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

May 9, 2017

Ms. Tanya Hamilton
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 – FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT (CAC NO. MF7931)

Dear Ms. Hamilton:

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54(f), "Conditions of Licenses" (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force report (ADAMS Accession No. ML111861807).

Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their site(s) using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses. Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

By letter dated December 21, 2016 (ADAMS Accession No. ML16348A010), Duke Energy Progress, LLC (Duke, the licensee) submitted its flooding mitigation strategies assessment (MSA) for Shearon Harris Nuclear Power Plant, Unit 1 (Harris). The MSAs are intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events. The purpose of this letter is to provide the NRC's assessment of the Harris MSA.

The NRC staff has concluded that the Harris MSA was performed consistent with the guidance described in Appendix G of Nuclear Energy Institute 12-06, Revision 2, as endorsed by Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01, Revision 1, and that the licensee has demonstrated that the mitigation strategies are reasonably protected from reevaluated flood hazards conditions for beyond-design-basis external events. This closes out the NRC's efforts associated with CAC No. MF7931.

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

Sincerely,

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

Enclosure:
Staff Assessment Related to the
Mitigating Strategies for Harris

Docket No. 50-400

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STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO MITIGATION STRATEGIES FOR SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1, AS A RESULT OF THE REEVALUATED FLOODING HAZARD NEAR-TERM TASK FORCE RECOMMENDATION 2.1 – FLOODING (CAC NO. MF7931)

1.0 INTRODUCTION

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), "Conditions of Licenses" (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807).

Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their respective site(s) using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses. Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). That order requires holders of operating reactor licenses and construction permits issued under 10 CFR Part 50 to modify the plants to provide additional capabilities and defense-in-depth for responding to beyond-design-basis external events, and to submit to the NRC for review a final integrated plan that describes how compliance with the requirements of Attachment 2 of the order was achieved. In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

The NRC staff and industry recognized the difficulty in developing and implementing mitigating strategies before completing the reevaluation of flood hazards. The NRC staff described this issue and provided recommendations to the Commission on integrating these related activities in COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flood Hazards," dated November 21, 2014 (ADAMS Accession No. ML14309A256). The Commission issued a staff requirements memorandum on March 30, 2015 (ADAMS Accession No. ML15089A236), affirming that the Commission expects licensees for operating nuclear power plants to address the reevaluated flood hazards, which are considered beyond-design-basis external events, within their mitigating strategies.

Nuclear Energy Institute (NEI) 12-06, Revision 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (ADAMS Accession No. ML16005A625), has been endorsed by the NRC as an appropriate methodology for licensees to perform assessments of the mitigating strategies against the reevaluated flood hazards developed in response to the March 12, 2012, 50.54(f) letter. The guidance in NEI 12-06, Revision 2, and Appendix G in particular, supports the proposed Mitigation of Beyond-Design-Basis Events rulemaking. The NRC's endorsement of NEI 12-06, including exceptions, clarifications, and additions, is described in Japan Lessons-Learned Division (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01, Revision 1,

"Compliance with Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events"" (ADAMS Accession No. ML15357A163). As discussed in JLD-ISG-2012-01, Appendix G of NEI 12-06, Revision 2, describes acceptable methods for demonstrating that the reevaluated flooding hazard is addressed within the Shearon Harris Nuclear Power Plant, Unit 1 (Harris) mitigating strategies for beyond-design-basis external events.

2.0 BACKGROUND

By letter dated March 12, 2013 (ADAMS Accession No. ML13079A253), Duke Energy Progress, LLC (Duke, the licensee) submitted the flood hazard reevaluation report (FHRR) for Harris in response to the 50.54(f) letter. By letters dated April 29, 2015 (ADAMS Accession No. ML15104A370), and November 2, 2015 (ADAMS Accession No. ML15301A557), the NRC staff provided the staff assessment documenting the results of the staff's review of the FHRR. The FHRR staff assessment provided the reevaluated flood hazard mechanisms that exceeded the current design basis (CDB) for Harris, which were to be used in conducting the mitigating strategies assessment (MSA), as described in NEI 12-06, Revision 2. For Harris, the mechanisms listed as not bounded by the CDB in the FHRR staff assessment are local intense precipitation (LIP), streams and rivers, and probable maximum storm surge (PMSS).

By letter dated December 21, 2016 (ADAMS Accession No. ML16356A665), Duke submitted the Harris MSA for review by the NRC staff.

3.0 TECHNICAL EVALUATION

3.1 Mitigating Strategies under Order EA-12-049

By letter dated February 28, 2013 (ADAMS Accession No. ML13112A020), Duke submitted its Overall Integrated Plan (OIP) for Harris in response to Order EA-12-049. At 6 month intervals following the submittal of the OIP, the licensee submitted reports on its progress in complying with Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff was conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). By letters dated February 12, 2014 (ADAMS Accession No. ML13364A214), and April 14, 2015 (ADAMS Accession No. ML15083A024), the NRC issued an Interim Staff Evaluation (ISE) and audit report, respectively, on the licensee's progress. By letter dated July 10, 2015 (non-public), as supplemented by letter dated June 29, 2016 (ADAMS Accession No. ML16182A047), Duke submitted its compliance letter and Final Integrated Plan (FIP) in response to Order EA-12-049. The compliance letter stated that the licensee had achieved full compliance with Order EA-12-049.

By letter dated August 30, 2016 (ADAMS Accession No. ML16217A449), the NRC staff issued a safety evaluation documenting the results of the NRC staff review of the FLEX strategies for Harris. The safety evaluation concluded that Duke has developed guidance to maintain or restore core cooling, spent fuel pool cooling, and containment which, if implemented appropriately, should adequately address the requirements of Order EA-12-049. Also, in December 2016, the NRC staff completed an inspection of the licensee's strategies (ADAMS Accession No. ML17011A222) that confirmed the licensee's compliance with the orders.

A brief summary of Harris' FLEX strategies are listed below:

- At the onset of an extended loss of ac power (ELAP), the operators initiate reactor and turbine trip and isolate the reactor coolant system (RCS) to prevent inventory loss. Duke will use the steam generators (SGs) as the heat sink for core cooling. The SGs will be fed by the Turbine-Driven Auxiliary Feedwater (TDAFW) pump, which is capable of operating for a minimum of 24 hours during an ELAP event. The condensate storage tank (CST) is the initial water source to the TDAFW pump.

- The Phase 2 core cooling strategy continues to use the SGs as the heat sink. Duke will transition to an electric motor-driven FLEX Auxiliary Feedwater (AFW) Pump, which can deliver water to the SG injection point.

- The CST water supply can provide at least 36 hours of cooling water for non-seismic events. For a seismic event, the CST is credited with providing at least 21 hours of cooling water. As CST depletion approaches, an Emergency Service Water (ESW) header may be pressurized by one of two portable FLEX ESW Pumps taking suction from an ESW pump bay in the ESW and Cooling Tower Make-up Water Intake Structure.

- Duke will restore power to selected plant equipment at Harris and provide power to FLEX equipment using a permanently pre-staged FLEX Diesel Generator (DG) located in the Emergency Diesel Generator Building. A second permanently pre-staged DG provides backup capability. Duke plans to establish FLEX Power within 6 hours of the event.

- An electric-powered FLEX RCS pump will be mobilized at the Charging/Safety Injection Pump (CSIP) rooms to provide RCS makeup as well as maintain subcriticality, using RCS boration. The sources of borated water will be from the Boric Acid Tank (BAT), Alternate Seal Injection (ASI) Tank, or Refueling Water Storage Tank (RWST).

- The Phase 3 core cooling strategy continues to use the SGs as the heat sink. If necessary, the FLEX RCS, AFW, and ESW pumps can be replaced by pumps from the National Strategic Alliance for FLEX Emergency Response (SAFER) Response Center (NSRC). Duke will also receive water treatment equipment from the NSRC to ensure a long-term source of clean water for core cooling.

3.2. Evaluation of Current FLEX Strategies Against Reevaluated Hazard(s)

The licensee has assessed the potential impacts of the LIP, streams and rivers, and PMSS, as described in the staff assessment letter, against the mitigating strategies designed to meet Order EA 12 049. The purpose of the MSA is to determine if mitigating strategies are adequate as-is, need to be modified, or new mitigating strategies need to be developed to address the hazard exceedances.

Overall, the licensee concluded that the existing FLEX strategies can be successfully implemented and deployed, as designed, for all applicable flood-causing mechanisms at Harris.

3.2.1 Summary of Mitigating Strategies Assessment

In its MSA, the licensee described that implementation of the FLEX strategies at Harris is divided into three phases. In general, the first phase is to initially cope by relying on installed plant equipment, the second phase is to transition from installed plant equipment to the on-site FLEX equipment, and the third phase is to obtain additional capability and redundancy from off-site equipment.

The licensee had previously stated in the FIP (Section 2.3.4.1) that protection of the FLEX strategies from applicable extreme external hazards is provided by site structures. The Containment Building, the Reactor Auxiliary Building (RAB), the Tank Building, the Diesel Fuel Oil Storage Building (DFOSTB), the Emergency Service Water and Cooling Tower Make-up Water Intake Structure, and the Emergency Diesel Generator (EDG) Building are all Seismic Category I structures designed to provide protection from applicable extreme external hazards.

For LIP, the NRC staff confirmed in the FHRR staff assessment that the reevaluated flood hazard, including associated effects, is elevation 261.4 feet (ft) NGVD29 (all elevations in this assessment are associated with this datum unless specified otherwise).

With regards to safety-related systems, structures, and components (SSCs), the licensee stated in its MSA that flood levels are either lower than the CDB flood level or the protected elevation. Specifically, all SSCs are protected from flooding up to elevation 262 ft at the Turbine Building (TB), EDG Building, and DFOSTB by curbing or raised entrances. With regards to other structures, the licensee determined that two doors in the Waste Process Building (WPB) do not have flood protection for flood levels higher than 261.06 ft. However, the licensee also stated in its MSA, that these two entrances to the WPB provide access to areas which do not house any safety-related equipment.

As a result of the above analysis, the licensee concluded in its MSA that flooding levels due to LIP have no impact on the storage, deployment, and implementation of FLEX strategies; and that no procedural changes or additional actions were required.

For streams and rivers, the NRC staff confirmed in the staff assessment that the reevaluated flood hazard is based on a stillwater-surface elevation of 256.5 ft at the Plant Island, 243.8 ft at the Main Dam, and 259.3 ft at the Auxiliary Dam. Inclusion of the effects from wind setup and wave runup results in an elevation of 256.5 ft at the Plant Island, 249.8 ft at the Main Dam, and 259.3 ft at the Auxiliary Dam.

For PMSS, the NRC staff confirmed in the staff assessment that the reevaluated hazard (including associated effects) for site flooding near Harris is 254.5 ft. At the Auxiliary Dam, the NRC staff also confirmed that the reevaluated hazard elevation of 257.9 ft is not bounded by the design-basis of 256.2 ft. No design-basis flood event was evaluated at the Main Dam at the time of licensing, where the reevaluated flood hazard elevation is 233.4 ft using present day methods and guidance.

In its MSA submittal, the licensee stated that flooding levels due to streams and rivers, PMSS, and combined effects flooding (streams and rivers PMF with coincident wind-wave effects) affect the entire watershed, including dams, reservoirs, and the plant site. However, the licensee also stated that the crests (protected elevation) of both the Auxiliary and Main Dams are located at elevation 260 ft, and as such, are greater than the reevaluated flood hazards.

As a result, the licensee stated that the plant site is bounded for these events by the CDB and concluded in the MSA that for streams and rivers and PMSS flood causing mechanisms have no impact on the storage, deployment, and implementation of FLEX strategies.

3.2.2 Summary of NRC Staff Evaluation

The NRC staff has reviewed the information presented in the MSA, as well as supporting documentation. This included:

- Review of licensing documents and previous NTTF flooding submittals;
- Review of the topographical features of the site; and
- Review and documentation of existing mitigating strategies under Order EA-12-049.

The Harris MSA identified the following reevaluated flood-causing mechanisms as not bounded by the current design basis: LIP; streams and rivers; and PMSS. The NRC staff confirmed that these reevaluated hazards and respective elevations used in the MSA evaluation by the licensee match the values listed in the Harris staff assessment, as described in Section 2 of this document, and therefore are suitable input for the MSA.

As part of the MSA review, the NRC staff sought to confirm if the reevaluated hazards listed above had any impact on the storage location(s) for FLEX equipment, deployment paths, hauling routes, connection points, staging areas, etc.

For LIP, the NRC staff had previously concluded in its August 30, 2016, safety evaluation that the licensee has developed guidance that, if implemented appropriately, should protect the FLEX equipment and adequately addresses the requirements of Order EA-12-049. The NRC staff compared the elevation of the FLEX storage buildings to the reevaluated hazard elevation. The following table summarizes the results of the MSA LIP review:

Location	Flood Protection Elevation	Reevaluated LIP Elevation	Protected?	Reference
EDG Building	262 ft	261.12 ft	Y	FSAR, Rev 26, Section 3.4
Reactor Auxiliary Building and Tank building	262 ft	261.36 ft	Y	FSAR, Rev 26, Section 3.4
DFOSTB	262 ft	261.41 ft	Y	FSAR, Rev 26, Section 3.4

Based on the elevations of the FLEX storage buildings when compared to the reevaluated LIP hazard, the NRC staff concludes that the FLEX equipment storage locations are protected against the reevaluated LIP hazard. Since no other changes were made to previously reviewed information, the NRC staff agrees that FLEX equipment appears to be reasonably protected from the reevaluated LIP hazard.

The NRC staff then verified that deployment and haul paths, staging areas; and connection points, among others, were not adversely impacted by the reevaluated LIP hazard.

In its FIP, Duke stated that FLEX strategies at Harris were developed such that most FLEX equipment does not require outdoor transportation. Duke also designated outdoor FLEX staging areas and haul paths to support deployment of FLEX strategies. Also in the FIP, Duke stated that due to the diverse haul path options, no logistical bottlenecks, and the fact that the vast majority of the required response equipment is stored inside the protected area, such pathways do not require specific programmatic monitoring or control. Furthermore, debris removal equipment stored in robust structures is maintained available such that pathways may be cleared in a timely manner following a BDBEE. In its August 30, 2016, safety evaluation, the NRC staff had already concluded that the licensee has developed guidance that, if implemented appropriately, should allow deploying the FLEX equipment consistent with NEI 12-06, as endorsed by JLD-ISG-2012-01, and should adequately address the requirements of Order EA-12-049.

The licensee stated in its MSA that the reevaluated LIP hazard does not cause an ELAP or a loss of ultimate heat sink (LUHS) scenario. In addition, the licensee also stated that the reevaluated flood hazard period of concentration is on the order of seven to 52 minutes and that the total duration of peak flood elevation is not expected to exceed 30 minutes based on the one-hour rainfall distribution for the local PMP. The licensee also concluded that Phase 1 FLEX response can continue well beyond the LIP flood duration; and that deployment of personnel or FLEX equipment is not required before floodwaters recede. The flood hazard does not impact the FLEX storage and deployment strategies. The time when the ELAP/LUHS occurs has no consequence on FLEX strategies.

The MSA states that the reevaluated LIP hazard has a period of inundation of 1 hour and a recession period of 1 hour, and that the total duration of peak flood elevation is not expected to exceed 30 minutes based on the one-hour rainfall distribution for the local PMP. The NRC staff reviewed the FIP, Section 2.9, "Sequence of Events," and confirmed that that during the first two hours of the event (corresponding to inundation and recession periods), Phase 1 FLEX strategies are not impacted and can continue well beyond the LIP flood duration.

For streams and rivers and PMSS, the NRC staff confirmed that the reevaluated hazard levels are below the protected capacity of the main and auxiliary dams of elevation 260 ft, and as such, the plant site is protected for these events. Therefore, these events have no impact on the storage, deployment, and implementation of FLEX strategies.

Based on the review of the above information, the NRC staff finds that Duke has adequately assessed the mitigating strategies against the reevaluated flood hazard information for the LIP, streams and rivers, and PMSS events at Harris; and that the existing FLEX strategies can be implemented and are reasonably protected from these reevaluated flood hazard conditions.

3.3 Evaluation of Flood Event Duration

The NRC staff reviewed the information provided by Duke in its MSA and FHRR regarding the flood event duration (FED) parameters needed to perform the MSA for flood causing-mechanisms not bounded by the CDB. The FED parameters for these flood-causing mechanisms are summarized in Table 3.3.-1.

For LIP, the licensee stated in its MSA that the maximum water elevation remains above two door sills that are not pathways for safe-shutdown equipment for an inundation period up to 1 hour after the start of rainfall. Buildings containing safety-related SSCs are protected to a water level higher than the maximum elevation computed for the LIP event. The licensee defined a

warning time of 0 hours and a period of recession of 1 hour. The MSA states that the LIP warning time is not required to execute the FLEX procedures because the site's UHS is not challenged by the LIP event. The maximum water elevations and inundation periods for different locations across the power block are listed in Table 6 of the FHRR, supplemented as described in the staff assessment. The licensee used results from a steady-state numerical model, as described in the FHRR, to qualitatively estimate the inundation duration and period of recession parameters. The staff confirmed that the licensee's reevaluation of the inundation periods for LIP and associated drainage uses present-day methodologies and regulatory guidance.

For the streams and rivers and storm surge flood-causing mechanisms, the staff determined during its review of the FHRR that the licensee's warning time of 36 hours is acceptable and that other FED parameters are not applicable because the site would not be inundated from these events.

In summary, the NRC staff agrees with the licensee's conclusion related to determining the FED parameters as the approach is consistent with the guideline provided by Appendix G of NEI 12-06, Revision 2. Based on this review, the staff determined that the licensee's FED parameters are reasonable and acceptable for use in the MSA.

3.4 Evaluation of Associated Effects

The staff reviewed the information provided by Duke in its FHRR, supplemented as described in the staff assessment, and the MSA regarding reevaluated associated effects (AE) parameters for flood hazards not bounded by the CDB. The AE parameters related to water surface elevation (i.e., stillwater elevation with wind waves and runup effects) were previously reviewed by the NRC staff, and the conclusions were transmitted to the licensee by letter dated November 2, 2015. The AE parameters not directly associated with water surface elevation are discussed below and summarized in Table 3.4-1.

For the LIP event, the licensee identified in its FHRR and its MSA that the water velocities, which are proportional to the hydrostatic and hydrodynamic loads, are low at the site and that the corresponding hydrodynamic and debris loads are minimal. This estimation is based on the result of a one-dimensional numerical model as described in FHRR. The licensee also stated that the other associated effects (including sediment deposition and erosion, debris, groundwater ingress, and others) were minimal due to shallow flow depths and slow water velocities. In addition, buildings containing safety-related SSCs are protected by curbing or raised entrances. The NRC staff confirmed the licensee's statements by reviewing the licensee-provided LIP model's input and output files and verified that the inundation depths and water velocities are appropriate and reasonable for use as part of the MSA.

For streams and rivers and storm surge flood events, the staff had previously concluded in the staff assessment that all AE parameters are not applicable because the site would not be inundated from these flood-causing mechanisms.

In summary, the NRC staff concludes the licensee's methods were appropriate and the AE parameter results are reasonable for use in the MSA.

3.5 Conclusion

The NRC staff has reviewed the information provided in the Harris MSA related to the original FLEX strategies, as assessed against the reevaluated hazard(s). The staff concludes that the licensee has demonstrated the capability to implement FLEX strategies, as designed, against the reevaluated hazards described in the staff assessment. The NRC staff made its determination based upon:

- For the streams and rivers and PMSS flood causing mechanisms, the protected elevation of the Auxiliary and Main Dams bound the reevaluated hazard levels. Therefore, no impact is expected to occur at the site.

- For LIP, all FLEX storage locations are protected to elevations above the reevaluated hazard level.

- For LIP, two locations in the WPB were identified as being impacted by the reevaluated flood hazard level. However, these locations do not store any safety-related systems or components or FLEX equipment.

- In general, Duke designed strategies such that most FLEX equipment does not require outdoor transportation. Furthermore, Phase 1 FLEX response can continue well beyond the LIP flood duration and the licensee has verified that deployment of personnel or FLEX equipment is not required before floodwaters recede.

Therefore, the NRC staff concludes that the licensee has demonstrated the capability to implement the original FLEX strategies, as designed, under the conditions associated with the reevaluated LIP, streams and rivers, and PMSS floods, including associated effects and flood event duration, as described in NEI 12-06, Revision 2, and JLD-ISG-2012-01, Revision 1.

4.0 CONCLUSION

The NRC staff has reviewed the information presented by the licensee in its MSA for Harris. The NRC staff confirmed that the licensee's flood hazard MSA for Harris was performed consistent with the guidance in Appendix G of NEI 12-06, Revision 2, as endorsed by JLD-ISG-2012-01, Revision 1. Based on the licensee's use of the hazards characterized in the NRC FHRR staff assessment, the methodology used in the Harris MSA evaluation, and the description of its current FLEX strategy in the Harris MSA and supporting documentation, the NRC staff concludes that the licensee has demonstrated that the mitigation strategies are reasonably protected from reevaluated flood hazards conditions.

Table 3.3-1. Flood Event Durations for Flood-Causing Mechanisms Not Bounded by the CDB

Flood-Causing Mechanism	Time Available for Preparation for Flood Event	Duration of Inundation of Site	Time for Water to Recede from Site
Local Intense Precipitation and Associated Drainage	0 hour	1 hour (1)	1 hour (1)
Flooding from Streams and Rivers	36 hours	Not Applicable (2)	Not Applicable (2)
Storm Surge	36 hours	Not Applicable (2)	Not Applicable (2)

Source: (FHRR, staff assessment and MSA)
Notes:
(1) Values are qualitatively estimated, as elevations were computed using a steady-state numerical model.
(2) The plant site would not be inundated.

TABLE 3.4-1. ASSOCIATED EFFECTS PARAMETERS NOT DIRECTLY ASSOCIATED WITH TOTAL WATER HEIGHT FOR FLOOD-CAUSING MECHANISMS NOT BOUNDED BY THE CDB

Associated Effects Parameter	Local Intense Precipitation and Associated Drainage	Flooding from Streams and Rivers (1)	Storm Surge (1)
Hydrodynamic loading at plant grade	Minimal	Not Applicable	Not Applicable
Debris loading at plant grade	Minimal	Not Applicable	Not Applicable
Sediment loading at plant grade	Minimal	Not Applicable	Not Applicable
Sediment deposition and erosion	Minimal	Not Applicable	Not Applicable
Concurrent conditions, including adverse weather - Winds	Hail, strong wind, tornado possible	Not Applicable	Not Applicable
Groundwater ingress	Minimal: Waterproof protection to elevation 259.0 ft; floor drains and sump pumps in place; FLEX strategies not affected	Not Applicable	Not Applicable
Other pertinent factors (e.g., waterborne projectiles)	Tornado possible	Not Applicable	Not Applicable

Source: (FHRR, staff assessment and MSA)
Notes:
(1) The plant site would not be inundated.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 – FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT DATED May 9, 2017

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