent to the plant site is needed. Flood waves produced by postulated dam failure scenarios should be routed to the proposed plant site to conservatively estimate the most severe floodwater surface elevation that may affect SSC important to safety.
Please clarify the steady flow methodology for analysis of the dam break-induced flood and to justify why the estimated flood water surface elevations are conservative.

PGN RAI ID #: L-0222

PGN Response to NRC RAI:

The LNP safety-related structures are positioned entirely in the Waccasassa River Basin and are not located directly on or near a water body in that river basin. As described in FSAR Subsection 2.4.1.2.9, there are no known water control structures in the Waccasassa River Basin (FSAR Figure 2.4.1-212). Therefore, no potential hazard to the LNP site or safety-related structures exists within the Waccasassa River Basin that could occur as a result of flood waves from severe breaching of upstream dams or domino-type or cascading failures of dams. The nearest water control structures to the LNP site are present in the adjacent Withlacoochee River Basin, which is hydrologically separate from the Waccasassa River Basin. The process followed to determine the most conservative of plausible conceptual models for flood waves from severe breaching of upstream dams, domino-type or cascading failures of dams, dynamic effects on safety-related SSCs, loss of safety-related water supplies, sediment deposition and erosion, and failure of on-site water control or storage structures is discussed in the response to FSAR RAI 02.04.04-1.

Water control structures within the Withlacoochee River Basin are discussed in FSAR Subsection 2.4.1.2.7, FSAR Subsection 2.4.1.2.8, and in the response to FSAR RAI 02.04.04-2. Potential impacts from the failure of water control structures associated with Lake Rousseau (Inglis Dam and Spillway and Inglis Lock) are discussed in FSAR Subsection 2.4.4. This analysis using steady-state flow methodology conservatively assumes a downstream water elevation equal to the 10 percent exceedance high tide and a probable maximum flood (PMF) event. The results of this analysis indicate that the maximum water surface elevation in the Lower Withlacoochee River associated with a postulated failure of the Inglis Dam during a PMF is 24.65 ft. NGVD29. As described in LNP FSAR Subsection 2.4.1.1, the NGVD29 datum at the LNP site is approximately (averaged across the site) 1 ft. higher than the NAVD88 datum; therefore, 24.65 ft. NGVD29 is approximately equivalent to 23.65 ft. NAVD88. The nominal plant grade floor elevation for the LNP site is 15.5 m (51 ft.) NAVD88, which is more than 27 ft. higher than the maximum water surface elevation in the Lower Withlacoochee River.

The majority of popular floodplain hydraulic programs use steady-state, gradually varied flow assumptions to compute water surface elevations and to size channels, levees, and other flood

reduction components. Watercourses to be modeled using a steady, gradually varied flow assumption must satisfy the following assumptions:

- The peak discharge is not affected by storage in the river system, or the storage has been addressed in a separate study using a hydrologic model. The storage could be a reservoir or a natural area of floodplain storage in the overbank areas.
- The peak discharge and stage occur simultaneously throughout the reach under study. In reality, the peak discharge may occur only for a short time at a given location, but the flow rate at this time elsewhere in the reach is less than the peak discharge. For steady flow, however, the peak discharge is assumed to occur instantaneously at all locations in the reach. Compared to unsteady flow computations, the steady flow solution tends to give a slightly more conservative (higher) estimate of the water surface elevation. Channel sizes, levee heights, spillway dimensions, and floodway capacities are often designed for a peak flow rate with steady, gradually varied flow assumptions. Similarly, flood studies often concentrate solely on the peak discharge, without concern for the shape of the hydrograph prior to or after the peak discharge.

Based on the above assumptions, the steady-state flow methodology is not the most accurate method for the analysis of the dam break-induced flood; however, it provides conservative results. The intent of the PMF analysis is to determine a conservative estimate of PMF elevation at the LNP site rather determining the most accurate estimate of the PMF elevation. The steady flow approach is typically considered conservative in its determination of water levels in that, other things being equal, the steady flow analysis tends to overestimate flow and thus stage. This overestimation is due to the assumption that flow is constant within a reach; thus, the effects of channel storage on the shape and peak of the flow hydrograph are ignored. To better understand the limitations of a steady flow model, consider that, during peak flow, an unsteady flow model would yield results similar to those of a steady flow model if the hydrograph being routed yielded sufficient volume prior to the time of peak flow to fill all of the available storage in the reach. In other words, the steady-state predictions are, in effect, those that would occur if the flow rate were held constant long enough to fill all available storage. The main factors justifying why the estimated flood water surface elevations are conservative are as follows:

- Not accounting for storage effects - Use of an unsteady flow model to account for storage effects reduces the hydrograph peak and, therefore, results in a lower peak water surface than would be computed with a steady flow model.

- Not accounting for attenuation effects - The attenuation of flow refers to any means by which peak flows are reduced. Attenuation may also be seen as a delay of flows through some natural or man-made means. Attenuation occurs naturally in channels and may significantly reduce peak flows and prolong the hydrograph, especially when the channel contains wide floodplains and lakes. Unless the modeler explicitly modifies flows based on external hydrologic model results, the steady-state model will use the constant flow specified at the reach's upstream boundary throughout the reach. This flow will differ increasingly from the actual flow as attenuation modifies the hydrograph.

Associated LNP COL Application Revisions:

None.

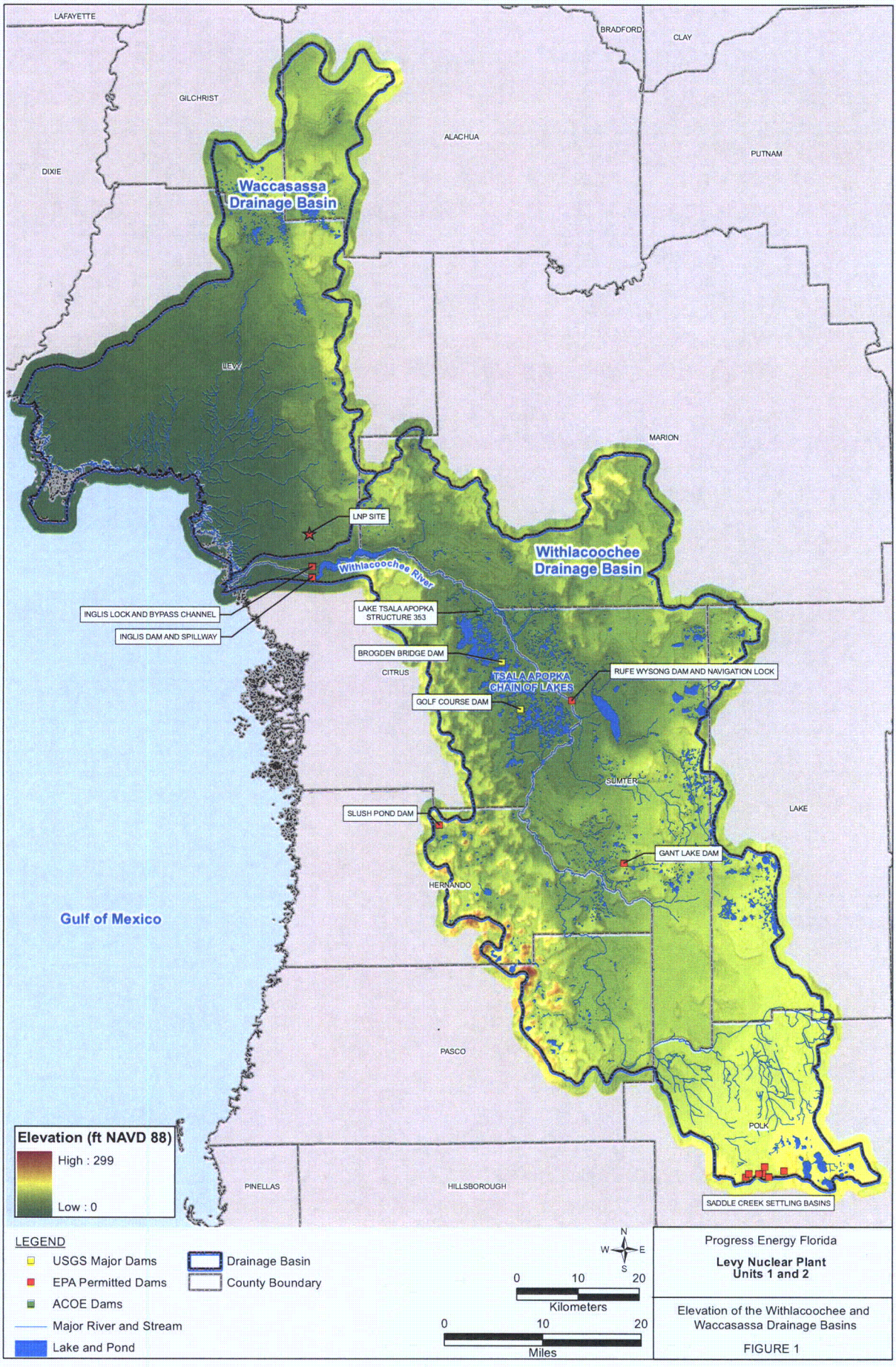
Attachments/Enclosures:

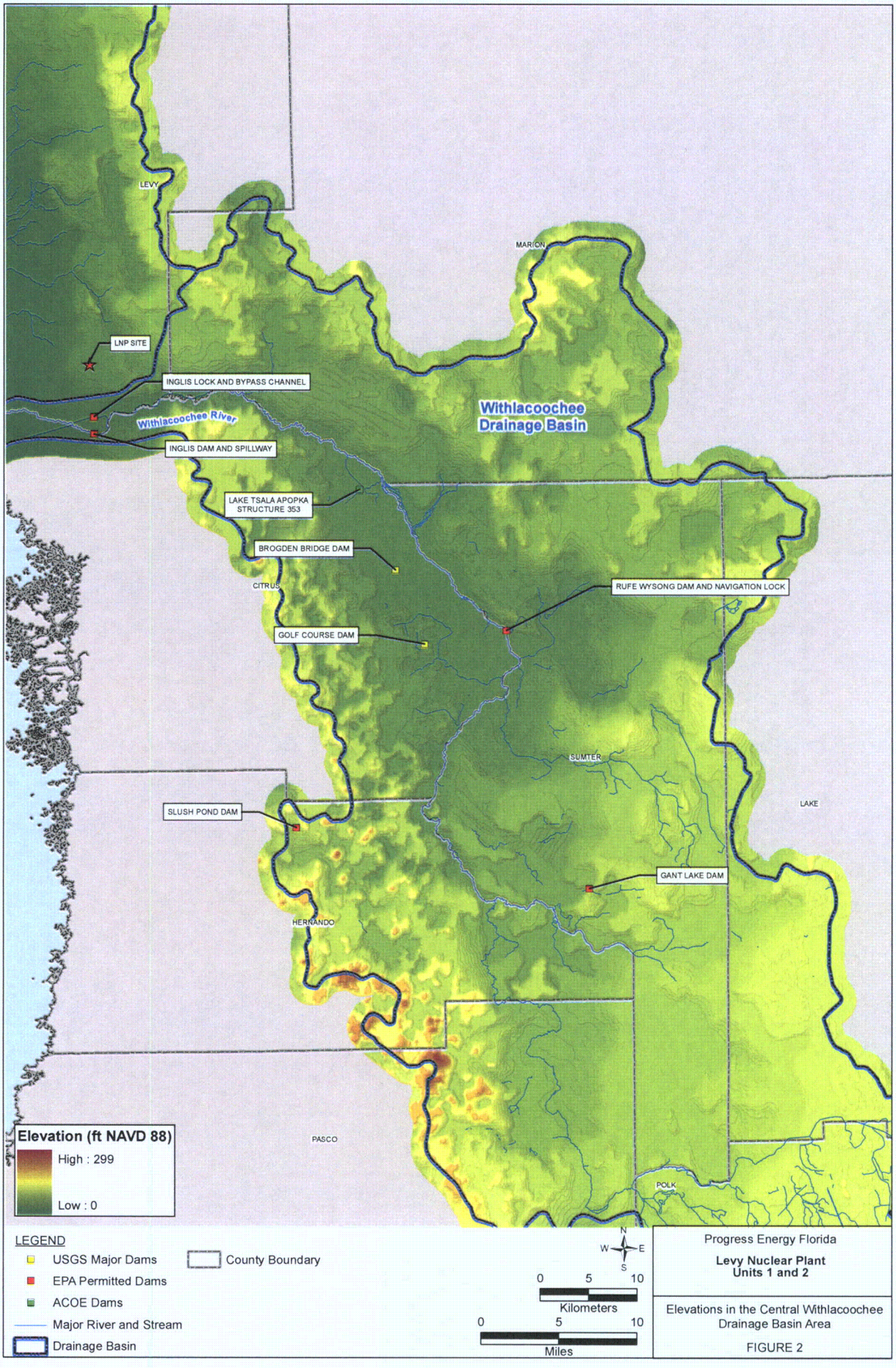
None.

List of Attachments

1. NRC RAI# 02.04.04-2 (PGN RAI# L-0222)
   Attachment 02.04.04-2A, "Elevation of the Withlacoochee and Waccasassa Drainage Basins" (1 Page)

2. NRC RAI# 02.04.04-2 (PGN RAI# L-0222)
   Attachment 02.04.04-2B, "Elevations in the Central Withlacoochee Drainage Basin Area" (1 Page)


LAFAYETTE
BRADFORD
CLAY
GILCHRIST
ALACHUA
PUTNAM
DIXIE
Waccasassa Drainage Basin
LEVY
MARION
LNP SITE
Withlacoochee Drainage Basin
Withlacoochee River
INGLIS LOCK AND BYPASS CHANNEL
INGLIS DAM AND SPILLWAY
LAKE TSALA APOPKA STRUCTURE 353
BROGDEN BRIDGE DAM
CITRUS
TSALA APOPKA CHAIN OF LAKES
RUFE WYSONG DAM AND NAVIGATION LOCK
GOLF COURSE DAM
SUMTER
LAKE
SLUSH POND DAM
GANT LAKE DAM
HERNANDO
Gulf of Mexico
PASCO
POLK
PINELLAS
HILLSBOROUGH
SADDLE CREEK SETTLING BASINS
Elevation (ft NAVD 88)
High : 299
Low : 0
LEGEND
USGS Major Dams
EPA Permitted Dams
ACOE Dams
Major River and Stream
Lake and Pond
Drainage Basin
County Boundary
N
W
E
S
0 10 20
Kilometers
0 10 20
Miles
Progress Energy Florida
Levy Nuclear Plant
Units 1 and 2
Elevation of the Withlacoochee and Waccasassa Drainage Basins
FIGURE 1


LEVY
MARION
LNP SITE
INGLIS LOCK AND BYPASS CHANNEL
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LAKE TSALA APOPKA STRUCTURE 353
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County Boundary
N
W
E
S
0 5 10
Kilometers
0 5 10
Miles
Progress Energy Florida
Levy Nuclear Plant
Units 1 and 2
Elevations in the Central Withlacoochee Drainage Basin Area
FIGURE 2