Progress Energy

Serial: NPD-NRC-2011-024 10 CFR 52.79
March 15, 2011

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

LEVY NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NOS. 52-029 AND 52-030
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 097 RELATED TO SRP SECTION 2.4.12 FOR THE LEVY NUCLEAR PLANT UNITS 1 AND 2 COMBINED OPERATING LICENSE APPLICATION

Reference: Letter from Brian C. Anderson (NRC) to John Elnitsky (PEF), dated January 5, 2011, "Request for Additional Information Letter No. 097 Related to SRP Section 2.4.12 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 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 (727) 820-4481.

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

Executed on March 15, 2011.

Sincerely,

John Elnitsky
Vice President
New Generation Programs & Projects

Enclosure/Attachments

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

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**Levy Nuclear Plant Units 1 and 2
Response to NRC Request for Additional Information Letter No. 097 Related to SRP Section 2.4.12 for the Combined License Application, dated January 5, 2011**

NRC RAI #	Progress Energy RAI #	Progress Energy Response
02.04.12-25	L-0878	Response enclosed – see following pages

NRC Letter No.: LNP-RAI-LTR-097

NRC Letter Date: January 5, 2011

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.04.12-25

Text of NRC RAI:

To meet the requirements of 10 CFR 52.79(a)(1)(iii), 10 CFR 100.20(c), 10 CFR 100.21(d), and GDC 2, additional information is required regarding maximum post-construction groundwater elevations in areas near the SSCs. The key area of interest is between the SSCs and the surrounding stormwater drainage ditches. The applicant's previous estimates based on observed pre-construction water levels do not appear to account for recharge from precipitation resulting in groundwater mounding in the raised areas around the SSCs. The calculation package LNG-0000-XDC-001, "Effect of Grouting on Groundwater Flow Regime, Rev. 2" (Rev. 2, 11/19/08) previously provided in response to a related RAI does not appear to address the issue of recharge and groundwater mounding between the SSCs and the surrounding stormwater drainage ditches.

NRC staff performed an independent assessment which indicated that local groundwater mounding at times of intense and/or prolonged precipitation may be sufficient to exceed the AP1000 DCD requirement regarding maximum allowable groundwater elevation at the SSCs. This assessment was based on the staff's understanding of plant operational conditions, including raising the nominal grade around the plants from 42 to 50 ft elevation NAVD88, grading and installation of stormwater drainage ditches. The staff lacks adequate information on characteristics of the ground surface cover, expected recharge rates, and hydraulic properties of subsurface materials in the area between the safety-related SSCs and the surrounding drainage ditches to make a definitive analysis of the reasonably expected maximum post-construction groundwater level.

As result, the applicant is requested to provide an estimate of the maximum post-construction groundwater level that is based on anticipated post-construction surface conditions, the anticipated properties of the fill material, the conceptual model of the subsurface, and expected maximum recharge rates. This estimate must be based on specific recharge rates associated with the main surface features, including any semi-impervious surfaces, gravel-covered surfaces, and grass-covered surfaces. The applicant's estimate must also be based on the post-construction elevation and capacity of the surrounding stormwater drainage ditches and ponds, and the post-construction geology including properties of engineered fill and backfill. In its response, the applicant is requested to provide proposed updates to the FSAR, which would include the results of this analysis and supporting information used in the analysis.

PGN RAI ID #: L-0878

PGN Response to NRC RAI:

As described in LNP FSAR Subsection 2.5.4.5, reinforced concrete diaphragm walls will be constructed at the horizontal excavation limits of the nuclear islands. Concurrent with the installation of the diaphragm walls, a grouting program will be performed at the base of the nuclear island excavations to form the bottom of a "bathtub" around the nuclear islands. The anticipated average hydraulic conductivity of the diaphragm wall and grouted zone are 0.002835 feet/day and 0.027 feet/day, respectively; the average hydraulic conductivity of the native surficial and Upper Floridan Aquifer systems is 9.2 and 13.9 feet/day, respectively.

Together, the bathtub formed by the diaphragm walls and grout zone around the nuclear islands will inhibit the flow of groundwater beneath the nuclear islands. Therefore, significant groundwater mounding beneath SSCs is not anticipated.

In addition, as described in LNP FSAR Subsection 2.4.12.5, final grading of the LNP site will result in potential hydrologic alteration, including the permanent change in groundwater levels within the plant site from site grading and a series of storm water drainage ditches. After site grading, a series of storm water drainage ditches will be constructed around and within the site to direct storm water and intercepted groundwater away from the footprint of LNP 1 and LNP 2. Impervious surfaces around SSCs will direct stormwater runoff toward these drainage ditches and to the retention ponds. Stormwater drainage ditches installed within the LNP site will have bottom elevations ranging from approximately 12.97 m (42.55 ft) NAVD88 or lower to approximately 14.57 m (47.80 ft) NAVD88. These storm water drainage ditches will act to reduce groundwater elevations to 12.97 m (42.55 ft) NAVD88 or lower.

The engineering controls discussed above will act to minimize groundwater mounding near SSCs. In addition, an evaluation of maximum post-construction groundwater elevations in the areas between SSCs and the surrounding storm water drainage ditches was conducted using a MODFLOW groundwater flow model. The model was developed to address the following site-specific post-construction conditions:

- Impervious and pervious areas,
- Groundwater recharge rate/storm water infiltration rate,
- Subsurface properties, and
- Engineering controls, including the storm water retention ponds, storm water drainage system, diaphragm wall, grout curtain, and foundations of safety-related structures.

The MODFLOW model was developed based on known or designed site properties and features and conservative parameters, therefore no calibration was performed. The MODFLOW model is based on the following conservative parameters that result in higher than anticipated groundwater elevations:

- Lower hydraulic conductivity values in the surficial and Upper Floridan Aquifer systems than determined by calibration of other groundwater flow models in the area of safety-related structures;
- Initial groundwater elevations based on the seasonal high groundwater elevations (March 2007), plus a sensitivity analysis that increases the initial groundwater elevation 1.09 feet (25% of the seasonal fluctuation during 2007);
- Storm water retention ponds simulated by constant heads boundary conditions. Constant head boundary conditions continuously contribute water to the model;
- The storm water retention ponds do not empty during the 72-hour period of no recharge during the PMP design storm;
- Groundwater recharge (i.e., infiltration) is applied directly to the groundwater table, no lag is applied for infiltration through the unsaturated zone; and,
- Constant infiltration rate.

To assess the maximum infiltration rate at pervious areas that would result in groundwater elevations less than 14.9 m (49 ft) NAVD88 at safety-related structures, an AP1000 DCD requirement based on a nominal plant grade floor elevation of 15.5 m (51 ft) NAVD88, an iterative approach was used as outlined below:

- An infiltration rate was selected and kept constant during the analysis.
- Based on the selected infiltration rate, the hourly groundwater recharge rate for pervious areas was calculated from the hourly PMP rate (LNP FSAR Table 2.4.3-216).
- Excess precipitation, that which does not infiltrate at pervious areas and that which falls on impervious areas, was applied to the storm water retention ponds until the ponds reached the design water level.
- Once the ponds reached the design water level, it was assumed that any additional excess precipitation was pumped to the cooling water tower basins such that the ponds remained at the design water level.
- It was assumed that no infiltration from the ponds or pump down of the ponds occurs during the 72-hour period of no precipitation, resulting in a pond condition at the beginning of the 72-hour PMP storm equivalent to that at the end of the antecedent 72-hour storm.
- The selected infiltration rate was increased until groundwater elevations of 49 feet were simulated at safety-related structures or the selected infiltration rate was equivalent to the highest hourly PMP rate, whichever occurred first.

The results of this evaluation indicate that a pervious area infiltration rate equivalent to the maximum hourly PMP rate (3.57 inches/hour) will not result in groundwater elevations exceeding 14.9 m (49 ft) NAVD88 at safety-related structures, although groundwater elevations exceeding 14.9 m (49 ft) NAVD88 were generated in the model at some locations of the site. RAI 02.04.12-25 Figure 1 (Attachment RAI 02.04.12-25A) and RAI 02.04.12-25 Figure 2 (Attachment RAI 02.04.12-25B) present these results.

A sensitivity analysis was also performed to assess the sensitivity of the model to the initial water levels and associated general head and initial constant head boundary conditions. Initial water levels, general head, and initial constant head boundary condition were increased 0.33 m (1.09 ft), 25% of the seasonal groundwater fluctuation observed during 2007.

While the results of the sensitivity analysis showed some groundwater levels near the safety-related structures greater than those generated in the base model analysis, the sensitivity model results indicate that a pervious area infiltration rate equivalent to the maximum hourly PMP rate (3.57 inches/hour) will not result in groundwater elevations exceeding 14.9 m (49 ft) NAVD88 at safety-related structures. RAI 02.04.12-25 Figure 3 (Attachment RAI 02.04.12-25C) and RAI 02.04.12-25 Figure 4 (Attachment RAI 02.04.12-25D) present the results of the sensitivity analysis.

The results presented in RAI 02.04.12-25 Figures 1 through 4 (Attachments RAI 02.04.12-25A through Attachment RAI 02.04.12-25D) are conservative. Groundwater elevations of 50 feet would not realistically be expected within the pervious areas of the site because groundwater would move down the topographic slope via overland flow once the groundwater surface intersected the ground surface.

The simulated infiltration rate of 3.57 inches/hour was limited by the maximum hourly infiltration rate during the PMP design storm. Based on the representation of the probable maximum precipitation design storm as the maximum precipitation that will occur at the LNP site, higher infiltration rates at the pervious areas of the LNP site would result in groundwater elevations similar to those depicted on RAI 02.04.12-25 Figure 1 and Figure 2 (Attachment RAI 02.04.12-25A and Attachment RAI 02.04.12-25B, respectively) because the rise in groundwater elevations would be limited by the precipitation rate, not the infiltration rate.

Associated LNP COL Application Revisions:

The following text will be inserted at the end of LNP FSAR Section 2.4.12.2.2 "Groundwater Levels and Movement" during a future revision of the LNP FSAR:

> An evaluation of maximum post-construction groundwater elevations in the areas between SSCs and the surrounding storm water drainage ditches during the PMP design storm was performed. A MODFLOW groundwater flow model was developed that addressed the following site-specific post-construction conditions:
>
> - Impervious and pervious areas,
> - Groundwater recharge rate/storm water infiltration rate,
> - Subsurface properties, and
> - Engineering controls, including the storm water retention ponds, storm water drainage system, diaphragm wall, grout curtain, and foundations of safety-related structures.
>
> The MODFLOW model developed is based on known or designed site properties and features and conservative parameters, no calibration was performed.
>
> To assess the maximum infiltration rate at pervious areas that would result in groundwater elevations less than 14.9 m (49 ft) NAVD88 at safety-related structures, an AP1000 DCD requirement based on a nominal plant grade floor elevation of 15.5 m (51 ft) NAVD88, an iterative approach was used as described below:
>
> - An infiltration rate was selected and kept constant during the analysis.
> - Based on the selected infiltration rate, the hourly groundwater recharge rate for pervious areas was calculated from the hourly PMP rate (LNP FSAR Table 2.4.3-216).
> - Excess precipitation, that which does not infiltrate at pervious areas and that which falls on impervious areas, was applied to the storm water retention ponds until the ponds reached the design water level.
> - Once the ponds reached the design water level, it was assumed that any additional excess precipitation was pumped to the cooling water tower basins such that the ponds remained at the design water level.
> - It was assumed that no infiltration from the ponds or pump down of the ponds occurs during the 72-hour period of no precipitation, resulting in a pond condition at the beginning of the 72-hour PMP storm equivalent to that at the end of the antecedent 72-hour storm.
> - The selected infiltration rate was increased until groundwater elevations of 49 feet were simulated at safety-related structures or the selected infiltration rate was equivalent to the highest hourly PMP rate, whichever occurred first.

The results of this evaluation indicate that a pervious area infiltration rate equivalent to the maximum hourly PMP rate (3.57 inches/hour) will not result in groundwater elevations exceeding 14.9 m (49 ft) NAVD88 at safety-related structures, although groundwater elevations exceeding 14.9 m (49 ft) NAVD88 are simulated at some locations of the site. RAI 02.04.12-25 Figure 1 and RAI 02.04.12-25 Figure 2 present these results.

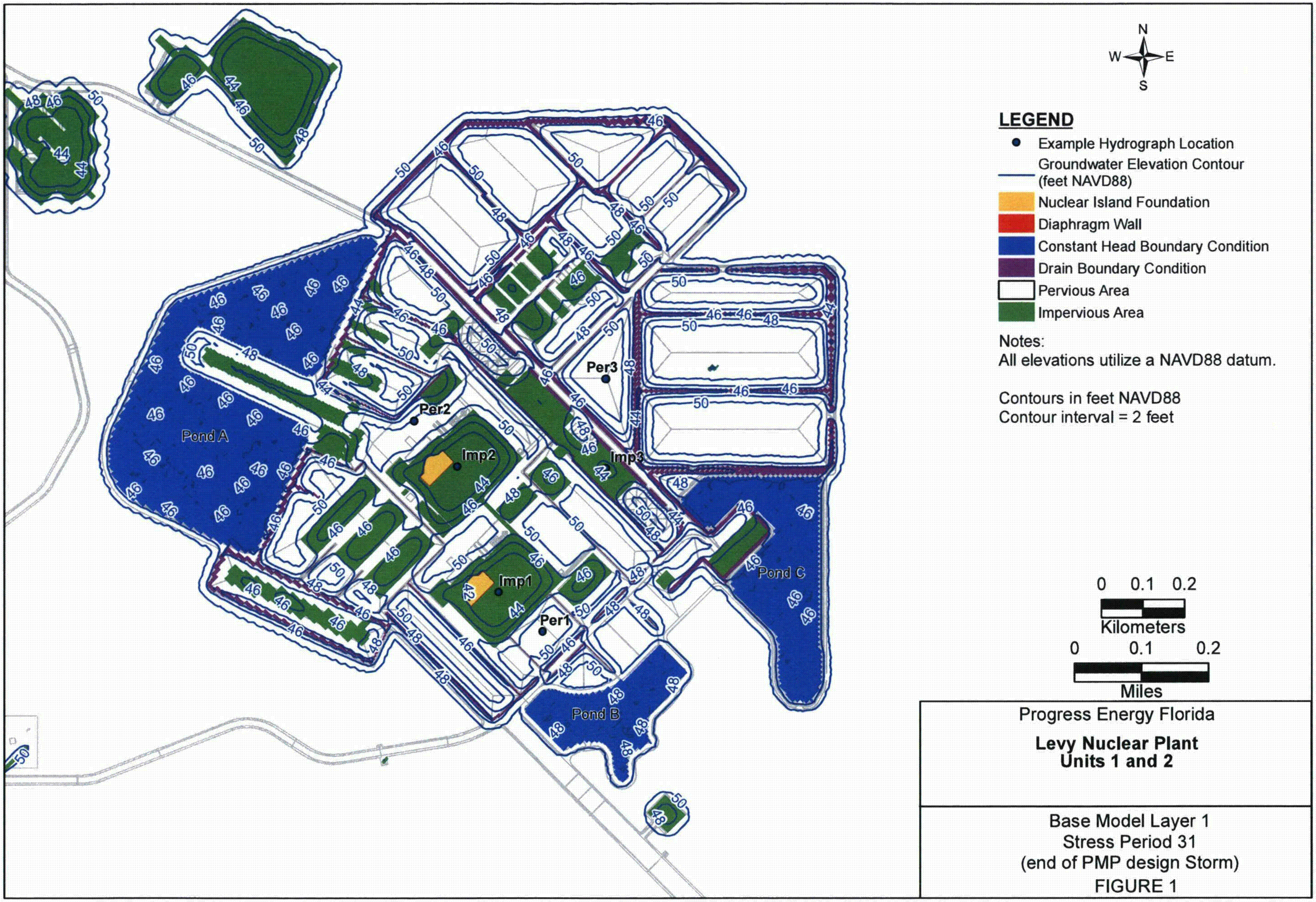
The results presented in RAI 02.04.12-25 Figure 1 and RAI 02.04.12-25 Figure 2 are conservative. Groundwater elevations of 50 feet would not realistically be expected within the pervious areas of the site because groundwater would move down the topographic slope via overland flow once the groundwater surface intersected the ground surface.

The simulated infiltration rate of 3.57 inches/hour was limited by the maximum hourly infiltration rate during the PMP design storm. Based on the representation of the probable maximum precipitation design storm as the maximum precipitation that will occur at the LNP site, higher infiltration rates at the pervious areas of the LNP site would result in groundwater elevations similar to those depicted on RAI 02.04.12-25 Figure 1 and RAI 02.04.12-25 Figure 2 because the rise in groundwater elevations would be limited by the precipitation rate, not the infiltration rate.

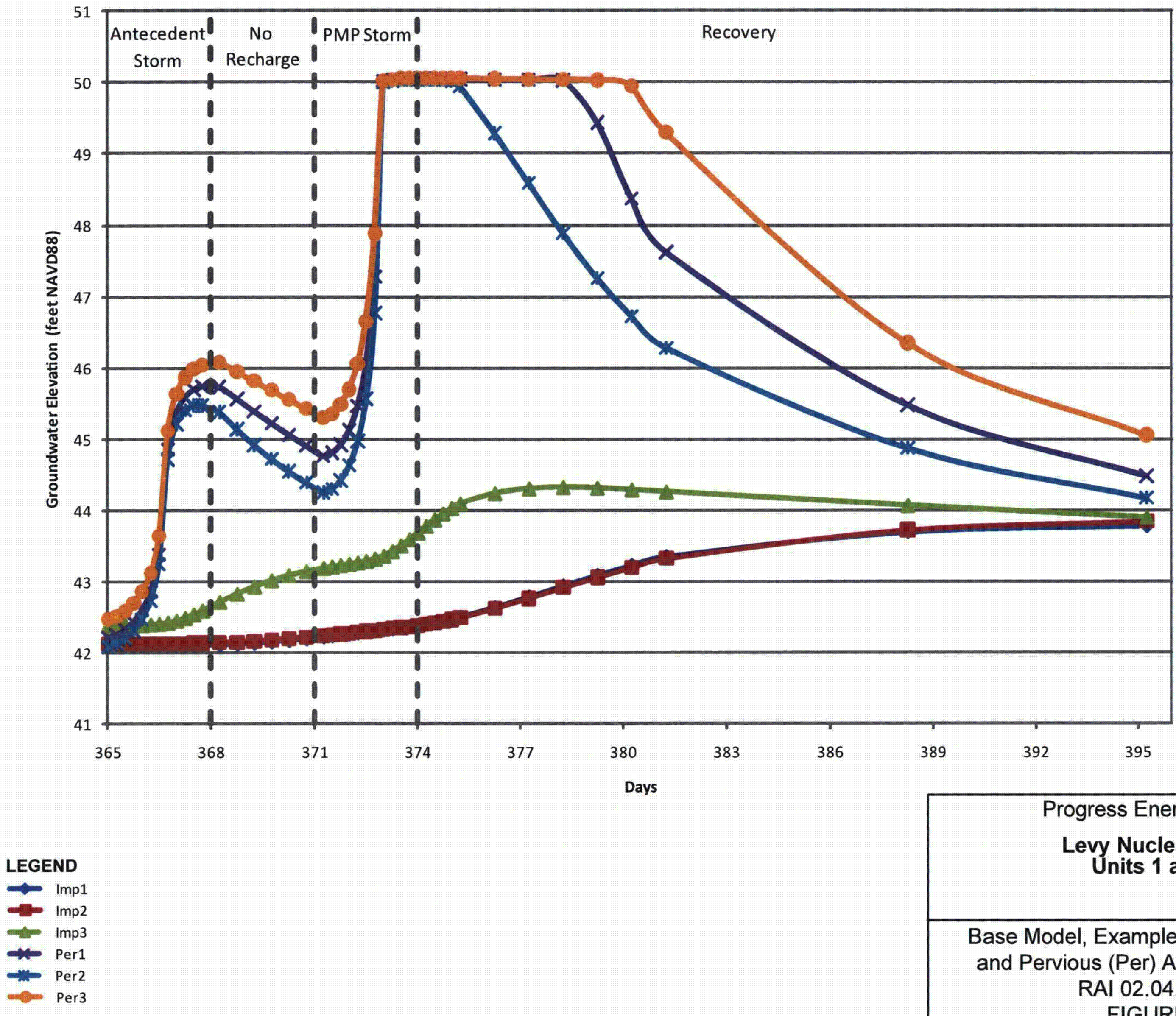
In addition, Figure 1, Attachment RAI 02.04.12-25A, and Figure 2, Attachment RAI 02.04.12-25B, will be added to LNP FSAR Section 2.4.12.2.2 during a future revision of the LNP FSAR.

Attachments:

Attachment RAI 02.04.12-25A	RAI 02.04.12-25 Figure 1 Base Model Layer 1, Stress Period 31 (end of PMP design storm)
Attachment RAI 02.04.12-25B	RAI 02.04.12-25 Figure 2 Base Model, Example Impervious (Imp) and Pervious (Per) Area Hydrographs
Attachment RAI 02.04.12-25C	RAI 02.04.12-25 Figure 3 Sensitivity Model Layer 1, Stress Period 31 (end of PMP design storm)
Attachment RAI 02.04.12-25D	RAI 02.04.12-25 Figure 4 Sensitivity Model, Example Impervious (Imp) and Pervious (Per) Area Hydrographs



Attachment RAI 02.04.12-25A

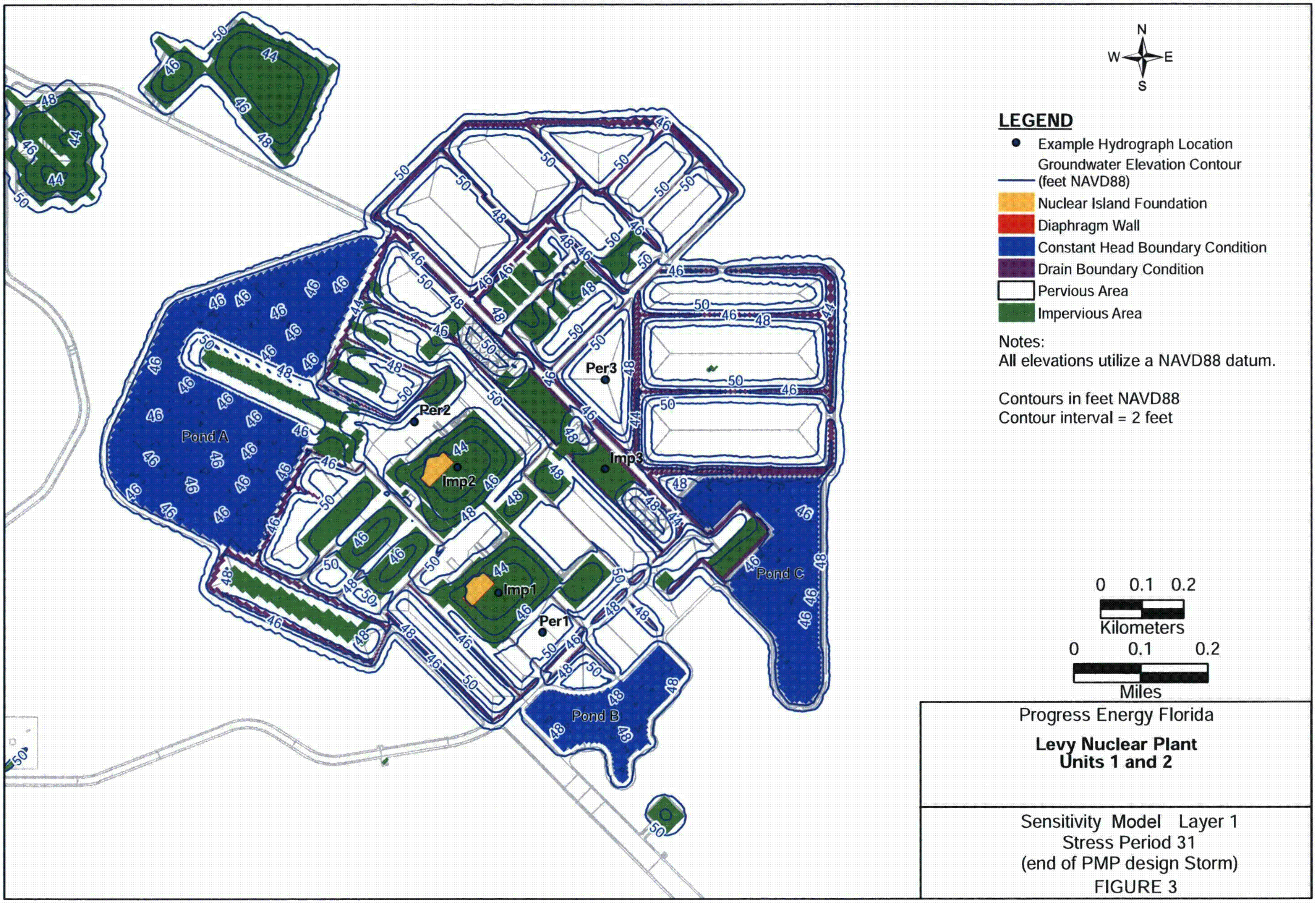


Progress Energy Florida

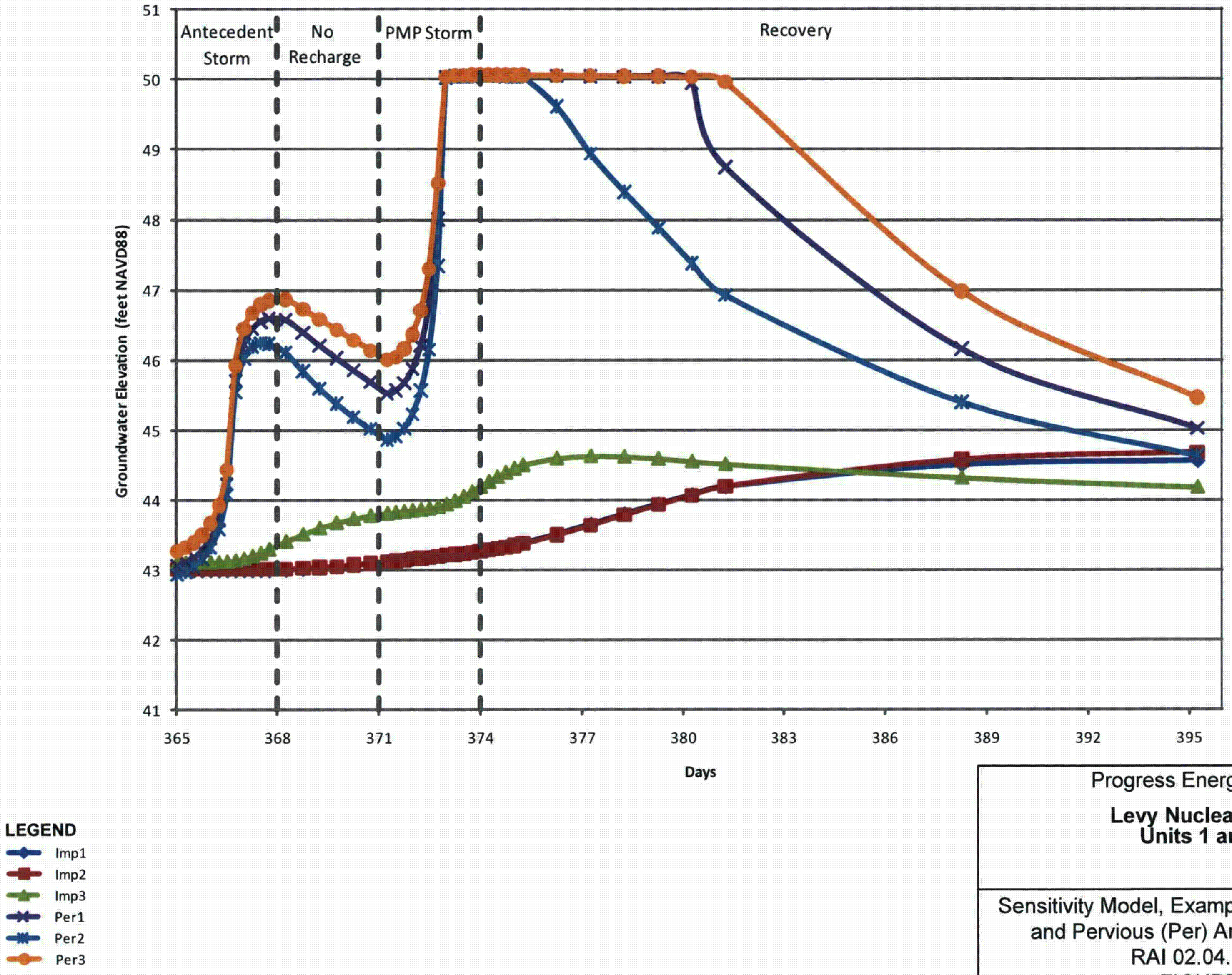
Levy Nuclear Plant
Units 1 and 2

Base Model, Example Impervious (Imp) and Pervious (Per) Area Hydrographs
RAI 02.04.12-25
FIGURE 2

Attachment RAI 02.04.12-25B



Attachment RAI 02.04.12-25C



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Levy Nuclear Plant Units 1 and 2

Sensitivity Model, Example Impervious (Imp) and Pervious (Per) Area Hydrographs
RAI 02.04.12-25
FIGURE 4

Attachment RAI 02.04.12-25D