FPL.

January 31, 2014
L-2014- 023

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Flood Hazard Reevaluation Report (FHRR), Recommendation 2.1 –Flooding

References:

1. NRC Letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012, Agency Documents and Access Management System (ADAMS) ML12053A340.

2. FPL Letter, M. Kiley to NRC, L-2013-087, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Flood Hazard Reevaluation of Recommendation 2.1, dated March 11, 2013, ADAMS Accession No. ML13095A196

3. FPL Letter, M. Kiley to NRC, L-2013-256, Florida Power and Light Company's, Turkey Point Units 3 and 4, Supplemental Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated August 22, 2013 ADAMS Accession No. 13248A312

4. NRC email from Audrey Klett to Bob Tomonto, Request for Additional Information - Turkey Point 3 & 4 - Flood Hazard Reevaluation Report (FHRR) - Recommendation 2.1 - Flooding (TACs MF1114/15), dated January 15, 2014 ADAMS Accession No. ML14016A277

On March 12, 2012, the NRC issued Reference 1 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 2 of Reference 1 requested that each licensee perform a reevaluation of external flooding sources and report the results in accordance with the NRC's prioritization plan. Florida Power & Light Company (FPL) submitted the Flood Hazard Reevaluation for Turkey Point Units 3 and 4 in Reference 2. FPL provided supplemental information regarding interim actions taken, associated supporting actions, and implementation dates for these supporting actions in Reference 3.

A001
NRR

On January 15, 2014, the NRC requested FPL to respond to the request for additional information (RAI) for the Turkey Point Units 3 and 4 Flood Hazard Evaluation Report by January 31, 2014 for RAI questions 1-9 and by February 28, 2014 for questions 10 and 11 (Reference 4).

On January 30, 2014, FPL discussed with Ms. Audrey Klett, NRC Project Manager for Turkey Point Units 3 and 4, the need to extend the due date for RAI-6 to a mutually agreed upon date. The NRC understands that the responses to RAIs 6, 10, and 11 will not be part of this submittal. As such, the enclosure to this letter contains the FPL response to RAI questions 1-5, and 7-9.

This letter does not include any additional and or new regulatory commitments.

Should you have any questions concerning the content of this letter, please contact Mr. Robert J. Tomonto, Turkey Point Licensing Manager, at 305-246-7327.

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

Executed on January 31, 2014.

Sincerely,

Michael Kiley

Enclosure

cc: USNRC Regional Administrator, Region II
USNRC Project Manager, Turkey Point Nuclear Plant
USNRC Senior Resident Inspector, Turkey Point Nuclear Plant

L-2014-023

Enclosure

Florida Power & Light Company's

Turkey Point Units 3 and 4

Response to NRC Request for Information Pursuant to 10 CFR 50.54(f)

Regarding the Flood Hazard Reevaluation Report (FHRR)

Recommendation 2.1 –Flooding

NRC RAI No. 1:
3.2 Local Intense Precipitation and Associated Site Drainage

The licensee's analysis of local intense precipitation (LIP) from the 1-hour probable maximum precipitation (PMP) event uses a center-loaded distribution for this event. In order to demonstrate the suitability of the method and level of conservatism, the NRC staff requests the licensee to provide a description of the basis for selecting a center-loaded temporal rainfall distribution for analysis of the one-hour probable maximum precipitation (PMP) event. The NRC staff also requests the licensee to describe whether the analysis of this rainfall distribution is bounding for the effects of PMP-induced flooding at the site.

FPL Response to RAI No. 1:
Basis for Selecting a Center-Loaded Temporal Rainfall Distribution

The National Resources Conservation Service (NRCS) developed synthetic 24-hour rainfall distributions, representing various geographic regions of the United States (SCS, 1986). The site is located in the Type III region where the most intense rainfall occurs within the middle of the duration (SCS, 1986). For all durations (6-96 hour durations), the most intense rainfall occurs in the middle of the synthetic storm for the majority of the events. In addition, Hydrometeorological Report 52 (HMR-52) considers a 72-hour storm where the greatest precipitation may occur any time except during the first 24 hours of the storm. The 6-hr increments of precipitation are arranged such that the increments decrease progressively to either side of the greatest 6-hour increment (USACE, 1984). Furthermore, other distributions (e.g., front-loaded and end-loaded) are typically applied when infiltration variability and basin storage conditions significantly affect the runoff response. Since, a large percentage of the site is impervious and the duration of the event is quite short (i.e., 1 hour), these effects were expected to be negligible at Turkey Point. Thus, the center-loaded distribution was chosen to represent the rainfall distribution during a PMP event.

Analyses of Temporal Rainfall Distributions

To determine if the center loaded LIP distribution produces bounding results, a sensitivity study was performed using front-, front-third-, end-third- and end-loaded LIP distributions. Using FLO-2D Pro software the resulting flood levels for each distribution were compared to the center-loaded LIP distribution. The results of each distribution are provided in Table 2-1.

The 5-, 15-, 30-, and 60-minute intensities prescribed by HMR-52 were used to construct the distributions (NOAA, 1982). A one-minute time step was used. A front-loaded temporal distribution has the most intense 5-minute precipitation at the beginning of the total rainfall event, with successively diminishing depth intervals occurring thereafter as shown in the precipitation distribution in Figure 2-1. A front-third-loaded temporal distribution has the most intense 5-minute intensity during the first-third of the total rainfall duration (Figure 2-2), with successively diminishing depth intervals placed on either side of the center of the distribution. A center-loaded temporal distribution has the most intense 5-minute intensity during the middle of the total rainfall duration (Figure 2-3), with successively diminishing depth intervals placed on either side of the center of the distribution. The end-third-loaded temporal distribution will have the most intense 5-minute precipitation at the end-third of the total rainfall event (Figure 2-4). Lastly, the end-loaded temporal distribution will have the most intense 5-minute precipitation at the end of the total rainfall event, with successively increasing depth intervals occurring beforehand as shown in Figure 2-5. In all cases, the cumulative precipitation is identical: 19.4 inches.

Each distribution was used as precipitation input to the original FLO-2D Pro model prepared for the flood hazard re-evaluation report (FHRR) for LIP effects. The results of the five runs demonstrate that the front and front-third-loaded LIPs produced somewhat lower depths. The center, end-third and end-loaded distributions produced similar results with some depths higher. Only two points (13 and 15) of interest experienced an increase larger than 0.05 feet (0.09 and 0.06 feet respectively) in maximum flow depth as compared to the center-loaded case. Location 13 is on the outside of the Unit 3 emergency diesel generator flood berm which has a maximum height of 21.9 feet NAVD88 well above the new flood level of 18.98 feet NAVD88. Location 15 is outside the Unit 3 Spent Fuel Pool heat exchanger (SFP HX) room which has a critical elevation of 17.36 feet NAVD88. The new flood height of 17.11 feet NAVD88 remains below the critical elevation for the SFP HX room. The impact of the revised maximum flood heights due to the sensitivity study has been incorporated into the results reported in the response to RAI 7.

Conclusion

The sensitivity study has shown that additional precipitation distribution profiles produce slightly greater maximum flood height at two locations and thus the center loaded distribution is not bounding at those locations. Other locations also showed greater flood elevations but not of any significance (less than 0.05 feet). The bounding flood elevation calculation is now based on the maximum flood depth from the combination of the profiles listed in Table 2-1 and not a single distribution profile. Affected documents have been revised to reflect this new approach.

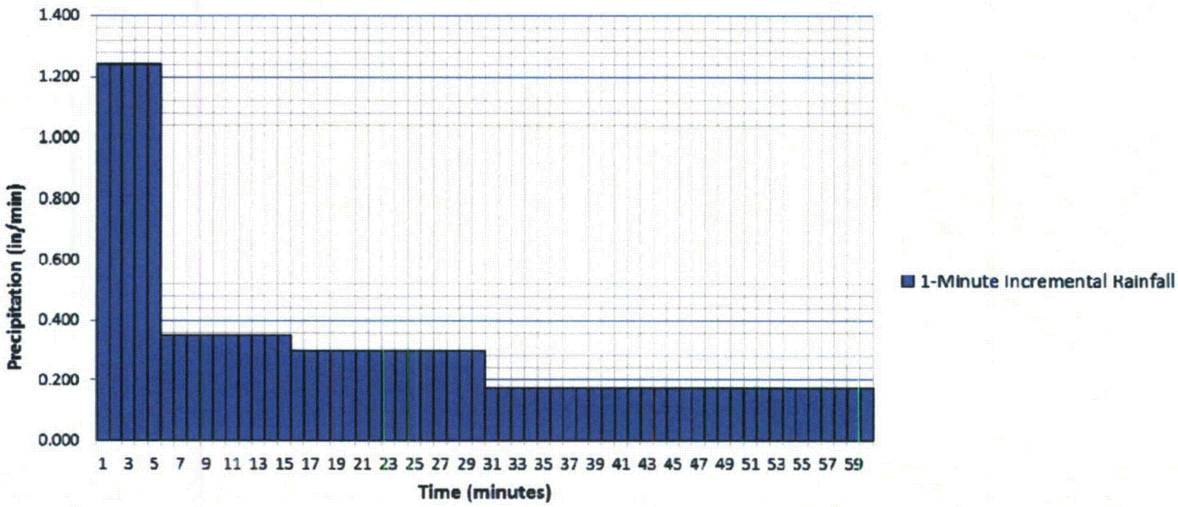

Figure 2-1: Front-Loaded Temporal Distribution for 60-Minute LIP

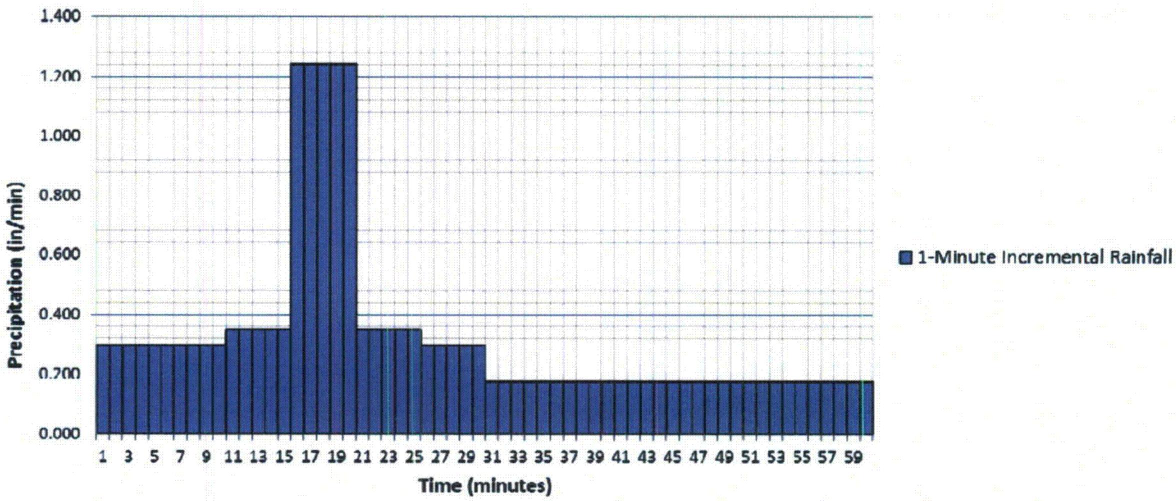

Figure 2-2: Front-Third-Loaded Temporal Distribution for 60-Minute LIP

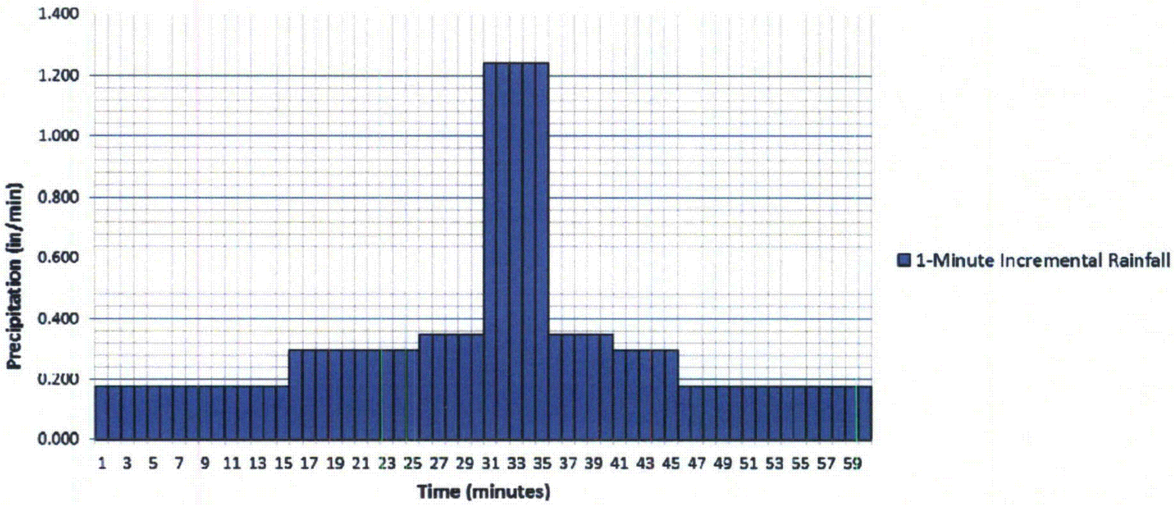

Figure 2-3: Center-Loaded Temporal Distribution for 60-Minute LIP

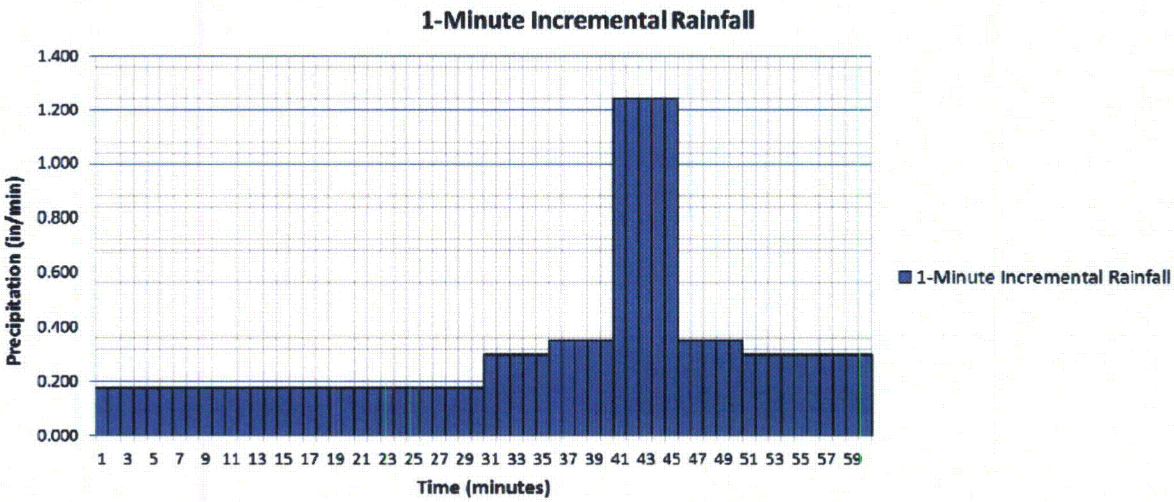

Figure 2-4: End-Third-Loaded Temporal Distribution for 60-Minute LIP

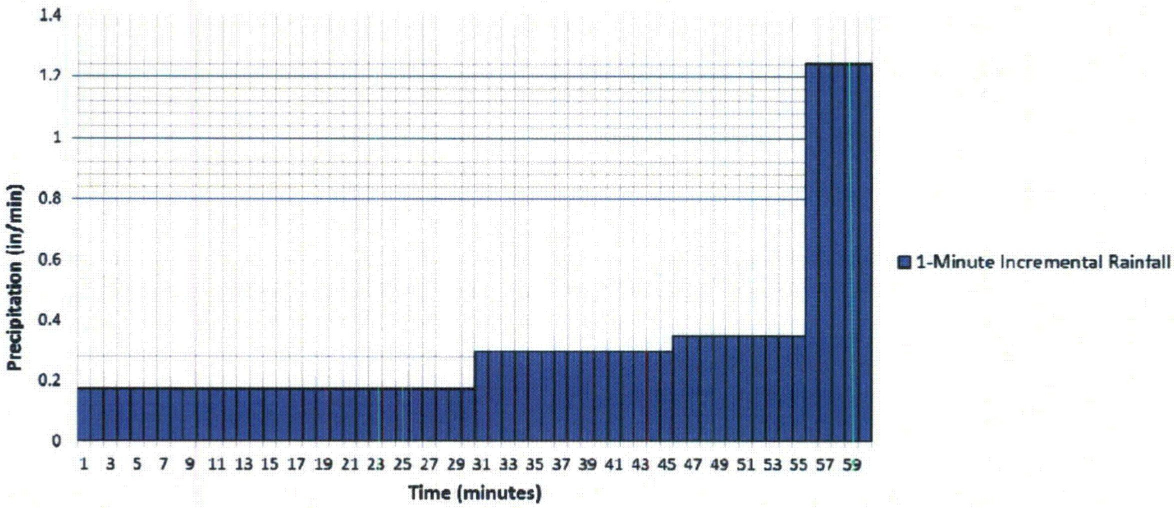

Figure 2-5: End-Loaded Temporal Distribution for 60-Minute LIP

Table 2-1: Table of Results for Flow Depths for Precipitation Distributions

Location	(1) Flow Depth from Front-Loaded Distribution (ft)	(2) Flow Depth from Front-Third-Loaded Distribution (ft)	(3) Flow Depth from Center- Loaded Distribution (ft)	(4) Flow Depth from End-Third-Loaded Distribution (ft)	(5) Flow Depth from End- Loaded Distribution (ft)	(6) = (3)-(5) Difference Between Center-Loaded and End-Loaded Distribution Flow Depths (ft)	(7) = (3)-(4) Difference Between Center-Loaded and End-Third-Loaded Distribution Flow Depths (ft)
1	0.73	0.90	0.91	0.92	0.91	0.00	-0.01
2	1.14	1.29	1.31	1.32	1.31	0.00	-0.01
3	0.85	0.96	0.98	0.98	0.98	0.00	0.00
4	0.60	0.66	0.68	0.68	0.68	0.00	0.00
5	0.62	0.67	0.68	0.68	0.67	0.01	0.00
6	0.60	0.60	0.60	0.60	0.60	0.00	0.00
7	0.60	0.61	0.61	0.61	0.61	0.00	0.00
8	0.62	0.66	0.69	0.69	0.68	0.01	0.00
9	0.6	0.61	0.61	0.61	0.61	0.00	0.00
10	0.67	0.73	0.72	0.73	0.73	-0.01	-0.01
11	0.62	0.64	0.64	0.65	0.64	0.00	-0.01
12	0.63	0.67	0.68	0.69	0.68	0.00	-0.01
13	1.01	1.03	1.08	1.15	1.17	-0.09	-0.07
14	0.60	0.60	0.60	0.6	0.60	0.00	0.00

Location	(1) Flow Depth from Front-Loaded Distribution (ft)	(2) Flow Depth from Front-Third-Loaded Distribution (ft)	(3) Flow Depth from Center- Loaded Distribution (ft)	(4) Flow Depth from End-Third-Loaded Distribution (ft)	(5) Flow Depth from End- Loaded Distribution (ft)	(6) = (3)-(5) Difference Between Center-Loaded and End-Loaded Distribution Flow Depths (ft)	(7) = (3)-(4) Difference Between Center-Loaded and End-Third-Loaded Distribution Flow Depths (ft)
15	0.91	1.26	1.38	1.41	1.44	-0.06	-0.03
16	0.79	1.13	1.23	1.26	1.27	-0.04	-0.03
17	0.88	1.14	1.24	1.23	1.24	0.00	0.01
18	0.89	1.11	1.20	1.22	1.21	-0.01	-0.02
19	0.61	0.62	0.62	0.62	0.62	0.00	0.00
20	0.77	0.81	0.82	0.83	0.83	-0.01	-0.05
21	0.60	0.66	0.68	0.67	0.68	0.00	0.01
22	0.77	0.83	0.84	0.84	0.84	0.00	0.00
23	0.60	0.60	0.60	0.60	0.60	0.00	0.00
24	0.60	0.61	0.61	0.61	0.61	0.00	0.00
25	0.60	0.61	0.61	0.62	0.61	0.00	-0.01
26	0.60	0.6	0.60	0.60	0.60	0.00	0.00
27	0.66	0.71	0.71	0.72	0.71	0.00	-0.01
28	0.65	0.71	0.71	0.71	0.70	0.01	0.00
29	0.61	0.64	0.65	0.66	0.65	0.00	-0.01

Location	(1) Flow Depth from Front-Loaded Distribution (ft)	(2) Flow Depth from Front-Third-Loaded Distribution (ft)	(3) Flow Depth from Center- Loaded Distribution (ft)	(4) Flow Depth from End-Third-Loaded Distribution (ft)	(5) Flow Depth from End- Loaded Distribution (ft)	(6) = (3)-(5) Difference Between Center-Loaded and End-Loaded Distribution Flow Depths (ft)	(7) = (3)-(4) Difference Between Center-Loaded and End-Third-Loaded Distribution Flow Depths (ft)
30	0.60	0.60	0.60	0.60	0.60	0.00	0.00
31	0.78	0.87	0.88	0.89	0.88	0.00	-0.01
32	0.68	0.73	0.75	0.74	0.74	0.01	0.01
33	0.60	0.60	0.60	0.60	0.60	0.00	0.00

[1]The same FLO-2D software build (13.02.04) was used to model the three temporal distributions in order to perform an accurate comparison. The FLO-2D software build used to compare the three distributions is an update from the build (12.01.01) used for results in the Flood Hazards Reevaluation Report Thus, flow depths reported for the center-loaded distribution provided in Table 4-2 of the Flood Hazards Reevaluation Report may not correspond to those listed above for the center-loaded distribution These small discrepancies are not due to any known errors in the previous software build.

<u>NRC RAI No. 2</u>:
<u>Section 3.2 Local Intense Precipitation and Associated Site Drainage</u>

The NRC staff's review of the local intense precipitation (LIP) flooding results submitted by the licensee indicates that the FLO-2D model terminated early with errors in mass balance. The NRC staff also observed that FLO-2D's volume conservation and mass balance calculations included in output files BASE.OUT and SUMMARY.OUT show very large mass balance discrepancies and indicate that the model run simulated only the first 17 minutes of the one-hour PMP event. Since the modeling error is significant and can affect the results, the NRC staff requests the licensee to submit a revised flooding analysis which includes a revised analysis for LIP Scenario A or provide a justification to demonstrate the acceptability of the FLO-2D model results for LIP Scenario A.

<u>FPL Response to RAI No. 2:</u>

The computer output files from the FLO-2D Pro model were informally transmitted to the NRC through an e-portal. The transmittal process did not go through a rigorous validation process to ensure the correct files were loaded. The BASE.OUT and SUMMARY.OUT files indicated in the Staff's RAI were model outputs from an early (pre-final) simulation that were not intended for submittal as final model files. The final results presented in the Flood Hazard Reevaluation Report (FHRR), were not based on the model run indicated by the RAI. The appropriate BASE.OUT and SUMMARY.OUT files from the final run are available for NRC staff review. The final BASE.OUT and SUMMARY.OUT files showed no mass balance discrepancies and properly simulated the entire one-hour LIP event. The shapefile outputs and tabular values reported at locations of interest are the same as those presented in the FHRR. The model error associated with the simulation used as the basis for the results in the FHRR was below the critical levels advised by the FLO-2D Pro manual (FLO-2D, 2009).

It should be noted, however, that a revision to the Local Intense Precipitation (LIP) Scenario A analysis was prepared in response to NRC RAI 1. This revision provides additional clarification regarding the effects of the temporal distribution of precipitation. Those results have been provided in the response to NRC RAI 1.

<u>NRC RAI No. 3</u>:
<u>Section 3.2 Local Intense Precipitation and Associated Site Drainage</u>

The NRC staff's review of the local intense precipitation (LIP) flooding hazard analysis around the powerblock area indicates a need for additional descriptions in order to demonstrate the appropriateness of the modeling approach used for determining the localized water levels and flow velocities from the PMP event. For LIP Scenario A, the FLO-2D numerical model was used to simulate the flow of runoff at the powerblock and its surrounding areas. The NRC staff requests the licensee to provide justification to demonstrate the structure and scale of this model application is appropriate for simulating flow within spaces between buildings and structures with sufficient accuracy and spatial resolution in order to predict water levels and velocities at specific doorways and other critical locations within the power block.

FPL Response to RAI No.3:

The structure and scale of this model application is appropriate for simulating flow within spaces between buildings and structures with sufficient accuracy and spatial resolution in order to predict water levels and velocities at specific doorways and other critical locations within the powerblock. This will be justified with an examination of the model itself and the parameters that measure accuracy and spatial resolution.

Model Overview

Two-dimensional flow in FLO-2D Pro is accomplished through integration of the equations of motion. The following shallow-water assumptions are used to simplify the model, but do limit applicability to the site: no vertical flow acceleration, depth-averaged flow, and no wind nor Coriolis Effect. A schematic example of the computational grid elements is shown in Figures 3-1A and B. Figure 3-1A is a series of 9 connected computational elements (cells), each numbered with their respective elevation, interpolated from a digital elevation model (DEM). Figure 3-1B shows the inflow and outflows for the center cell, element 5. Inflow arrives from element 2. FLO-2D Pro computes outflow in eight directions (dashed arrows), corresponding to each neighboring computational element. In this example, outflow will be directed to elements 4, 7, and 9 (solid arrows). The FLO-2D computations in each element are a composite average of the terrain and flow within it. Thus, it is sufficient to resolve features larger than the element spacing but likely inadequate to include smaller site components.

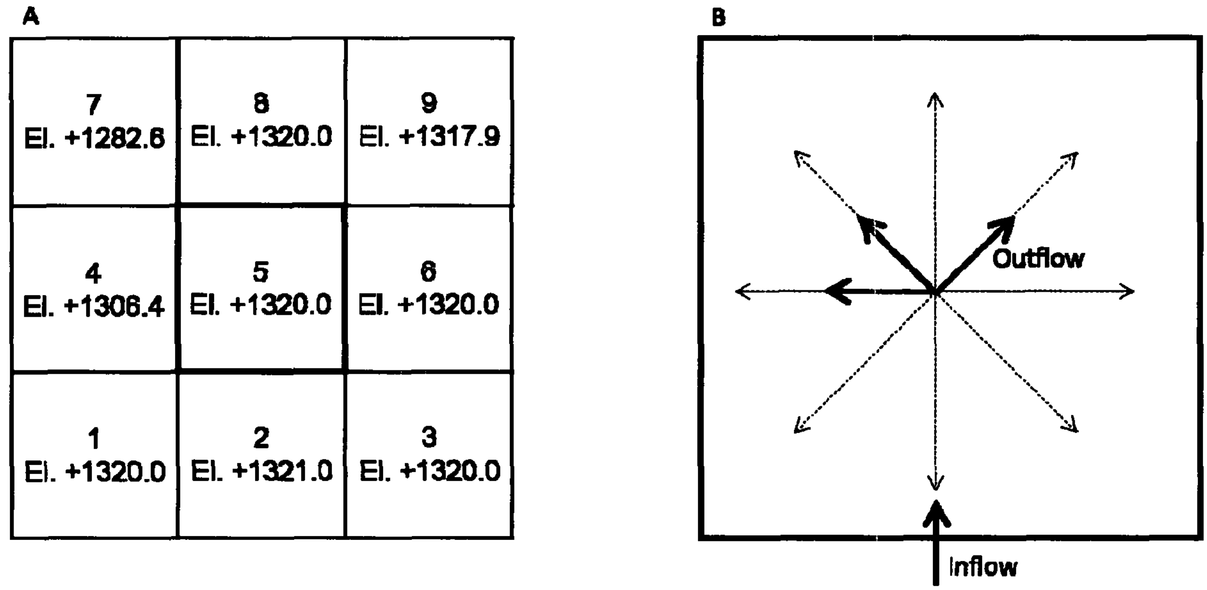

Figure 3.1 – FLO-2D Computational Schematic. A) Example Configuration of Computational Elements with Corresponding Elevations. B) Example of Inflow and Outflow Experienced in Computational Element 5. Figure modified from FLO-2D (2009).

Model Stability and Accuracy

The FLO-2D reference manual recommends spatial resolution (i.e., cell width) between 25 feet and 500 feet with an unlimited number of computational elements (FLO-2D, 2009). The practical limit of computational elements is set by the computing power available; a FLO-2D Pro simulation with excessive computational elements will terminate before completion. The FLO-2D Pro numerical model used in this flooding hazard re-evaluation (FHR) analysis was created with a spatial resolution of 5 feet between computation elements, two orders of magnitude smaller than the maximum recommended distance. This finer resolution was chosen to simulate properly constricted flow passages and depths between and near structures and buildings.

FLO-2D Pro has three measures of model performance and stability. The first is the Courant-Friedrich-Lewy (CFL) condition (FLO-2D, 2009). Physically, the CFL condition prevents a fluid particle from travelling more than one spatial increment in one time step. In FLO-2D Pro, the spatial resolution is defined by the user when developing the computational grid. The temporal resolution is adjusted dynamically based on the above equation to ensure stability (i.e., Courant number below 1.0, with a default value of 0.8) for every grid element. In confined flow areas, such as smaller openings between structures/buildings, continuity predicts the flow velocity to rise. Figure 3-2 shows an example of such a constriction in the Scenario A simulation between the Computer Room and Containment Units 3 and 4. FLO-2D Pro is able to maintain numerical stability, thereby maintaining the mass balance in these areas by reducing the time step based on the CFL condition. Generally, time steps range from 0.1 to 30 seconds (FLO-2D, 2009). In this simulation, the average time step ranged from 0.026 to 30 seconds due to the higher flow values in the constricted areas. Still, the model satisfied the CFL condition throughout the LIP Scenario simulation. Further, the sites of interest around the Auxiliary Building and Confinement s in the model were not in constricted flow areas (Figure 3-3). The second measure is a slope-based time step limiter built into the model. The time step used for a temporal computation will be the lesser of that determined from the first and second measures.

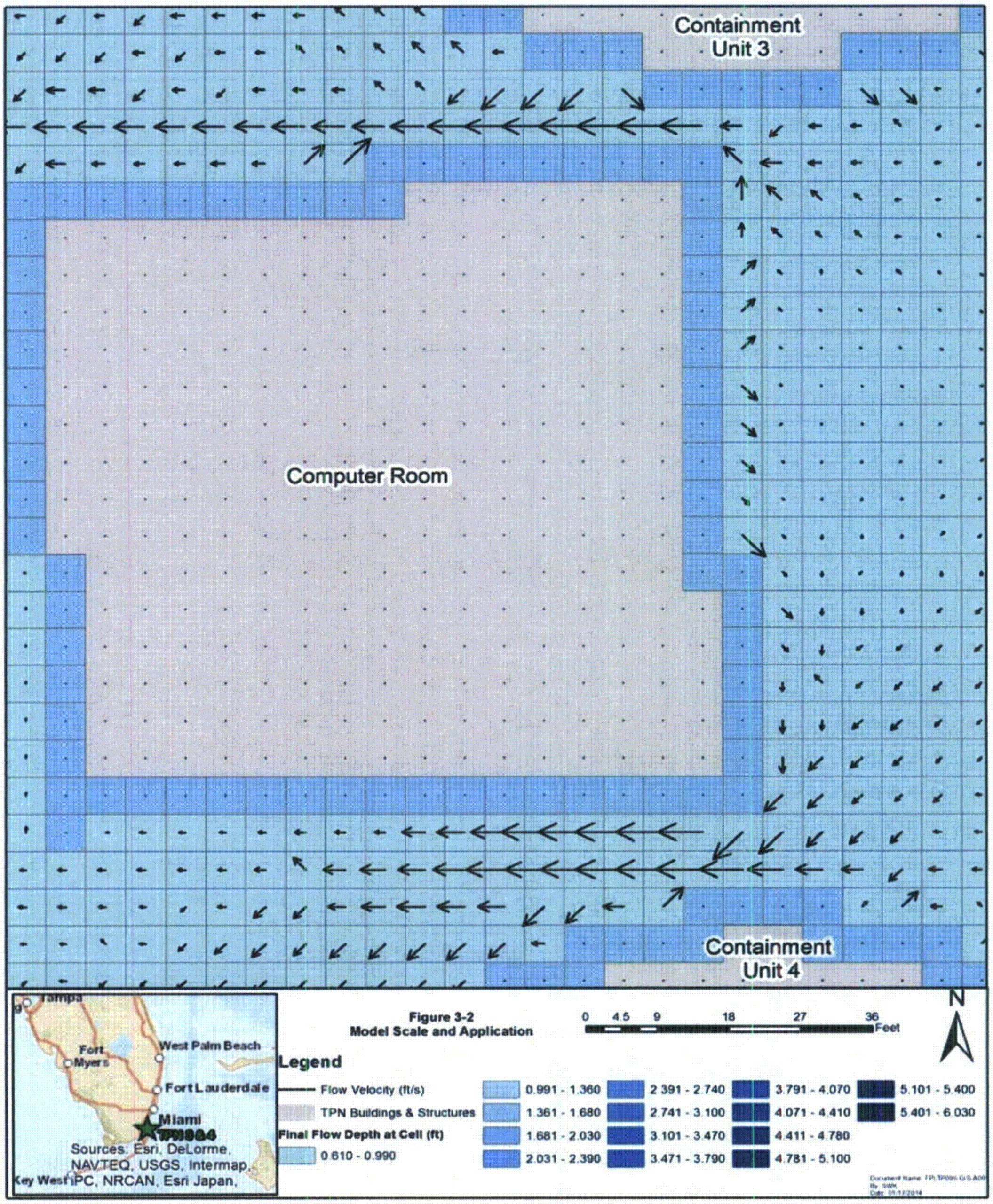

Figure 3.2 - Scenario A Flow Depths and Velocities between Computer Room and Containment Units 3 and 4.

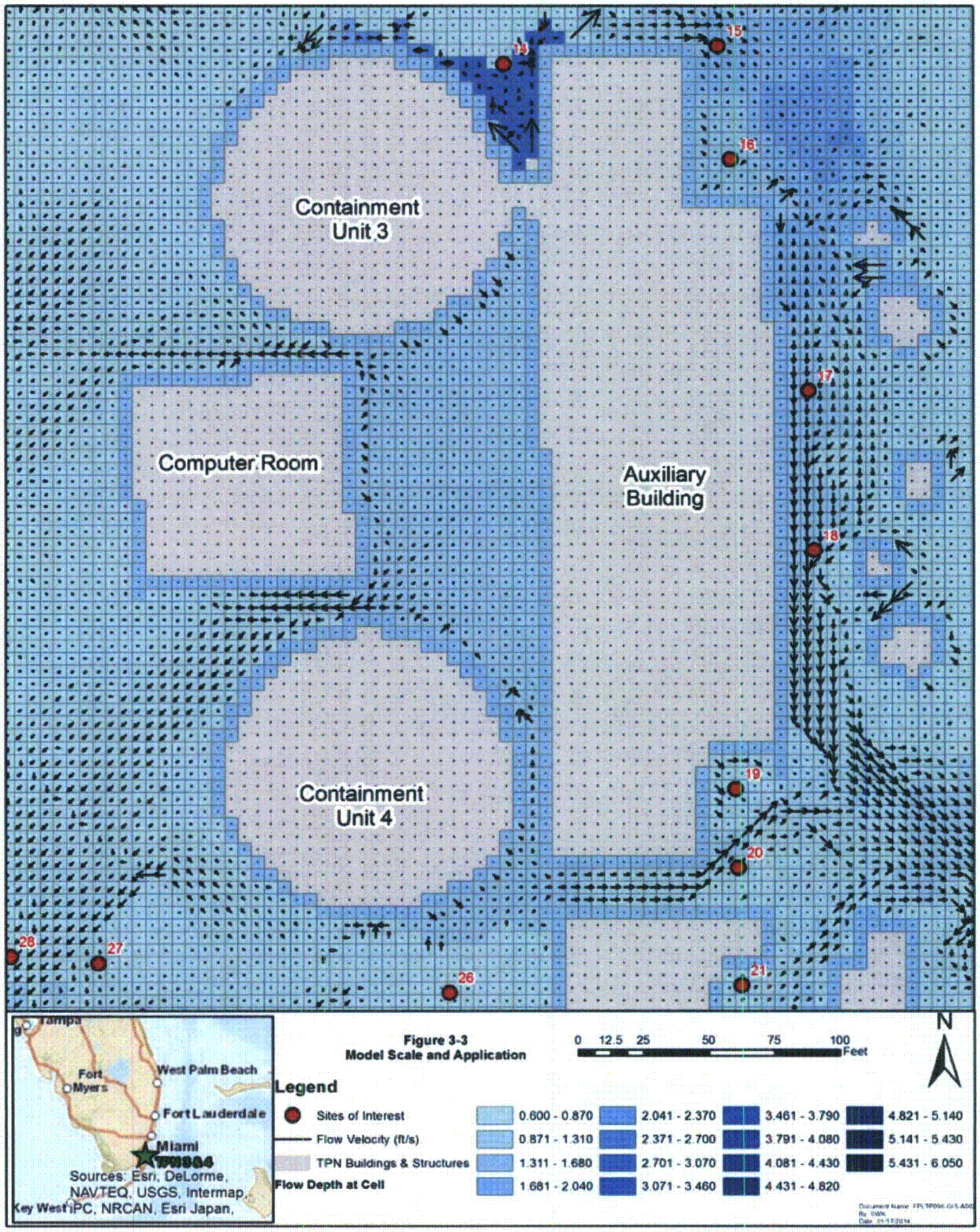

Figure 3.3 - Scenario A Flow Depths and Velocities between Computer Room and Containment Units 3 and 4, and Auxiliary Building.

The third measure of FLO-2D numerical stability, as well as accuracy, is volume conservation (FLO-2D, 2009). The inflow volume, outflow volume, changes in storage, and infiltration/evaporation losses are summed at the end of each time step. Generally, volume conservation within 0.001 percent corresponds to a successful simulation (FLO-2D, 2009). The maximum volume conservation was 0.000012 percent during the simulation, reported to six significant figures. The maximum volume conservation was less than or equal to 0.000005 during the duration most maximum depths were modeled. If the resolution of the model was too fine or too coarse, errors much greater than those reported would be expected due the model's inability to properly represent the hydrologic processes at the site.

The FLO-2D Pro software certification (SC-FLO-2D Build 13.11.06, Rev. 0) documents benchmarking tests that verify FLO-2D is capable of meeting the critical characteristics defined in the commercial grade dedication (CGD-FLO2DPRO-001 Build 13-11-06, Rev. 0). Two benchmarking tests against hand calculations and one benchmarking test against observed stream flow data for the Truckee River (USGS Gage 10350000) verified FLO-2D Pro is valid for determination of stillwater elevations and inundation extents from resulting rainfall-runoff and to simulate the propagation of storm surge, seiches, tsunamis and riverine flow through overland flow.

Modeling Approach

In addition to the CFL, slope and volume conservation stability criteria, the modeling methodology aimed to produce the highest potential water levels outside the powerblock buildings. The entire computational domain (powerblock and surrounding areas) was assumed to be impervious and no credit was given to yard drains. All precipitation inflow would runoff the site or accumulate in local depressions. Further, no storage capacity was given to either the Component Cooling Water (CCW) or Condenser Pits in the Scenario A simulation. Both the CCW and Condenser Pits were modeled at site grade. The precipitation inflow also was computed conservatively from the United States Army Corps of Engineers (USACE) Hydrometeorological Report 51 (HMR-51) and Hydrometeorological Report 52 (HMR-52 (NOAA, 1978; NOAA, 1982).

Conclusion

The FLO-2D Pro model's structure and spatial scale could adequately represent the physical processes of the LIP event. The computational scheme resolves all features larger than the element spacing, 5 feet, which is typically greater than spacing between structures at the site. The smallest passageway between buildings was measured with ArcGIS software as ~6 feet. Further, FLO-2D Pro has three measures of model performance – the CFL condition, the Ponce and Theurer slope-stability criteria and volume conservation. The Scenario A simulation satisfied both criteria. Finally, multiple conservative methods were incorporated in development of the model and LIP event, aimed to produce the highest potential water levels.

NRC RAI No. 4:
Section 3.2 Local Intense Precipitation and Associated Site Drainage

The model documentation for the FLO-2D flood analysis indicates that areas occupied by buildings were treated as no-flow zones in modeling onsite hydraulics, but it does not indicate how the model handled precipitation onto these zones. The NRC staff requests the licensee to describe how precipitation that falls on building roofs would be routed to the ground surface during a flood event, and how the routing of this precipitation is handled in modeling of Scenario A.

FPL Response to RAI No.4:

Precipitation that falls onto the building roofs was included in the model's mass balance. In the LIP analysis, buildings were modeled as no-flow areas. This option prevents the inflow of water to buildings from computational cells outside the structure, but it does not prevent outflow of water from buildings to computational cells outside (FLO-2D, 2009). Precipitation was introduced to each computational cell within a building/structure (but without inflow). FLO-2D Pro then calculated the runoff from the building area using the topography defined within the footprint of the building. Figure 4-1 shows an example of a no-flow structure with a topographic high running under the center. No precipitation was allowed to accumulate in any no-flow building footprint in FLO-2D Pro; instead inflow was routed to computational cells outside the building (FLO-2D, 2009). For the case presented in Figure 4-1, runoff would be directed to either side of the structure. The precipitation effectively was introduced as inflow to adjacent cells around the building perimeter, as highlighted in the figure below. This approach is akin to assuming complete blockage of roof drainage components while not crediting the roof for any storage capacity.

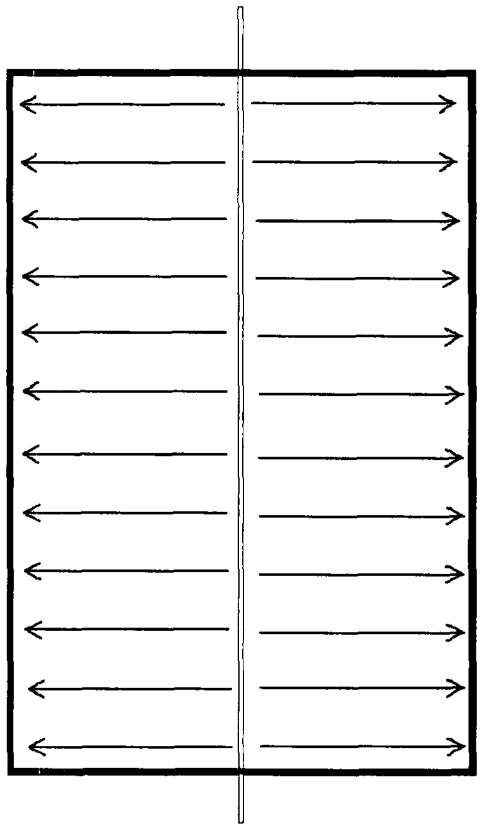

Figure 4-1: Runoff over No-Flow Area Schematic

<u>NRC RAI No. 5</u>:
<u>Section 3.2 Local Intense Precipitation and Associated Site Drainage</u>

The NRC staff requests additional information to complete its review the modeling of the local intense precipitation Scenario A using FLO-2D. Specifically, the Condenser Pits and Component Cooling Water (CCW) are not discernible as low-elevation areas in the files provided to document model input, nor are they discernible as sites of significant water accumulation in the model output files or on the images (maps) provided to illustrate model results. The NRC staff requests the licensee to provide a description of how the Condenser Pits and CCW Areas for Units 3 and 4 are represented in the FLO-2D model.

<u>FPL Response to RAI No.5:</u>

The NRC's staff review was correct in noting that the Condenser Pits and Component Cooling Water (CCW) were not modeled as low elevation areas. This approach was selected to increase the level of conservatism by not crediting storage in these areas. The Condenser Pits and Component Cooling Water (CCW) were not represented as low-elevation areas in FLO-2D Pro Scenario A model simulation, as shown in Figure 5-1. Rather, these areas were modeled conservatively at local grade. This technique did not credit the areas for any storage capacity. Instead, precipitation runoff was directed to computational cells adjacent to the east side of the CCW. Because these low storage volumes are not credited, the model is inherently more conservative.

However, hand calculations were performed to determine the effects of the LIP in the CCW and Condenser Pits with credited outgoing pumping. Those computations found that the maximum accumulated water depth during the LIP scenario B event in CCW3 and CCW4 was 0.88 feet and 0.97 feet, respectively. The maximum depth was greater for Condenser Pits at 7.87 feet for each unit.

Since the FHRR submittal, FPL has revised the Condenser Pit calculation to include additional retention areas previously not accounted for, including additional holdup volume on the east end of the Condenser, and to correct the elevation of the pit. In addition, FPL has reduced the size of the temporary hurricane pumps for the Condenser Pits to enhance deployment prior to a hurricane yet maintain levels well below any critical equipment.

The Condenser Pit is 16 ft deep rather than 22 ft deep as originally reported in the FHRR. The revised results of the maximum Condenser Pit water level for scenario A (non- hurricane) calculation show a new maximum depth in the pit will be 14.8 ft from the bottom of the pit verses the 13 ft reported in the FHRR. The surface elevation of the water would be at elv 14.5 ft NAV88 and the top of the pit is at 15.7 ft NAV88.

The temporary hurricane pumps are deployed prior to onset of a major hurricane. The original basis for sizing the temporary pumps did not take credit for the Condenser Pit holdup volume and consequently sized very large pumps greater than 1,800 gpm for each pit. Reducing the capacity of the pumps will allow a much faster deployment during the 48 hour storm preparation activities and free up resources for other critical activities. Given the available margin in the Condenser Pit for scenario B, a reduction in pump capacity to 600 gpm is warranted to improve storm preparation activities. With smaller pumps the maximum Condenser Pit depth will be 11.8 ft (Elv 12.1 NAV88) versus the 8 ft reported in the FHRR again below the level of any critical equipment. Scenario A still remains the bounding maximum Condenser Pit flood level.

For completeness it is noted that the model is being further refined as part of the integrated assessment. It is expected that additional margin will be gained through this analysis.

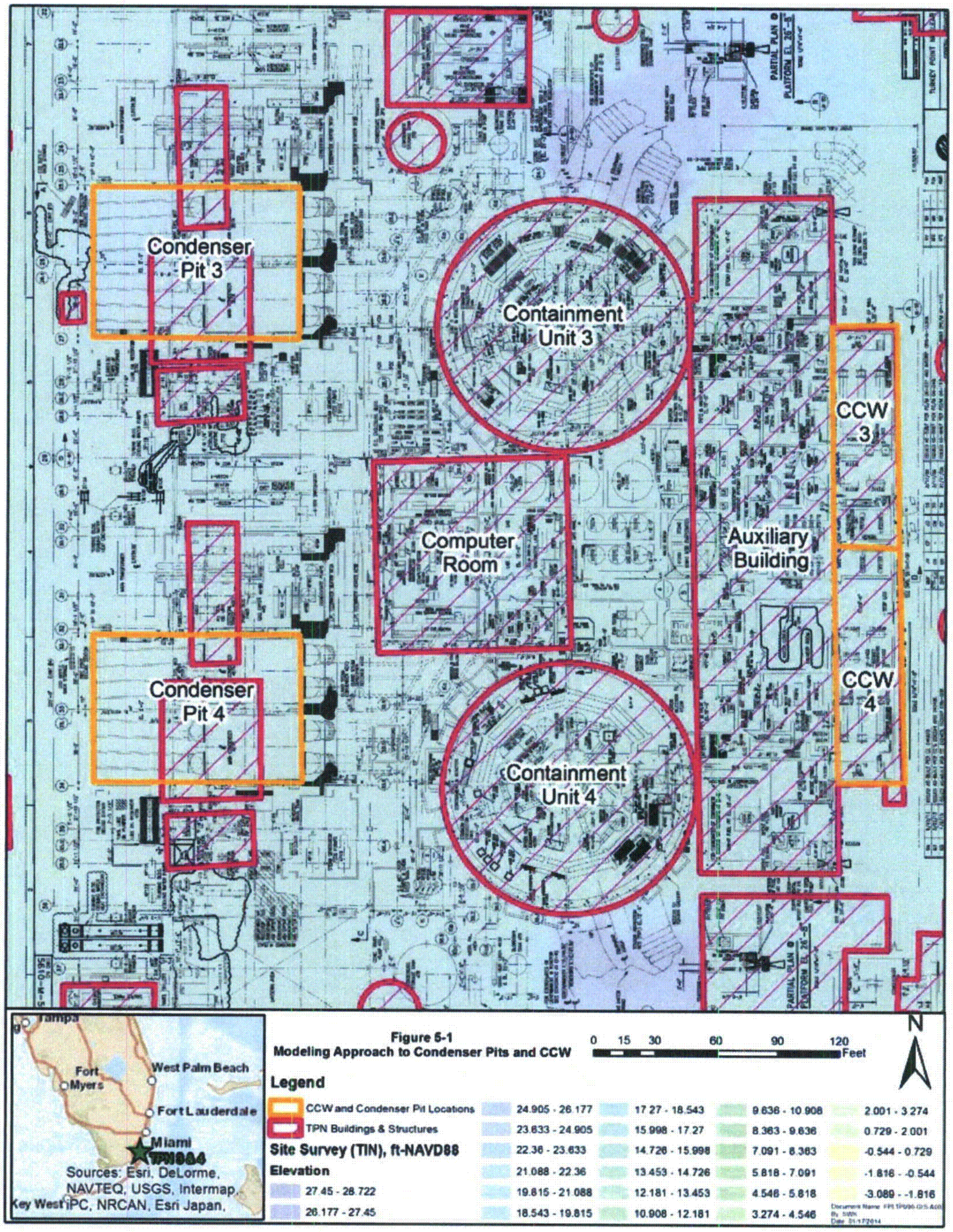

Figure 5-1: Location of Condenser Pits and CCW with FLO-2D model topography represented.

<u>NRC RAI No. 7:</u>
<u>Section 3.2 Local Intense Precipitation and Associated Site Drainage</u>

The discussion provided in the FHRR for local intense precipitation (LIP) Scenario A, presented on page 71 indicates that flood water could enter the non-watertight east doors of the Auxiliary Building and that there are three motor control centers (MCCs) "several feet" west of the doors. The FHRR states that these MCCs would not be affected by flooding because they are mounted on curbs that elevate them 5 inches above the floor and because water would flow down to lower levels of the building. Since the qualitative description does not explain the volume of water coming through the depth of accumulation inside the room, the NRC staff requests the licensee to provide quantitative information in support of this conclusion."

<u>FPL Response to RAI No. 7:</u>

A more detailed analysis for this area was planned for the integrated assessment. To provide the response to this RAI, the work was accelerated in order to provide a quantitative estimate of possible flows into the building under the LIP conditions, the water levels inside the building, and the corresponding water volumes of water involved in surrounding areas of the MCCs. A flow model was developed which simulates the accumulation of water inside the Auxiliary Building from exterior unsealed doors, and outflow through unsealed closed doors to the lower levels of the building. The model treats the inside of the building as a reservoir and the points of inflow and outflow as orifices. Inflows at each potential entry point (unsealed doors) are modeled using the water-depth hydrographs produced in the FLO-2D LIP model. Each of the simulated LIP distributions (described in RAI 1 response) is analyzed to determine the worst-case scenario. Areas of the Auxiliary Building with normally open doors are modeled as a connected volume to the hallway with the exception of the Monitor tank room which was excluded for conservatism. Figure 7-1 shows shaded areas where water is assumed to flow once entering from exterior doors.

Section 5.1.1 of the FHRR indicated that a flood height of 1.6 ft. could develop in the CCW area for LIP scenario A (non-hurricane). The analysis assumed that no flow would exit the open doorways to the adjacent road which is 6 inches below the CCW area elevation. At the time of the CCW analysis, the site flooding analysis had not been completed so this very conservative approach was taken to establish levels at the building perimeter. The analysis developed for this RAI uses the flood response from a revised FLO-2D model to establish the flood elevation of 0.8 feet at the Auxiliary Building doors which are in the Unit 4 CCW room. The FLOW-2D model points 17 and 18 conservatively include the surface area runoff for the entire Auxiliary Building even though the CCW area does not have a roof. The flood levels inside the Unit 4 CCW area would equalize through the 10 feet open doorway so the 0.8 ft level outside the door is used. The other two doors that are outside the Unit 4 CCW area which also provided access to the Auxiliary Building use a flood height of 1.2 feet based on new point of interest 16 from the revised FLOW-2D model. The base level, i.e. floor level inside the building is EL. 18 feet-MLW-Site (equivalent to EL. 15.7 ft-NAVD88).

There are four potential points of inflow from the exterior of the building that can reach the central hallway: D058-1, D058-2, D046-2, and 159. D058-1, D046-2, and 159 are located on the east side of the Auxiliary Building, and D058-2 is located on the west side (See Figure 7-1). Note that inflow through door D046-2 enters the Laundry Room and then must go out through door D046-01 to reach the interior of the building; inflow through door 159 reaches the interior of the main hallway through door D055-1; this process is simulated in the model. The model also simulates flow into the Electrical Equipment Room through door D025-1.

The potentially impacted MCCs are: MCC 3C, MCC 3D, MCC 4C and 4D. MCC 4D is located in the Electrical Equipment Room on the west side of the Auxiliary Building which is accessed from the Auxiliary Building hallway through a closed door.

Water that accumulates inside of the building can flow out through gaps in closed doors to the lower levels of the Auxiliary Building. There are 6 direct-route outflow points (unsealed doors) from the center hallway: Doors D058-4, D030-1, D058-5, D025-1, D058-3, and D040-1. Doors D030-1 and D040-1 provide access to Doors D030-2 and D040-2, respectively, to stairwells to lower levels. The model configuration is presented in Figure 7-1.

The maximum water level in the main hallway was determined to be 4.7 inches above the floor. As stated in the FHRR, the MCC are mounted on concrete pads which elevate them 5 inches off the floor. This includes structural support steel that is part of the MCC frame.

The total integrated volume of water entering each of the four RHR pump rooms or the Waste Holdup Tank area over the 1 hour LIP is approximately 330 ft3. Using the smallest room, a maximum flood height of 1.4 feet would be reached. The critical height for RHR equipment located in the pump room is greater than 3 feet off the room floor. Furthermore, each RHR pump room has two 75 gpm (10 cfm) sump pumps powered from redundant safety trains. The 20 cfm pumping capacity exceeds the maximum flooding inflow of approximately 6 cfm to the room. Therefore, buildup of water in the room is not expected. There is no safety related equipment in the Waste Holdup Tank area or connecting hallway on the 2 ft elevation of the Auxiliary Building hallway.

As mentioned in the response to RAI 5, the model is being further refined as part of the integrated assessment. It is expected that additional margin will be gained through this analysis.

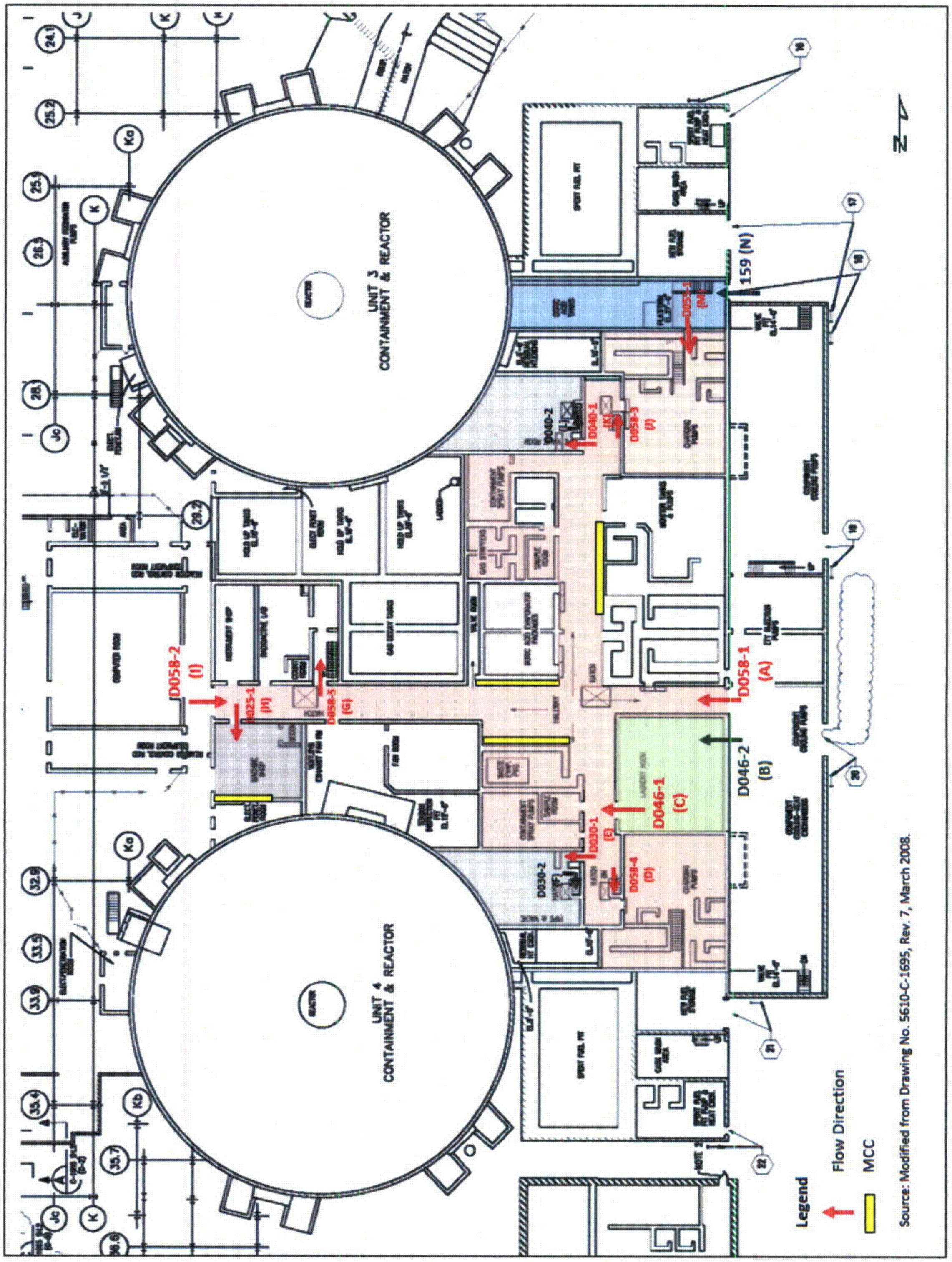

Figure 7- 1 General Model Layout

NRC RAI No. 8:
Section 3.2 Local Intense Precipitation and Associated Site Drainage

The NRC staff requests additional information to complete its review of the local intense precipitation flood hazard at the Component Cooling Water (CCW) structures 3 and 4. The NRC staff requests the licensee to provide the critical elevations of the safety-related SSCs associated with CCW3, CCW4 and the Condenser Pits.

FPL Response to RAI No. 8:

Condenser Pits

All safety related SSCs are located at or above the 18 ft Turbine building elevation. The top of the Condenser Pit is at the 18 ft elevation. Therefore, there are no safety related SSCs located in the Unit 3 or Unit 4 Condenser Pits.

CCW3 and CCW4

Since Unit 3 and Unit 4 are very similar, the lowest elevation between the two units is provided. The following safety related SSCs are located in either the CCW3 area or CCW4 area along with their critical elevation.

SSC	Elevation (NAV88) ft
CCW pump/motor	18.12 ft
SI pump/motor	17.50 ft
MOV-3/4-856A	18.53 ft
MOV-3/4-856B	18.53 ft
SI Pump Local Control Panel	19.12 ft
CCW/SI associated Elect Junction Boxes	18.20 ft

NRC RAI No. 9:
Section 3.2 Local Intense Precipitation and Associated Site Drainage

In order to clarify the licensee's conclusions regarding the potential for water to accumulate from local intense precipitation (LIP), the NRC staff requests the licensee to describe why the projected accumulation of water in the Turbine Building, Condenser Pits, and Component Cooling Water (CCW) areas under LIP Scenario A do not require the same types of additional actions as are indicated for accumulations in these areas under LIP Scenario B. In particular, the NRC staff requests the licensee to explain the statement in FHRR Section 5.1.2 that indicates that the LIP event Scenario B is "of a much longer duration than Scenario A and some external flooding may add to the accumulation." Since both LIP scenarios are based on the same one-hour PMP event, the NRC staff requests the licensee to provide additional clarification regarding the "much longer duration" referred to for scenario B. The NRC staff also requests the licensee to clarify what the licensee regards as "external flooding" in this context.

FPL Response to RAI No. 9:

Scenario A LIP occurs during a non-hurricane event when the stop logs are not installed in the CCW area doors out to the open yard. For scenario A, once the intense rain subsides, any water buildup will quickly drain out the 4 ft wide open doorway into the yard area which slopes away from the CCW area. During scenario B under hurricane conditions, stop logs would be installed in the CCW area open doorways to the yard and floor drain plugs would be installed. With stop logs installed, the temporary hurricane pumps are the only method for de-watering the CCW area. In addition, since scenario B is assumed to occur during a hurricane, external flooding due to storm surge could produce leakage through exterior wall seals and stop logs which would exist for longer than the 1 hr assumed LIP event. While any external leakage through flood barriers is expected to be small, it could add to the volume of water held up in the CCW areas. Therefore, the time water would be above the Auxiliary Building door threshold and potentially entering the Auxiliary Building is expected to be longer for scenario B than scenario A. As an interim measure, FPL Letter, L-2013-087 committed to add additional hurricane pumping capacity in the CCW area to gain margin. The additional pumps are stored on site and the hurricane readiness procedure has been revised to include the added pumps (FPL Letter, L-2013-256). RAI 7 determines the leakage into the Auxiliary building for bounding flood height produced by scenario A.