ENCLOSURE 2

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2

Prairie Island External Flooding Assessment
Focused Evaluation

(REDACTED VERSION)

(22 pages to follow)

Xcel Energy

Contract No. 00047588

Prairie Island External Flooding Assessment Focused Evaluation

CLIENT APP.: N/A

BLACK & VEATCH

Overland Park, KS

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PRAIRIE ISLAND NUCLEAR GENERATING PLANT

FLOODING FOCUSED EVALUATION SUMMARY

1.0 EXECUTIVE SUMMARY

The Prairie Island Nuclear Generating Plant (PINGP) has reevaluated its flooding hazard in accordance with the NRC's March 12, 2012, 10 CFR 50.54(f) request for information (RFI) (Reference 1). The RFI was issued as part of implementing lessons learned from the Fukushima Dai-ichi accident; specifically, to address Recommendation 2.1 of the NRC's Near-Term Task Force report. This information was submitted to NRC in a flood hazard reevaluation report (FHRR) on May 9, 2016, (Reference 2) as supplemented by letter dated September 29, 2016 (Reference 3), and is provided in the Mitigating Strategies Flood Hazard Information (MSFHI) documented in NRC's "Interim Staff Response to Reevaluated Flood Hazards" letter dated October 17, 2016 (Reference 10). No changes to the flooding analysis have been performed since the issuance of the MSFHI letter and this flooding analysis will serve as the input to this Focused Evaluation (FE). There is one mechanism that was found to exceed the design basis flood level at the PINGP. This mechanism is listed below and addressed in this FE:

1. Local Intense Precipitation (LIP)

   Associated effects (AE) and flood event duration (FED) parameters were assessed and submitted as a part of the FHRR. The FE affirms that during LIP events the site has effective flood protection through the determination of adequate Available Physical Margin (APM) and the reliability of protection features. The site does not require any human actions to protect Key SSCs so an evaluation of the overall site response was not necessary. This FE follows Path 2 of NEI 16-05, Rev. 1 (Reference 8), and utilizes Appendix B for guidance for evaluating the site protection features. This submittal completes the actions related to External Flooding required by the March 12, 2012 10 CFR 50.54(f) letter.

2.0 BACKGROUND

On March 12, 2012, the NRC issued Reference 1 to request information associated with Near-Term Task Force (NTTF) Recommendation 2.1 for flooding. The RFI (Reference 1) directed licensees, in part, to submit a Flood Hazard Reevaluation Report (FHRR) to reevaluate the flood hazards for their sites using present-day methods and guidance used for early site permits and combined operating licenses. For the PINGP, Units 1 and 2, the FHRR was submitted on May 9, 2016 (Reference 2) and supplemented by letter dated September 29, 2016 (Reference 3).

Following the Commission's directive to NRC Staff in Reference 7, the NRC issued a letter to industry (Reference 6) indicating that new guidance is being prepared to replace instructions in Reference 5 and provide for a "graded approach to flooding reevaluations" and "more focused evaluations of local intense precipitation and available physical margin in lieu of proceeding to an integrated assessment." NEI prepared the new "External Flooding Assessment Guidelines" in NEI 16-05 (Reference 8), which was endorsed by the NRC in Reference 9. NEI 16-05 indicates that each flood-causing mechanism not bounded by the design basis flood (using only stillwater and/or wind-wave runup level) should follow one of the following five assessment paths:

- Path 1: Demonstrate Flood Mechanism is Bounded Through Improve Realism
- Path 2: Demonstrate Effective Flood Protection
- Path 3: Demonstrate a Feasible Response to LIP
- Path 4: Demonstrate Effective Mitigation
- Path 5: Scenario Based Approach

Non-bounded flood-causing mechanisms in Paths 1, 2, or 3 only require an FE to complete the actions related to external flooding required by the March 12, 2012, 10 CFR 50.54(f) letter. Mechanisms in Paths 4 or 5 require an Integrated Assessment.

3.0 REFERENCES

1. U.S. Nuclear Regulatory Commission 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.

2. NSPM Letter L-PI-16-039, to the U.S. Nuclear Regulatory Commission, "Prairie Island Nuclear Generating Plant, Units 1 and 2, Response to March 12, 2012 Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, Flooding Hazard Reevaluation Report," dated May 9, 2016, (ADAMS Accession No. ML16133A041).

3. NSPM Letter L-PI-16-076 to the U.S. Nuclear Regulatory Commission, "Prairie Island Nuclear Generating Plant, Units 1 and 2 - Supplement to the Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, Flood Hazard Reevaluation Report," dated September 29, 2016, (ADAMS Accession No. ML16273A556).

4. U.S. Nuclear Regulatory Commission Letter, Supplemental Information Related to Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) regarding Flooding Hazard Reevaluations for Recommendation 2.1 of the Near Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 1, 2013.

5. U.S. Nuclear Regulatory Commission Letter, "Trigger Conditions For Performing An Integrated Assessment And Due Date For Response," dated December 3, 2012, (ADAMS Accession No. ML12326A912).

6. U.S. Nuclear Regulatory Commission Letter, "Coordination of Requests for Information Regarding Flooding Hazard Reevaluations and Mitigating Strategies for Beyond-Design-Basis External Events," dated September 1, 2015, (ADAMS Accession No. ML15174A257).

7. Commission Staff Requirements Memo (SRM), "SRM-COMSECY-14-0037: Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards," dated March 30, 2015, (ADAMS Accession No. ML15089A236).

8. Nuclear Energy Institute (NEI), Report NEI 16-05 [Rev 1], External Flooding Assessment Guidelines, dated June 2016.

9. U.S. Nuclear Regulatory Commission, JLD-ISG-2016-01, Revision 1, Guidance for Activities Related to Near-Term Task Force Recommendation 2.1, Flooding Hazard Reevaluation; Focused Evaluation and Integrated Assessment, dated July 11, 2016.

10. U.S. Nuclear Regulatory Commission, Letter to Scott D. Northard, Northern States Power Company - Minnesota, "Subject: Prairie Island Nuclear Generator Plant, Units 1 and 2 - Correction to Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request - Flood-Causing Mechanism Reevaluation (CAC Nos. MF7710 and MF7711)," Dated October 17, 2016, (ADAMS Accession No. ML16286A161).

11. Black & Veatch, "Local Intense PMP & Hydrology," Calculation 180461.51.1005, Revision 1.

12. NSPM, "Prairie Island Updated Safety Analysis Report," Revision 34P.

13. NSPM, Procedure AB-4, "Flood," Revision 50.

14. NSPM, Calculation ENG-ME-529, "Flood Barrier Leakage Criteria," Revision 0.

15. Black & Veatch, "D5/D6 Fuel Oil Tank Vault Free Volume," Calculation 180689.51.1016, Revision 0.

16. NSPM, Drawing NF-117027, "Fuel Oil Storage Vault Plans," Revision A.

17. Black & Veatch, "Evaluation of Structural Elements - Flood," Calculation 180461.51.1008, Revision 1.

18. NSPM, Calculation ENG-ME-448, "Auxiliary Building Flooding Analysis," Revision 1.

19. NSPM, Drawing NF-117023, "D5/D6 Bldg. – Architectural Door Schedule & Door Details," Revision B.

4.0 TERMS AND DEFINITIONS

AE – Associated Effects
AFW – Auxiliary Feedwater
APM – Available Physical Margin
EDG – Emergency Diesel Generator
FE – Focused Evaluation
FED – Flood Event Duration
FFE – Finished Floor Elevation
FHRR – Flood Hazard Reevaluation Report
FIAP – Flooding Impact Assessment Process
FLEX – Diverse and flexible coping strategies covered by NRC order EA-12-049
Key SSC – A system Structure or Component relied upon to fulfill a Key Safety Function
KSF – Key Safety function, i.e. core cooling, spent fuel pool cooling, or containment function.
LIP – Local Intense Precipitation
MSA – Mitigating Strategies Assessment
MSFHI – Mitigating Strategies Flood Hazard Information
NTTF – Near Term Task Force commissioned by the NRC to recommend actions following the Fukushima Dai-ichi accidents
PINGP – Prairie Island Nuclear Generating Plant
PMF – Probable Maximum Flood
RFI – Request for Information
RHR – Residual Heat Removal
WSE – Water Surface Elevation

5.0 FLOOD HAZARD PARAMETERS FOR UNBOUNDED MECHANISMS

The NRC has completed the "Interim Staff Response to Reevaluated Flood Hazards" (Reference 10) which contains the Mitigating Strategies Flood Hazard Information (MSFHI) related to the PINGP's Flood Hazard Reevaluation Report (Reference 2). In Reference 10, the NRC states that:

> "The NRC staff has concluded that the licensee's reevaluated flood hazards information, as summarized in the enclosure, 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 NRC staff) for Prairie Island. Further, the NRC staff has concluded that the licensee's reevaluated flood hazard information is a suitable input for the other assessments associated with Near-Term Task Force Recommendation 2.1 'Flooding.'"

The enclosure to Reference 10 includes a summary of the current design basis and reevaluated flood hazard parameters, respectively. In Table 1 of the enclosure to Reference 10, the NRC lists the following flood-causing mechanisms for the design basis flood:

- Local Intense Precipitation;
- Streams and Rivers;
- Failure of Dams and Onsite Water Control/Storage Structures;
- Storm Surge;
- Seiche;
- Tsunami;
- Ice Induced Flooding; and
- Channel Migrations/Diversions.

In Table 2 of the enclosure to Reference 10, the NRC lists flood hazard information (specifically stillwater elevation and wind-wave runup elevation) for the following flood-causing mechanism that is not bounded by the design basis hazard flood level. This is provided below in Table 5-1.

Table 5-1 Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Mechanism	Stillwater Elevation	Waves/Runup	Reevaluated Flood Hazard
Local Intense Precipitation	695.4 ft NGVD29	Minimal	695.4 ft NGVD29

This is the reevaluated flood-causing mechanism that should be addressed in the external flooding assessment. The one non-bounding flood mechanism for the PINGP is described in detail in References 2 and 3, the FHRR submittals. Table 5-2 summarizes how the unbounded mechanism is addressed in this external flooding assessment:

Table 5-2 Approach for Evaluation of Non-Bounded Flood Mechanism

	Flood Mechanism	Summary of Assessment
1	Local Intense Precipitation	Path 2 is pursued for the PINGP since permanent passive protection features are solely relied upon to maintain KSFs (see FIAP Path Determination Table, Section 6.3.3 of NEI 16-05).

6.0 OVERALL SITE FLOODING RESPONSE

6.1 DESCRIPTION OF OVERALL SITE FLOODING RESPONSE

The LIP calculation for the PINGP is provided in Reference 11; which describes the inputs, assumptions, methodology, and results. Permanent protection features such as characterized topographic and man-made features that affected runoff from a LIP were modeled. The timelines for the cumulative precipitation and precipitation rates during the LIP are shown in Table 6.1-1. The precipitation rate is determined by dividing the change in cumulative precipitation by the change in time duration.

Table 6.1-1, Precipitation Cumulative Precipitation and Rates

Time Duration	Cumulative Precipitation (inches)	Precipitation Rate (inches/hour)
5 min	4.6	55.2
15 min	7.3	16.2
30 min	10.4	12.4
1 hr	13.4	6.0
6 hr	21.0	1.5

The period of inundation during the LIP varies throughout the site; however, at the location with the highest flood depth, it was estimated that water level would remain above finished floor elevation for 66 minutes (Reference 11). Once the flood waters recede below finished floor elevation, it would take approximately 5.4 hours for flood waters to completely recede from areas near the critical doors, which is approximately within 30 minutes after the end of the 6-hr storm LIP event.

The PINGP is designed for a Probable Maximum Flood (PMF) from the Mississippi River with a flood water elevation up to 703.6 ft (Reference 12). The majority of the plant structures are capable of withstanding the PMF without protection measures being implemented; i.e., permanent passive protection. Selected actions are implemented in anticipation of a PMF to provide full protection. The water surface elevation during a PMF is much greater than during a LIP; thus, the permanent passive protection features are capable of withstanding a LIP. For the LIP, warning time is not credited.

Flood preparation measures for a PMF are implemented per procedure AB-4 (Reference 13). Specific measures are taken as part of Reference 13 for preparation for a flood from the Mississippi River. Due to absence of warning time the following actions would not be implemented for a LIP flood. Thus, the evaluation for the LIP focuses on these protection features credited for the PMF that would not be in place for the LIP.

- Installation of flood bulkheads and sealing flood doors. As part of preparation for a PMF, flood waters entering the plant through doors are precluded by either sealing plant access doors, or installing bulkheads over the other access doors.

- Installation of blind flanges on the D5/D6 fuel oil tank overflow lines. The tank overflow line is routed to the associated tank vault. This action precludes water from entering the fuel oil tanks for Emergency Diesel Generators D5 and D6 through the tank overflow line in the event that inleakage to the vault occurred during the PMF.

The evaluation of the plant flood protection features for the LIP considers these differences; specifically, the impact of water intrusion at doors that would be protected during a PMF, the structural impacts of the hydraulic loads to doors that would be protected by the bulkheads, and the potential for water intrusion into the D5/D6 Fuel Oil Tank Vaults.

6.2 SUMMARY OF PLANT MODIFICATIONS AND CHANGES

The PINGP has completed the flooding evaluations for the LIP. There are no remaining actions (plant modifications, procedural changes, or procurement activities) necessary to implement flood strategies described.

7.0 FLOOD IMPACT ASSESSMENT

7.1 LOCAL INTENSE PRECIPITATION

7.1.1 Description of Flood Impact

As described in Section 6.1, the majority of the plant is passively protected for a PMF; which has a much higher flood elevation than the LIP. Therefore, these passive protection features are bounded for the LIP by the PMF. The exceptions are:

- During a LIP the access doors to the plant structures may either be closed and not sealed or possibly open.
- During a LIP the blind flanges would not be installed in the D5/D6 Fuel Oil Tank overflow lines.

Table 7.1-1 below summarizes Key SSCs and the minimum critical water elevation in each structure that could impact Key SSCs. There may be other Key SSCs located in the structure at higher elevations. To be conservative only the lowest elevation is considered.

Table 7-1.1, Key SSCs and Associated Critical Elevation

Structure	Key SSC	Critical Elevation (ft)	Notes
Unit 1 Turbine Building	D1/D2 EDG Room	694.90	(1)
Unit 2 Turbine Building	D1/D2 EDG Room	694.90	(2)
Auxiliary Building	RHR Pits	695.75	(3)
D5/D6 Building	Fuel Oil Pump Motors	694.90	(4)
Screenhouse	Safety Related Power Cables	694.90	(5)
D5/D6 Fuel Oil Tank Vault	Fuel Oil Tanks	686.92	(6)

Notes:

(1) At elevation 694.90 ft, water could enter the Unit 1 Turbine Building. Inleakage would start to fill the condenser pit. The limiting water elevation in the Unit 1 condenser pit is where water could start to back-up into the D1 and D2 Room trenches at 693.83 ft in the Unit 1 condenser pit. The Unit 1 condenser pit can accommodate a total of 89,537 ft^3 not including the sump pit (Reference 14) below elevation 693.83 ft.

(2) The Unit 2 condenser pit can accommodate a total of 101,672 ft^3 below elevation 695 ft (Reference 14). It is possible for water to leak from the Unit 2 Turbine Building into the Unit 1 Turbine Building past closed doors at the 480 VAC Bus Rooms, the Battery Rooms, or the AFW Pump Rooms. In this case total leakage that can be accommodated into the Unit 2 Turbine Building is the sum of the Unit 1 and Unit 2 condenser pits; 89,537 ft^3 + 101,672 ft^3 = 191,209 ft^3.

(3) Above elevation 695.75 ft, water would flow over the barriers surrounding the openings into the Residual Heat Removal (RHR) pits. To fill the Auxiliary Building to 695.75 ft would require approximately 23,959 ft^3 of water (Reference 18).

(4) At elevation 694.90 ft, water could enter the D5/D6 Diesel Generator Rooms from inleakage past closed doors. Inleakage to the D5 and/or D6 Room would accumulate in the lower elevation. The lower elevation can accommodate water level up to the bottom of the motors for the Fuel Oil Transfer Pumps and the Fuel Oil Recirculation Pump (Reference 14). At this elevation there is a total available volume of 16,760 gallons (2240 ft^3) in the D5 compartment and 17,627 gallons (2356 ft^3) in the D6 compartment to accommodate potential inleakage.

(5) At elevation 694.90 ft, water could enter the Screenhouse. Inleakage would start to fill the Screenhouse basement. Water depth in the Screenhouse basement greater than elevation 687 ft (water depth of 17 ft) will cover cables supplying power to the safety related cooling water pumps (Reference 14). It is considered to be conservative to use this as a minimum water level as the cables contain no splices or terminations at this elevation. In the Screenhouse basement, there are 22,242 gallons/ft of available water volume per foot (Reference 14). The available volume to accommodate inleakage below elevation 687 ft is 17 ft * 22,242 gallons per ft = 378,114 gallons (50,550 ft^3).

(6) Water depth in the fuel oil vault above 686.92 ft could enter the fuel oil storage tanks through the tank overflow line. The available volume to accommodate inleakage below elevation 686.92 ft in the vault is 45,932 gallons (6140.3 ft^3) (Reference 15).

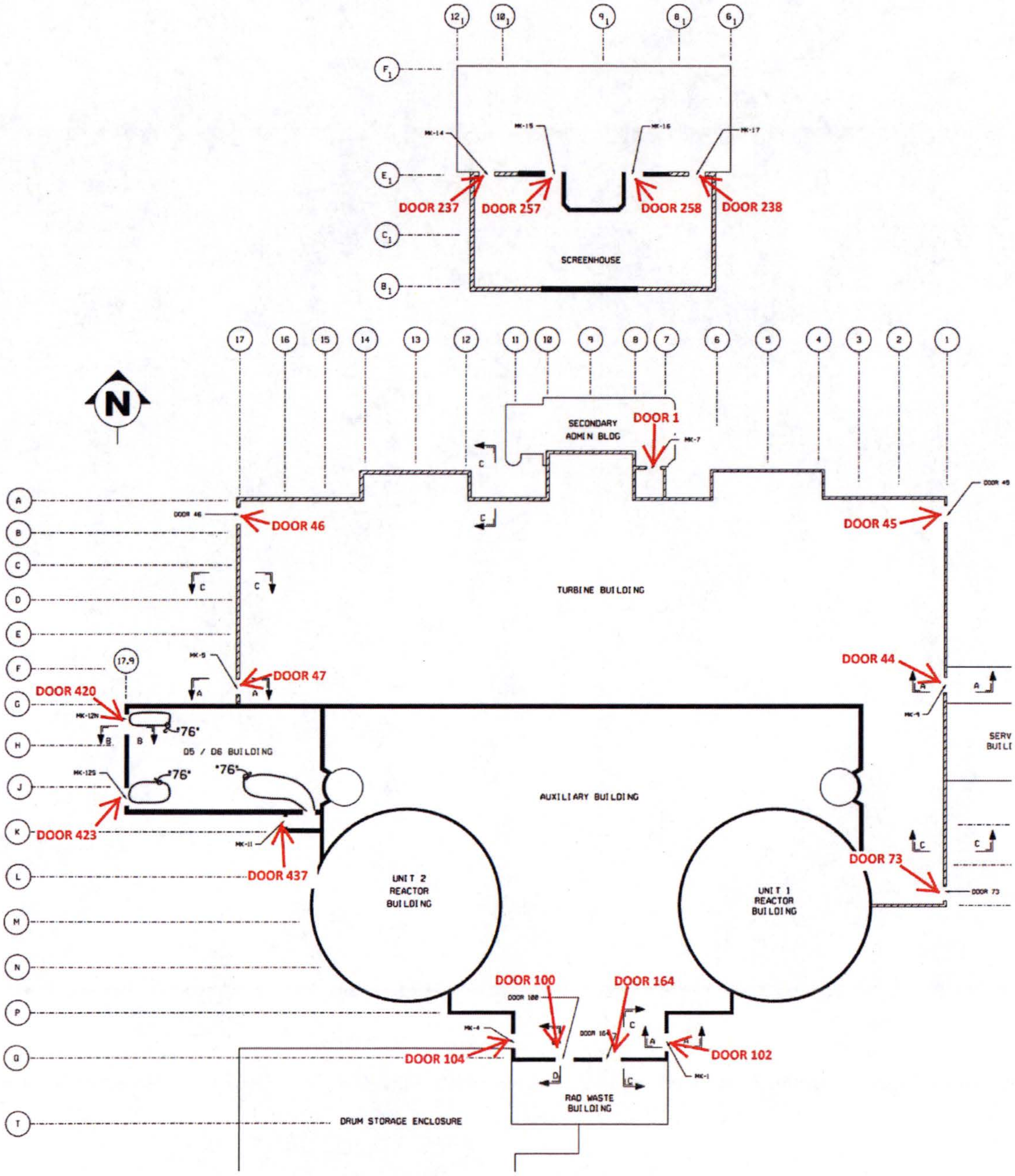
Table 7.1-2 shows the predicted maximum water surface elevations (WSE) at the plant access doors during the LIP (Reference 11). As shown in Table 7.1-2, the maximum water surface elevations around the plant structures can be up to 0.45 ft above the finished floor elevation (FFE) elevation for some of the plant access doors. The locations of the plant access doors are shown in Figure 7.1-1.

Table 7.1-2, Maximum Water Surface Elevations (WSE) at Plant Access Doors

Door Number	Description	Max WSE (ft)	Survey FFE (ft)	Maximum Depth Above FFE (ft)
237	Screenhouse	694.82	694.90	Below FFE
257	Screenhouse	694.82	694.90	Below FFE
258	Screenhouse	694.82	694.90	Below FFE
238	Screenhouse	694.82	694.90	Below FFE
1	Old Admin Building	694.82	694.90	Below FFE
47	Turbine Building	695.17	694.90	0.27
46	Turbine Building	694.74	694.90	Below FFE
45	Turbine Building	694.82	694.90	Below FFE
44	Turbine Building/Service Building	694.77	694.90	Below FFE
73	Turbine Building	694.76	694.90	Below FFE
104	Auxiliary Building/Rad Waste Building	695.35	694.90*	0.45
100	Auxiliary Building/Rad Waste Building	695.35	694.90*	0.45
164	Auxiliary Building/Rad Waste Building	695.24	694.90	0.34
102	Auxiliary Building/Rad Waste Building	695.24	694.90	0.34
420	D5/D6 Building	695.17	694.90	0.27
423	D5/D6 Building	695.17	694.90	0.27
437	D5/D6 Building	695.19	694.90	0.29

* No survey FFE point available at door, closest FFE survey point was used.

Figure 7.1-1, Plant Access Door Locations



Figures 7.1-2 and 7.1-3 show potential leakage pathways for water between the Auxiliary Building, the Unit 1 Turbine Building and the Unit 2 Turbine Building.

Figure 7.1-2 Unit 1 and Unit 2 Turbine Building

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[redacted]

Figure 7.1-3 Auxiliary Building

redacted per 10 CFR 2.390

[redacted]

redacted per 10 CFR 2.390

[redacted]

7.1.2 Adequate APM Justification

The APM for each of the Key SSCs is determined based on the difference between the critical water elevation in Table 7.1-1 and the maximum water surface elevation in Table 7.1-2. This is shown for each of the structures in Tables 7.1-3 through 7.1-7.

Table 7.1-3, APM Determination - Screenhouse

Door Number	Affected Structure	Max WSE (ft) (Table 7.1-2)	Critical Elevation (Table 7.1-1)	APM (ft)	Key SSC Affected
237	Screenhouse	694.82	694.90	0.08	No
238	Screenhouse	694.82	694.90	0.08	No
257	Screenhouse	694.82	694.90	0.08	No
258	Screenhouse	694.82	694.90	0.08	No

In addition to the 0.08 ft APM, the Screenhouse can accommodate 370,000 gallons of inleakage before a Key SSC could be affected. Given the relatively short duration of the LIP, the APM, and the significant available volume to accommodate inleakage, there is adequate margin.

Table 7.1-4, APM Determination – D5/D6 Building and Fuel Oil Vault

Door Number	Affected Structure	Max WSE (ft) (Table 7.1-2)	Critical Elevation (Table 7.1-1)	APM (ft)	Key SSC Affected
420	D5/D6 Building	695.17	694.90	See Below	No
423	D5/D6 Building	695.17	694.90	See Below	No
437	D5/D6 Building	695.19	694.90	See Below	No
---	D5/D6 Fuel Oil Tank Vaults	695.19	686.92	See Below	No

The predicted maximum water surface elevation at Doors 420 and 423 is 0.27 ft above the critical elevation; i.e., the FFE. Doors 420 and 423 are exterior access doors to the D5 and D6 diesel generator rooms from the west side of the building. Doors 420 and 423 are maintained closed. Figure 7.1-1 also shows that Door 437 could provide access to the building. However, flood protection bulkhead MK-11 is installed at Door 437 as controlled by station configuration documents. Predicted flood elevations for a PMF are much greater than for a LIP. Thus, leakage past Door 437 is not considered for a LIP.

The maximum water surface elevation and stage hydrograph at Doors 420 and 423 is redacted per 10 CFR 2.390 [redacted] the total water ingress through each door is 1069 ft^3 [3700 ft^3 * (4 ft 4 in. / 15 ft)].

The maximum allowable inleakage during an external flood is 16,760 gallons (2240 ft^3) into the D5 room and 17,627 gallons (2356 ft^3) into the D6 room (Reference 14). This is greater than the maximum volume of water that could enter either room with the door open. Given that the doors are maintained closed, that there is margin between the maximum inleakage, and the available capacity assuming the doors are open, there is adequate APM.

The tank vaults are accessed through covers located at grade elevation. The tank vault covers are a heavy duty watertight design (Reference 16). The actions in AB-4 (Reference 13) to install the blank flanges on the tank overflow lines are additional protective measures (i.e., defense-in-depth) due to the duration and water surface elevation above the tank covers during the design basis PMF. The vault can accommodate accumulated inleakage of 45,932 gallons (6140.3 ft^3) before water could enter the fuel oil tanks (Reference 15). Given the heavy duty watertight design of the vault covers, the relatively short time period of the LIP, the relatively small head of water above the vault covers during the LIP, and the available capacity of the fuel oil vaults to accept inleakage, there is adequate APM.

Table 7.1-5, APM Determination – Unit 1 Turbine Building

Door Number	Affected Structure	Max WSE (ft) (Table 7.1-2)	Critical Elevation (Table 7.1-1)	APM (ft)	Key SSC Affected
1	Unit 1 Turbine Building	694.82	694.90	0.08	No
44	Unit 1 Turbine Building	694.77	694.90	0.13	No
45	Unit 1 Turbine Building	694.82	694.90	0.08	No
73	Unit 1 Turbine Building	694.76	694.90	0.14	No

In addition to the 0.08 ft minimum APM, the Unit 1 Turbine Building can accommodate up to 89,537 ft^3 of inleakage before a Key SSC could be affected. Given the duration of the LIP, the APM and the available volume to accommodate inleakage provide adequate APM.

Table 7.1-6, APM Determination – Unit 2 Turbine Building

Door Number	Affected Structure	Max WSE (ft) (Table 7.1-2)	Critical Elevation (Table 7.1-1)	APM (ft)	Key SSC Affected
46	Unit 2 Turbine Building	694.74	694.90	0.16	No
47	Unit 2 Turbine Building	695.17	694.90	See Below	No

The predicted maximum water surface elevation at Door 47 is 0.27 ft above the critical elevation; i.e., the FFE. Door 47 is [redacted]. Based on the predicted water elevation vs. time and the duration of the LIP it was determined that 3700 ft^3 of water could enter the Unit 2 Turbine Building (Reference 11). The Unit 2 Turbine Building Condenser Pit can accommodate 101,672 ft^3 up to elevation 695 ft. Thus, the total inleakage during the LIP is only a small fraction of the available volume. The 3700 ft^3 of water inleakage will result in less than six inches of water on the condenser pit floor, which will have no impact to Key SSCs. Therefore, there is adequate APM.

Table 7.1-7, APM Determination – Auxiliary Building

Door Number	Affected Structure	Max WSE (ft) (Table 7.1-2)	Critical Elevation (Table 7.1-1)	APM (ft)	Key SSC Affected
100	Auxiliary Building	695.35	695.75	0.40	No
102	Auxiliary Building	695.24	695.75	0.51	No
104	Auxiliary Building	695.35	695.75	0.40	No
164	Auxiliary Building	695.24	695.75	0.51	No

The APM at Doors 100 and 104 is 0.40 ft. The APM at Doors 102 and 164 is 0.51 ft. Doors 102 and 104 are roll up doors from the exterior to the Fuel Receipt Area of the Auxiliary Building. Doors 100 and 164 provide access between the Fuel Receipt Area of the Auxiliary Building and the Rad Waste Building. Door 164 is surrounded by a block wall on the exterior side that would not allow water into the Auxiliary Building. Doors 100, 102, and 104 are normally maintained closed and will limit the volume of water that is able to enter the Auxiliary Building during a LIP event. If water inleakage occurs past Doors 100, 102, and/or 104 it will first accumulate in the Fuel Receipt area (refer to Figures 7.1-2 and 7.1-3). There are additional interior doors that are normally maintained closed between the Fuel Receipt area and the locations of SSCs important to safety in the Auxiliary Building. Inleakage would need to traverse a relatively long torturous path to reach SSCs important to safety. Furthermore, the water would need to fill the large interior surface area of the Auxiliary Building to a level of 695.75 ft before any SSCs important to safety are affected (Reference 14). To fill this area in the Auxiliary Building to 695.75 ft would require approximately 23,959 ft^3 of water (Reference 18). LIP events are of limited duration that precludes accumulating significant water through the closed doors. Furthermore, even if it is assumed that Doors 100, 102, and 104 were open and the water level in the Auxiliary Building equalized with the maximum water surface elevation outside the doors, the maximum water level in the Auxiliary Building would be 695.35 ft. This is below the water level of 695.75 ft where Key SSCs could be affected. Therefore, there is adequate APM.

As shown on Figures 7.1-2 and 7.1-3, there are two closed doors between the Auxiliary Building and the Turbine Building. Leakage by either of these door(s) could enter the Turbine Building. Similar to the discussion of the Unit 1 and Unit 2 Turbine Buildings, this leakage will initially accumulate in the Condenser Pits. If it conservatively assumed that only the Auxiliary Building to Unit 1 Turbine Building door leaks, leakage would accumulate in the Unit 1 Condenser Pit; which has an available capacity of 89,537 ft^3. Given the duration of the LIP, the available volume to accommodate inleakage provides adequate APM.

<u>Summary</u>

As described above the limiting flood elevations are below the critical elevations for Key SSCs. Therefore, the KSFs are protected by the characteristics of the site itself such as plant grading, by locations of the Key SSCs, and by the capability of the structures to accommodate inleakage. Therefore, the LIP is not a consequential flood for the PINGP. Furthermore, any flood up to the LIP flood described above would also not be considered a consequential flood for the PINGP.

7.1.3 Reliability of Flood Protection

As described above, flood protection for the LIP is provided by the permanently installed plant structures that are designed for a PMF. The WSE for the PMF is much higher than a LIP, thus the permanently installed plant structures will provide flood protection for the LIP. Since some plant doors will not be protected by flood bulkheads that would be installed as part of the PMF flood response, potential loads during the LIP event were evaluated at these doors. These doors and associated supporting structures have been evaluated (Reference 17) and determined to be capable of withstanding the loads from the LIP water level. The LIP event will not include debris impact or appreciable hydrodynamic effects due to the direction of flow being away from the buildings.

7.1.4 Adequate Overall Site Response

The site does not require any human actions to protect Key SSCs during the LIP. Thus, an evaluation of the overall site response was not necessary.

8.0 CONCLUSION

Associated effects (AE) and flood event duration (FED) parameters were assessed and submitted as a part of the FHRR. The FE affirms that during LIP events the site has effective flood protection through the determination of Available Physical Margin (APM) and the reliability of protection features. The site does not require any human actions to protect Key SSCs so an evaluation of the overall site response was not necessary. This FE follows Path 2 of NEI 16-05, Rev. 1, and utilizes Appendix B for guidance for evaluating the site protection features. This submittal completes the actions related to External Flooding required by the March 12, 2012, 10 CFR 50.54(f) letter.

APPENDIX 1

This appendix provides a matrix of the items identified in Section 9.2, "Documentation," of NEI 16-05, for Path 2, with the corresponding section(s) in the PINGP Focused Evaluation where the requested information is provided.

- **Characterization of Flood Parameters**
  Flood hazard parameters are summarized in Table 5-1.

- **Evaluation and Description of Flood Impacts**
  Section 6.1 provides a description of the overall site flooding response during a LIP. Section 7.1 summarizes the impacts to the site during a LIP. Table 7.1-2 identifies the maximum water surface elevations at each of the plant access doors during the LIP.

- **Key SSCs Potentially Impacted by Flood Waters**
  Table 7.1-1, including the notes identifies the Key SSCs that could potentially be impacted by flood waters during a LIP. As described in Section 7.1.1, the Key SSCs identified are those that would be initially impacted by water in each structure; i.e., those at the lowest elevation.

- **Critical Elevations That Could Impact Key SSCs**
  Table 7.1-1 identifies the critical elevations for the Key SSCs for each of the structures. As described in Section 7.1.1, to be conservative, the critical elevation corresponding to the Key SSC at the lowest elevation is identified.

- **Flood Features Relied On To Protect Key SSCs**
  As summarized in Table 5-2, permanent passive protection features are relied on to protect Key SSCs to maintain KSFs. Section 6.1 describes the permanent passive protection as the plant structures. To be conservative, plant access doors were not credited with limiting water inleakage during a LIP. Although not credited, these doors are present and would limit the amount of water inleakage. As summarized in Section 7.1.3, plant access doors were evaluated to ensure that they are capable of withstanding the loads from the LIP.

- **Demonstration of Effective Protection, Including:**

  - **Calculation of APM for Each Flood Protection Feature**
    The determination of APM for the flood protection features for each of the plant structures are provided in Tables 7.1-3 through 7.1-7.

  - **Justification that Calculated APM is Adequate**
    Appropriate justification that the APM for the flood protection features for each of the plant structures is adequate is provided in the discussion associated with Tables 7.1-3 through 7.1-7.

  - **Evaluation of Reliability of Each Flood Protection Feature**

As described in Section 7.1.3, flood protection for the LIP is provided by the permanently installed plant structures (passive protection) that are designed for a PMF. The WSE for the PMF is much higher than a LIP, thus the permanently installed plant structures will provide reliable flood protection for the LIP. Doors and the associated supporting structures have been evaluated and determined to be capable of withstanding the loads from the LIP water level.

- **Evaluation of Human Actions and an Adequate Site Response**

  As described in Section 7.1.4, the site does not require any human actions to protect Key SSCs during the LIP. Thus, an evaluation of the adequacy of the overall site response was not necessary.

- **Summary of Results and Conclusions of Assessment Demonstrating Effective Protection**
  As summarized in Section 8.0, associated effects and flood event duration parameters were assessed and submitted as a part of the FHRR. The FE affirms that during LIP events the site has effective flood protection through the determination of Available Physical Margin and the reliability of protection features. The site does not require any human actions to protect Key SSCs so an evaluation of the overall site response was not necessary. This FE follows Path 2 of NEI 16-05, Rev. 1, and utilizes Appendix B for guidance for evaluating the site protection features. This submittal completes the actions related to External Flooding required by the March 12, 2012, 10 CFR 50.54(f) letter.