
NRC Public Meeting

TVA CRN Strategy on Structural and Seismic Analyses based on existing Subsurface Investigation

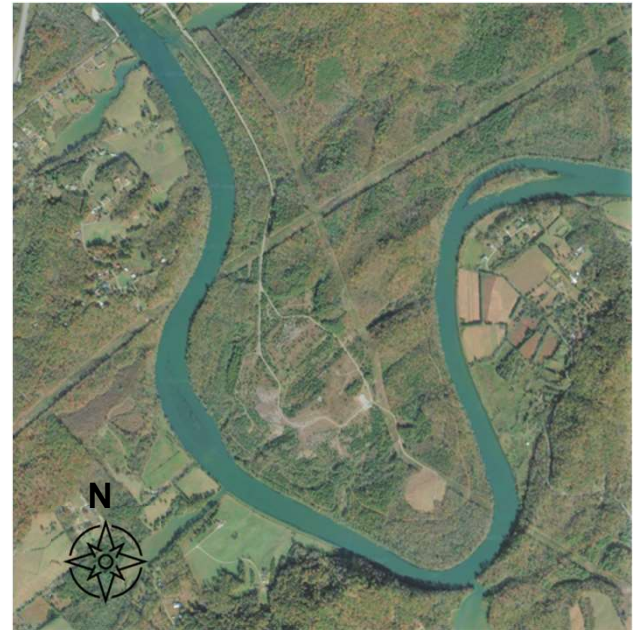
May 2, 2023



Agenda

- Welcome and Introductions
- Purpose and Scope
- Structural and Seismic Analyses Inputs
- Discussion on Reg Guide 1.132 Appendix D and LTR NEDO-33914 requirements
- Background and Overview of Existing Core Boring Investigations
- Overview of Proposed confirmatory core bores
- Summary

Clinch River Nuclear (CRN) Site



Purpose and Scope

- The purpose of this meeting is to discuss the CRN strategy for performing Structural and Seismic analyses to support the CPA based on subsurface investigation performed during the Early Site Permit Application (ESPA) development. Confirmatory subsurface investigations are performed simultaneously with the analyses to meet Reg Guide 1.132 Appendix D and LTR NEDO-33914-A requirements.
- The scope of this presentation covers the summary of existing core bore data for the CRN site and discussion on the proposed locations of the confirmatory core bore data. Detailed discussions on the analyses performed using these results are not included in this presentation.

Structural and Seismic Analyses Inputs

- In order to adequately account for the SSI effects, the one-step approach, as defined in Section 3.1.2 of ASCE/SEI 4-16, is implemented for the design of the BWRX-300 RB structure using a linear elastic SASSI (a system for analyses of soil-structure interaction) analysis approach.
 - Static and dynamic structural stress demands are obtained directly from the results of SSI analyses of combined models that include FE representations of the RB structure and the surrounding soil. The surrounding subgrade is represented by layered half-space continuum with equivalent linear elastic stiffness properties and complex damping.
- The BWRX-300 Safe Shutdown Earthquake (SSE) is developed based on the results of the site investigations discussed in Chapter 2, Section 2.5.
 - The spectra defining the amplitude and frequency of the SSE ground motion is based on the evaluation of the maximum earthquake potential, which considers the regional and local geology, seismology, and specific characteristics of local subsurface material.

Reg Guide 1.132 Appendix D Requirements

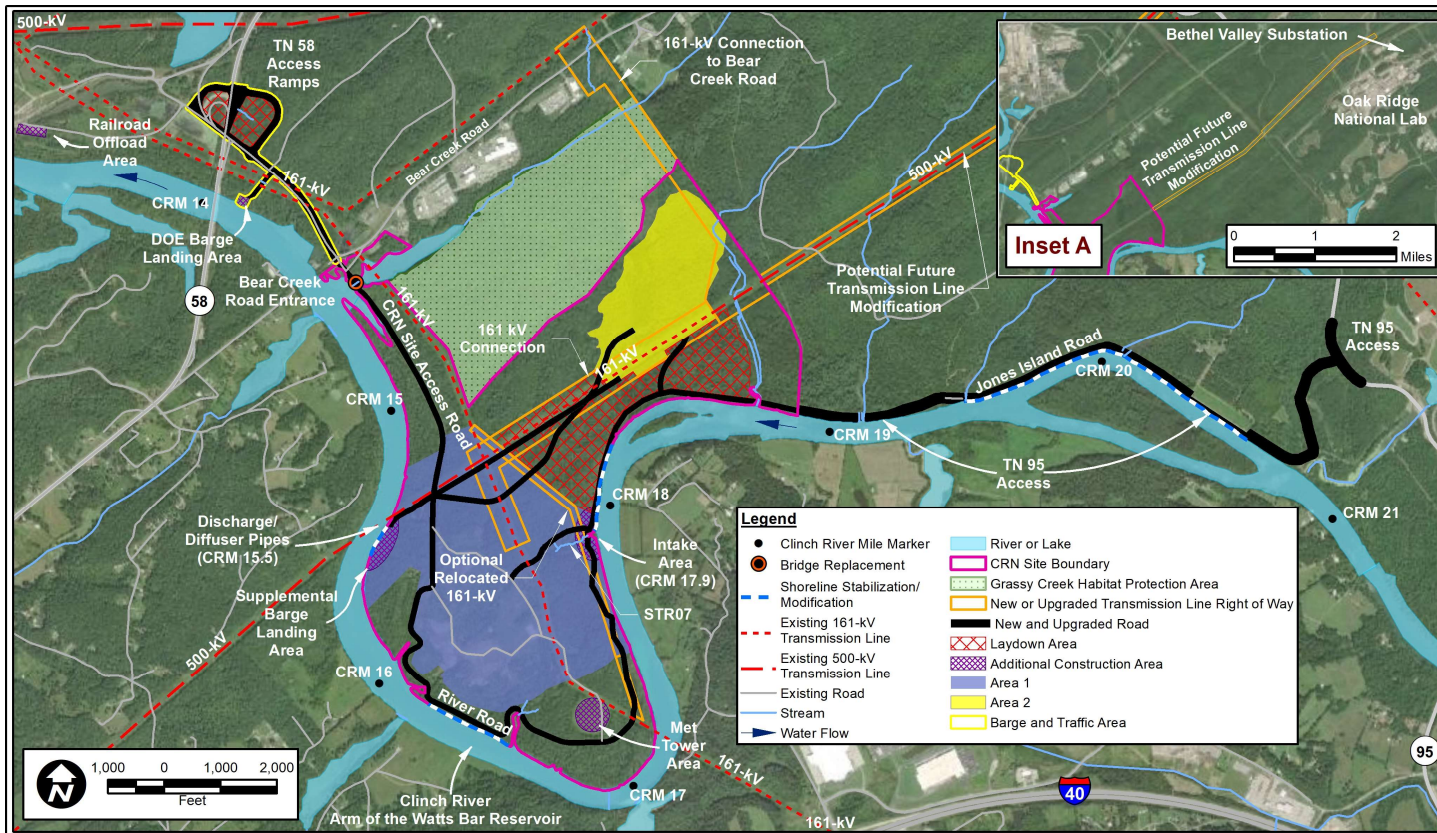
- General:
 - Spacing: At least 3 borings within the footprint of every SR structure
 - Depth: d_{\max} may be taken as the depth at which the change in vertical stress during or after construction for the combined foundation loading is less than 10% of the effective in situ overburden stress. Should extend at least 10m (33ft) below lowest part of foundation

- Structures:
 - Spacing: One boring at the center of SR structures and additional borings along the periphery, at corners, and other selected locations. For containment, at least one boring per 900m² (10,000ft²), approximately 30m (100ft) spacing. One boring per 30m (100ft) for essentially linear structures.
 - Depth: At least $\frac{1}{4}$ of principal borings and a minimum of one boring per structure to penetrate into sound rock or to d_{\max} . Others to a depth below foundation elevation equal to width of structure or to a depth equal to the foundation depth below the original ground surface, whichever is greater.

LTR NEDO-33914-A

- LTR NEDO-33914-A provides a boring layout of a minimum of 21 boring locations, which exceeds the minimum of 10 borings based on the recommendations in RG 1.132, Appendix D.
 - The increase in the number of boring is to ensure adequate characterization of subsurface properties under and around the deeply embedded RB structure.
 - Previously investigated sites may have information that cover a wide area. In such cases, **only limited and targeted additional exploration points may be required.**

Background on previous investigations



EXTENSIVE
CHARACTERIZATION

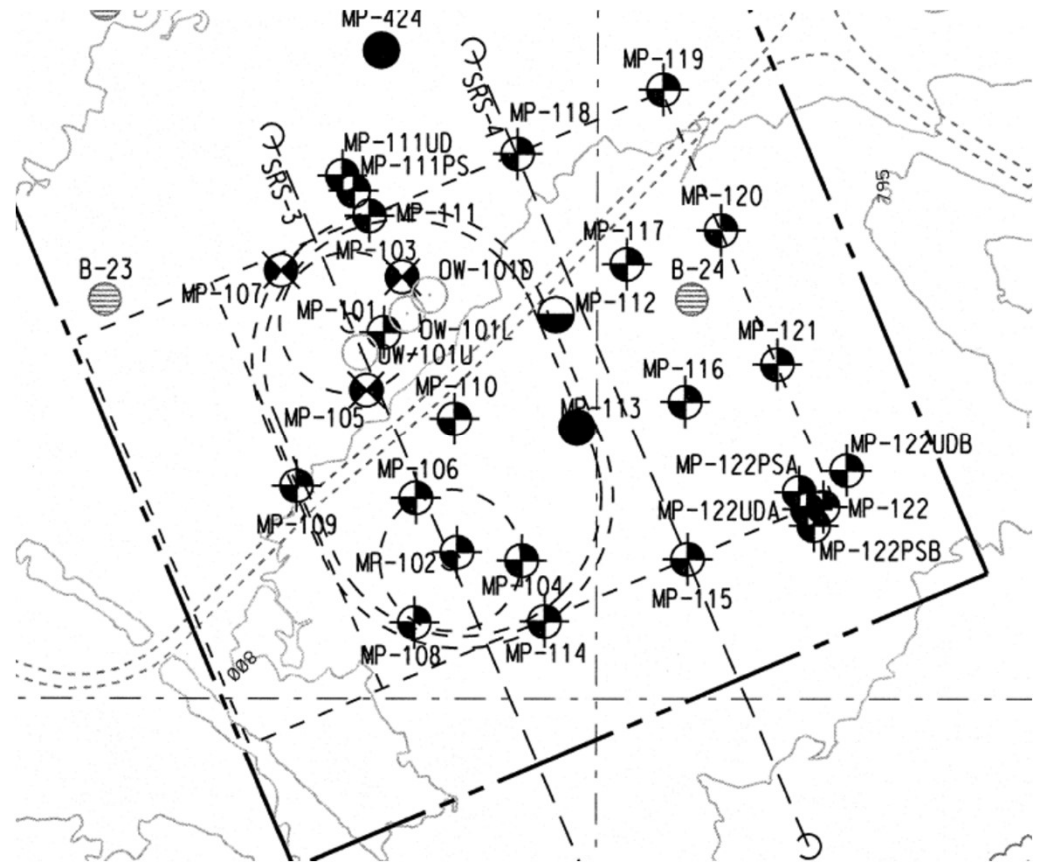
CLINCH RIVER
BREEDER PROJECT

1970-1983

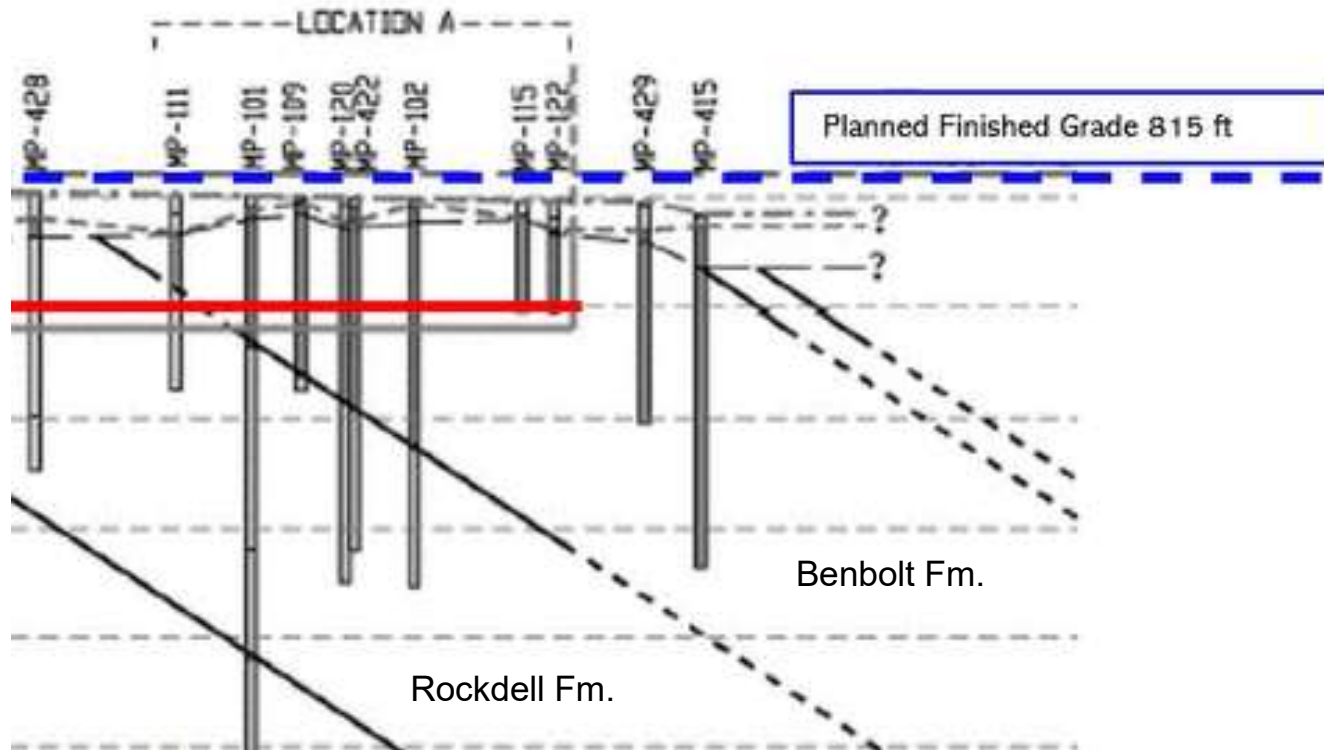
NRC EARLY SITE
PERMIT FOR SMRS
2019

Overview of Previous Core Boring Investigations

- Review and discussion of existing core bores
 - Drawing 255-000-CY-0010-00001
 - Drawing 255-000-CY-0010-00002

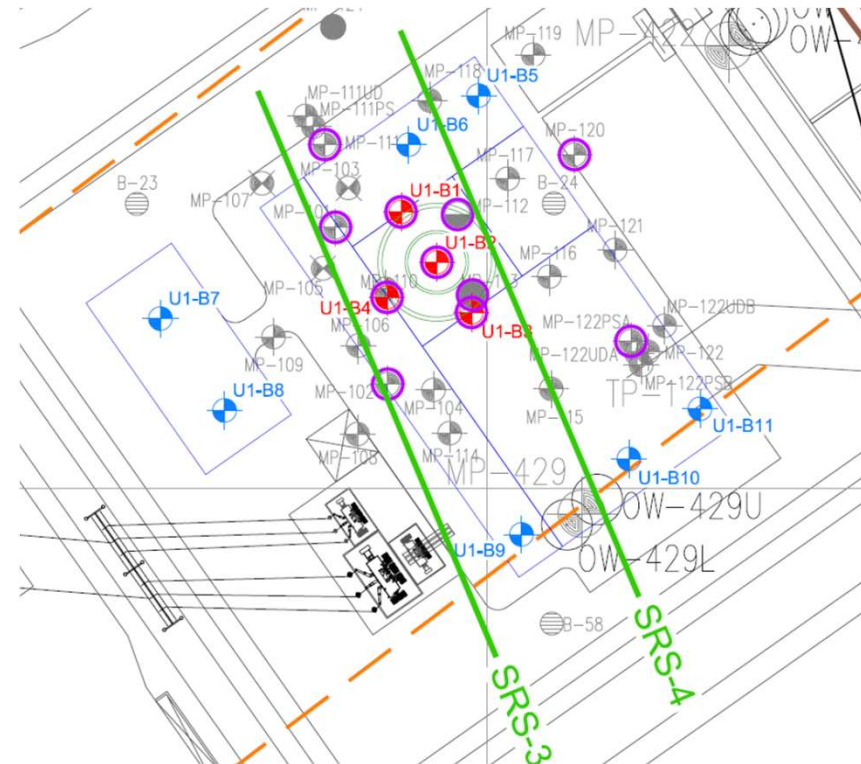


Elevation view of Existing Core Bores



Confirmatory Borings

- Approximately 15 new bores to meet requirements of Reg Guide 1.132 Appendix D and LTR NEDO-33914-A
 - Drawing 16-5737-E1 Sheets 1 and 2



Summary

- The PSAR 3.7 and 3.8 structural and seismic analyses are performed using the extensive subsurface information collected for the ESP.
- The confirmatory bores are completed to meet RG 1.132 Appendix D and NEDO-33914-A requirements and ensure no major deviations are discovered. Since the core bores from the ESP are in the same rock mass (Benbolt formation) and very near the locations required by RG 1.132 and NEDO-33914-A, the risk of discovering new information that would alter the analyses is low.