Lee Nuclear Station Units 1 and 2

Evaluation of 2012 Field Investigation Results for Plant Relocation

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1.0 INTRODUCTION

1.1 Purpose

This enclosure describes the evaluation results of the 2012 field investigation findings for plant relocation at Duke Energy's William States Lee III (WLS) Nuclear Station (Figure 1). The information described herein relies on assessments of field investigation and laboratory testing results for historic CNS explorations and WLS explorations performed in 2006-2007 and 2012. Following a decision in August 2012 to relocate the plant, field investigations for the plant relocation included drilling five borings and performing geophysical logging in three of these borings located within the approximate footprint of the relocated nuclear island of WLS Unit 1. Two borings, one with geophysical logging, were drilled at the relocated nuclear island of Unit 2. No additional laboratory tests were performed as part of the 2012 investigation.

Field work was performed by AMEC, FCL, and LCI personnel and AMEC's qualified subcontractors as part of site investigations for the proposed Duke Energy Lee Nuclear Station.

The purpose of the 2012 field work is to obtain confirmatory information at the relocated nuclear islands and to demonstrate that the relocation of the units does not affect the qualification of the AP1000 units for application at the site. This objective is now confirmed through completion of geologic, seismic and geotechnical engineering evaluations. Following completion of the field work activity, FSAR-supporting project deliverables (calculation packages and project reports) were revised to reflect changes to design input brought about by the plant relocation. These revisions to project deliverables included existing boring data representative of the relocated positions of the nuclear islands as well as the results of the 2012 field work. All FSAR-supporting deliverables are updated to include the 2012 field work results and the FSAR Section 2.5 and 3.7 text, tables, and figures will be revised (see Attachments 1 through 5).

The primary objectives of this enclosure are to document the encountered conditions in the 2012 field work and to provide an assessment of consistency with existing site data described in the FSAR Section 2.5 (Revision 6) and to the FSAR Section 3.7 (Revision 6) confirming that the conclusions of site-specific analysis are unaffected by the relocation of the units based on the results described herein. Updated FSAR Section 2.5 and FSAR Section 3.7 text, tables and figures are included as Attachments 1 through 5 of this enclosure.

The 2012 field work and subsequent evaluations described in this enclosure are focused on the Combined Operating License (COL) safety-related aspects of the AP1000 plant, namely the nuclear island. This enclosure uses the plant configuration changes described in Section 2.0 herein for the relocated structures per Duke Energy's decision in August 2012.

The information presented in this enclosure describes assessments of field investigation results in relation to their consistency with existing FSAR data as described above. This evaluation confirms that the site characteristics at the William States Lee III (WLS) Nuclear Station comply with the requirements of the DCD.

1.2 Scope of Work

The scope of work described in this enclosure consists of evaluating the results of field work conducted in late 2012 to obtain new geotechnical data for confirmatory information at the relocated nuclear islands. The 2012 field work includes drilling and logging seven new geotechnical borings at relocated Unit 1 and Unit 2 nuclear island structures for the Duke Energy Lee Nuclear Station COL Project (Figures 2 and 3). Geophysical testing was performed in four of the borings. Table 1 summarizes the 2012 borings and the scope of geophysical testing. The resulting data from these borings and in situ tests including important results relevant to site dynamic profiles, ground motion evaluations and comparison to design response spectra are presented in this enclosure. The results of these 2012 field explorations for Lee Nuclear Station Units 1 and 2 will be incorporated into a future revision of the FSAR (see Attachments 1 through 5).

1.3 Summary of Abbreviations

AMEC	AMEC Environment & Infrastructure, Inc.
CNS	Cherokee Nuclear Station
COL	Construction and Operating License
CSDRS	Certified Seismic Design Response Spectra
Duke	Duke Energy Corporation
ENERCON	ENERCON Services, Inc.
FCL	Fugro Consultants, Inc.
FIRS	Foundation Input Response Spectra
FSAR	Final Safety Analysis Report
GMRS	Ground Motion Response Spectra
HRHF	Hard Rock High Frequency Spectra
LCI	Lettis Consultants International, Inc. (formerly FCL)
LETCo	Law Engineering Testing Company (later MACTEC, now AMEC)

MACTEC	MACTEC Engineering and Consulting, Inc. (now AMEC)
NI	nuclear island
PSAR	Preliminary Safety Analysis Report
WEC	Westinghouse Electric Company
WLA	William Lettis & Associates, Inc. (now FCL)

Other abbreviations and acronyms are defined where they are first used in the body of this enclosure.

2.0 BACKGROUND

The Duke Energy William States Lee III Nuclear Station (WLS) will consist of twin AP1000 power plants located at the site of the former partially constructed Cherokee Nuclear Station (CNS). The new AP1000 Unit 1 will reoccupy the former CNS Unit 1 footprint and is planned to overlie portions of the CNS existing foundation; the new AP1000 Unit 2 will occupy the former CNS Unit 3 footprint area. Both plants under this configuration are located within the existing excavation and some additional minor excavation will be required. A filling operation is required to backfill the existing excavation to develop a plant yard grade.

The geotechnical investigation described in FSAR Section 2.5 is originally based on the twin AP1000 configuration described in the WLS FSAR Revision 6. In August 2012, the site plan was subsequently modified to reflect relocated site layout and elevations. This relocation moved Unit 1 and Unit 2 south 66 ft.; Unit 1 was also moved 50 ft. east. The floor elevation (corresponding to AP1000 generic elevation 100.0) was raised from elevation 590 ft. to elevation 593 ft. The yard elevation was raised from elevation 589.5 ft. (corresponding to AP1000 generic elevation 99.5) to elevation 592 ft. (corresponding to AP1000 generic elevation 99.0) adjacent to the nuclear islands.

3.0 EVALUATION OBJECTIVES

The purpose of the field investigation and testing program was to obtain new data at the nuclear islands for the relocated plant site to confirm geologic, seismic, and geotechnical evaluations described in the existing WLS COL Application (FSAR Revision 6). The field investigation considered the horizontal and vertical distribution of CNS and COLA developed field investigation data within the safety-related nuclear island structures for WLS Units 1 and 2. Boring locations in 2012 were positioned to evaluate the concrete and rock beneath the relocated WLS Unit 1 nuclear island and rock beneath the proposed relocated Unit 2 nuclear island. No exploration of Seismic Category II (SC-II) facilities was performed. No laboratory testing of recovered samples was performed. The field work is summarized in Table 1.

The exploration locations and borehole testing plan are specifically configured to meet the following data collection needs:

- Confirm and demonstrate the applicability of the existing field data from the previous explorations as being representative of the conditions at the relocated plant positions.

The field testing plan and this evaluation are in compliance with requirements of 10 CFR 52, 10 CFR 50 Appendix S, and 10 CFR 100.23, using guidance provided in:

- Regulatory Guide 1.132, Revision 2 – "Site Investigations for Foundations of Nuclear Power Plants"
- Regulatory Guide 1.206, Revision 0 – "Combined License Applications for Nuclear Power Plants"
- Regulatory Guide 1.208, Revision 0 – "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion"

The primary field investigation objective was to obtain confirmatory information that concrete and rock characteristics, including shear wave velocity profiles underlying the relocated nuclear islands, are consistent with the information presented in WLS FSAR Revision 6 and does not affect the qualification of the AP1000 units for application at the site.

Concrete Exploration Objectives – Unit 1

- Visual inspection of basemat slab for evidence of any significant surface cracking attributed to demolition.
- Coring of the structural and fill concrete materials in five locations for visual observation of concrete condition, using thin walled bits and/or wireline diamond coring methods.

Rock Exploration Objectives – Unit 1

- Coring through the concrete and/or rock in five locations for visual observation of the concrete and rock and the condition of the rock materials below the concrete fill or concrete slab. Obtain borehole geophysical measurements in some of the borings as follows:
  - Field compression and shear wave velocity measurements using P-S suspension test methods in two of the borings.
  - Acoustic televiewer imaging of boring walls to identify fractures and determine dip and azimuth of these features in three of the borings.

Concrete-Rock Interface Exploration Objectives – Unit 1

- Visual evaluation of the concrete-rock interface in recovered core for any separation, fracturing, or weathering.
- Televiewer logging at three locations to observe the in-situ concrete-rock contact for any separation, fracturing, or weathering.

Rock Exploration Objectives – Unit 2

- Coring into the rock in two locations for observation of the condition of the rock materials.
- Field compression and shear wave velocity measurements using P-S suspension test methods in one of the borings.
- Acoustic televiewer imaging of borehole walls in one of the borings.

4.0 FIELD EXPLORATION AND BOREHOLE GEOPHYSICAL LOGGING METHODOLOGY

Field activities including sample collection and testing at relocated WLS Units 1 and 2 were initiated on October 1, 2012 and continued through October 24, 2012. All test locations were surveyed on October 25, 2012. The additional exploration program in October 2012 consisted of seven additional borings, borehole geophysical tests consisting of P-S velocity measurements in three borings and acoustic televiewer logging at four borings. No additional laboratory testing, borehole testing, or surface geophysical testing was performed as part of this 2012 geotechnical exploration. The site exploration program is shown in Figure 3 and Figure 4. The completed boring and in-situ field testing program performed in 2012 for the plant relocation is summarized in Table 1. Table 2 summarizes the Lee Nuclear Station Geotechnical Exploration.

5.0 SUMMARY OF RESULTS

The results of the evaluation of the October 2012 field investigation, including evaluation of recovered core, geophysical logging and evaluations of field results developed for WLS plant relocation are summarized below. The site exploration map explanation and the exploration map are provided as Figures 2 and 3, respectively. A boring summary sheet explanation is provided within Figure 5 and the boring summary sheets with results of concrete and rock coring and P-S Suspension logging for tested borings are provided as Figures 6 through 12. The results of coring and borehole testing, including interpretation of subsurface geologic materials, are described on Figures 13 through 16. Figures 17 and 18 compare the Plant Relocation P-S

Suspension results to COLA (FSAR Revision 6) testing results. Figure 19 illustrates the small increase in concrete fill thickness for the 2012 to pre-2012 Dynamic Profile - Base Case A1.

5.1 Visual Logging of Recovered Core

Visual examination of the rock and concrete core samples indicated both were of good quality. The rig geologist visually described the rock core and noted the presence of joints and fractures, distinguishing mechanical breaks from natural breaks where possible. The rig geologist also calculated Rock Quality Designation (RQD) prior to moving the core from the drill site. Field boring logs and photographs were used to document the drilling operations and recovered materials. Descriptions of the lithology, weathering and rock strength characteristics for recovered rock materials were completed according to project approved procedures.

5.1.1 Concrete

No significant surface cracking of the structural slab was noted during the field investigation based on visual inspection of the concrete basemat in and around the completed borings at Unit 1. No concrete was present at boring locations at Unit 2.

5.1.2 Rock – Unit 1

In borings B-2000, B-2001, B-2002, B-2003, and B-2004, continuous rock was encountered beneath the existing concrete. Visual logging characterized the weathering stage and strength characteristics of recovered rock core as described on the boring logs presented in Enclosure 1 (this letter) for revisions to FSAR Appendix 2AA, Attachment 6. Consistent with past evaluations, the rock is generally described as meta-granodiorite to meta-diorite, strong to very strong (R4 to R5). In general, weathering is characterized as fresh/unweathered to slightly weathered with infrequent minor intervals of moderately weathered rock. No significant or pervasive localized zones of highly weathered rock are observed in the recovered core.

Prior to the plant relocation in August 2012, the northwest corner of the WLS Unit 1 nuclear island extended beyond the limits of the existing concrete of the former CNS Unit 1. This locality, beyond the existing concrete, was underlain by a deep weathered rock profile with low RQD values. The relocated WLS Unit 1 nuclear island now lies entirely on the existing concrete of the CNS Unit 1. Boring B-2000, near the northwest corner of the relocated WLS Unit 1, encountered continuous rock with high RQD values under the existing concrete. Boring B-2000 thus confirms that the conditions at the former northwest corner of WLS Unit 1, before relocation, are not present at the northwest corner of the WLS Unit 1 after the 2012 relocation.

Except at the northwest corner before relocation, the rock strength and weathering characteristics in the 2012 borings at WLS Unit 1 are consistent with evaluations presented in FSAR Revision 6. The discussions concerning the northwest corner of the WLS Unit 1 nuclear island are not relevant to the relocated WLS Unit 1 nuclear island.

5.1.3 Rock – Unit 2

In borings B-2005 and B-2006, continuous rock was encountered at 5 ft. and 3 ft. below the existing ground surface, respectively. Visual logging characterized the weathering stage and strength characteristics of recovered rock core as described on the boring logs presented in Enclosure 1, Attachment 6 of this letter. Consistent with past evaluations, the rock is generally described as meta-granodiorite to meta-diorite, strong to very strong (R4 to R5). In general, weathering is characterized as fresh/unweathered to slightly weathered with infrequent minor intervals of moderately weathered rock. No significant or pervasive localized zones of highly weathered rock are observed in the recovered core.

The rock strength and weathering characteristics in the 2012 borings at WLS Unit 2 are consistent with evaluations presented in FSAR Revision 6.

5.2 Geophysical Logging

Selected boreholes were geophysical logged using acoustic televiewer and/or P-S suspension test methods.

5.2.1 Acoustic Televiewer Logging – Unit 1

The acoustic televiewer was used to image the boring wall in three boreholes (B-2000, B2002, and B-2003) at the relocated WLS Unit 1 with fracture dips and dip azimuths identified. The concrete-rock interface imaged at borings located at Unit 1, B-2000, B2002, B-2003, show that the concrete-rock interface is irregular, very tight, with the absence of major fracturing or separation, and no significant weathering. These televiewer logs confirm that rock below the fill concrete contact exhibits slight to slightly moderate fracturing with slight to moderate weathering.

5.2.2 Acoustic Televiewer Logging – Unit 2

The acoustic televiewer was used to image the boring wall in one borehole (B-2005) at the relocated WLS Unit 2 with fracture dips and dip azimuths identified. The televiewer log at B-2005 exhibits slight to slightly moderate fracturing with slight to moderate weathering with foundation quality rock near the top of hole.

5.2.3 P-S Suspension Logging – Unit 1

In Figure 17, the seismic wave velocities from P-S Suspension data for the relocated Unit 1 nuclear island 2012 borings B-2000 and B-2002 is compared to the results from 2006-2007 logs. Inspection of this figure shows the 2012 shear wave (Vs) and compression wave (Vp) data are consistent with previous results and show good correlation to the COLA data in FSAR Revision 6.

Seismic wave velocities for Unit 1 CNS fill concrete measured in B-2000, were 8330 and 8440 feet per second (ft./sec.) with a corresponding Vp of 15,150 and 15,500 ft./sec. The measured fill concrete velocities are considered to represent very good concrete as shown by the average wave velocities. The values of ν for the fill concrete were 0.28 to 0.29 and are slightly higher than the typical range for concrete (ν = 0.20 to 0.30).

Note that the shear wave velocity data in the rock at boring B-2000 at the northwest corner of the relocated WLS Unit 1 nuclear island is consistent with the shear wave velocity in other borings for rock beneath the existing concrete of former CNS Unit 1. The P-S velocity data in boring B-2000 thus confirm that the conditions at the former northwest corner of the WLS Unit 1, before relocation, are not present at the northwest corner of the relocated WLS Unit 1 nuclear island.

The comparisons described above show that the Vs and Vp data at WLS Unit 1 from the 2012 borings is consistent with the 2006-2007 borings; thus the dynamic profile (Base Case A1 – Unit 1, FSAR Figure 2.5.4-252 Rev. 6) for the Unit 1 relocated nuclear island is valid for the relocated plant. Note that the revised FIRS A1 – Unit 1 dynamic profile has 3 ft. thickness of fill concrete added to the top of the profile due to the raised plant elevation and is shown in Figure 19. The local velocity profile B (FSAR Figure 2.5.4-249 Rev. 6) at the northwest corner of WLS Unit 1, before relocation, does not exist at the northwest corner of the relocated WLS Unit 1 and therefore is not considered as part of this evaluation.

5.2.4 P-S Suspension Logging – Unit 2

In Figure 18, the seismic wave velocities from P-S Suspension data for the relocated Unit 2 nuclear island 2012 boring B-2005 is compared to the results from 2006-2007 logs. Inspection of this figure shows the 2012 shear wave and compression wave data are consistent with previous results and show good correlation to the COLA data in FSAR Revision 6.

The comparison described above shows that the Vs and Vp data at WLS Unit 2 from the 2012 borings is consistent with the 2006-2007 borings; thus the dynamic profile (Smoothed Profile C

– Unit 2 (FSAR Figure 2.5.4-250 Rev. 6)) for the Unit 2 relocated nuclear island is valid for the relocated plant.

6.0 EVALUATION OF PLANT RELOCATION FIELD EXPLORATION RESULTS TO COLA RESULTS

The revisions to FSAR Subsections 2.5.1, 2.5.2, 2.5.4, 2.5.5, and Section 3.7 based on the 2012 plant relocation and elevation change, as well as the new geotechnical field data consisting of geotechnical borings and geophysical tests that were obtained from recent explorations completed at the relocated nuclear islands in 2012, are summarized below. No additional exploration of facilities beyond the nuclear islands was conducted in 2012. This section presents a comparison of the field conditions at the relocated plant location with respect to the conditions at the initial plant location described in FSAR Revision 6 and prior. Changes to the results and conclusions in the existing FSAR Revision 6, if any, are identified. Future updates to the FSAR are described in Section 7.0 of this enclosure.

The 2012 field data has been reviewed and evaluated, the rock and foundation conditions at the relocated nuclear islands are confirmed to be the same as those at the nuclear islands before their relocation with the exception that the localized weathered rock condition related to the northwest corner of Unit 1 before relocation does not exist beneath the northwest corner of the Unit 1 after the relocation.

6.1 Evaluation of FSAR Subsection 2.5.1, Basic Geologic and Seismic Information

The locations of the Lee Nuclear Station on FSAR Figures 2.5.1-220, Site Geologic Map, and 2.5.1-229, Surficial Geologic Map of Existing Excavation will be revised to depict the relocated plant location. Evaluations of regional and site geologic and seismic information described in this subsection remain valid. No updates or changes to conclusions presented in FSAR Subsection 2.5.1 Revision 6 are planned as a result of plant relocation.

6.2 Evaluation of FSAR Subsection 2.5.2, Vibratory Ground Motion

FSAR Subsection 2.5.2, Vibratory Ground Motion will be updated to incorporate 2012 field investigation results for the relocated plant site. The information provided for the Lee Nuclear Station Units 1 and 2 ground motion evaluations is based on data from historic field explorations for the Cherokee Nuclear Station and the field explorations for the Lee Nuclear Station completed in 2006-2007 and 2012.

FSAR Subsection 2.5.4 revisions will describe the results of recently-completed geotechnical explorations for the relocated plant. Updates to dynamic material profiles used to perform ground motion calculations will be revised in FSAR Subsection 2.5.4.7. The locations of dynamic velocity profiles and associated data sources are illustrated in Figure 22. Figures 23, 24, and 25 illustrate dynamic profiles for Base Cases A1, A5, and C4, respectively. The horizontal and vertical GMRS results for Lee Nuclear Station are summarized in Table 3. The horizontal and vertical results for Unit 1 FIRS A1 and A5 and Unit 2 FIRS C4 at Lee Nuclear Station are summarized in Table 4. The horizontal and vertical spectra for FIRS A1, A5, and C4 are plotted in Figures 26, 27, and 28, respectively.

6.2.1 Evaluation of FSAR Subsection 2.5.2.7, Development of FIRS for Units 1 and 2

FSAR Subsection 2.5.2.7 will be revised to describe the development of the foundation input response spectra (FIRS) for Units 1 and 2, to evaluate potential site response effects attributed to existing fill concrete and structural concrete materials placed during construction of the existing Cherokee Nuclear Station as well as new fill concrete for Lee Nuclear Station placed above the existing Cherokee Nuclear Station concrete materials and within localized lower pump room areas.

The Lee Nuclear Station Unit 1 foundation is supported on new and previously placed concrete materials positioned directly over continuous hard rock with shear wave velocity dominantly over 9,200 ft/sec. Localized portions of the Unit 1 nuclear island overlie legacy Cherokee lower rooms as shown in Figure 20 (new FSAR Figure 2.5.4-266). The Lee Nuclear Station Unit 2 foundation is supported on continuous hard rock with shear wave velocity dominantly over 9,200 ft/sec with the exception of the eastern edge of the nuclear island which may be supported by up to 20 feet of new leveling fill concrete (Figure 21) (new FSAR Figure 2.5.4-267). Dynamic profiles for FIRS A1, A5, and C4 are represented in Figures 23, 24, and 25, respectively.

FSAR Subsection 2.5.2.7 will be revised to present the location-specific Lee Nuclear Station Unit 1 FIRS A1 with Unit 1 FIRS A5 and Unit 2 FIRS C4 representing sensitivity evaluations to assess localized foundation conditions described below.

As illustrated in Figure 20, the conditions associated with FIRS A5 are only applicable to a small localized portion of the Unit 1 footprint, while FIRS A1 is applicable to the remainder. Since the nuclear island basemat will respond as a unit, the actual input to the nuclear island will be much closer to FIRS A1, and the contribution of FIRS A5 will not adversely impact the overall response of Unit 1. Similarly, FIRS C4 was developed as a sensitivity analysis of the potential effects of localized fill concrete beneath the eastern extents of Unit 2. The potential effects of

FIRS C4 are bounded by FIRS A1 for Unit 1, and the GMRS presented in FSAR Subsection 2.5.2.6 define the input motion at Unit 2.

Ground motion calculations use available EPRI seismicity, seismic source (including an update of the Charleston and New Madrid seismic sources), and EPRI ground motion models.

6.3 Evaluation of FSAR Subsection 2.5.3, Surface Faulting

There are no revisions to FSAR Subsection 2.5.3, Surface Faulting due to the relocation of Lee Units 1 and 2. There are no capable tectonic sources within the Lee Nuclear Site vicinity (25 mi. radius), and there is negligible potential for tectonic fault rupture at the site and within the site vicinity. There is also negligible potential for non-tectonic surface deformation at the site and within the site area (5 mi. radius). Evaluations for this FSAR subsection remain valid and will not be revised due to the relocation of Lee Units 1 and 2 in the future revision of the FSAR.

6.4 Evaluation of FSAR Subsection 2.5.4, Stability of Subsurface Materials and Foundations

FSAR Subsection 2.5.4 will be updated as summarized below.

6.4.1 Evaluation of FSAR Subsection 2.5.4.2.1.1 Soil, Rock, and Concrete Borings
The boring logs from the 2012 explorations will be included as FSAR Appendix 2AA, Attachment 6, as described in Enclosure 1 to this letter.

6.4.2 Evaluation of FSAR Subsection 2.5.4.2.4, Material Properties
Minor text revisions will be made in various locations throughout FSAR Subsection 2.5.4.2.4 as necessary to accommodate the relocated plant structures and the results of recently-completed geotechnical exploration. The geotechnical model described will not be revised because the 2012 explorations encountered only materials already included in the geotechnical model. No additional laboratory tests were performed, so the static soil properties described in FSAR Subsection 2.5.4.2.4.2 and supporting tables and figures remain unchanged.

6.4.3 Evaluation of FSAR Subsection 2.5.4.3, Foundation Interfaces
Text revisions will be made in various locations throughout FSAR Subsection 2.5.4.3 to describe the relocated plant structures and the results of recently-completed geotechnical exploration. The description of the power block exploration in FSAR Subsection 2.5.4.3.1 will be updated to reflect the relocated plant structures and the results of geotechnical and geophysical explorations performed in 2012. Borehole Summary figures presented as Figures 6 through 12 of this enclosure, prepared using for 2012 boring data including P-S velocity logging, will be

included in FSAR Subsection 2.5.4.3.4. The geotechnical plan and profile drawings described in FSAR Subsection 2.5.4.3.5 will be updated to reflect the relocated plant structures and the results of the 2012 explorations in a future revision of the FSAR.

6.4.4 Evaluation of FSAR Subsection 2.5.4.5, Excavations and Backfill

FSAR Subsection 2.5.4.5 will be revised to indicate that, within the foundation support zone of the SC-II annex building area and the SC-II turbine building first bay, the soil and partially weathered rock (PWR) will be removed to rock (the foundation support zone of these SC-II buildings is defined in the AP1000 DCD as being within a prism whose sides extend at 1:1 (horizontal:vertical) from the base edge of the structural foundations). If the rock, (or, in the case of Unit 1, existing concrete), elevation is below the elevation of the bottom of the nuclear island, the foundation support zone will use fill concrete to build up to the elevation of the bottom of the nuclear island before placing granular fill to support the SC-II structures near plant grade. If the elevation of the existing concrete or rock is above the bottom of the nuclear island, the concrete or rock will be removed to the elevation of the bottom of the nuclear island. This configuration ensures that the Lee Nuclear Station site provides uniform support for the Seismic Category II structures in a configuration identical to that considered in the AP1000 DCD designs.

FSAR Subsection 2.5.4.5 will note that the excavation for the foundation support zone of the SC-II annex building at Unit 1 may expose PWR or fractured rock in the northwest corner. This will be a relatively small area at the extreme northwest extent of the annex building support zone, and will not affect the demands on the annex building. The majority of the foundation support zone for the SC-II annex building of Unit 1 will, upon excavation, expose rock or CNS Unit 1 concrete over rock.

FSAR Subsection 2.5.4.5.2.1 – Unit 1 Excavation Conditions, will be revised to illustrate that the former CNS auxiliary building mat and some underlying rock is removed in the south end of the relocated nuclear island because the CNS auxiliary building mat in this area is at an elevation higher than the nuclear island of the relocated WLS Unit 1. Otherwise, the CNS auxiliary building mat will remain in-place beneath the relocated nuclear island except where a 2 ft. strip must be removed to remove the isolation joint surrounding the former CNS Unit 1 circular reactor building mat.

FSAR Subsection 2.5.4.5.2.1 – Unit 1 Excavation Conditions, will be revised to remove consideration of the deep profile of weathered rock that occupied the area northwest of the corner of the WLS Unit 1 nuclear island before the unit was relocated southeast in August,

2012. This subsection will include a discussion regarding the existing Cherokee Nuclear Station concrete foundation that has several local pits (referred to as pump rooms) that were to serve various purposes (Figure 20). These local pits were typically to be provided with horizontal and vertical waterproofing membranes. In pits having the horizontal and vertical waterproofing membranes, these features will be removed down to the top of the fill concrete layer resting on the continuous rock and outward to the surrounding rock and replaced with new fill concrete.

FSAR Subsection 2.5.4.5.2.2 – Unit 2 Excavation Conditions, will be revised to note that the eastern edge of the relocated nuclear island will require about 20 ft. of fill concrete between the bottom of the nuclear island and the top of continuous rock (Figure 21). The central and western portions of the relocated WLS Unit 2 nuclear island will require only minimal thicknesses of fill concrete.

FSAR Subsection 2.5.4.5.3 – Specifications and Control, requires no revisions.

FSAR Subsection 2.5.4.5.3.1 – Nuclear Island Foundation Materials, will be revised to note that some previously mapped Cherokee foundation rock may be exposed during WLS Unit 1 construction. Exposed rock will be mapped and compared to the previous Cherokee mapping to confirm FSAR interpretations.

FSAR Subsection 2.5.4.5.3.2 – Fill Concrete beneath the Nuclear Island Foundation Limits, will be revised to indicate the requirements for fill concrete are also applicable to the fill concrete that is used to build up the rock surface exposed by excavation to the same level as the bottom of the nuclear island foundation in the foundation support zones of the SC-II building areas (annex building and turbine building first bay).

FSAR Subsection 2.5.4.5.3.3 – Foundation Materials Outside the Nuclear Island, will be revised to describe the requirement for rock, fill concrete, or partially weathered rock to support the granular backfill within the foundation support zone of the SC-II annex building and the SC-II turbine building first bay.

FSAR Subsection 2.5.4.5.3.4 – Fill Concrete Outside the Nuclear Island Foundation Limits, will be revised to note that requirements for fill concrete used within the foundation support zone of the SC-II building areas adjacent to the nuclear island (see FSAR Subsection 2.5.4.5.3.2).

FSAR Subsection 2.5.4.5.3.5 – Granular Backfill Outside the Nuclear Island, will be revised to provide clarification on compactor selection for granular backfill considering the results of the test fill.

6.4.5 Evaluation of FSAR Subsection 2.5.4.6, Groundwater Conditions

FSAR Subsection 2.5.4.6 – Groundwater Conditions, will be revised to note changes to the nuclear island elevation and corresponding standard plant elevation. The elevation used to confirm the DCD design groundwater characteristic will be revised to conform to the change in vertical position of the plant.

6.4.6 Evaluation of FSAR Subsection 2.5.4.7, Response of Soil and Rock to Dynamic Loading

Revisions will be made in various locations throughout FSAR Subsection 2.5.4.7 as necessary to describe the relocated plant structures, the results of recently-completed compressional and shear wave velocity logging, and foundation condition and uniformity. The description of the compressional and shear wave velocity logging in FSAR Subsection 2.5.4.7.2 will be updated to reflect geophysical explorations performed in 2012. This subsection also presents the revised profile for the location-specific Lee Nuclear Station Unit 1 FIRS A1 (Figure 23), along with newly developed profiles for Unit 1 FIRS A5 (Figure 24) and Unit 2 FIRS C4 (Figure 25) representing sensitivity evaluations to assess localized foundation conditions.

FSAR Subsection 2.5.4.7.1 – Prior Earthquake Effects and Geologic Stability, requires no revisions.

FSAR Subsection 2.5.4.7.2 – Field Dynamic Measurements, will be revised to reflect geophysical explorations performed in 2012 and 2006-2007. This subsection will be revised to remove information associated with geophysical logging of borings B-1074A and B-1075A located in the former Unit 1 northwest corner of the nuclear island performed in 2006-2007. The August 2012 plant relocation shifted the Unit 1 nuclear island 50 ft. east and 66 ft. to the south of the proposed location in 2006-2007. The local lower seismic velocities at the Lee Nuclear Station Unit 1 northwest corner are no longer representative of conditions beneath the Lee Nuclear Station Unit 1 nuclear island in its relocated position. In 2012, borehole P-S suspension log seismic velocity surveys were made in the relocated nuclear island positions to obtain new data at the relocated plant site and to confirm geologic and geotechnical evaluations described in the FSAR, Revision 6. The locations of these 2012 P-S velocity measurements are included on Figure 22 and on revised FSAR Figure 2.5.4-247.

FSAR Subsection 2.5.4.7.4 – Foundation Conditions and Uniformity, will be revised to reflect foundation conditions and uniformity for the relocated nuclear islands. Compliance with the subsurface uniformity criteria as described in AP1000 DCD Subsection 2.5.4.5 is confirmed as part of the 2012 evaluations.

FSAR Subsection 2.5.4.7.4.1 – Lee Nuclear Station, Unit 1 Nuclear Island

The foundation support zone for the relocated Lee Nuclear Station nuclear island is entirely underlain by the footprint of the existing concrete foundation of Cherokee Nuclear Station Unit 1 which is underlain by continuous rock. Discussions concerning the northwest corner of the Lee Nuclear Station Unit 1 nuclear island and its extension beyond the limits of the Cherokee Nuclear Station structure are not relevant to the relocated Lee Nuclear Station Unit 1 nuclear island and will be removed from the FSAR. The thicknesses of the composite concrete, defined as Lee Nuclear Station and Cherokee Nuclear Station Unit 1 fill and structural concretes, under Lee Nuclear Station Unit 1 nuclear island basemat generally ranges between several feet to about 25 feet thick and contains localized areas underlain by CNS pump room that will be backfilled with approximately 22 ft. of new fill concrete. The localized condition associated with the CNS pump rooms is limited to a small portion of the Unit 1 nuclear island footprint as depicted in Figure 20 (new FSAR Figure 2.5.4-266).

FSAR Subsection 2.5.4.7.4.2 – Lee Nuclear Station, Unit 2 Nuclear Island

This subsection will be revised to reflect the maximum thickness of fill concrete is about 16 to 20 feet beneath the east portion of the nuclear island, but generally will be less than about 1 to 2 feet as depicted in Figures 16 and 21 (new FSAR Figures 2.5.4-264 and 2.5.4-267). This relatively small area of concrete fill required to build up the eastern edge of the Unit 2 nuclear island basemat will not result in localized adverse conditions due to the relatively small difference in shear wave velocity of fill concrete (7,500 ft/sec) and rock (8391 to 8983 ft/sec) in this area. The fill concrete conditions described for the Lee Nuclear Station Unit 2 nuclear island eastern portion have no practical significance on differential shear wave velocity, site amplification or foundation performance.

FSAR Subsection 2.5.4.7.5 – Dynamic Profile

This subsection will be revised to include two base case dynamic velocity profiles for the Lee Nuclear Station Unit 1 centerline and one base case dynamic profile for Lee Nuclear Station Unit 2. The base case models the Lee Units 1 and 2 nuclear island configurations are described below.

- Base Case A1, Unit 1 Nuclear Island Centerline (revised)

  Defines the GMRS and the typical relationship of the Lee Nuclear Station fill concrete (8.5 feet) overlying Cherokee Nuclear Station structural and fill concrete (composite 23.5 feet) above continuous rock (Figure 23) (new FSAR Figure 2.5.4-252a).

- Base Case A5, Unit 1 CNS Pump Rooms (new)

  Defines the GMRS and localized condition of the Lee Unit 1 nuclear island that will overlie legacy CNS pump rooms at approximately 527 ft (NAVD). Base Case Profile A5 is based on the Lee Nuclear Station GMRS developed at the top of a hypothetical outcrop fixed at 523 ft (NAVD) transferred up through previously placed Cherokee Nuclear Station concrete materials and newly placed Lee Nuclear Station concrete materials to the basemat foundation level at 553.5 ft (NAVD). Base Case Profile A5 models the localized as-built areas of the Lee Unit 1 nuclear island that will overlie legacy CNS pump rooms (Figure 20) (new FSAR Figure 2.5.4-266). The horizontal slab concrete of these pump rooms and existing waterproofing membrane will be removed during Lee construction and the pump rooms will then be backfilled using approximately 22 feet of fill concrete up to CNS basemat elevation 545 feet MSL with an additional 8.5 feet of fill concrete placed up to the basemat floor elevation (553.5 feet MSL) (Figure 24) (new FSAR Figure 2.5.4-252b).

- Base Case C4, Unit 2 Nuclear Island Eastern Edge (new)

  Defines the GMRS and the typical relationship of proposed new leveling fill concrete above continuous rock. The location of Lee Unit 2 will require placing between 8 and 20 feet of new leveling fill concrete beneath the eastern extents of the Lee Unit 2 Nuclear Island as depicted in Figure 21 (new FSAR Figure 2.5.4-267). Base Case C4 defines the GMRS and the maximum concrete thickness along the eastern extents of Lee Nuclear Station Unit 2.

The base case models are based on updated Vs and Vp data at WLS Unit 1 from the 2012 borings and 2006-2007 borings. The revised dynamic profiles (Base Case A1 – Unit 1, Figure 23 (new FSAR Figure 2.5.4-252a) for the Unit 1 relocated nuclear island is valid for the relocated plant. Note that the FIRS A1 – Unit 1 dynamic profile has 3 ft. thickness of fill concrete added to the top of the profile due to the raised plant elevation (Figure 23) (revised FSAR Figure 2.5.4-252a). The local velocity profile B (FSAR Figure 2.5.4-249) at the northwest corner of WLS Unit 1, before relocation, does not exist at the northwest corner of the relocated WLS Unit 1 and therefore is not considered as part of this evaluation. Profile B (FSAR Figure 2.5.4-249) will be removed from this subsection as it is no longer relevant to the Unit 1 nuclear island assessments as a result of plant relocation. The 2012 data conclusively indicate that the local lower velocities at the Lee Nuclear Station Unit 1 northwest corner are no longer representative of conditions beneath the Lee Nuclear Station Unit 1 nuclear island in its relocated position.

Change in the shear wave velocity profile attributed to the increased concrete fill thickness (3 ft.) at the hard rock condition results in a negligible variation in site response calculations for relocated Unit 1. The additional thickness of fill concrete amounts to a 15% increase in the fill concrete profile for relocated FIRS A1 for the relocated Lee Nuclear Station Unit 1 nuclear island. The average shear wave velocity of the shear wave velocity profile with the added concrete is slightly different from the average shear wave velocity of the profile before the addition of the 3 ft. of fill concrete. This small change will have no practical significance on differential shear wave velocity, site amplification or foundation performance and compliance with the subsurface uniformity criteria as described in AP1000 DCD Subsection 2.5.4.5.

FSAR Subsection 2.5.4.7.5 will be revised to describe comparisons demonstrating that the Vs and Vp data at WLS Unit 2 from the 2012 borings is consistent with the 2006-2007 borings. FSAR Subsection 2.5.4.2.2 will be revised to describe the Unit 2 excavation conditions and notes that the eastern edge of the relocated nuclear island will require about 20 ft. of fill concrete between the bottom of the nuclear island and the top of continuous rock, referred to as Base Case C4, Unit 2 Nuclear Island Eastern Edge (Figure 25) (new FSAR Figure 2.5.4-252c). This relatively small area of fill concrete required to build up the eastern edge of the Unit 2 nuclear island basemat will not result in localized adverse conditions due to the relatively small difference in shear wave velocity of fill concrete (7,500 ft./sec.) and rock (8391 to 8983 ft./sec.) in this area. The fill concrete conditions described for the relocated Lee Nuclear Station Unit 2 nuclear island eastern portion have no practical significance on differential shear wave velocity, site amplification or foundation performance and compliance with the subsurface uniformity criteria as described in AP1000 DCD Subsection 2.5.4.5. The dynamic profile (Smoothed Profile C – Unit 2 (FSAR Figure 2.5.4-250)) for the Unit 2 relocated nuclear island is valid for the relocated plant.

The shear wave velocities presented in FSAR Tables 2.5.4-224a, 2.5.4-224b, and 2.5.4-224c are estimated based on the ground surface (yard elevation) at Elevation 589.5 feet. The change of the yard to Elevation 592 feet adds 2.5 feet of non-buoyant soil weight over the layers in these tables, resulting in slightly higher wave velocities. The slightly higher shear wave velocities for the yard at Elevation 592 feet averaged over a profile depth of 40 feet are 0.9% to 2.3% higher than those based on the previous yard at Elevation 589.5 ft. Thus, the shear wave velocities and other parameters summarized in FSAR Tables 2.5.4-224a, 2.5.4-224b, and 2.5.4-

224c are representative of shear wave velocities and shear modulus values associated with either yard elevation (589.5 feet or 592 feet). The same is true for the modulus ratio and damping ratio results in FSAR Tables 2.5.4-224d, 2.5.4-224e and 2.5.4-224f. In all the tables, the depth reference is the ground surface. New base case profiles, Base Case A5, Unit 1 CNS Pump Rooms and Base Case C4, Unit 2 Nuclear Island Eastern Edge, were developed to perform ground motion sensitivity studies described in FSAR Subsection 2.5.2.

6.4.7 Evaluation of FSAR Subsection 2.5.4.10, Static Stability

The nuclear island bearing capacity and settlement analyses consider borings in the Unit 1 and Unit 2 vicinities. As a result of the plant relocation and 2012 explorations, the borings considered for the Unit 1 and Unit 2 bearing capacity and settlement analyses are revised as summarized in the table below.

	Unit 1	Unit 2
Borings to be removed from FSAR Rev. 7	B-1074A and B-1075A	None
Borings to be added to FSAR Rev. 7	B-1005, B-1007, B64 (1), B151P (1), B-2000, B-2001, B-2002, B-2003 and B-2004(2)	B-1021, B66 (1), B-2005 and B-2006(2)

(1) Historic borings from CNS explorations.

(2) B-2000 series borings completed in 2012.

6.4.7.1 Bearing Capacity of Nuclear Islands

The bearing capacity of the Unit 1 and Unit 2 relocated nuclear island foundation is evaluated for each unit. Two independent methods are used to determine the bearing capacity of the foundation materials. The first method is based on the RQD of the rock. The second method is based on the strength of the rock.

The allowable bearing pressure method utilizes an empirical relationship between allowable bearing pressure and average RQD. The allowable bearing pressure determined from this empirical relationship is compared to the required allowable bearing capacity provided in the AP1000 DCD Subsection 2.5.4.2. RQD data from the 2012 borings is consistent with the previous data from the 2006-2007 borings and the historic CNS borings. Thus the allowable bearing pressure determined from the RQD data for the Unit 1 and Unit 2 relocated nuclear islands including the 2012 boring data is comparable to the allowable bearing pressures for the nuclear islands in their 2006-2007 locations. Thus, there is no change to the conclusion in the FSAR Revision 6 that the allowable bearing pressure at the relocated positions of the Lee Nuclear Station Unit 1 and Unit 2 nuclear islands will exceed the bearing requirements provided in the AP1000 DCD.

The ultimate bearing capacity method utilizes Hoek-Brown parameters of the rock mass to establish the Mohr-Coulomb parameters of friction angle and cohesion for the rock. The bearing capacity factors are determined based on the established Mohr-Coulomb parameters. The rock quality evaluated from the 2012 borings in the relocated positions of the Unit 1 and Unit 2 nuclear islands is comparable to the rock quality in the 2006-2007 locations (note that borings B-1074A and B-1075A are removed from consideration in the relocated WLS Unit 1 nuclear island). Thus, there is no change to the conclusion in the FSAR Revision 6 that the allowable bearing pressure at the relocated positions of the Lee Nuclear Station Unit 1 and Unit 2 nuclear islands, including the 2012 boring data, will exceed the bearing requirements provided in the AP1000 DCD.

6.4.7.2 Settlement of Nuclear Islands

Estimates of post-construction settlement are calculated separately for relocated Unit 1 and Unit 2 based on the theory of elasticity. Three settlement methods (equations) are employed for estimation of settlement beneath the nuclear island using this approach. The three methods used are the Steinbrenner equation, the Corps of Engineers equation, and the Boussinesq equation. The calculations utilize rock modulus values determined from the RQD values and from the seismic shear wave velocities.

The calculations estimate settlement resulting from static loading of the nuclear island foundation bearing directly on rock or bearing on a depth of fill concrete in turn resting on rock.

RQD-based Young's modulus values from the 2012 borings are consistent with the previous data from the 2006-2007 borings and the historic CNS borings. Thus the elastic settlement values determined from the RQD-based Young's modulus profiles for the Unit 1 and Unit 2 relocated nuclear islands is comparable to the settlement values for the nuclear islands in their 2006-2007 locations. Thus, there is no change to the conclusion in the FSAR Revision 6 that the settlement of the relocated positions of the Lee Nuclear Station Unit 1 and Unit 2 nuclear islands, including the 2012 boring data, is within the limits allowed by the AP1000 DCD.

Young's modulus values derived from the 2012 P-S velocity measurements are consistent with those from the 2006-2007 measurements. Thus, elastic settlement values calculated for the relocated nuclear islands considering the Young's modulus values adjusted for the shear wave velocity measurements for the rock at the 2012 relocations are similar to those for the 2006-2007 locations for Lee Nuclear Station Unit 1 and Unit 2 nuclear islands.

Based on the consistency of RQD values and P-S seismic velocity values in the 2012 and 2006-2007 borings at Lee Nuclear Station Unit 1 and Unit 2, the settlement calculated for the relocated nuclear islands is similar to the settlements calculated for the 2006-2007 locations as contained in the FSAR, Revision 6. Thus, there is no change to the conclusion in the FSAR Revision 6 that the settlement of the relocated positions of the nuclear islands, including 2012 boring data, is within the limits allowed by the AP1000 DCD.

6.4.7.3 Bearing Capacity and Settlement of Adjacent Structures

The bearing capacity of the non-safety related structures adjacent to the relocated nuclear islands (radwaste buildings, annex buildings (both non-seismic and Category II portions), and turbine buildings) is evaluated using allowable bearing pressure and using ultimate bearing capacity, and the results are applicable to each unit.

The allowable bearing pressure method is used to estimate the allowable bearing pressure to limit settlement based on SPT blow count of the granular fill. This method determines the allowable foundation loading which, if not exceeded, will result in settlements not to exceed 1 inch for smaller footings and not to exceed 2 inches for larger foundation areas (e.g., mat foundations). The ultimate bearing capacity is also calculated to verify that foundations that would appear not to undergo the limiting settlement also have an acceptable margin of safety against a bearing capacity failure.

The relocation of the nuclear islands in 2012 also involved raising the plant yard elevation by 2.5 feet. This effectively places the water table deeper below the bottom of the foundations bearing in the granular fill. This increases the computed ultimate bearing capacity and allowable bearing pressure of foundations in the granular fill. There is no change to the conclusion expressed in the FSAR Revision 6 that the foundations supported on the granular fill will perform as intended and will meet the requirements for these foundations.

6.4.7.4 Lateral Pressures on Nuclear Island Foundation Walls

The relocated plant structures also involved raising the plant yard elevation by 2.5 ft. The design high and low groundwater elevations remained unchanged so that the depth to the high and low groundwater levels is increased by 2.5 ft., thus increasing the lateral earth pressures on the nuclear island foundation walls by a small amount due to the extra thickness of non-buoyant soil above the water table.

6.5 Evaluation of FSAR Subsection 2.5.5, Stability of Slopes

Minor revisions to the stability of slopes subsection presented in FSAR Revision 6 are necessary to accommodate the relocated plant structures. These revisions will be made in a future revision of the FSAR. Figure 29 (Revised FSAR Figure 2.5.5-201) shows the location of permanent slopes to the relocated structures. There are no changes to conclusions presented in the WLS FSAR.

6.6 Evaluation of FSAR Section 3.7 Seismic Design

Future revisions to FSAR Section 3.7 are summarized in the subsection below.

6.6.1 Evaluation of FSAR Subsection 3.7.1.1.1 Design Ground Motion Response Spectra
This subsection will be revised to present the design ground motion response spectra for Lee Nuclear Station Unit 1 and Unit 2 relocated nuclear islands. The foundation conditions at Lee Nuclear Station are unique in that the Unit 1 nuclear island foundation is supported on new and previously placed concrete materials placed directly over continuous rock. In contrast, the Unit 2 nuclear island foundation is configured more conventionally with the nuclear island founded directly over continuous rock, except for the eastern edge of the Unit 2 nuclear island, which will require approximately 20 ft. of fill concrete to build up the support zone to the base of the nuclear island. FSAR Subsection 3.7.1.1.1 presents individual design ground motion response spectra for the certified design portion of the plant at Units 1 and 2.

Figures 30 and 31 compare the Units 1 and 2 horizontal and vertical site-specific design ground motion response spectra, including Unit 1 FIRS A1 and A5 and Unit 2 FIRS C4, to the certified seismic design response spectrum (CSDRS) and the AP1000 generic hard rock spectrum (WEC). For Unit 1, the Foundation Input Response Spectrum (FIRS) defines the site response foundation input motion for the nuclear island foundation placed on concrete over continuous rock. Unit 1 FIRS, associated with Dynamic Profile Base Case A1 (Figure 23) (revised FSAR Figure 2.5.4-252a), represents the nuclear island centerline foundation input motion and is based on the GMRS developed at the top of a hypothetical outcrop (e.g., continuous rock) fixed at 530 feet (NAVD) transferred up through previously placed and new concrete materials to the basemat foundation level at 553.5 feet (NAVD). For Unit 2, the GMRS defines the site response foundation input motion developed at the top of a hypothetical outcrop of competent material (e.g., continuous rock) fixed at the basemat foundation level at 553.5 feet (NAVD). For comparison, Unit 1 FIRS A5 and Unit 2 FIRS C4 horizontal and vertical site-specific design ground motion response spectra are included on Figures 30 and 31, respectively.

As shown on Figure 30, the horizontal GMRS and Unit 1 FIRS (revised FSAR Figure 3.7.1-201) exceed the horizontal CSDRS at frequencies of about 20 to 75 hertz and 20 to 85 hertz, respectively. PGA at 100 hertz of the GMRS and Unit 1 FIRS is 0.21 g and 0.23 g, respectively. As shown on Figure 31, the vertical GMRS and Unit 1 FIRS (revised FSAR Figure 3.7.1-202) exceed the vertical CSDRS at frequencies between about 25 to 70 hertz. There is no change to the conclusion expressed in the FSAR Revision 6 that the WLS site provides uniform hard-rock support for the nuclear island, and the site characteristic GMRS and Unit 1 FIRS are less than the horizontal and vertical WEC generic hard rock spectrum at all frequencies. The site complies explicitly with the AP1000 DCD and no site-specific analysis is required.

6.6.2 Evaluation of FSAR Subsection 3.7.2.1.2 Time-History Analysis and Complex Frequency Response Analysis

For cases when site-specific analyses of the nuclear island structures may be required, artificial time histories (two horizontal and one vertical) are revised to be compatible with the Lee Nuclear Station Unit 1 FIRS spectrum (Figure 26) (revised FSAR Figures 3.7-201 and 3.7 202), and satisfy the requirements of Standard Review Plan (SRP) 3.7.1.

6.6.3 Evaluation of FSAR Subsection 3.7.2.8.4, Seismic Modeling and Analysis of Seismic Category II Building Structures

A future update to FSAR Subsection 2.5.4.5.2 will describe how areas in the foundation support zones of Seismic Category II buildings (the Annex Building and Turbine Building first bay) will be excavated to expose concrete or rock, and fill concrete will be used to build up to the base level of the nuclear island. If rock within the foundation support zone of these Seismic Category II structures is higher than the base of the nuclear island, the rock will be removed to the elevation of the base of the nuclear island. In areas where the pre-existing concrete and/or rock within the foundation support zone of these Seismic Category II structures are at a lower elevation than the base of the nuclear island, fill concrete will be used to build up the base level of the nuclear island. This configuration is illustrated in Figures 13 through 16 (revised FSAR Figures 2.5.4-260, and 2.5.4-262 through 2.5.4-264). The revised excavation and backfill configuration ensure that the Lee Nuclear Station site provides uniform support for the Seismic Category II structures in a configuration identical to that considered in the AP1000 DCD designs.

Duke Energy has determined that Macadam Base Course material provides properties appropriate for precluding interaction of Seismic Category II buildings with the nuclear island. Duke Energy has selected the static and dynamic properties described in FSAR Subsection 2.5.4 as well-graded gravel (GW) to represent that Macadam Base Course material. The static and dynamic properties of the material supporting Seismic Category II buildings will be verified as compatible with Lee Nuclear Station site response analyses as part of pre-construction site activities.

The revised subsection concludes that the Lee site provides uniform support for the Seismic Category II buildings; site-specific fill material is consistent with that considered in establishing generic AP1000 design criteria for these buildings; the site-specific seismic demands on the Seismic Category II buildings are less than those considered in the AP1000 standard design; the configuration of the granular fill supporting the Seismic Category II buildings is consistent with that described in the AP1000 DCD; and the bearing capacity of the supporting granular fill is greater than the bearing demand. Therefore, the Lee Nuclear Station site complies explicitly with the requirements of AP1000 DCD Subsection 3.7.2.8.4 for a hard rock site, and no site-specific analysis is required.

6.6.4 Evaluation of FSAR Subsection 3.7.2.15 Site-Specific Analyses of Nuclear Island Seismic Category I Structures

The Lee Nuclear Station site provides uniform hard-rock support and the site characteristic GMRS and Unit 1 FIRS are bounded by the Westinghouse generic hard rock spectrum. Therefore, no site-specific analysis of the nuclear island is required. The results of previously-submitted site-specific analyses confirmed that the presence of approximately 20 ft. of fill concrete instead of rock has very small effect on in-structure response spectra. The three-dimensional incoherent SSI analyses confirmed that at the six key locations, in-structure response spectra are enveloped by those resulting from the AP1000 CSDRS and HRHF SSI envelopes.

FSAR Subsections 3.7.2.15.1, Site Characteristics, 3.7.2.15.2, Seismic Inputs, 3.7.2.15.3, Two-Dimensional SASSI Parametric Studies, 3.7.2.15.4 Three-Dimensional SASSI SSI Analyses, and 3.7.2.15.5 Site-Specific Analyses Conclusions will be removed from a future revision of the FSAR.

7.0 CONCLUSIONS

The assessments of the plant relocation geotechnical investigation evaluated in this enclosure confirm that the geological, seismological, and geotechnical engineering information described in the Lee Nuclear Station FSAR Revision 6 are valid for the relocated units. There are no significant changes to the conclusions described in FSAR Revision 6. Evaluations described in this enclosure, including detailed assessments performed, confirm that the site characteristics at the Lee WLS Nuclear Station comply with the requirements of the AP1000 DCD.

The foundation support zone for the relocated WLS Unit 1 nuclear island is entirely underlain by the footprint of the existing concrete foundation of the CNS Unit 1 which is underlain by continuous rock. Discussions and analysis results contained in FSAR Revision 6 concerning the northwest corner of the WLS Unit 1 nuclear island are not relevant to the relocated WLS Unit 1 nuclear island and will be deleted from a future revision of the FSAR. Otherwise, the key geotechnical and seismological interfaces described in FSAR Revision 6 are confirmed to be valid. Ground motion calculations presented in the FSAR are based on 2004 EPRI SOG seismic source model with an update of the Charleston and New Madrid seismic sources and EPRI 2004-2006 Ground Motion Model.

The summary presented below describes the relevant findings and conclusions that will be presented in a future revision of FSAR Section 2.5 and Section 3.7. Updates to FSAR subsections are included in Attachments 1 through 5 to this enclosure.

7.1 FSAR Section 2.5, Geology, Seismology, and Geotechnical Engineering

7.1.1 FSAR Subsection 2.5.1, Basic Geologic and Seismic Information

Subsection 2.5.1 describes basic geological and seismologic information.

- The logs of borings from 2012 explorations confirm similar rock characteristics as described in the site area geologic characteristics presented in FSAR Revision 6. The logs of borings from 2012 explorations will be included as Appendix 2AA, Attachment 6 as described in Enclosure 1, Attachment 6.
- WLS Unit 1 is entirely underlain by former Cherokee concrete overlying mapped foundation level rock surfaces.
- Rock lithology underlying relocated plant locations is similar to initial location. Structural features (e.g., joints, fractures, shears, brecciated zones, including features demonstrating secondary mineralization) demonstrate similar relationships to features documented and mapped at Cherokee Units 1 and 2. The site has not experienced tectonic deformation since early Mesozoic, and possibly not since 219 Ma to 300 Ma.
- FSAR Figures 2.5.1-220, Site Geologic Map, and 2.5.1-229, Surficial Geologic Map of Existing Excavation will be revised to illustrate the relocated Lee Nuclear Station.
- Revised FSAR 2.5.1 figures are included as Attachment 1 to this enclosure. There are no changes to FSAR Subsection 2.5.1 text and tables.

7.1.2 FSAR Subsection 2.5.2, Vibratory Ground Motion

- Subsection 2.5.2 presents the vibratory ground motion at the site, including the Ground Motion Response Spectra (GMRS) and Foundation Input Response Spectra (FIRS) for the Lee Nuclear Site. This subsection presents the location-specific Lee Nuclear Station Unit 1 FIRS A1 (Figure 26) (revised FSAR Figure 2.5.2-246a), with Unit 1 FIRS A5 (Figure 27) (FSAR new Figure 2.5.2-246b) and Unit 2 FIRS C4 (Figure 28) (new FSAR Figure 2.5.2-246c) representing sensitivity evaluations to assess localized foundation conditions described below. The Lee Nuclear Station Unit 1 foundation is supported on new and previously placed concrete materials positioned directly over continuous hard rock with shear wave velocity dominantly over 9,200 ft/sec. Localized portions of the Unit 1 nuclear island overlie legacy Cherokee lower rooms (Figure 20) (new FSAR Figure 2.5.4-266). The Lee Nuclear Station Unit 2 foundation is supported on continuous hard rock with shear wave velocity dominantly over 9,200 ft/sec with the exception of the eastern edge of the nuclear island which may be supported by up to 20 feet of new leveling fill concrete (Figure 21) (new FSAR Figure 2.5.4-267). Site dynamic profiles used to compute the site-specific GMRS (FSAR Figure 2.5.4-250), Unit 1 FIRS A1 (Figure 23) (revised FSAR Figure 2.5.4-252a), Unit 1 FIRS A5 (Figure 24) (new FSAR Figure 2.5.4-252b) and Unit 2 FIRS C4 (Figure 25) (new FSAR Figure 2.5.4-252c) spectra and are suitable for evaluations of the AP1000 seismic design (FSAR Section 3.7).
- For relocated Unit 1 the addition of 3 ft. of fill concrete to bring up the basemat level to 553.5 ft. increased the horizontal and vertical spectra a small increment at frequencies of about 20 Hz and above. This small change in fill concrete thickness will have no practical significance on differential shear wave velocity, site amplification or foundation performance and compliance with the subsurface uniformity criteria as described in AP1000 DCD Subsection 2.5.4.5.
- For relocated Unit 2, the eastern edge of the relocated nuclear island foundation will be supported on about 20 ft. of fill concrete between the bottom of the nuclear island and the top of continuous rock (Figure 21). This relatively small localized area of concrete fill underlying the eastern edge of the relocated Unit 2 nuclear island will not result in localized amplification / deamplification effects due to the relatively small difference in the average shear wave velocities for fill concrete (7,500 ft./sec.) and surface rock (8,391 ft./sec. to about 8,983 ft./sec.) in this area (FSAR Figure 2.5.4-250). The addition

of fill concrete to support the relocated Lee Nuclear Station Unit 2 nuclear island eastern portion will have no practical significance on differential shear wave velocity, site amplification or foundation performance and compliance with the subsurface uniformity criteria as described in AP1000 DCD Subsection 2.5.4.5.

- Site-specific ground motion evaluations currently described in FSAR Subsection 2.5.2 will be updated in a future revision of the FSAR.
- Revisions to FSAR Subsection 2.5.2 text, tables, and figures are included in Attachment 2 to this enclosure.

7.1.3 FSAR Subsection 2.5.3, Surface Faulting

Subsection 2.5.3 describes the potential for surface faulting in the site area.

- No information derived from the plant relocation investigation exists that result in changes to assessments of tectonic and non tectonic in FSAR Revision 6.
- There are no capable tectonic sources within the Lee Nuclear Site vicinity (25 mi. radius), and there is negligible potential for tectonic fault rupture at the site and within the site vicinity. There is also negligible potential for non-tectonic surface deformation at the site and within the site area (5 mi. radius).
- There are no changes to conclusions presented in FSAR Subsection 2.5.3.

7.1.4 FSAR Subsection 2.5.4, Stability of Subsurface Materials and Foundations

Subsection 2.5.4, describes the stability of subsurface materials and foundations.

- Evaluations for the stability of subsurface materials and foundations were the primary focus of the plant relocation geotechnical investigation program.
- Compression and shear wave velocities measured at WLS Unit 1 and Unit 2 2012 borings are consistent with the 2006-2007 borings.
- Unit 1 – Dynamic profile (Base Case A1 – Unit 1, new FSAR Figure 2.5.4-252a) for the Unit 1 relocated nuclear island is valid for the relocated plant. Note that the FIRS A1 – Unit 1 dynamic profile has 3 ft. thickness of fill concrete added to the top of the profile due to the raised plant elevation (Figure 19). Local velocity profile B (FSAR Figure 2.5.4-249) at the northwest corner of WLS Unit 1, before relocation, does not exist at the northwest corner of the relocated WLS Unit 1 and therefore is not considered as part of this evaluation. Profile B (FSAR Figure 2.5.4-249) will be removed from this subsection in a future revision of the FSAR.

- Unit 2 - Dynamic profile (Smoothed Profile C – Unit 2 (revised FSAR Figure 2.5.4-250) for the Unit 2 relocated nuclear island is valid for the relocated plant.
- The allowable bearing pressure at the relocated positions of the WLS Unit 1 and Unit 2 nuclear islands will exceed the bearing requirements provided in the AP1000 DCD.
- There is no change to the conclusion in the FSAR, Revision 6 that the allowable bearing pressure at the relocated positions of the Lee Nuclear Station Unit 1 and Unit 2 nuclear islands will exceed the bearing requirements provided in the AP1000 DCD.
- The settlement of the relocated nuclear islands is within the limits allowed by the AP1000 DCD.
- There is no change to the conclusion expressed in the FSAR Revision 6 that the foundations supported on the granular fill will perform as intended and will meet the requirements for these foundations.
- The Lee Nuclear Station site is considered a hard rock site with rock having a shear wave velocity generally greater than 8,000 ft./sec. The rock underlying the relocated WLS Units 1 and 2 nuclear islands complies with the subsurface uniformity criteria as described in AP1000 DCD Subsection 2.5.4.5.
- Revisions to FSAR Subsection 2.5.4 text, tables, and figures are included in Attachment 3 to this enclosure.

7.1.5 FSAR Subsection 2.5.5, Stability of Slopes

Subsection 2.5.5 describes that stability of slopes which could adversely affect the safety of the seismic Category I plant components.

- There are no permanent slopes within one-quarter mile radius whose failure would impact the relocated WLS nuclear island facilities.
- There are no changes to the conclusions presented in FSAR Subsection 2.5.5.
- Revisions to FSAR Subsection 2.5.5 text, table, and figure are included in Attachment 4 to this enclosure.

7.2 FSAR Section 3.7, Seismic Design

Section 3.7 describes the design ground motion response spectra at the site, including comparisons of the site-specific Ground Motion Response Spectra (GMRS) and Foundation Input Response Spectra (FIRS) for the Lee Nuclear Site to certified seismic design response spectrum (CSDRS) and the AP1000 generic hard rock spectrum (HRHF).

Additional geotechnical field data obtained in 2012 at the relocated plant site confirms geologic and geotechnical evaluations previously described in the FSAR. The 2012 field data confirm similar rock subsurface conditions for the relocated structures to those evaluated from the 2006-2007 field data before relocation. The only exception is that the 2012 field data confirm that the deep weathered rock beneath the northwest corner of Unit 1, before relocation, is not present beneath the northwest corner of Unit 1 after relocation in 2012. Discussions regarding evaluations for the northwest corner of the WLS Unit 1 nuclear island are not relevant to the relocated WLS Unit 1 nuclear island and will be removed from a future revision of FSAR.

For relocated WLS Unit 1, the foundation support zone for the relocated nuclear island is entirely underlain by the footprint of the existing concrete foundation of Cherokee Nuclear Station Unit 1 which is underlain by continuous rock (Figure 3). Localized portions of the Unit 1 nuclear island overlie legacy Cherokee lower rooms (Figure 20) (new FSAR Figure 2.5.4-266). The 2012 field data indicates conclusively that the deeply weathered rock condition beyond the northwest corner of Unit 1, before relocation in 2012, does not exist beneath the northwest corner of Unit 1 after relocation. Discussions concerning the northwest corner of the Lee Nuclear Station Unit 1 nuclear island and its extension beyond the limits of the Cherokee Nuclear Station structure are not relevant to the relocated Lee Nuclear Station Unit 1 nuclear island and will be removed from a future revision of the FSAR.

For relocated Unit 2, the eastern edge of the relocated nuclear island foundation will be supported on about 20 ft. of fill concrete between the bottom of the nuclear island and the top of continuous rock (Figures 16 and 21) (new FSAR Figures 2.5.4-264 and 2.5.4-267) (FSAR Subsection 2.5.4.4.2). This relatively small localized area of concrete fill underlying the eastern edge of the relocated Unit 2 nuclear island does result in some localized amplification / deamplification effects due to the increased fill concrete thickness in this area as described below.

- FSAR Subsection 3.7.1.1.1 Design Ground Motion Response Spectra results remain valid and are suitable for evaluations of the relocated AP1000 nuclear islands. Discussions regarding evaluations for the northwest corner WLS Unit 1 described in FSAR Revision 6 are not relevant to the relocated WLS Unit 1 nuclear island and will be removed from FSAR Section 3.7. Revised FIRS A1 (Figure 26) (revised FSAR Figure 2.5.2-246a) and new FIRS A5 (Figure 27) (revised FSAR Figure 2.5.2-246b) and FIRS C4 (Figure 28) (revised FSAR Figure 2.5.2-246c) remain within the desired hazard and risk levels across all structural frequencies to 100.0 Hz. Horizontal FIRS A5 is coincident with, but does not exceed, the

WEC HRHF spectrum at 50Hz. The Lee Nuclear Station site provides uniform hard-rock support for the nuclear island, and the site characteristic GMRS and Unit 1 FIRS (FIRS A1) are less than the horizontal and vertical WEC HRHF spectrum at all frequencies (Figures 30 and 31) (revised FSAR Figure 3.7-201 and 3.7-202). Therefore the site complies explicitly with the AP1000 DCD and no site-specific analysis is required.

- FSAR Subsection 3.7.2.8.4 Seismic Modeling and Analysis of Seismic Category II Building results remain valid and are suitable for evaluations of the relocated AP1000 Seismic Category II Buildings. Duke Energy's decision to relocate the plant replaces the lower portions of thick granular fill with fill concrete which is very similar to the hard rock considered in the AP1000 DCD. If rock within the foundation support zone of these Seismic Category II structures is higher than the base of the nuclear island, the rock will be removed to the elevation of the base of the nuclear island. This results in the same configuration considered in the AP1000 DCD. These measures ensure that the Lee Nuclear Station site provides uniform support for the Seismic Category II structures in a configuration identical to that considered in the AP1000 DCD designs.
- Candidate granular fill materials are described in FSAR Subsection 2.5.4. Duke Energy has determined that Macadam Base Course material provides properties appropriate for precluding interaction of Seismic Category II buildings with the nuclear island. Duke Energy has selected the static and dynamic properties described in FSAR Subsection 2.5.4 as well-graded gravel (GW) to represent that Macadam Base Course material. The Lee site-specific bearing capacity for the granular fill material supporting the Seismic Category II structures is greater than the generic AP1000 bearing demand for these structures. The information above demonstrates that the Lee site provides uniform support for the Seismic Category II buildings; site-specific fill material is consistent with that considered in establishing generic AP1000 design criteria for these buildings; the site-specific seismic demands on the Seismic Category II buildings are less than those considered in the AP1000 standard design; the configuration of the granular fill supporting the Seismic Category II buildings is consistent with that described in the AP1000 DCD; and the bearing capacity of the supporting granular fill is greater than the bearing demand. Therefore, the Lee Nuclear Station site complies explicitly with the requirements of AP1000 DCD Subsection 3.7.2.8.4 for a hard rock site, and no site-specific analysis is required.
- Revisions to FSAR Section 3.7 text, tables, and figures are included as Attachment 5 to this enclosure.

Attachments

1. Revisions to FSAR Chapter 2, Subsection 2.5.1
2. Revisions to FSAR Chapter 2, Subsection 2.5.2
3. Revisions to FSAR Chapter 2, Subsection 2.5.4
4. Revisions to FSAR Chapter 2, Subsection 2.5.5
5. Revisions to FSAR Chapter 3, Section 3.7

Table 1
Summary of Completed Borings and In-Situ Testing, 2012 Plant Relocation

Facility or Zone	**Boring Number**	**Coordinates and Elevation**			**Boring Type**					**Depth (ft bgs)**		**In-Situ Testing**					
		Northing	Easting	Elevation (ft MSL)	Rock Coring		Soil Sampling Method			Proposed	Actual	P-S Velocity	Downhole Velocity	Televiewer	Goodman Jack	Pressure-meter	Packer Test
					HQ	NQ[5]	SPT	UD	CME								
Power Block AP1000 (Nuclear Island)																	
Unit 1	**B-2000**	1166027.29	1846301.71	544.45	X					125	126	X		X			
(Basemat Elevation 553.5 ft.)	**B-2001**	1165894.29	1846423.34	544.47		X				100	100.5						
	B-2002	1165782.16	1846364.98	558.84		X				100	225.6	X		X			
	B-2003	1165773.77	1846448.63	559.03	X					225	54.6	(Note 6)		X			
	B-2004	1165936.81	1846506.19	544.55		X				100	101						
Unit 2	**B-2005**	1165972.37	1847267.57	550.28	X					225	225	X		X			
(Basemat Elevation 553.5 ft.)	**B-2006**	1166175.58	1847173.13	558.37		X				100	101						

Notes:
1. Locations indicated in **black** depict exploration points intended to confirm conditions similar to those described in FSAR Revision 6.
2. ft bgs = feet below ground surface
3. ft MSL = feet above mean sea level
4. Coordinate and elevation values represent the as-drilled positions. Northing and Easting values are the same coordinate system used in FSAR Table 2.5.4-203.
5. Where NQ coring is specified, HQ coring was performed for convenience.
6. Boring B-2003 was planned to be a 225 foot deep boring with P-S Velocity logging and Acoustic Televiewer testing. Boring B-2002 was planned to be a 100 foot deep boring with no in-situ testing. Boring B-2003 experienced issues with the verticality of the borehole which lead to excessive vibrations of the drilling equipment during rock coring beginning at a depth of about 36 feet. Continuing to advance boring beyond the completed depth of 54.6 feet would have likely lead to damage to the drilling equipment and was not considered practical. The decision was made to drill Boring B-2002 to a depth of 225 feet and to perform P-S Velocity logging and Acoustic Televiewer testing in Boring B-2002. Boring B-2003 was terminated at its drilled depth of 54.6 feet with no P-S Velocity logging but with Acoustic Televiewer testing.

Table 2
Summary of Lee Nuclear Station Geotechnical Exploration

SUMMARY OF LEE NUCLEAR STATION GEOTECHNICAL EXPLORATION

Test Type	Number (2006-2007 Exploration)	Number (2012 Exploration)
Soil and Rock Borings/Geotechnical Monitoring Well Borings	124/24	7/0
Monitoring Wells/Packer Tests	21/4	0/0
Cone Penetrometer Test/SCPT	29/10	0/0
Geotechnical Test Pits and Geologic Trenches	14	0/0
Goodman Jack	14 (2 borings)	0
Pressuremeter Testing	24 (2 borings)	0
P-S Suspension Log	13	3
Downhole Velocity	4	0
Televiewer Survey	13	4
Spectral Analysis of Surface Waves (SASW) Survey	15	0
Petrographic Analysis	15	0

Table 3

Horizontal and Vertical GMRS Amplitudes

TABLE 3 (SHEET 1 OF 2)
HORIZONTAL AND VERTICAL GMRS AMPLITUDES

Frequency Hz	Horizontal GMRS (g)	Vertical GMRS (g)
100	2.12E-01	1.74E-01
90	2.35E-01	2.04E-01
80	2.72E-01	2.43E-01
70	3.30E-01	2.96E-01
60	4.04E-01	3.71E-01
50	4.80E-01	4.86E-01
45	5.13E-01	4.93E-01
40	5.40E-01	5.01E-01
35	5.60E-01	5.11E-01
30	5.75E-01	5.02E-01
25	5.81E-01	4.87E-01
20	5.43E-01	4.33E-01
15	4.77E-01	3.73E-01
12.5	4.29E-01	3.39E-01
10	3.70E-01	3.02E-01
9	3.51E-01	2.83E-01
8	3.29E-01	2.63E-01
7	3.05E-01	2.42E-01
6	2.77E-01	2.20E-01
5	2.47E-01	1.97E-01

TABLE 3 (SHEET 2 OF 2)
HORIZONTAL AND VERTICAL GMRS AMPLITUDES

Frequency Hz	Horizontal GMRS (g)	Vertical GMRS (g)
4	2.09E-01	1.65E-01
3	1.64E-01	1.32E-01
2.5	1.46E-01	1.15E-01
2	1.31E-01	9.68E-02
1.5	1.07E-01	7.76E-02
1.25	9.17E-02	6.74E-02
1	7.36E-02	5.68E-02
0.9	7.16E-02	5.43E-02
0.8	6.93E-02	5.18E-02
0.7	6.60E-02	4.90E-02
0.6	6.13E-02	4.60E-02
0.5	5.53E-02	4.27E-02
0.4	4.42E-02	3.37E-02
0.3	3.32E-02	2.48E-02
0.2	2.21E-02	1.61E-02
0.15	1.66E-02	1.19E-02
0.125	1.38E-02	9.78E-03
0.1	8.84E-03	6.69E-03

Table 4

FIRS for Profiles A1, A5, and C4

**TABLE 4 (SHEET 1 OF 2)
FIRS FOR PROFILES A1, A5, AND C4**

Frequency (Hz)	FIRS A1 Horizontal SA (G)	FIRS A1 Vertical SA (G)	FIRS A5 Horizontal SA (G)	FIRS A5 Vertical SA (G)	FIRS C4 Horizontal SA (G)	FIRS C4 Vertical SA (G)
100	0.229	0.173	0.233	0.176	0.225	0.169
90	0.263	0.198	0.269	0.203	0.258	0.194
80	0.307	0.231	0.316	0.238	0.300	0.225
70	0.366	0.275	0.378	0.284	0.356	0.267
60	0.447	0.335	0.466	0.350	0.435	0.324
50	0.568	0.425	0.597	0.447	0.550	0.409
45	0.588	0.440	0.617	0.462	0.570	0.425
40	0.611	0.457	0.640	0.478	0.595	0.444
35	0.639	0.478	0.667	0.498	0.623	0.467
30	0.629	0.476	0.653	0.492	0.617	0.468
25	0.608	0.467	0.624	0.478	0.598	0.461
20	0.540	0.414	0.552	0.422	0.534	0.410
15	0.465	0.355	0.471	0.359	0.460	0.352
12.5	0.422	0.322	0.426	0.324	0.419	0.320
10	0.376	0.286	0.377	0.286	0.374	0.285
9	0.353	0.268	0.354	0.268	0.351	0.266
8	0.329	0.248	0.330	0.249	0.328	0.247
7	0.304	0.228	0.305	0.229	0.303	0.227
6	0.278	0.207	0.279	0.208	0.277	0.206
5	0.250	0.185	0.250	0.185	0.249	0.184
4	0.211	0.157	0.211	0.157	0.210	0.156
3	0.170	0.127	0.170	0.127	0.170	0.127

TABLE 4 (SHEET 2 OF 2)
FIRS FOR PROFILES A1, A5, AND C4

Frequency (Hz)	FIRS A1 Horizontal SA (G)	FIRS A1 Vertical SA (G)	FIRS A5 Horizontal SA (G)	FIRS A5 Vertical SA (G)	FIRS C4 Horizontal SA (G)	FIRS C4 Vertical SA (G)
2.5	0.148	0.111	0.149	0.111	0.148	0.111
2	0.125	0.094	0.125	0.094	0.125	0.094
1.5	0.101	0.076	0.101	0.076	0.101	0.076
1.25	0.088	0.067	0.088	0.067	0.088	0.067
1	0.074	0.057	0.074	0.057	0.074	0.057
0.9	0.071	0.054	0.071	0.054	0.071	0.054
0.8	0.068	0.051	0.068	0.051	0.068	0.051
0.7	0.064	0.048	0.064	0.048	0.064	0.048
0.6	0.060	0.045	0.060	0.045	0.060	0.045
0.5	0.056	0.041	0.056	0.041	0.056	0.041
0.4	0.044	0.033	0.044	0.033	0.044	0.033
0.3	0.033	0.024	0.033	0.024	0.033	0.024
0.2	0.021	0.016	0.021	0.016	0.021	0.016
0.15	0.016	0.012	0.016	0.012	0.016	0.012
0.125	0.013	0.010	0.013	0.010	0.013	0.010
0.1	0.009	0.007	0.009	0.007	0.009	0.007

Table 5

Permanent Slopes Within One Quarter Mile of Unit 1 and 2 Nuclear Island Structures

TABLE 5
PERMANENT SLOPES WITHIN ONE-QUARTER MILE OF UNIT 1 AND 2 NUCLEAR ISLAND STRUCTURES

Slope (Number)	Constructed Condition	Approximate Distance to Toe (feet)	Approximate Distance to Crest (feet)	Approximate Slope Height (feet)	Approximate Slope Inclination (Horizontal to Vertical)
Hill Southwest of Unit 1 (5)	Natural Slope – cut	1000	-	80	2.5:1.0
Pond North of Units (7)	Engineered Fill	-	1200	55	2.0:1.0

Sources: 1. Site topography and structure - Sanborn 2006
Shaw, Stone & Webster, September, 2007.
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

Coordinate System: South Carolina State Plane, NAD83 Int'l Feet
Vertical - NAVD88

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NUCLEAR STATION UNITS 1 & 2

Site Features of Lee Nuclear Station Units 1 and 2

FIGURE 1

Explanation

WLS Borings

- Principal boring (2012)
- CPT
- SCPT
- Geotech boring
- Monitoring well - other facilities
- Monitoring well - Power Block area
- Other facilities
- Principal boring
- Secondary boring
- UD boring
- Test pit
- Test pit trench

Historic Borings (Cherokee)

- Boring location (information available)
- Boring location (information not available)

Symbols

- Project limits
- SASW survey line
- Cross section location
- Cooling tower
- Pipeline
- Power Block configuration
- Crane pedestal
- Limits of excavated area
- 525 kV and 230 kV switchyard
- CNS Unit 1 turbine building condenser pit
- Lee Nuclear Station nuclear island
- CNS existing structure
- Concrete slab surface
- Concrete slab, buried
- Stream course
- Water body
- Railway

5' Topographic Contours

- Certain
- Approximated

Sources: 1. Site topography and structure - Sanborn 2006
Shaw, Stone & Webster, September, 2007.
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005,
Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

Coordinate System: South Carolina State Plane, NAD83 Int'l Feet
Vertical - NAVD88

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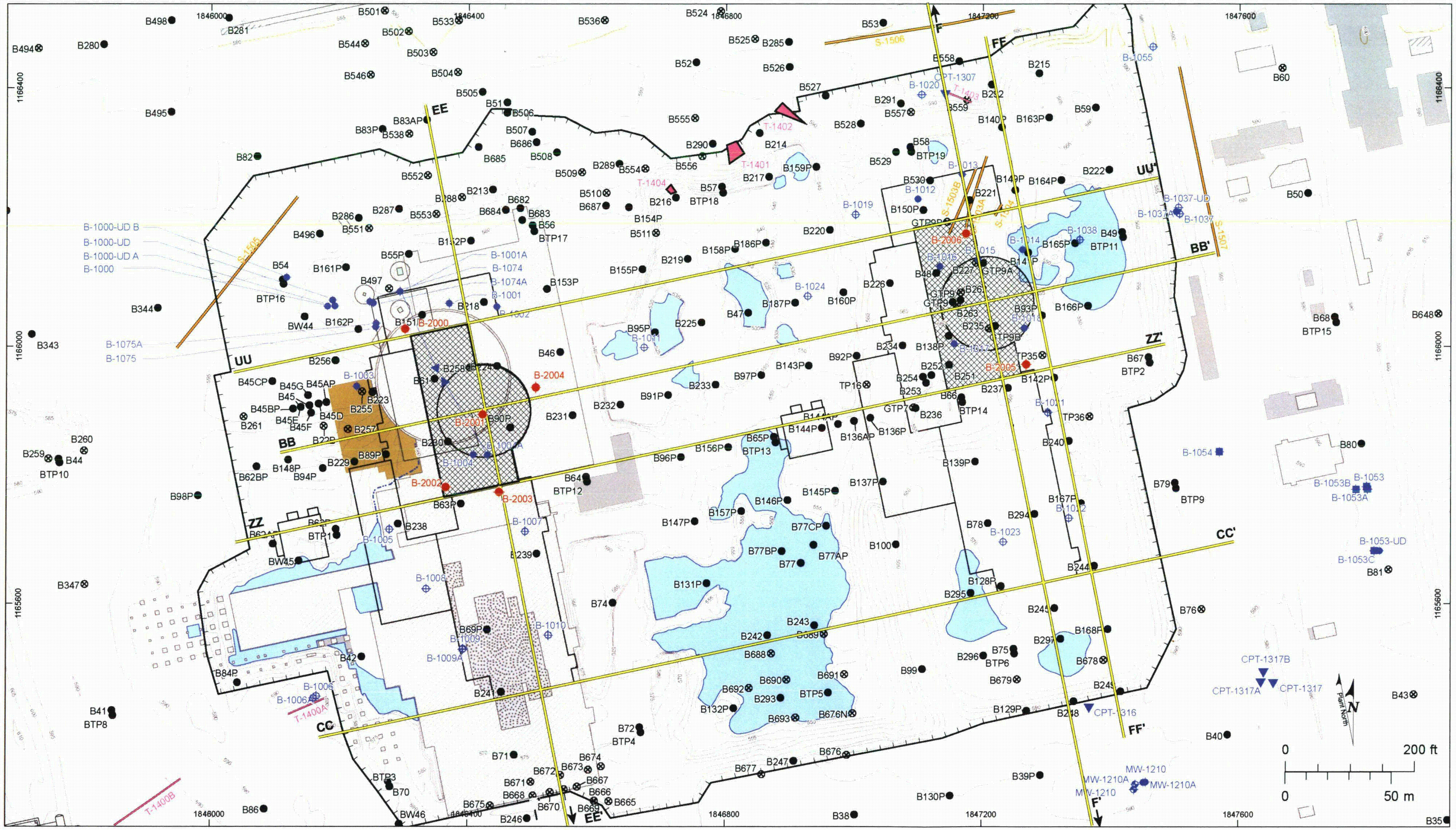
Site Exploration Map - Explanation

FIGURE 2



Sources: 1. Site topography and structure - Sanborn 2006
Shaw, Stone & Webster, September, 2007.
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

Coordinate System: South Carolina State Plane, NAD83 Int'l Feet
Vertical - NAVD88

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Site Exploration Map - Power Block and Adjacent Areas - Map

FIGURE 3

Sources: 1. Site topography and structure - Sanborn 2006
Shaw, Stone & Webster, September, 2007
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

Coordinate System: South Carolina State Plane, NAD83 Int'l Feet
Vertical - NAVD88

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Borehole Geophysical
Test Locations

FIGURE 4

Explanation

Symbols

Lab test

RQD — Percent of recovery (0 – 100%): Rock Quality Designation (RQD) and percent of recovery

● 16,930 psi — Laboratory unconfined compression test result (E, psi)

(8,238,000 psi) — Young's Modulus (psi)

(P) — Petrographic analysis

UTA-54-A — Resonant column and torsional shear test

In situ test

3,200,000 psi
4,300,000 psi — Goodman Jack (True Young's Modulus, Et, psi)

90,000 psi ◆ — Pressuremeter (Shear Modulus, G, psi)

Abbreviations

Res = Residuum

Sap = Saprolite

Col = Colluvium

PWR = Partially weathered rock

MW = Moderately weathered

SL-F = Slightly weathered to fresh rock

BOH = Bottom of hole

Lithology

- Concrete
- Silty sand (SM)
- Sandy silt (ML)
- Gravel
- Diabase
- Meta-granodiorite
- Meta-quartz Diorite
- Meta-diorite

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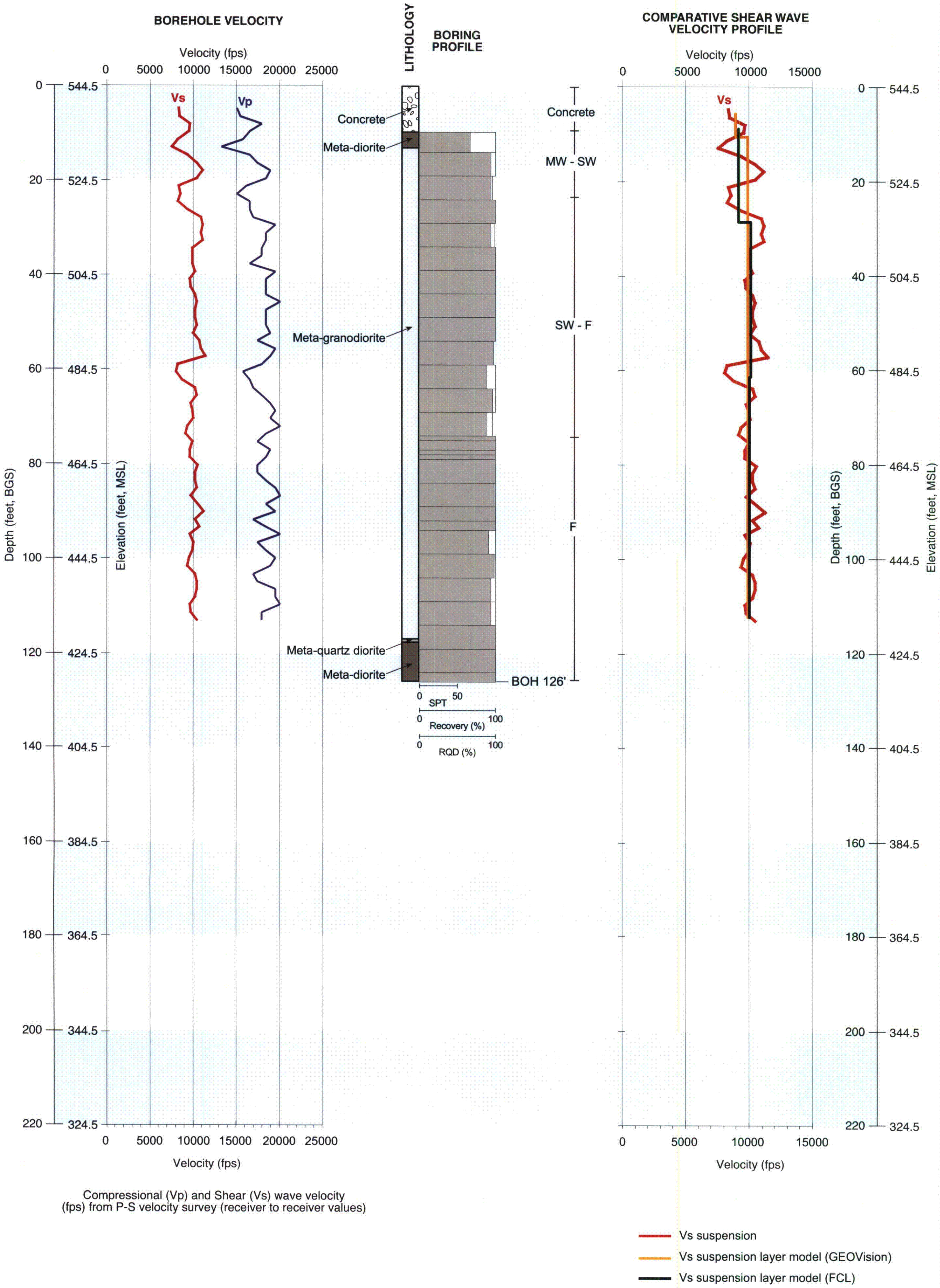
NUCLEAR STATION UNITS 1 & 2

Boring Summary Sheet Explanation

FIGURE 5



Notes:

1. Borehole geophysics performed by V. Gonzales of GEOVision Geophysical Services
2. RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

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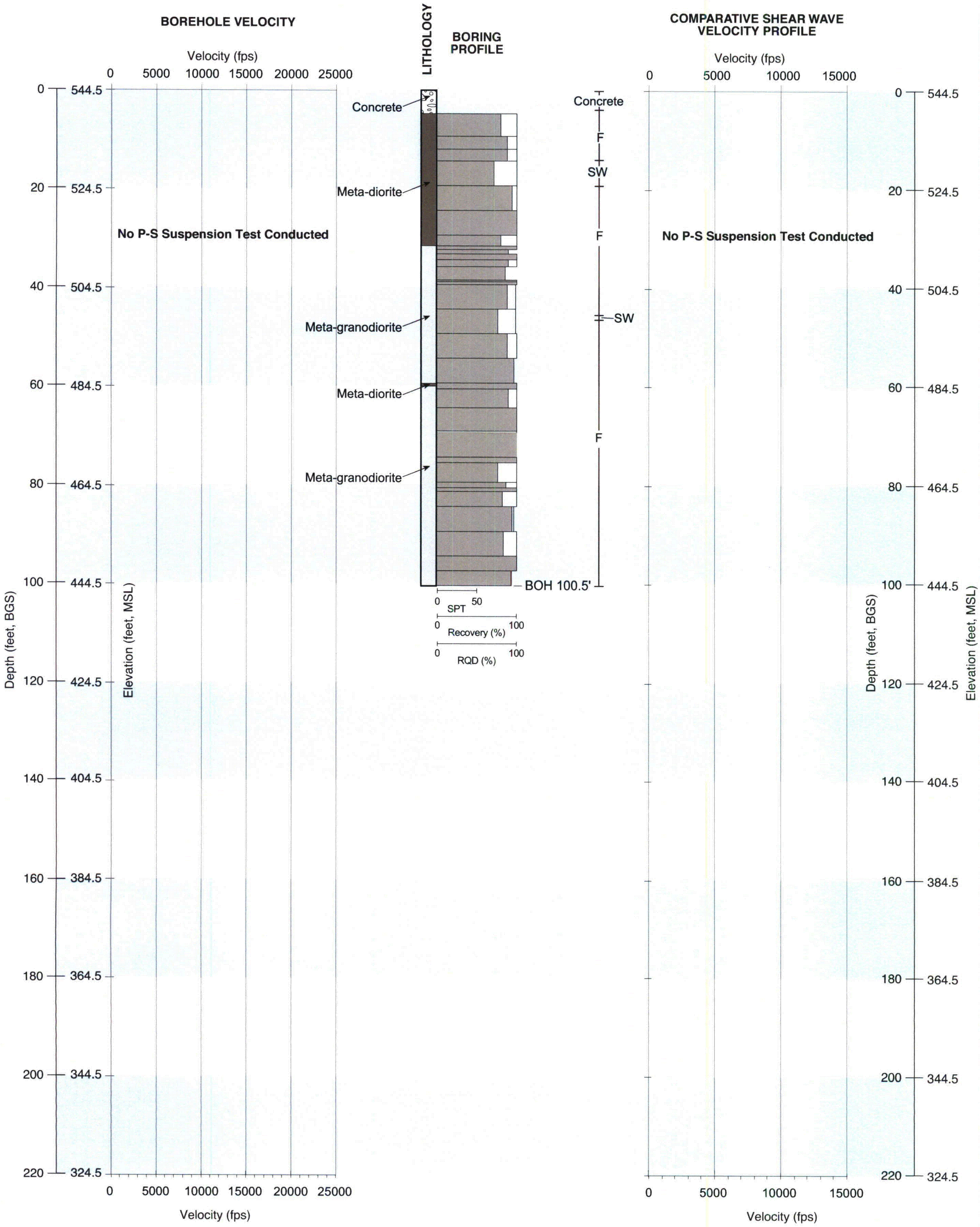
NUCLEAR STATION UNITS 1 & 2

Boring Summary Sheet, B-2000

FIGURE 6



Compressional (Vp) and Shear (Vs) wave velocity (fps) from P-S velocity survey (receiver to receiver values)

Note:
RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

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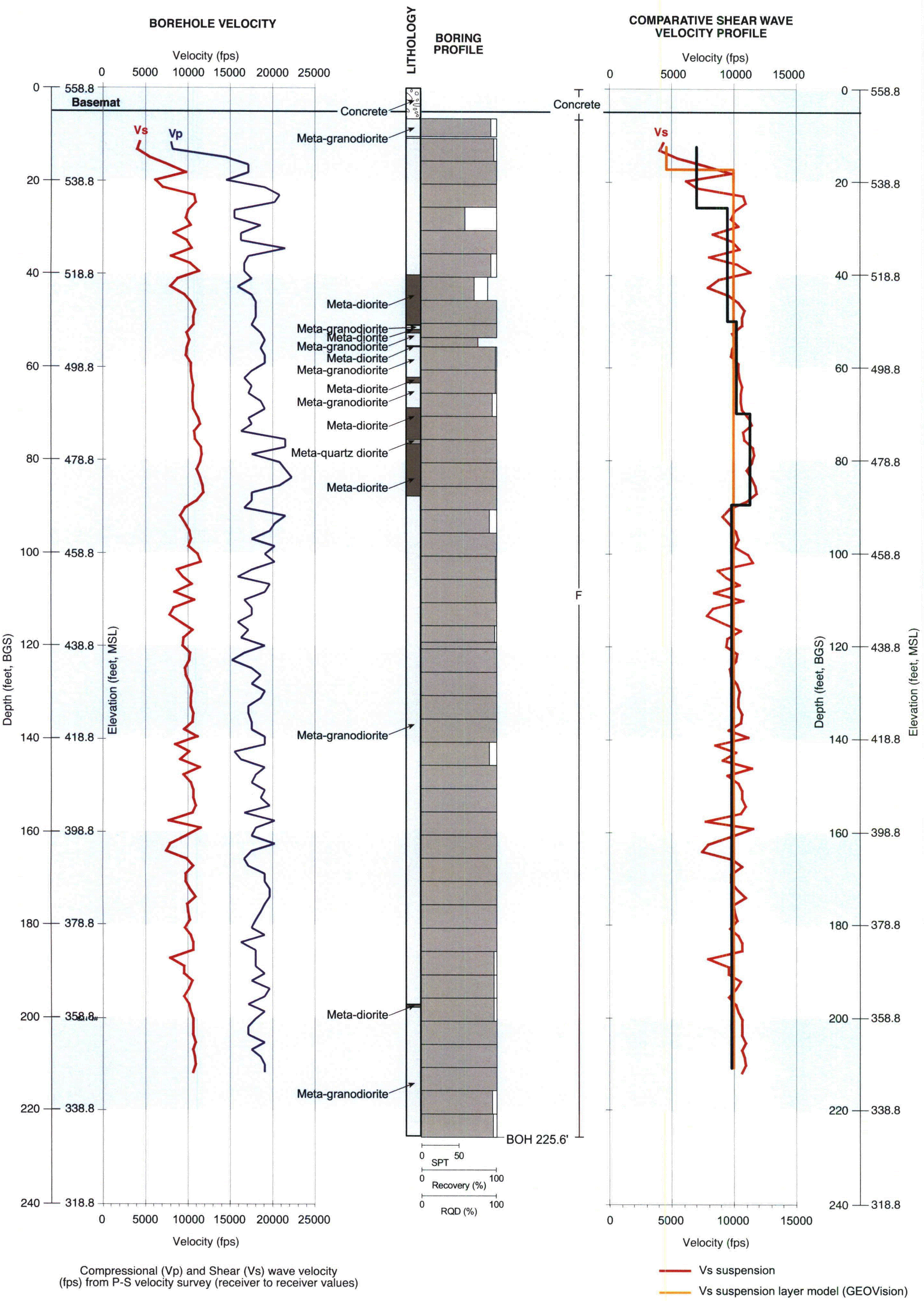
NUCLEAR STATION UNITS 1 & 2

Boring Summary Sheet, B-2001

FIGURE 7

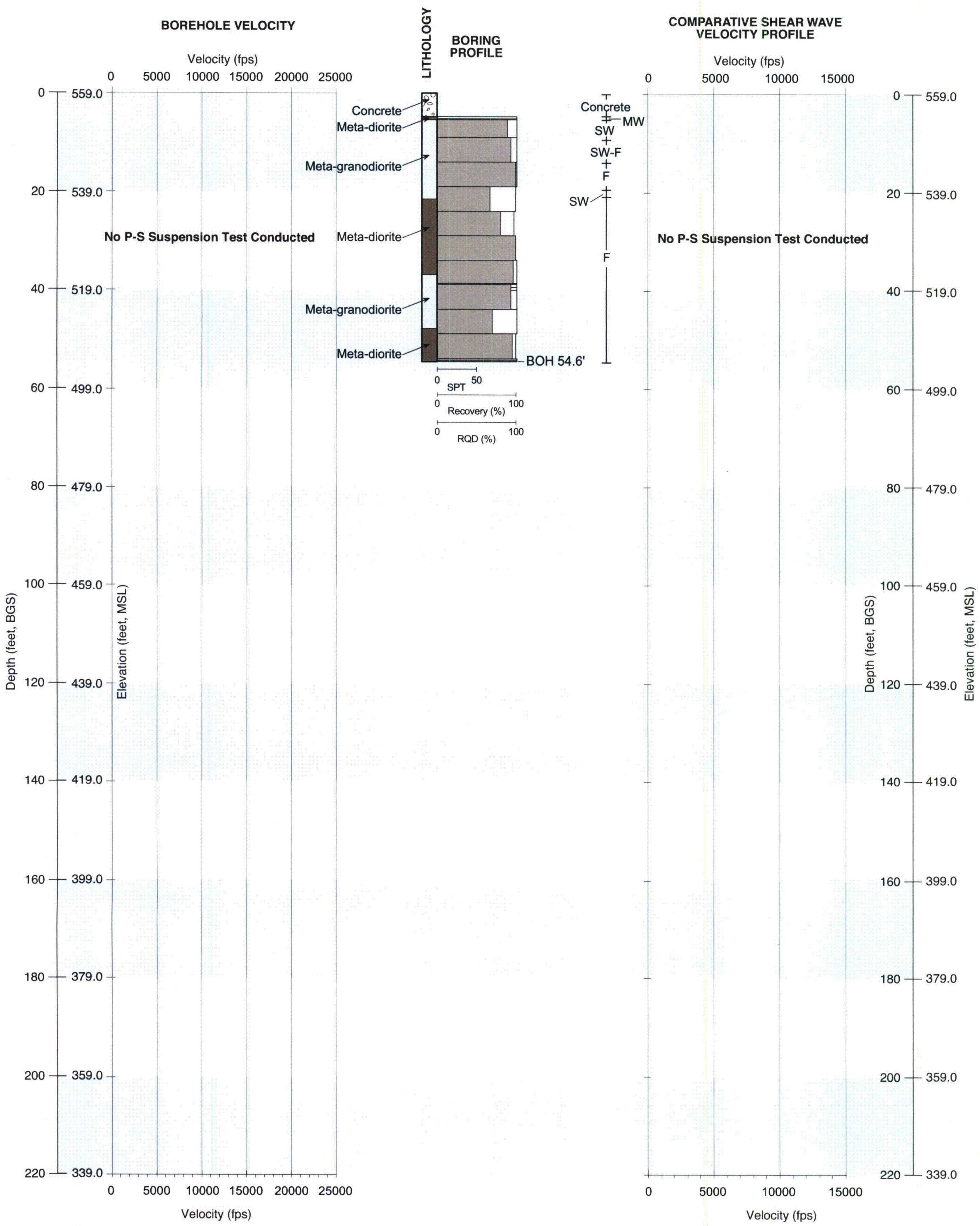


Notes:
1. Borehole geophysics performed by V. Gonzales of GEOVision Geophysical Services
2. RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 & 2

Boring Summary Sheet, B-2002

FIGURE 8



Compressional (Vp) and Shear (Vs) wave velocity (fps) from P-S velocity survey (receiver to receiver values)

Note:
RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

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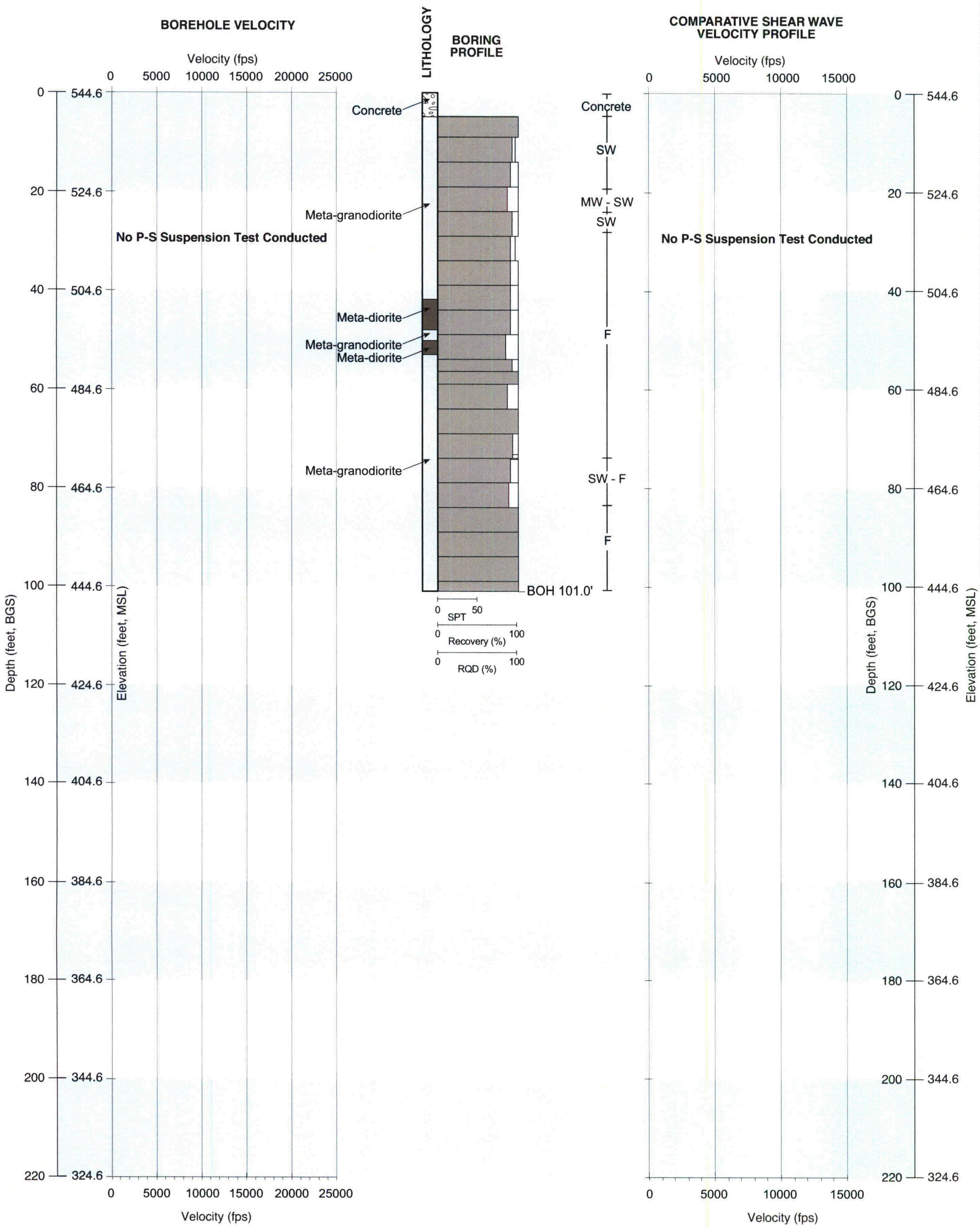
Boring Summary Sheet, B-2003

FIGURE 9



Compressional (Vp) and Shear (Vs) wave velocity (fps) from P-S velocity survey (receiver to receiver values)

Note:
RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

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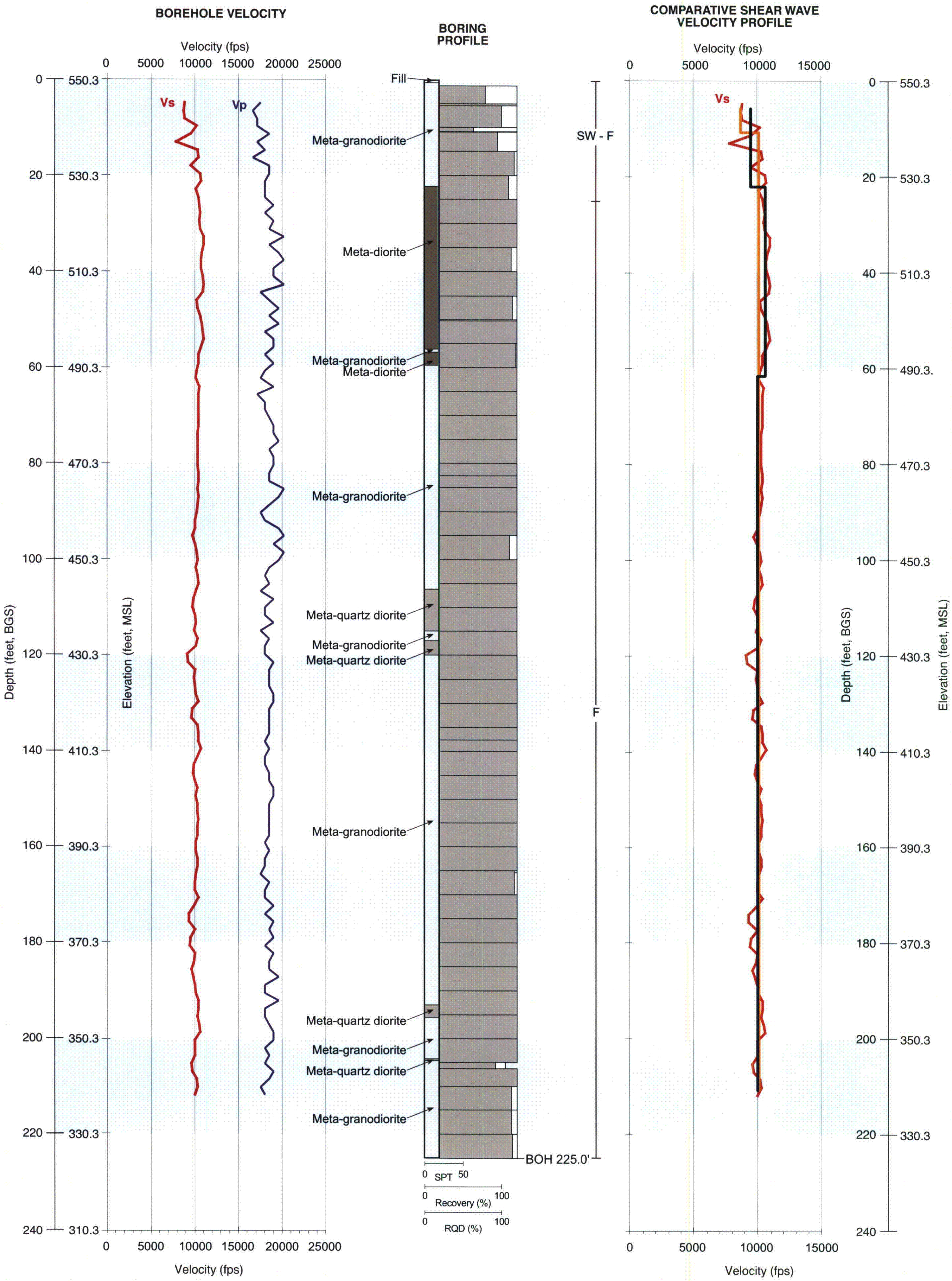
Boring Summary Sheet, B-2004

FIGURE 10



Compressional (Vp) and Shear (Vs) wave velocity (fps) from P-S velocity survey (receiver to receiver values)

Notes:

1. Borehole geophysics performed by V. Gonzales of GEOVision Geophysical Services
2. RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

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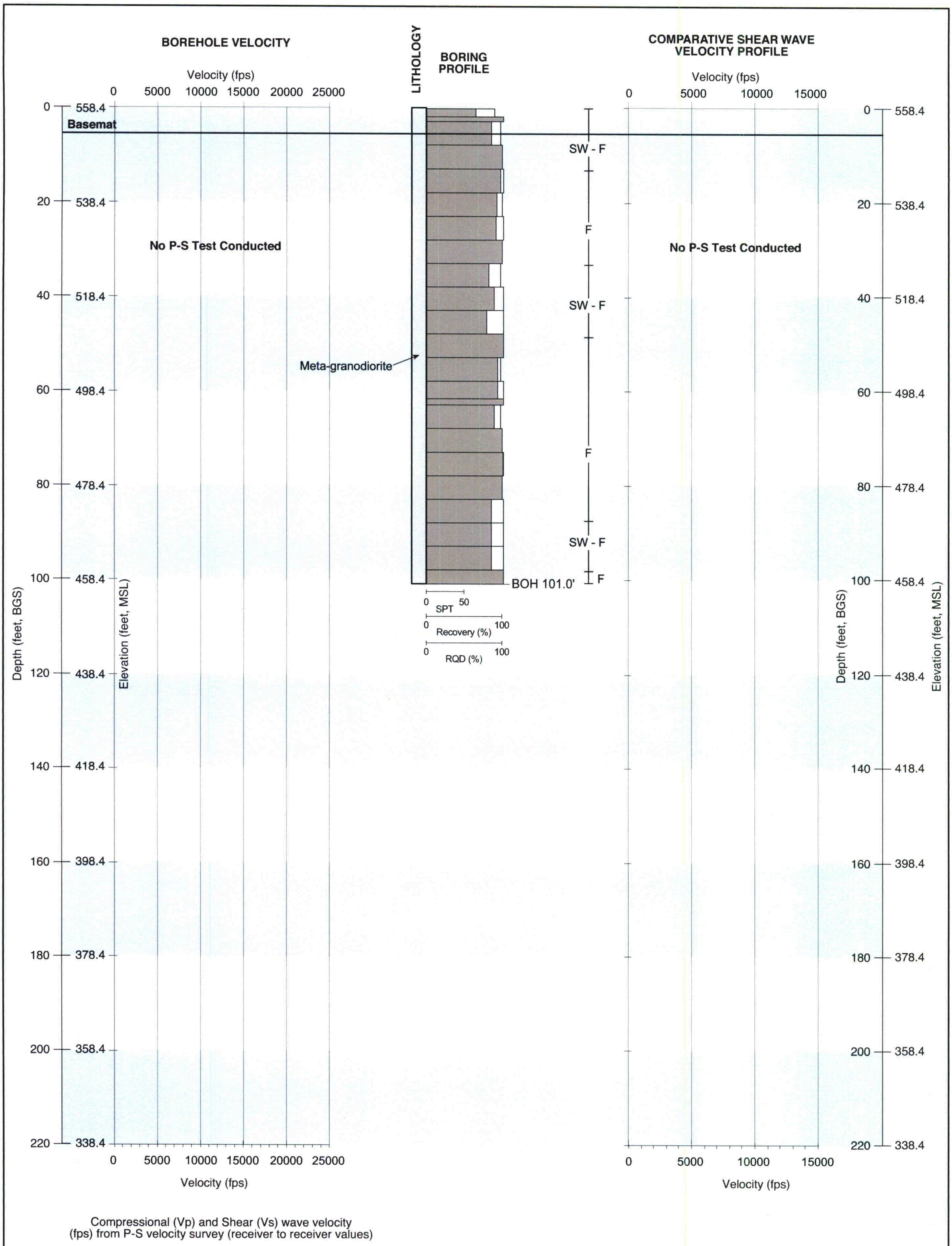
Boring Summary Sheet, B-2005

FIGURE 11



Note:
RQD (Rock Quality Designation) - a percentage of solid core segments larger than 0.33 feet relative to core run length, excluding mechanical breaks

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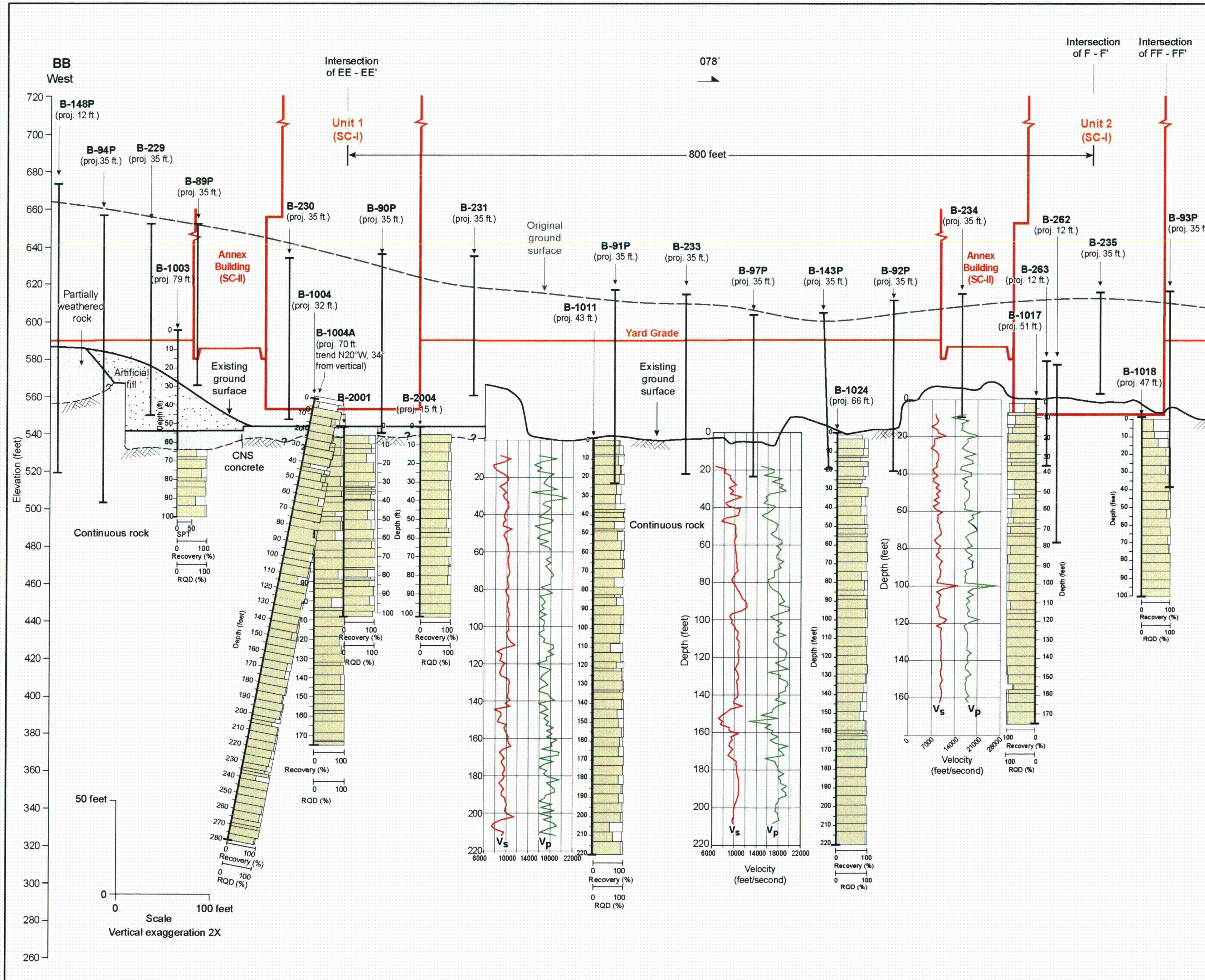
NUCLEAR STATION UNITS 1 & 2

Boring Summary Sheet, B-2006

FIGURE 12



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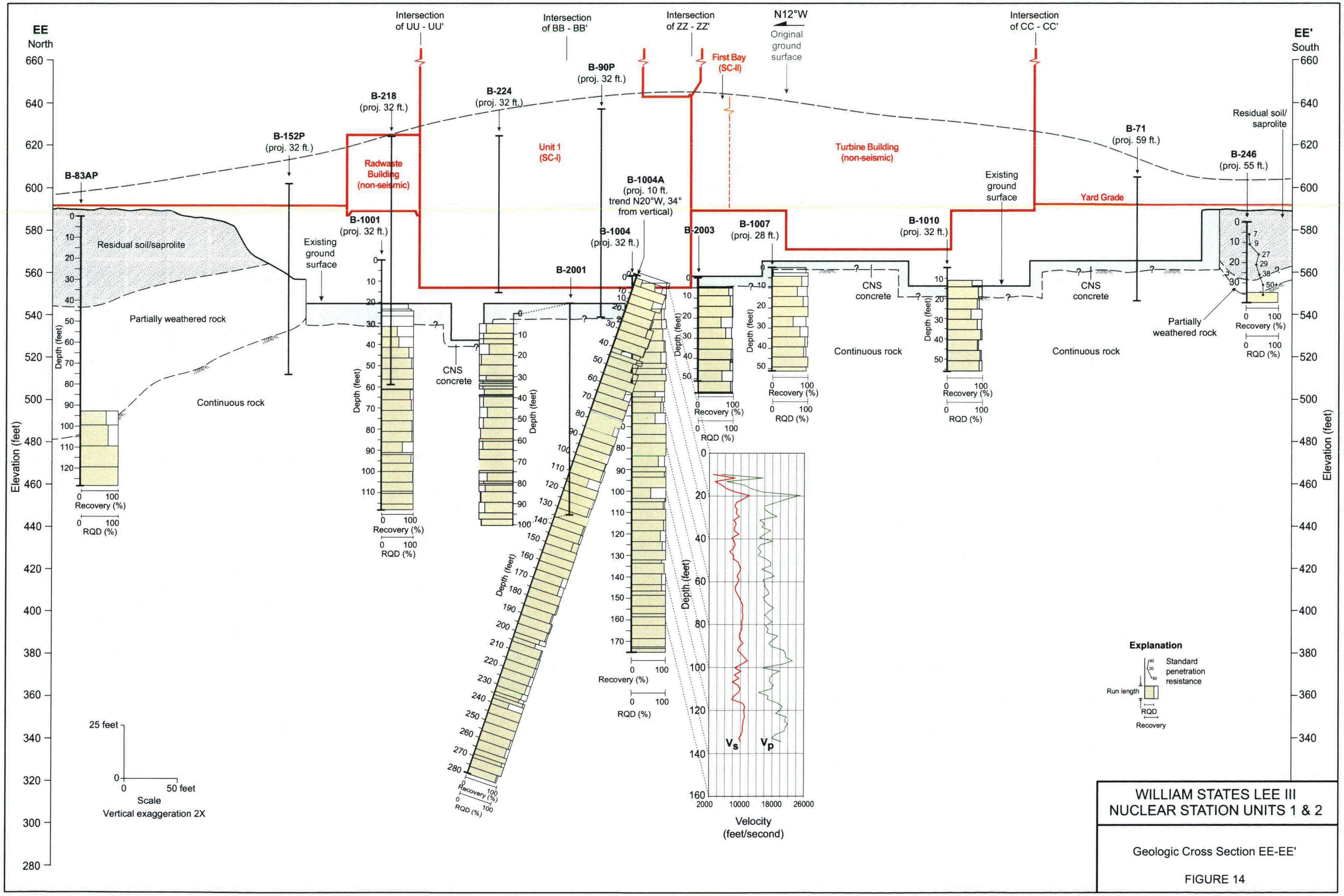
Geologic Cross Section BB-BB'

FIGURE 13



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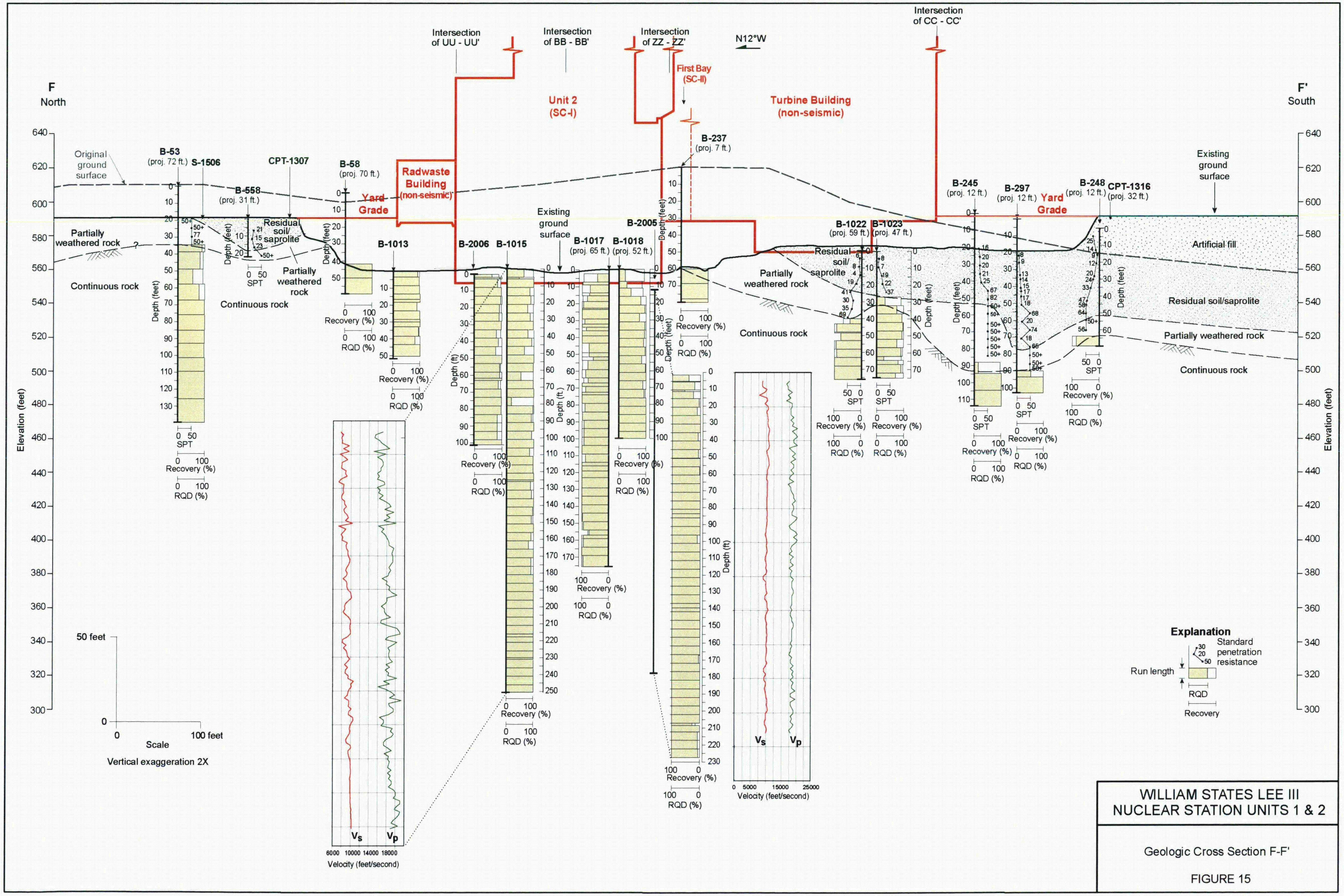
Geologic Cross Section EE-EE'

FIGURE 14



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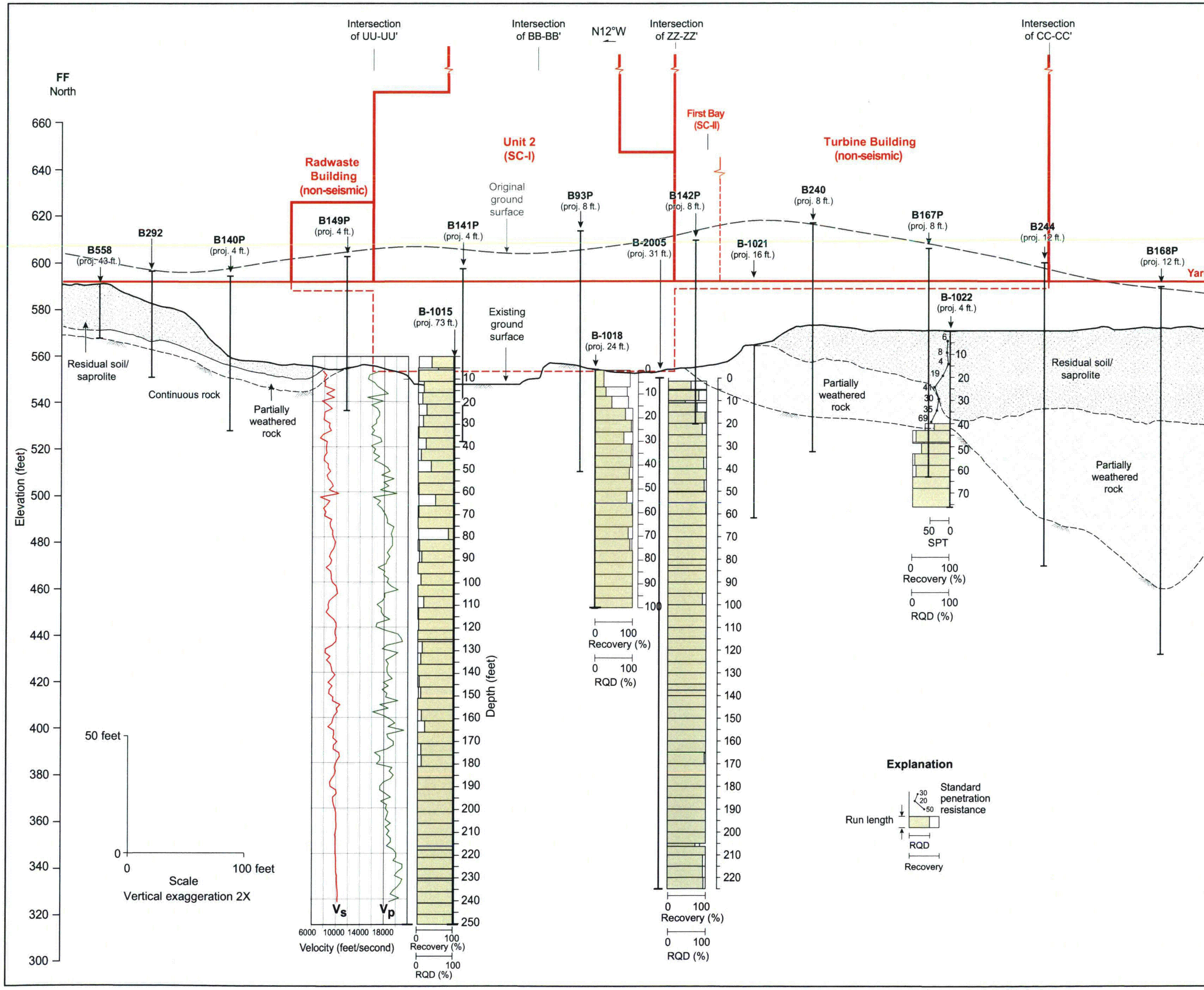
NUCLEAR STATION UNITS 1 & 2

Geologic Cross Section F-F'

FIGURE 15



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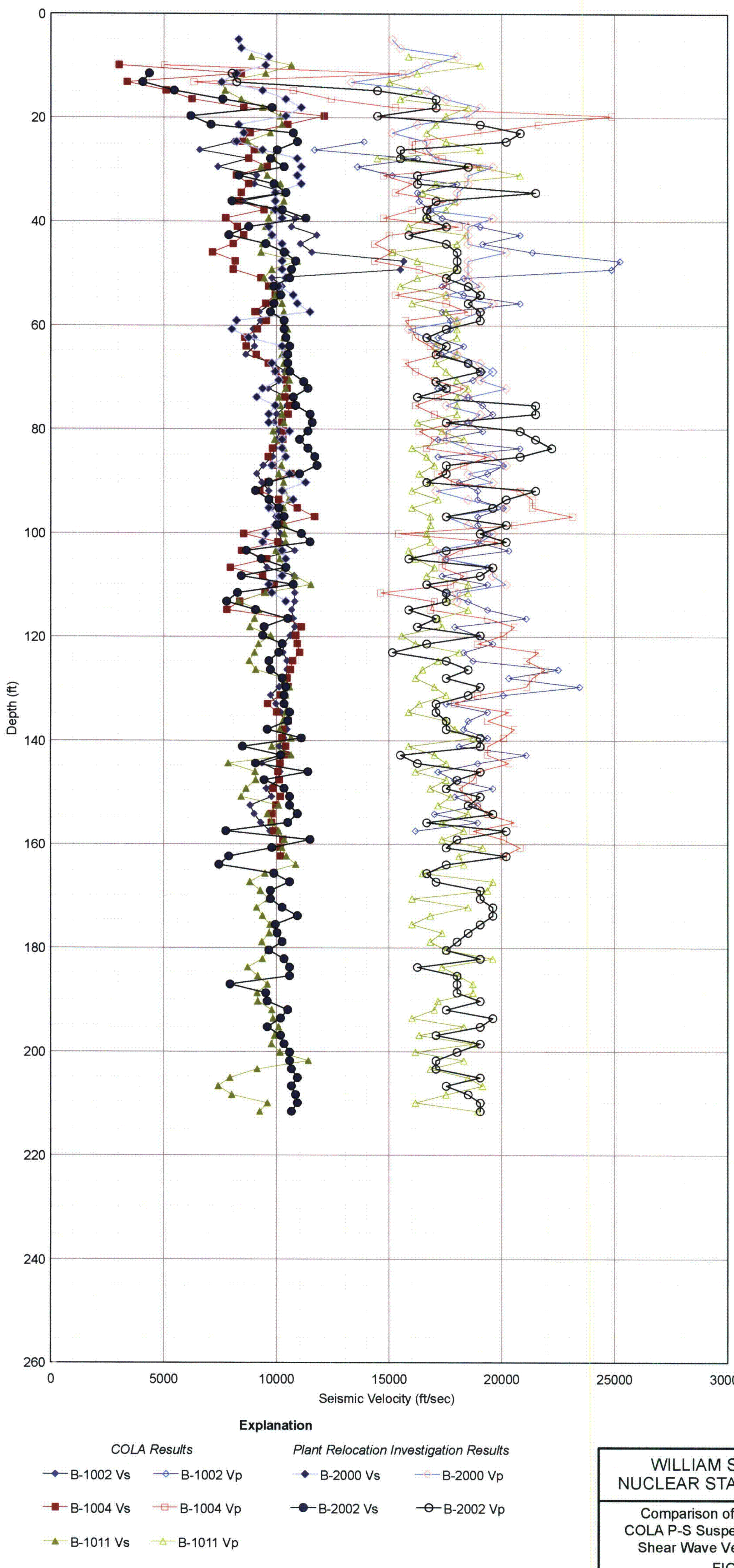
NUCLEAR STATION UNITS 1 & 2

Geologic Cross Section FF-FF'

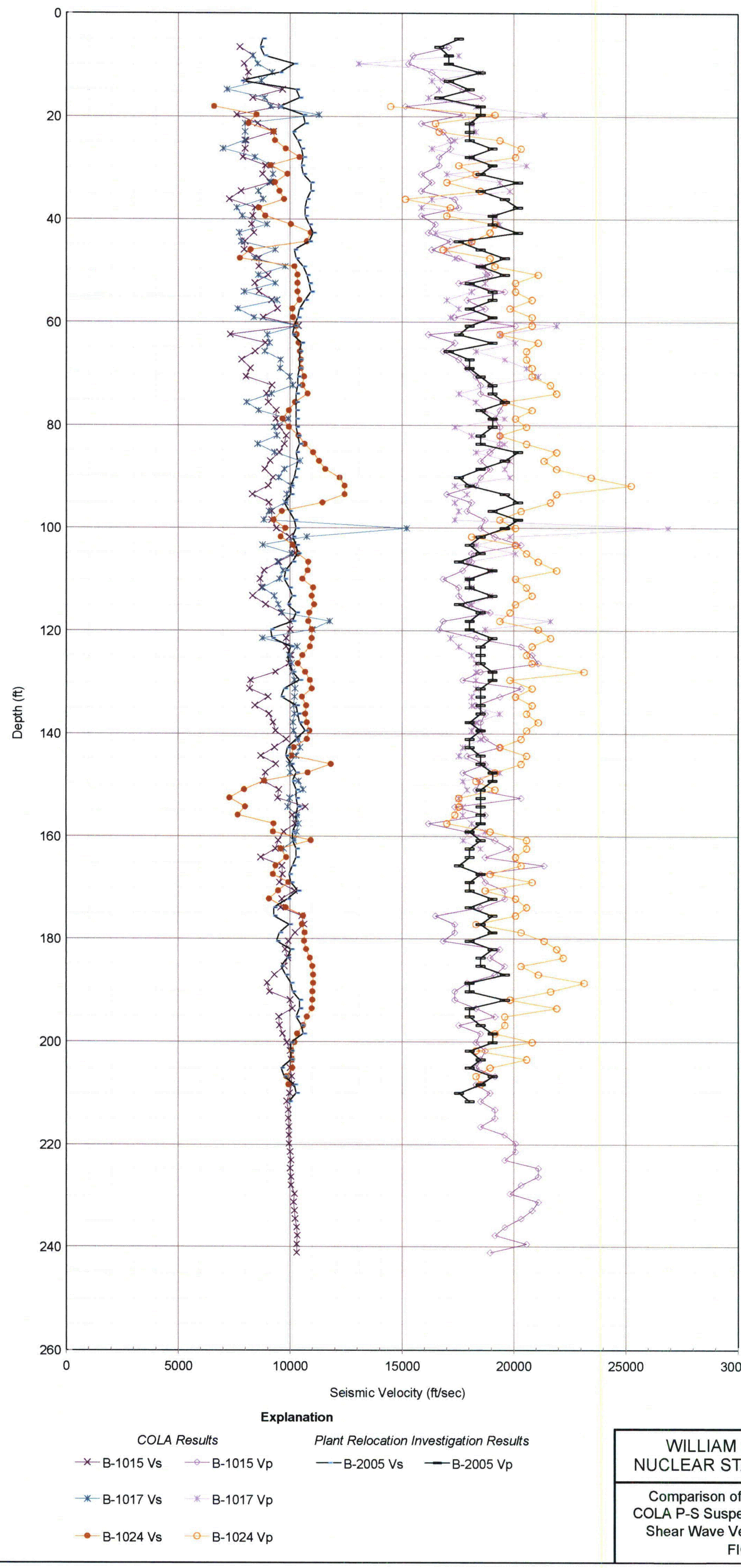
FIGURE 16



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Comparison of Plant Relocation and COLA P-S Suspension Compressive and Shear Wave Velocity Results - Unit 1

FIGURE 17



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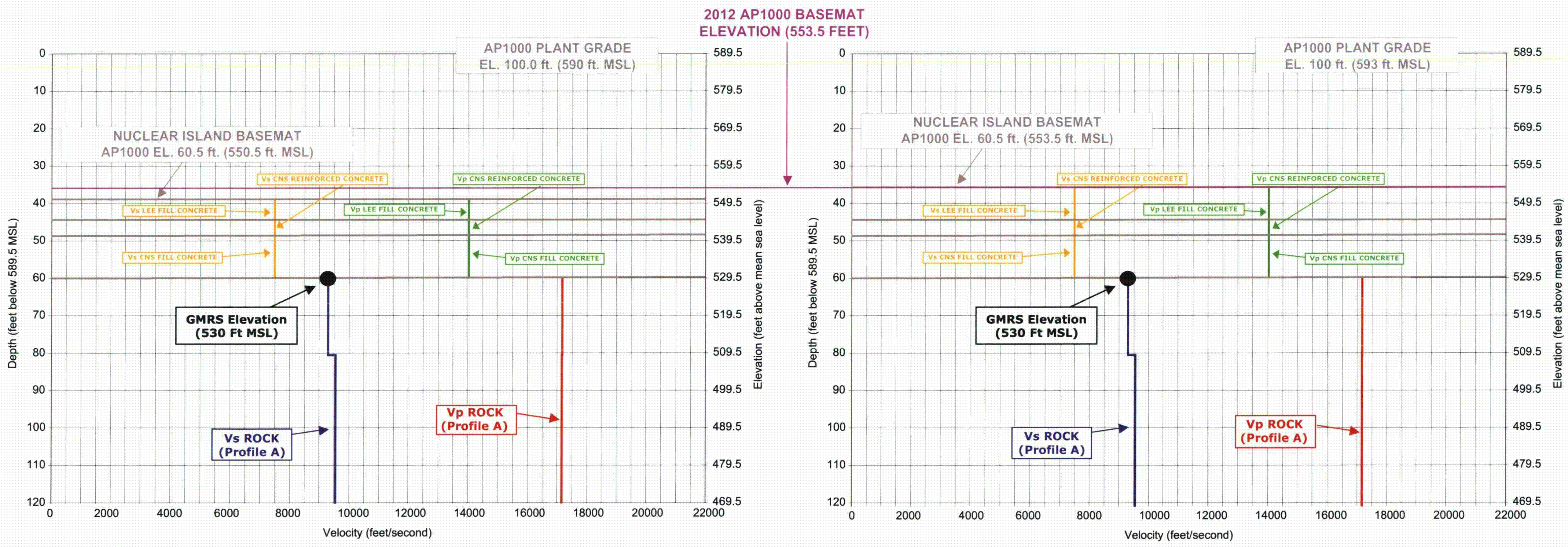
NUCLEAR STATION UNITS 1 & 2

Comparison of Plant Relocation and COLA P-S Suspension Compressive and Shear Wave Velocity Results - Unit 2
FIGURE 18



Pre-2012 Base Case A1

2012 Base Case A1

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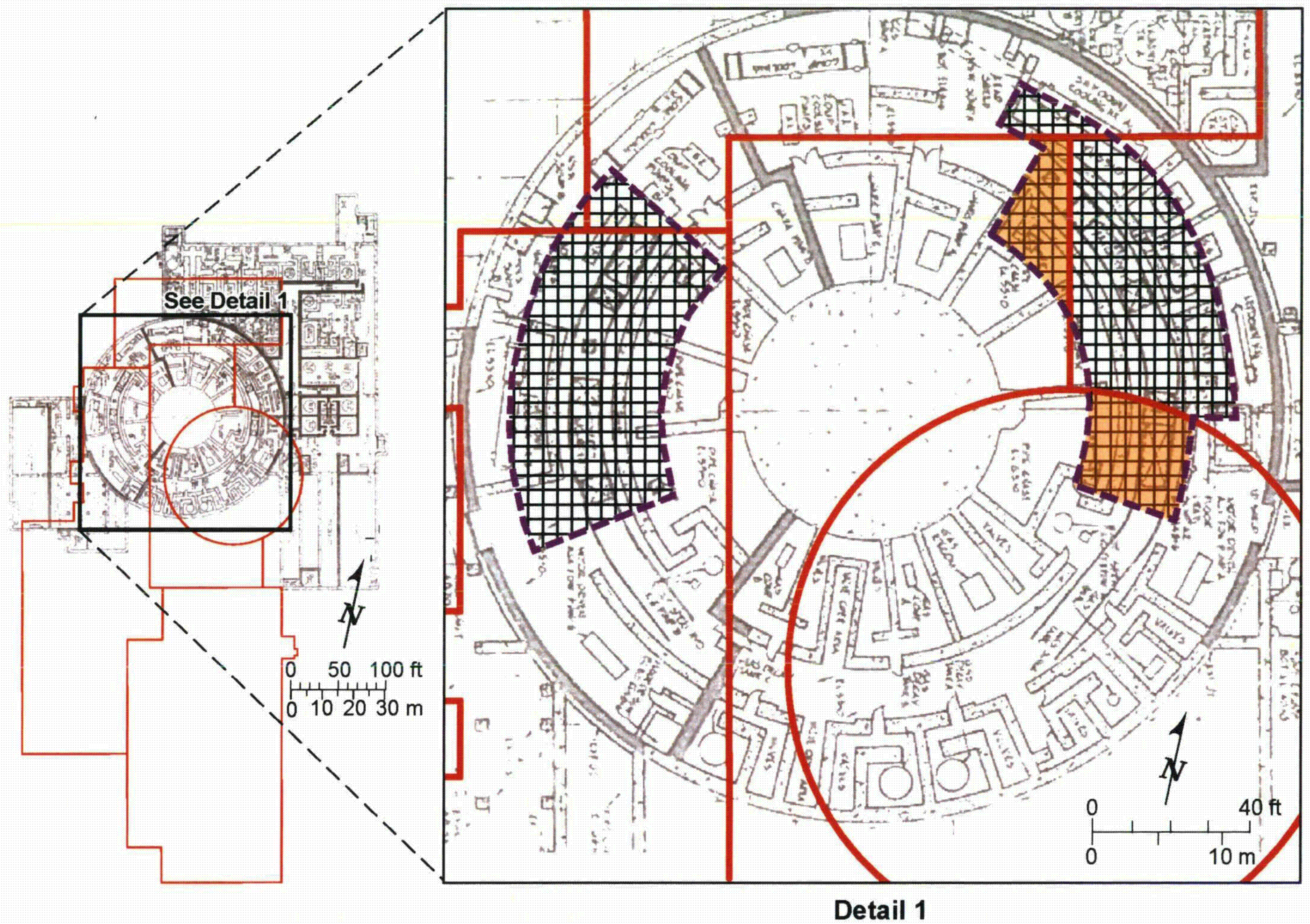
NUCLEAR STATION UNITS 1 & 2

Schematic Comparison of August 2012 to Pre-August 2012 Dynamic Profile - Base Case A1 at Unit 1 Nuclear Island
FIGURE 19



Explanation

- CNS pump room floor
- WLS Unit 1 AP1000 power block footprint
- Area of WLS Unit 1 Nuclear Island underlain by CNS pump room
- Area of CNS pump room (elevation 37 + 0, 527 ft MSL)

Sources: 1. PSAR Figure 2.4.13-1, Reactor and Auxiliary Buildings, Ground Water Control, Cherokee Nuclear Station, Duke Power Company, 1974.
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

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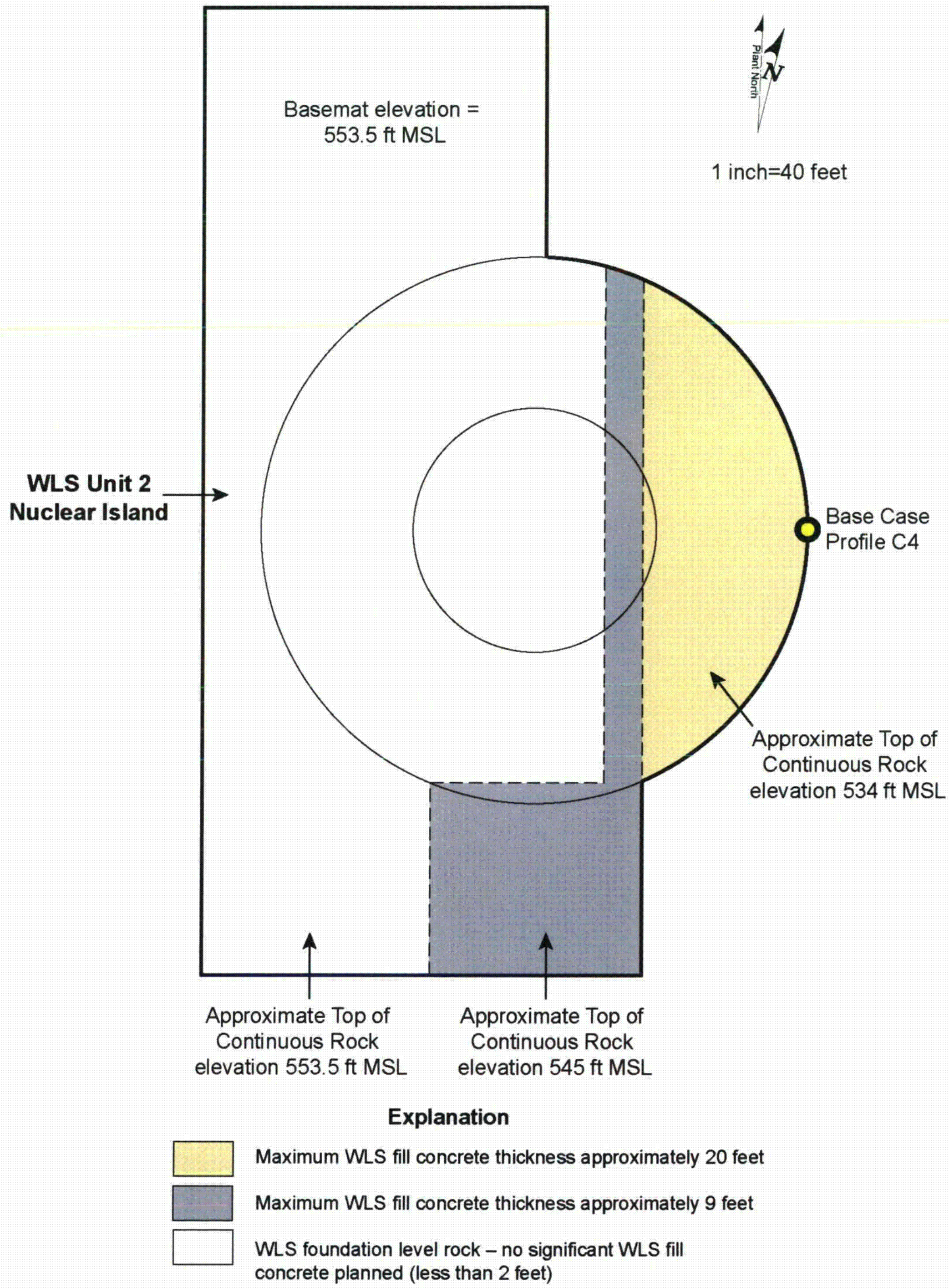
Cherokee Basemat
and Lower Room Details

FIGURE 20

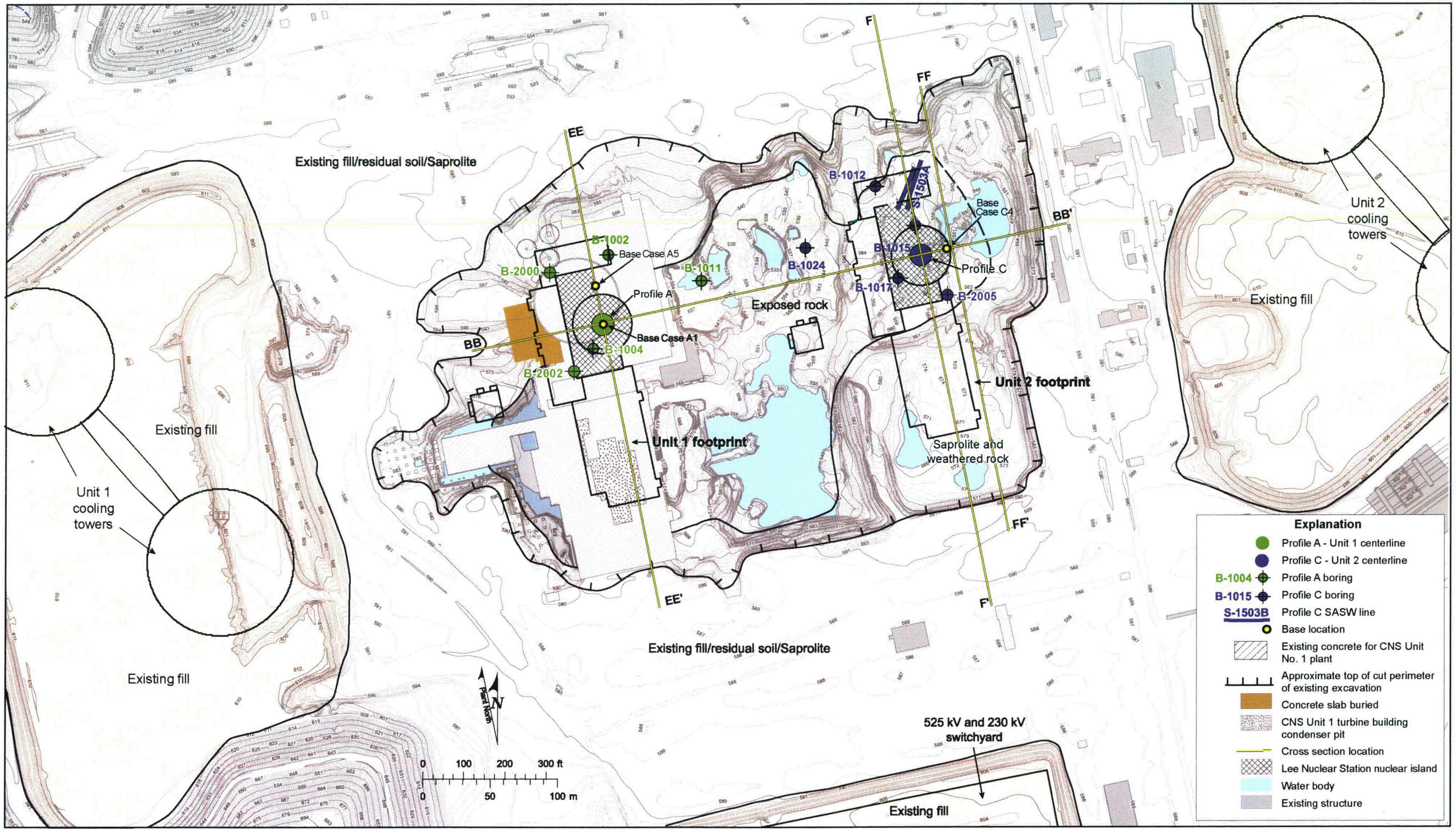


Note: See Figures 2.5.4-260, 2.5.4-263, 2.5.4-264, and 2.5.4-265 for WLS fill concrete slope and bench plans.

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Fill Concrete Configuration
along East Side of WLS Unit 2

FIGURE 21



Sources: 1. Site topography and structure - Sanborn 2006
Shaw, Stone & Webster, September, 2007
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

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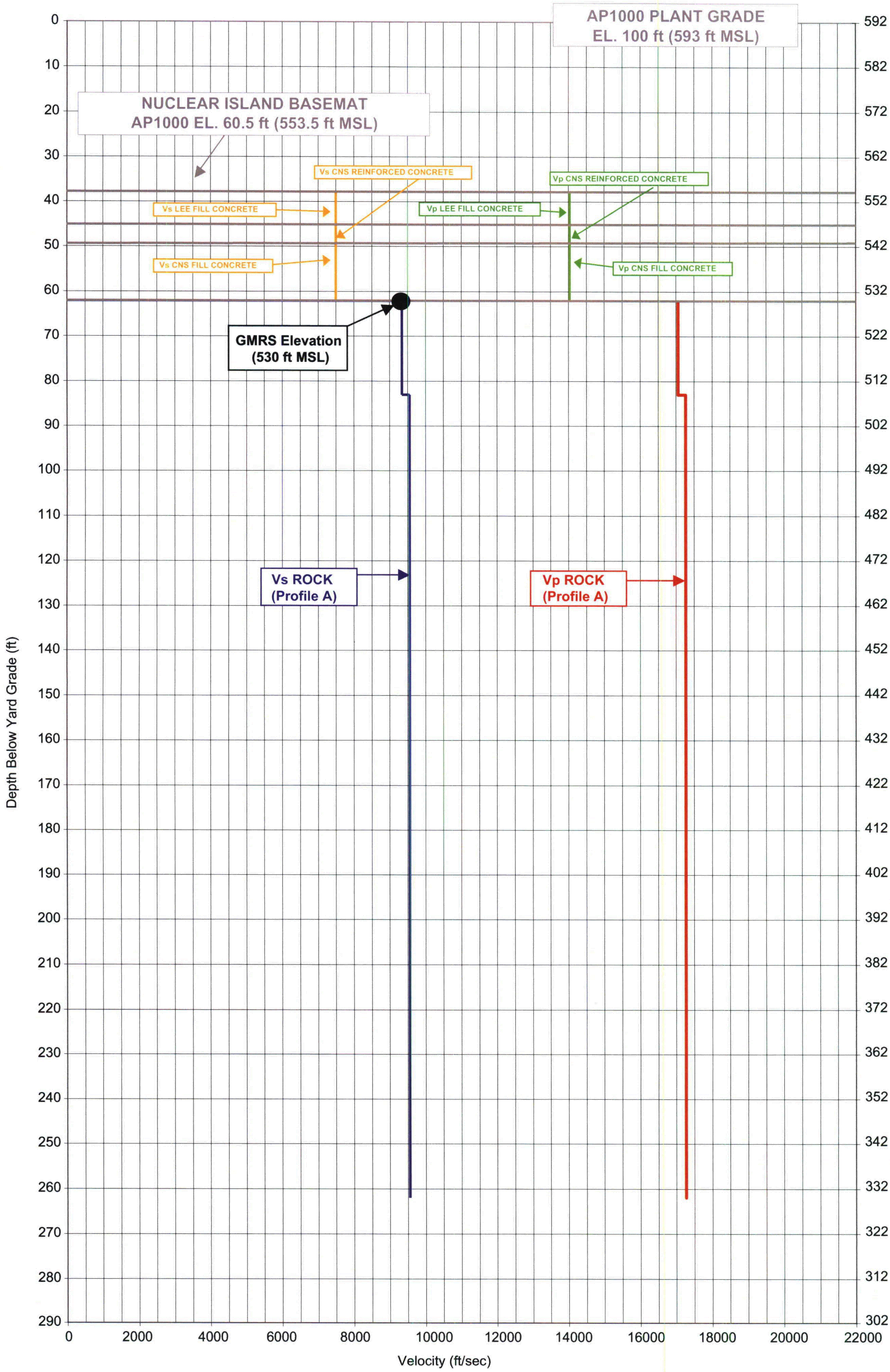
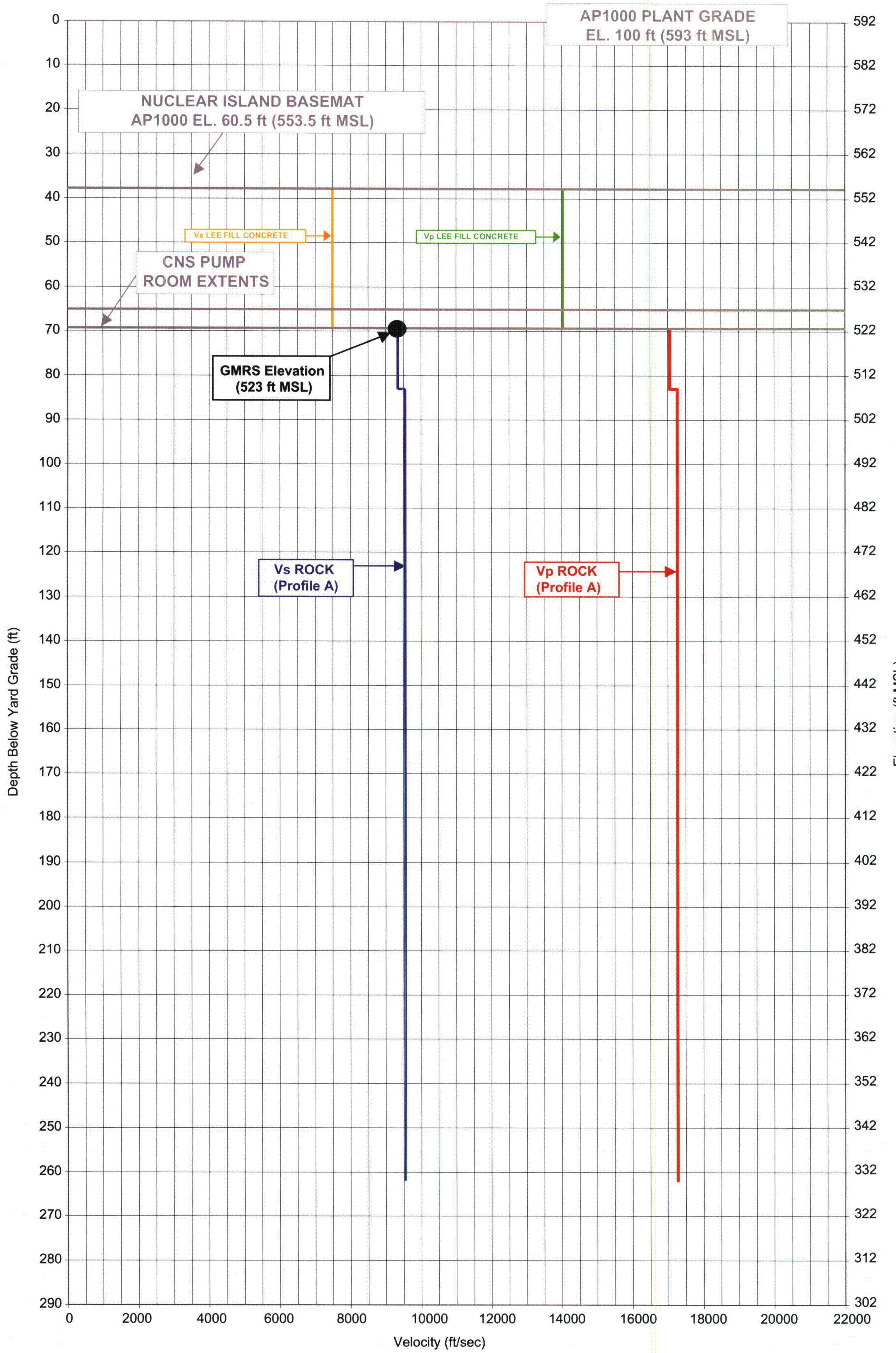
Locations of Dynamic Velocity Profiles, Associated Data Sources, and Cross Section Locations

FIGURE 22



Note: Plot truncated at elevation 330 feet MSL.

WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 & 2
Dynamic Profile - Base Case A1
FIGURE 23



Note: Plot truncated at elevation 330 feet MSL.

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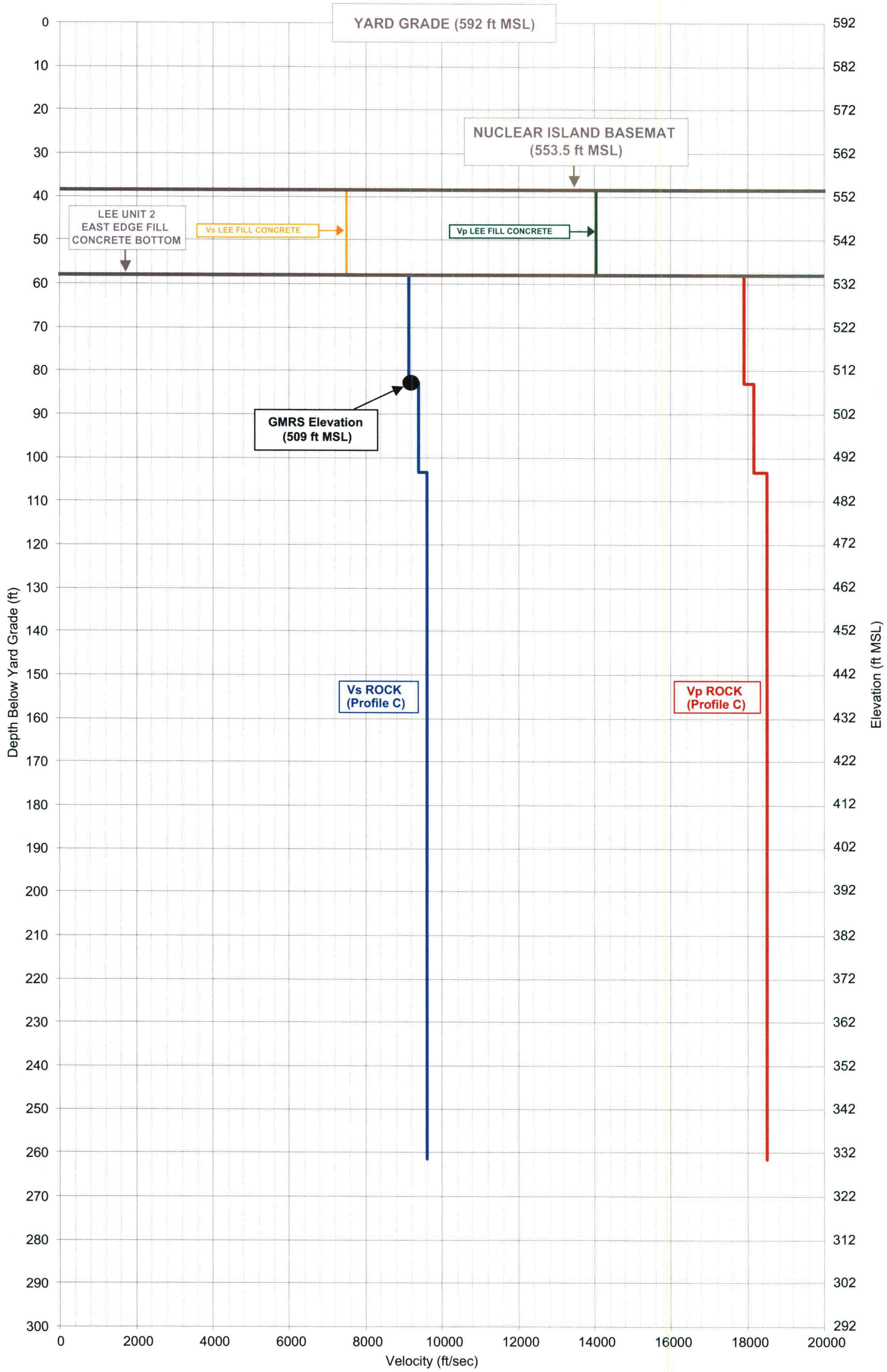
Dynamic Profile - Base Case A5

FIGURE 24



Note: Plot truncated at elevation 330 feet MSL.

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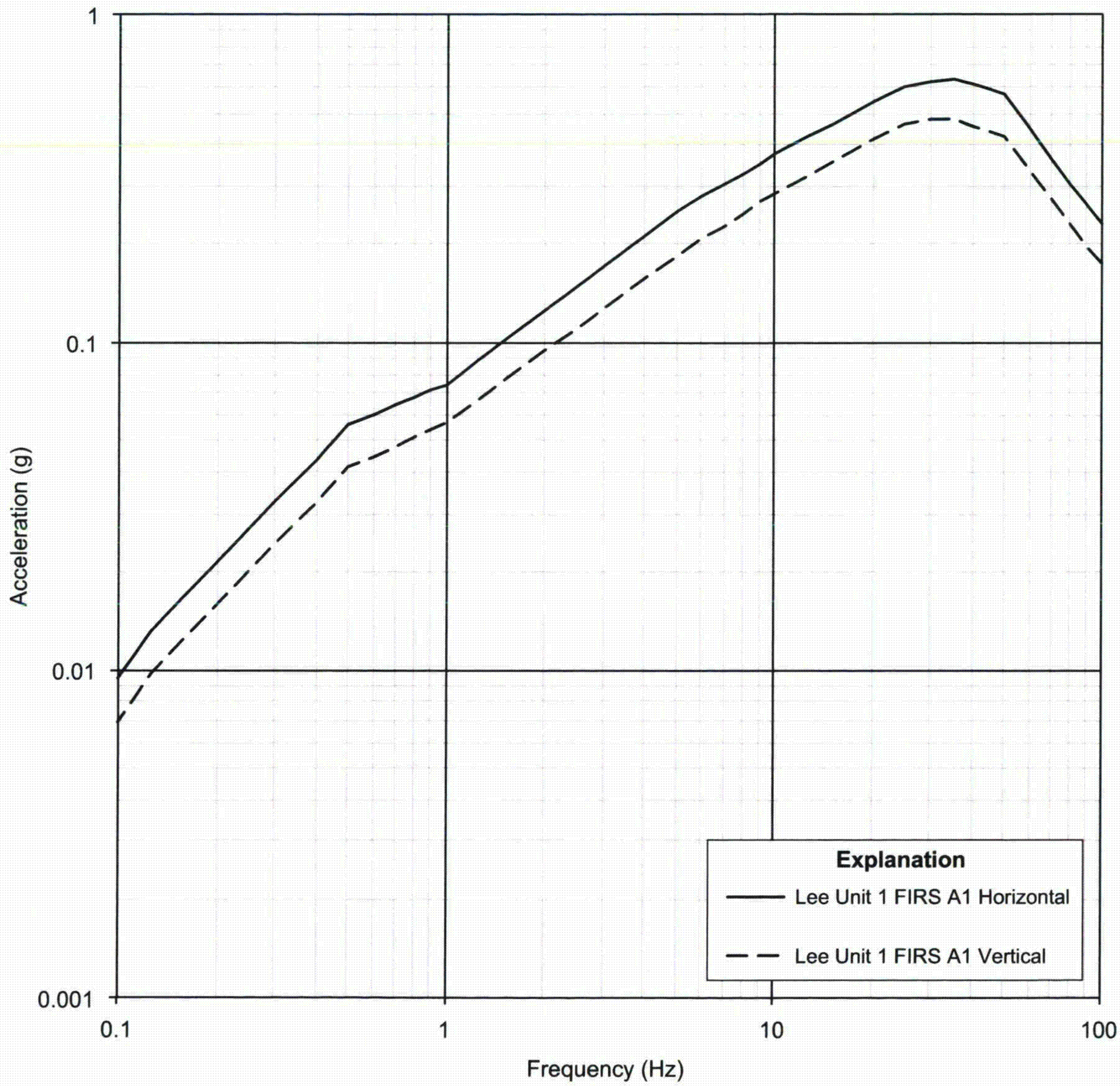
Dynamic Profile - Base Case C4

FIGURE 25



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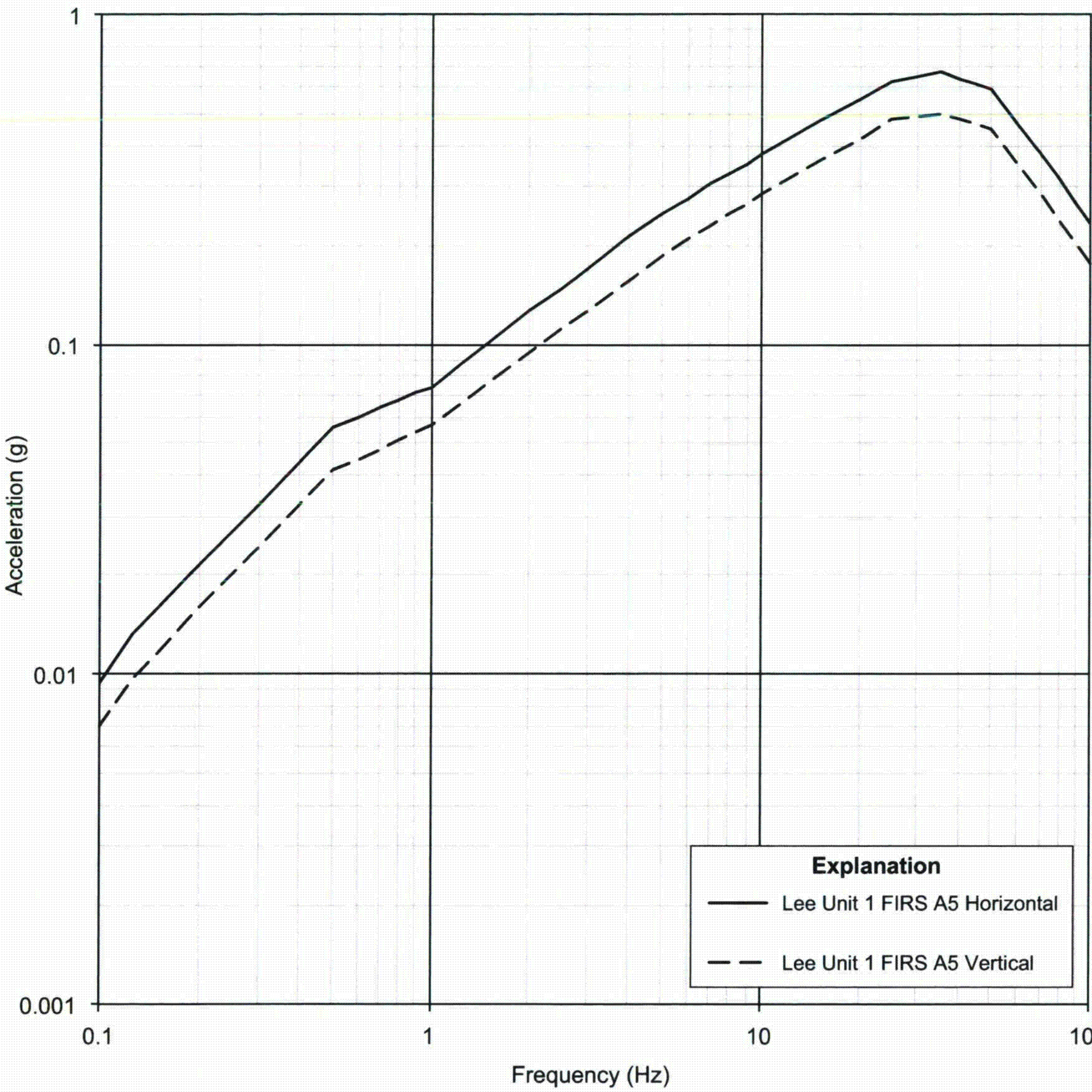
Comparison of Horizontal and Vertical FIRS A1

FIGURE 26



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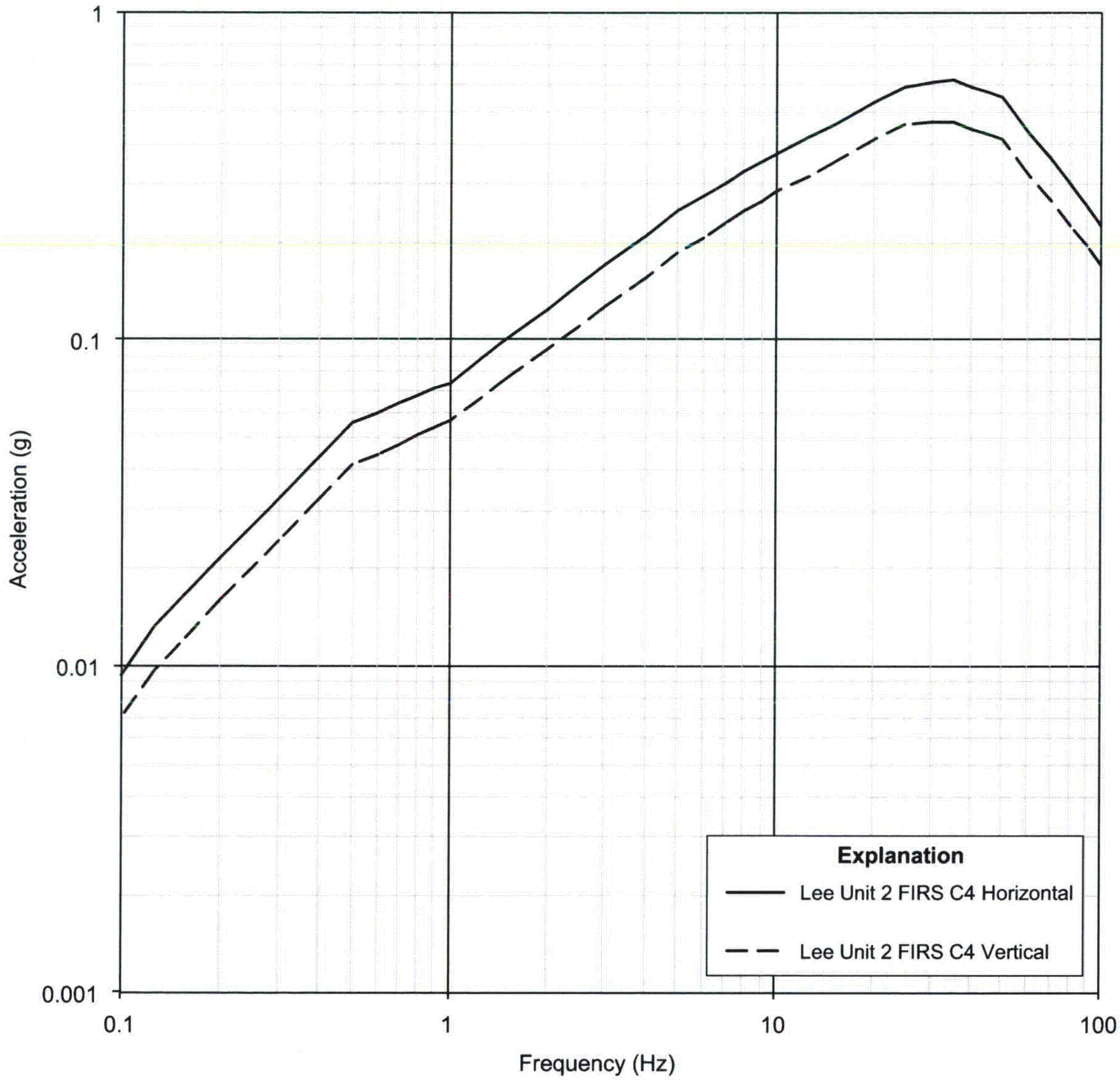
NUCLEAR STATION UNITS 1 & 2

Comparison of Horizontal and Vertical FIRS Computed for Profile A5

FIGURE 27



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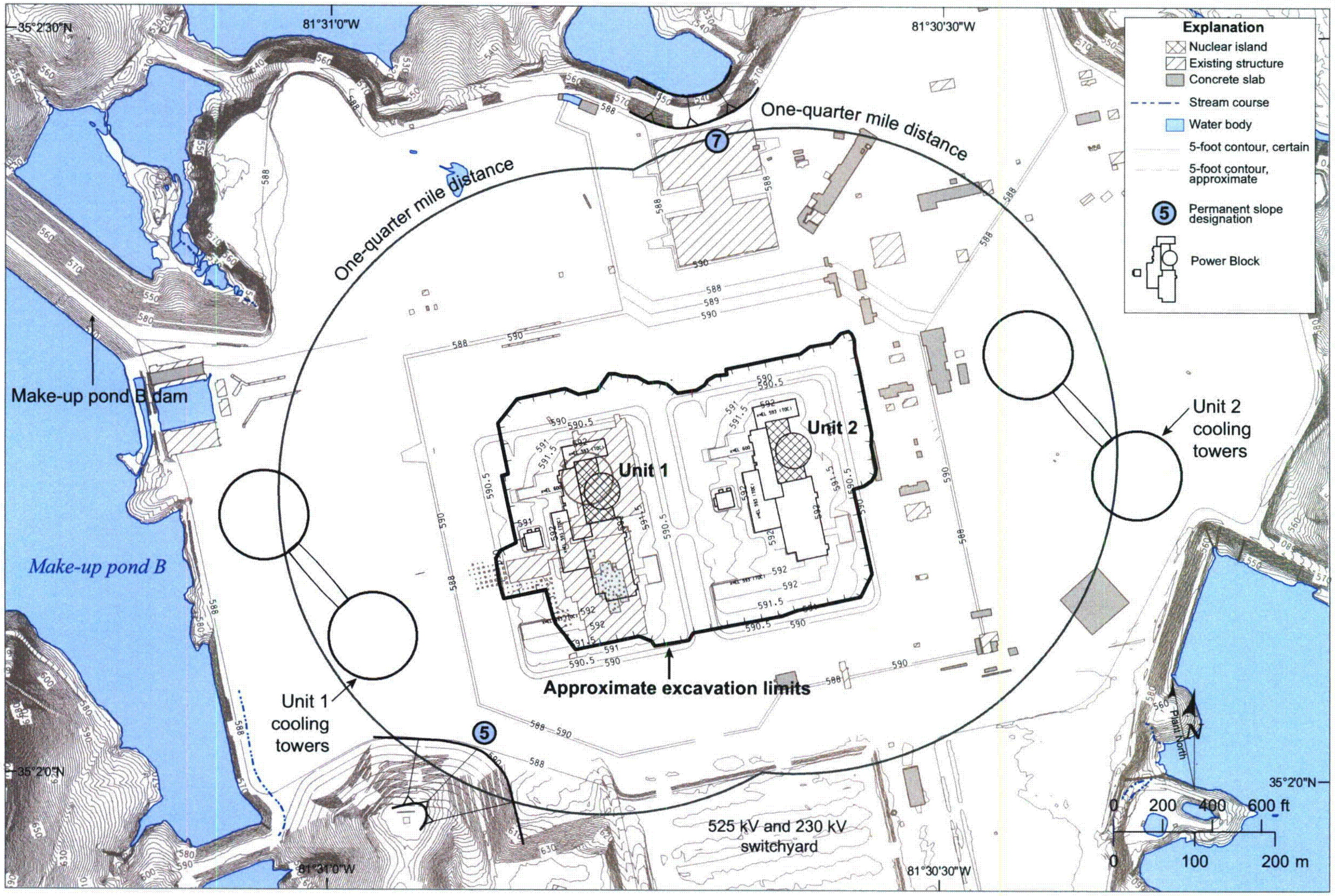
NUCLEAR STATION UNITS 1 & 2

Comparison of Horizontal and Vertical FIRS Computed for Profile C4

FIGURE 28



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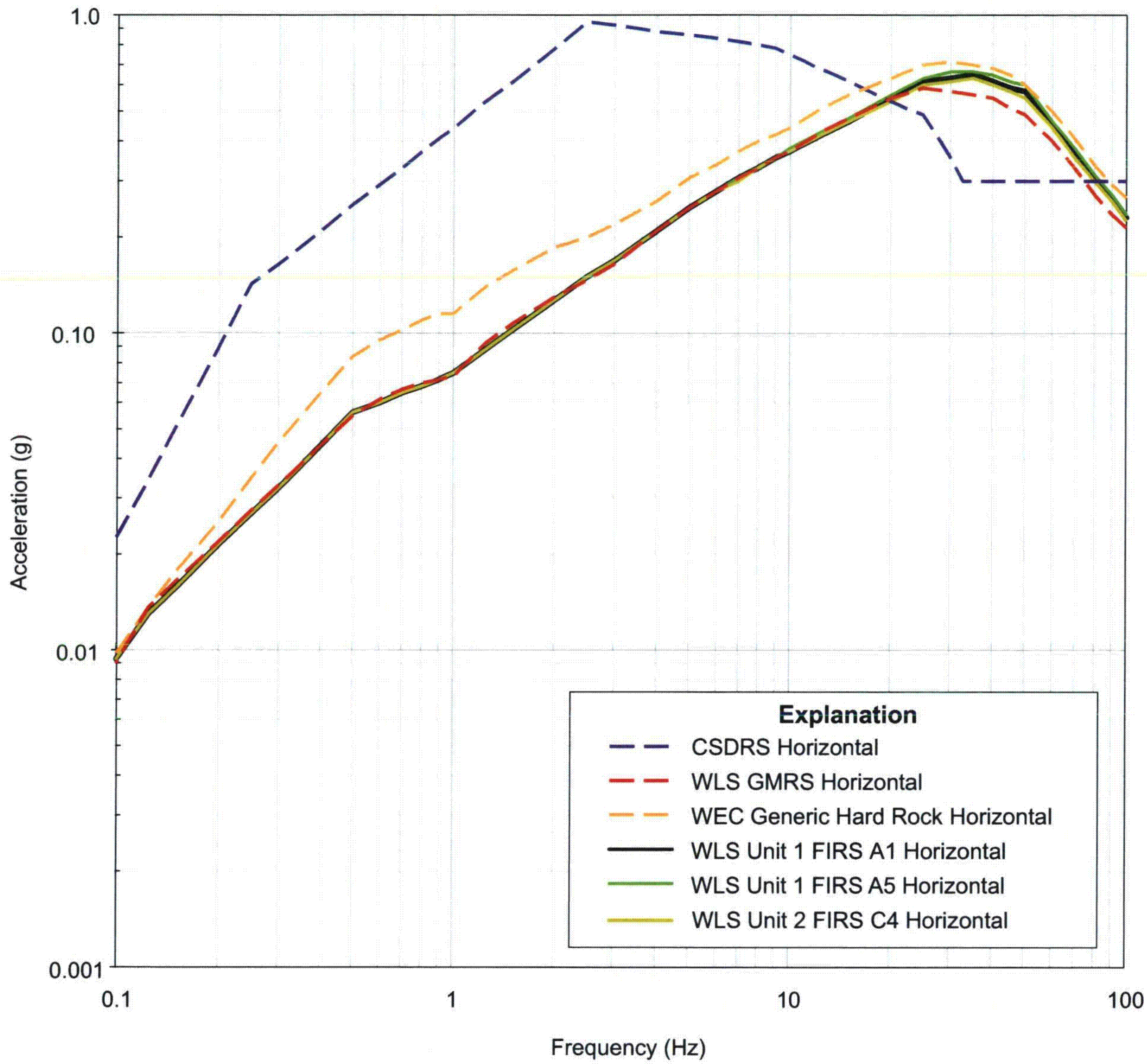
NUCLEAR STATION UNITS 1 & 2

Permanent Slopes within One-Quarter Mile of Units 1 and 2 Nuclear Island Structures

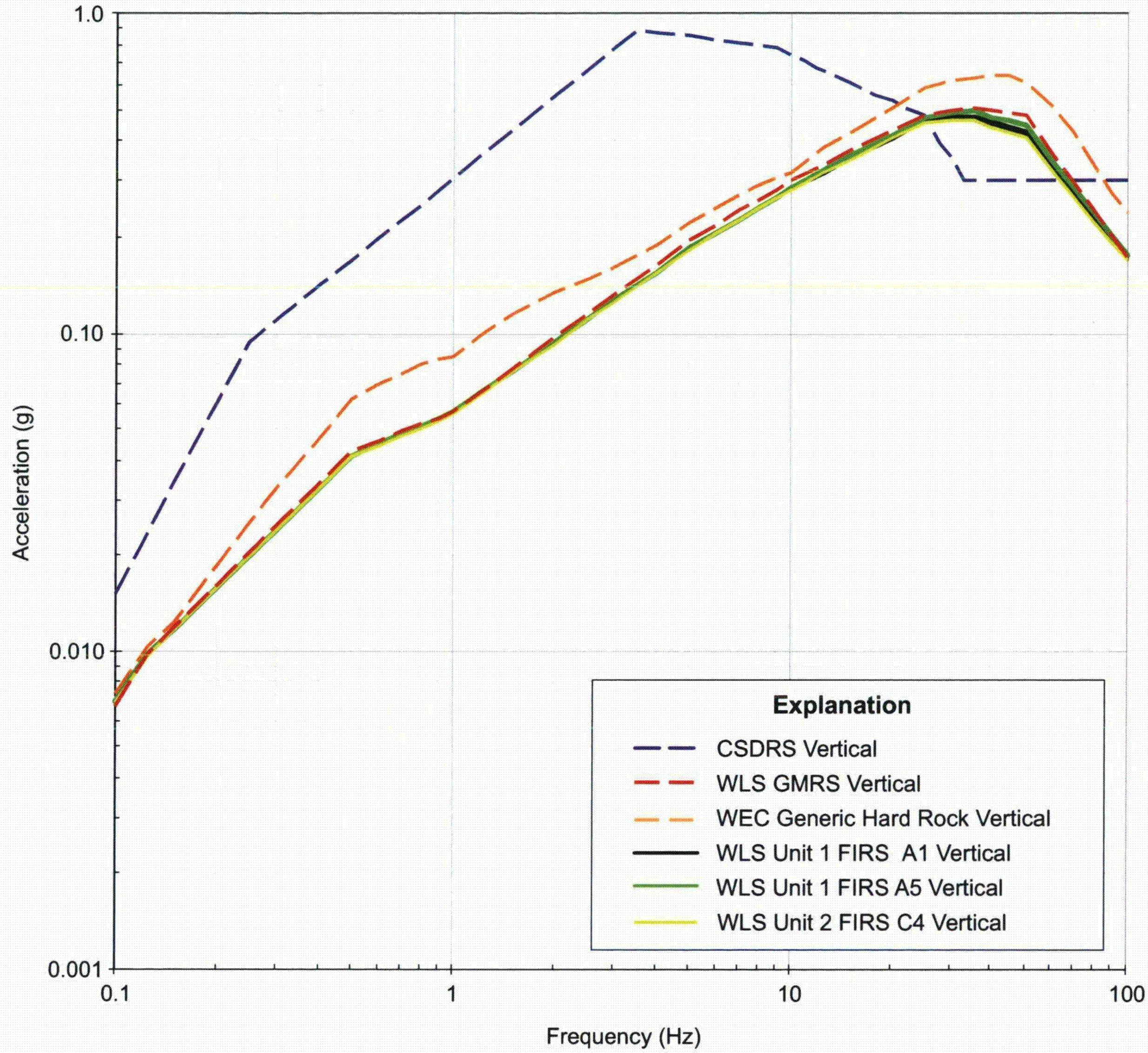
FIGURE 29



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Design Ground Motion
Response Spectra - Horizontal

FIGURE 30



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Design Ground Motion
Response Spectra - Vertical

FIGURE 31

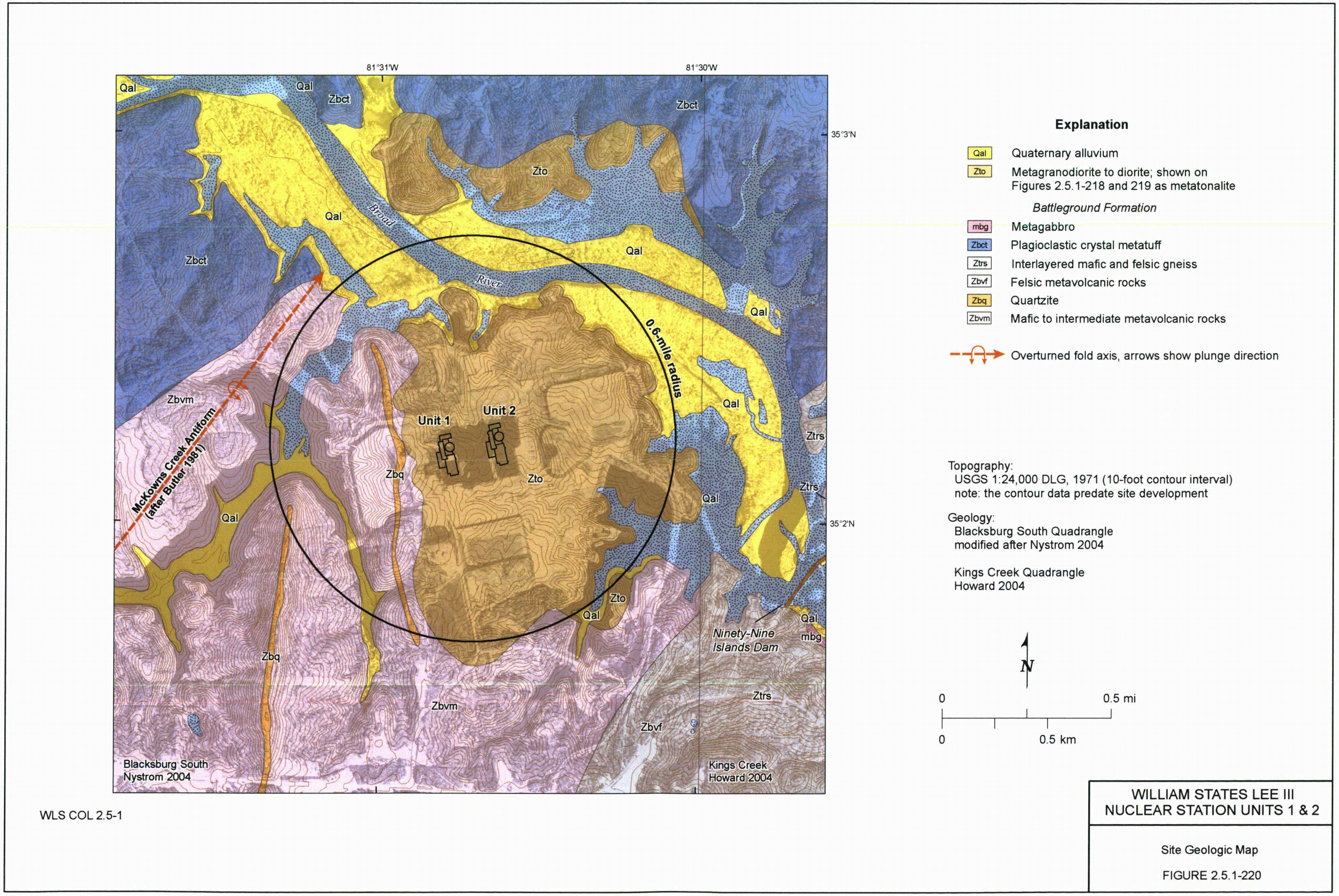
Attachment 1

Revisions to FSAR Chapter 2, Subsection 2.5.1

Figure 2.5.1-220

Figure 2.5.1-229

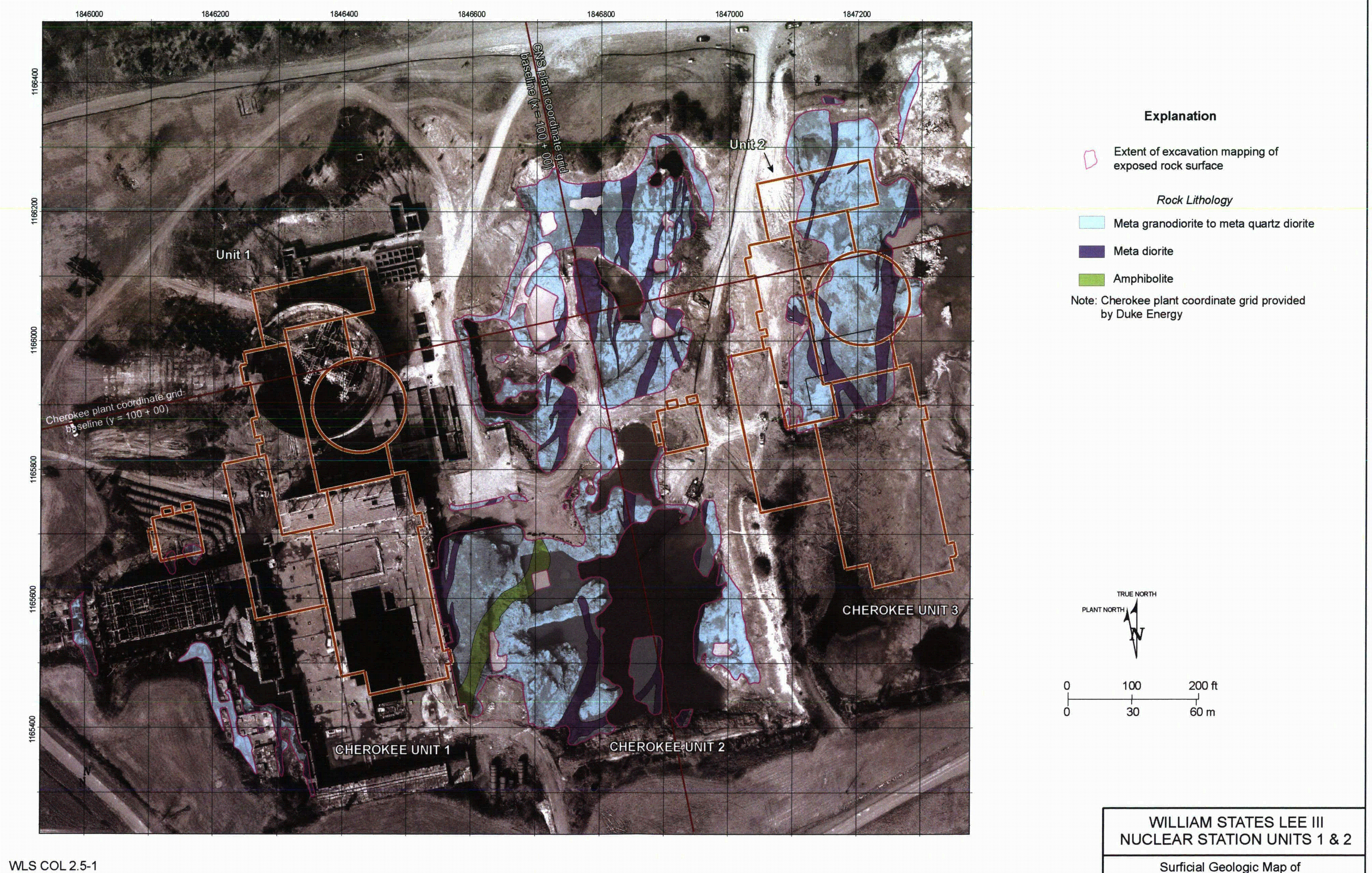
1. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-220 is revised as follows:



Site Geologic Map

FIGURE 2.5.1-220

2. COLA Part 2, FSAR Chapter 2, Figure 2.5.1-229 is revised as follows:



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Surficial Geologic Map of Existing Excavation

FIGURE 2.5.1-229

Attachment 2

Revisions to FSAR Chapter 2, Subsection 2.5.2

Subsection 2.5.2

Table 2.5.2-222

Table 2.5.2-224

Table 2.5.2-225

Table 2.5.2-226

Figure 2.5.2-240 - Deleted

Figure 2.5.2-240a

Figure 2.5.2-240b

Figure 2.5.2-240c

Figure 2.5.2-241 - Deleted

Figure 2.5.2-241a

Figure 2.5.2-241b

Figure 2.5.2-241c

Figure 2.5.2-244 - Deleted

Figure 2.5.2-244a

Figure 2.5.2-244b

Figure 2.5.2-244c

Figure 2.5.2-245 - Deleted

Figure 2.5.2-245a

Figure 2.5.2-245b

Figure 2.5.2-245c

Figure 2.5.2-246 - Deleted

Figure 2.5.2-246a

Figure 2.5.2-246b

Figure 2.5.2-246c

Figure 2.5.2-247 - Deleted

Figure 2.5.2-247a

Figure 2.5.2-247b

Figure 2.5.2-247c

1. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2, second paragraph, last bullet is revised as follows:

- Development of Foundation Input Response Spectra (FIRS) developed for Lee Nuclear Station Units 1 and 2 (Subsection 2.5.2.7)

2. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2, sixth paragraph is revised and new last paragraph is added to read:

Subsections 2.5.2.1 through 2.5.2.4 document the review and update of the available EPRI seismicity, seismic source, and ground motion models. Subsection 2.5.2.5 summarizes information about the seismic wave transmission characteristics of the Lee Nuclear Site with reference to more detailed discussion of all engineering aspects of the subsurface in Subsection 2.5.4. Subsection 2.5.2.6 describes the development of the site-specific GMRS for the Lee Nuclear Site. Regulatory Guide 1.208 provides guidance for development of the GMRS. Subsection 2.5.2.7 describes the development of the foundation input response spectra (FIRS) FIRS for Units 1 and 2, to evaluate potential site response effects attributed to existing fill concrete and structural concrete materials placed during construction of the existing Cherokee Nuclear Station as well as new fill concrete for Lee Nuclear Station placed above the existing Cherokee Nuclear Station concrete materials and within localized lower pump room areas. For Unit 2, sound, continuous rock meeting the hard rock definitions is located at the foundation level. Therefore, the calculated GMRS defines the input motion at Unit 2.

The information provided for the Lee Nuclear Station Units 1 and 2 is based on data from historic field explorations for the Cherokee Nuclear Station and the field explorations for the Lee Nuclear Station completed in 2006, 2007, and 2012.

3. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7 is revised as follows:

2.5.2.7 Development of FIRS for Units 1 and 2

This subsection presents the location-specific Lee Nuclear Station Unit 1 FIRS A1, with Unit 1 FIRS A5 and Unit 2 FIRS C4 representing sensitivity evaluations to assess localized foundation conditions described below. As previously stated, the Lee Nuclear Station Unit 1 foundation is supported on new and previously placed concrete materials positioned directly over continuous hard rock with shear wave velocity dominantly over 9,200 ft/sec. Localized portions of the Unit 1 nuclear island overlie legacy Cherokee lower rooms (Figure 2.5.4-266). The Lee Nuclear Station Unit 2 foundation is supported on continuous hard rock with shear wave velocity dominantly over 9,200 ft/sec with the exception of the eastern edge of the nuclear island which may be supported by up to 20 feet of new leveling fill concrete (Figure 2.5.4-267).

To address this these configurations, location-specific FIRS analyses are conducted for the Unit 1 nuclear island, referred to as Unit 1 FIRS A1, the Unit 1 localized condition where the nuclear island overlies legacy CNS pump rooms, referred to as FIRS A5, and the eastern edge of the Unit 2 nuclear island, referred to as FIRS C4. Subsection 2.5.4.7 describes the material dynamic properties and Figures 2.5.4-252a, 2.5.4-252b and 2.5.4-252c shows the dynamic profiles for Base Cases A1, A5, and C4 respectively that represents the Unit 1 FIRS A1, Unit 1 FIRS A5 and Unit 2 FIRS C4 configurations.

Unit 1 FIRS (Figure 2.5.4-252a) defines the Unit 1 nuclear island centerline foundation input motion and is based on the Lee Nuclear Station GMRS developed at the top of a hypothetical outcrop (continuous rock) transferred up through previously placed Cherokee Nuclear Station concrete materials and newly placed Lee Nuclear Station concrete materials to the basemat foundation level at 550553.5 ft (NAVD). Unit 1 FIRS as described in this subsection is calculated using the mean and fractiles hazard curves described in Subsection 2.5.2.4.5.

The profile for the Lee Nuclear Station Unit 1 FIRS is shown in Figure 2.5.4-252a with approximately eight (8) feet of new fill concrete overlying an average of about 15 feet of existing fill concrete, structural basemat concrete and native rock from the former Cherokee foundation. The Unit 1 NI centerline Vs reflects shear wave velocities from about 7,500 feet per second (fps) (fill concrete) to about 9,600 fps (continuous rock) as shown in Figure 2.5.4-252a, Base Case A1 – Unit 1 for basemat at 553.5 ft.

Unit 1 FIRS A5 defines the localized condition of the Lee Unit 1 nuclear island that will overlie legacy CNS pump rooms at approximately 527 ft (NAVD). As described in Subsection 2.5.4.5.2 -the horizontal slab concrete of these CNS pump rooms and existing waterproofing membrane will be removed during construction and the pump rooms will then be backfilled using fill concrete up to the basemat floor level at 553.5 ft (NAVD). FIRS A5 is based on the Lee Nuclear Station Ground Motion Response Spectra (GMRS) developed at the top of a hypothetical outcrop (continuous rock) fixed at 523 ft (NAVD) transferred up through previously placed Cherokee Nuclear Station concrete materials and newly placed Lee Nuclear Station concrete materials to the basemat foundation level at 553.5 ft (NAVD).

Unit 2 FIRS C4 defines the Unit 2 nuclear island eastern edge foundation input motion and is based on the Lee Nuclear Station GMRS developed at the top of a hypothetical outcrop (continuous rock) fixed at 509 ft (NAVD) transferred up through newly placed Lee Nuclear Station concrete materials to the basemat foundation level at 553.5 ft (NAVD).

4. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1, first paragraph, first sentence is revised as follows:

In calculating the probabilistic ground motions at the Lee Nuclear Site, the Unit 1 FIRS A1, FIRS A5, and FIRS C4 must be hazard consistent (i.e., the annual exceedance probability of the uniform hazard spectrum (UHRS) from which the Unit 1 FIRS is derived should be the same as the hard rock UHRS, referred to herein as the hypothetical rock outcrop UHRS). NUREG/CR-6728 (Reference 251), recommends several site response approaches to produce soil or rock motions consistent with the hypothetical outcrop UHRS.

5. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1.1, first paragraph, first bullet is revised as follows:

- Randomization of the base case site-dynamic velocity profiles (A1, A5, and C4) to produce a suites of velocity profiles that incorporates site-specific randomness.

6. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1.1.1, first paragraph is revised as follows:

Transfer functions are spectral ratios (5% damping) of horizontal top of concrete foundation (firm rock) motions to hard rock (Table 2.5.2-221) as well as vertical-to-horizontal ratios (5% damping) computed for the location-specific profiles Unit 1 FIRS. Horizontal amplification factors reflect motions (5% damping response spectra) computed at the top of the profiles Unit 1 FIRS (concrete) divided by motions computed for a hypothetical (hard) rock outcrop (9,300 ft/sec, Table 2.5.2-221). Due to the profile stiffness, 7,500 ft/sec for concrete, linear analyses are performed.

7. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1.1.1, third paragraph is revised as follows:

Empirical western North America (WNA) V/H ratios are included in the development of vertical motions in addition to site-specific point-source simulations. The use of WNA empirical V/H ratios implicitly assumes similarity in shear- and compression-wave profiles and nonlinear dynamic material properties between site conditions in WNA and location-specific soft rock columns (Figures 2.5.4-252a, 2.5.4-252b, and 2.5.4-252c). Whereas this may not be the case for the average WNA rock site profile (Reference 281), the range in site conditions sampled by the WNA empirical generic rock relations likely accommodates site-specific conditions. The relative weights listed in Table 2.5.2-223 reflect the assumed appropriateness of WNA soft rock empirical V/H ratios for Unit 1 and Unit 2. Additionally, because the model for vertical motions is not as thoroughly validated as the model for horizontal motions (References 277, 280, and 281), inclusion of empirical models is warranted. The additional epistemic variability introduced by inclusion of both analytical and empirical models also appropriately reflects the difficulty and lack of consensus regarding the modeling of site-specific vertical motions (Reference 282). In the implementation of Approach 3 to develop vertical hazard curves, the epistemic variability is properly accommodated in the vertical mean UHRS, reflecting a weighted average over multiple vertical hazard curves computed for the ~~Unit 1~~ FIRS ~~(Base Case Profile~~ A1, FIRS A5, and FIRS C4(Figures 2.5.4-252a, 2.5.4-252b, and 2.5.2-252c) models (empirical and numerical). The vertical FIRS (and UHRSs) then maintain the desired risk and hazard levels, consistent with the horizontal design response spectra (GMRS) and UHRSs.

8. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1.1.1.1, first paragraph is revised as follows:

Horizontal amplification factors are developed using hard rock spectral shapes as control motions (Reference 251). Base Case Profiles A1~~is~~, A5, and C4 were placed on top of the regional hard rock crustal model (Table 2.5.2-221, Reference 273). A hard rock kappa value of 0.006 sec (Table 2.5.2-221) is used, consistent with that incorporated in the hard rock attenuation relations (Reference 273). With a hysteretic damping in concrete between 0.5% and 1.0% any additional damping in the shallow concrete profile is neglected as its impacts will be beyond the fundamental shallow column resonance, well above 50 Hz.

9. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1.1.1.1, last paragraph is revised as follows:

While the site response analyses are linear and therefore strictly independent of control motion spectral shape for Fourier amplitude spectral ratios, at high frequency, 5% damped response spectral ratios may not be strictly independent of control motion spectral shape. This can occur because the width of the simple harmonic oscillator transfer function is constant in log frequency and increases directly with frequency, averaging over a wider range in frequencies as oscillator frequency increases. At very large distances, where crustal damping has depleted high frequencies (spectral shapes shift to lower frequencies, Reference 251) and the site resonance is not highly excited, response spectral ratios may depart from those computed using control motions relatively rich in high frequency energy (close distances). To accommodate the possibility of distance dependent transfer functions in a linear analysis, a suite of spectral shapes is used as control motions at distances of 0.6, 12, 62,125, 250 mi (1, 20, 100, 200, and 400 km). Results are shown in Figures 2.5.2-241a, 2.5.2-241b, and 2.5.2-241c and reveal the shallow site resonance.~~,~~ The FIRS demonstrate median amplification of about ~~10~~11%, 15% and 10% for A1, A5 and C4 respectively. This occurs near 60 Hz to 70 Hz~~, with a~~ for FIRS A1 and A5 and near 40 and 80 Hz for FIRS C4. All amplification factors show very slight differences only at 250 mi (400 km). The width of the resonance is broadened by the profile randomization with shear-wave velocities varying ±10%

about the Unit 1 FIRSconcrete Vs value of 7,500 ft/sec along with depth to hard rock at 23.5 ft for FIRS A1, 30.5 ft for FIRS A5, and 20 ft for FIRS C4, randomly varied ± 3 ft.

10. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.1.1.1.2, first paragraph, first sentence is revised as follows:

For the Lee Nuclear Station, the concrete profile is randomized between depths of 23.5±3 ft for FIRS A1, 30.5±3 ft for FIRS A5, and 20±3 ft for FIRS C417 to 23 ft, the range in depths to hard rock conditions [shear-wave velocity exceeding, on average, 9,300 ft/sec (2.83 km/sec)] (Reference 273).

11. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.2, second paragraph is revised as follows:

In the implementation of the equivalent-linear approach to estimate V/H response spectral ratios for the Lee Nuclear Station Unit 1 FIRS A1, FIRS A5, and FIRS C4, the horizontal component analyses are performed for vertically propagating shear waves. To compute the vertical motions, a linear analysis is performed for incident inclined P-SV waves using low-strain V_P and V_S derived from the profiles Unit 1 FIRS A1, FIRS A5, and FIRS C4 (Subsection 2.5.4.7). The P-wave damping is set equal to the low strain S-wave damping (Reference 289). The horizontal component and vertical component analyses are performed independently.

12. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.2, fifth paragraph is revised as follows:

For Lee Nuclear Station Unit 1 FIRS the site-specific V/H ratios, Figures 2.5.2-240a, 2.5.2-240b, and 2.5.2-240c for FIRS A1, FIRS A5 and FIRS C4 respectively shows median estimates computed with the stochastic model for **M** 5.1. For **M** 5.1, the distances range from 50 to 0 mi. (80 to 0 km) (Table 2.5.2-221) with expected horizontal hard rock peak accelerations ranging from 0.01 to 0.50g. Figures 2.5.2-240a, 2.5.2-240b, and 2.5.2-240c all shows that the V/H for the shallow concrete profile Unit 1 FIRS are nearly constant with frequency and increase rapidly as distance decreases, within about a 9 mi. source distance. For distances beyond 6 to 9 mi., the V/H ratio is about 0.5 and increases rapidly to about 0.9. The peaks near 60 Hz areis likely due to the peak in the horizontal amplification factors (Figures 2.5.2-241a, 2.5.2-241b, and 2.5.2-241c). In Figures 2.5.2-240a, 2.5.2-240b, and 2.5.2-240c, the multiple peaks beginning near 1 Hz reflect deep crustal resonances (structure below 0.5 mi., Table 2.5.2-221) that would be smoothed if the crustal model were randomized and discrete layers replaced with steep velocity gradients to reflect lateral variability and a more realistic crustal structure. The **M** 5.1 distance ranges more than adequately accommodate the hazard deaggregation (Subsection 2.5.2.4.5).

13. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.3, first paragraph, second sentence is revised as follows:

At high frequency, hard rock hazard curves are interpolated at 34 and 50 Hz, as these are the critical frequencies to define the Unit 1 FIRS A1, FIRS A5, FIRS C4, and UHRS shapes beyond 25 Hz.

14. COLA Part 2, FSAR Chapter 2, Subsection 2.5.2.7.4 is revised as follows:

Tables 2.5.2-224, 2.5.2-225, and 2.5.2-226 and Figures 2.5.2-244a, 2.5.2-244b, 2.5.2-244c, 2.5.2-245a, 2.5.2-245b, and 2.5.2-245c show horizontal and vertical Unit 1 FIRS A1, A5, and C4 developed compared to the horizontal and vertical GMRS developed for Unit 2. Figures 2.5.2-246a, 2.5.2246b, and 2.5.2-246c shows both the horizontal and vertical FIRS A1, A5, and C4, respectively. Figures 2.5.2-247a, 2.5.2-247b, and 2.5.2-247c shows the horizontal and vertical UHRS at exceedance levels of 10^{-4}, 10^{-5}, and 10^{-6} yr^{-1} for FIRS A1, A5, and C4, respectively. Through Approach 3, both the horizontal and vertical UHRS and Unit 1 FIRS are hazard- and performance-based consistent across structural frequency from 0.5 to 100 Hz, the frequency range over which the hard rock hazard is computed (Reference 273). For frequencies below 0.5 to 0.1 Hz, the extrapolation employed is intended to reflect conservatism, likely resulting in motions of lower probability. Tables 2.5.2-224, 2.5.2-225, and 2.5.2-226 lists discrete FIRS and UHRS horizontal and vertical spectral acceleration values for Unit 1.

As illustrated in Figure 2.5.4-266, the conditions associated with FIRS A5 are only applicable to a small localized portion of the Unit 1 footprint, while FIRS A1 is applicable to the remainder. Since the nuclear island basemat will respond as a unit, the actual input to the nuclear island will be much closer to FIRS A1, and the contribution of FIRS A5 will not adversely impact the overall response of Unit 1. Similarly, FIRS C4 was developed as a sensitivity analysis of the potential effects of localized fill concrete beneath the eastern extents of Unit 2. The potential effects of FIRS C4 are bounded by FIRS A1 for Unit 1, and the GMRS presented in Subsection 2.5.2.6 defines the input motion at Unit 2. Section 3.7 compares the site-specific ground motions to the AP-1000 design ground motions.

15. COLA Part 2, FSAR Chapter 2, Table 2.5.2-222 is revised as follows:

WLS COL 2.5-2

TABLE 2.5.2-222
WEIGHTING SCHEME TO DEVELOP V/H RATIOS

	Weighting		Empirical Relation Weights		Site Condition Weights	
Profile	Empirical	Model	A&S (1997)	C&B (2003)	Soft Rock	Soil
A1	0.2	0.8	0.5	0.5	1.0	0.0
A5	0.2	0.8	0.5	0.5	1.0	0.0
C4	0.2	0.8	0.5	0.5	1.0	0.0

Notes:
A&S (1997) = Abrahamson and Silva (1997) (Reference 296)
C&B (2003) = Campbell and Bozorgnia (2003) (Reference 298)

16. COLA Part 2, FSAR Chapter 2, Table 2.5.2-224 is revised as follows:

WLS COL 2.5-2

TABLE 2.5.2-224 (Sheet 1 of 2)
FIRS AND UHRS FOR PROFILE A1

Frequency (Hz)	FIRS Horizontal SA (G)	FIRS Vertical SA (G)	UHRS(10^{-4}) Horizontal SA (G)	UHRS(10^{-4}) Vertical SA (G)	UHRS(10^{-5}) Horizontal SA (G)	UHRS(10^{-5}) Vertical SA (G)	UHRS(10^{-6}) Horizontal SA (G)	UHRS(10^{-6}) Vertical SA (G)
100	0.229~~0.224~~	0.173~~0.168~~	0.113~~0.110~~	0.088~~0.086~~	0.510~~0.497~~	0.384~~0.374~~	1.479~~1.439~~	1.221~~1.192~~
90	0.263~~0.256~~	0.198~~0.193~~	0.127~~0.123~~	0.100~~0.097~~	0.585~~0.570~~	0.441~~0.428~~	1.716~~1.664~~	1.422~~1.385~~
80	0.307~~0.298~~	0.231~~0.224~~	0.145~~0.141~~	0.114~~0.111~~	0.682~~0.663~~	0.513~~0.497~~	2.027~~1.956~~	1.686~~1.637~~
70	0.366~~0.355~~	0.275~~0.265~~	0.169~~0.163~~	0.134~~0.129~~	0.813~~0.788~~	0.610~~0.590~~	2.447~~2.350~~	2.044~~1.978~~
60	0.447~~0.433~~	0.335~~0.323~~	0.201~~0.193~~	0.160~~0.154~~	0.994~~0.962~~	0.745~~0.718~~	3.043~~2.905~~	2.554~~2.462~~
50	0.568~~0.548~~	0.425~~0.407~~	0.247~~0.236~~	0.198~~0.190~~	1.262~~1.217~~	0.944~~0.905~~	3.937~~3.733~~	3.324~~3.190~~
45	0.588~~0.569~~	0.440~~0.424~~	0.250~~0.240~~	0.200~~0.193~~	1.307~~1.264~~	0.977~~0.942~~	4.037~~3.859~~	3.393~~3.274~~
40	0.611~~0.593~~	0.457~~0.443~~	0.254~~0.244~~	0.202~~0.195~~	1.358~~1.318~~	1.016~~0.985~~	4.153~~4.005~~	3.472~~3.372~~
35	0.639~~0.622~~	0.478~~0.466~~	0.257~~0.248~~	0.204~~0.198~~	1.419~~1.383~~	1.062~~1.036~~	4.288~~4.176~~	3.564~~3.486~~
30	0.629~~0.616~~	0.476~~0.467~~	0.259~~0.252~~	0.206~~0.201~~	1.399~~1.369~~	1.058~~1.037~~	4.174~~4.088~~	3.479~~3.423~~
25	0.608~~0.598~~	0.467~~0.460~~	0.261~~0.257~~	0.208~~0.205~~	1.350~~1.329~~	1.037~~1.023~~	3.974~~3.912~~	3.333~~3.298~~
20	0.540~~0.534~~	0.414~~0.410~~	0.244~~0.241~~	0.193~~0.191~~	1.201~~1.186~~	0.919~~0.909~~	3.466~~3.424~~	2.874~~2.852~~
15	0.465~~0.461~~	0.355~~0.353~~	0.224~~0.222~~	0.176~~0.175~~	1.032~~1.024~~	0.787~~0.781~~	2.906~~2.883~~	2.375~~2.365~~
12.5	0.422~~0.420~~	0.322~~0.321~~	0.212~~0.211~~	0.166~~0.165~~	0.938~~0.933~~	0.713~~0.710~~	2.599~~2.586~~	2.105~~2.100~~
10	0.376~~0.375~~	0.286	0.199~~0.198~~	0.154	0.834~~0.833~~	0.631	2.267~~2.263~~	1.816
9	0.353~~0.352~~	0.268~~0.267~~	0.191~~0.190~~	0.147	0.780~~0.778~~	0.588	2.101~~2.097~~	1.672~~1.671~~
8	0.329	0.248	0.183~~0.182~~	0.140~~0.139~~	0.723~~0.721~~	0.543~~0.542~~	1.930~~1.926~~	1.525~~1.523~~
7	0.304	0.228	0.174~~0.173~~	0.132~~0.131~~	0.663~~0.662~~	0.496~~0.495~~	1.753~~1.748~~	1.374~~1.371~~
6	0.278~~0.277~~	0.207	0.164~~0.163~~	0.123~~0.122~~	0.601~~0.599~~	0.447~~0.446~~	1.569~~1.564~~	1.218~~1.214~~

WLS COL 2.5-2

TABLE 2.5.2-224 (Sheet 2 of 2)
FIRS AND UHRS FOR PROFILE A1

Frequency (Hz)	FIRS Horizontal SA (G)	FIRS Vertical SA (G)	UHRS(10^{-4}) Horizontal SA (G)	UHRS(10^{-4}) Vertical SA (G)	UHRS(10^{-5}) Horizontal SA (G)	UHRS(10^{-5}) Vertical SA (G)	UHRS(10^{-6}) Horizontal SA (G)	UHRS(10^{-6}) Vertical SA (G)
5	0.250~~0.249~~	0.185~~0.184~~	0.153	0.113	0.535~~0.533~~	0.396~~0.394~~	1.376~~1.370~~	1.056~~1.052~~
4	0.211	0.157~~0.156~~	0.132	0.097	0.450~~0.449~~	0.335~~0.334~~	1.116~~1.113~~	0.860~~0.858~~
3	0.170	0.127	0.109	0.080	0.360	0.270~~0.269~~	0.853~~0.852~~	0.660~~0.659~~
2.5	0.148	0.111	0.096	0.071	0.313	0.235	0.719	0.558
2	0.125	0.094	0.079	0.059	0.267	0.201	0.602	0.472
1.5	0.101	0.076	0.061	0.046	0.217	0.164	0.479	0.380
1.25	0.088	0.067	0.052	0.039	0.190	0.144	0.415	0.332
1	0.074	0.057	0.043	0.032	0.162	0.123	0.347	0.281
0.9	0.071	0.054	0.039	0.029	0.155	0.118	0.337	0.269
0.8	0.068	0.051	0.034	0.026	0.148	0.112	0.325	0.257
0.7	0.064	0.048	0.030	0.023	0.141	0.106	0.313	0.244
0.6	0.060	0.045	0.026	0.019	0.133	0.099	0.299	0.230
0.5	0.056	0.041	0.022	0.016	0.124	0.092	0.284	0.215
0.4	0.044	0.033	0.018	0.013	0.098	0.073	0.226	0.171
0.3	0.033	0.024	0.014	0.010	0.073	0.054	0.169	0.128
0.2	0.021	0.016	0.009	0.007	0.048	0.035	0.112	0.085
0.15	0.016	0.012	0.007	0.005	0.035	0.026	0.084	0.064
0.125	0.013	0.010	0.006	0.004	0.029	0.022	0.070	0.053
0.1	0.009	0.007	0.004	0.003	0.021	0.015	0.047	0.036

17. COLA Part 2, FSAR Chapter 2, new Table 2.5.2-225 is added as follows:

WLS COL 2.5-2

TABLE 2.5.2-225 (Sheet 1 of 2)
FIRS AND UHRS FOR PROFILE A5

Frequency (Hz)	FIRS Horizontal SA (G)	FIRS Vertical SA (G)	UHRS(10^{-4}) Horizontal SA (G)	UHRS(10^{-4}) Vertical SA (G)	UHRS(10^{-5}) Horizontal SA (G)	UHRS(10^{-5}) Vertical SA (G)	UHRS(10^{-6}) Horizontal SA (G)	UHRS(10^{-6}) Vertical SA (G)
100	0.233	0.176	0.114	0.089	0.518	0.391	1.504	1.238
90	0.269	0.203	0.130	0.102	0.598	0.451	1.756	1.448
80	0.316	0.238	0.149	0.117	0.701	0.528	2.088	1.727
70	0.378	0.284	0.175	0.138	0.841	0.632	2.541	2.108
60	0.466	0.350	0.210	0.166	1.036	0.778	3.187	2.653
50	0.597	0.447	0.260	0.207	1.326	0.994	4.167	3.483
45	0.617	0.462	0.263	0.208	1.371	1.026	4.253	3.543
40	0.640	0.478	0.267	0.210	1.422	1.063	4.352	3.611
35	0.667	0.498	0.271	0.212	1.483	1.106	4.466	3.690
30	0.653	0.492	0.270	0.212	1.450	1.093	4.319	3.573
25	0.624	0.478	0.267	0.213	1.386	1.062	4.079	3.388
20	0.552	0.422	0.249	0.197	1.226	0.936	3.539	2.911
15	0.471	0.359	0.227	0.178	1.046	0.795	2.946	2.394
12.5	0.426	0.324	0.214	0.167	0.947	0.717	2.623	2.115
10	0.377	0.286	0.199	0.155	0.837	0.632	2.275	1.817
9	0.354	0.268	0.192	0.148	0.782	0.589	2.108	1.673
8	0.330	0.249	0.183	0.140	0.725	0.544	1.936	1.526
7	0.305	0.229	0.174	0.132	0.665	0.497	1.758	1.375
6	0.279	0.208	0.164	0.123	0.602	0.448	1.572	1.219

WLS COL 2.5-2

TABLE 2.5.2-225 (Sheet 2 of 2)
FIRS AND UHRS FOR PROFILE A5

Frequency (Hz)	FIRS Horizontal SA (G)	FIRS Vertical SA (G)	UHRS(10^{-4}) Horizontal SA (G)	UHRS(10^{-4}) Vertical SA (G)	UHRS(10^{-5}) Horizontal SA (G)	UHRS(10^{-5}) Vertical SA (G)	UHRS(10^{-6}) Horizontal SA (G)	UHRS(10^{-6}) Vertical SA (G)
5	0.250	0.185	0.153	0.113	0.535	0.396	1.378	1.058
4	0.211	0.157	0.132	0.097	0.451	0.335	1.118	0.861
3	0.170	0.127	0.109	0.080	0.361	0.270	0.853	0.661
2.5	0.149	0.111	0.096	0.071	0.313	0.235	0.719	0.559
2	0.125	0.094	0.079	0.059	0.267	0.201	0.602	0.472
1.5	0.101	0.076	0.061	0.046	0.217	0.164	0.479	0.381
1.25	0.088	0.067	0.052	0.039	0.190	0.144	0.415	0.332
1	0.074	0.057	0.043	0.032	0.162	0.123	0.347	0.281
0.9	0.071	0.054	0.039	0.029	0.155	0.118	0.337	0.269
0.8	0.068	0.051	0.034	0.026	0.148	0.112	0.325	0.257
0.7	0.064	0.048	0.030	0.023	0.141	0.106	0.313	0.244
0.6	0.060	0.045	0.026	0.019	0.133	0.099	0.299	0.230
0.5	0.056	0.041	0.022	0.016	0.124	0.092	0.284	0.214
0.4	0.044	0.033	0.018	0.013	0.098	0.073	0.226	0.171
0.3	0.033	0.024	0.014	0.010	0.073	0.054	0.169	0.128
0.2	0.021	0.016	0.009	0.007	0.048	0.035	0.112	0.085
0.15	0.016	0.012	0.007	0.005	0.035	0.026	0.084	0.064
0.125	0.013	0.010	0.006	0.004	0.029	0.022	0.070	0.053
0.1	0.009	0.007	0.004	0.003	0.021	0.015	0.047	0.036

18. COLA Part 2, FSAR Chapter 2, new Table 2.5.2-226 is added as follows:

WLS COL 2.5-2

TABLE 2.5.2-226 (Sheet 1 of 2)
FIRS AND UHRS FOR PROFILE C4

Frequency (Hz)	FIRS Horizontal SA (G)	FIRS Vertical SA (G)	UHRS(10^{-4}) Horizontal SA (G)	UHRS(10^{-4}) Vertical SA (G)	UHRS(10^{-5}) Horizontal SA (G)	UHRS(10^{-5}) Vertical SA (G)	UHRS(10^{-6}) Horizontal SA (G)	UHRS(10^{-6}) Vertical SA (G)
100	0.225	0.169	0.111	0.086	0.500	0.376	1.448	1.182
90	0.258	0.194	0.124	0.097	0.573	0.430	1.673	1.373
80	0.300	0.225	0.141	0.111	0.666	0.500	1.967	1.623
70	0.356	0.267	0.164	0.130	0.792	0.592	2.364	1.962
60	0.435	0.324	0.194	0.154	0.966	0.720	2.921	2.443
50	0.550	0.409	0.237	0.190	1.221	0.908	3.753	3.166
45	0.570	0.425	0.241	0.192	1.268	0.945	3.875	3.247
40	0.595	0.444	0.245	0.195	1.321	0.987	4.017	3.340
35	0.623	0.467	0.249	0.198	1.385	1.038	4.184	3.448
30	0.617	0.468	0.253	0.201	1.370	1.039	4.092	3.383
25	0.598	0.461	0.257	0.204	1.329	1.024	3.913	3.257
20	0.534	0.410	0.241	0.191	1.185	0.909	3.422	2.817
15	0.460	0.352	0.222	0.174	1.023	0.780	2.879	2.335
12.5	0.419	0.320	0.211	0.165	0.931	0.708	2.580	2.074
10	0.374	0.285	0.198	0.154	0.830	0.629	2.256	1.793
9	0.351	0.266	0.190	0.147	0.776	0.586	2.091	1.652
8	0.328	0.247	0.182	0.139	0.719	0.541	1.921	1.508
7	0.303	0.227	0.173	0.131	0.660	0.494	1.745	1.360
6	0.277	0.206	0.163	0.122	0.598	0.445	1.561	1.206

WLS COL 2.5-2

TABLE 2.5.2-226 (Sheet 2 of 2)
FIRS AND UHRS FOR PROFILE C4

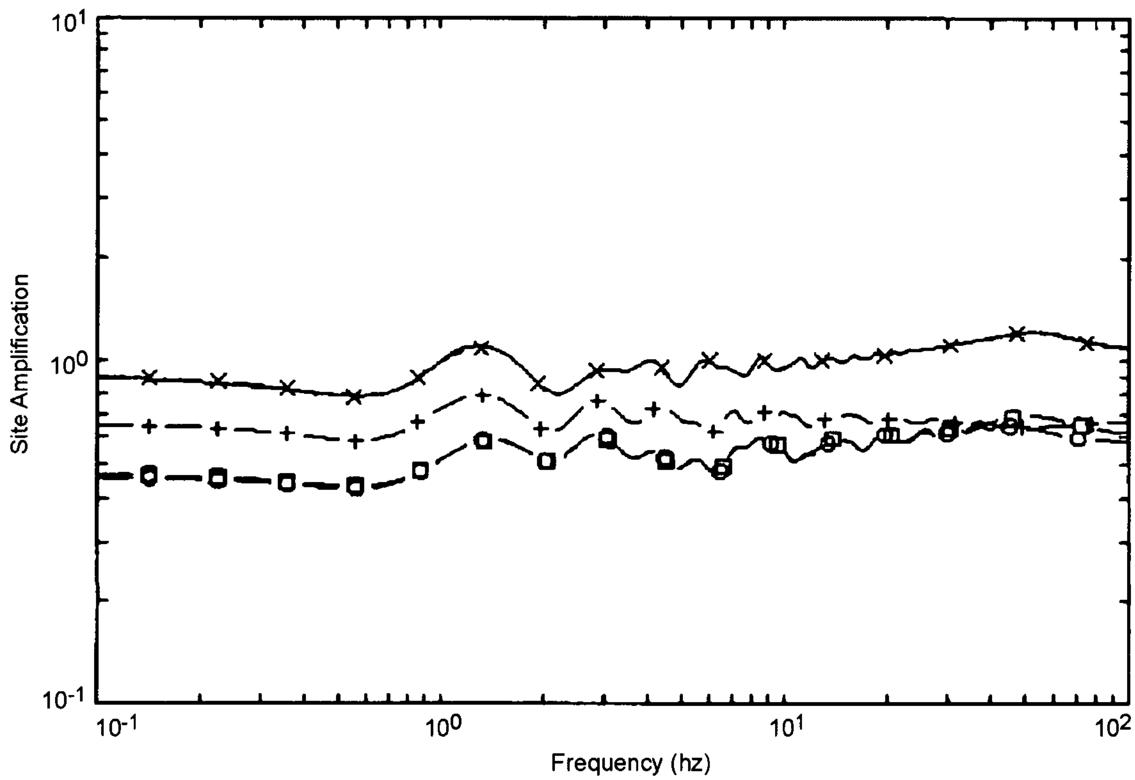
Frequency (Hz)	FIRS Horizontal SA (G)	FIRS Vertical SA (G)	UHRS(10^{-4}) Horizontal SA (G)	UHRS(10^{-4}) Vertical SA (G)	UHRS(10^{-5}) Horizontal SA (G)	UHRS(10^{-5}) Vertical SA (G)	UHRS(10^{-6}) Horizontal SA (G)	UHRS(10^{-6}) Vertical SA (G)
5	0.249	0.184	0.152	0.113	0.532	0.394	1.369	1.047
4	0.210	0.156	0.131	0.097	0.448	0.333	1.111	0.851
3	0.170	0.127	0.108	0.080	0.359	0.269	0.850	0.652
2.5	0.148	0.111	0.096	0.071	0.312	0.235	0.717	0.551
2	0.125	0.094	0.079	0.059	0.266	0.201	0.601	0.463
1.5	0.101	0.076	0.061	0.046	0.216	0.164	0.478	0.369
1.25	0.088	0.067	0.052	0.039	0.190	0.144	0.414	0.320
1	0.074	0.057	0.043	0.032	0.162	0.123	0.347	0.269
0.9	0.071	0.054	0.039	0.029	0.155	0.118	0.337	0.259
0.8	0.068	0.051	0.034	0.026	0.148	0.112	0.325	0.249
0.7	0.064	0.048	0.030	0.023	0.141	0.106	0.313	0.238
0.6	0.060	0.045	0.026	0.019	0.133	0.099	0.299	0.226
0.5	0.056	0.041	0.022	0.016	0.124	0.092	0.284	0.212
0.4	0.044	0.033	0.018	0.013	0.098	0.073	0.226	0.169
0.3	0.033	0.024	0.014	0.010	0.073	0.054	0.169	0.127
0.2	0.021	0.016	0.009	0.007	0.048	0.035	0.112	0.085
0.15	0.016	0.012	0.007	0.005	0.035	0.026	0.084	0.063
0.125	0.013	0.010	0.006	0.004	0.029	0.022	0.070	0.053
0.1	0.009	0.007	0.004	0.003	0.021	0.015	0.047	0.035

19. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-240 is deleted and presented as Figure 2.5.2-240a, Figure 2.5.2-240b, and Figure 2.5.2-240c as follows:

Figure 2.5.2-240

Deleted

20. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-240a is added as follows:



V/H Ratios
Unit 1 FIRS A1

LEGEND

—O— 50th percentile, D = 80 km, 0.01 g (D = 50 MI, 0.01 g)
—□— 50th percentile, D = 16 km, 0.10 g (D = 10 MI, 0.10 g)
—+— 50th percentile, D = 7 km, 0.20 g (D = 4 MI, 0.20 g)
—X— 50th percentile, D = 0 km, 0.30 g (D = 0 MI, 0.30 g)
——— 50th percentile, D = 0 km, 0.50 g (D = 0 MI, 0.50 g)

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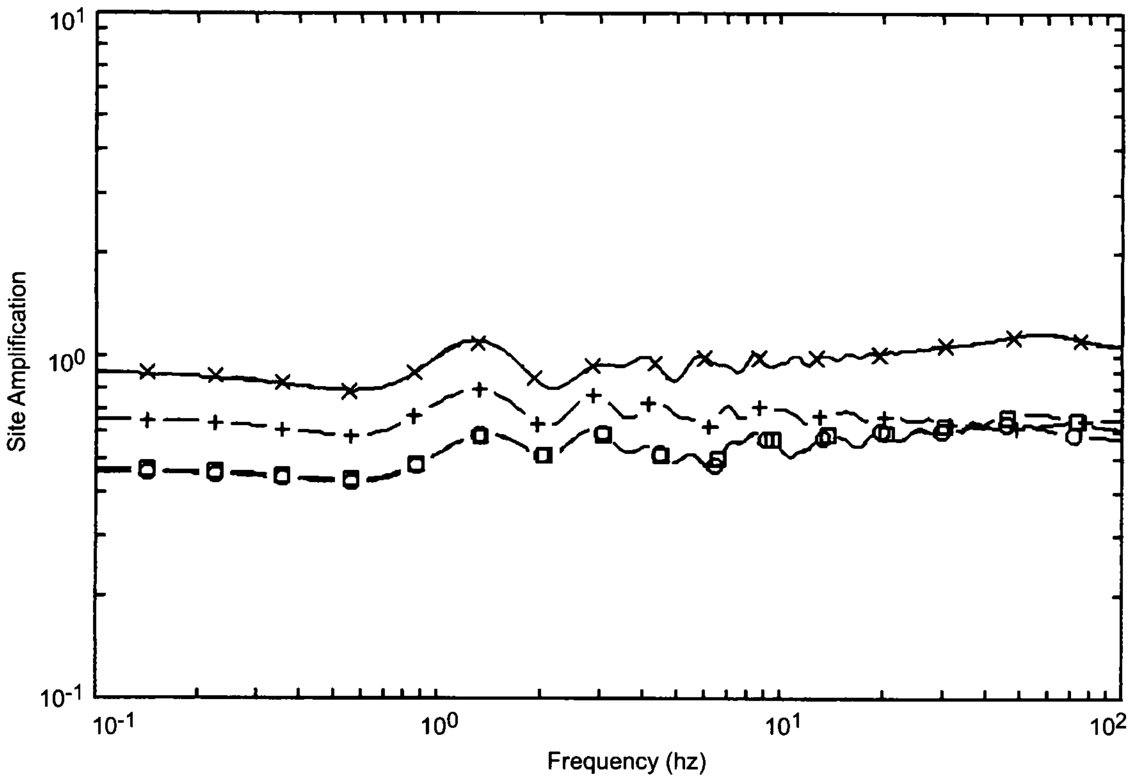
NUCLEAR STATION UNITS 1 & 2

Example of Median V/H Ratios Computed for M 5.1, Single-Corner Source Model, Unit 1 FIRS A1

FIGURE 2.5.2-240a

21. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-240b is added as follows:



V/H Ratios
Unit 1 FIRS A5

LEGEND

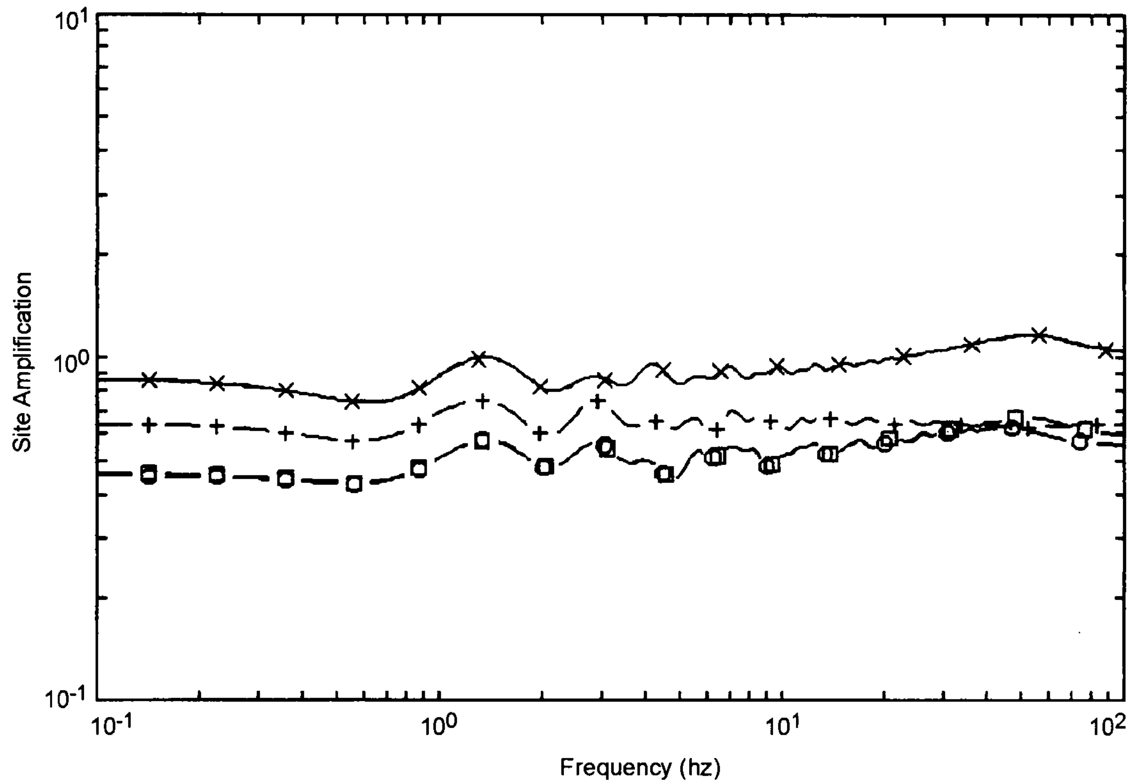
—o—	50th percentile, D = 80 km, 0.01 g (D = 50 MI, 0.01 g)
—□—	50th percentile, D = 16 km, 0.10 g (D = 10 MI, 0.10 g)
—+—	50th percentile, D = 7 km, 0.20 g (D = 4 MI, 0.20 g)
—x—	50th percentile, D = 0 km, 0.30 g (D = 0 MI, 0.30 g)
——	50th percentile, D = 0 km, 0.50 g (D = 0 MI, 0.50 g)

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Example of Median V/H Ratios Computed for **M** 5.1, Single-Corner Source Model, Unit 1 FIRS A5

FIGURE 2.5.2-240b

22. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-240c is added as follows:



V/H Ratios
Unit 2 FIRS C4

LEGEND

—O—	50th percentile, D = 80 km, 0.01 g (D = 50 MI, 0.01 g)
—□—	50th percentile, D = 16 km, 0.10 g (D = 10 MI, 0.10 g)
—+—	50th percentile, D = 7 km, 0.20 g (D = 4 MI, 0.20 g)
—X—	50th percentile, D = 0 km, 0.30 g (D = 0 MI, 0.30 g)
——	50th percentile, D = 0 km, 0.50 g (D = 0 MI, 0.50 g)

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Example of Median V/H Ratios Computed for M 5.1, Single-Corner Source Model, Unit 2 FIRS C4

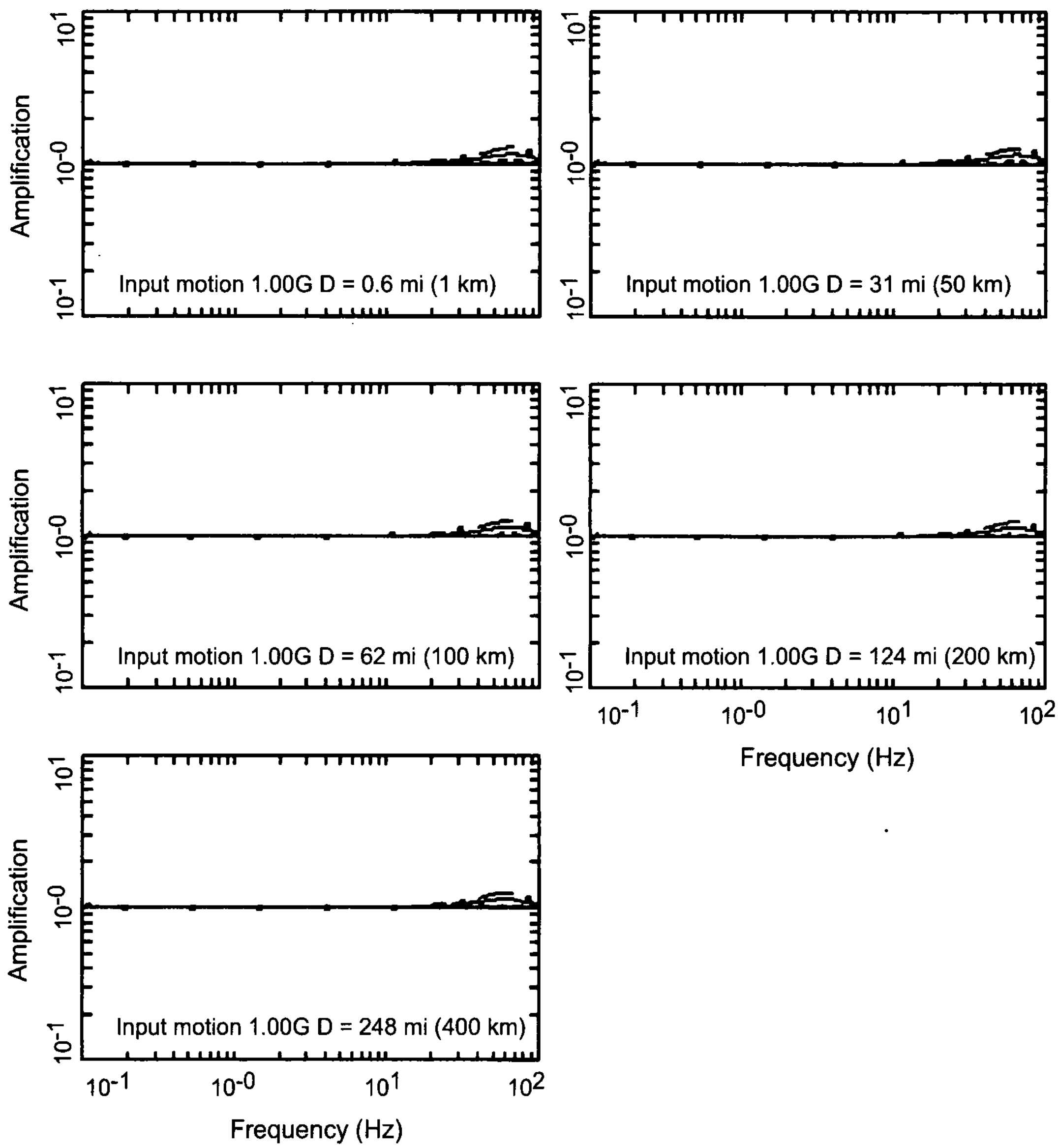
FIGURE 2.5.2-240c

23. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-241 is deleted and presented as Figure 2.5.2-241a, Figure 2.5.2-241b, and Figure 2.5.2-241c as follows:

Figure 2.5.2-241

Deleted

24. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-241a is added as follows:



AMPLIFICATION (H), UNIT 1 FIRS A1

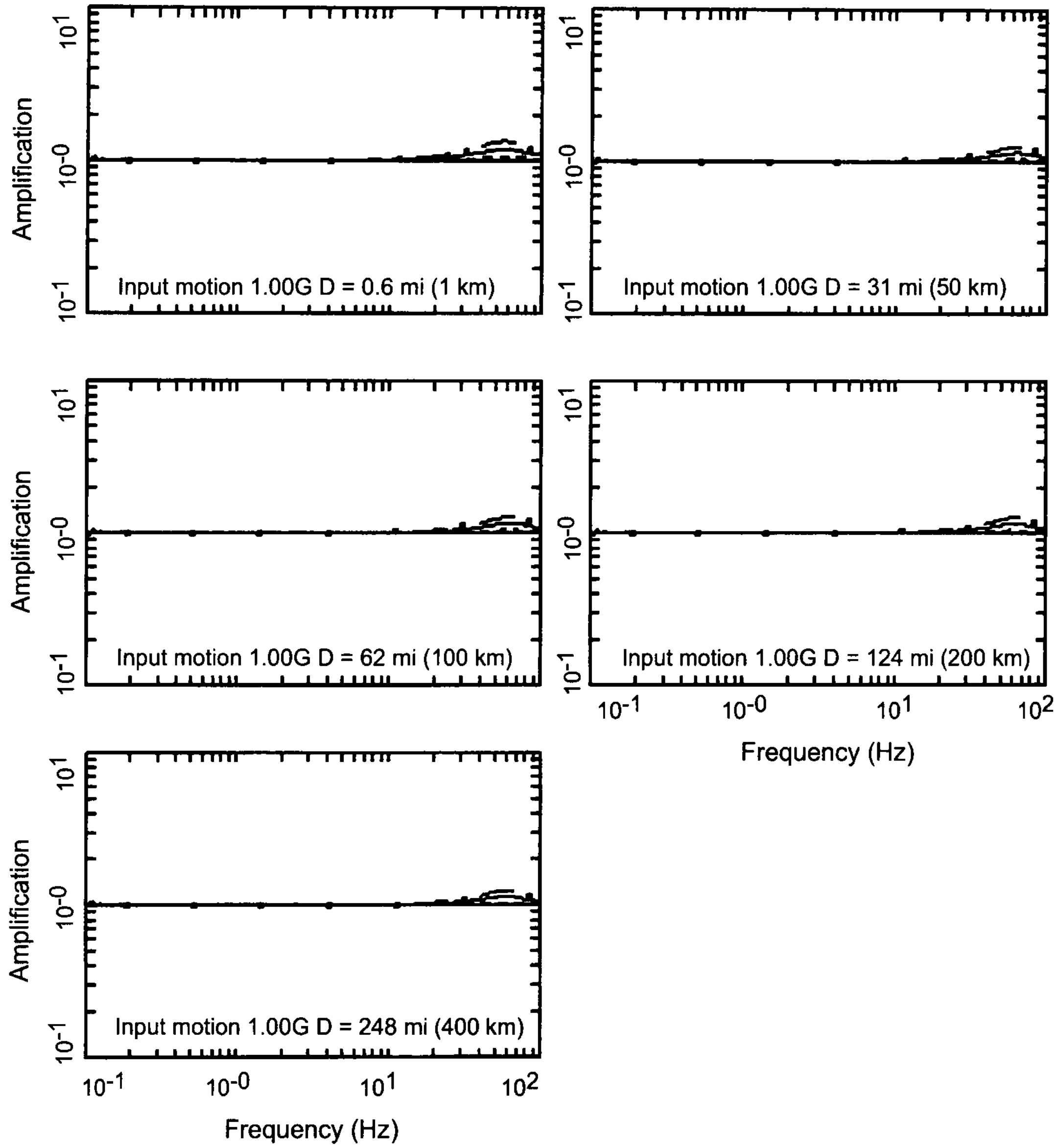
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Amplification Factors for **M** 5.1, Single-Corner Source Model, Unit 1 FIRS A1 Computed Using Spectral Shapes as Control Motions

FIGURE 2.5.2-241a

25. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-241b is added as follows:



AMPLIFICATION (H), UNIT 1 FIRS A5

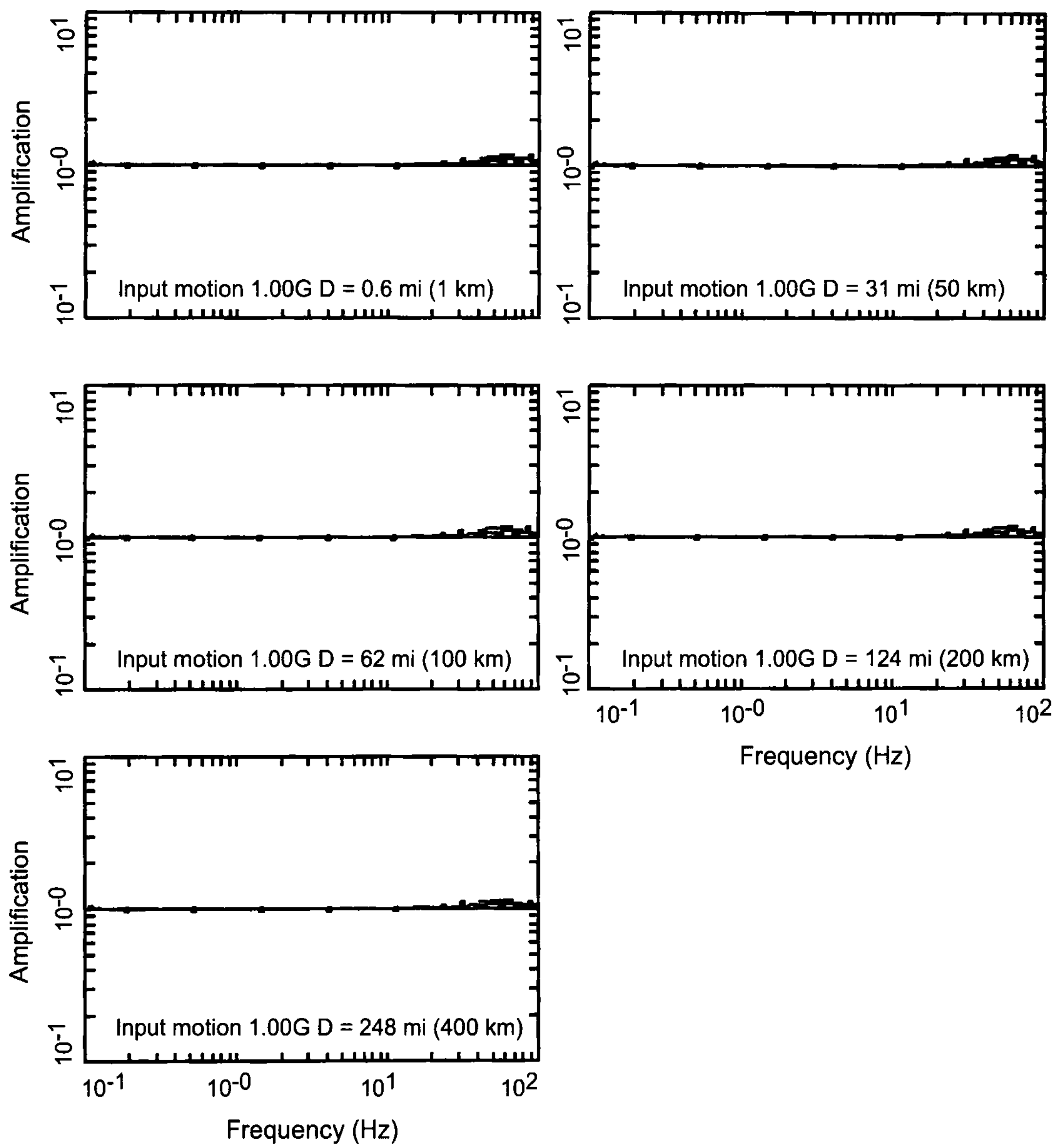
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Amplification Factors for **M** 5.1, Single-Corner Source Model, Unit 1 FIRS A5 Computed Using Spectral Shapes as Control Motions

FIGURE 2.5.2-241b

26. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-241c is added as follows:



AMPLIFICATION (H), UNIT 2 FIRS C4

WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Amplification Factors for **M** 5.1, Single-Corner Source Model, Unit 2 FIRS C4 Computed Using Spectral Shapes as Control Motions

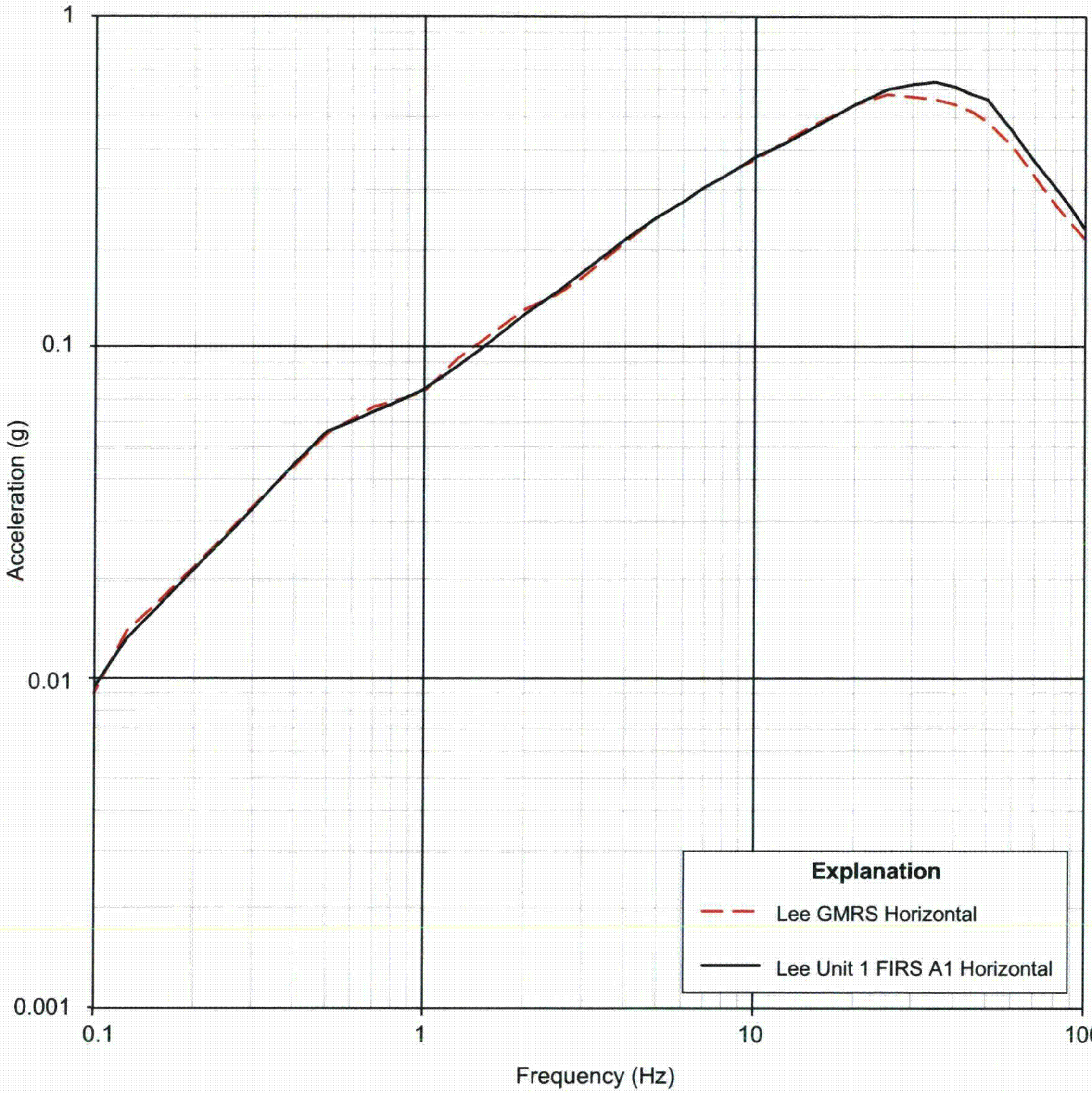
FIGURE 2.5.2-241c

27. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-244 is deleted and presented as Figure 2.5.2-244a, Figure 2.5.2-244b, and Figure 2.5.2-244c as follows:

Figure 2.5.2-244

Deleted

28. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-244a is added as follows:



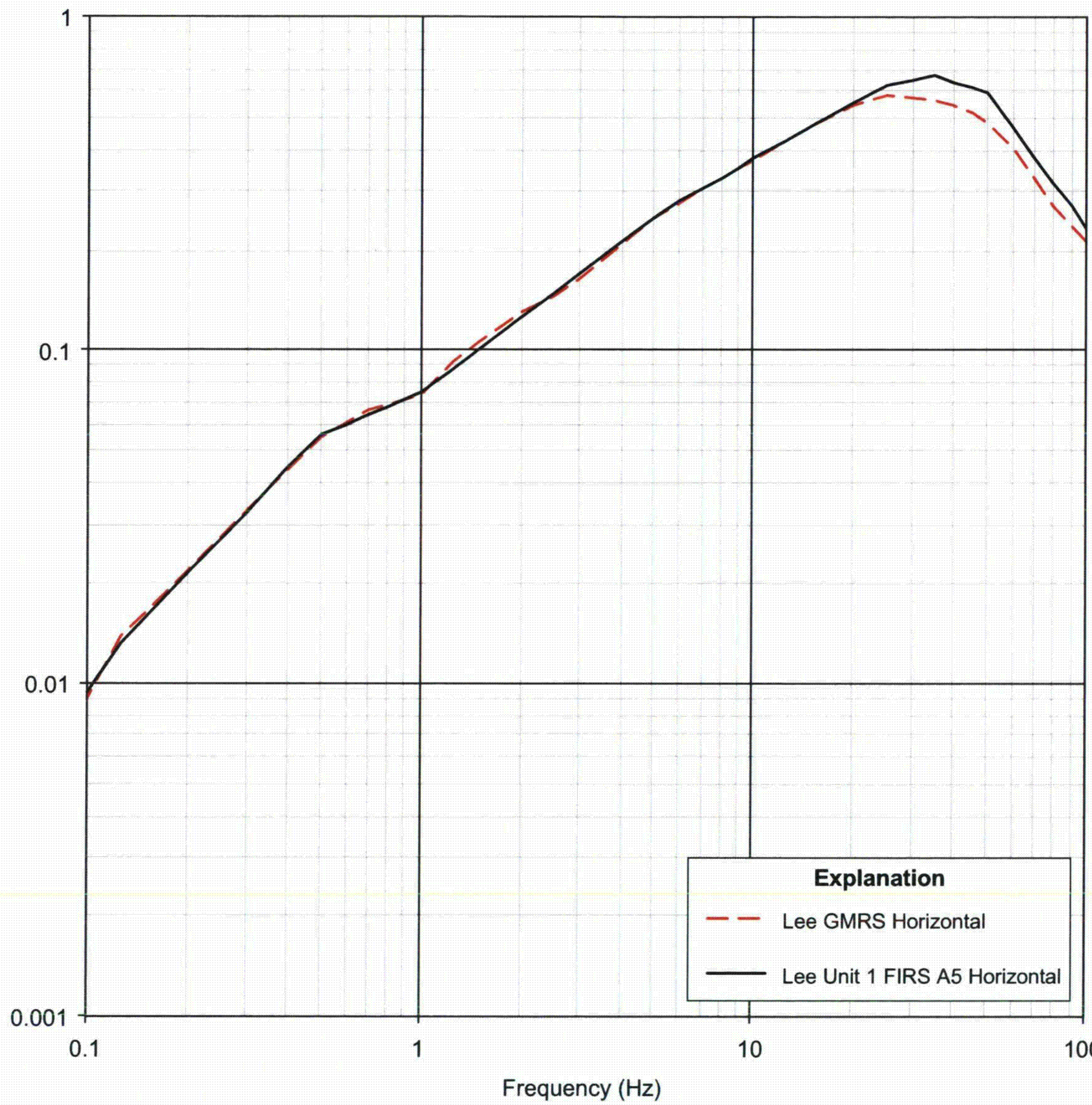
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Horizontal Component Unit 1
FIRS A1 Compared to the GMRS

FIGURE 2.5.2-244a

29. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-244b is added as follows:



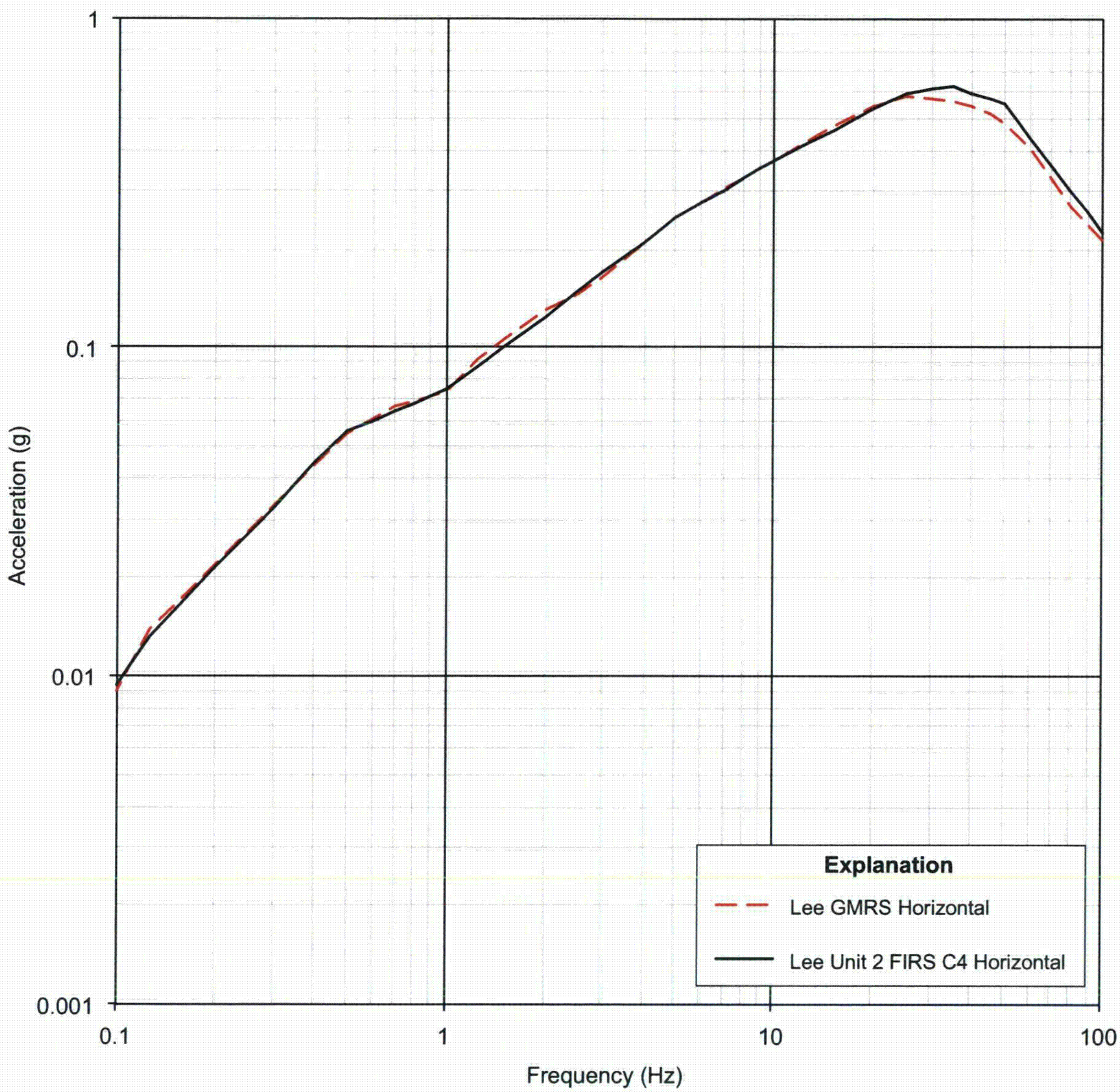
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Horizontal Component Unit 1
FIRS A5 Compared to the GMRS

FIGURE 2.5.2-244b

30. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-244c is added as follows:



WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Horizontal Component Unit 2
FIRS C4 Compared to the GMRS

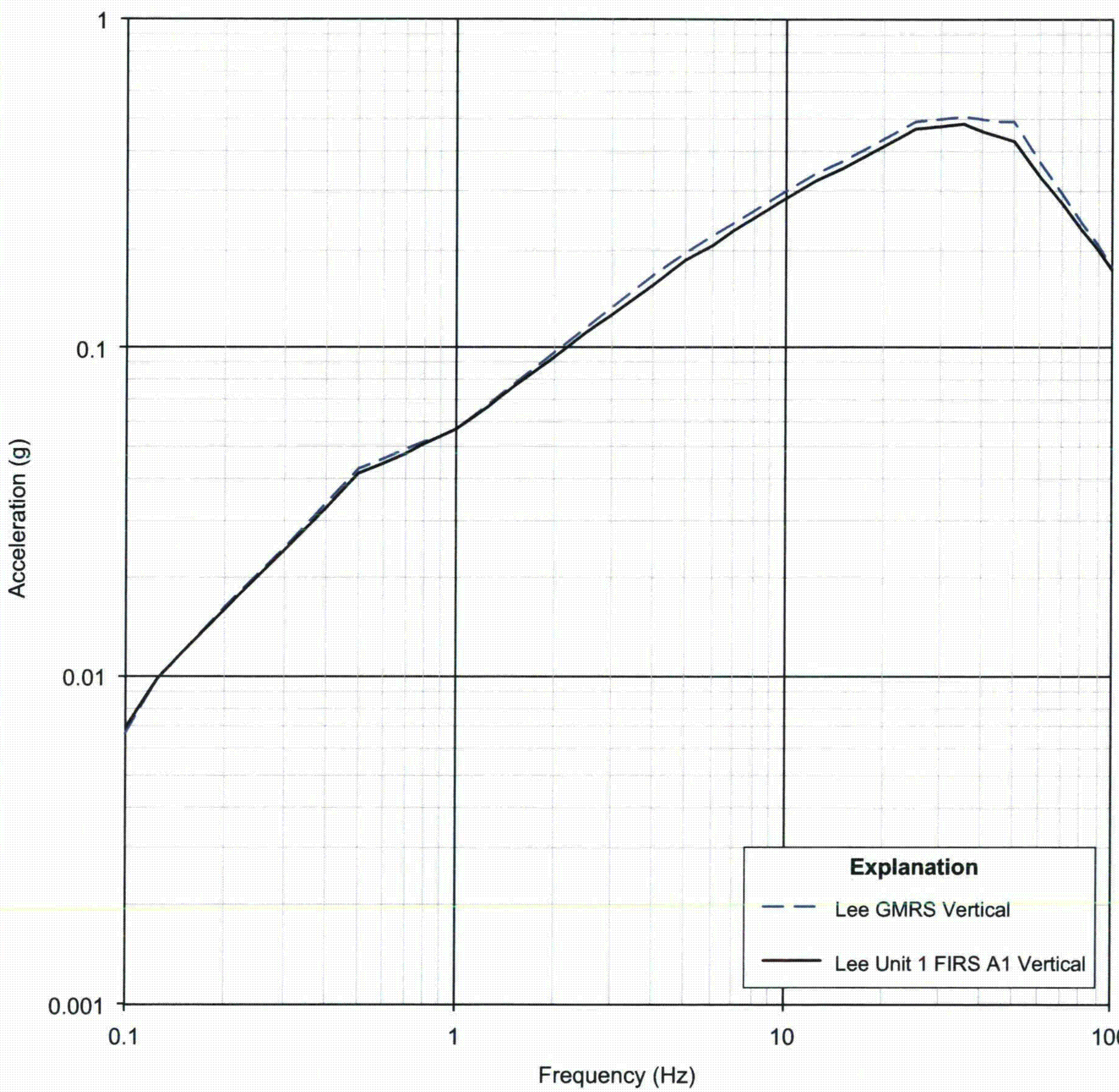
FIGURE 2.5.2-244c

31. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-245 is deleted and presented as Figure 2.5.2-245a, Figure 2.5.2-245b, and Figure 2.5.2-245c as follows:

Figure 2.5.2-245

Deleted

32. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-245a is added as follows:



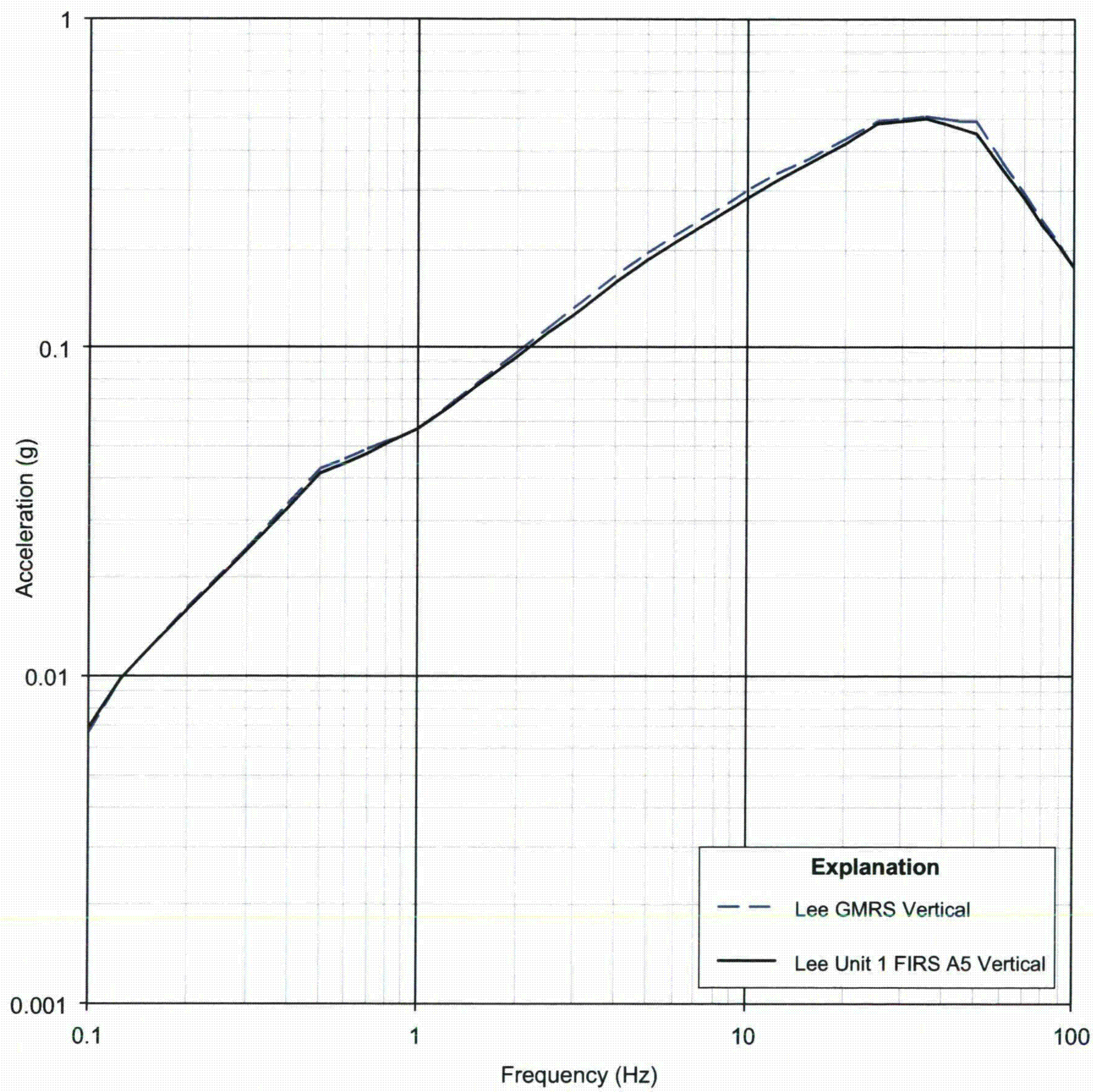
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Vertical Component Unit 1
FIRS A1 Compared to the GMRS

FIGURE 2.5.2-245a

33. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-245b is added as follows:



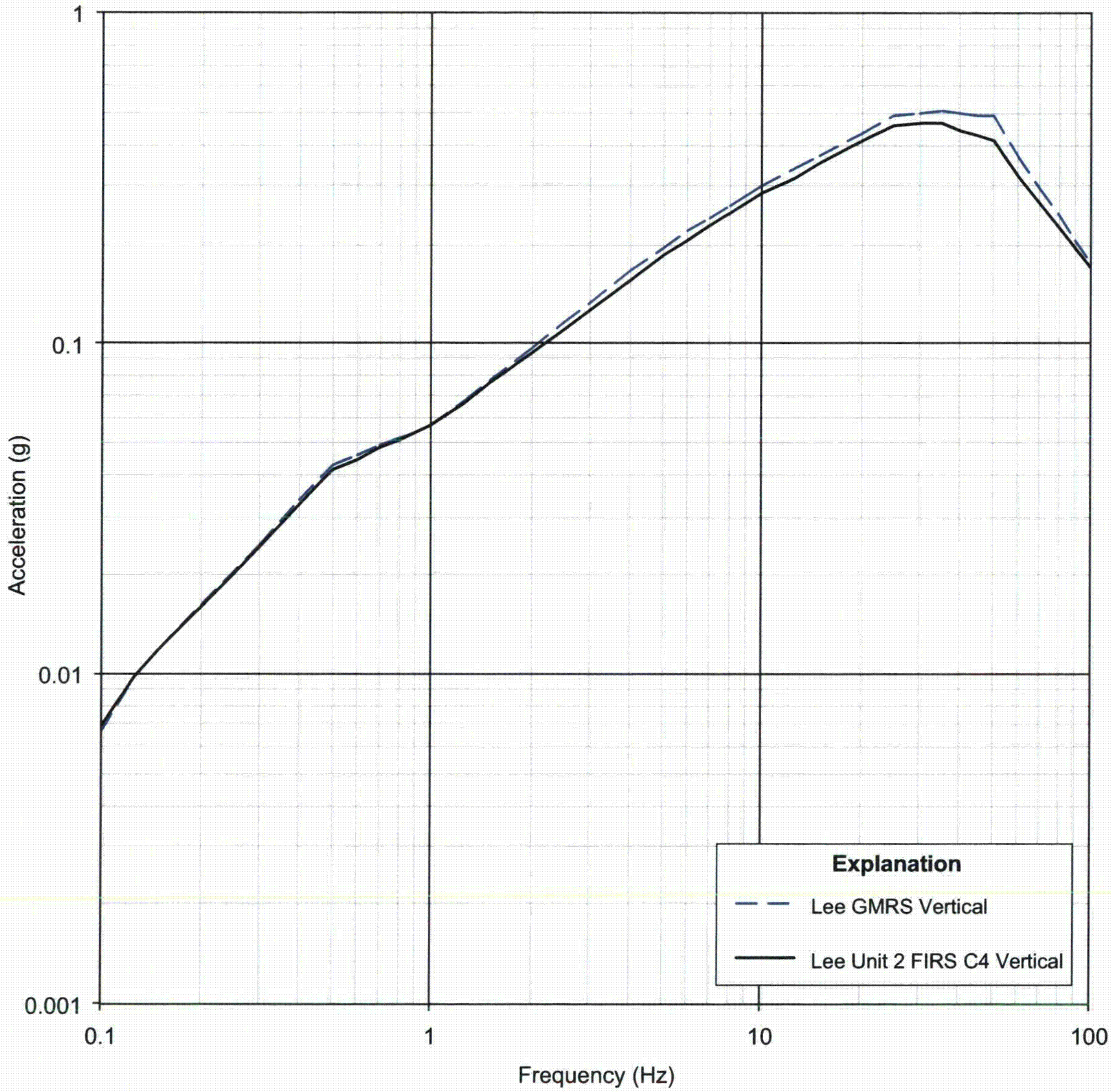
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Vertical Component Unit 1
FIRS A5 Compared to the GMRS

FIGURE 2.5.2-245b

34. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-245c is added as follows:



WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Vertical Component Unit 2
FIRS C4 Compared to the GMRS

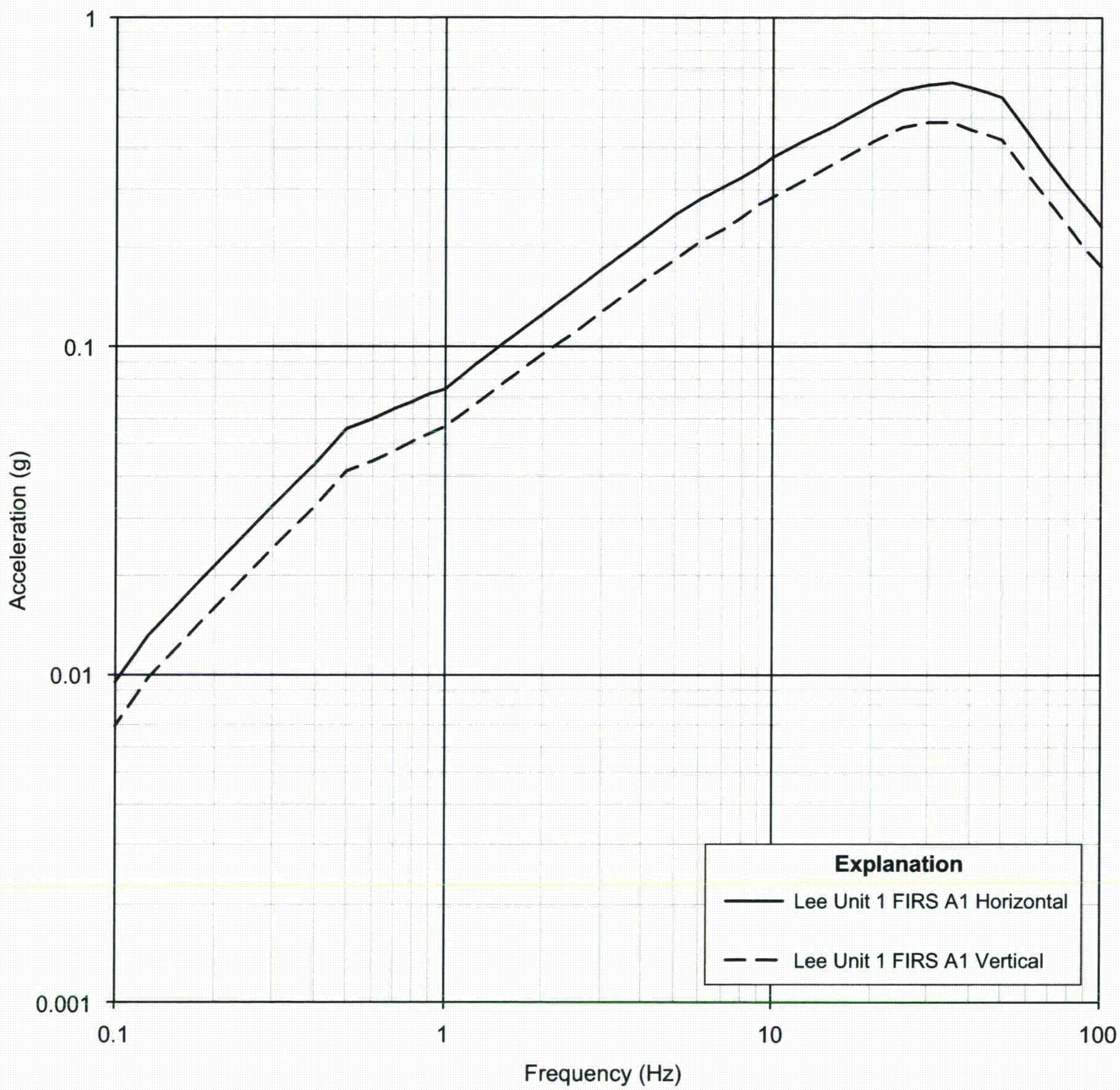
FIGURE 2.5.2-245c

35. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-246 is deleted and presented as Figure 2.5.2-246a, Figure 2.5.2-246b, and Figure 2.5.2-246c as follows:

Figure 2.5.2-246

Deleted

36. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-246a is added as follows:



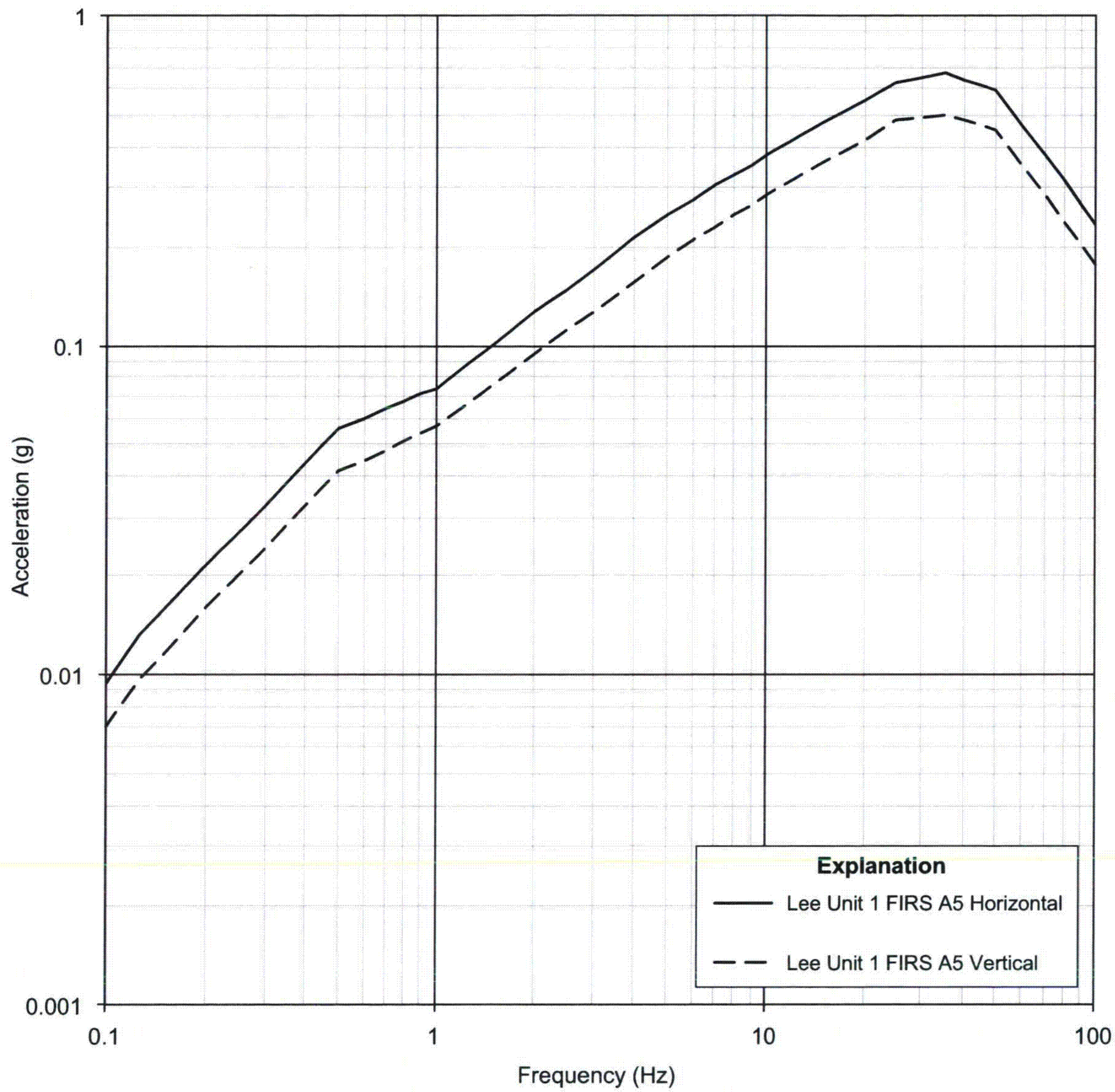
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Comparison of Horizontal and Vertical FIRS A1

FIGURE 2.5.2-246a

37. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-246b is added as follows:



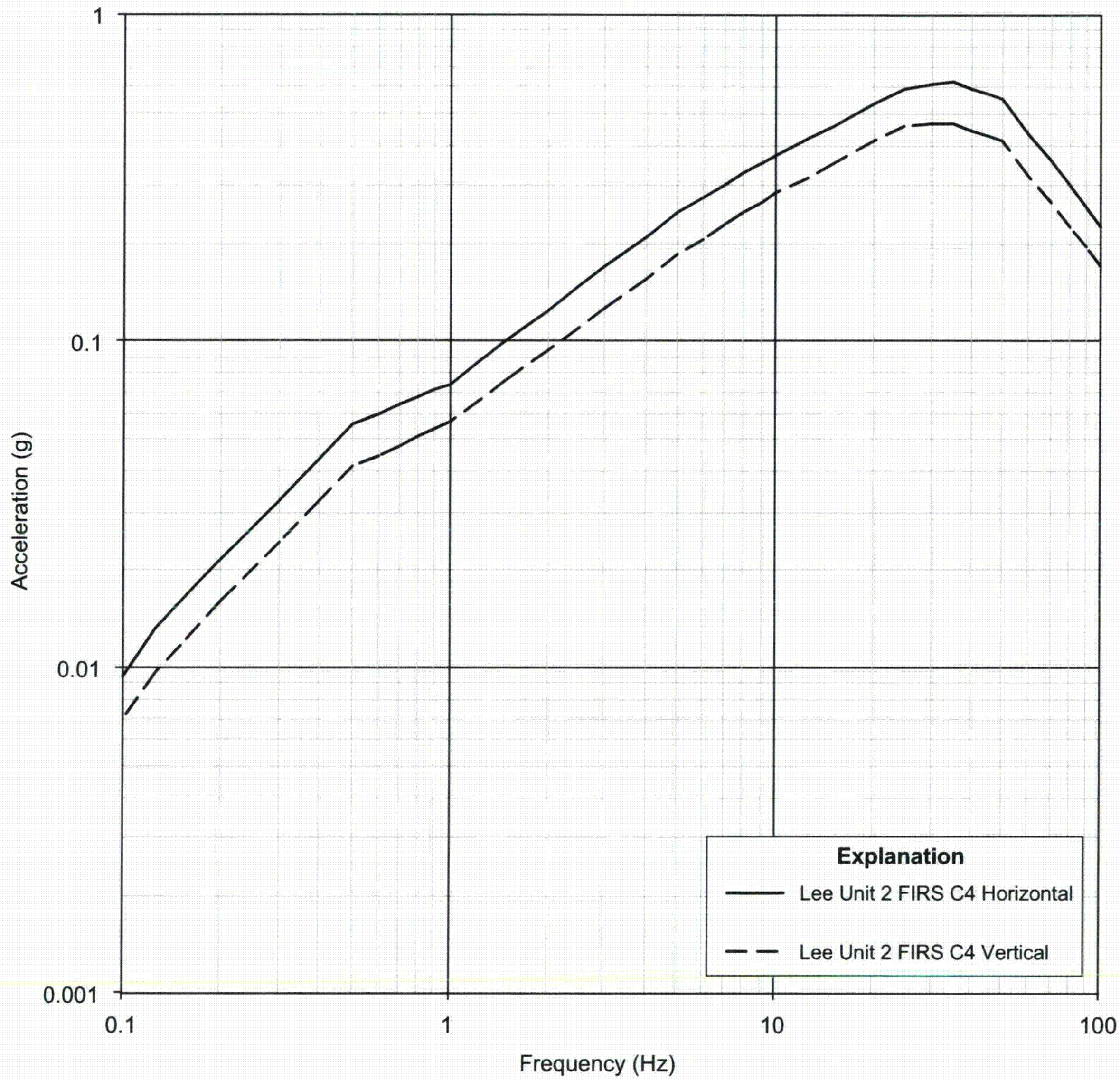
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Comparison of Horizontal and Vertical FIRS Computed for Profile A5

FIGURE 2.5.2-246b

38. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-246c is added as follows:



WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Comparison of Horizontal and Vertical
FIRS Computed for Profile C4

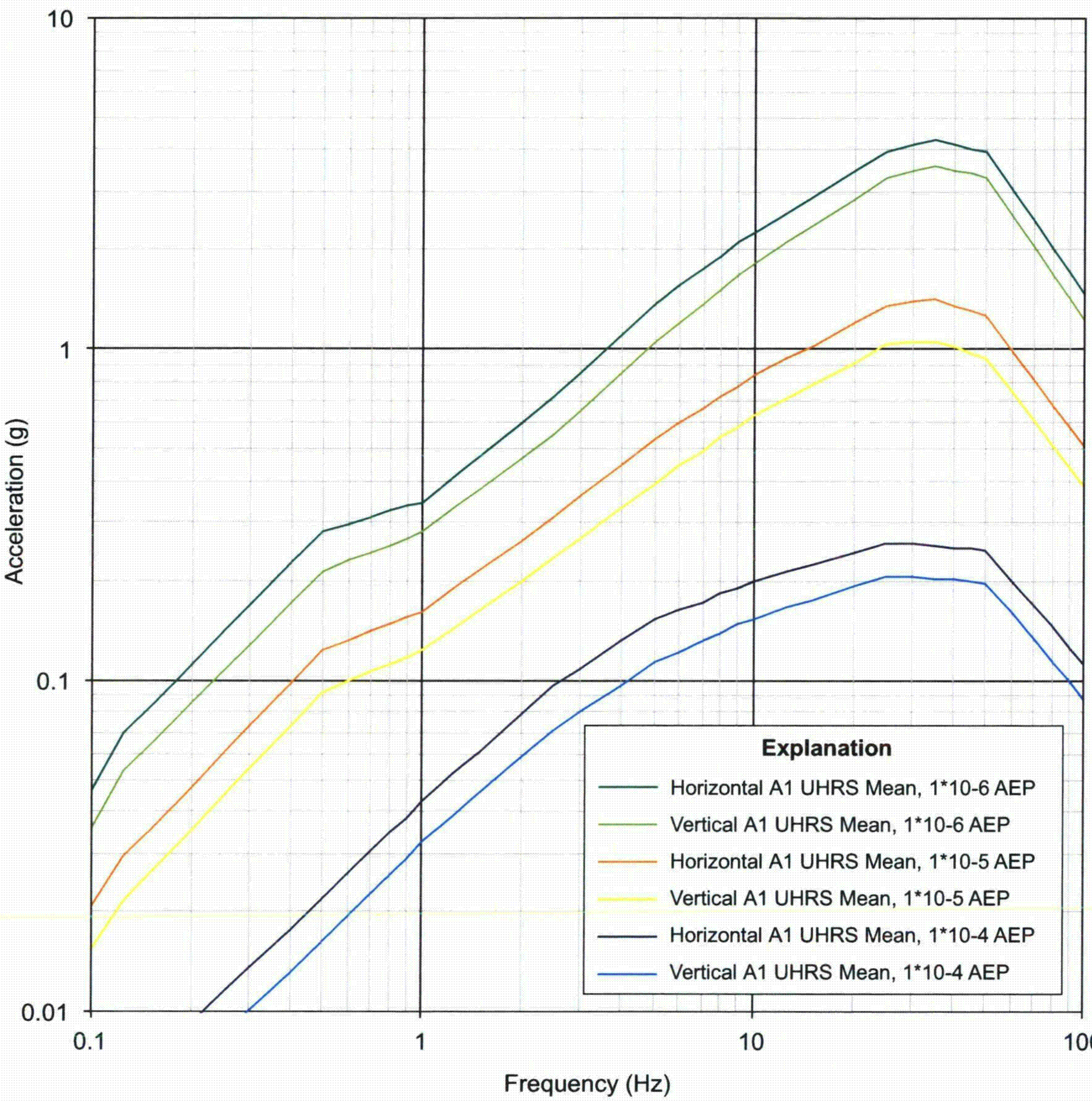
FIGURE 2.5.2-246c

39. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-247 is deleted and presented as Figure 2.5.2-247a, Figure 2.5.2-247b, and Figure 2.5.2-247c as follows:

Figure 2.5.2-247

Deleted

40. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-247a is added as follows:



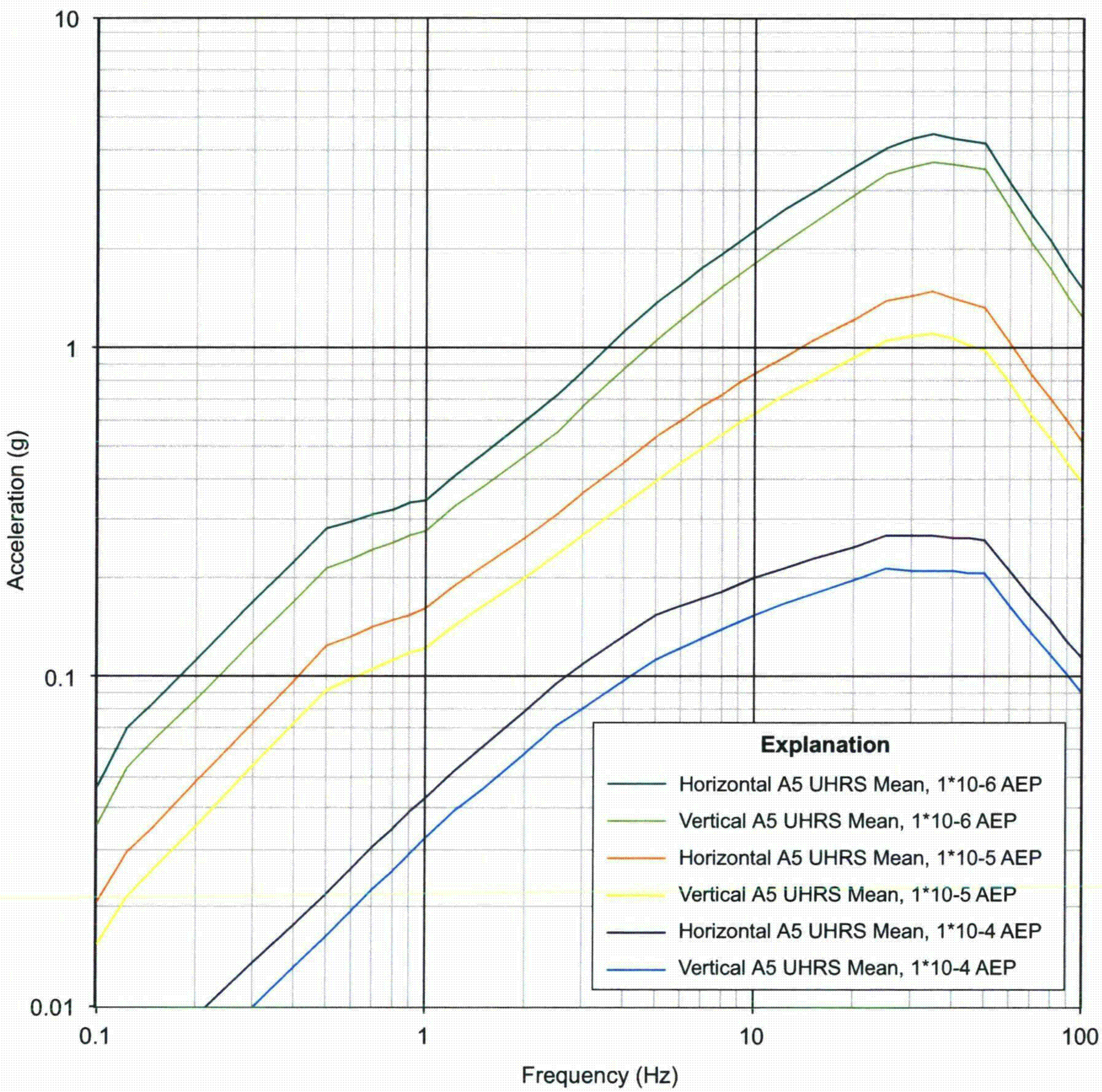
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Unit 1 FIRS A1 Horizontal and Vertical Component UHRS at Annual Exceedence Probabilities 10^{-4}, 10^{-5}, and 10^{-6} yr^{-1}

FIGURE 2.5.2-247a

41. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-247b is added as follows:



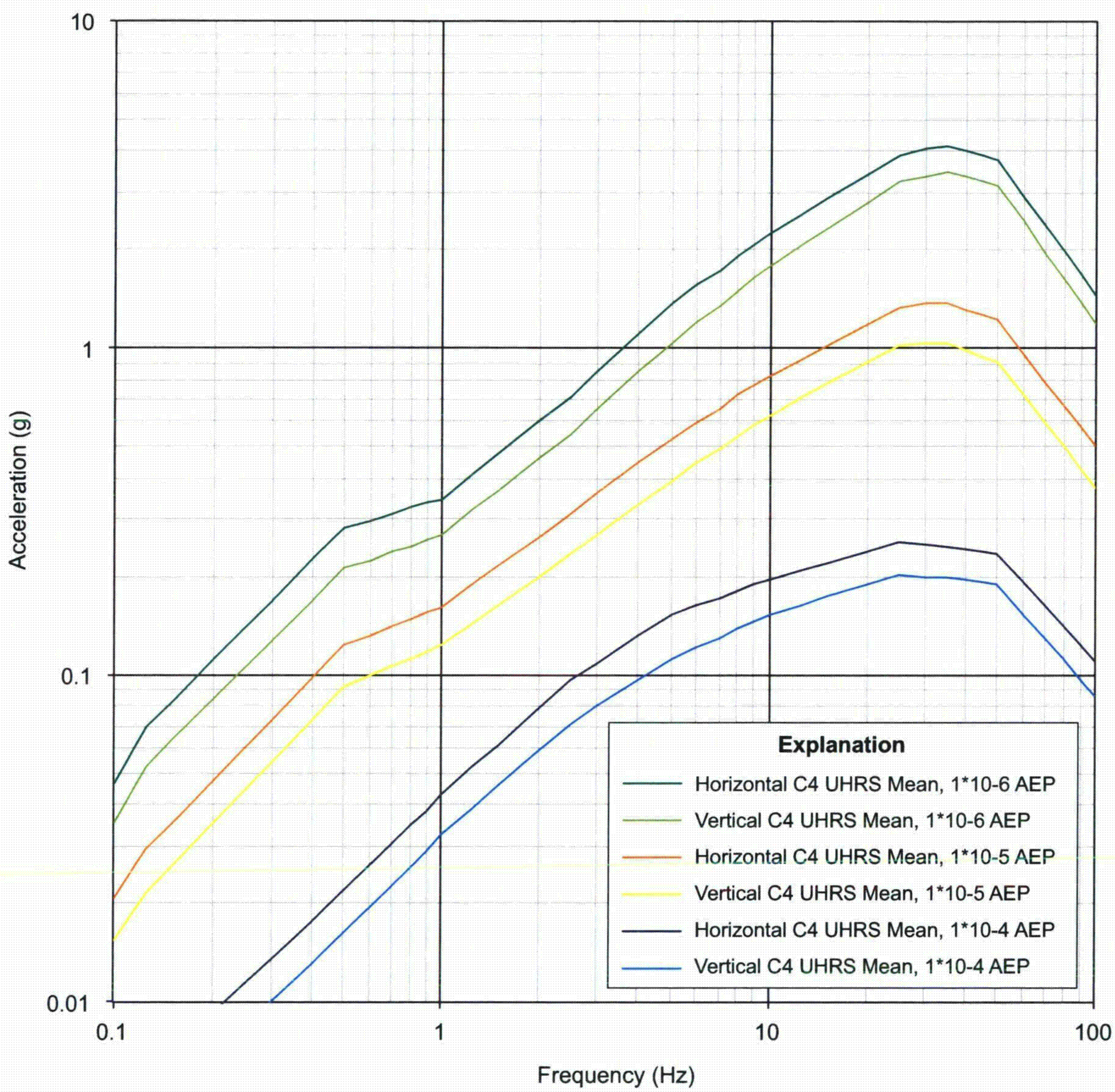
WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Unit 1 FIRS A5 Horizontal and Vertical Component UHRS at Annual Exceedence Probabilities 10^{-4}, 10^{-5}, and 10^{-6} yr^{-1}

FIGURE 2.5.2-247b

42. COLA Part 2, FSAR Chapter 2, Figure 2.5.2-247c is added as follows:



WLS COL 2.5-2

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Unit 2 FIRS C4 Horizontal and Vertical Component UHRS at Annual Exceedence Probabilities 10^{-4}, 10^{-5}, and 10^{-6} yr^{-1}

FIGURE 2.5.2-247c