



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 2, 2015

Mr. Benjamin C. Waldrep, Site Vice President
Shearon Harris Nuclear Power Plant
5413 Shearon Harris Rd.
M/C HNP01
New Hill, NC 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 – SUPPLEMENT TO
STAFF ASSESSMENT OF RESPONSE TO 10 CFR 50.54(f) INFORMATION
REQUEST - FLOOD-CAUSING MECHANISM REEVALUATION (CAC NO.
MF1103)

Dear Mr. Waldrep:

The purpose of this letter is to transmit the supplement to the U.S. Nuclear Regulatory Commission (NRC) staff's assessment of Shearon Harris Nuclear Power Plant, Unit 1 (HNP) reevaluated flood hazard information that was issued to you by letter dated April 29, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15104A370). The supplement updates the original staff assessment to address changes in the NRC's approach to the steps following the review of the flood hazard reevaluations as directed by the Commission. The letter also addresses the next steps associated with the mitigation strategies assessment with respect to the reevaluated flood hazards.

By letter dated March 12, 2012 (ADAMS Accession No. ML12053A340), the NRC issued a request for information pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (hereafter referred to as the 50.54(f) letter). The request was issued as part of implementing lessons-learned from the accident at the Fukushima Dai-ichi nuclear power plant in Japan. Enclosure 2 to the 50.54(f) letter requested licensees to reevaluate flood-causing mechanisms using present-day methodologies and guidance. By letter dated March 12, 2013 (ADAMS Accession No. ML13079A253), Duke Energy Progress, Inc. (the licensee) responded to this request for HNP. This response was supplemented by letters dated March 24, 2014 (ADAMS Accession No. ML14087A165), and April 1, 2015 (ADAMS Accession No. ML15091A590). By letter dated March 31, 2015, the staff transmitted to you the staff assessment of the information provided in the aforementioned letters. The NRC staff has completed its review of the information provided, as documented in the staff assessment and the enclosed supplement to the staff assessment. This closes out the NRC's efforts associated with CAC No. MF1103.

The enclosed supplement to the NRC staff assessment updates the staff's conclusions in accordance with the flood hazard reevaluation approach described in NRC letter dated September 1, 2015 (ADAMS Accession No. ML15174A257), concerning the coordination of requests for information regarding flooding hazard reevaluations and mitigating strategies for beyond-design-basis external events. This letter describes the changes in the NRC's approach to the flood hazard reevaluations that were approved by the Commission in its Staff Requirements Memorandum (ADAMS Accession No. ML15209A682) to COMSECY-15-0019

B. Waldrep

- 2 -

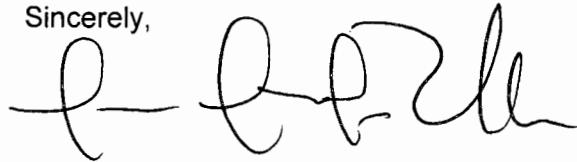
(ADAMS Accession No. ML15153A104) that described the NRC's mitigating strategies and flooding hazard reevaluation action plan.

As documented in the NRC staff assessment and the enclosed supplement, the staff has concluded that the licensee's reevaluated flood hazard information is suitable for the assessment of mitigation strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and staff) for HNP. Further, the licensee's reevaluated flood hazard information is suitable for other assessments associated with Near-Term Task Force Recommendation 2.1 "Flooding."

The reevaluated flood hazard results for local intense precipitation, streams and rivers, and storm surge were not bounded by the current design-basis flood hazard. In order to complete its response to Enclosure 2 to the 50.54(f) letter, the licensee is expected to submit a revised integrated assessment or focused evaluation(s), as appropriate, to address these reevaluated flood hazards, as described in the NRC's September 1, 2015, letter.

If you have any questions, please contact me at (301) 415-3809 or email at Juan.Uribe@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'Juan F. Uribe', written in a cursive style.

Juan F. Uribe, Project Manager
Hazards Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket No. 50-400

Enclosure:
Supplement to Staff Assessment of Flood
Hazard Reevaluation Report

cc w/encl: Distribution via Listserv

SUPPLEMENT TO
STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO FLOODING HAZARD REEVALUATION REPORT
NEAR-TERM TASK FORCE RECOMMENDATION 2.1
SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
DOCKET NO. 50-400

1.0 INTRODUCTION

This document is a supplement to the U.S. Nuclear Regulatory Commission (NRC) staff assessment that was transmitted by letter dated April 29, 2015 (NRC, 2015a) to Duke Energy Progress, Inc. (Duke, the licensee) for Shearon Harris Nuclear Power Plant, Unit 1 (HNP, Harris). With the exceptions of the Table 3.1-1 and the Reference section, this supplement only contains the sections that were changed to resolve the open item and reflect the changes in the NRC's approach to the flood hazard reevaluations that were approved by the Commission in its Staff Requirements Memorandum (SRM) (NRC, 2015b) to COMSECY-15-0019 (NRC, 2015c), which described the NRC's mitigating strategies and flooding hazard reevaluation action plan. Table 3.1-1 at the end of the supplement is copied from the staff assessment for convenience. Instead of repeating the Reference section in its entirety, only the additions to the list of references are included in the supplement.

2.0 REGULATORY BACKGROUND

2.1 Applicable Regulatory Requirements

There are no changes or updates to this section of the NRC staff assessment.

2.2 Enclosure 2 to the 50.54(f) Letter

There are no changes or updates to this section of the NRC staff assessment.

2.2.1 Flood-Causing Mechanisms

There are no changes or updates to this section of the NRC staff assessment.

2.2.2 Associated Effects

There are no changes or updates to this section of the NRC staff assessment.

2.2.3 Combined Effect Flood

Enclosure

2.2.3 Combined Effect Flood

There are no changes or updates to this section of the NRC staff assessment.

2.2.4 Flood Event Duration

There are no changes or updates to this section of the NRC staff assessment.

2.2.5 Actions Following the Flooding Hazard Reevaluation Report (FHRR)

For the sites where the reevaluated flood hazard is not bounded by the current design-basis (CDB) flood hazard for all flood-causing mechanisms, the request for information issued Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (hereafter referred to as the 50.54(f) letter) (NRC, 2012a) requests licensees and construction permit holders to:

- Submit an interim action plan with the FHRR documenting actions planned or already taken to address the reevaluated hazard(s)
- Perform an integrated assessment subsequent to the FHRR to: (a) evaluate the effectiveness of the current licensing basis (i.e., flood protection and mitigation systems); (b) identify plant-specific vulnerabilities; and (c) assess the effectiveness of existing or planned systems and procedures for protecting against and mitigating consequences of flooding for the flood event duration.

After issuance of the 50.54(f) letter, the NRC changed the approach to the steps following the review of the flood hazard reevaluations, as directed by the Commission, to permit use of focused evaluations as an alternative to an integrated assessment. The NRC letter dated September 1, 2015 (NRC, 2015d), describes the changes in the NRC's approach to the flood hazard reevaluations.

If the reevaluated flood hazard is bounded by the CDB flood hazard for all flood-causing mechanisms at the site, licensees are not required to perform an integrated assessment or a focused evaluation(s) at this time.

3.0 TECHNICAL EVALUATION

There are no changes or updates to this section of the NRC staff assessment.

3.1 Site Information

There are no changes or updates to this section of the NRC staff assessment.

3.2 Local Intense Precipitation (LIP) and Associated Site Drainage

There are no changes or updates to this section of the NRC staff assessment.

3.2.1 Site Drainage

There are no changes or updates to this section of the NRC staff assessment.

3.2.2 Local Intense Precipitation

There are no changes or updates to this section of the NRC staff assessment.

3.2.3 Runoff Analyses

There are no changes or updates to this section of the NRC staff assessment.

3.2.4 Sumps and Containment Areas

There are no changes or updates to this section of the NRC staff assessment.

3.2.5 Hydraulic Model

There are no changes or updates to this section of the NRC staff assessment.

3.2.6 Sensitivity Analyses

There are no changes or updates to this section of the NRC staff assessment.

3.2.7 Flood Event Duration

The NRC staff notes that the bases and justification for flood duration parameters (e.g., warning time based on existing forecasting resources or agreements) may be further evaluated as part of the focused evaluation consistent with the process and guidance discussed in COMSECY-15-0019 (NRC, 2015c). The staff issued a request for additional information (RAI) to the licensee (NRC, 2014a) to supplement the HNP, Unit 1, FHRR. The licensee's response (Duke, 2014b, RAI No. 18 response), is discussed in Section 3 of this supplemental staff assessment. The staff notes that longer duration Probable Maximum Precipitation (PMP) events, such as the 72-hr PMP, generate greater volumes of runoff; and, the shorter duration PMP events, such as the 1-hour PMP, result in (potentially significantly) shorter warning time with greater peak event magnitude, and likewise may result in flooding above the elevation of openings to plant structures.

The NRC staff notes that a reasonable estimate of the site's LIP PMP is the application of an appropriate National Oceanic Atmospheric Administration (NOAA) Hydro Meteorological Report (HMR) estimate for any rainfall duration used in NUREG/CR-7046, regardless of temporal distribution of the rainfall. The licensee obtained 1-sq. mile PMP depths for durations ranging between 5-minutes and 1-hour using HMR 52 (HMR-52). Therefore, the NRC staff confirmed that the licensee selected appropriate rainfall rate values to satisfy the 50.54(f) information request.

3.2.8 Conclusion

The NRC staff confirmed the licensee's conclusion that the reevaluated flood hazard for LIP and associated site drainage is not bounded by the CDB flood hazard. Therefore, the licensee is expected to submit a focused evaluation for LIP and associated site drainage consistent with the process outlined in COMSECY-15-0019 (NRC, 2015c) and associated guidance that will be issued. Under this approach, the NRC staff anticipates that licensees will perform and document a focused flooding evaluation for LIP and associated site drainage that evaluates the impact of the LIP hazard on the site and implements any necessary programmatic, procedural or plant modifications to address this hazard exceedance. The NRC staff anticipates that licensees will submit letters providing a summary of the evaluation and, if needed, regulatory commitments to implement and maintain appropriate programmatic, procedural or plant modifications to protect against the LIP hazard.

3.3 Streams and Rivers

There are no changes or updates to this section of the NRC staff assessment.

3.3.1 Probable Maximum Precipitation

There are no changes or updates to this section of the NRC staff assessment.

3.3.2 Precipitation Losses

There are no changes or updates to this section of the NRC staff assessment.

3.3.3 Snyder Coefficients

There are no changes or updates to this section of the NRC staff assessment.

3.3.4 Unit Hydrographs

There are no changes or updates to this section of the NRC staff assessment.

3.3.5 Spillway Rating Curves

There are no changes or updates to this section of the NRC staff assessment.

3.3.6 Runoff and Probable Maximum Flood Elevations

There are no changes or updates to this section of the NRC staff assessment.

3.3.7 Coincident Wind and Wave Activity

There are no changes or updates to this section of the NRC staff assessment.

3.3.8 Conclusion

The NRC staff confirmed the licensee's conclusion that the reevaluated flood hazard for site flooding from streams and rivers is not bounded by the CDB flood hazard; therefore, the licensee should address flooding from streams and rivers, including combined effects, such as wind setup and wave runup, within the scope of the integrated assessment or focused evaluation consistent with the process and guidance discussed in COMSECY-15-0019 (NRC, 2015c). The information on flooding from streams and rivers that is specific to the data needs of the integrated assessment or focused evaluation is described in Section 4 of this staff assessment.

3.4 Failure of Dams and Onsite Water Control/Storage Structures

There are no changes or updates to this section of the NRC staff assessment.

3.5 Storm Surge

The licensee stated in its FHRR, that the reevaluated hazard, including associated effects, for site flooding due to storm surge near HNP, Unit 1 is 254.5 ft (77.57 m). This flood-causing mechanism is described in the licensee's CDB. The CDB hazard for site flooding due to storm surge at the HNP, Unit 1 site is 254.9 ft (77.69 m). At the Auxiliary Dam, the reevaluated hazard elevation of 257.9 ft (78.61 m) is not bounded by the design basis of 256.2 ft (78.09 m). No design-basis was evaluated at the Main Dam, where the reevaluated hazard elevation is 233.4 ft (71.14 m).

To estimate the effects from storm surge, the FHRR referenced current methods supplemented with guidance from NUREG/CR-7046 (NRC, 2011e). Additionally, the licensee used NOAA Technical Report National Weather Service (NWS) 23 (NWS-23) in its FHRR to determine parameter values used in the Probable Maximum Hurricane (PMH) calculation.

The meteorological characteristics used by the licensee to calculate the PMH were obtained from National Oceanic and Atmospheric Administration (NOAA) Technical Report NWS 23 (NOAA, 1979) for Milepost 2200 and 35.6 degrees latitude. The licensee computed wave runup using the methods in the U.S. Army Corps of Engineers (USACE) (2008) and wind setup using the methods in USACE (1997).

To determine the fetch, the licensee used five straight line fetch distances in the PMH-induced wave runup and wave setup calculations. Since several headlands interrupt the fetches when the Main Reservoir level is at the present lower level of 220 ft (67.1 m), the licensee stated that the calculated fetches were conservative for present conditions.

The licensee determined the PMH-induced wave runup and wind setup at the Main and Auxiliary Reservoirs assuming normal operating water levels in the Auxiliary and Main Dams, and by following the procedure given in the USACE Coastal Engineering Manual, Engineer Manual 1110-2-1100 (USACE, 2008). The licensee calculated the average water depth of the reservoirs by taking the storage volume at the stillwater elevation divided by the surface area

but used the higher value from the Harris Advanced Reactor,¹ Units 2 and 3 combined license application final safety assessment report (Revision 3) (PEC, 2011) in subsequent calculations. The licensee did not evaluate the CDB flood hazard level for PMH-induced storm surge for the Main Dam, but noted that both the Main and Auxiliary Dams and HNP, Unit 1 are protected up to elevation 260 ft (79.2 m).

The licensee noted that the reevaluated PMH-induced storm surge flood level for the Auxiliary Dam exceeds the CDB flood level by 1.65 ft (0.50 m), but remains below the Auxiliary Dam flood protection level by 2.15 ft (0.66 m). In addition, water wave phase speed and water velocity would produce significantly smaller dynamic forces with floating debris compared to dynamic forces produced by hurricane/tornado wind projectiles.

The licensee stated the embankment of the plant island along the Main Reservoir is protected by 300 ft (91.4 m) of sacrificial spoil fill at elevation 245 ft (74.7 m). The extent of erosion due to the 2 worst fetches is estimated by the licensee to be 150 ft (45.7 m) resulting from a PMH duration of 48 hours. Therefore, the licensee stated that the sacrificial spoil fill provides a conservative design.

The NRC staff agrees with the licensee that dynamic forces from floating debris are minimal compared to those resulting from hurricane/tornado wind projectiles and concludes that the CDB is bounded for hydrodynamic loading on the safety-related structures, except for the Auxiliary Dam, which is not bounded by the CDB. The staff further concludes that the loading from waterborne projectiles and debris are bounded by loading from other hazards such as tornado wind and tornado missiles. The staff confirmed the fetch lengths, straight-line fetches, wind speed, and calculation of wind-wave runup and setup associated with the HNP, Unit 1 and Auxiliary/Main dams. The staff agrees with the licensee's use of the USACE (2008) as the source of applicable methodology for the performing relevant wave action calculations. The staff also agrees that the sacrificial spoil fill erosion of 50 percent provides a conservative design.

The NRC staff confirmed the licensee's conclusion that the reevaluated hazard at the Auxiliary Dam for flooding from storm surge is not bounded by the CDB flood hazard; therefore, the licensee should include flooding from storm surge within the scope of the integrated assessment or focused evaluation consistent with the process and guidance discussed in COMSECY-15-0019 (NRC, 2015c). The information on flooding from storm surge that is specific to the data needs of the integrated assessment or focused evaluation is described in Section 4 of this staff assessment.

3.6 Seiche

There are no changes or updates to this section of the NRC staff assessment.

3.7 Tsunami

There are no changes or updates to this section of the NRC staff assessment.

¹ Harris Advanced Reactor is a proposed addition of new Units 2 and 3 to the HNP, Unit 1 site, and is located adjacent to HNP, Unit 1.

3.8 Ice-Induced Flooding

There are no changes or updates to this section of the NRC staff assessment.

3.9 Channel Migrations or Diversions

There are no changes or updates to this section of the NRC staff assessment.

4.0 REEVALUATED FLOOD HEIGHT, EVENT DURATION AND ASSOCIATED EFFECTS FOR HAZARDS NOT BOUNDED BY THE CDB

The NRC staff confirms that the reevaluated hazard results for LIP, streams and rivers, and storm surge are not bounded by the CDB flood hazard. Therefore, the NRC staff anticipates that the licensee will perform additional assessments (i.e., integrated assessment or focused evaluation) of plant response for HNP, Unit 1, as described, in NRC letter dated September 1, 2015 (NRC, 2015d).

The NRC staff reviewed the following flood hazard parameters needed to perform the additional assessments or evaluations of plant response:

- Flood event duration, including warning time and intermediate water surface elevations that trigger actions by plant personnel, as defined in Japan Lessons-Learned Directorate (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-05. Flood event durations for the flood-causing mechanisms identified above are shown in Table 4.0-1.
- Flood height and associated effects, as defined in JLD-ISG-2012-05. Flood height and associated effects for the flood-causing mechanisms identified above are shown in Table 4.0-2.

4.1 Flood Event Duration

The NRC staff requested the licensee to provide the applicable flood event duration parameters associated with mechanisms that are not bounded by the CDB. The applicable flood duration parameters include the warning time the site will have to prepare for the event, the period of time the site is inundated, and the period of time necessary for water to recede from the site. The staff also requested the licensee to provide the flood height and associated effects for these mechanisms:

(a) Local Intense Precipitation - The warning time stated by the licensee for an inundation of the site as a consequence of a LIP event is zero, since it may occur without warning from localized storms (Duke, 2014b). The site is assumed by the licensee to be inundated for a period of one hour (Duke, 2014b). The water level is then expected by the licensee to recede below site grade within one hour (Duke, 2014b). In its FHRR, the licensee identified the flood height as 0.4 ft (0.12 m) at the Waste Process Building and 0.4 ft (0.12 m) at the Diesel Fuel Oil Storage Tank Building. The hydrodynamic loadings at these locations are minimal when compared to the strength of the buildings;

(b) Streams and rivers - The warning time for flooding from rivers and streams is 36 hours (Duke, 2014b) based on information from the National Weather Service; the site is not inundated from this flood mechanism;

(c) Storm surge - The warning time for flooding from storm surge is 36 hours (Duke, 2014b) based on information from the NWS; the site is not inundated from this flood mechanism.

4.2 Conclusion

Based upon the preceding analysis, NRC staff confirmed that the reevaluated flood hazard information is appropriate input to other assessments or evaluations associated with Near-Term Task Force Recommendations, including the assessment of mitigation strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and staff).

5.0 CONCLUSION

The NRC staff has reviewed the information provided for the reevaluated flood-causing mechanisms of HNP, Unit 1. Based on its review, the staff concludes that the licensee conducted the hazard reevaluation using present-day methodologies and regulatory guidance used by the NRC staff in connection with early site permit and combined license reviews.

Based on the preceding analysis, the NRC staff confirmed that the licensee responded appropriately to Enclosure 2, Required Response 2, of the 50.54(f) letter, dated March 12, 2012. In reaching this determination, the NRC staff confirmed the licensee's conclusions that (a) the reevaluated flood hazard results for local intense precipitation, streams and rivers, and storm surge are not bounded by the current design-basis flood hazard, (b) additional assessments of plant response will be performed for the local intense precipitation, streams and rivers, and the storm surge flood-causing mechanisms, and (c) the reevaluated flood-causing mechanism information is appropriate input to additional assessments or evaluations of plant response, as described in the 50.54(f) letter and COMSECY-15-0019 (NRC, 2015b), including the assessment of mitigation strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and staff).

The NRC staff has no additional information needs at this time with respect to the FHRR.

6.0 REFERENCES

U.S. Nuclear Regulatory Commission Documents and Publications

NRC (U.S. Nuclear Regulatory Commission), 2015a, letter from Juan F. Uribe, NRC, to Benjamin C. Waldrep, Vice President, Shearon Harris Nuclear Power Plant, "Shearon Harris Nuclear Power Plant, Unit 1 – Staff Assessment of Response to 10 CFR 50.54(f) Information Request Flood-Causing Mechanism Reevaluation (TAC No. MF1103), April 29, 2015, ADAMS Accession No. ML15104A370.

NRC (U.S. Nuclear Regulatory Commission), 2015b, SRM – COMSECY-15-0019 – Closure Plan for the Reevaluation Of Flooding Hazards for Operating Nuclear Power Plants," COMSECY-15-0019, July 28, 2015, ADAMS Accession No. ML15209A682.

NRC (U.S. Nuclear Regulatory Commission), 2015c, "COMSECY-15-0019 - Closure Plan for the Reevaluation of Flooding Hazards for Operating Nuclear Power Plants," June 30, 2015, ADAMS Accession No. ML15153A104.

NRC (U.S. Nuclear Regulatory Commission), 2015d, letter from William M. Dean, Director, to Power Reactor Licensees, "Coordination of Requests for Information for Flooding Hazard Reevaluations and Mitigating Strategies for Beyond-Design-Basis External Events," September 1, 2015, ADAMS Accession No. ML15174A257.

Codes and Standards

There are no additions to the references in this section.

Other References

There are no additions to the references in this section.

Table 3.1-1. Current Design Basis Flood Hazards at HNP

Flooding Mechanism	Stillwater Level ft (m) NGVD29	Associated Effects	Flood Level¹ ft (m) NGVD29	Section in FHRR (Duke, 2013)
Local Intense Precipitation and Associated Drainage (based on 1-hr PMP)	261.27 (79.64)	Negligible	261.27 (79.64) at powerblock buildings	2.1.1, 4.1 and Table 6
Streams and Rivers (using PMF resulting from 36-hr PMP) combined with wind setup and wave runup	256.0 (78.03) at Plant Island 238.9 (72.82) at Main Dam 256.0 (78.03) at Auxiliary Dam	1.7 ft (0.52 m) at Plant Island, wind setup and wave runup 4.2 ft (1.28 m) at Main Dam, wind setup and wave runup 2.0 ft (0.61 m) at Auxiliary Dam, wind setup and wave runup	257.7 (78.55) at Plant Island 243.1 (74.10) at Main Dam 258.0 (78.64) at Auxiliary Dam	2.1.2, 2.1.3, 2.1.8, 4.2, and Table 6
Failure of Dams and Onsite Water Control/Storage Structures	Bounded by Streams and Rivers at Auxiliary Dam	None (below site grade)	Bounded by Streams and Rivers at Auxiliary Dam	2.1.9 and 4.9
Storm Surge (based on PMH)	252.0 (76.81) at Plant Island No analysis at Main Dam 252.0 (76.81) at Auxiliary Dam	2.9 ft (0.88) at Plant Island, wind setup and wave runup No analysis at Main Dam 4.2 ft (1.28 m) at Auxiliary Dam, wind setup and wave runup	254.9 (77.69) at Plant Island No CDB at Main Dam 256.2 (78.09) at Auxiliary Dam	2.1.8 and Table 6
Seiche	N/A	N/A	Not discussed in current design basis	2.1.4 and 4.4
Tsunami	N/A	N/A	Not discussed in current design basis	2.1.5 and 4.5
Ice-Induced	N/A	N/A	Not discussed in current design basis	2.1.6 and 4.6
Channel Migrations or Diversions	N/A	N/A	Not discussed in current design basis	2.1.7 and 4.7

N/A = Not Applicable

¹ Site grade at elevation 260.0 ft (79.25 m) NGVD29.

Table 4.0-1. Flood Event Duration for Reevaluated Hazards for Flooding-Causing Mechanisms Not Bounded by CDB Hazard

Flood-Causing Mechanism	Time for Site Preparation for Flood Event	Period of Site Inundation	Time for Recession of Water from Site
Local Intense Precipitation and Associated Drainage	0 hours	1 hour ¹	1 hour ¹
Storm Surge	36 hours	Site not inundated	Site not inundated
Flooding in Streams and Rivers	36 hours	Site not inundated	Site not inundated

¹These values are estimates by licensee, as analysis was limited to steady-state one-dimensional modeling.

Table 4.0-2. Reevaluated Flood-Causing Mechanisms and Associated Effects for Flooding-Causing Mechanisms Not Bounded by CDB Hazard

Flood-Causing Mechanism	Stillwater Elevation ¹ NGVD29	Associated Effects	Flood Hazard ^{1,2} NGVD29	Reference
<p>Local Intense Precipitation and Associated Drainage</p> <p>(based on 1-hr PMP)</p>	Varies with maximum of 261.4 ft (79.7 m) at the Diesel Fuel Oil Storage Tank and Waste Processing Buildings	Assumed drain blockages due to sediment, debris, or ice. Other associated effects: wind (N/A), hydrodynamic force (minimal), and groundwater effects (none).	<p>261.41 ft (79.68 m) at Diesel Fuel Oil Storage Tank Building (protected to 262.0 ft (79.86 m)); <u>not bounded</u> by CDB of 261.27 ft (79.64 m)</p> <p>261.36 ft (79.66 m) at Waste Processing Building (protected to 261.06 ft (79.57 m)); <u>not bounded</u> by CDB of 261.27 ft (79.64 m)</p>	FHRR, Table 3 and Table 6
<p>Streams and Rivers</p> <p>(based on PMF resulting from design storm consisting of antecedent storm at 0.4 x 72-hr PMP followed by 72-hr dry period followed by 72-hr PMP, combined with wind setup and wave runup)</p>	<p>256.50 ft (78.18 m) at Plant Island; <u>not bounded</u> by CDB of 256.0 ft (78.03 m)</p> <p>243.84 ft (74.32 m) at Main Dam; <u>not bounded</u> by CDB of 238.9 ft (72.82 m)</p> <p>256.50 ft (78.18 m) at Auxiliary Dam; <u>not bounded</u> by CDB of 256.0 ft (78.03 m)</p>	<p>1.14 ft (0.35 m)³ at Plant Island, wind setup and wave runup</p> <p>5.96 ft (1.82 m)³ at Main Dam, wind setup and wave runup</p> <p>2.84 ft (0.87 m)³ at Auxiliary Dam Upstream, wind setup and wave runup</p>	<p>257.64 ft (78.53 m) at Plant Island; bounded by CDB of 257.7 ft (78.55 m)</p> <p>249.80 ft (76.14 m) at Main Dam; <u>not bounded</u> by CDB of 243.1 ft (74.10 m)</p> <p>259.34 ft (79.05 m) at Auxiliary Dam; <u>not bounded</u> by CDB of 258.0 ft (78.64 m)</p>	FHRR, Section 3.2.1.5 and Table 6
<p>Storm Surge</p> <p>(based on PMH, combined with wind setup and wave runup)</p>	<p>252.0 ft (76.81 m) at Plant Island</p> <p>220.0 ft (67.06 m) at Main Dam</p> <p>252.0 ft (76.81 m) at Auxiliary Dam</p>	<p>2.47 ft (0.75 m) at Plant Island, wind setup and wave runup</p> <p>13.43 ft (4.09 m) at Main Dam, wind setup and wave runup</p> <p>5.85 ft (1.78 m) at Auxiliary Dam Upstream, wind setup and wave runup</p>	<p>254.47 ft (77.56 m) at Plant Island; bounded by CDB of 254.9 ft (77.69 m)</p> <p>233.43 ft (71.15 m) at Main Dam; no CDB</p> <p>257.85 ft (78.59 m) at Auxiliary Dam; <u>not bounded</u> by CDB of 256.2 ft (78.09 m)</p>	FHRR, Table 4 and Table 6

N/A = Not Applicable

¹ Numbers of significant figures in elevation and flood hazard values reflect those presented by the licensee in its FHRR

² Protected to 260.0 ft (79.25 m) NGVD29 unless otherwise noted.

³ Deduced from hazard elevation and stillwater elevation.

Table 5.0-1: Integrated Assessment Open Items

Deleted

(ADAMS Accession No. ML15153A104) that described the NRC’s mitigating strategies and flooding hazard reevaluation action plan.

As documented in the NRC staff assessment and the enclosed supplement, the staff has concluded that the licensee’s reevaluated flood hazard information is suitable for the assessment of mitigation strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and staff) for HNP. Further, the licensee’s reevaluated flood hazard information is suitable for other assessments associated with Near-Term Task Force Recommendation 2.1 “Flooding.”

The reevaluated flood hazard results for local intense precipitation, streams and rivers, and storm surge were not bounded by the current design-basis flood hazard. In order to complete its response to Enclosure 2 to the 50.54(f) letter, the licensee is expected to submit a revised integrated assessment or focused evaluation(s), as appropriate, to address these reevaluated flood hazards, as described in the NRC’s September 1, 2015, letter.

If you have any questions, please contact me at (301) 415-3809 or email at Juan.Uribe@nrc.gov.

Sincerely,

/RA/

Juan F. Uribe, Project Manager
 Hazards Management Branch
 Japan Lessons-Learned Division
 Office of Nuclear Reactor Regulation

Docket No. 50-400

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