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XO1-25-012

ATTN: Document Control Desk
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Acceptability of Historical Information - Flooding (Project #99902130)

Reference:
1. Energy Northwest New Nuclear. “Methodology for Determining the Acceptability of Historical Information,” White Paper, XO1-25-009, July 2025, ML25183A400.

2. Energy Northwest. "Columbia Generating Station, Docket No. 50-397 Flooding Hazard Reevaluation Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident." 6 Oct 2016, ML16286A309.

3. U.S. Nuclear Regulatory Commission. “Columbia Generating Station Staff Assessment of Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (CAC No. MF8455, EPID NO. 000495/05000397/L-2016-JLD-0010).” 21 Feb 2018, ML18051A401 (public), ML18051A332 (non-public).

This letter transmits Energy Northwest New Nuclear LLC’s (ENNN) Acceptability of Historical Information - Flooding white paper to the U.S. Nuclear Regulatory Commission (NRC) for review. The paper is provided for NRC review, planning and familiarization in support of pre-application discussions.

ENNN intends to submit a Construction Permit Application (CPA) for up to twelve Xe-100 small modular reactors at a site adjacent to Columbia Generating Station (Columbia). Using the criteria provided in Reference 1, the attached white paper provides ENNN’s evaluation of the acceptability of using existing 2016 post-Fukushima flooding hazard reevaluations for Columbia (Reference 2), which were accepted by the NRC (Reference 3) in 2018, in satisfying the requirements for assessing flooding hazards in ENNN’s CPA.

ENNN requests the NRC review this white paper and provide feedback on ENNN's evaluation of the acceptability of applying the historical information from Columbia's post-Fukushima flooding hazard reevaluations to the flooding evaluations necessary for the proposed ENNN project license application.

This letter contains no commitments. If you have any questions or need any additional information, please contact Nathan Clark at ndclark@energy-northwest.com or 509-377-6069.

Sincerely,

Signed by:
Lisa Williams
D582EC1FE95E4D8...

Lisa Williams
Operations, Licensing, Environmental Manager, New Nuclear Development

Enclosures
1. Acceptability of Historical Information - Flooding, ENNN White Paper, Rev 0, July 2025.
2. Energy Northwest Letter, "Request for Preliminary Dam Failure Flood Hazard Review of Energy Northwest Advanced Reactor Site", 21 Apr 2022, XO1-22-002.
3. U.S. Army Corps of Engineers Letter, "Response to Energy Northwest Request Letter", 22 Jun 2022.

cc:
Greg Cullen
Ken Langdon
Eric Andrews
Ms. Denise McGovern, NRR/DANU/UAL2
Ms. Madelyn Nagel, NMSS/REFS/EPMB3

Enclosure 1

Acceptability of Historical Information – Flooding, ENNN White Paper, Rev 0, July 2025

Energy Northwest
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White Paper

Acceptability of Historical Information - Flooding

Revision 0

July 2025

Prepared by: Signed by: Stephan C. Moen 3E36B180D5B34C3... **Date:** 7/30/2025

Approved by: Signed by: Lisa Williams D582EC1FE95E4D8... **Date:** 7/30/2025

Executive Summary

Recent increases in demand for carbon-free energy have led to support for construction of new nuclear power capability. Energy Northwest New Nuclear, LLC (ENNN) is considering the construction and operation of up to twelve small modular nuclear reactors at the former Washington Nuclear Project No. 1 (WNP-1) and Washington Nuclear Project No. 4 (WNP-4) sites adjacent to the Columbia Generating Station (Columbia) in southeastern Washington State. The recently passed ADVANCE Act requires the NRC to make use of applicable licensing information of existing nuclear facilities when evaluating adjacent new nuclear sites. The ENNN site is in the same drainage basin and projected to be at a higher elevation than Columbia and the project would benefit from Columbia's historical analyses.

ENNN plans to submit a Construction Permit Application (CPA), which will include an evaluation of the potential flooding hazards for the proposed site. Flooding hazards for Columbia were reevaluated following the 2011 Fukushima Dai-Ichi accident in Japan. The reevaluation specifically addressed the following flooding mechanisms: local intense precipitation (LIP) and site drainage, flooding in streams and rivers, dam breaches and failure, storm surge including wind-wave activity, seiche, tsunami, ice induced flooding, channel migration and diversion, and combined effects (including wind-waves and run-up effects).

Six questions were used to evaluate the historical information for each flooding mechanism. Responses to the questions confirm the Columbia flooding hazard reevaluation is applicable to the proposed site, with the exception of Local Intense Precipitation (LIP) as described in Section 3.1, and flooding is not expected to pose hazards for the project. These conclusions will be confirmed in the CPA to ensure flooding hazards are thoroughly addressed.

1. INTRODUCTION

1.1 Purpose

The purpose of this white paper is to provide a basis for using existing post-Fukushima flooding hazard reevaluations performed for Columbia Generating Station (Columbia) for the proposed Energy Northwest New Nuclear, LLC (ENNN) Construction Permit Application (CPA).

Section 505(c) of the ADVANCE Act requires that the Commission, to the extent practicable, use information that was part of the licensing basis of the utilization facility located at the site. ENNN intends to make use of these measures under NRC review processes for project license applications.

1.2 Project Background

ENNN is considering the construction and operation of up to twelve Xe-100 reactors at the former Washington Nuclear Project No. 1 (WNP-1) and Washington Nuclear Project No. 4 (WNP-4) sites adjacent to Columbia in southeastern Washington State. The Xe-100 reactor is a high temperature helium gas-cooled advanced reactor designed by X-energy. ENNN plans to submit a CPA for this project. The CPA includes a Preliminary Safety Analysis Report (PSAR) with an evaluation of potential flooding hazards at the proposed ENNN Project Site (Project Site).

The Project Site is about one mile east of Columbia, towards the Columbia River, at a higher elevation, and located on the same relatively flat, featureless desert scrub plain. The Columbia site grade elevation is 441 ft MSL [444.4 ft NAVD 88][1]. The ENNN Project Site elevation is anticipated to be between 452 ft and 467 ft MSL [455.4 ft and 470.4 ft NAVD 88]. The relative position of Columbia and the ENNN Project Site to the Columbia River is shown in Figure 1, and the topography is shown in Figure 2.

[1] Mean Sea Level (MSL) (equivalent to NGVD 29) are used in this document, consistent with Columbia flooding analyses. The NAVD 88 datum is 3.4 ft higher than MSL and is likely to be used for the ENNN project.

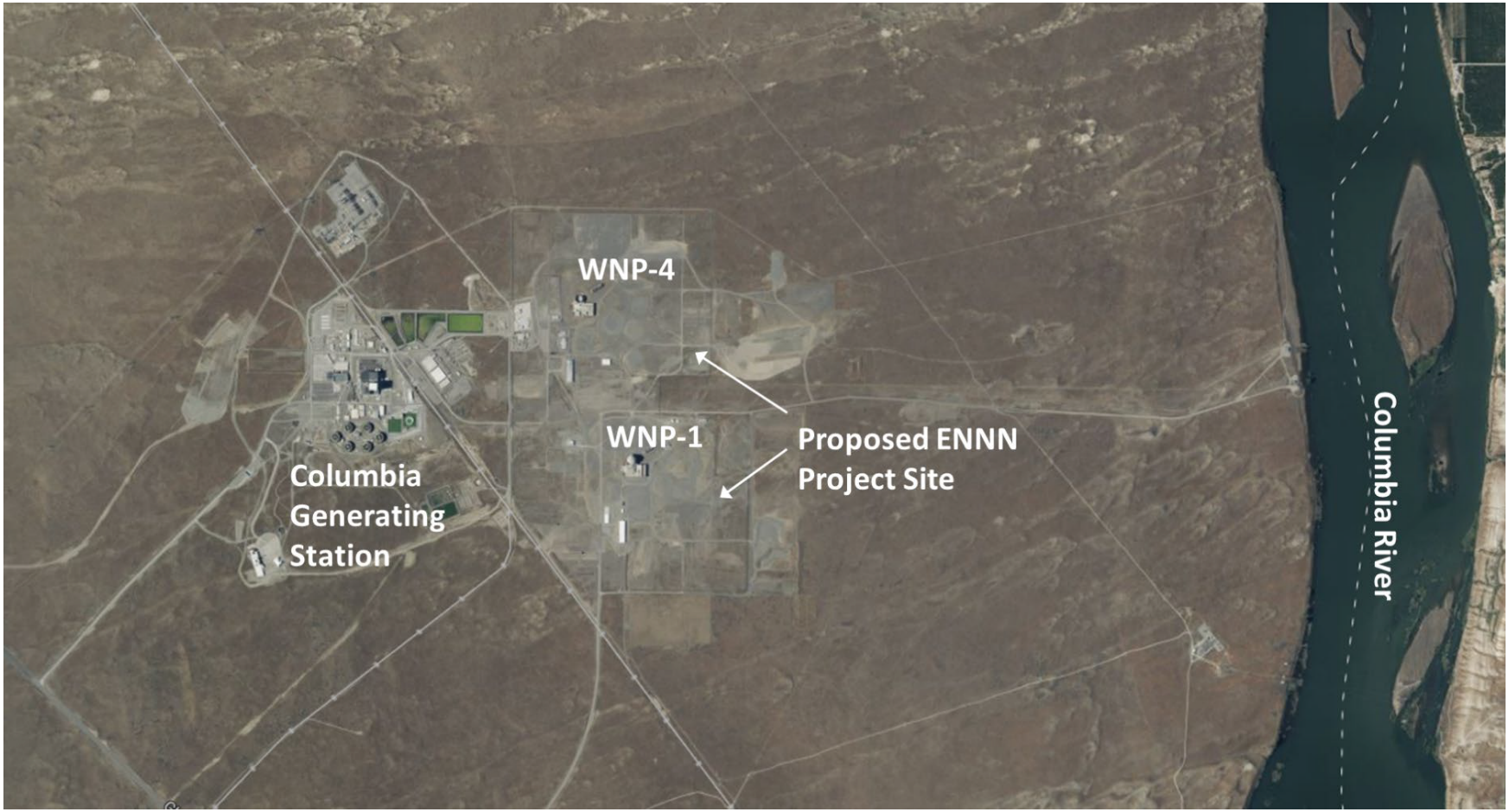

Figure 1: Project Site relative to Columbia Generating Station and the Columbia River

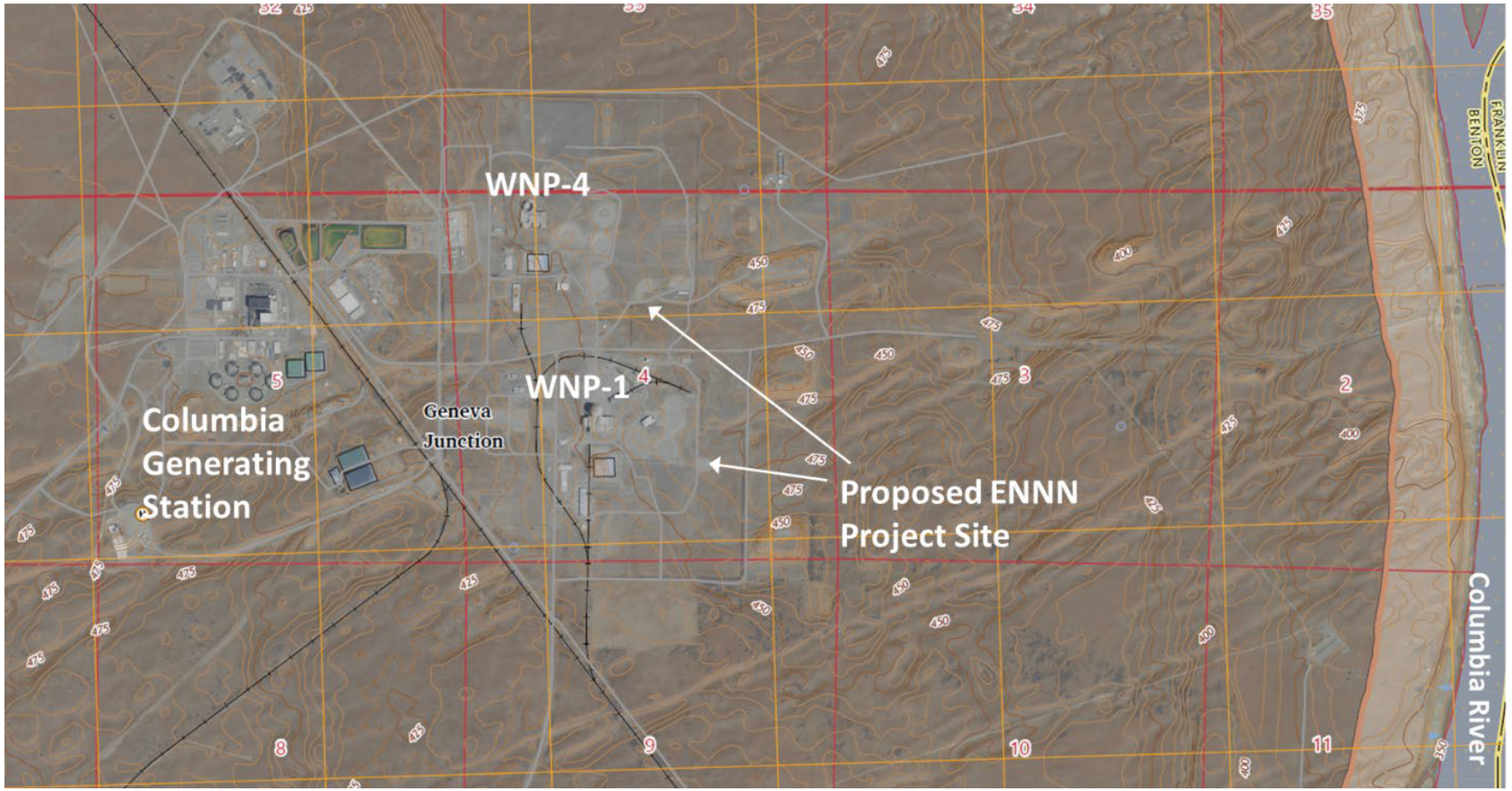

Figure 2: Representative topographic map near the ENNN Project Site. Contour elevations are given in NAVD 88 in 5 ft increments. (United States Geological Survey, Wooded Island WA 7.5-Minute Topo Map, 2025)

1.3 Historical Columbia Flooding Analyses

For the proposed ENNN Project Site, historical flooding hazard information exists for WNP-1/4 and Columbia and is applicable to the ENNN PSAR. A brief history of these efforts is given in this section.

WNP-1 and WNP-4 PSAR

The WNP-1 and WNP-4 sites contain partially constructed pressurized water reactors from the 1970's. The WNP-1/4 PSAR, submitted as part of the CPA for the WNP-1/4 project, includes Section 2.4, Hydrology Engineering. The CPA for WNP-1 was approved by the NRC through the granting of Construction Permit CPPR-134 in December of 1975. Construction was halted in 1982 prior to the issuance of an operating license and the WNP-1 project was cancelled in 2007. The CPA for WNP-4 was approved by the NRC through the granting of Construction Permit CPPR-174 in February 1978. Construction was halted in 1982 and cancelled in 1985.

Columbia FSAR

The Columbia FSAR, submitted as part of the initial Operating License application (OLA), includes Section 2.4, Hydrology Engineering. The OLA was approved by the NRC through the granting of the original operating license (Facility Operating License Number NPF-21, December 1983) and the more recent 20-year life extension license in May 2012.

Columbia Post-Fukushima Flooding Hazard Reevaluation

In response to the March 2011 tsunami and Fukushima Dai-Ichi accident in Japan, the NRC issued a series of recommendations for improving nuclear safety known as the Near-Term Task Force (NTTF) recommendations. In March of 2012, the NRC issued an information request under 10 CFR 50.54(f) (NRC, 2012) that required Energy Northwest (EN) to reevaluate flooding hazards for Columbia. From the NTTF letter, the NRC required the following:

> Evaluation of the flood hazard for each flood causing mechanism, based on present-day methodologies and regulatory guidance. Provide an analysis of each flood causing mechanism that may impact the site including local intense precipitation and site drainage, flooding in streams and rivers, dam breaches and failures, storm surge and seiche, tsunami, channel migration or diversion, and combined effects. Mechanisms that are not applicable at the site may be screened out; however, a justification should be provided. Provide a basis for inputs and assumptions, methodologies and models used, including input and output files, and other pertinent data.

The Columbia Flood Hazard Reevaluation Report (FHRR) was submitted to the NRC by Energy Northwest in October 2016 (EN, 2016). The NRC's final assessment of the FHRR was given in February 2018 (NRC, 2018). For the intents of this white paper all references to "historical analyses" (when applying the criteria of this white paper) refer to the Columbia post-Fukushima flooding hazard reevaluation analyses.

Guidance used for Post-Fukushima Flooding Hazard Reevaluation

For post-Fukushima reevaluations, EN utilized the following guidance identified in the NTTF letter (NRC, 2012):

- Regulatory Guide (RG) 1.59 "Design Basis Floods for Nuclear Power Plants," Regulatory Guide 1.59, Revision 2, Aug 1977 (NRC, 1977)

- NUREG/CR-7046 “Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America,” Nov 2011 (NRC, 2011)
- NUREG-0800 “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” Chapter 2, “Site Characteristics and Site Parameters,” Mar 2007 (NRC, 2007)
- ANSI/ANS-2.8-1992 “Determining Design Basis Flooding at Power Reactor Sites,” (ANSI/ANS, 1992)

During the reevaluation period, additional guidance was issued, including:

- JLD-ISG-2012-06 “Guidance for Performing a Tsunami, Surge, or Seiche Hazard Assessment,” Jan 2013. This ISG is planned for closure to RG 1.59 Revision 3 when the latter is issued. Note that tsunami, surge, and seiche were determined to be not applicable for Columbia.
- JLD-ISG-2013-01 “Guidance for Assessment of Flooding Hazards Due to Dam Failure,” Jul 2013 (NRC, 2013). This ISG is planned for closure when RG 1.256 is issued. This guidance was used for performing the Columbia dam failure analysis.

Table 1 summarizes the guidance used for Columbia compared to the current guidance.

Table 1: Summary of Regulation/Guidance used for Flooding Evaluations

Regulation/Guidance	Post-Fukushima Reevaluation	Current Guidance
Regulations	10 CFR 50 App. A GDC 2 10 CFR 100.20	10 CFR 50 App. A GDC 2 10 CFR 100.20
Application Guidance	NUREG-0800 as modified by NTTF Letter (NRC, 2012)	DANU-ISG-2022-02
Flooding Evaluation Guidance	RG 1.59 Revision 2 NUREG/CR-7046 JLD-ISG-2012-06 JLD-ISG-2013-01	RG 1.59 Revision 2 (DG-1290)[2] NUREG/CR-7046 JLD-ISG-2012-06 JLD-ISG-2013-01
Industry Standards	ANSI/ANS-2.8-1992	ANSI/ANS-2.8-1992

[2] DANU-ISG-2022-02 recognizes that an update to RG 1.59 Revision 2 is planned (DG-1290). DG-1290, “Design-Basis Floods for Nuclear Power Plants”, July 2024, describes current methodologies and NRC positions though it has not been formally released as RG 1.59 Revision 3. Per DG-1290, the two JLD-ISGs that currently provide guidance are planned for closure upon issuance of RG 1.59 Revision 3:

- JLD-ISG-2012-06 -- material from this ISG is included in DG-1290 (Appendices E and G).
- JLD-ISG-2013-01 -- RG 1.256 (DG-1417) will succeed the ISG.

2. EVALUATION PROCESS

2.1 Historical Data Approach

As described in ENNN White Paper "Methodology for Determining the Acceptability of Historical Information" (ENNN, 2025), the following criteria (questions) are used to determine the acceptability of historical analyses:

1. Regulatory Changes—Are the applicable regulations associated with the required information the same as during the time of the historical analysis?
2. Analysis Methodology—Is the same analytical methodology in effect today as was when the historical analysis was performed?
3. Scope of Analysis—Does the scope of the historical analysis fully address the project site?
4. Site Changes—Is the project site today consistent with the project site that was analyzed?
5. Quality Assurance (QA)--Was the historical analysis developed under an Appendix B QA program?
6. Copy of Record—Is a copy of the historical analysis still available today?

For each question, if the answer is "yes" then no new analysis is needed. If an answer is "no" then ask, "Does a reasonable basis for applying the historical analysis to the current project exist?" If "yes", document the basis and conclude that the historical analysis is adequate. If not, then conclude that a new or revised analysis is needed.

2.2 Generic Answers for Questions 1, 2, 4, and 6

Questions 1, 2, 4, and 6 can be answered generically for most flooding mechanisms. Exceptions are addressed in Section 3 below.

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

No. Columbia, as a light water reactor, falls under the general design criteria (GDC) requirements of 10 CFR 50 Appendix A. The ENNN project involves a non-light water reactor and will be subject to Principal Design Criteria (PDC) developed in accordance with RG 1.232, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors," Revision 0, April 2018.

However, a reasonable basis for applying the historical analysis to the current project exists based on the following details.

- No material changes to 10 CFR 100.20 or 10 CFR 50 App. A GDC 2 have occurred since the historical analyses were completed in 2016.
- The ENNN project intends to apply PDCs associated with the Xe-100 design. The PDCs associated with the Xe-100 design were presented by X-energy in their NRC-approved licensing topical report (X-energy, 2023).
- X-energy's PDC-2, Design Bases for Protection Against Natural Phenomena, is nearly identical to GDC 2 such that the GDC and PDC are the same for the

present purpose of evaluating flooding hazards. Table 2 compares GDC 2 and PDC-2. Differences are highlighted in red text.

Table 2: Comparison of 10 CFR 50 Appendix A GDC Criterion 2 to X-energy PDC-2

GDC 2	X-energy PDC-2
Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.	Safety-significant structures, systems, and components shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the severity of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal, anticipated operational occurrence, design basis event, and design basis accident conditions with the effects of the natural phenomena, (3) the safety-significance of the functions to be performed.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

Yes. NUREG/CR-7046 remains the current methodology, which supplements RG 1.59. JLD-ISG-2013-01 was used for Dam Failure for Columbia (NRC, 2016) and still applies as current guidance; however, it is noted that draft RG 1.256 (DG-1417) will succeed JLD-ISG-2013-01 upon the publication of RG 1.59 Revision 3. ANSI/ANS-2.8-1992 still applies to the analyses covered by the standard.

Table 3 identifies the guidance documents and standards used for analysis of the different flooding mechanisms.

Table 3: Summary of Guidance Documents for Flooding Mechanism Analysis

Evaluation	Eval Date	Guidance Used for Fukushima Reevaluations	Rev Used	Current Guidance	Current Rev
LIP	Nov 2016	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992	RG 1.59 NUREG/CR-7046[3] ANSI/ANS-2.8	Aug 1977 Nov 2011 1992
PMF (local basin)	Nov 2016	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992
PMF (streams and rivers)	Nov 2016	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992
Dam Failure	Jun 2022	RG 1.59 JLD-ISG-2013-01	Aug 1977 Jul 2013	RG 1.59 JLD-ISG-2013-01	Aug 1977 Jul 2013
Channel Migration	Nov 2016	NUREG/CR-7046	Nov 2011	NUREG/CR-7046	Nov 2011
Ice Effects	Nov 2016	NUREG/CR-7046	Nov 2011	NUREG/CR-7046	Nov 2011
Tsunami, Seiche, Storm Surge	2016	RG 1.59 NUREG/CR-7046 JLD-ISG-2012-06	Aug 1977 Nov 2011 Jan 2013	RG 1.59 NUREG/CR-7046	Aug 1977 Nov 2011
Combined Effects	Nov 2016	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992	RG 1.59 NUREG/CR-7046 ANSI/ANS-2.8	Aug 1977 Nov 2011 1992

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

Yes. Watershed and basin characteristics in the area surrounding the Project Site do not appear to and are unlikely to have changed. EN maintains a map of areas of the site that have been disturbed; most of land within the corridor out to the river is shown as undisturbed. Additionally, the land to the north, east, and south of the site is largely categorized as Conservation or Preservation areas in the Hanford Comprehensive Land Use Plan. The topography in the vicinity of the site and river will be confirmed in the PSAR.

[3] Although NUREG/CR-7046 is specified by the NRC for Fukushima reevaluations, RG 1.59 Revision 2 does not mention it. However, DG-1290 (draft RG 1.59 Revision 3) points to NUREG/CR-7046 and ANSI/ANS-2.8-1992 and -2019 (currently not endorsed by the NRC) as containing advice and examples for performing flooding evaluations.

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

Yes. The analysis calculation packages referenced in Columbia's FHRR (EN, 2016) are retained by EN. The dam failure analysis for the Columbia River watershed for Columbia's post-Fukushima flooding hazard reevaluation required by the NTTF letter (NRC, 2012) was performed by the USACE under contract with the NRC. The analysis is labeled Official Use Only. The NRC transmitted results of the dam failure analysis to EN (NRC, 2016).

3. FLOODING ACCEPTABILITY EVALUATION

This section evaluates each flooding mechanism from a perspective of whether the historical Columbia post-Fukushima flooding reevaluation analyses are applicable to the ENNN project.

3.1 Local Intense Precipitation

Introduction

Local Intense Precipitation (LIP) is a theoretical measure of extreme rainfall. This represents the upper limit of rainfall at a given location. The LIP reanalysis for Columbia was performed in two steps. Step 1 determined the amount and timing of a LIP event at the Columbia site. Step 2 determined the maximum water surface elevation (WSE) at various locations on the Columbia site resulting from the LIP event.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: NUREG/CR-7046 (NRC, 2011) and ANSI/ANS-2.8-1992 (ANSI/ANS, 1992)

NRC Documentation of Acceptance: Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

No. The analysis specifically addresses Columbia, not the Project Site. Therefore, Step 2 (maximum WSE) of the LIP event will require a site-specific analysis.

However, a reasonable basis exists for applying Step 1 (amount of rainfall) of the historical LIP analysis to the current project. The Project Site is only about one mile from the Columbia site (441 ft MSL) and at a higher elevation (452 -467 ft MSL). The process of transposing comparable storms to the current site requires the site elevation rounded to the nearest 50 feet, which means the same value of 450 feet would be used for both Project Site and Columbia. The comparable LIP events used for the Columbia evaluation are from six different states in the Northwest region over the years 1956 to 1990 and are equally applicable to the Project Site. Transposing these six events to Columbia would be nearly identical to transposing them to the Project Site.

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

Yes. It was performed under Enercon's Appendix B program.

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for LIP rainfall quantity and timing for LIP evaluations are applicable to the ENNN Project Site and acceptable for use in the ENNN Project CPA. The determination of maximum WSE at the Project Site and potential impact on critical SSCs requires a site-specific evaluation.

3.2 Probable Maximum Flood in a Basin

Introduction

Probable maximum flood (PMF) in a basin finds the maximum WSE in the basin where the plant is located corresponding to the 72-hour General Storm probable maximum precipitation (PMP) with an antecedent storm equal to 40 percent of the PMP.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: NUREG/CR-7046 (NRC, 2011) and ANSI/ANS-2.8-1992 (ANSI/ANS, 1992)

NRC Documentation of Acceptance: Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

Yes. The evaluation for Columbia addresses the basin containing the Columbia site. The Project Site is located about one mile east of the Columbia site (441 ft MSL) on the opposite side of the same basin at a higher elevation (452 ft - 467 ft MSL), as shown in Figure 3.

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

Yes. It was performed under Enercon's Appendix B program.

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for evaluating local drainage basin PMF apply to the ENNN Project Site and are acceptable for use in the ENNN Project CPA. The analysis considered the entire basin and included both Columbia and the Project Site.

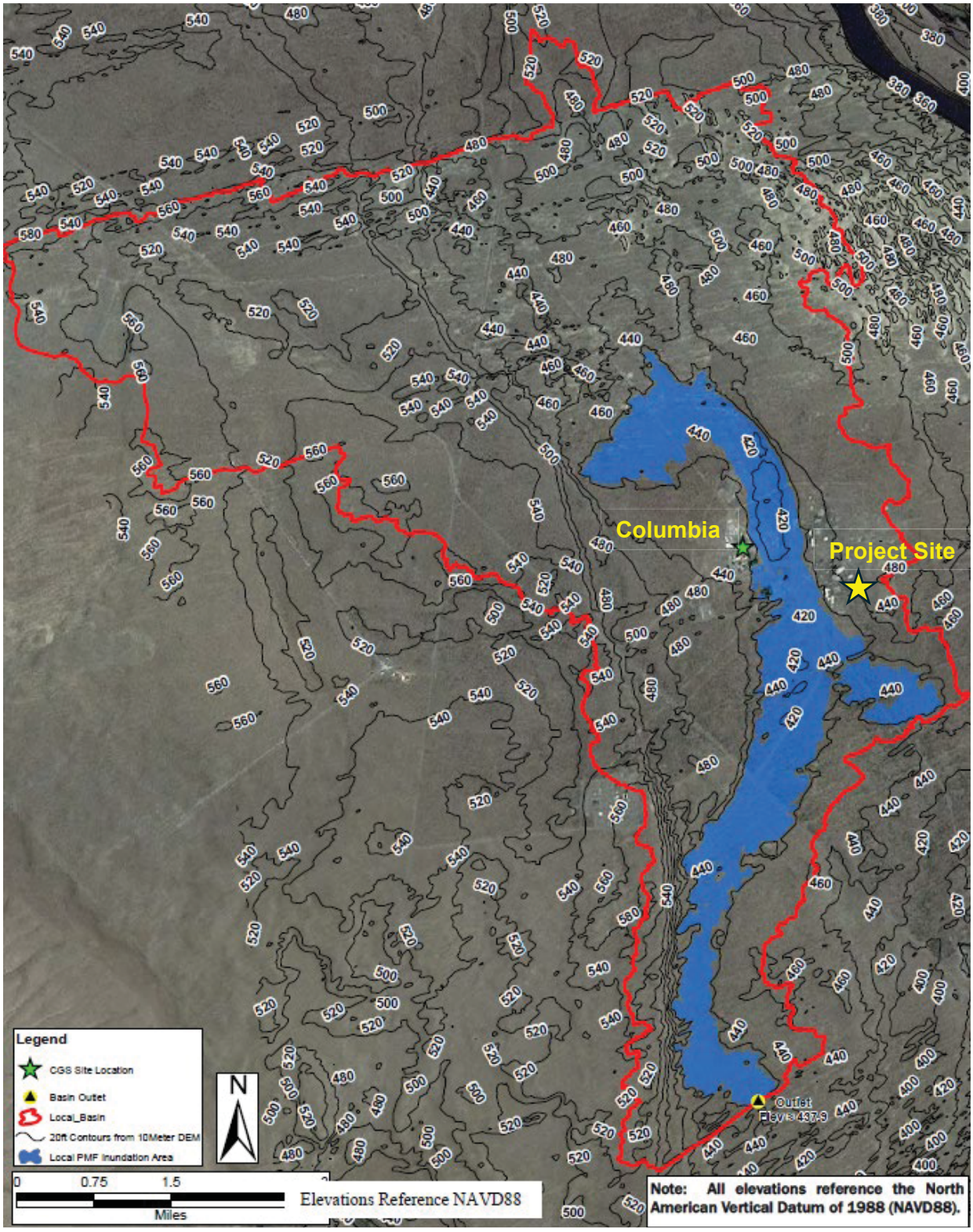

Figure 3: Local drainage basin PMF for Columbia and the Project Site. (EN, 2016)

3.3 Probable Maximum Flood on Streams and Rivers

Introduction

PMF on streams and rivers finds the maximum WSE on the Columbia River near the Project Site resulting from PMP occurring either in the Columbia, Yakima, or Snake River watersheds.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: NUREG/CR-7046 (NRC, 2011) and ANSI/ANS-2.8-1992 (ANSI/ANS, 1992)

NRC Documentation of Acceptance: Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

Yes. The evaluation for Columbia addresses flooding of the Columbia River near the Columbia site. The Project Site is located about one mile east of Columbia and closer to the Columbia River as depicted in Figure 1. The inundation map for the limiting Snake River PMF (Figure 4) shows that the Project Site remains dry.

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

Yes. It was performed under Enercon’s Appendix B program.

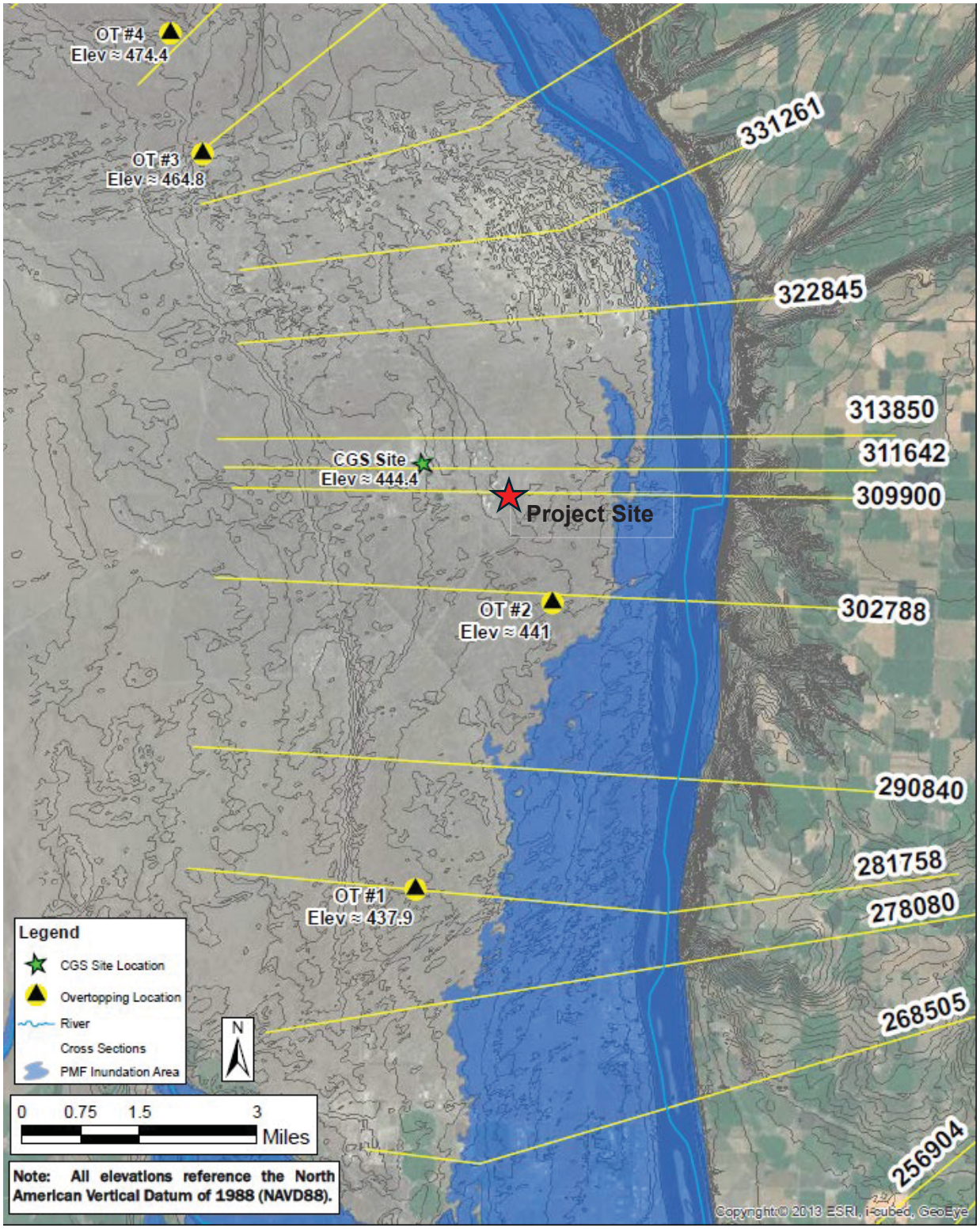

Figure 4: Columbia River Inundation Map near Columbia Generating Station (Snake River PMF). Yellow lines represent surface inundation cross-sections. (EN, 2016)

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for river PMF are applicable to the ENNN Project Site and acceptable for use in the ENNN Project CPA. The historical Columbia inundation results include flooding elevations between the Columbia River and Columbia Generating Station which encompasses the Project Site as illustrated by Figure 4.

3.4 Dam Failure

Introduction

The dam failure evaluation finds the maximum WSE on the Columbia River near the Project Site resulting from failure of one or several dams on the Columbia, Yakima, or Snake Rivers.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: JLD-ISG-2013-01 (NRC, 2013)

NRC Documentation of Acceptance: Columbia USACE Flood Reevaluation Transmittal (NRC, 2016) and Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

Yes. Columbia and the Project Site are both in proximity to the Columbia River and potentially subject to river floods. The USACE evaluations (Official Use Only) concluded that Columbia would be a dry site for dam failure. Additionally, in 2022 EN requested USACE perform a preliminary evaluation of the Project Site using the parameters from the FHRR (EN, 2022). USACE preliminarily confirmed the ENNN Project Site would also be dry per their response letter (USACE, 2022). These letters are enclosures to the transmittal letter.

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

No. However, a reasonable basis exists for applying the historical analysis to the current project because the NRC accepted the historical dam failure analysis from USACE (NRC, 2016 and NRC, 2018).

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for dam failure evaluations are applicable to the ENNN Project Site and acceptable for use in the ENNN Project CPA. ENNN intends to engage USACE again when additional site utilization plans have been developed prior to CPA submittal in order to confirm that previous conclusions have not changed.

3.5 Channel Migration

Introduction

The channel migration evaluation finds the flooding effects on the Columbia River near the Project Site resulting from potential changes in the Columbia River's riverbed.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: NUREG/CR-7046 (NRC, 2011)

NRC Documentation of Acceptance: Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

Yes. Columbia and the Project Site are both in proximity to the Columbia River and subject to the same effects of channel migration. The Columbia post-Fukushima reevaluation concluded that the Columbia River channel is well defined near Columbia and is unlikely to be diverted. Due to their proximity to each other and distance from the river, ENNN concludes that the Columbia data and analyses for channel migration are applicable to the Project Site.

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

Yes. It was performed under Enercon's Appendix B program.

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for channel migration are applicable toto the ENNN Project Site and acceptable for use in the ENNN Project CPA.

3.6 Ice Effects

Introduction

Ice jams and ice dams can form in rivers and streams near a site resulting in flooding due to (1) collapse of an ice jam or ice dam upstream of the site causing a dam-breach-like flood wave that may propagate downstream to a project site or (2) an ice jam or ice dam downstream of a project site impounding water, thus causing flooding through backwater effects upstream.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: NUREG/CR-7046 (NRC, 2011)

NRC Documentation of Acceptance: Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

Yes. Columbia and the Project Site are both in proximity to the Columbia River and potentially subject to the same effects of ice jamming. The analysis determined that ice jam flooding is bounded by PMF and dam failure flood.

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

Yes. It was performed under Enercon's Appendix B program.

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for ice jam are applicable to the ENNN Project Site and acceptable for use in the ENNN Project CPA.

3.7 Tsunami, Seiche, and Storm Surge

The tsunami, seiche, and storm surge events occur only at sites adjacent to large bodies of water such as an ocean or large lake. Columbia and the Project Site are located far from the Pacific Ocean and from any other body of water sufficiently large to experience a tsunami, seiche, or storm surge. These events were screened out of further evaluation for Columbia and would also screen out for the Project Site.

3.8 Combined Effects Analysis

Introduction

The combined effects of wind-waves and run-up are evaluated in conjunction with the maximum WSE for PMF and Dam Failure events.

Columbia Analysis Considered: Columbia FHRR (EN, 2016)

Methodology Applied: NUREG/CR-7046 (NRC, 2011) and ANSI/ANS-2.8-1992 (ANSI/ANS, 1992)

NRC Documentation of Acceptance: Columbia FHRR Acceptance Letter (NRC, 2018)

Question 1, Regulatory Changes

Are the applicable regulations associated with the required information the same as during the time of the historical analysis?

See Section 2.2.

Question 2, Analysis Methodology

Is the same analytical methodology in effect today as was when the historical analysis was performed?

See Section 2.2.

Question 3, Scope of Analysis

Does the scope of the historical analysis fully address the project site?

Yes. Conditions leading to combined effects (wind-wave and run-up) are common to both Columbia and the ENNN Project Site. The inundation patterns for both PMF Local Basin and Dam Failure (Figure 3 and Figure 4) apply to the ENNN Project Site due to their proximity. The combined effects analysis for Columbia found the maximum WSE to be lower than the Columbia grade elevation for both PMF Local Basin and Dam Failure (PMF Streams and Rivers was not evaluated because Dam Failure WSE was higher).

Question 4, Site Changes

Is the project site today consistent with the project site that was analyzed?

See Section 2.2.

Question 5, Quality Assurance

Was the historical analysis developed under an Appendix B QA program?

Yes. It was performed under Enercon’s Appendix B program.

Question 6, Copy of Record

Is a copy of the historical analysis still available today?

See Section 2.2.

Conclusion

ENNN concludes that the Columbia data and analyses for combined analysis are applicable to the ENNN Project Site and acceptable for use in the ENNN Project CPA.

4. SUMMARY OF RESULTS

Table 4 summarizes the answers to the six questions for evaluating the applicability of the Columbia post-Fukushima flooding hazard reevaluations to the Project Site. All questions for each flooding mechanism have been answered as “yes” or a basis for applying the historical flooding reevaluation analysis, indicated by “No but justified,” has been provided in discussions above. The one exception is the need to perform a site-specific evaluation for maximum WSE for the LIP event, as noted in Section 3.1.

Table 4: Summary of responses to evaluation questions for Project Site

Flooding Mechanism	Same Regulations?	Same Methods?	Same Scope of Analysis?	Site Unchanged?	App B Program?	Copy of Record?
LIP	No but justified	Yes	No	Yes	Yes	Yes
PMP (local basin)	No but justified	Yes	Yes	Yes	Yes	Yes
PMP (streams and rivers)	No but justified	Yes	Yes	Yes	Yes	Yes
Dam Failure	No but justified	Yes	Yes	Yes	No but justified	Yes
Channel Migration	No but justified	Yes	Yes	Yes	Yes	Yes
Ice Effects	No but justified	Yes	Yes	Yes	Yes	Yes
Tsunami, Seiche, and Storm Surge	No but justified	Yes	Yes	Yes	Yes	Yes
Combined Effects	No but justified	Yes	Yes	Yes	Yes	Yes

5. CONCLUSIONS

ENNN concludes that the historical flooding reevaluation analysis from the Columbia post-Fukushima reevaluations are applicable for characterizing the flooding hazards at the Project Site with the exception of a site-specific evaluation of the LIP maximum WSE (Section 3.1). Regarding the acceptability of historical Dam Failure analysis, ENNN plans to engage with USACE prior to CPA submittal (Section 3.4).

Specific justification for using historical analyses will be documented in the ENNN PSAR. ENNN acknowledges the PSAR will confirm the elevation of the Project Site and address any differences in the topography in the vicinity of the site and river.

6. REFERENCES

American National Standards Institute /American Nuclear Society (ANSI/ANS), 1992. "Determining Design Basis Flooding at Power Reactor Sites," ANSI/ANS-2.8-1992.

Energy Northwest (EN), 2016. "Columbia Generating Station, Docket No. 50-397 Flooding Hazard Reevaluation Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from The Fukushima Dai-Ichi Accident." GO2-16-143, 6 Oct 2016, ML16286A309.

EN, 2022. "Request for Preliminary Dam Failure Flood Hazard Review of Energy Northwest Advanced Reactor Site," EN Letter to USACE, 21 Apr 2022, XO1-22-002.

Energy Northwest New Nuclear (ENNN), 2025. "Methodology for Determining the Acceptability of Historical Information," White Paper, XO1-25-009, July 2025, ML25183A400.

U.S. Nuclear Regulatory Commission (NRC), 1977. "Design Basis Floods for Nuclear Power Plants," Regulatory Guide 1.59, Revision 2, Aug 1977, ML003740388.

NRC, 2007. "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," NUREG-0800 Chapter 2, "Site Characteristics and Site Parameters," Mar 2007, Chapter 2 | NRC.gov.

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NRC, 2013. "Guidance for Assessment of Flooding Hazards Due to Dam Failure," Japan Lessons-Learned Project Directorate Interim Staff Guidance, JLD-ISG-2013-01, July 29, 2013, ML13151A153.

NRC, 2016. "Columbia Generating Station-Transmittal of U.S. Army Corps of Engineers Flood Hazard Reevaluation Information (CAC NO. MF3039)." 11 Aug 2016, ML16202A414.

NRC, 2018. "Columbia Generating Station -- Staff Assessment of Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (CAC No. MF8455, EPID NO. 000495/05000397/L-2016-JLD-0010)." 21 Feb 2018, ML18051A401 (public), ML18051A332 (non-public).

U.S. Army Corps of Engineers (USACE), 2022. "Response to Energy Northwest Request Letter," USACE Letter to EN, 22 Jun 2022.

X-energy, 2023. "Xe-100 Licensing Topical Report Principal Design Criteria," 004799-A, Rev. 3, 12 Aug 2023, ML24319A155.

Enclosure 2

Energy Northwest Letter, “Request for Preliminary Dam Failure Flood Hazard Review of Energy Northwest Advanced Reactor Site”, 21 Apr 2022, XO1-22-002

Don Gregoire
Energy Northwest
P.O. Box 968, MD:1035
Richland, WA 99352-0968
Ph. 509-377-8616
dwgregoire@energy-northwest.com

April 21, 2022
XO1-22-002

U.S. Army Corps of Engineers, Northwestern Division
ATTN: Jason DeRosa, Assistant Northwestern Division Counsel
1201 NE Lloyd Blvd #400
Portland, OR 97232
Via Regular Mail and Email: jason.r.derosa@usace.army.mil

Subject: **REQUEST FOR PRELIMINARY DAM FAILURE FLOOD HAZARD REVIEW OF ENERGY NORTHWEST ADVANCED REACTOR SITE**

Reference: 1) Letter, GO2-16-143, dated October 6, 2016 from AL Javorik (Energy Northwest) to NRC, Columbia Generating Station, Docket No. 50-397 Flooding Hazard Reevaluation Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident.

2) Letter dated August 23, 2016, from LK Gibson (NRC) to Energy Northwest, Summary of June 9, 2016, Closed Meeting Between Representatives of the U.S. Army Corps of Engineers, Bureau of Reclamation, U.S. Nuclear Regulatory Commission, and Energy Northwest to Discuss the Flood Analysis Associated with Columbia Generating Station (CAC No. MF3039).

Dear Mr. DeRosa:

In or around 2014 Energy Northwest (EN) obtained data from USACE Columbia River inundation models that were informed by sensitive and proprietary BC Hydro dam failure analyses. These models supported post-Fukushima flood hazard reevaluations for Columbia Generating Station (CGS) (Reference 1). The sensitive data was communicated in a closed meeting between the USACE, Nuclear Regulatory Commission (NRC), and EN (Reference 2). The results supported a determination of no impact to CGS from an upstream dam failure. In order to avoid an extensive effort to re-evaluate the same potential flooding hazard EN is seeking to make use of that same

analysis to support preliminary licensing efforts for a new reactor project on a site adjacent to CGS.

EN requests USACE assistance in a preliminary characterization of the dam failure hazard of a proposed advanced reactor site adjacent to CGS. The dam failure flood evaluation would support initial licensing efforts to characterize a proposed small modular reactor (SMR) project on this site.

To facilitate a USACE review, a description of the location of the proposed activities is provided.

- The proposed nuclear project site is located on the Department of Energy Hanford Site, approximately 1.1 miles southeast of CGS (see Attachment 1 and Attachment 2).
- The proposed project site lies within the same local drainage basin as CGS (see Figure 8 of Reference 1).
- The proposed project site topography slopes from approximately 480 feet NAVD88 in the northeast corner to 450 feet NAVD88 in the southwest corner (see Attachment 3).
- The proposed project elevation is 462 feet NAVD88, which is at least 17 feet higher than CGS ground elevation at 444.4 feet NAVD88.

EN requests USACE provide an evaluation of the proposed site on or before May 31, 2022, to allow us to meet project schedule requirements. We look forward to working with USACE to support progress on the site characterization. Please contact Nathan Clark at 509-377-4511 if you have questions or need any additional information on this matter.

Respectfully,

Don Gregoire
Licensing and Environmental Manager, New Nuclear

Attachments:
1) Proposed SMR Site Location
2) Site Investigation Aerial Map
3) Site Investigation Contour Map

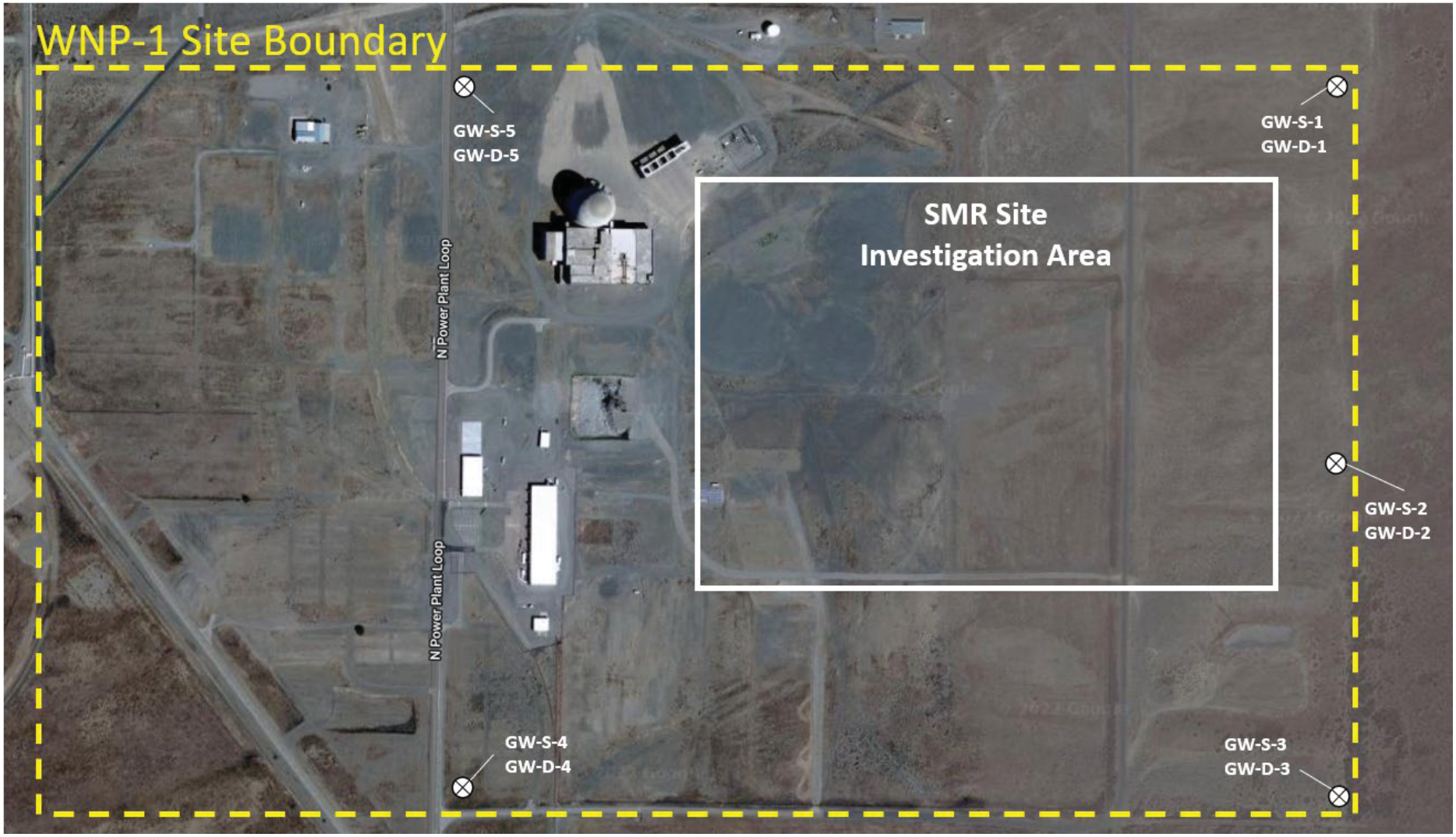
cc: Travis Ball, USACE
Travis Chapman, X-energy, LLC
Milton Gorden, X-energy, LLC
Alex Javorik, EN
Nathan Clark, EN

Attachment 1: Proposed SMR Site Location

This figure shows the approximate location of the advanced reactor location. CGS is located 1.1 miles to the NW and the Columbia River 2.3 miles east.

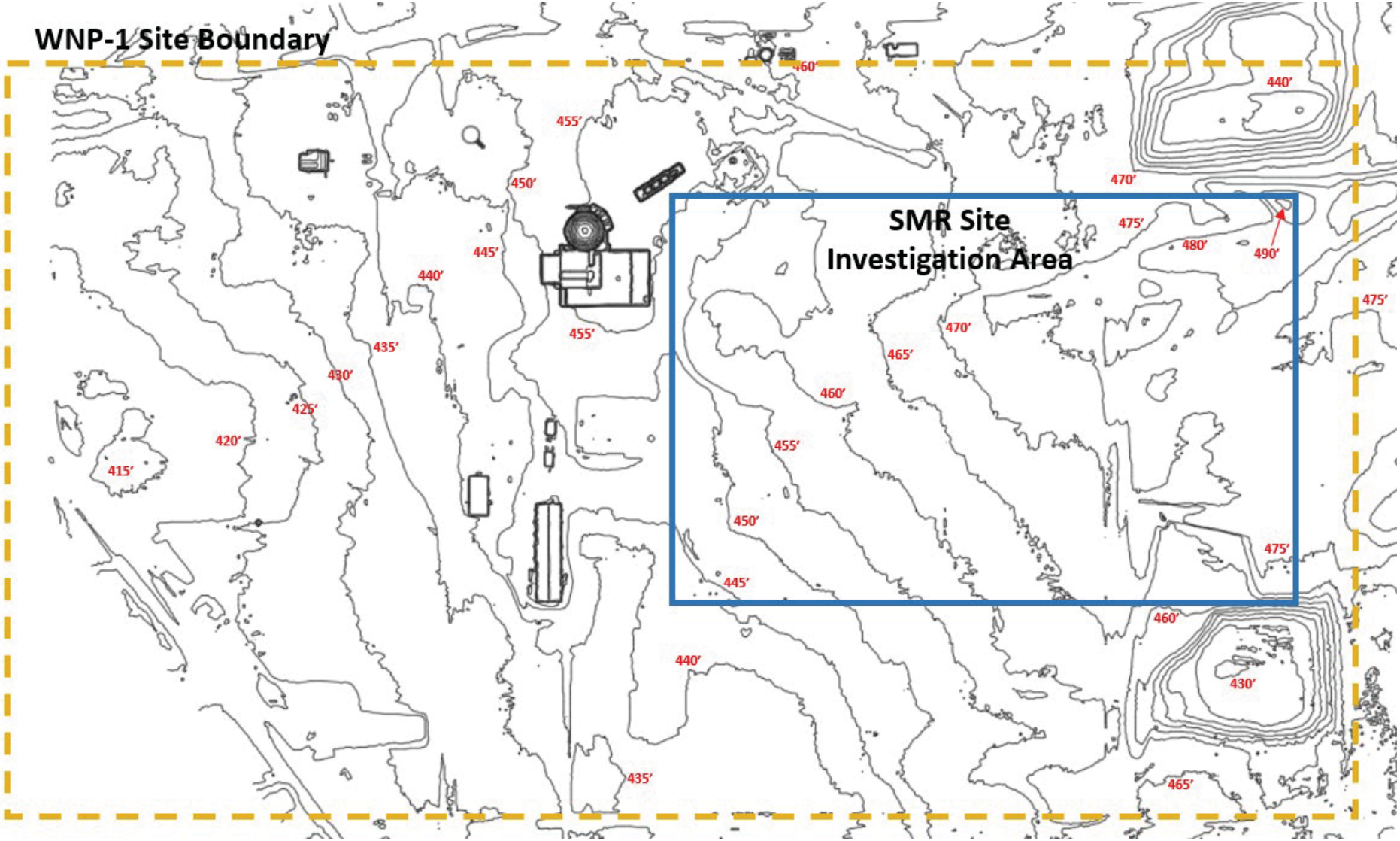
Attachment 2: Site Investigation Aerial Map

Aerial image showing the proposed project site within the WNP-1 boundaries.



Attachment 3: Site Investigation Contour Map

Contour map showing the NE to SW downward slope. NAVD88 contour elevations are given in red text.



Enclosure 3

U.S. Army Corps of Engineers Letter, “Response to Energy Northwest Request Letter”, 22 Jun 2022

DEPARTMENT OF THE ARMY
U.S ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT
4735 EAST MARGINAL WAY SOUTH BLDG 1202
SEATTLE, WA 98134-2388

June 22, 2022

Don Gregoire
Energy Northwest
P.O. Box 968, MD: 1035
Richland, WA 99352-0968

Subject: RESPONSE TO ENERGY NORTHWEST REQUEST LETTER

Dear Mr. Gregoire,

This letter is in response to the request you sent to Jason DeRosa on 21 April 2022 concerning the preliminary dam failure flood hazard review of Energy Northwest advanced reactor site. I am responding as this project's lead hydraulic engineer in the Seattle District U.S. Army Corps of Engineers.

In December 2016 the U.S. Army Corps of Engineers – Seattle District (USACE) completed flood hazard evaluation of the Columbia Generating Station (CGS), as requested through an Interagency Agreement with the Nuclear Regulatory Commission (NRC). The evaluation adhered to NRC's Interim Staff Guidance for Assessment of Flooding Hazards Due to Dam Failure. The results of the evaluation confirmed the CGS would remain dry for the range of modeled scenarios. Inundation mapping using depth grids produced from hydraulic modeling clearly demonstrated the terrain surrounding the Columbia River right bank and the CGS provides for a dry site for the modeled scenarios.

Energy Northwest recently requested USACE assistance in a preliminary characterization of the dam failure hazard of a proposed advanced reactor site adjacent to CGS. The proposed nuclear project site is located approximately 1.1 miles southeast of the CGS, at approximately 46.4662° N, 119.3111° W. The proposed project elevation is 462 feet NAVD88 (~17 feet higher than the CGS ground elevation).

Preliminary evaluation of the proposed advanced reactor site indicates it would also remain dry in the flood hazard scenarios modeled for the 2016 CGS evaluation. The high elevation terrain adjacent to the Columbia River right bank prevents floodwaters from moving west toward the facility.

Sincerely,

BALL.TRAVIS.D.1292040241

Digitally signed by BALL.TRAVIS.D.1292040241
Date: 2022.06.22 11:26:05 -07'00'

Travis Ball
Hydraulic Engineer
USACE Seattle District

Certificate Of Completion

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Document Pages: 35
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Stephan C. Moen scmoen@energy-northwest.com Security Level: Email, Account Authentication (Optional)	Signed by:  3E36B180D5B34C3... Signature Adoption: Pre-selected Style Using IP Address: 66.119.205.190	Sent: 7/30/2025 4:40:00 PM Viewed: 7/30/2025 4:54:47 PM Signed: 7/30/2025 4:57:38 PM
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