NRC RAI Letter No. PTN-RAI-LTR-061 Dated May 17, 2012

SRP Section: 03.07.01 – Seismic Design Parameters

Questions from Structural Engineering Branch 1

NRC RAI Number: 03.07.01-14 (eRAI 6432)

In Revision 3 of the applicant's FSAR, (aka. TPG-1000-S2R-802, "Turkey Point Site-Specific Seismic Evaluation Report") Figure 3.1-2 shows the lean concrete bridging mat extending approximately 30 ft beyond the reinforced concrete base mat of the NI. The staff believes that including the unreinforced bridging mat in the SSI analysis as a continuous 'structure' can result in an increase in the translational impedance of the SSI system of roughly 50% as well as a large increase in the rocking impedance. If in fact the material is 'non-structural' and cracks at the face of the NI, the resulting stiffness (and frequency) of the NI/soil system may be significantly overstated by the modeling approach used.

The Staff requests that the applicant demonstrate that the stresses are sufficiently low in the supporting mat to preclude cracking of the mat or provide an assessment of the affect of potential cracking of the mat on the SSI responses computed for the NI structures.

INTRODUCTION:

The context of the existing response to this RAI has not changed as a result of the site response and soil-structure interaction (SSI) sensitivity analyses that were performed. Therefore, the conclusions of the site-specific SSI analysis (TPG-1000-S2R-802 Revision 5) performed for the Turkey Point Units 6 & 7 remain valid. However, in TPG-1000-S2R-802 Revision 6, Figure 3.1-2 has been updated to add a label depicting the grouted rock layer, and the Key Largo and Fort Thompson formations were relabeled to be less confusing. The updated Figure 3.1-2 is provided in this response.

FPL RESPONSE:

In Revision 5 of TPG-1000-S2R-802, "Turkey Point Site-Specific Seismic Evaluation Report") Figure 3.1-2, described below indicates the material beneath the Nuclear Island (NI) reinforced concrete foundation as lean concrete fill, which was inadvertently referred to as a 'bridging mat' in Revision 3 of the report. Consequently, the term 'bridging mat' was replaced throughout the text with 'lean concrete fill' in subsequent revisions of the report.

The lean concrete fill does extend approximately 30 ft beyond the reinforced concrete foundation of the NI. The lean concrete fill is unreinforced and was modeled as a continuous layer in the three-dimensional (3D) soil-structure interaction (SSI) analysis of the NI. However, as shown in Figure 4.3-1 of TPG-1000-S2R-802 Rev. 5 and presented below, the lateral extent of the lean concrete fill was modeled in two-dimensional (2D) parametric SSI analyses of the NI, and the 2D model/analysis included lateral boundary conditions beyond the extent of the lean concrete fill. Thus,

the limits of the lean concrete fill are modeled, the response evaluated, and potential impedance effects accounted for in the 2D parametric analysis, which compares the in-structure response spectra (ISRS) from the embedded portions of the 3D continuous and 2D expanded models/analysis.

The issue of the potential increase in the translational impedance of the SSI system and uncertainty or increase in the rocking impedance, as well as passing frequency and mesh-related filtering were accounted for in the development of the 2D-to-3D, frequency-dependent Bump Factors. In Revision 5 of the report, the Bump Factors ranged from 1.0 to 1.5 horizontally and 1.0 to 1.7 vertically at the six (6) key NI locations. Bump factors shown in Figures 6.1-1 and 6.1-2 of the Revision 5 report (and shown below) were applied to the 3D SSI ISRS for all three soil profiles including the best-estimate (BE), lower-bound (LB) and upper-bound (UB) cases. ISRS are further broadened by $\pm$ 15 percent and subsequently compared to the AP1000 CSDRS and HRHF envelopes at the six (6) key locations of the NI.

Further, any uncertainty associated with the stiffness (and frequency) of the NI/soil system and/or potential cracking of the lean concrete fill due to rocking of the NI was accounted for in the SSI analyses by utilizing a range of concrete shear wave velocity (Vs) properties from the LB Vs=4506 feet per second (fps) to an UB Vs=6759 fps. The approximate $\pm$ 20 percent range in concrete Vs properties accounts for potential degradation due to cracking around the BE concrete Vs of 5519 fps. Additionally, the BE, LB and UB ISRS were factored by the 2D-to-3D frequency-dependent Bump Factors, and all cases were conservatively broadened by $\pm$ 15 percent as described above for comparison to the CSDRS and HRHF envelopes.

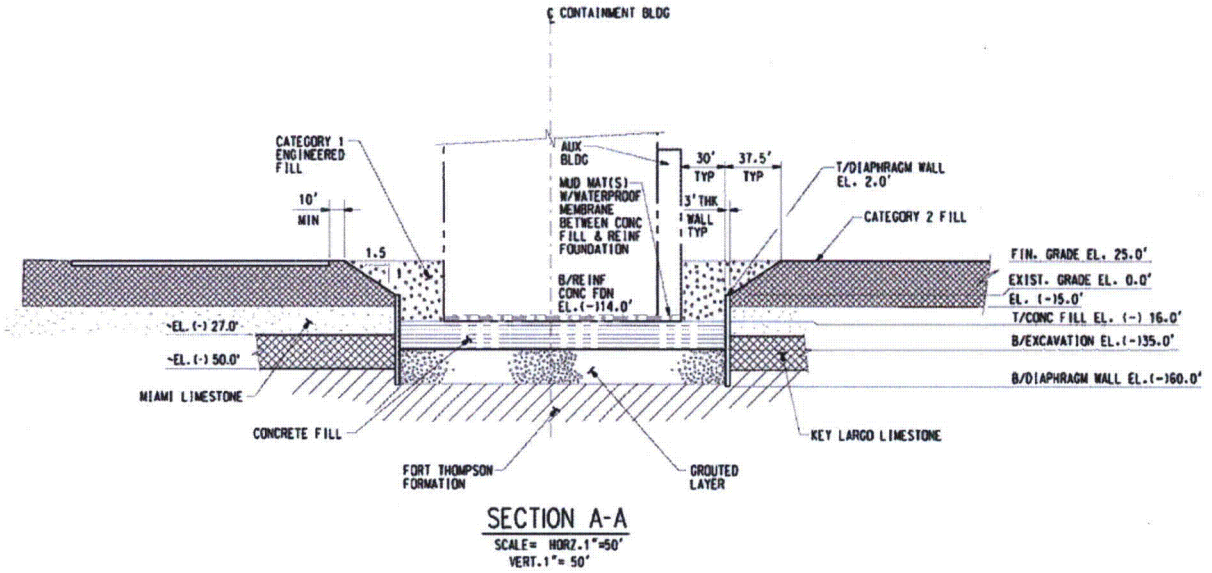

Figure 3.1-2

Turkey Point Unit 7 Excavation Cross-Section

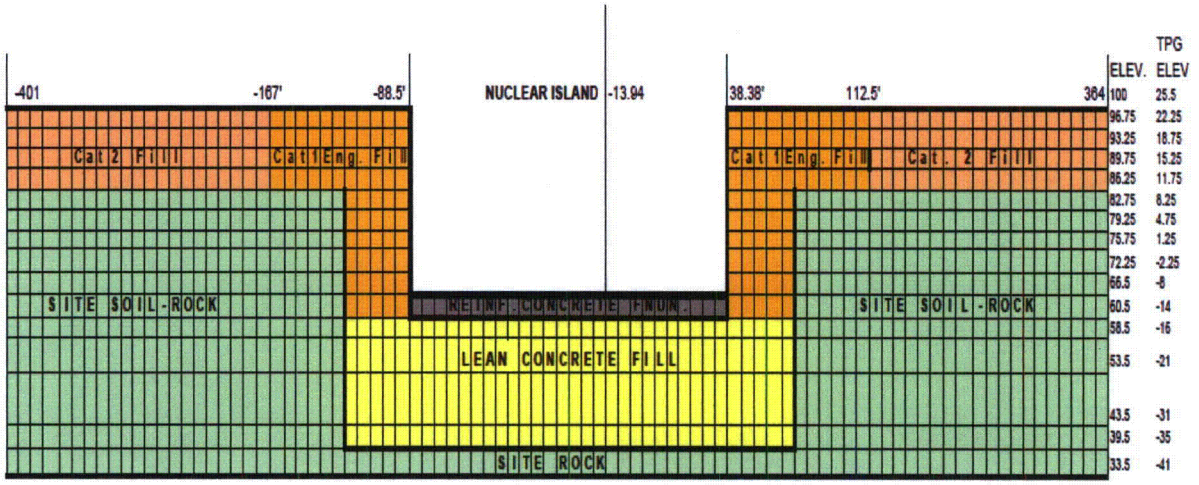

Figure 4.3-1

Turkey Point 2D Fine SASSI Model (not to scale)

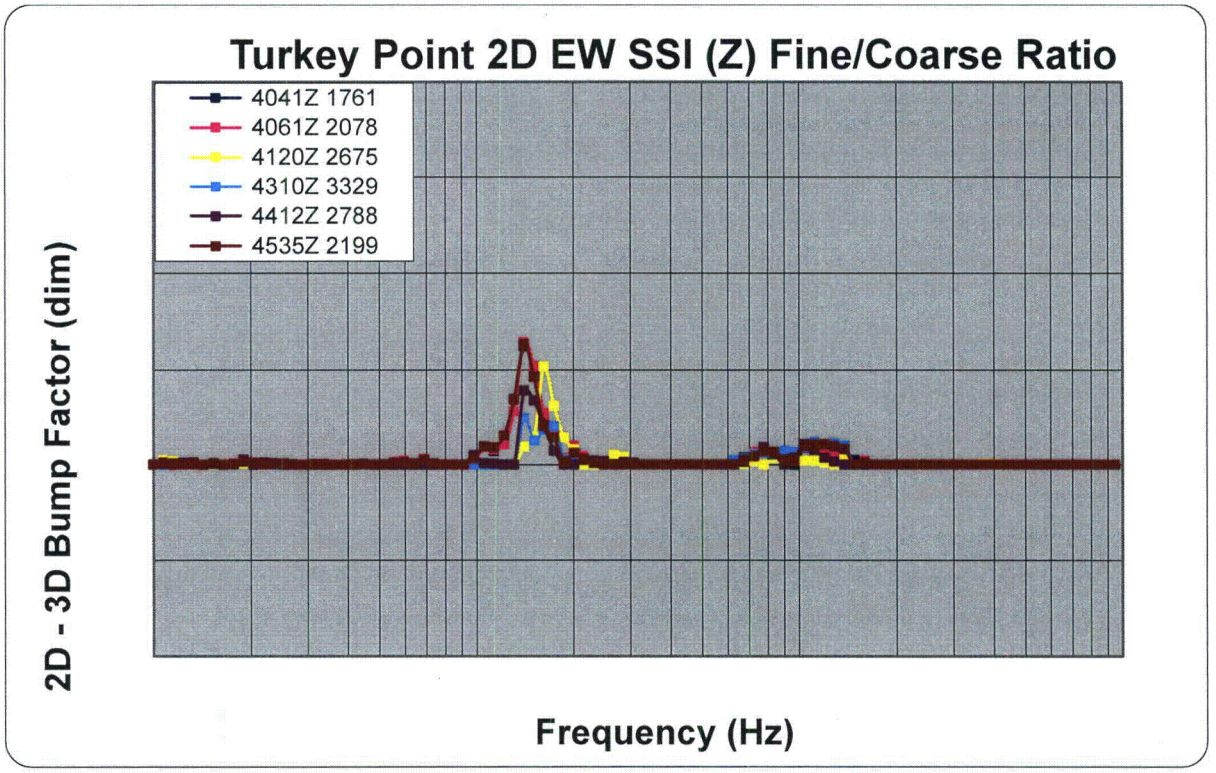

Figure 6.1-2

TPNP 2D-3D Vertical Bump Factors – All Nodes

This response is PLANT SPECIFIC.

References:

1. Westinghouse Report No. TPG-1000-S2R-802, Rev.6, "Turkey Point Site Specific Seismic Evaluation Report," dated March 2015.
2. Westinghouse Report No. TPG-1000-S2R-807, Rev.3, "Turkey Point Site Specific Seismic Evaluation Report," dated March 2015

ASSOCIATED COLA REVISIONS:

No additional changes to COLA Revision 6 have been identified as a result of this revised RAI response.

ASSOCIATED ENCLOSURES:

None

NRC RAI Letter No. PTN-RAI-LTR-061 Dated May 17, 2012

SRP Section: 03.07.01 – Seismic Design Parameters

Questions from Structural Engineering Branch 1

NRC RAI Number: 03.07.01-15 (eRAI 6432)

In Revision 3 of the applicant's FSAR, (aka. TPG-1000-S2R-802, "Turkey Point Site-Specific Seismic Evaluation Report") Figures 2.1-3 through 8 show the response spectra at the foundation level. These spectra have zpa values that are less than the 0.1g at the foundation depth that is required by Appendix S to 10 CFR Part 50. (Note that this issue was previously identified in a question on Figure 2.5.2-252 regarding the input motion at Elevation -35). The response spectra shown in those figures form the basis of the input motions that are used to compute the in-structure response spectra (ISRS) from the SSI analyses. Meeting the Appendix S requirements would appear to require adjusting the input motions upward which would result in margins, as compared to the DCD ISRS at the six key locations, to reduce significantly from those indicated in the tables mentioned above. Additionally, it is noted in the AP1000 DCD that the CSDRS is at finished grade. Since the input motion at the foundation level is less than the minimum required by Appendix S, the surface spectra shown in Appendix 3JJ, which neglect any adjustment required to satisfy Appendix S, appear to be understated. Thus, the applicant is requested to provide a discussion as to how the results provided in Appendix 3JJ and Figures 2.1-3 through 8 meet the Appendix S to 10 CFR Part 50 requirements for minimum seismic input at the foundation level.

FPL RESPONSE:

This response is a revision and update to information previously submitted to the NRC in FPL letter L 2013-071, "Response to NRC Request for Additional Information Letter No. 62 (eRAI 6432) Related to SRP Section 03.07.01 – Seismic Design Parameters," dated March 7, 2013. Subsequent to that submittal, supplemental subsurface investigations were conducted at the Turkey Point Units 6 & 7 site that resulted in changes to the geotechnical site characterization. Sensitivity studies have been conducted to assess if the data from the supplemental subsurface investigations resulted in any changes to the site response analysis, strain compatible properties and site-specific soil structure interaction (SSI) analyses performed for Turkey Point Units 6 & 7.

This submittal provides an update to the initial response to RAI 03.07.01-15, which remains essentially unchanged with the exception of reference to an updated revision of the Turkey Point Site-Specific Seismic Evaluation Report as shown with revision bars for the affected text in Part A of this revised response. The updated portion of this response in Parts B through D (shown without revisions bars) provide additional information on the seismic site response and subsequent sensitivity evaluations conducted as indicated below:

Part A: Revised Response to RAI 03.07.01-15

Part B: Evaluation of Effect of Grouted Rock on Seismic Site Response

Part C: Sensitivity Assessment of Updated Site Characterization on Site Response and Strain Compatible Properties

Part D: Sensitivity Evaluation of Updated Site Characterization on SSI Analyses

Part A: Revised Response to RAI 03.07.01-15

In Revision 6 of TPG-1000-S2R-802, "Turkey Point Site-Specific Seismic Evaluation Report", Section 2.1 presents a summary of the Turkey Point Units 6 & 7 free-field site response analyses, which updates the information from the Revision 3 report and presents detailed descriptions of how the Appendix S to 10 CFR Part 50 requirements for minimum seismic input at the foundation level are met.

The updated free-field site response analyses results, acceleration response spectra, soil-structure interaction (SSI) input time histories, and strain compatible soil properties were drawn from changes to FSAR Subsection 3.7.1 and Appendix 3JJ. ~~These changes are shown in the Associated COLA Revisions section of this response.~~

To satisfy the requirements of Appendix S to 10 CFR Part 50, specifically that the Safe Shutdown Earthquake (SSE) motion must be an adequate acceleration response spectra (ARS) with a minimum peak ground acceleration (PGA) of 0.1g, the Turkey Point Units 6 & 7 site-specific design response spectra (DRS) at the foundation level (El. -16 ft) consists of the envelope of the Turkey Point site-specific foundation input response spectra (FIRS) and the RG 1.60 spectra scaled to 0.1g. The resulting outcrop horizontal and vertical envelope FIRS is considered the SSE motion for the Units 6 & 7 site meeting the minimum 0.1g PGA. The horizontal and vertical Turkey Point site-specific FIRS and RG 1.60 spectra envelopes scaled to 0.1g are presented in Figure 2.1-2.

Two horizontal (H1 and H2) and one vertical (UP) acceleration time histories are spectrally matched to the SSE motion. The SSI analysis of the Nuclear Island (NI) uses a set of SSE acceleration time histories that are input as "within," i.e., in-column motion at the elevation of the Turkey Point foundation (El. -16 ft) located 41.5-foot depth. To obtain these "within" time histories, each of the strain compatible BE, LB and UB soil profiles is analyzed by inputting the time histories consistent with the 41.5-foot depth, minimum 0.1g SSE spectra as an "outcrop" motion at this foundation depth. Horizontal and vertical ARS at the design grade elevation were developed following the Interim Staff Guidance DC/COL-ISG-017 to check that the response due to the site-specific FIRS envelope the surface ARS using the best estimate (BE), lower bound (LB) and upper bound (UB) soil properties.

The horizontal and vertical BE, LB and UB "within" ARS at the Turkey Point foundation El. -16 ft are shown in TPG-1000-S2R-802 Rev. 6, Figures 2.1-3 through 2.1-5 for the NI (near) site conditions, and Figures 2.1-6 through 2.1-8 for the FAR site conditions. Figures 2.1-9 through 2.1-14 also present the comparison of the computed surface motions to the respective DRS for each directional component (H1, H2, V), each soil case (BE, LB and UB) and each site condition (NI and FAR) using the site-specific FIRS.

As indicated, the SSE time histories were input into the three (BE, LB and UB) soil columns as outcropping motions at El. -16 ft, and then output as in-column motions at El. -16 ft for use in the SSI analysis. These in-column time histories at El.-16 ft are presented in Figures 3.5-1 through 3.5-3 of the Revision 6 report for the NI site conditions and in Figures 3.5-4 through 3.5-6 for the FAR site conditions.

Time history seismic analyses for the Turkey Point 3D Design-Basis model and the Units 6 & 7 BE, LB and UB cases were performed in two horizontal and one vertical direction. The revised Turkey Point input time histories at the top of lean concrete fill (El. 16 ft) based on the minimum 0.1g PGA outcrop SSE spectra were used in SASSI with the SASSI Direct method of

analysis. In-structure floor response spectra (FRS) for 5 percent damping were obtained at the six key NI locations.

Figures 6.2-1 through 6.2-18 present the broadened horizontal and vertical Turkey Point Units 6 & 7 Factored 3D Design-Basis FRS, which includes the BE, LB and UB FRS and Turkey Point FRS envelope compared to the 3D AP1000 certified seismic design response spectra (CSDRS) and hard rock high frequency (HRHF) floor response spectra (FRS) envelopes at the six (6) key NI locations. The HRHF FRS envelope is presented to demonstrate that additional margin exists at the key nodes in the high frequency range (20-50 Hz). As shown, the Turkey Point site specific FRS are enveloped by the AP1000 CSDRS and HRHF FRS envelopes at each of the six key NI locations.

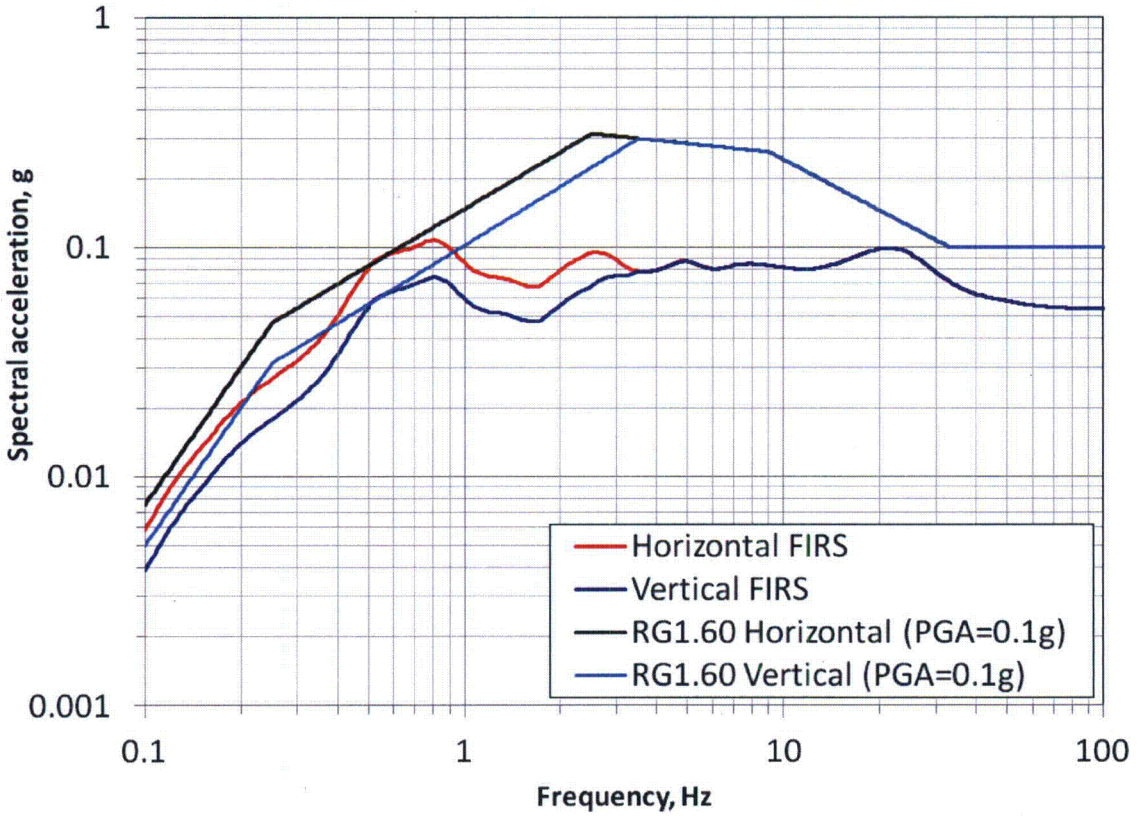

Figure 2.1-2

TPNP FIRS and RG 1.60 PGA=0.1g Foundation Level Outcrop SSE

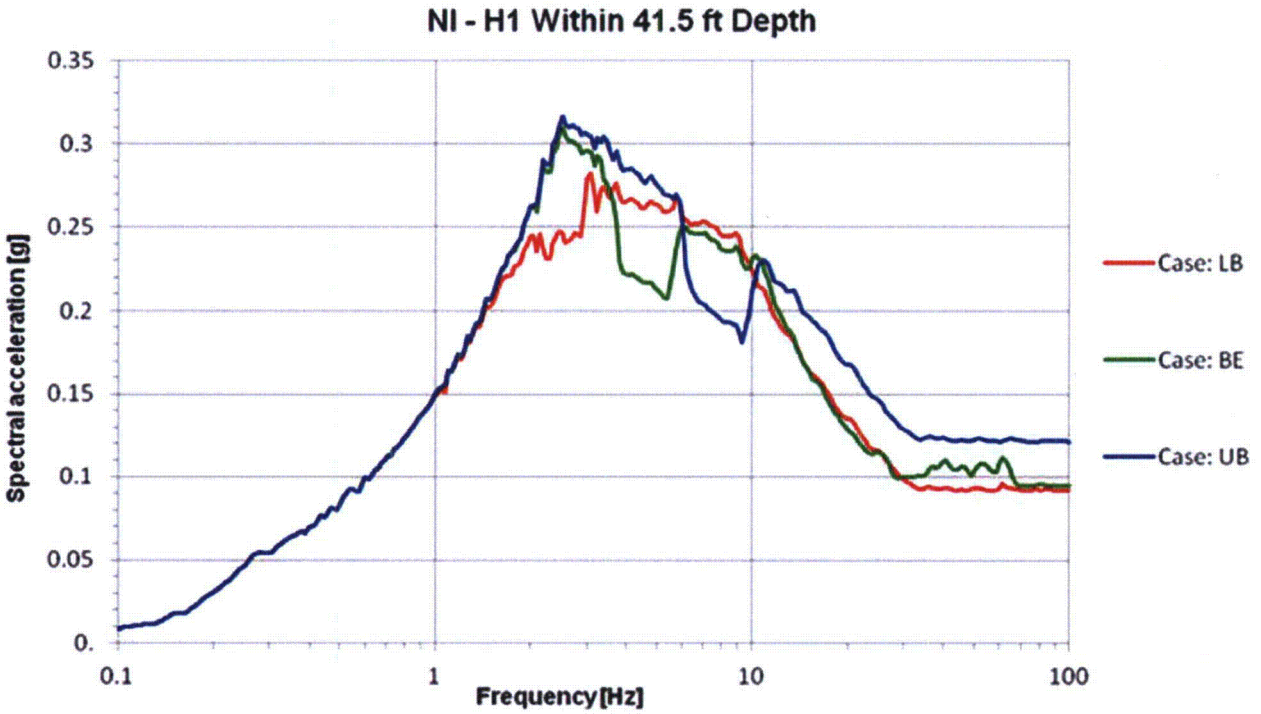

Figure 2.1-3

NI H1 Horizontal Within ARS at TPNP Foundation El. -16

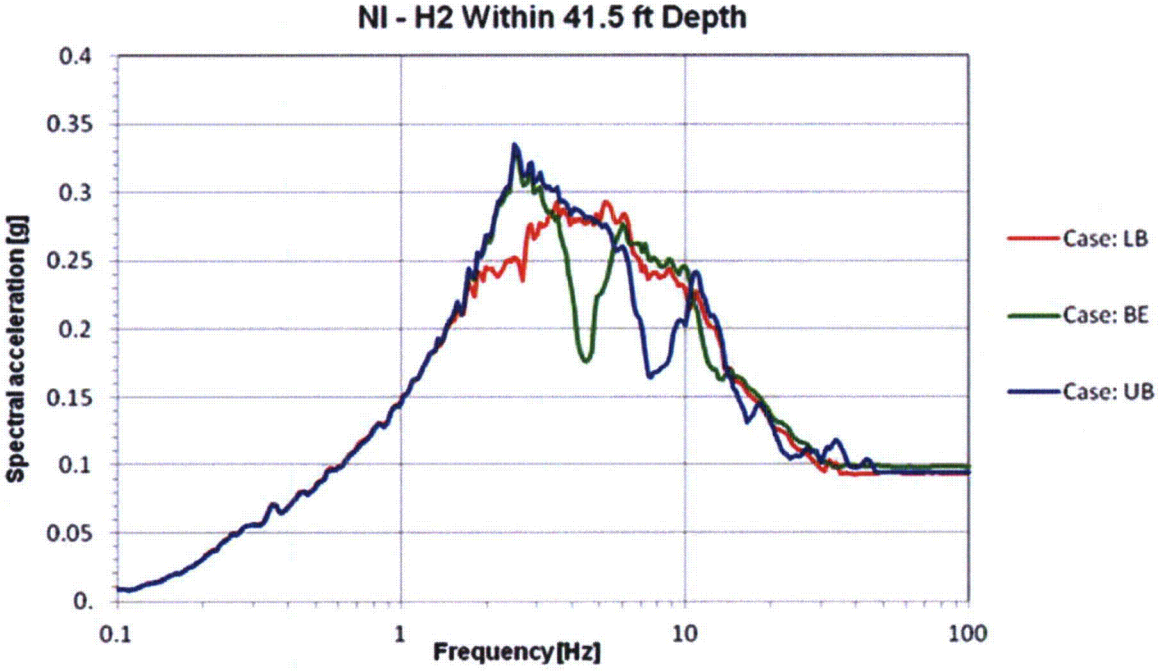

Figure 2.1-4

NI H2 Horizontal Within ARS at TPNP Foundation El. -16'

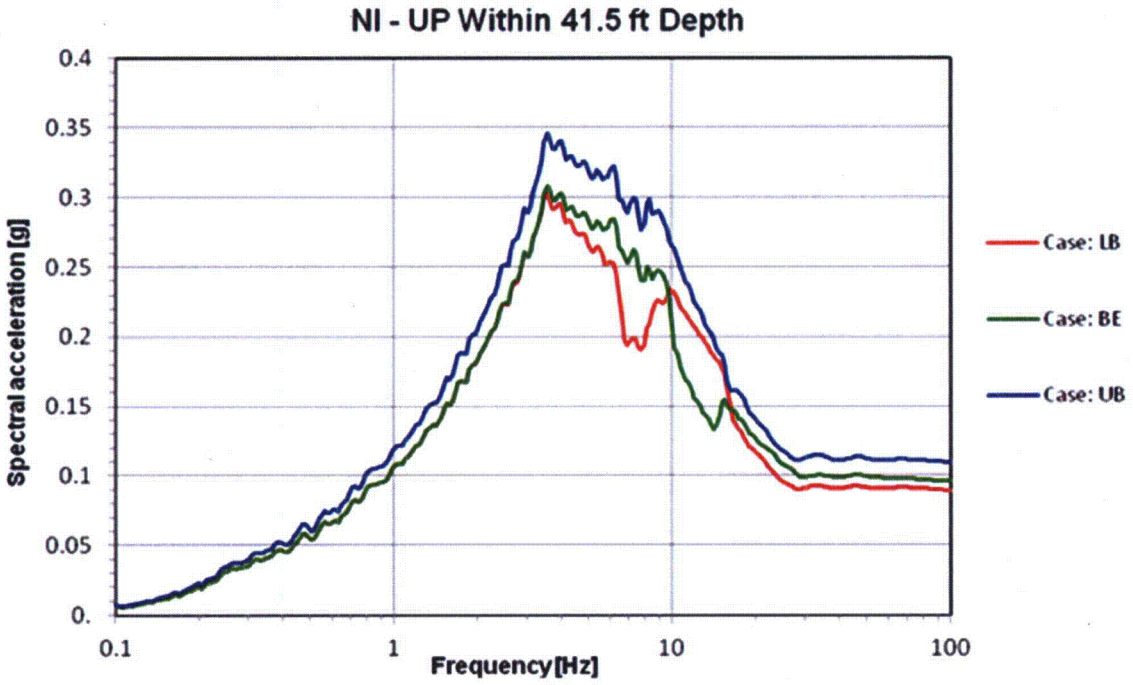

Figure 2.1-5

NI UP Vertical Within ARS at TPNP Foundation El. -16'

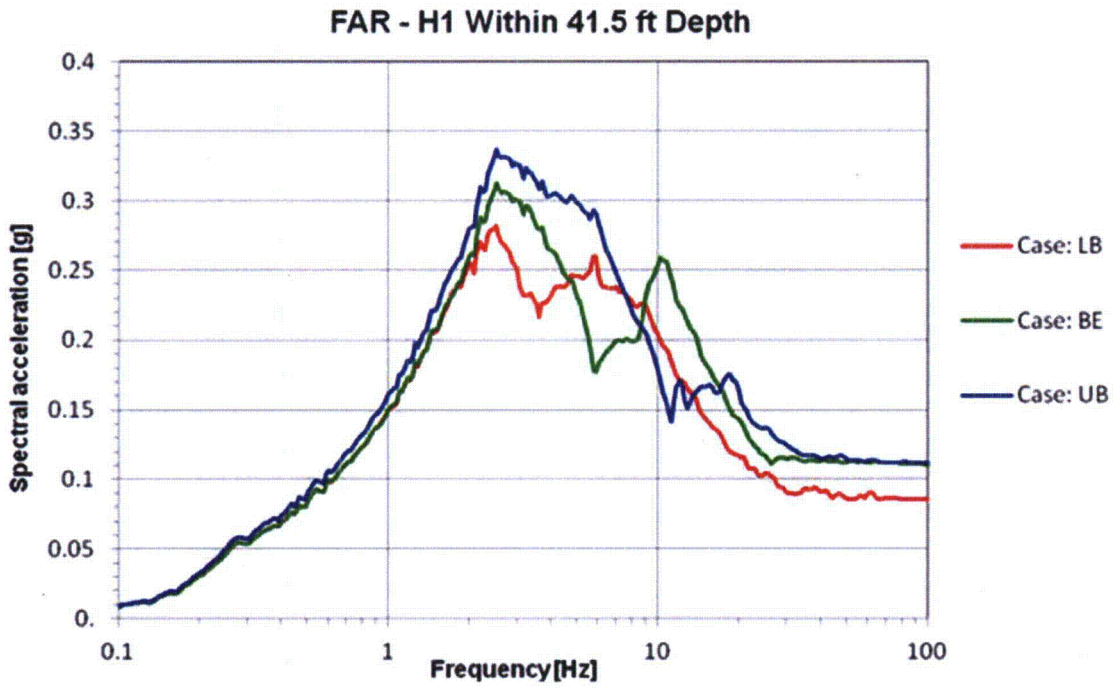

Figure 2.1-6

FAR H1 Horizontal Within ARS at TPNP Foundation El. -16'

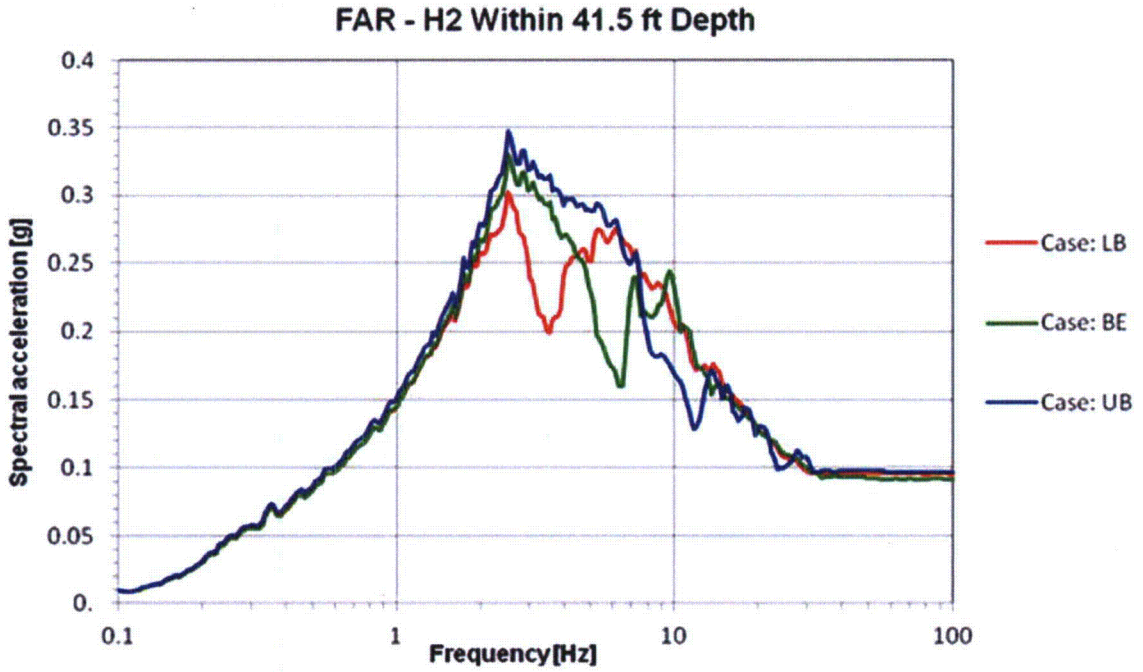

Figure 2.1-7

FAR H2 Horizontal Within ARS at TPNP Foundation El. -16'

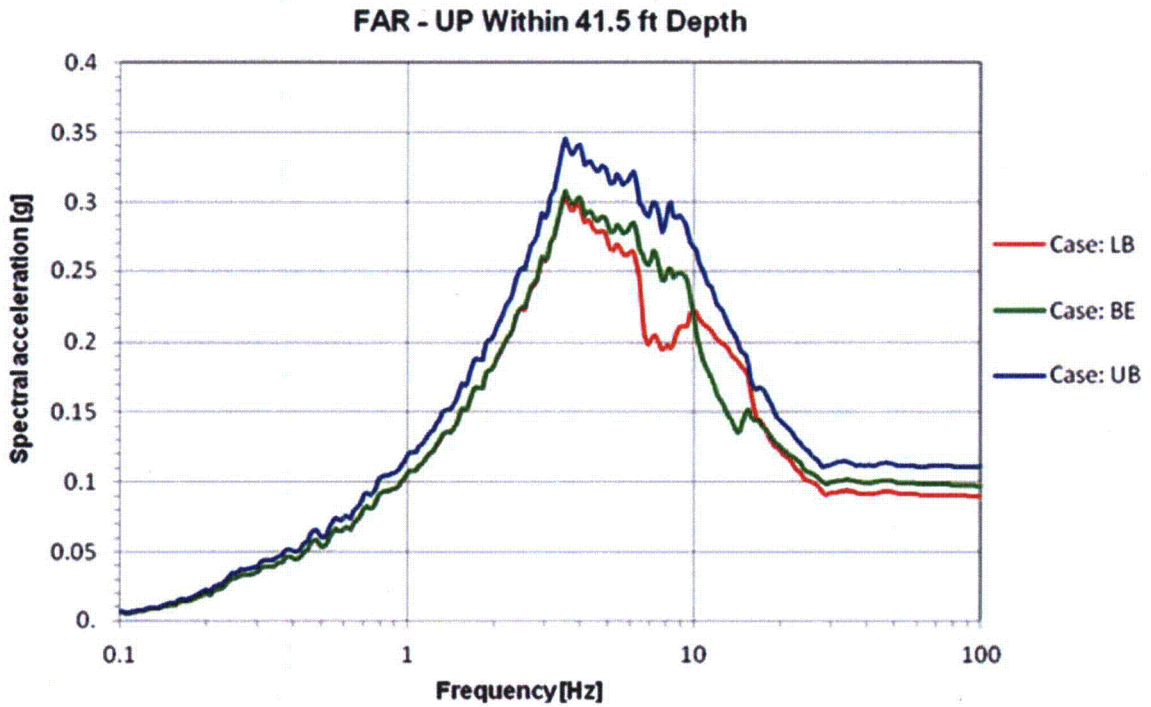

Figure 2.1-8

FAR UP Vertical Within ARS at TPNP Foundation El. -16'

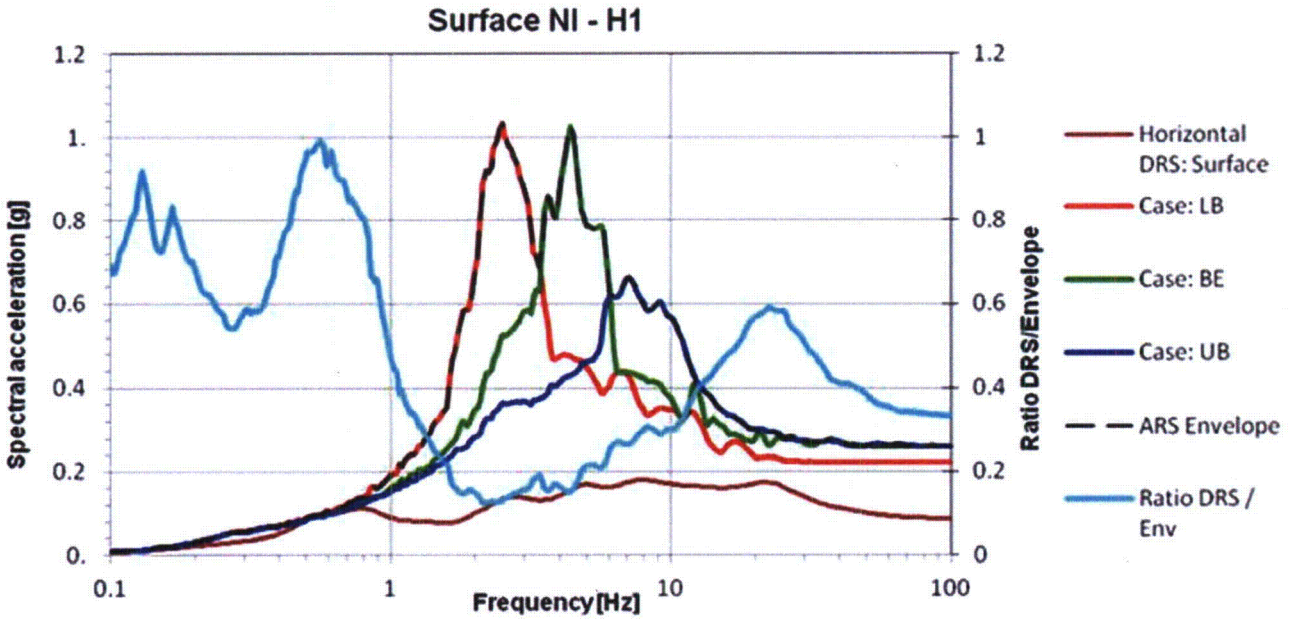

Figure 2.1-9

Comparison of Spectra of Computed H1 Component Surface Motions for NI SSI Profiles with Horizontal DRS

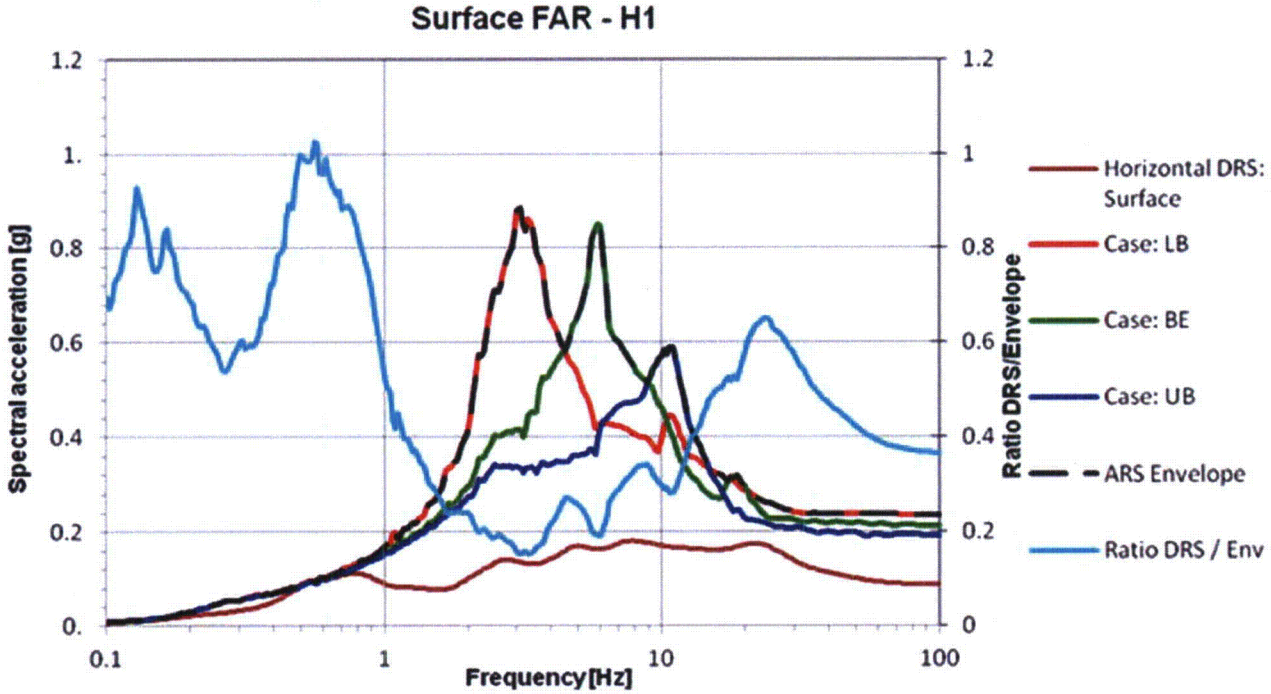

Figure 2.1-10

Comparison of Spectra of Computed H1 Component Surface Motions for FAR SSI Profiles with Horizontal DRS

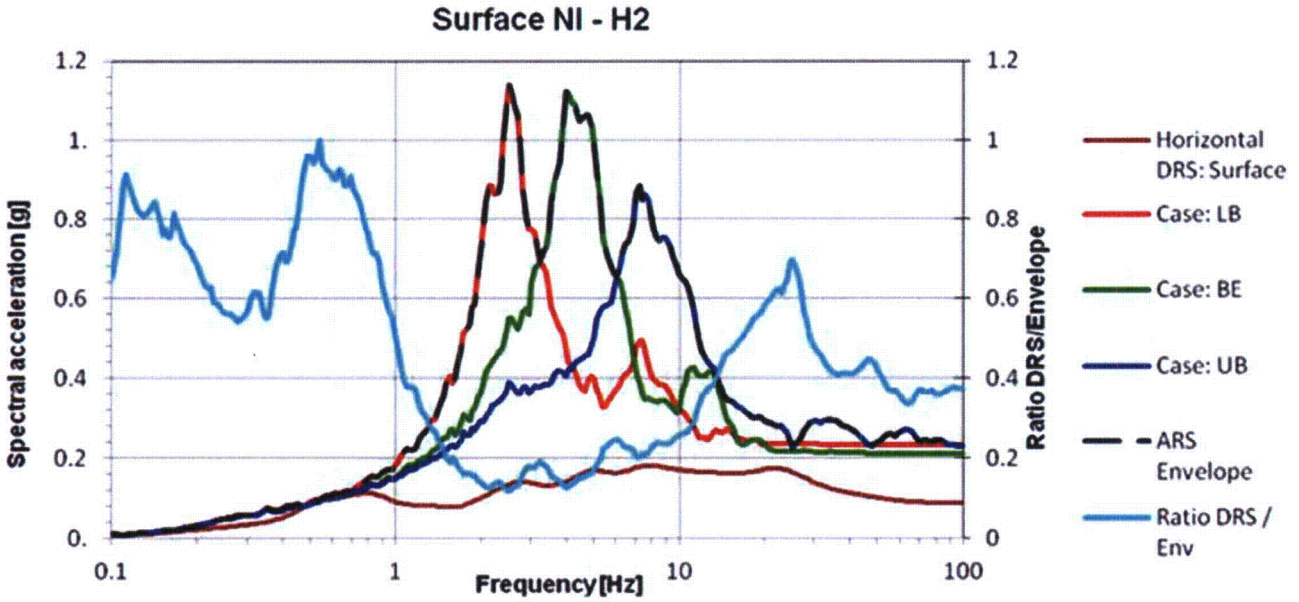

Figure 2.1-11

Comparison of Spectra of Computed H2 Component Surface Motions for NI SSI Profiles with Horizontal DRS

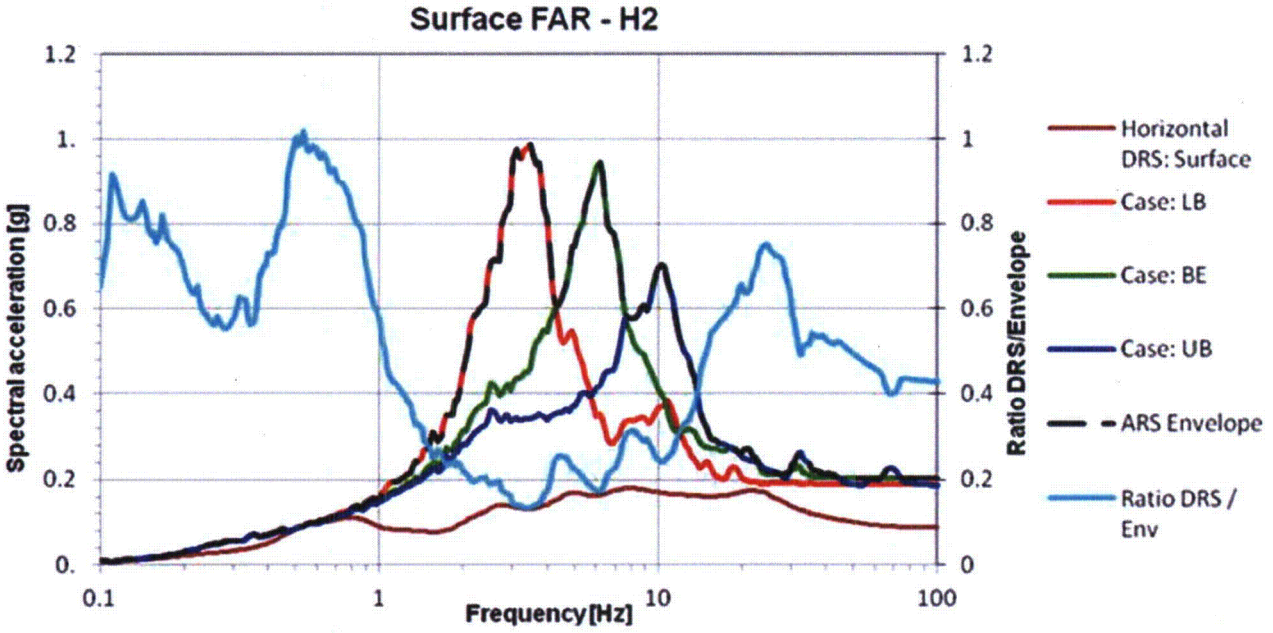

Figure 2.1-12

Comparison of Spectra of Computed H2 Component Surface Motions for FAR SSI Profiles with Horizontal DRS

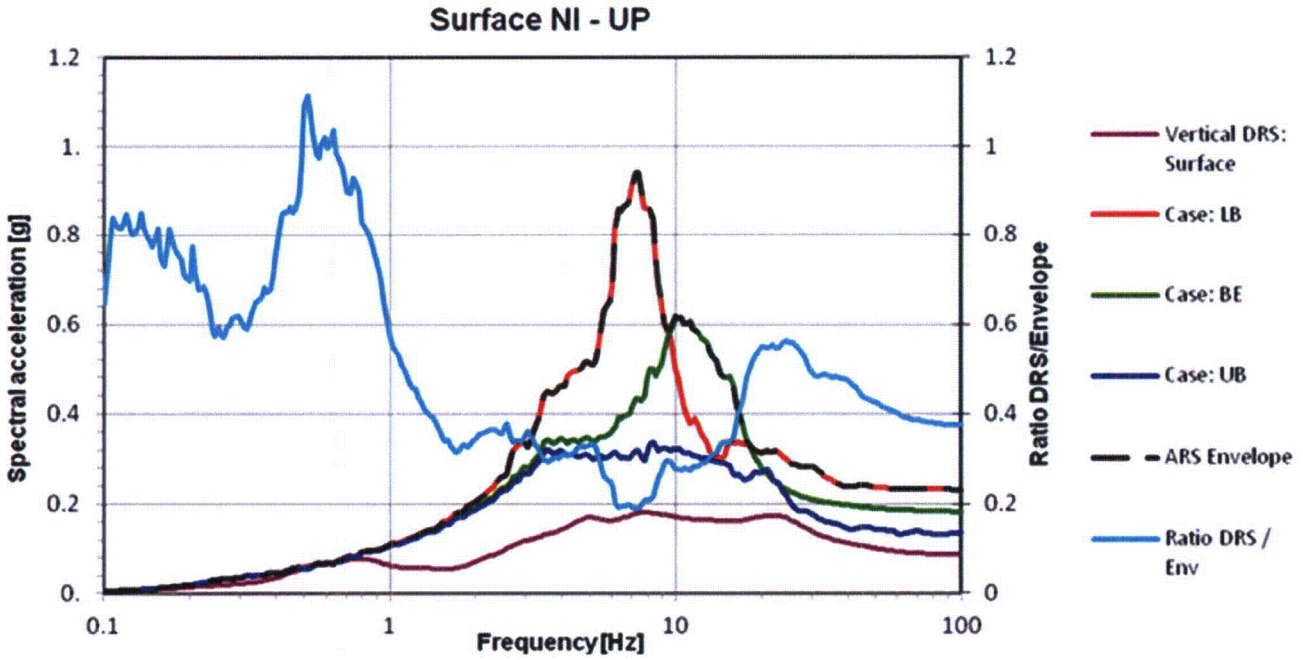

Figure 2.1-13

Comparison of Spectra of Computed V Component Surface Motions for NI SSI Profiles with Vertical DRS

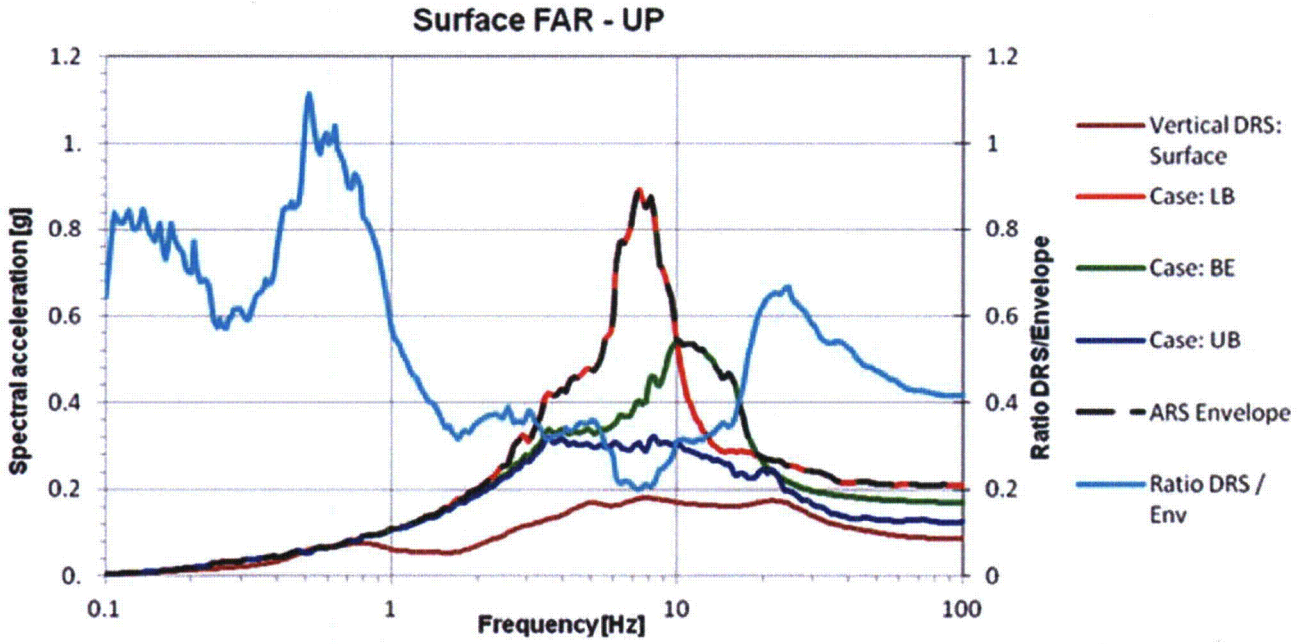

Figure 2.1-14

Comparison of Spectra of Computed V Component Surface Motions for FAR SSI Profiles with Vertical DRS

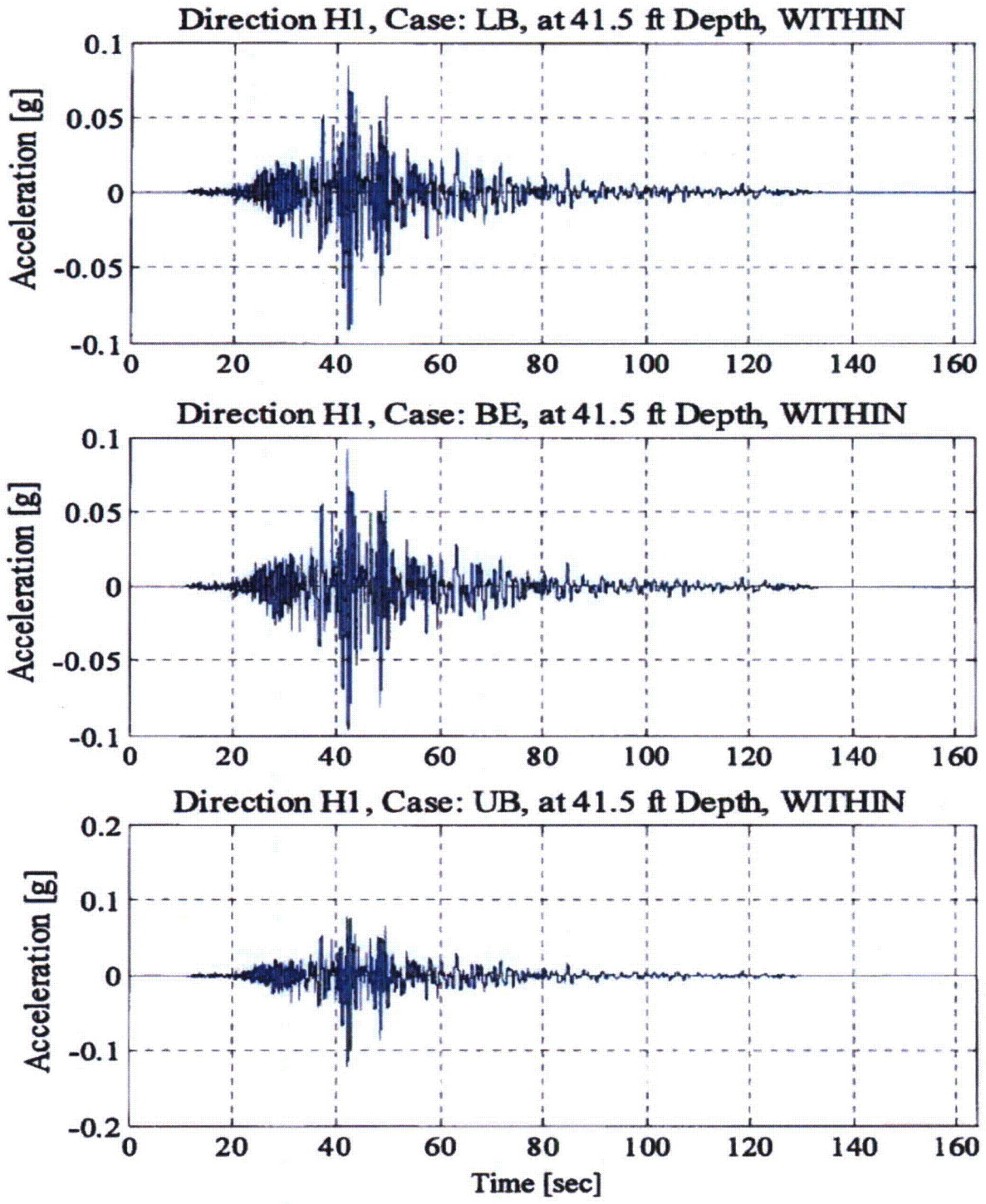

Figure 3.5-1

TPNP NI BE, LB and UB Seismic Input in H1 (X-Direction) – El. -16'

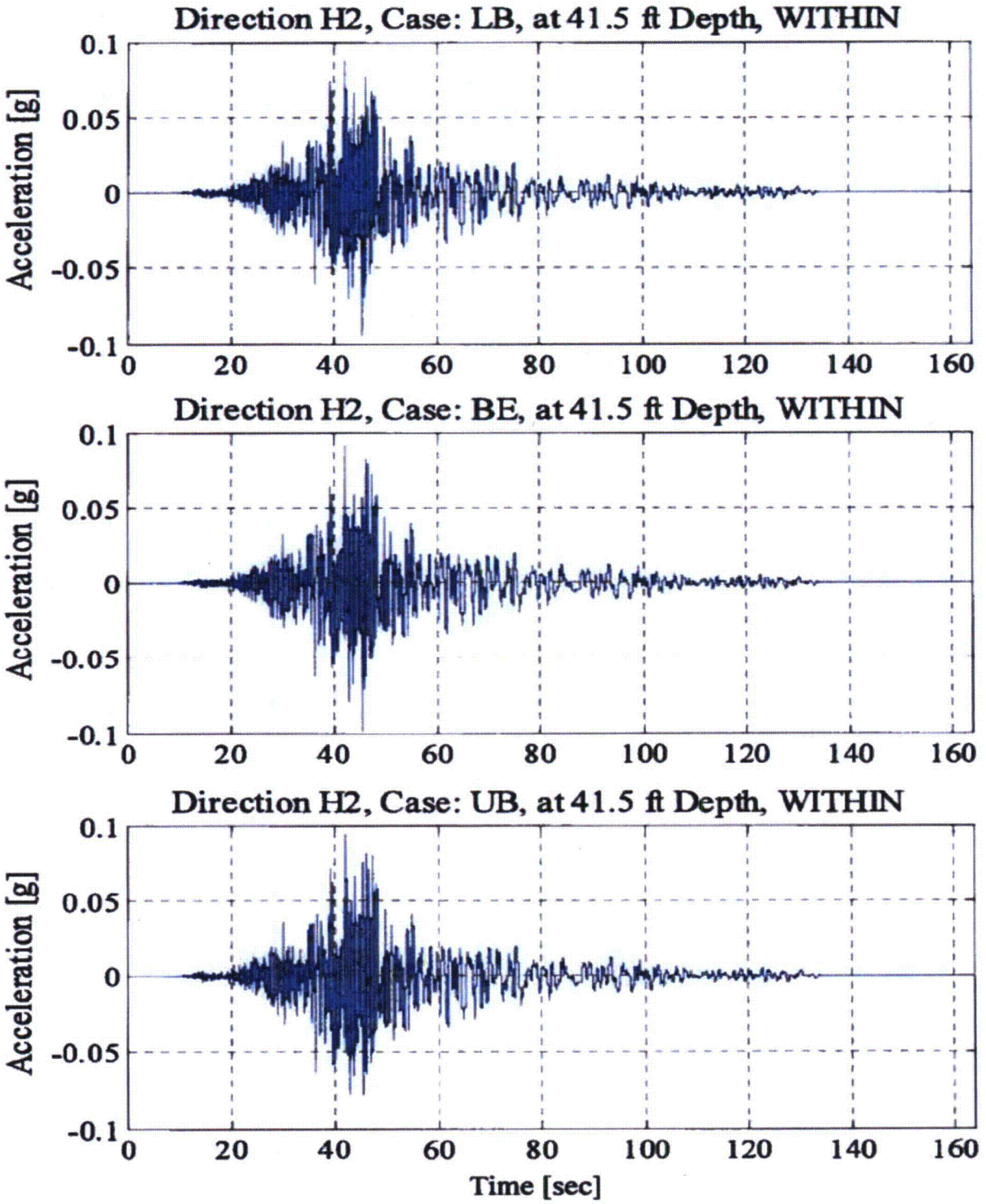

Figure 3.5-2

TPNP NI BE, LB and UB Seismic Input in H2 (Y-Direction) – El. -16'

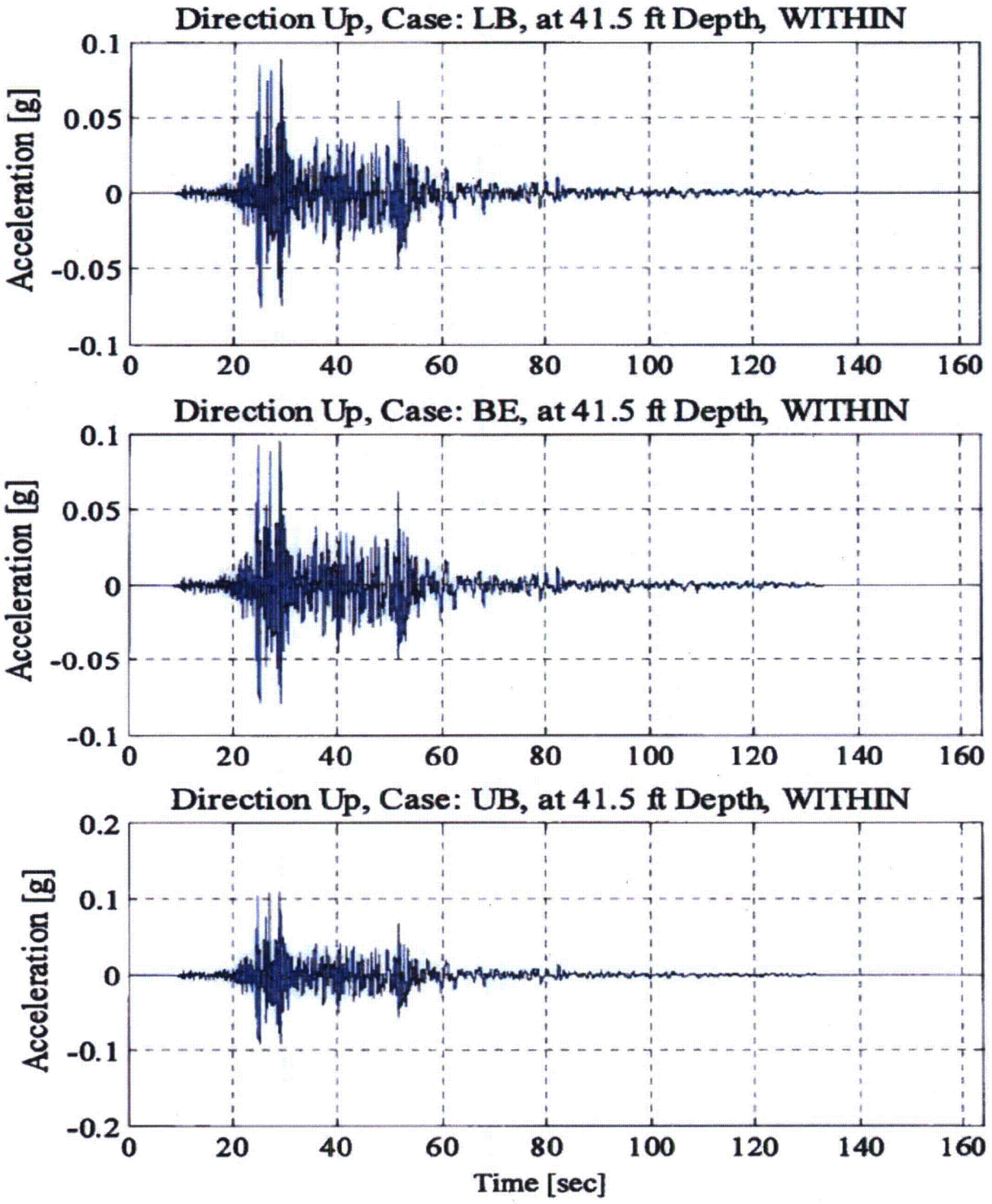

Figure 3.5-3

TPNP NI BE, LB and UB Seismic Input in UP (Z-Direction) – El. -16'

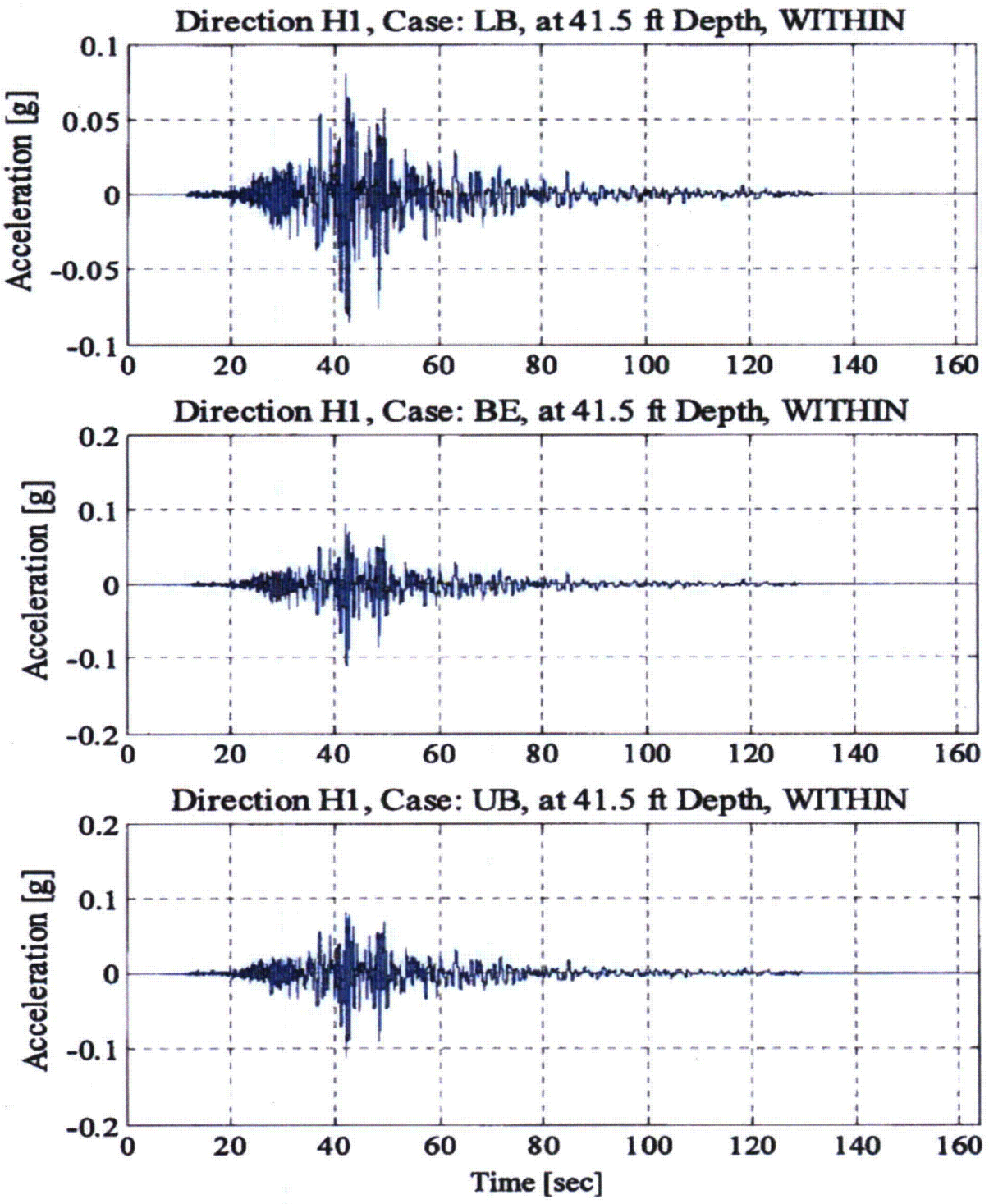

Figure 3.5-4

TPNP FAR BE, LB and UB Seismic Input in H1 (X-Direction) – El. -16'

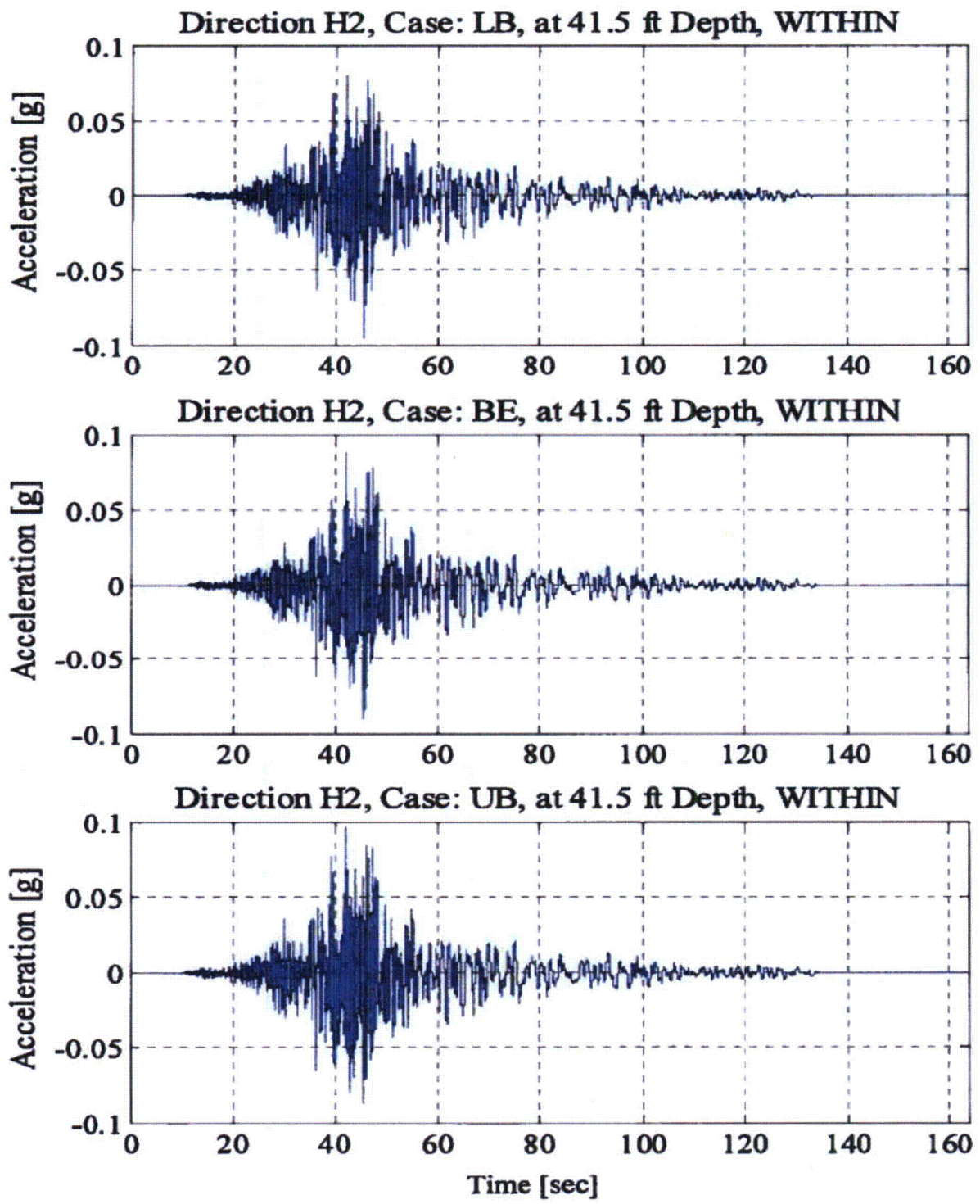

Figure 3.5-5

TPNP FAR BE, LB and UB Seismic Input in H2 (Y-Direction) – El. -16'

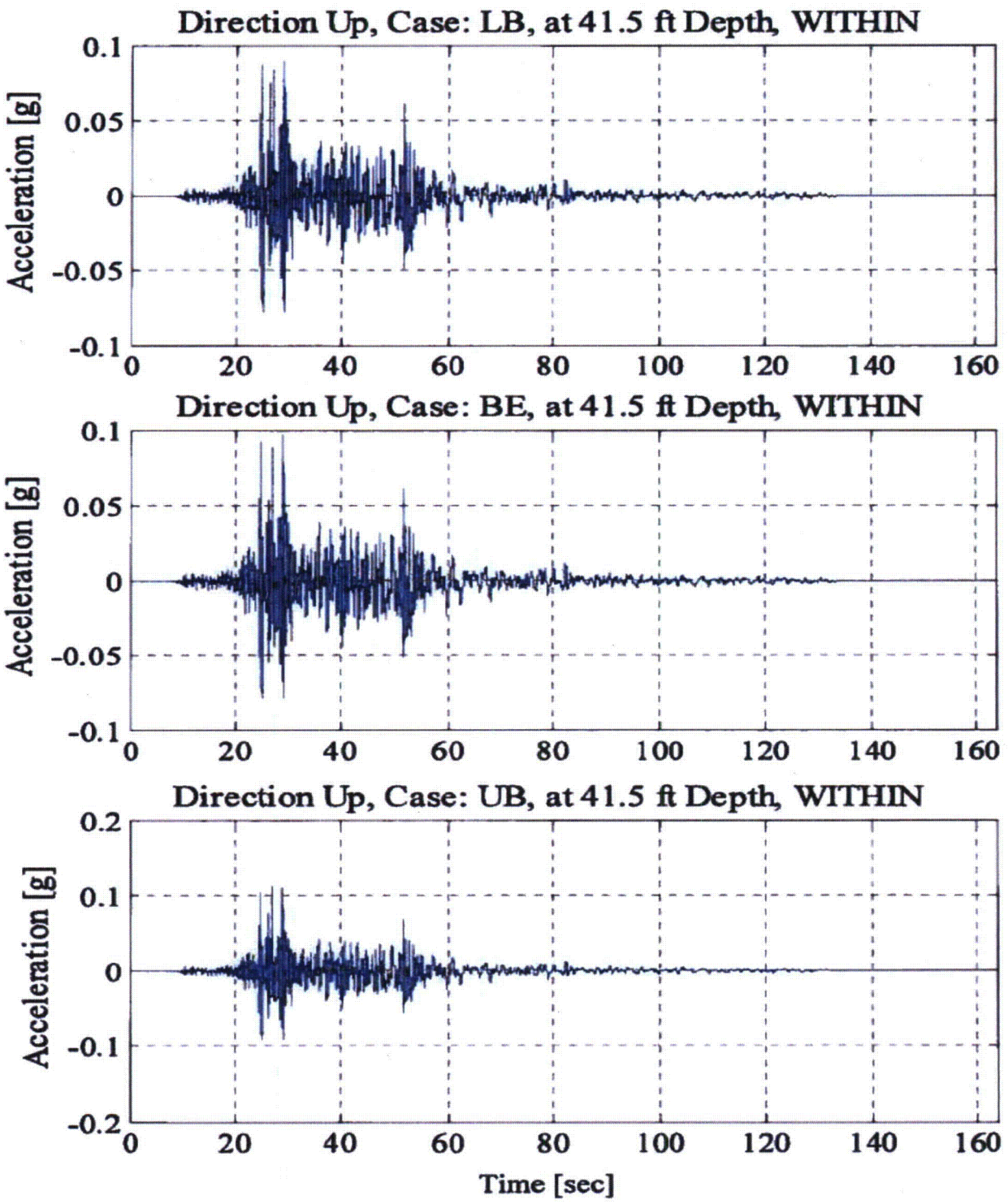

Figure 3.5-6

TPNP FAR BE, LB and UB Seismic Input in UP (Z-Direction) – El. -16'

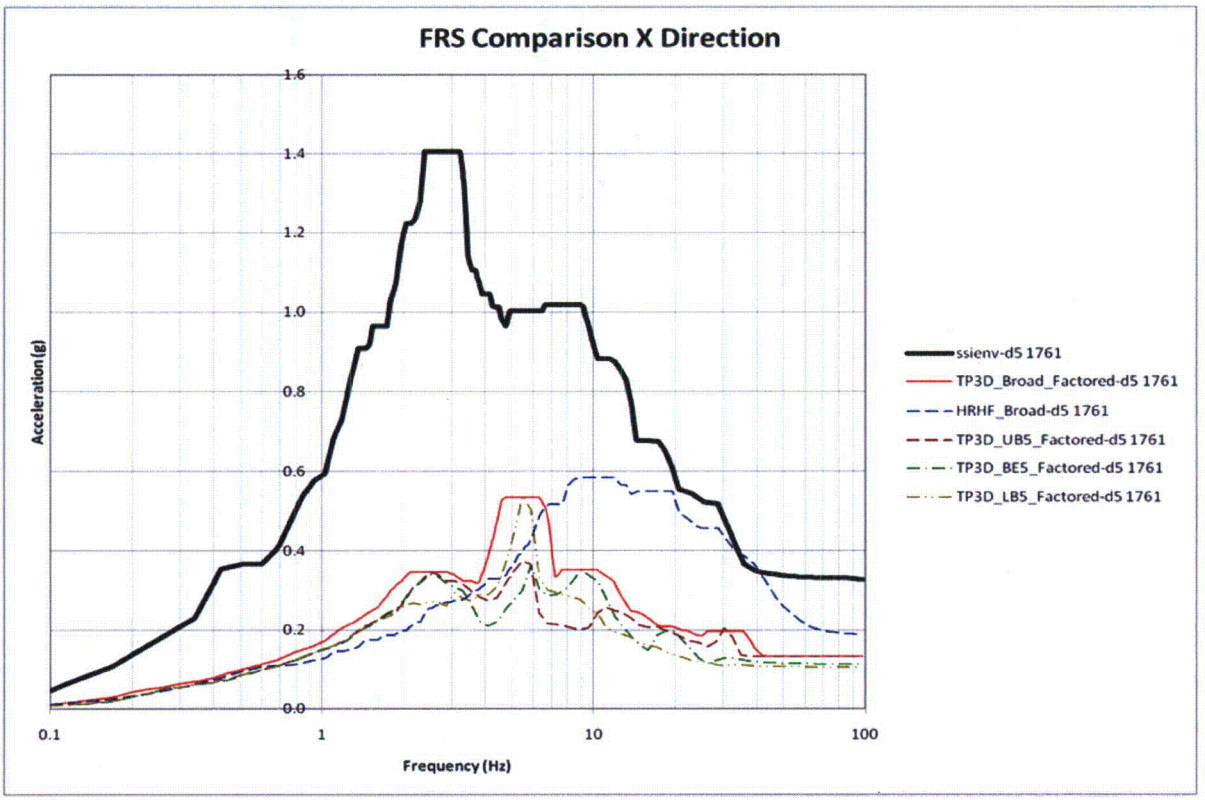

Figure 6.2-1

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in X-Direction – Node 1761

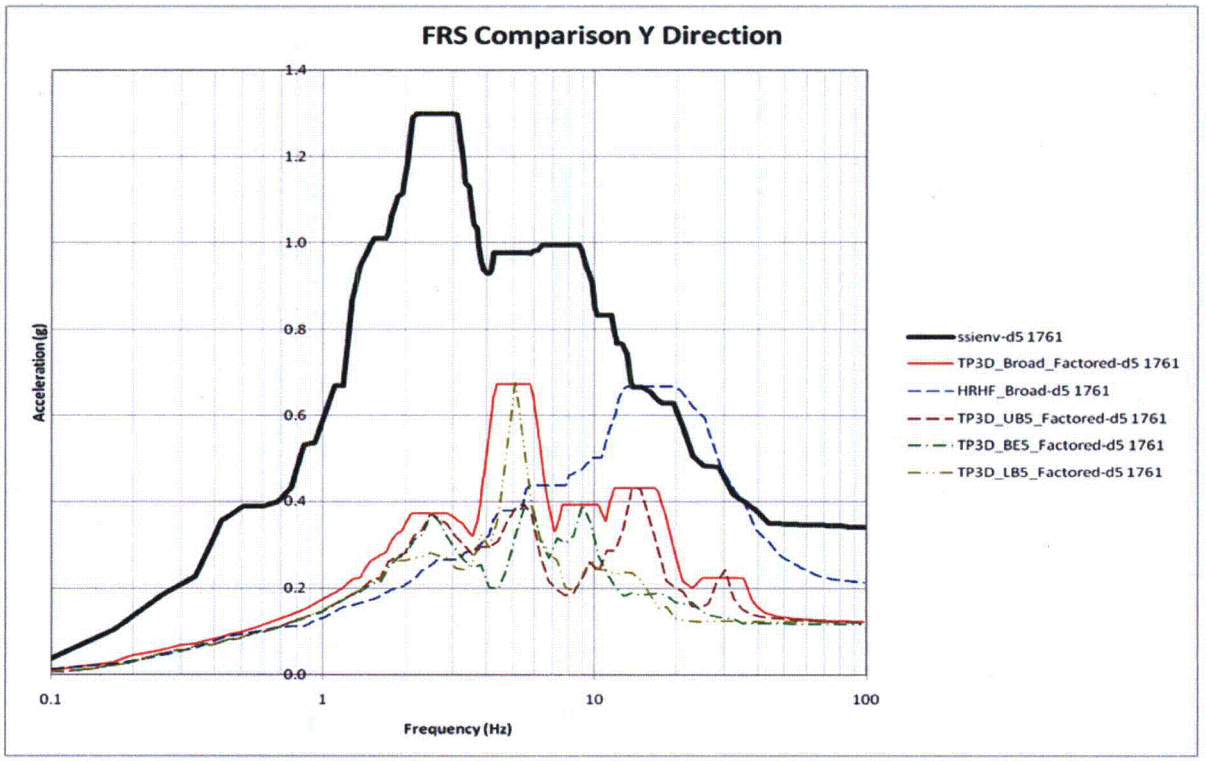

Figure 6.2-2

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Y-Direction – Node 1761

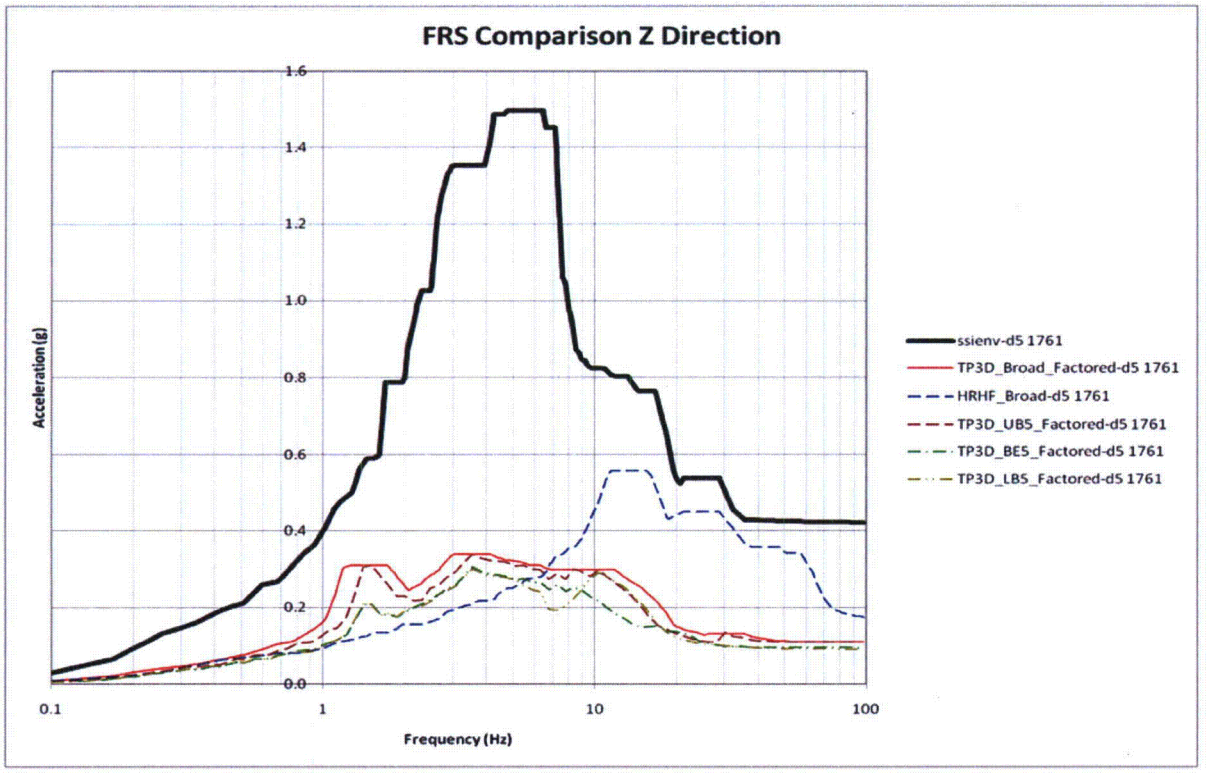

Figure 6.2-3

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Z-Direction – Node 1761

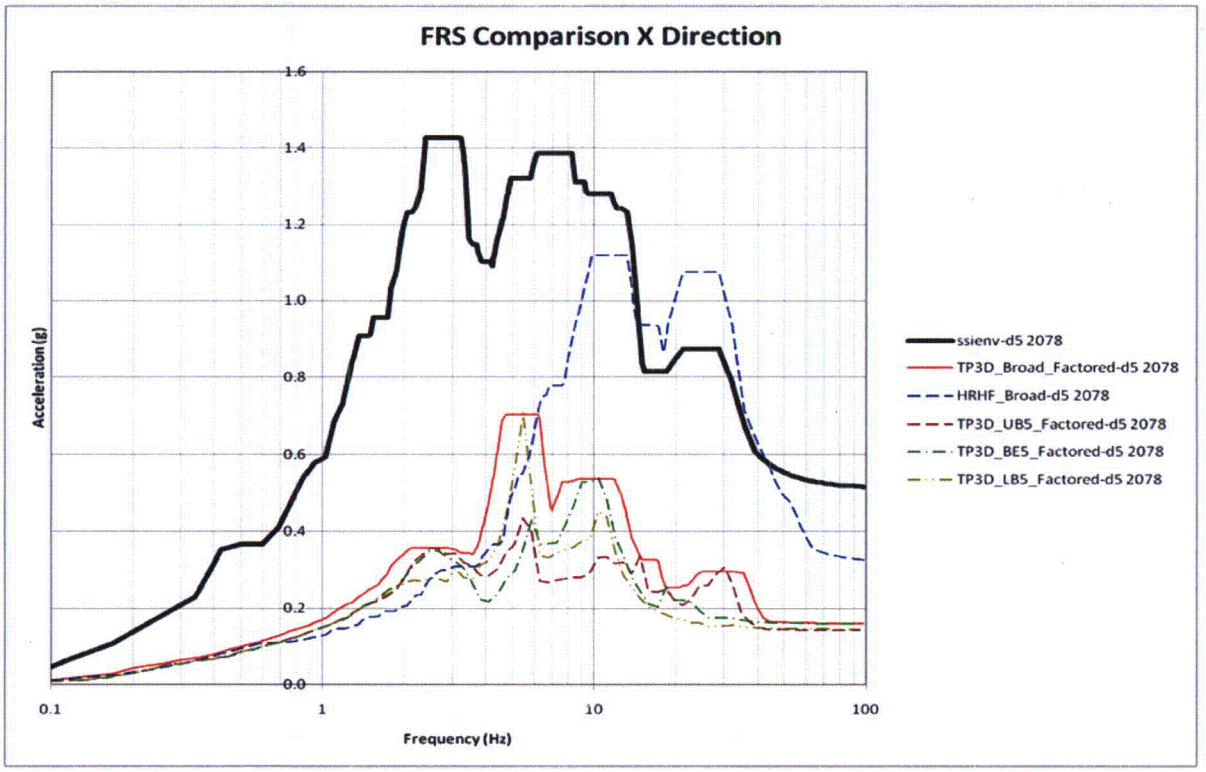

Figure 6.2-4

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in X-Direction – Node 2078

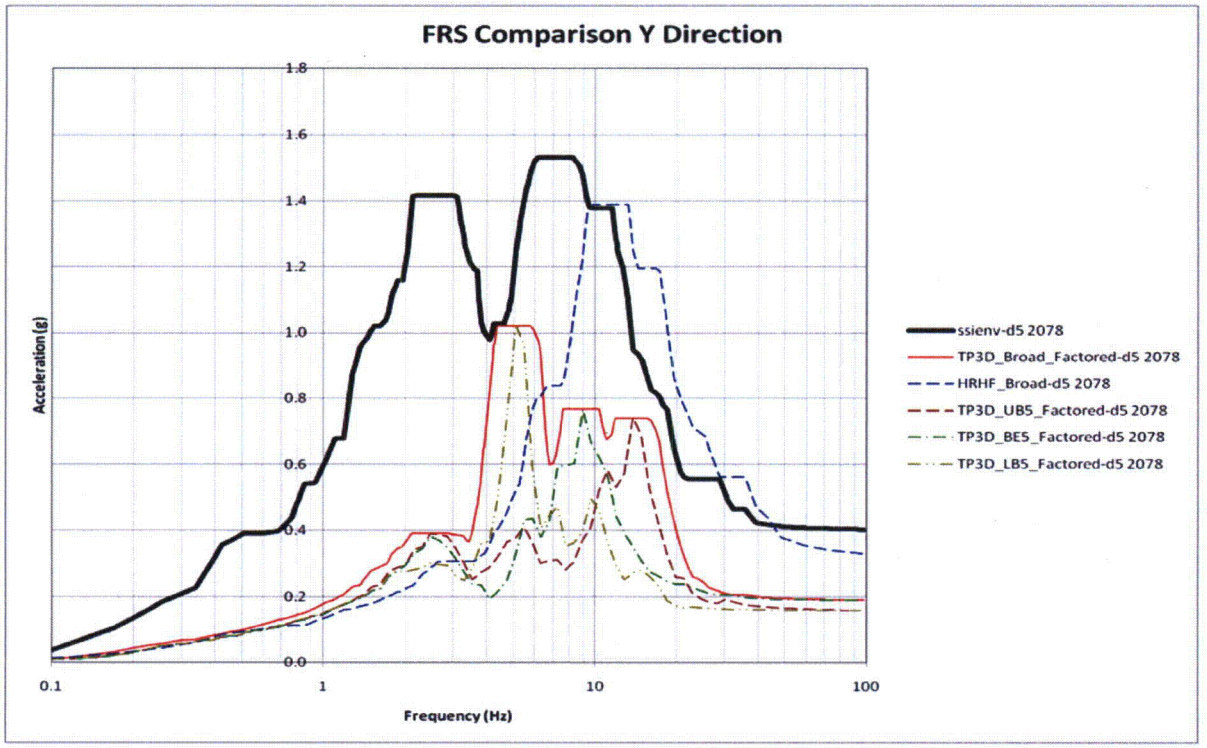

Figure 6.2-5

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Y-Direction – Node 2078

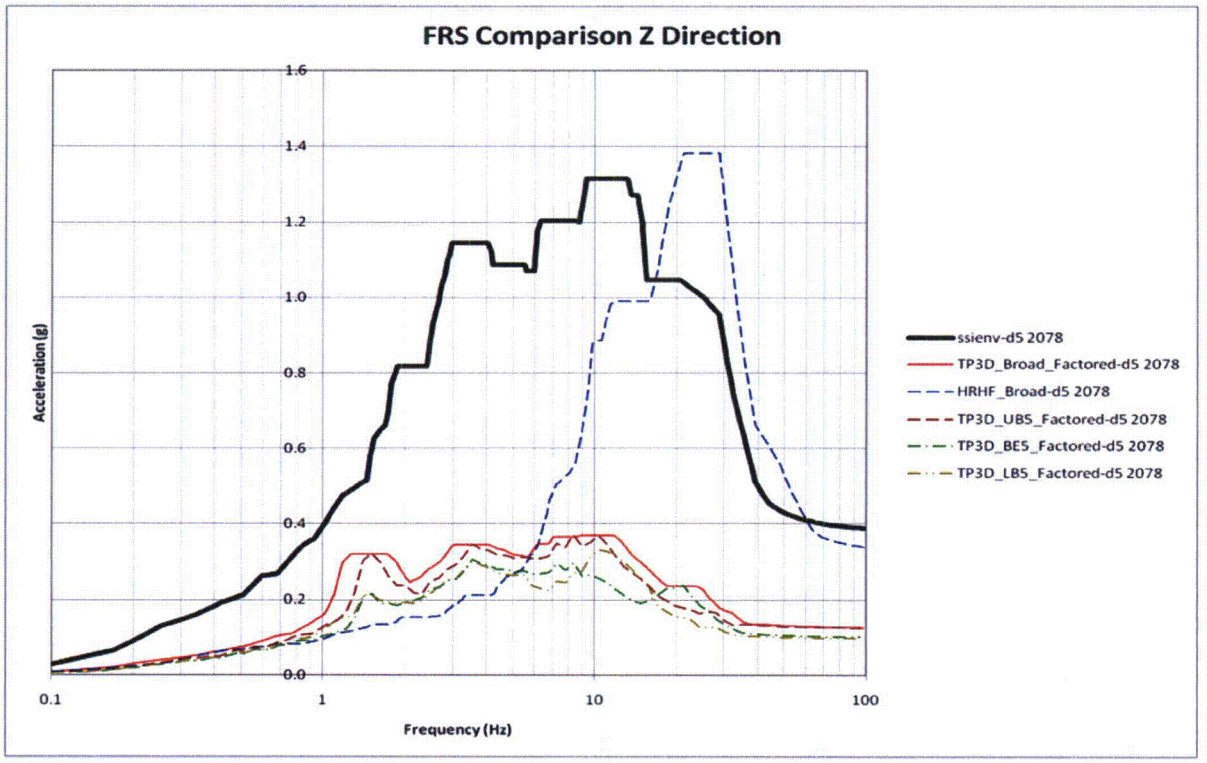

Figure 6.2-6

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Z-Direction – Node 2078

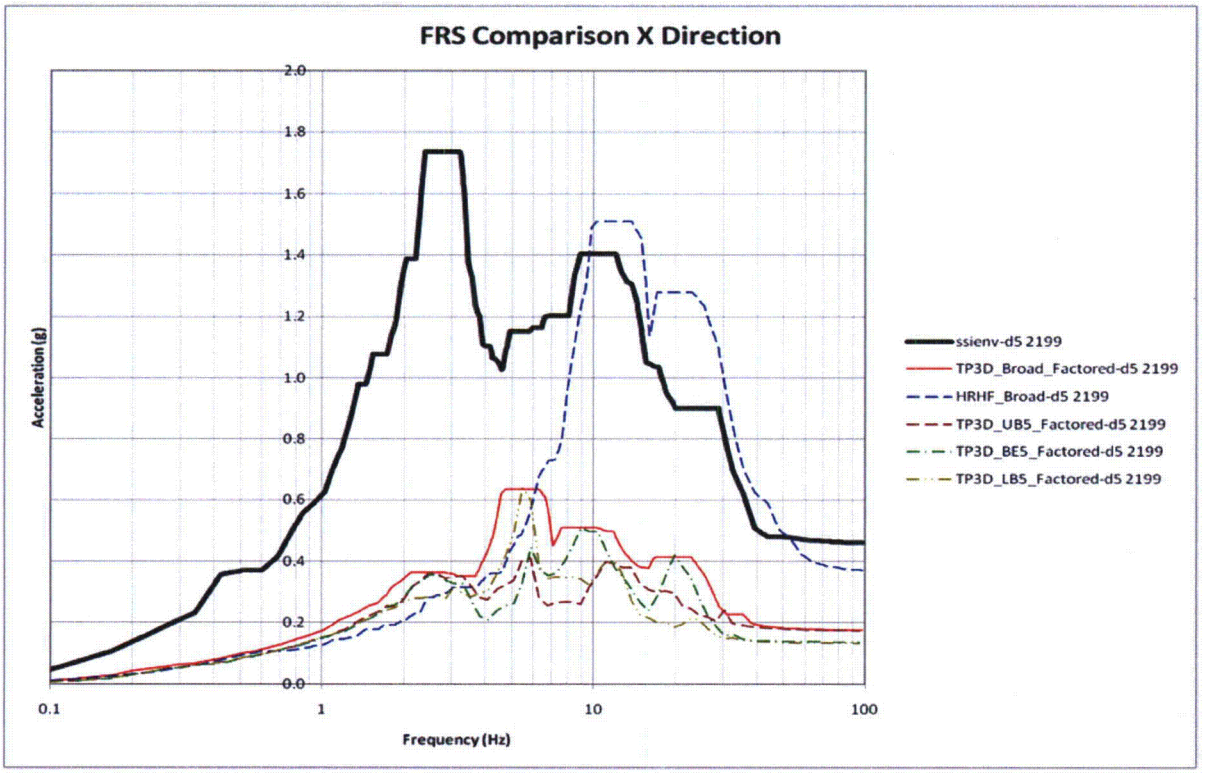

Figure 6.2-7

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in X-Direction – Node 2199

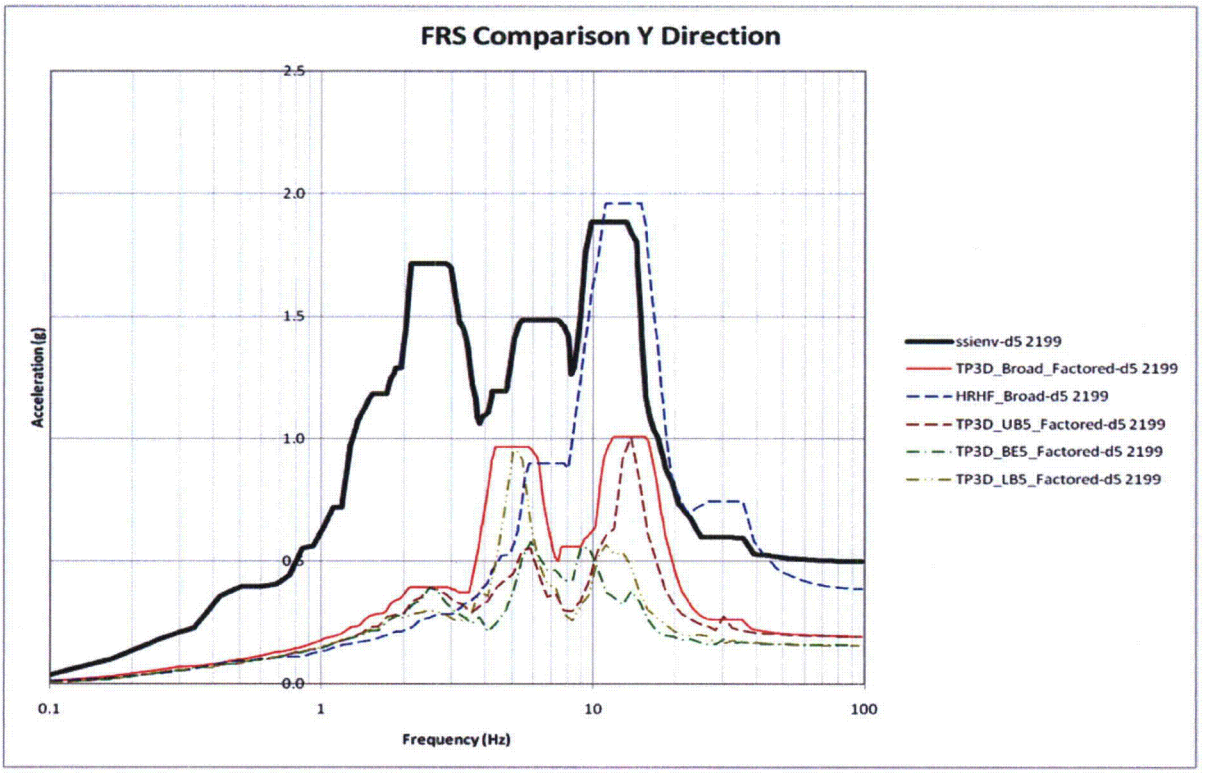

Figure 6.2-8

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Y-Direction – Node 2199

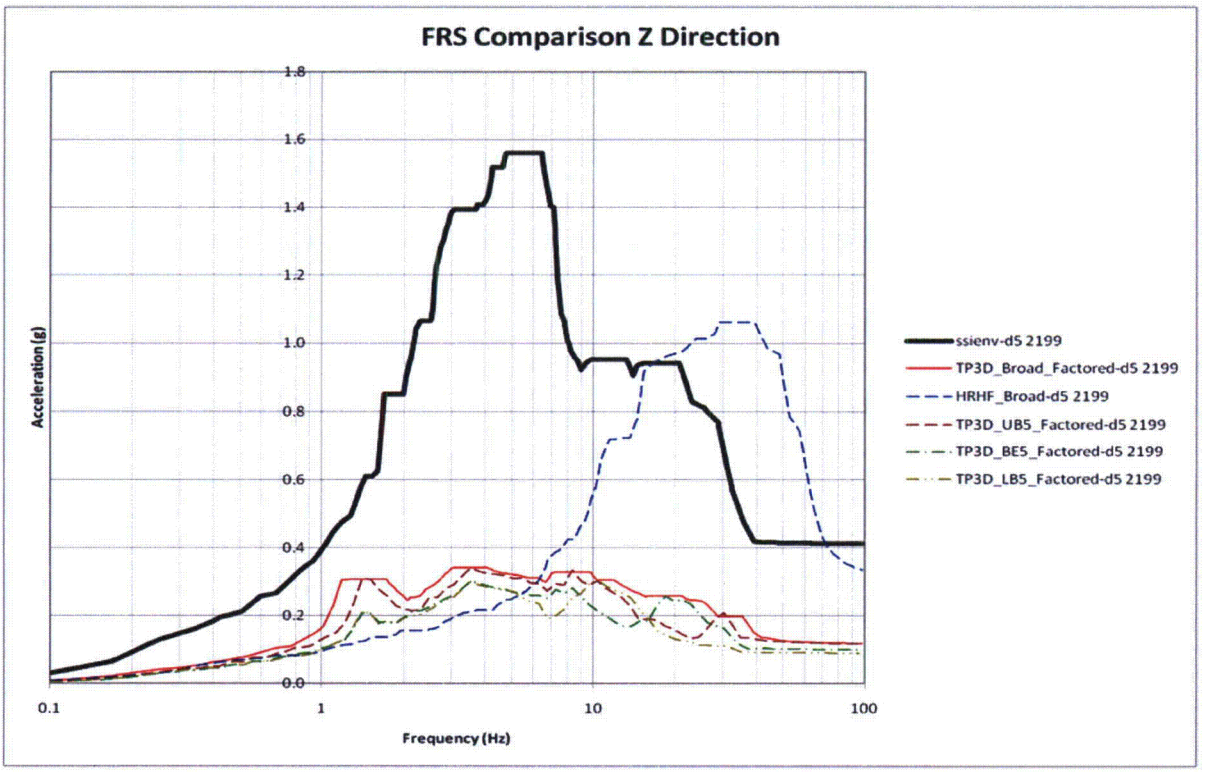

Figure 6.2-9

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Z-Direction – Node 2199

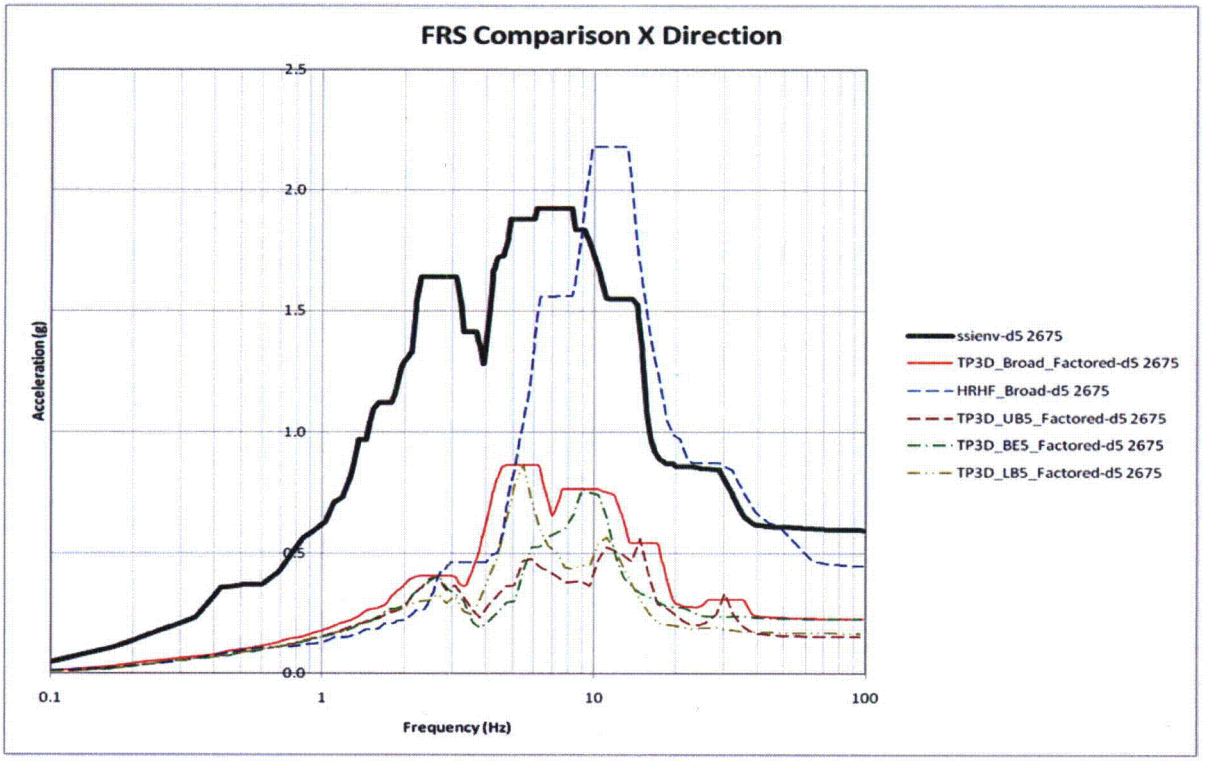

Figure 6.2-10

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in X-Direction – Node 2675

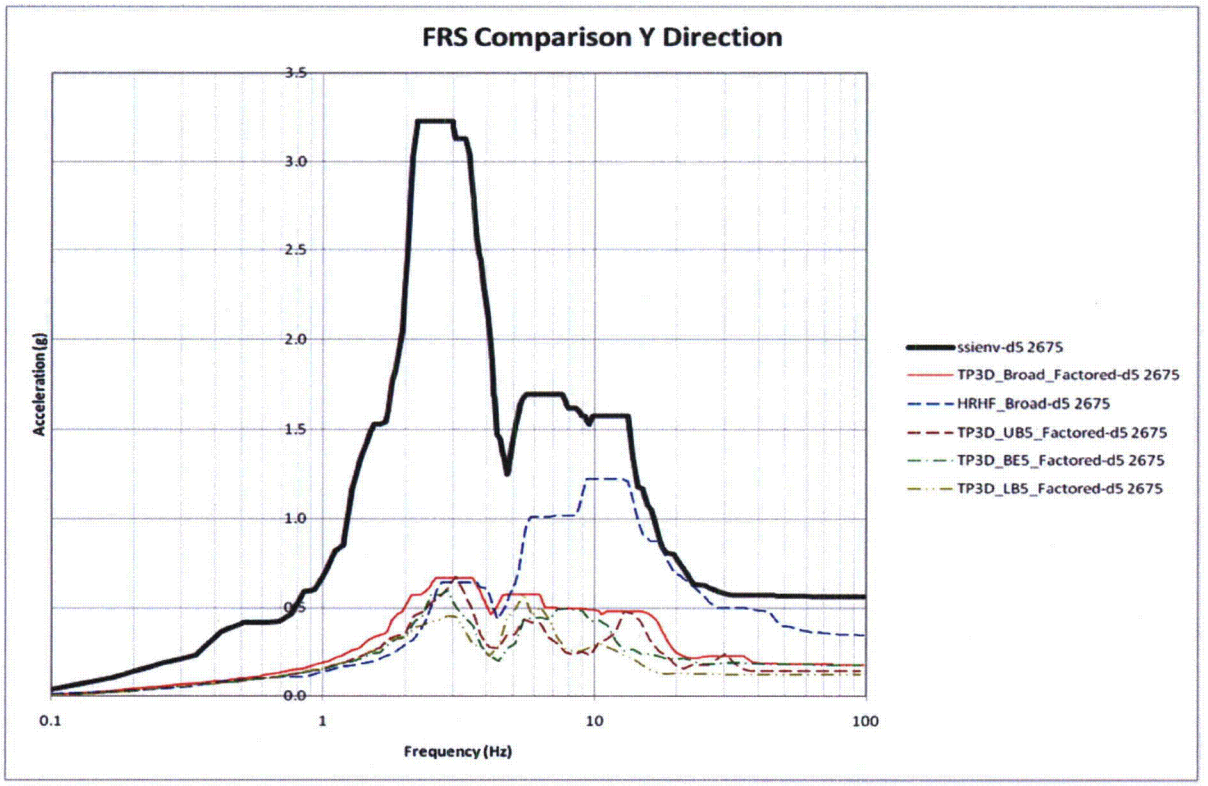

Figure 6.2-11

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Y-Direction – Node 2675

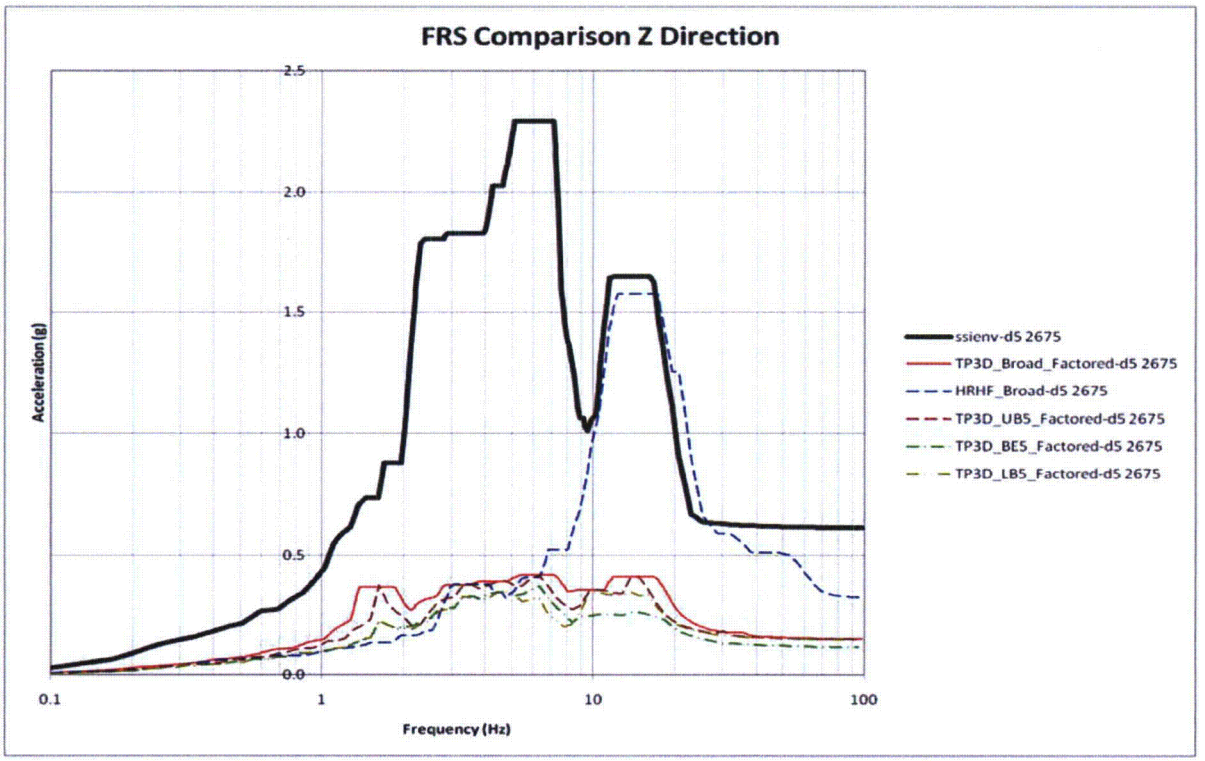

Figure 6.2-12

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Z-Direction – Node 2675

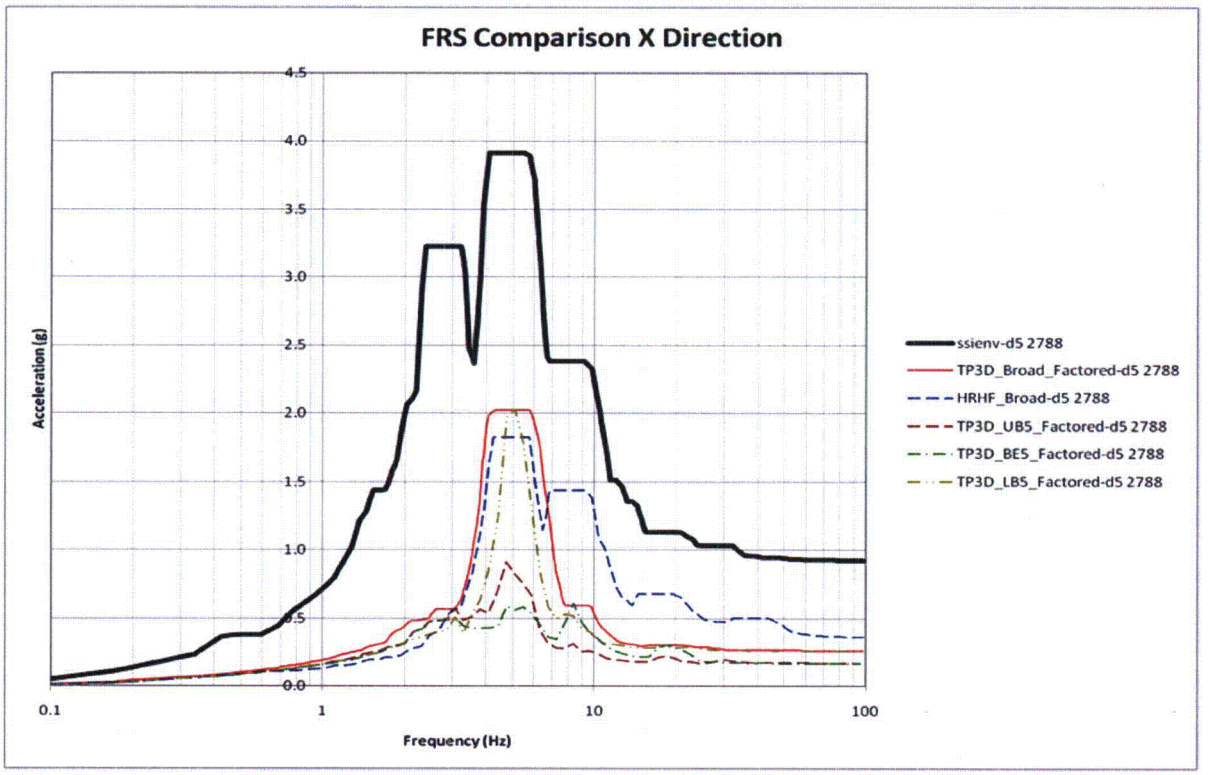

Figure 6.2-13

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in X-Direction – Node 2788

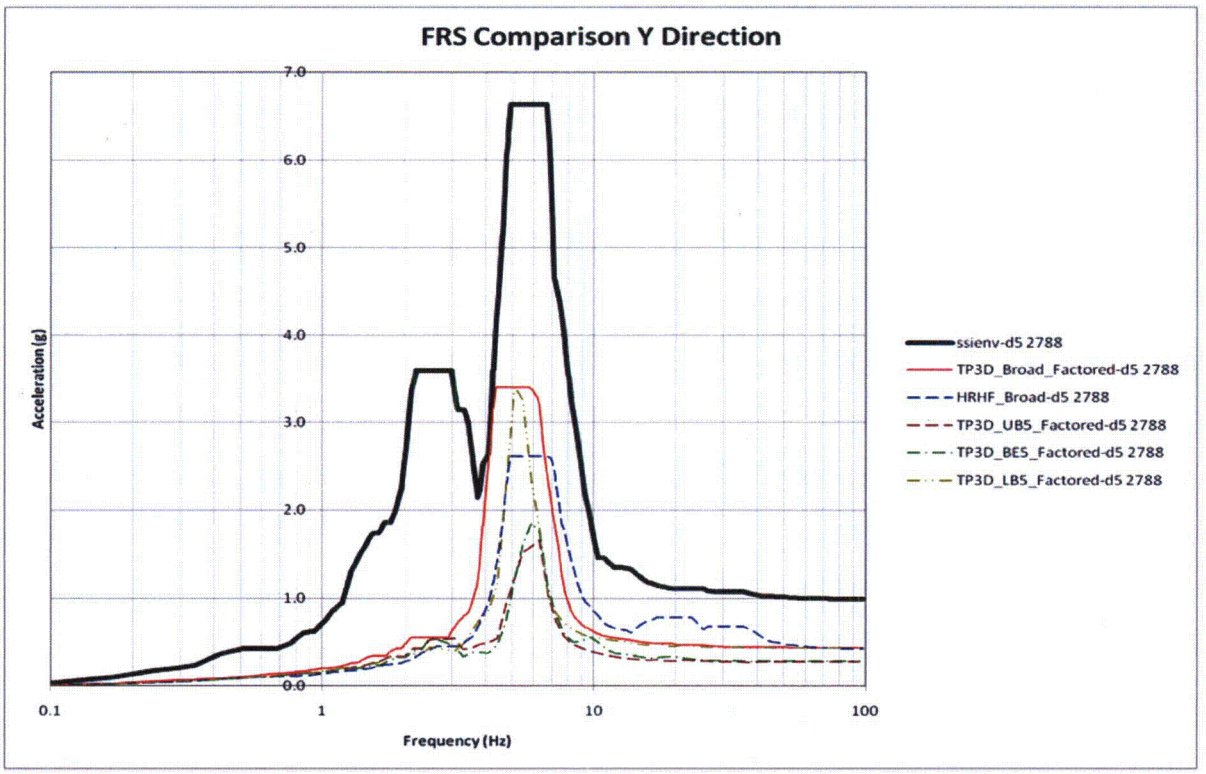

Figure 6.2-14

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Y-Direction – Node 2788

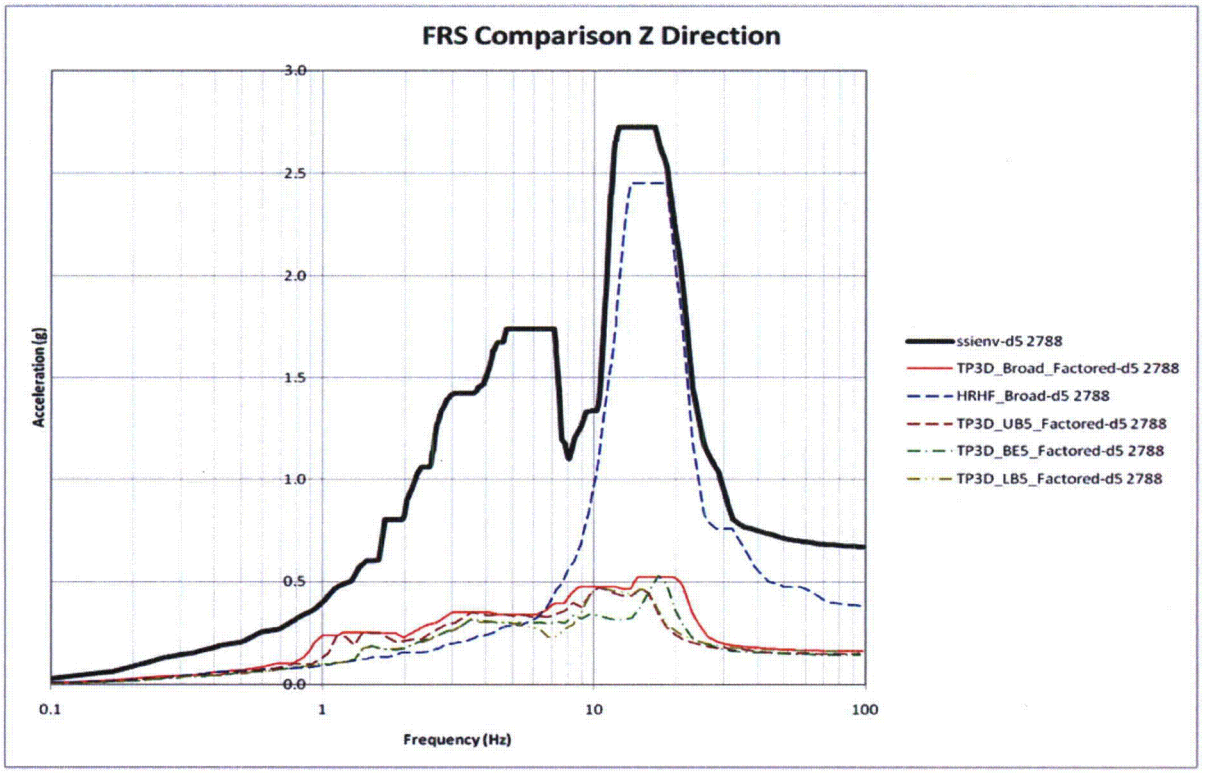

Figure 6.2-15

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Z-Direction – Node 2788

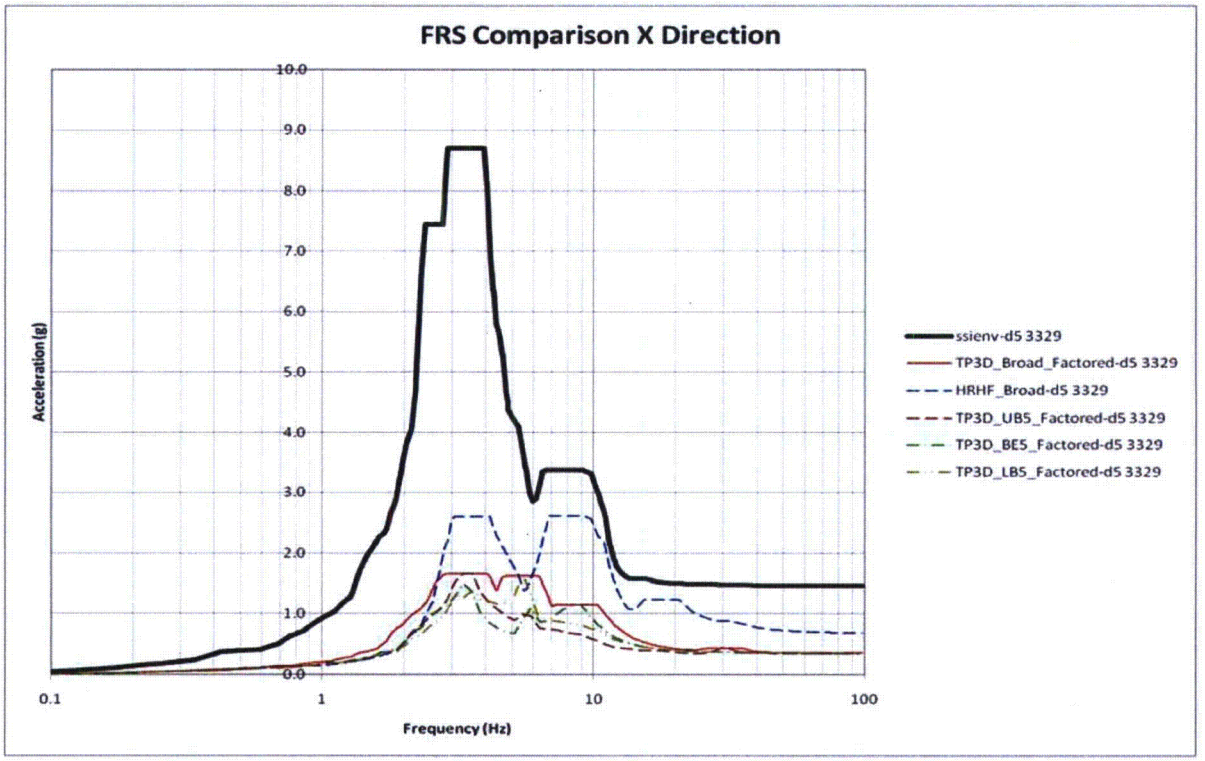

Figure 6.2-16

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in X-Direction – Node 3329

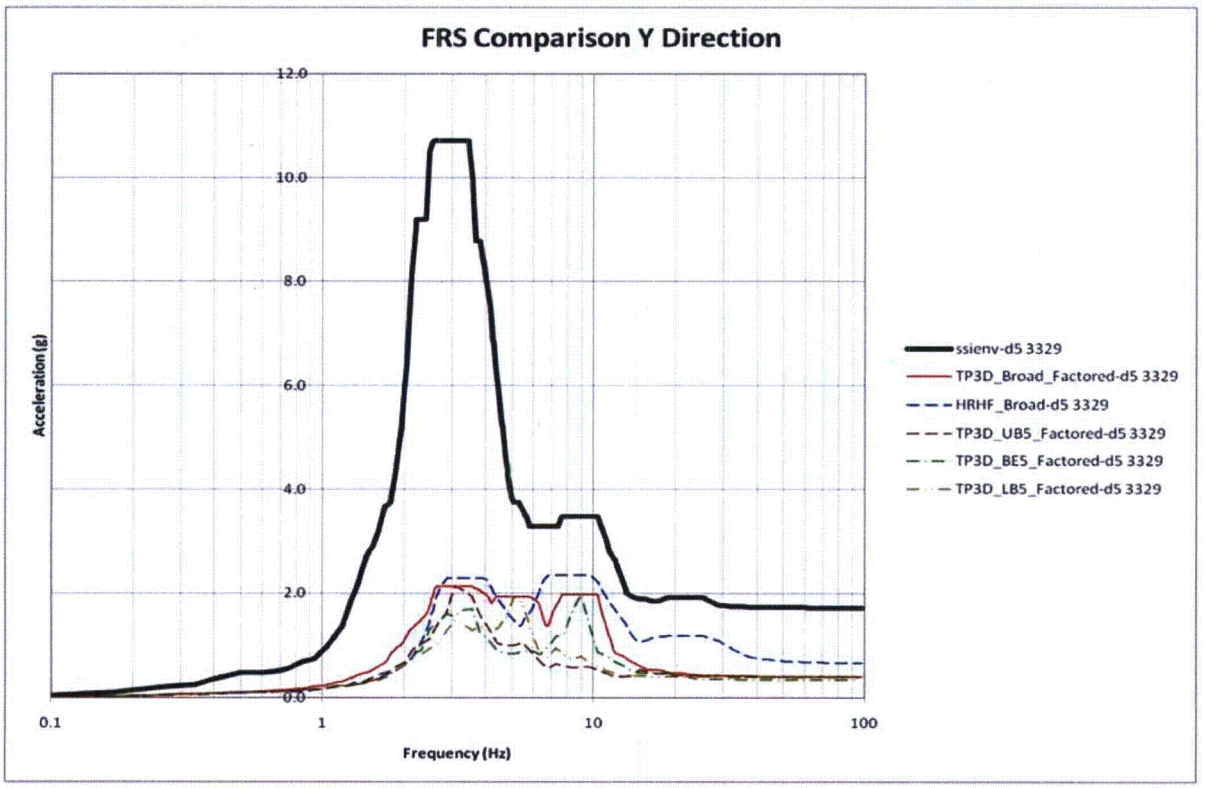

Figure 6.2-17

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Y-Direction – Node 3329

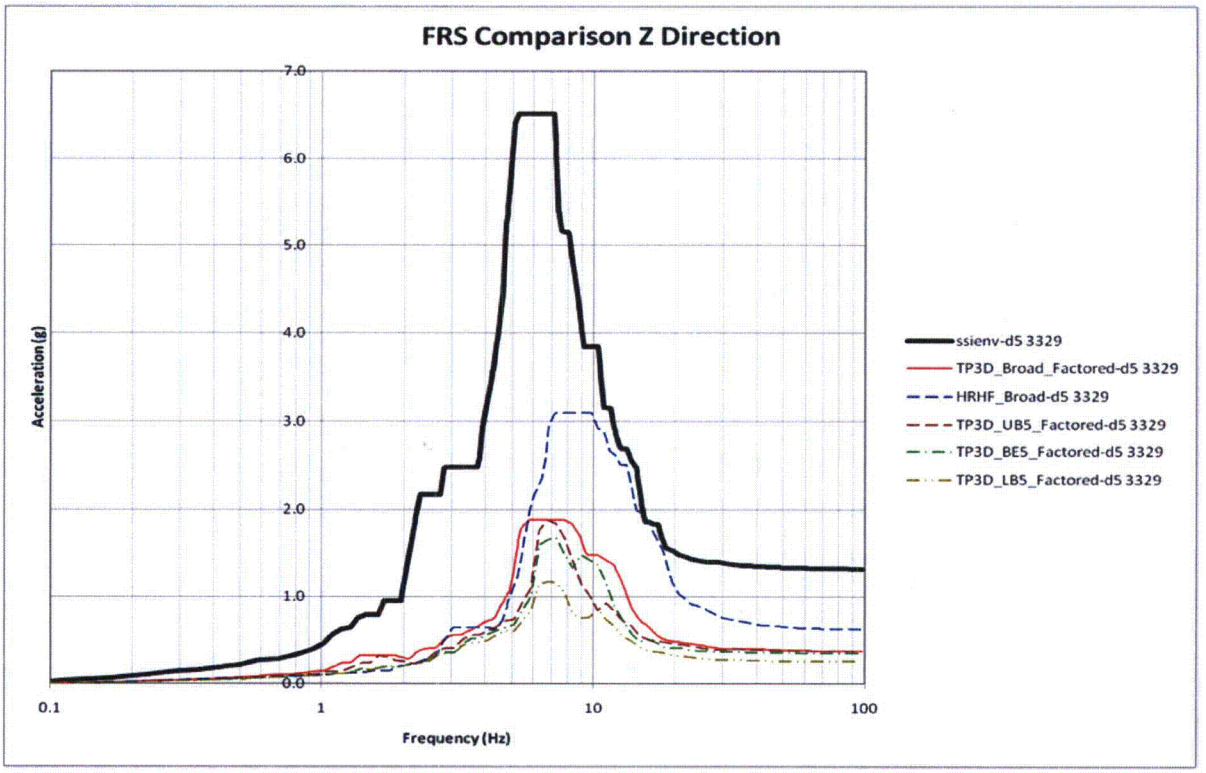

Figure 6.2-18

TPNP 3D BE, LB, UB FRS and AP1000 FRS Envelope in Z-Direction – Node 3329

Part B: Evaluation of Grouted Rock on Seismic Site Response

At the Turkey Point Units 6 & 7 site, the groundwater table is located around El. 0 feet (NAVD 88); therefore, significant dewatering is needed to draw the water level temporarily to below El. -35 feet to allow concrete fill placement and the NI foundation construction. Concrete fill will be placed underneath the base of the NI foundation from El. -15 to El. -35 feet with the base of the NI foundation at El. -15 feet. Since the Key Largo and Fort Thompson Limestone formations below El. -35 feet are highly permeable, a reinforced concrete diaphragm wall will be placed around the NI footprint to about El. 60 feet to prevent water entering laterally during dewatering. However, this does not provide a barrier for water directly below the NI footprint. Therefore, grouting is planned in the zone within the diaphragm wall from El. -35 feet to El. -60 feet to provide a barrier against upward water intrusion from the base. Additional discussion of the grouting plans is provided in FSAR Subsection 2.5.4.6.2.

An evaluation of grouting between El. -35 feet and El. -60 feet indicated that while the unit weight of grouted rock would increase (155 pcf) compared to the in-situ materials (137 pcf), the shear wave velocity of the grouted rock remains nearly unchanged. The low strain shear and elastic modulus values increase in proportion to the increase in unit weight of the grouted rock. Seismic site response sensitivity analyses were conducted to examine the effect of the change in properties of the grouted layers underneath the NI on the strain-compatible properties and acceleration response spectra at the ground level and NI foundation level. The analyses show that the effect of the grouted rock on the strain-compatible properties is minimal. Similarly, the sensitivity analyses show that the effect of the grouted rock on the ground surface and NI foundation level acceleration response spectra results in slightly lower response spectra. Thus, the response spectra computed without grouted properties is slightly conservative. Based on these analyses it was concluded that the FIRS at the NI foundation elevation and at the ground surface developed without considering the grout effect are valid for use in seismic design and evaluation.

As described in FSAR Subsection 3JJ.4, the design basis SSI strain-compatible soil profiles are developed for two soil columns representing the near field, NI, and far field, FAR, site conditions. The aforementioned sensitivity analyses indicated only minimal changes to the nonlinear properties due to the changes in the unit weight of the grouted rock. For this reason, only the unit weight is modified for the grouted layers when compared with the design basis SSI soil properties. The grouted rock layers are only in the vicinity of the NI, thus only the SSI strain-compatible properties for the NI soil profile are modified as a result of grouting.

The sensitivity analyses also concluded that the acceleration time histories, previously developed at the foundation of the NI without taking the effect of the grouted layers into consideration, are also valid for use with the SSI soil profiles that include the properties of the grouted layers. Further discussion on the effect of the grouted rock on the seismic site response will be added to Subsection 3JJ.4 as shown in the Associated COLA Revisions section of this response.

Part C: Sensitivity Assessment of Updated Site Characterization on Site Response and Strain Compatible Properties

Additional data collected through supplemental site investigations at the Turkey Point Units 6 & 7 site was used to refine the properties of the NI and FAR site profiles. The additional data resulted in updated recommendations on the unit weight, thicknesses, nonlinear curves, S-wave velocity and P wave velocity for layers within the top 636 ft. A series of sensitivity analyses were performed to understand the influence of these updated properties on the GMRS (horizontal), FIRS, and SSI inputs.

In the sensitivity assessments, the profiles based on the initial and updated site properties were considered. For each profile the site response was computed as the average of the lower-bound (LB), best-estimate (BE), and upper-bound (UB) S-wave velocity profiles. These results were compared with the initial site response analyses which used 60 simulated profiles to rigorously capture the uncertainty in the site properties. The response spectra were developed by adjusting the initial response spectra by a ratio of the newly computed response spectra, which were computed with just three profiles (i.e., LB, BE, and UB). The ratio was smoothed and limited to be greater than unity. Only best-estimate strain-compatible properties were developed due to the limited number of profiles considered in the sensitivity analyses.

The results from these sensitivity assessments indicate the following:

- The RG 1.60 spectra with a PGA of 0.1 g envelopes the sensitivity NI FIRS developed using limited number of soil column analysis with updated site properties as shown in Figure C-1. Thus, the previously established SSE is still valid, which was partially based on the RG 1.60 spectra with a PGA of 0.1g as described in FSAR Appendix 3KK.
- The sensitivity horizontal GMRS developed based on the updated site properties and limited number of soil column analysis is slightly higher than the performance-based GMRS developed under a rigorous process as described in FSAR Subsection 2.5.2.6 (see Figure C-2). The sensitivity horizontal GMRS increased from 0.058g to 0.062g at a frequency of 100 Hz (a ratio of 1.07); with a maximum ground-motion change from 0.0635g to 0.0698g (a ratio of 1.10) at a frequency of 45 Hz. Although the ratio of these differences may indicate a significant change due to the updated site properties, the ground-motion difference of 0.004g at a frequency of 100 Hz, and 0.006g at a frequency of 45 Hz is well within the confidence bounds of probabilistic seismic hazard analysis (PSHA) and seismic site response. Therefore, the GMRS developed based on initial and updated site properties both characterize Turkey Point Units 6 & 7 site as a site with low seismic hazard.

The sensitivity assessments performed provide approximate ground motions and SSI properties used in further sensitivity evaluations of the site-specific SSI analyses as described under Part D of this RAI response. Further details of the sensitivity assessments performed are provided in the Associated COLA Revisions section of this response in a new Subsection 3JJ.7.

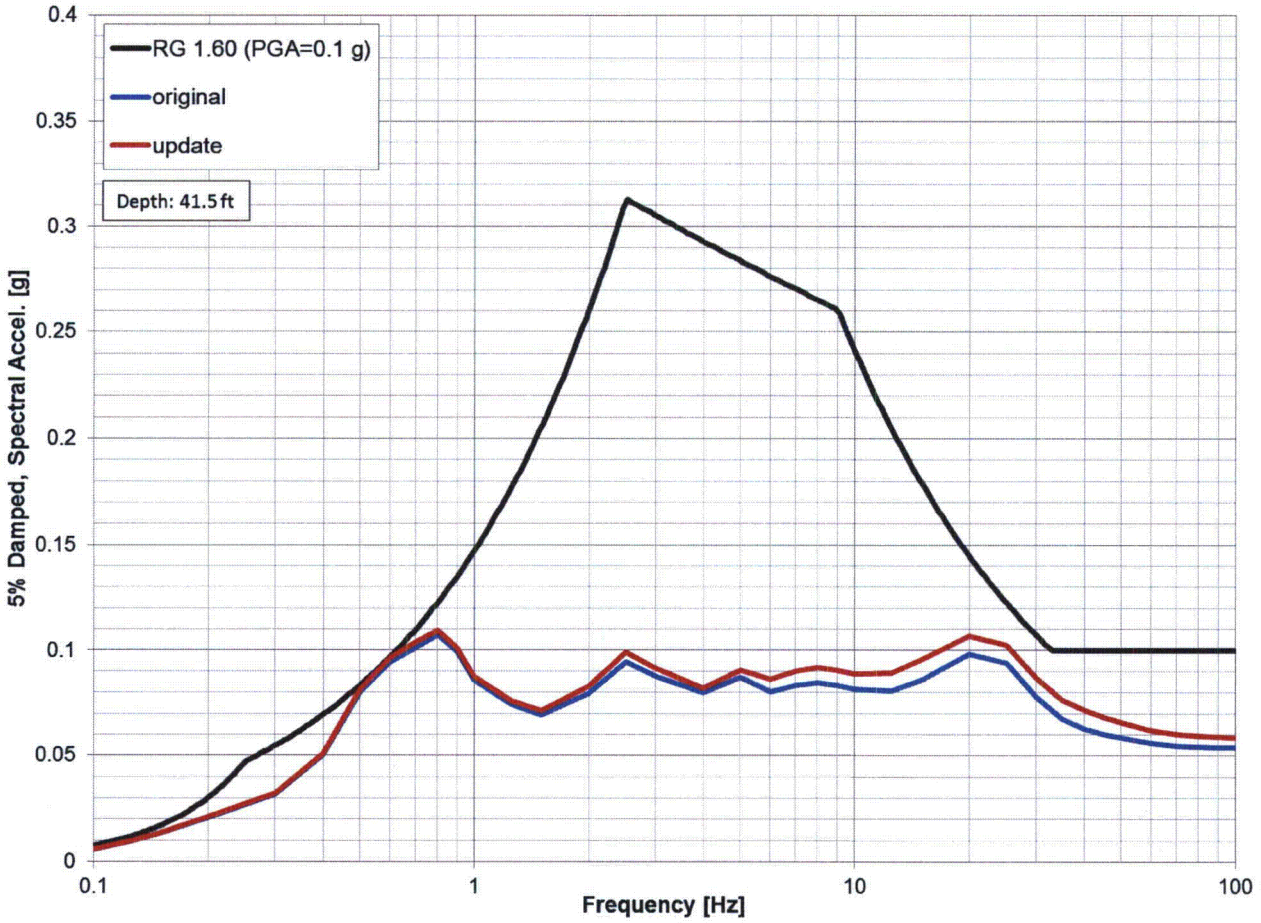

Figure C-1

Comparison between the NI FIRS Computed with the Approximate Updated and the Initial Analyses (NI Profile)

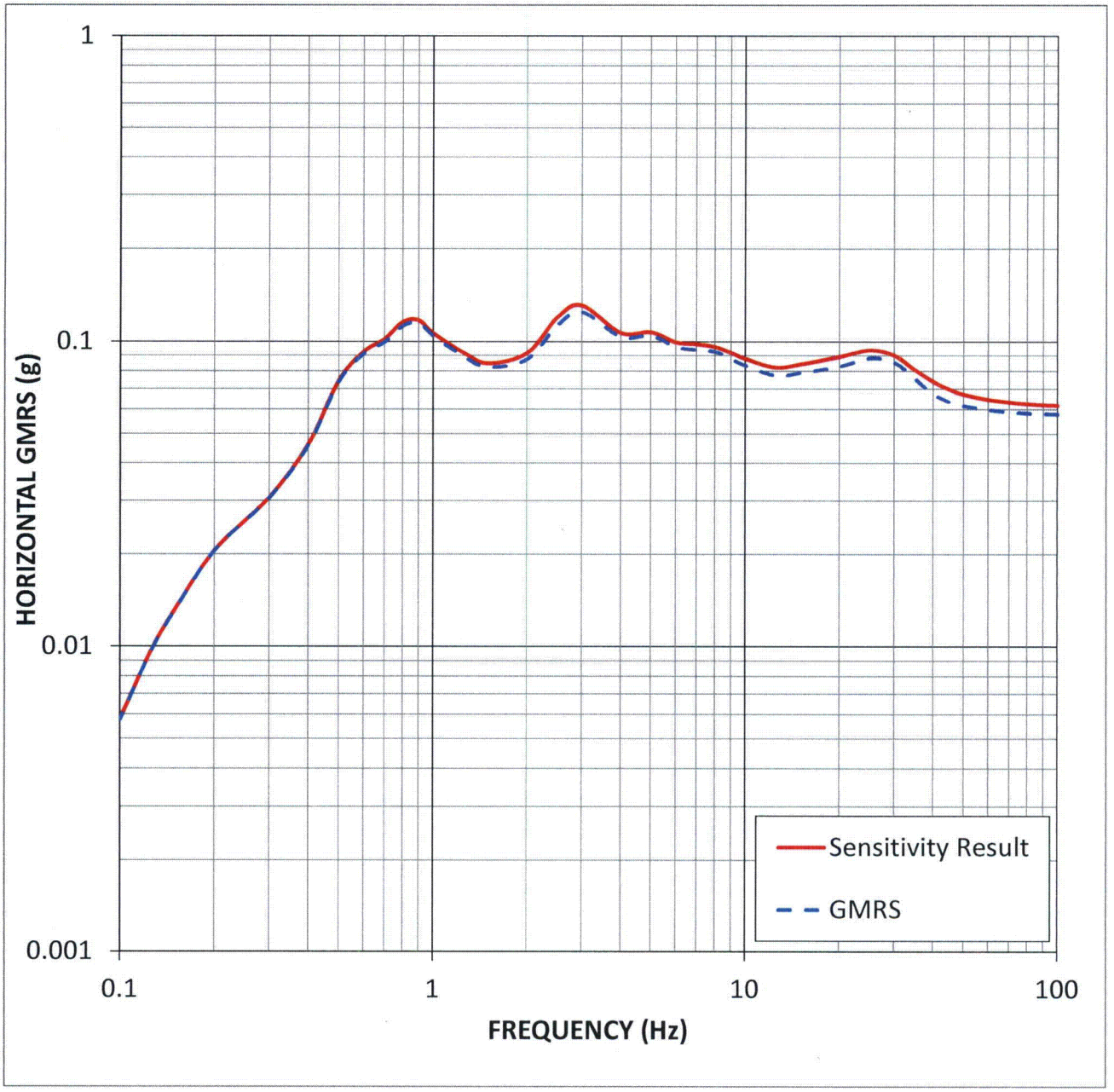

Figure C-2
Sensitivity Result Showing the Effect on the 5% Damped Horizontal GMRS of an Updated Soil Column

Part D: Sensitivity Evaluation of Updated Site Characterization on SSI Analyses

Part D.1 – Sensitivity Evaluation of Updated Site Characterization on NI SSI Analysis

In 2013, a supplemental site subsurface investigation was performed at the Turkey Point Units 6 & 7 (Turkey Point) site. The additional site characterization data was used to update the site profile (S-wave velocity, layer thickness, and unit weight), as well as the nonlinear curves (G/Gmax and damping ratio). In 2014, Bechtel subsequently evaluated the sensitivity of the updated site properties on the GMRS, FIRS, and soil-structure interaction (SSI) properties on both near NI and FAR profiles as described in Parts B and C, and provided updated SSI best-estimate (BE) soil/rock properties for further seismic SSI sensitivity analysis for the NI and Seismic Category (SC) II Turbine Building First Bay and Annex Building adjacent structures. A summary of the SSI sensitivity analyses for the Nuclear Island (NI) and Seismic Category (SC) II adjacent structures performed by Westinghouse Electric Company (WEC) is presented below in Parts D.1 and D.2, respectively, and a complete detailed description of the corresponding analyses are presented in TPG-1000-S2R-802 Rev. 6 (Appendix 3KK), specifically Appendixes E and F.

Updated three-dimensional (3D) SASSI SSI sensitivity analyses of the Nuclear Island were performed utilizing the updated site characterization data and included both the initial and updated strain compatible BE soil/rock, grouted rock and lean concrete fill properties. The initial and updated BE NI and FAR layer thickness, unit weight, shear wave velocity (Vs), compression wave velocity (Vp) and damping values, from the ground surface to the simulated half-space at a depth of about 600 feet are presented in Tables D.1-1 to D.1-6. Figures D.1-1 through D.1-6 graphically present the TPNP Vs, Vp and damping profiles over the approximately 600-foot depth.

SSI sensitivity analyses were performed to calculate the updated in-structure FRS at the six (6) key NI locations shown in Table D.1-7, which are compared to assess the validity of the more rigorously derived SSI seismic input and initial design-basis SSI analyses results described in Part A of this response to RAI 03.07.01-15.

The Turkey Point sensitivity time history SSI analyses were carried out using the site specific BE seismic input and updated BE soil/rock, grouted rock and lean concrete properties, and the resulting FRS are compared to the previous FRS results, as well as the 3D AP1000 CSDRS and HRHF FRS envelopes at the six (6) key NI locations defined in Table D.1-7.

The Turkey Point NI acceleration time histories are shown in Figures 3.5-1 to 3.5-3 of TPG-1000-S2R-802 Rev. 6; however, only the NI BE time histories are used for this analysis. For comparison, dynamic material properties for the lean concrete, grouted rock and engineered fill side soil for the previous and updated BE cases are presented in Tables D.1-5 and D.1-6, respectively. As shown, the updated material properties are only minor variations of the previous dynamic material properties.

Time history seismic analyses for the updated Turkey Point BE case were performed in two horizontal and one vertical direction. The top of lean concrete mat (El. -16) input time histories were used in SASSI with the SASSI Direct method of analysis. FRS for 5 percent damping were obtained at the six key NI locations shown in Table D.1-7.

Figures D.1-7 through D.1-24 present the comparison of the horizontal and vertical Turkey Point 3D Design-Basis Factored (TP3D BE R5) FRS and the updated SSI sensitivity analysis

(TP3D BE R6 Sensitivity) FRS, which are also compared to the previous 3D TPNP BE, LB and UB Broadened FRS envelope, and the AP1000 CSDRS and HRHF design FRS envelopes at the six (6) key locations. The HRHF FRS envelope is presented to demonstrate that additional and significant margin exists at the key nodes in the high frequency range (20-50 Hz).

As shown, the updated sensitivity analysis BE FRS are very similar to, negligibly effect the previous BE FRS, and are enveloped by the AP1000 FRS envelopes at each of the six key NI locations with margin.

Therefore, based on the results of the Turkey Point 3D NI SSI sensitivity analyses presented in Part D.1 and comparisons with the design-basis analysis results presented in Part A at the 6 key NI locations, the effect of the updated site characterization and site response at Turkey Point Units 6&7 on the NI response is considered negligible. Therefore, the design-basis results and conclusions presented in TPG-1000-S2R-802 Rev. 6, specifically Section 6.2, Figures 6.2-1 through 6.2-18, and Section 7.0, respectively are considered still valid.

Table D.1-1: Best-estimate NI SSI profile from 25409-000-K0C-0000-00066

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
1	5.00	0.130	610.4	1142.0	2.72
2	5.00	0.130	715.7	1339.0	3.83
3	5.00	0.130	756.7	1415.7	4.59
4	5.00	0.130	756.6	1415.5	5.21
5	5.00	0.130	761.9	1425.3	5.74
6	5.50	0.130	728.5	3714.7	6.42
7	6.00	0.130	721.1	3676.9	6.83
8	5.00	0.130	726.7	3705.4	7.10
9	6.33	0.150	5518.5	8600.0	1.05
10	6.33	0.150	5518.5	8600.0	1.05
11	6.33	0.150	5518.5	8600.0	1.05
12	6.00	0.136	5674.2	8842.7	0.99
13	10.00	0.136	5781.3	10815.9	0.99
14	10.00	0.136	5449.9	10015.8	0.99
15	10.00	0.136	4858.1	9006.7	0.99
16	10.00	0.136	4768.7	9622.9	0.99
17	10.00	0.136	4712.1	9446.3	0.99
18	10.00	0.136	4670.9	9223.8	0.99
19	10.00	0.136	4559.3	9080.0	0.99
20	10.00	0.136	1847.0	5000.0	0.99
21	10.00	0.120	1469.6	5000.0	1.89
22	10.00	0.120	1531.8	6388.5	1.82
23	10.00	0.120	1532.4	5079.2	1.84
24	10.00	0.120	1596.1	6309.2	1.70
25	10.00	0.120	1606.9	5860.8	1.69
26	10.00	0.120	1622.1	5640.3	1.67
27	10.00	0.120	1626.0	5819.6	1.68
28	10.00	0.120	1647.0	5981.3	1.67
29	10.00	0.120	1734.7	6059.5	1.57
30	10.00	0.120	1941.1	6303.2	1.38
31	10.00	0.120	1958.5	5563.6	1.37
32	10.00	0.120	1886.2	5085.9	1.43
33	10.00	0.120	1839.0	5698.6	1.48
34	10.00	0.120	1754.1	5082.1	1.57
35	10.00	0.120	1679.1	5410.9	1.65
36	10.00	0.120	1675.0	5880.4	1.66
37	10.00	0.120	1608.9	5533.7	1.75
38	10.00	0.120	1558.7	5021.6	1.82
39	10.00	0.120	1554.7	5327.5	1.82
40	10.00	0.120	1518.3	5163.6	1.89
41	10.00	0.120	1445.0	5000.0	2.02
42	10.00	0.120	1440.3	5650.4	2.03
43	10.00	0.120	1439.7	5745.5	2.03

Table D.1-1: Best-estimate NI SSI profile from 25409-000-K0C-0000-00066 (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
44	10.00	0.120	1438.1	5682.1	2.04
45	10.00	0.120	1437.8	5615.5	2.04
46	10.00	0.120	1424.5	5629.8	2.07
47	10.00	0.120	1416.2	5707.3	2.09
48	10.00	0.120	1407.5	5360.2	2.12
49	10.00	0.120	1398.7	5599.0	2.14
50	10.00	0.120	1394.9	5438.2	2.16
51	10.00	0.120	1395.3	5586.8	2.18
52	10.00	0.120	1390.5	5588.1	2.19
53	10.00	0.120	1389.8	5582.4	2.21
54	10.00	0.130	3911.1	15710.3	0.79
55	10.00	0.130	3910.9	15709.5	0.80
56	10.00	0.130	3910.6	8543.3	0.81
57	10.00	0.130	3910.1	7713.9	0.82
58	10.00	0.130	3897.2	7895.1	0.83
59	10.00	0.130	3886.0	7881.0	0.85
60	10.00	0.130	3866.8	8006.0	0.85
61	10.00	0.130	3839.6	8011.6	0.86
62	10.00	0.130	3789.4	7637.4	0.87
63	10.00	0.130	3778.8	7913.5	0.89
64	10.00	0.130	3568.7	7860.7	0.93
65	10.00	0.130	3407.3	7719.2	0.97
66	10.00	0.130	3151.4	7436.6	1.04
67	10.00	0.130	3158.5	7682.8	1.04
68	10.00	0.130	3189.4	7486.7	1.03
69	10.00	0.130	3381.8	7493.4	1.00
70	10.00	0.130	3529.0	7346.1	0.96
71	64.00	0.130	4308.0	8967.7	0.29
72	100.00	0.130	4304.4	8960.4	0.29
73	200.00	0.130	4483.1	9105.3	0.29
74	200.00	0.130	4895.2	9514.6	0.29
75	200.00	0.130	5131.4	9600.0	0.29
76	200.00	0.130	5375.9	10057.4	0.29
77	200.00	0.130	5640.4	10552.3	0.29
78	200.00	0.130	5665.1	10598.5	0.29
79	200.00	0.130	6496.8	12154.4	0.29
80	200.00	0.130	6705.9	12545.6	0.29
81	200.00	0.130	6771.8	12668.9	0.29
82	200.00	0.130	6771.8	12668.9	0.29
83	200.00	0.130	6779.1	12682.6	0.29
84	200.00	0.130	6717.1	12566.6	0.29
85	200.00	0.130	6724.7	12580.8	0.29
86	200.00	0.130	6724.7	12580.8	0.29
87	200.00	0.130	6756.6	12640.4	0.29

Table D.1-1: Best-estimate NI SSI profile from 25409-000-K0C-0000-00066 (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
88	200.00	0.130	8996.6	16831.0	0.29
89	200.00	0.130	9050.7	16932.3	0.29
90	200.00	0.130	9132.9	17086.1	0.29
91	200.00	0.130	9113.1	17049.0	0.29
92	200.00	0.130	8800.1	16463.4	0.29
93	200.00	0.130	8750.5	16370.7	0.29
94	200.00	0.130	8444.8	15798.7	0.29
95	200.00	0.130	8119.4	15190.0	0.29
96	200.00	0.130	8034.9	15032.0	0.29
97	200.00	0.130	7967.0	14904.9	0.29
98	200.00	0.130	7755.8	14509.8	0.29
99	200.00	0.130	7761.2	14519.8	0.29
100	200.00	0.130	7676.3	14361.0	0.29
101	200.00	0.130	7678.0	14364.3	0.29
102	200.00	0.130	7673.1	14355.0	0.29
103	200.00	0.130	7616.5	14249.2	0.29
104	200.00	0.130	7601.7	14221.5	0.29
105	200.00	0.130	7755.0	14508.2	0.29
106	200.00	0.130	7827.7	14644.2	0.29
107	200.00	0.130	7812.5	14615.9	0.29
108	200.00	0.130	7823.1	14635.6	0.29
109	200.00	0.130	7953.1	14878.8	0.27
110	200.00	0.130	7953.1	14878.8	0.27
111	200.00	0.130	7967.0	14904.9	0.27
112	200.00	0.130	8059.6	15078.2	0.26
113	200.00	0.130	8276.7	15484.3	0.25
114	200.00	0.130	8394.8	15705.3	0.26
115	200.00	0.130	8499.1	15900.4	0.25
116	200.00	0.130	8499.1	15900.4	0.25
117	200.00	0.130	8632.8	16150.6	0.24
118	200.00	0.130	8683.6	16245.5	0.24
119	200.00	0.130	8629.9	16145.1	0.24
120	200.00	0.130	8655.0	16191.9	0.25
121	200.00	0.130	8684.4	16247.0	0.25
122	200.00	0.130	8749.0	16367.9	0.25
123	200.00	0.130	8749.0	16367.9	0.25
124	200.00	0.130	8760.9	16390.2	0.25
125	200.00	0.130	8726.0	16324.9	0.22
126	--	0.170	9200.0	17211.6	1.00

Note: % = percent; ft. = feet; ft/sec = feet per second; kcf = kips per cubic foot; SSI = soil structure interaction

Table D.1-2: Best-estimate NI SSI Properties for the "Updated" Profile

The strain compatible properties are struck through to indicate that they are not recommended for use.

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
1	5	0.130	~~519.0~~	~~971.0~~	~~3.17~~
2	5	0.130	~~607.3~~	~~1136.1~~	~~4.47~~
3	5	0.130	~~633.0~~	~~1184.2~~	~~5.57~~
4	5	0.130	~~649.7~~	~~1215.4~~	~~6.32~~
5	5	0.130	~~665.4~~	~~1244.8~~	~~6.73~~
6	5.2	0.130	~~667.5~~	~~3403.7~~	~~7.13~~
7	6.3	0.130	~~682.6~~	~~3480.7~~	~~7.35~~
8	5	0.130	~~684.7~~	~~3491.5~~	~~7.60~~
9	9	0.150	5000.0	7791.9	1.00
10	10	0.150	5000.0	7791.9	1.00
11	6	0.137	5554.5	10724.8	1.00
12	8.4	0.137	6860.2	12666.1	0.80
13	1.6	0.137	6847.9	12643.4	0.80
14	10	0.137	5715.6	10802.1	0.80
15	10	0.137	4676.9	9604.0	0.80
16	10	0.137	4462.0	9231.9	0.83
17	10	0.137	4541.8	9127.3	0.80
18	10	0.137	4241.7	8621.6	0.83
19	10	0.137	4428.3	8541.7	0.80
20	4.4	0.137	2521.5	6682.9	1.03
21	5.6	0.119	2538.1	6726.9	0.82
22	10	0.119	1117.0	5000.0	1.58
23	10	0.119	1667.5	5572.4	1.09
24	10	0.119	1271.1	5019.5	1.39
25	10	0.119	1419.8	5357.3	1.23
26	6.6	0.119	1601.7	5541.7	1.10
27	3.4	0.117	1596.1	5522.4	1.10
28	10	0.117	1524.6	5469.3	1.20
29	10	0.117	1507.9	5449.6	1.20
30	10	0.117	1558.6	5505.5	1.16
31	10	0.117	1702.9	5581.4	1.10
32	6.8	0.117	2089.8	6108.1	0.93
33	3.2	0.121	2090.4	6110.0	0.93
34	10	0.121	2333.6	6414.5	0.87
35	10	0.121	1988.7	5955.9	0.96
36	10	0.121	1988.5	5941.1	0.96
37	10	0.121	1812.2	5807.8	1.00
38	10	0.121	1576.2	5610.5	1.16
39	10	0.121	1635.8	5639.9	1.10
40	10	0.121	1754.7	5752.9	1.06

Table D.1-2: Best-estimate NI SSI Properties for the "Updated" Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
41	10	0.121	1702.9	5770.6	1.10
42	10	0.121	1655.5	5655.7	1.10
43	10	0.121	1537.7	5500.6	1.20
44	10	0.121	1375.0	5528.3	1.33
45	10	0.121	1366.1	5382.2	1.33
46	10	0.121	1348.3	5450.3	1.33
47	10	0.121	1414.4	5517.1	1.30
48	10	0.121	1408.6	5506.8	1.30
49	10	0.121	1359.4	5447.9	1.33
50	10	0.121	1413.7	5481.1	1.33
51	10	0.121	1358.2	5422.1	1.33
52	10	0.121	1367.6	5376.9	1.33
53	10	0.121	1377.6	5441.6	1.33
54	10	0.121	1389.7	5464.9	1.33
55	10	0.121	1379.7	5430.1	1.36
56	10	0.121	1369.2	5284.9	1.39
57	3.8	0.121	3985.4	8755.7	0.70
58	6.2	0.129	3993.8	8774.2	0.70
59	10	0.129	3993.4	8773.4	0.70
60	10	0.129	4214.3	8415.3	0.70
61	10	0.129	3779.1	7657.4	0.73
62	10	0.129	3923.9	7963.1	0.73
63	10	0.129	3887.4	8056.2	0.73
64	10	0.129	3921.9	8197.4	0.73
65	10	0.129	3814.6	7772.5	0.73
66	10	0.129	3887.5	8007.2	0.73
67	10	0.129	3544.3	7748.2	0.77
68	10	0.129	3415.5	7685.4	0.77
69	10	0.129	3011.5	7131.8	0.83
70	10	0.129	3031.3	7264.3	0.83
71	10	0.129	3084.8	7348.5	0.83
72	10	0.129	3633.8	8119.1	0.77
73	10	0.129	3289.1	7747.8	0.83
74	64	0.130	4027.0	8382.9	0.30
75	100	0.130	4071.0	8474.5	0.30
76	200	0.130	4356.0	8847.1	0.30
77	200	0.130	4878.0	9481.1	0.30
78	200	0.130	5080.0	9503.8	0.30
79	200	0.130	5396.0	10095.0	0.30
80	200	0.130	5700.0	10663.7	0.30
81	200	0.130	5700.0	10663.7	0.30
82	200	0.130	6500.0	12160.4	0.30
83	200	0.130	6769.0	12663.6	0.30
84	200	0.130	6900.0	12908.7	0.30

Table D.1-2: Best-estimate NI SSI Properties for the "Updated" Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
85	200	0.130	6950.0	13002.3	0.30
86	200	0.130	6800.0	12721.6	0.30
87	200	0.130	6450.0	12066.8	0.30
88	200	0.130	6400.0	11973.3	0.30
89	200	0.130	6403.0	11978.9	0.30
90	200	0.130	6518.0	12194.1	0.30
91	200	0.130	8397.0	15709.3	0.30
92	200	0.130	8821.0	16502.6	0.30
93	200	0.130	9273.0	17348.2	0.30
94	200	0.130	9834.0	18397.7	0.30
95	200	0.130	9152.0	17121.8	0.30
96	200	0.130	8995.0	16828.1	0.30
97	200	0.130	8670.0	16220.1	0.30
98	200	0.130	8229.0	15395.1	0.30
99	200	0.130	7993.0	14953.5	0.30
100	200	0.130	7908.0	14794.5	0.30
101	200	0.130	7607.0	14231.4	0.30
102	200	0.130	7511.0	14051.8	0.30
103	200	0.130	7340.0	13731.9	0.30
104	200	0.130	7222.0	13511.1	0.30
105	200	0.130	7207.0	13483.1	0.30
106	200	0.130	7063.0	13213.7	0.30
107	200	0.130	7118.0	13316.6	0.30
108	200	0.130	7584.0	14188.4	0.30
109	200	0.130	7787.0	14568.1	0.30
110	200	0.130	7822.0	14633.6	0.30
111	200	0.130	7741.0	14482.1	0.30
112	200	0.130	8256.0	15445.6	0.30
113	200	0.130	8219.0	15376.3	0.30
114	200	0.130	8120.0	15191.1	0.30
115	200	0.130	8388.0	15692.5	0.30
116	200	0.130	8905.0	16659.7	0.30
117	200	0.130	9265.0	17333.2	0.30
118	200	0.130	9073.0	16974.0	0.30
119	200	0.130	9227.0	17262.1	0.30
120	200	0.130	9629.0	18014.2	0.30
121	200	0.130	9938.0	18592.3	0.30
122	200	0.130	9652.0	18057.2	0.30
123	200	0.130	8777.0	16420.3	0.30
124	200	0.130	8955.0	16753.3	0.30
125	--	0.170	9200.0	17211.6	1.00

Note: % = percent; ft. = feet; ft/sec = feet per second; kcf = kips per cubic foot; SSI = soil structure interaction

Table D.1-3: Best-estimate FAR SSI profile from 25409-000-K0C-0000-00066

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
1	5.0	0.130	729.1	1364.0	2.40
2	5.0	0.130	802.4	1501.1	3.46
3	5.0	0.130	775.4	1450.7	4.45
4	5.0	0.130	769.2	1439.1	5.16
5	5.0	0.130	735.1	1375.2	5.90
6	5.5	0.130	718.8	3665.2	6.48
7	6.0	0.125	2680.5	7458.3	0.62
8	5.0	0.125	4735.1	10085.5	0.62
9	5.0	0.125	4735.1	10085.5	0.62
10	10.0	0.125	5053.1	9998.6	0.62
11	4.0	0.136	5658.6	10552.7	0.95
12	6.0	0.136	5680.4	10593.4	0.95
13	10.0	0.136	5728.9	10528.6	0.95
14	10.0	0.136	5426.4	10060.1	0.95
15	10.0	0.136	4784.2	9654.2	0.95
16	10.0	0.136	4762.5	9547.3	0.95
17	10.0	0.136	4704.8	9290.7	0.95
18	10.0	0.136	4633.9	9228.5	0.95
19	10.0	0.136	4613.8	8919.6	0.95
20	10.0	0.136	1681.1	5000.0	0.95
21	10.0	0.120	1325.7	5529.0	2.07
22	10.0	0.120	1461.8	5000.0	1.85
23	10.0	0.120	1460.0	5771.2	1.86
24	10.0	0.120	1550.5	5655.0	1.83
25	10.0	0.120	1555.3	5408.0	1.83
26	10.0	0.120	1585.5	5674.8	1.79
27	10.0	0.120	1592.6	5783.7	1.79
28	10.0	0.120	1627.3	5684.2	1.74
29	10.0	0.120	1690.4	5489.3	1.67
30	10.0	0.120	1932.9	5490.7	1.42
31	10.0	0.120	1934.3	5215.4	1.42
32	10.0	0.120	1876.8	5815.8	1.47
33	10.0	0.120	1810.8	5246.1	1.54
34	10.0	0.120	1783.9	5748.3	1.57
35	10.0	0.120	1712.5	6012.2	1.67
36	10.0	0.120	1701.6	5852.2	1.69
37	10.0	0.120	1629.9	5250.9	1.80
38	10.0	0.120	1611.5	5522.2	1.83
39	10.0	0.120	1611.3	5480.1	1.83
40	10.0	0.120	1575.2	5436.3	1.90
41	10.0	0.120	1493.4	5858.7	2.03
42	10.0	0.120	1458.8	5821.9	2.10
43	10.0	0.120	1439.1	5685.9	2.13

Table D.1-3: Best-estimate FAR SSI profile from 25409-000-K0C-0000-00066 (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
44	10.0	0.120	1433.2	5597.5	2.14
45	10.0	0.120	1432.9	5663.1	2.15
46	10.0	0.120	1417.6	5712.8	2.19
47	10.0	0.120	1407.9	5361.7	2.21
48	10.0	0.120	1404.4	5621.5	2.23
49	10.0	0.120	1406.9	5485.2	2.23
50	10.0	0.120	1420.1	5685.9	2.23
51	10.0	0.120	1415.2	5687.4	2.25
52	10.0	0.120	1412.2	5672.7	2.28
53	10.0	0.120	1411.4	5669.4	2.29
54	10.0	0.130	3911.9	15713.4	0.85
55	10.0	0.130	3911.7	8545.8	0.85
56	10.0	0.130	3911.3	7716.3	0.85
57	10.0	0.130	3910.7	7922.5	0.86
58	10.0	0.130	3845.3	7798.5	0.88
59	10.0	0.130	3829.2	7928.1	0.89
60	10.0	0.130	3826.2	7983.7	0.90
61	10.0	0.130	3747.4	7552.8	0.92
62	10.0	0.130	3746.0	7844.7	0.92
63	10.0	0.130	3488.1	7683.3	0.99
64	10.0	0.130	3369.4	7633.4	1.02
65	10.0	0.130	3240.5	7646.8	1.05
66	10.0	0.130	3225.9	7846.8	1.07
67	10.0	0.130	3272.2	7681.1	1.06
68	10.0	0.130	3484.3	7720.5	1.02
69	10.0	0.130	3608.3	8500.0	1.00
70	64.0	0.130	4184.5	8710.7	0.30
71	100.0	0.130	4225.7	8796.6	0.30
72	200.0	0.130	4448.1	9034.0	0.30
73	200.0	0.130	5043.4	9802.5	0.30
74	200.0	0.130	5282.7	9883.1	0.30
75	200.0	0.130	5498.6	10287.0	0.30
76	200.0	0.130	5670.7	10609.0	0.30
77	200.0	0.130	5670.7	10609.0	0.30
78	200.0	0.130	6325.5	11833.9	0.30
79	200.0	0.130	6469.4	12103.1	0.30
80	200.0	0.130	6530.7	12217.8	0.30
81	200.0	0.130	6533.4	12222.8	0.30
82	200.0	0.130	6619.6	12384.2	0.30
83	200.0	0.130	6581.8	12313.5	0.30
84	200.0	0.130	6575.4	12301.5	0.30
85	200.0	0.130	6575.4	12301.5	0.30
86	200.0	0.130	6637.5	12417.6	0.30
87	200.0	0.130	8875.7	16605.0	0.30

Table D.1-3: Best-estimate FAR SSI profile from 25409-000-K0C-0000-00066 (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
88	200.0	0.130	8974.3	16789.3	0.30
89	200.0	0.130	9070.2	16968.7	0.30
90	200.0	0.130	9037.4	16907.5	0.30
91	200.0	0.130	8822.5	16505.4	0.30
92	200.0	0.130	8696.8	16270.1	0.30
93	200.0	0.130	8373.1	15664.7	0.30
94	200.0	0.130	8043.4	15047.7	0.30
95	200.0	0.130	7829.9	14648.3	0.30
96	200.0	0.130	7767.4	14531.6	0.30
97	200.0	0.130	7501.9	14034.8	0.30
98	200.0	0.130	7457.2	13951.2	0.30
99	200.0	0.130	7395.1	13835.0	0.30
100	200.0	0.130	7408.1	13859.4	0.30
101	200.0	0.130	7408.1	13859.4	0.30
102	200.0	0.130	7414.9	13872.0	0.30
103	200.0	0.130	7384.3	13814.7	0.30
104	200.0	0.130	7509.0	14048.1	0.30
105	200.0	0.130	7600.5	14219.2	0.30
106	200.0	0.130	7615.6	14247.5	0.30
107	200.0	0.130	7736.9	14474.4	0.30
108	200.0	0.130	7924.8	14825.9	0.30
109	200.0	0.130	7924.8	14825.9	0.30
110	200.0	0.130	7968.8	14908.3	0.30
111	200.0	0.130	8046.5	15053.6	0.29
112	200.0	0.130	8237.9	15411.7	0.28
113	200.0	0.130	8304.3	15536.0	0.27
114	200.0	0.130	8470.7	15847.2	0.28
115	200.0	0.130	8470.7	15847.2	0.28
116	200.0	0.130	8642.6	16168.8	0.30
117	200.0	0.130	8659.8	16201.0	0.31
118	200.0	0.130	8684.6	16247.4	0.31
119	200.0	0.130	8651.9	16186.2	0.30
120	200.0	0.130	8658.5	16198.6	0.30
121	200.0	0.130	8611.3	16110.3	0.30
122	200.0	0.130	8617.2	16121.3	0.29
123	200.0	0.130	8624.9	16135.7	0.29
124	200.0	0.130	8558.5	16011.5	0.29
125	82.0	0.130	8558.5	16011.5	0.29
126	--	0.170	9200.0	17211.6	1.00

Note: % = percent; ft. = feet; ft/sec = feet per second; kcf = kips per cubic foot; SSI = soil structure interaction

Table D.1-4: Best-estimate FAR SSI Properties for the "Updated" Profile

The strain compatible properties are struck through to indicate that they are not recommended for use.

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
1	5	0.130	~~525.9~~	~~983.9~~	~~3.00~~
2	5	0.130	~~618.6~~	~~1157.3~~	~~4.18~~
3	5	0.130	~~650.8~~	~~1217.6~~	~~5.00~~
4	5	0.130	~~672.8~~	~~1258.7~~	~~5.60~~
5	5	0.130	~~693.5~~	~~1297.5~~	~~6.05~~
6	5.2	0.130	~~702.2~~	~~3580.3~~	~~6.37~~
7	6.3	0.125	2258.2	5273.4	0.60
8	5	0.125	3551.2	7526.9	0.60
9	5	0.125	3551.2	7526.9	0.60
10	5.9	0.125	4660.9	9298.6	0.60
11	4.1	0.137	4653.8	9284.5	0.80
12	4	0.137	5547.1	10710.4	0.80
13	6	0.137	5546.5	10709.3	0.80
14	8.4	0.137	6860.5	12666.7	0.80
15	1.6	0.137	6848.5	12644.6	0.80
16	10	0.137	5716.4	10803.5	0.80
17	10	0.137	4677.4	9605.0	0.80
18	10	0.137	4462.4	9232.7	0.83
19	10	0.137	4542.2	9128.1	0.80
20	10	0.137	4242.1	8622.5	0.83
21	10	0.137	4428.7	8542.4	0.80
22	4.4	0.137	2521.5	6683.0	1.03
23	5.6	0.119	2537.6	6725.7	0.82
24	10	0.119	1117.5	5000.0	1.55
25	10	0.119	1667.1	5570.7	1.11
26	10	0.119	1271.2	5020.1	1.39
27	10	0.119	1420.1	5358.0	1.23
28	6.6	0.119	1602.0	5542.8	1.10
29	3.4	0.117	1596.4	5523.2	1.10
30	10	0.117	1524.9	5470.3	1.20
31	10	0.117	1508.2	5451.0	1.20
32	10	0.117	1559.2	5507.4	1.13
33	10	0.117	1703.8	5584.2	1.10
34	6.8	0.117	2090.3	6109.6	0.93
35	3.2	0.121	2091.0	6111.7	0.93
36	10	0.121	2334.3	6416.4	0.87
37	10	0.121	1989.4	5957.9	0.96
38	10	0.121	1989.2	5943.0	0.93
39	10	0.121	1812.9	5810.0	1.00
40	10	0.121	1577.0	5613.3	1.13

Table D.1-4: Best-estimate FAR SSI Properties for the "Updated" Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
41	10	0.121	1636.6	5642.8	1.10
42	10	0.121	1755.4	5755.4	1.03
43	10	0.121	1703.7	5773.3	1.10
44	10	0.121	1656.6	5659.5	1.10
45	10	0.121	1538.8	5504.7	1.20
46	10	0.121	1376.3	5533.2	1.33
47	10	0.121	1367.5	5387.6	1.33
48	10	0.121	1349.8	5456.4	1.33
49	10	0.121	1415.8	5522.7	1.23
50	10	0.121	1409.9	5511.8	1.30
51	10	0.121	1360.6	5452.4	1.33
52	10	0.121	1414.5	5484.2	1.29
53	10	0.121	1359.0	5425.2	1.33
54	10	0.121	1368.1	5379.0	1.33
55	10	0.121	1377.9	5442.8	1.33
56	10	0.121	1389.8	5465.4	1.33
57	10	0.121	1379.9	5431.0	1.39
58	10	0.121	1369.4	5285.7	1.39
59	3.8	0.121	3985.5	8755.9	0.70
60	6.2	0.129	3993.8	8774.4	0.70
61	10	0.129	3993.6	8773.7	0.70
62	10	0.129	4214.5	8415.6	0.70
63	10	0.129	3779.3	7657.9	0.73
64	10	0.129	3924.3	7963.8	0.73
65	10	0.129	3887.8	8057.0	0.73
66	10	0.129	3922.4	8198.3	0.73
67	10	0.129	3815.2	7773.7	0.73
68	10	0.129	3888.2	8008.5	0.73
69	10	0.129	3544.9	7749.5	0.77
70	10	0.129	3416.2	7687.0	0.77
71	10	0.129	3012.3	7133.8	0.83
72	10	0.129	3032.1	7266.2	0.83
73	10	0.129	3085.5	7350.2	0.83
74	10	0.129	3634.4	8120.4	0.77
75	10	0.129	3289.7	7749.1	0.83
76	64	0.130	4027.0	8382.9	0.30
77	100	0.130	4071.0	8474.5	0.30
78	200	0.130	4356.0	8847.1	0.30
79	200	0.130	4878.0	9481.1	0.30
80	200	0.130	5080.0	9503.8	0.30
81	200	0.130	5396.0	10095.0	0.30
82	200	0.130	5700.0	10663.7	0.30
83	200	0.130	5700.0	10663.7	0.30
84	200	0.130	6500.0	12160.4	0.30

Table D.1-4: Best-estimate FAR SSI Properties for the "Updated" Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
85	200	0.130	6769.0	12663.6	0.30
86	200	0.130	6900.0	12908.7	0.30
87	200	0.130	6950.0	13002.3	0.30
88	200	0.130	6800.0	12721.6	0.30
89	200	0.130	6450.0	12066.8	0.30
90	200	0.130	6400.0	11973.3	0.30
91	200	0.130	6403.0	11978.9	0.30
92	200	0.130	6518.0	12194.1	0.30
93	200	0.130	8397.0	15709.3	0.30
94	200	0.130	8821.0	16502.6	0.30
95	200	0.130	9273.0	17348.2	0.30
96	200	0.130	9834.0	18397.7	0.30
97	200	0.130	9152.0	17121.8	0.30
98	200	0.130	8995.0	16828.1	0.30
99	200	0.130	8670.0	16220.1	0.30
100	200	0.130	8229.0	15395.1	0.30
101	200	0.130	7993.0	14953.5	0.30
102	200	0.130	7908.0	14794.5	0.30
103	200	0.130	7607.0	14231.4	0.30
104	200	0.130	7511.0	14051.8	0.30
105	200	0.130	7340.0	13731.9	0.30
106	200	0.130	7222.0	13511.1	0.30
107	200	0.130	7207.0	13483.1	0.30
108	200	0.130	7063.0	13213.7	0.30
109	200	0.130	7118.0	13316.6	0.30
110	200	0.130	7584.0	14188.4	0.30
111	200	0.130	7787.0	14568.1	0.30
112	200	0.130	7822.0	14633.6	0.30
113	200	0.130	7741.0	14482.1	0.30
114	200	0.130	8256.0	15445.6	0.30
115	200	0.130	8219.0	15376.3	0.30
116	200	0.130	8120.0	15191.1	0.30
117	200	0.130	8388.0	15692.5	0.30
118	200	0.130	8905.0	16659.7	0.30
119	200	0.130	9265.0	17333.2	0.30
120	200	0.130	9073.0	16974.0	0.30
121	200	0.130	9227.0	17262.1	0.30
122	200	0.130	9629.0	18014.2	0.30
123	200	0.130	9938.0	18592.3	0.30
124	200	0.130	9652.0	18057.2	0.30
125	200	0.130	8777.0	16420.3	0.30
126	200	0.130	8955.0	16753.3	0.30
127	--	0.170	9200.0	17211.6	1.00

Note: % = percent; ft. = feet; ft/sec = feet per second; kcf = kips per cubic foot; SSI = soil structure interaction

Table D.1-5: NI BE Backfill Soil, Fill Concrete and Grouted Rock Profile – BE Initial

Material	Thickness [feet]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping
Engineered Fill	5.0	0.130	610.4	1142.0	0.027
Engineered Fill	5.0	0.130	715.7	1339.0	0.038
Engineered Fill	5.0	0.130	756.7	1415.7	0.046
Engineered Fill	5.0	0.130	756.6	1415.5	0.052
Engineered Fill	5.0	0.130	761.9	1425.3	0.057
Engineered Fill	5.5	0.130	728.5	3714.7	0.064
Engineered Fill	6.0	0.130	721.1	3676.9	0.068
Engineered Fill	5.0	0.130	726.7	3705.4	0.071
Lean Concrete	6.33	0.150	5518.5	8600.0	0.011
Lean Concrete	6.33	0.150	5518.5	8600.0	0.011
Lean Concrete	6.33	0.150	5518.5	8600.0	0.011
Grouted Rock	6.0	0.155	5674.2	8842.7	0.0099
Grouted Rock	10.0	0.155	5781.3	10815.9	0.0099
Grouted Rock	10.0	0.155	5449.9	10015.8	0.0099

Table D.1-6: NI Backfill Soil, Fill Concrete and Grouted Rock Profile – BE Updated Profile

Material	Thickness [feet]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping
Engineered Fill	5.0	0.130	610.4	1142.0	0.027
Engineered Fill	5.0	0.130	715.7	1339.0	0.038
Engineered Fill	5.0	0.130	756.7	1415.7	0.046
Engineered Fill	5.0	0.130	756.6	1415.5	0.052
Engineered Fill	5.0	0.130	761.9	1425.3	0.057
Engineered Fill	5.2	0.130	728.5	3714.7	0.064
Engineered Fill	6.3	0.130	721.1	3676.9	0.068
Engineered Fill	5.0	0.130	726.7	3705.4	0.071
Lean Concrete	9.0	0.150	5000.0	7791.9	0.010
Lean Concrete	10.0	0.150	5000.0	7791.9	0.010
Grouted Rock	6.0	0.155	5554.5	10724.8	0.010
Grouted Rock	8.4	0.155	6860.2	12666.1	0.008
Grouted Rock	1.6	0.155	6847.9	12643.4	0.008
Grouted Rock	10.0	0.155	5715.6	10802.1	0.008

Table D.1-7: Key Nodes at Location

NI20r Nodes	X (feet)	Y (feet)	Z (feet)	Location
1761	1000	1000	100	CIS at Reactor Vessel Support Elevation
2078	1116.5	948.5	116.5	ASB NE Corner at Control Room Floor
2199	1008	1014	134.25	CIS at Operating Deck
2675	929	1000	179.19	ASB Corner of Fuel Building Roof at Shield Building
2788	1000	1000	224	SCV Near Polar Crane
3329	956.5	1000	327.41	ASB Shield Building Roof Area

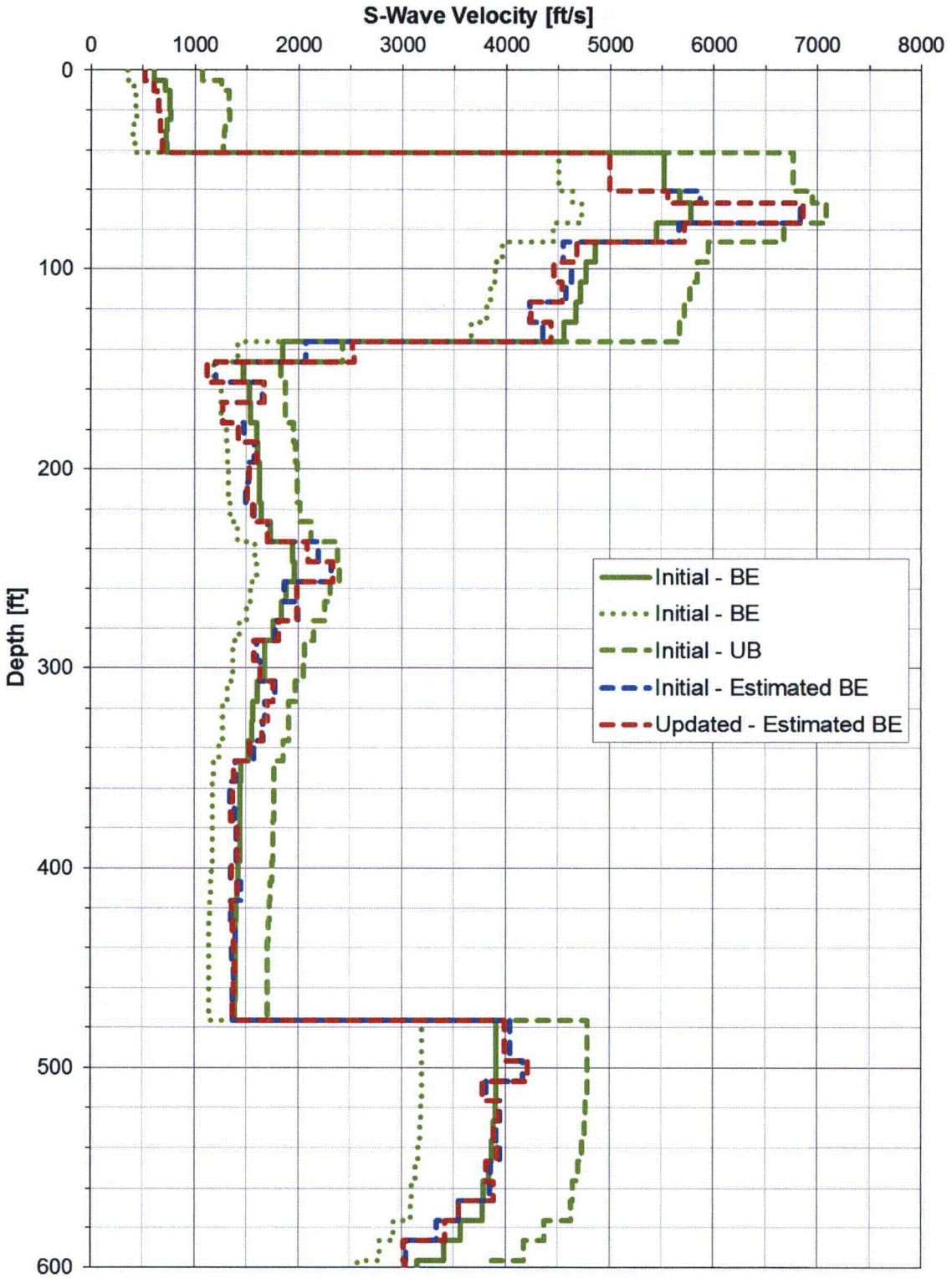

Figure D.1-1. Turkey Point Estimated Best-Estimate S-Wave Velocity Profile for the NI Profile for the RG 1.60 Motion

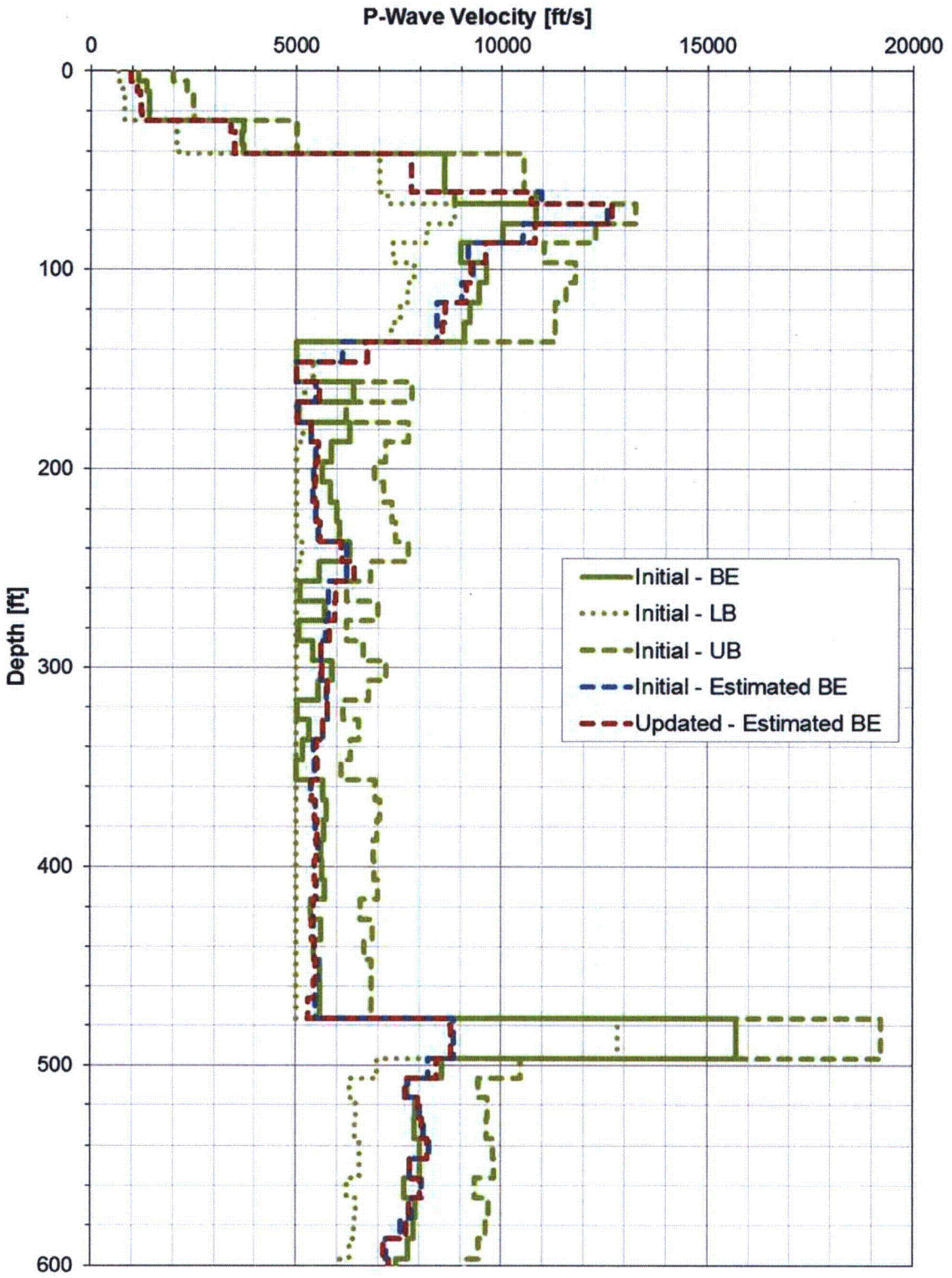

Figure D.1-2. Turkey Point Estimated Best-Estimate P-Wave Velocity Profile for the NI Profile for the RG 1.60 Motion

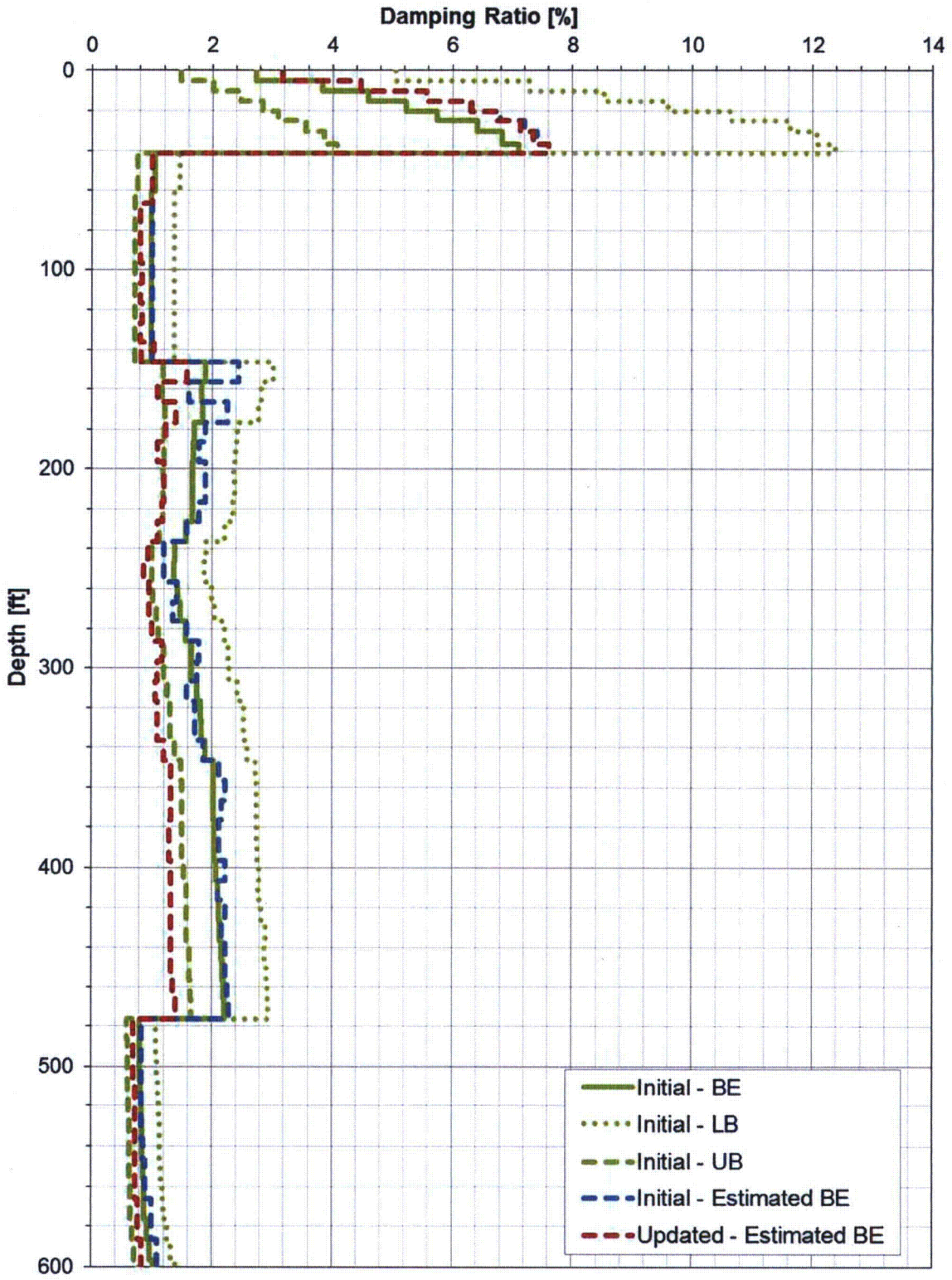

Figure D.1-3. Turkey Point Estimated Best-Estimate Damping Profile for the NI Profile for the RG 1.60 Motion

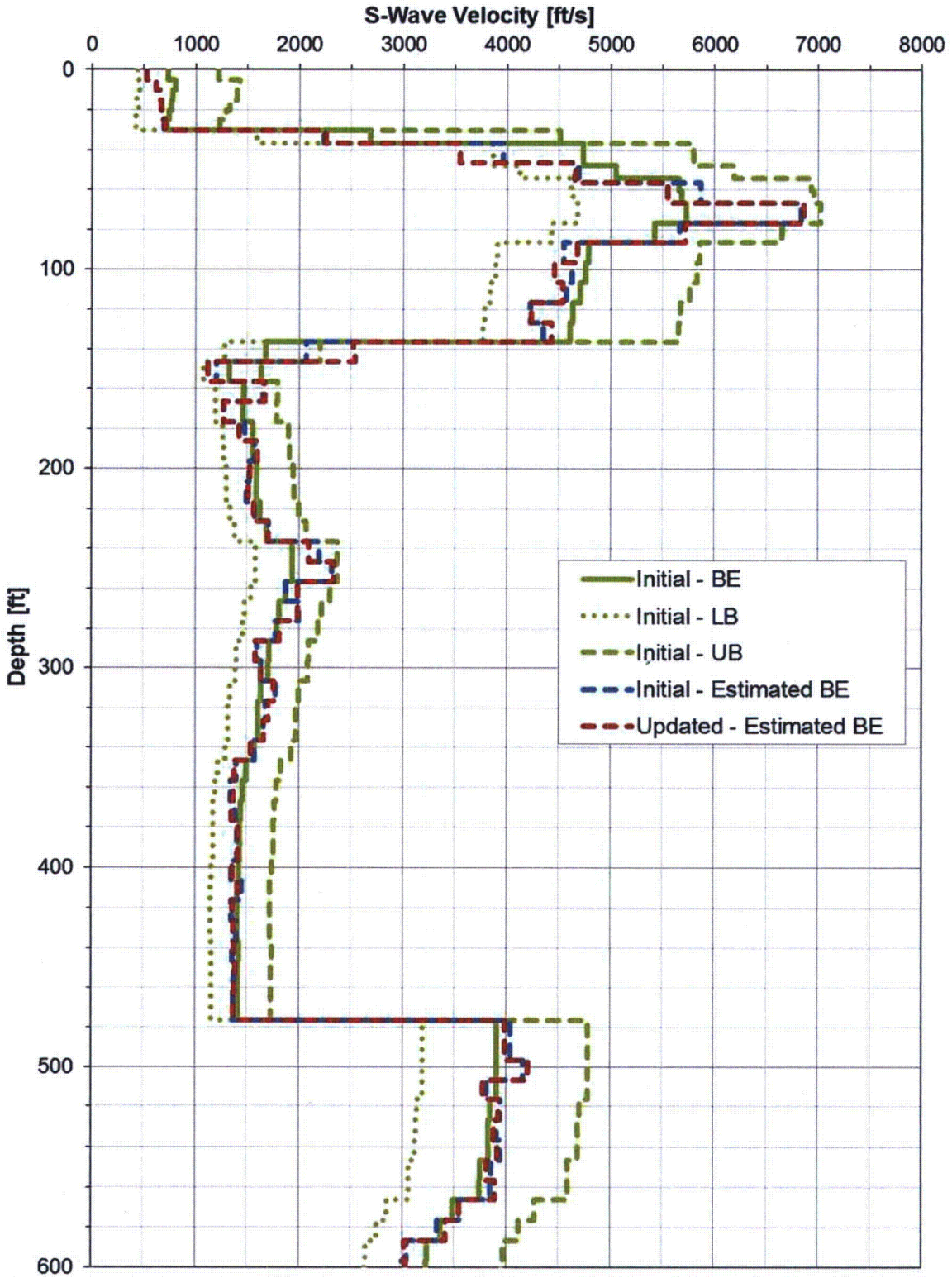

Figure D.1-4. Turkey Point Estimated Best-Estimate S-Wave Velocity Profile for the FAR Profile

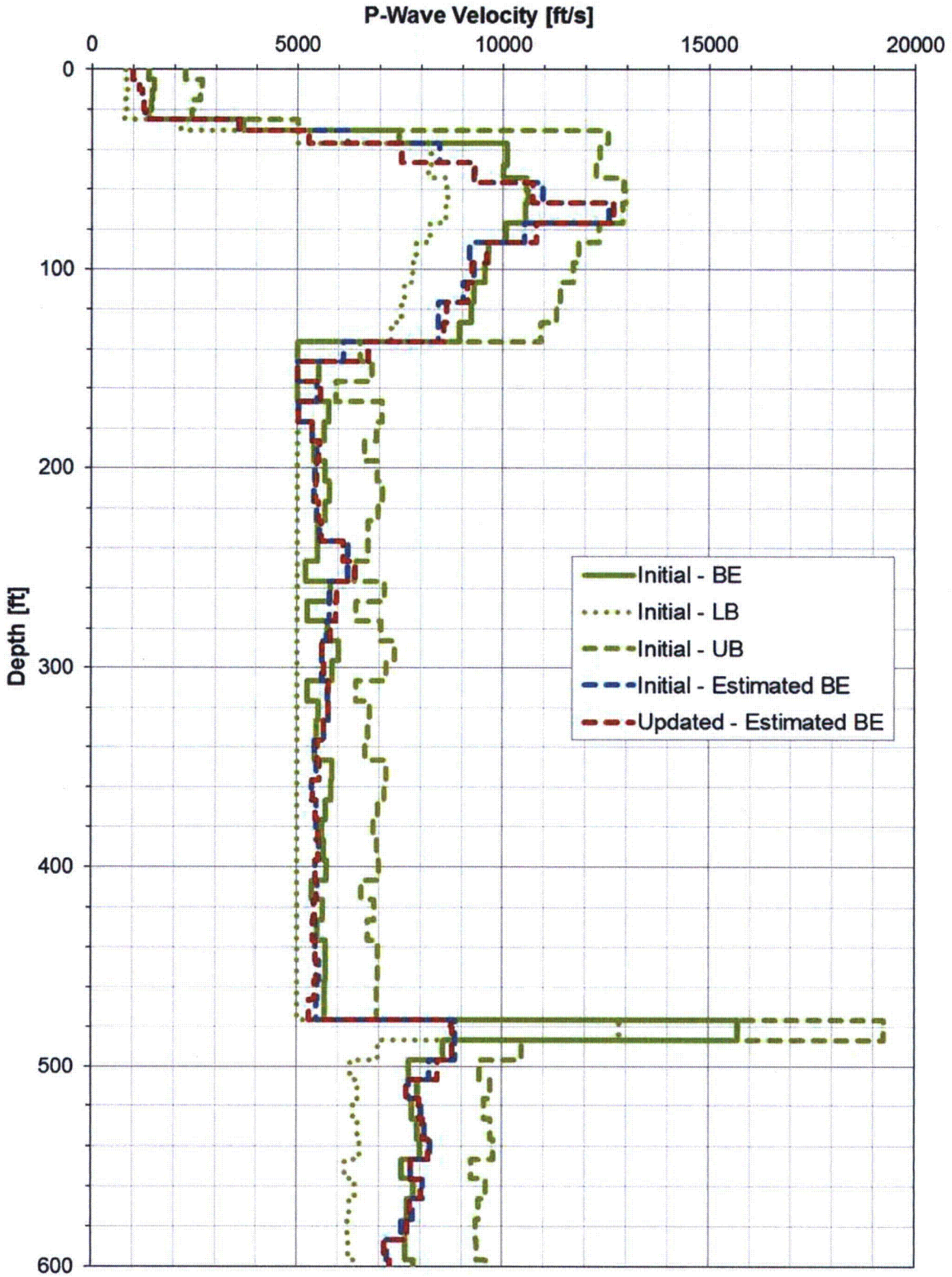

Figure D.1-5. Turkey Point Estimated Best-Estimate P-Wave Velocity Profile for the FAR Profile

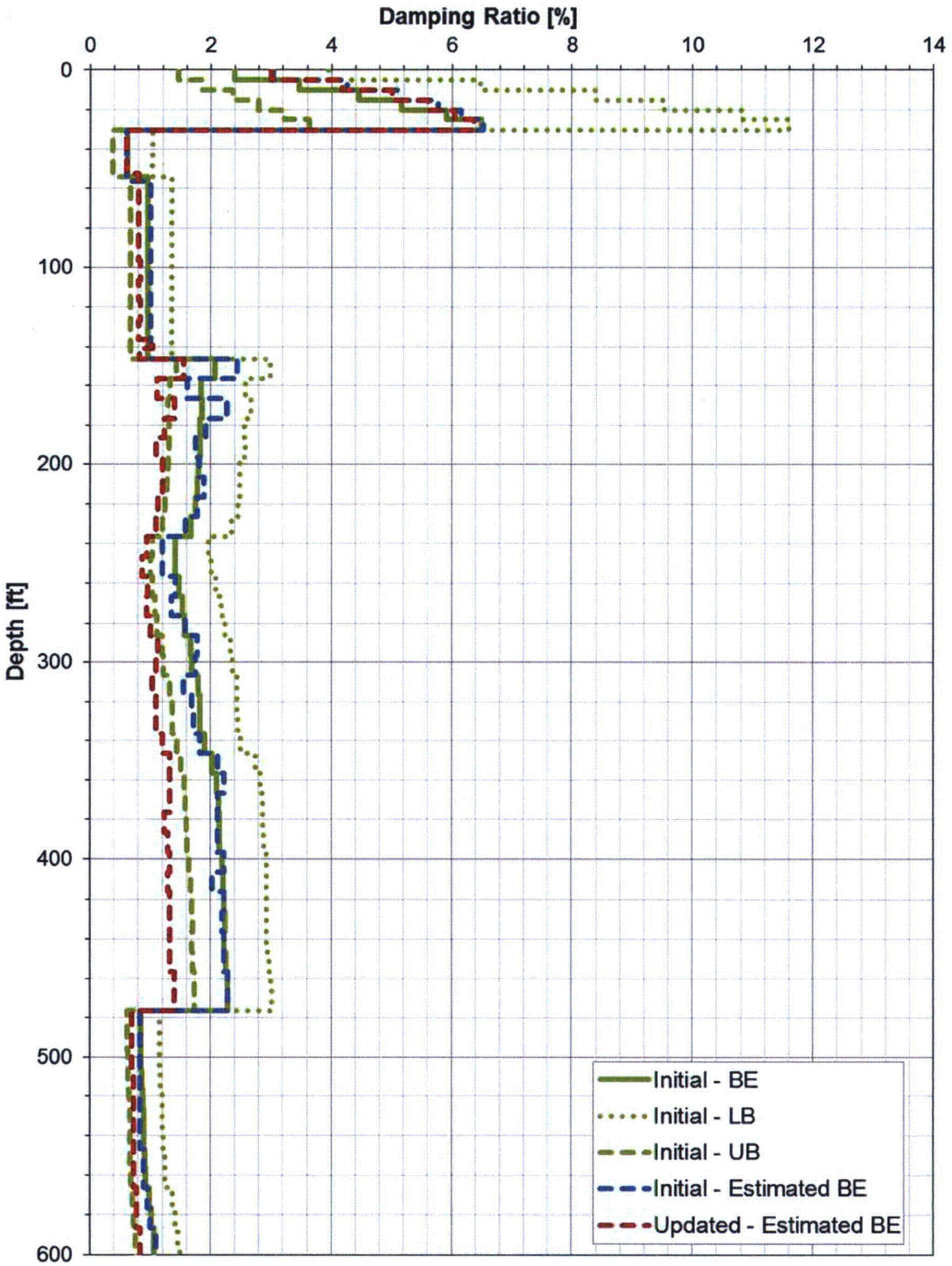

Figure D.1-6. Turkey Point Estimated Best-Estimate Damping Profile for the FAR Profile

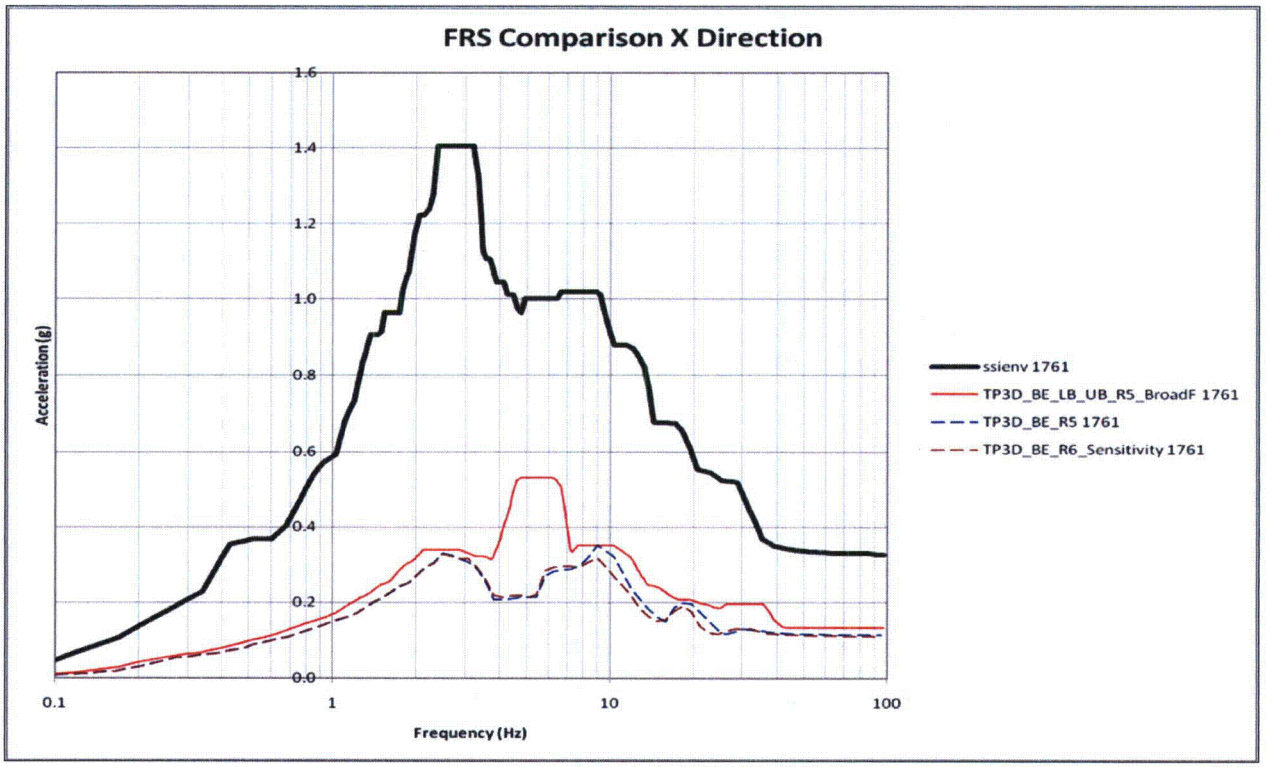

Figure D.1-7. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 1761

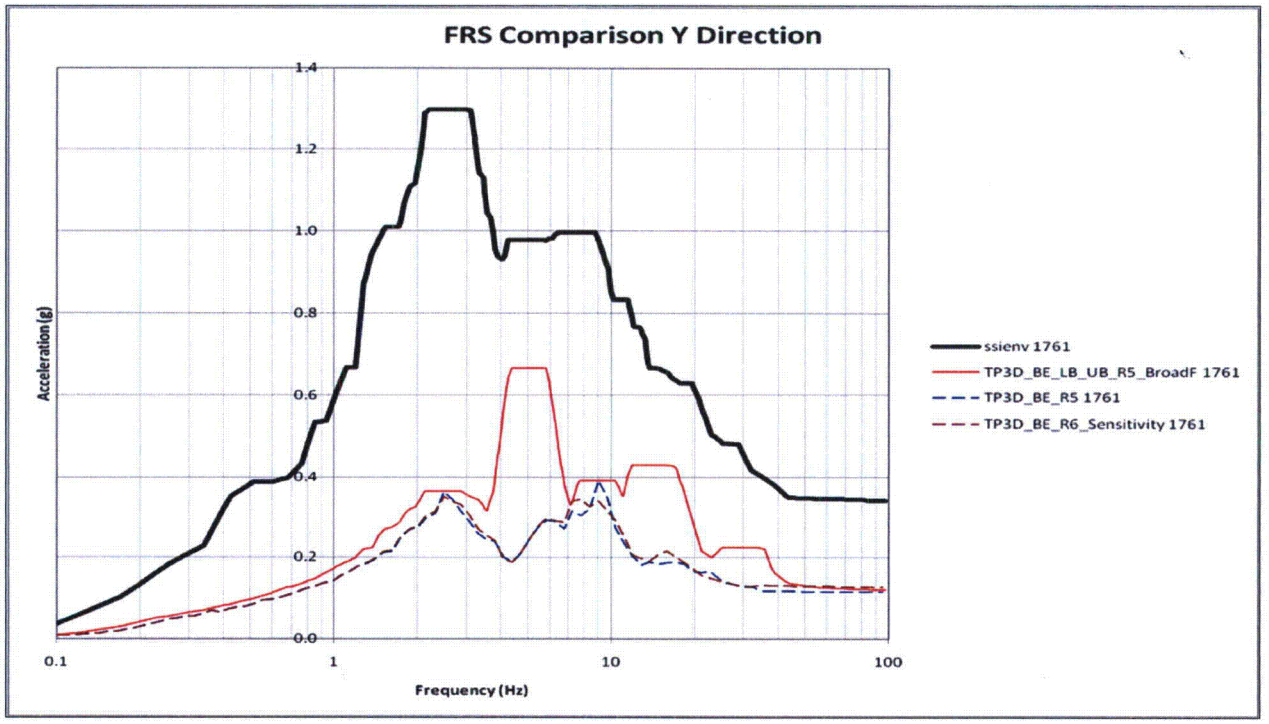

Figure D.1-8. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 1761

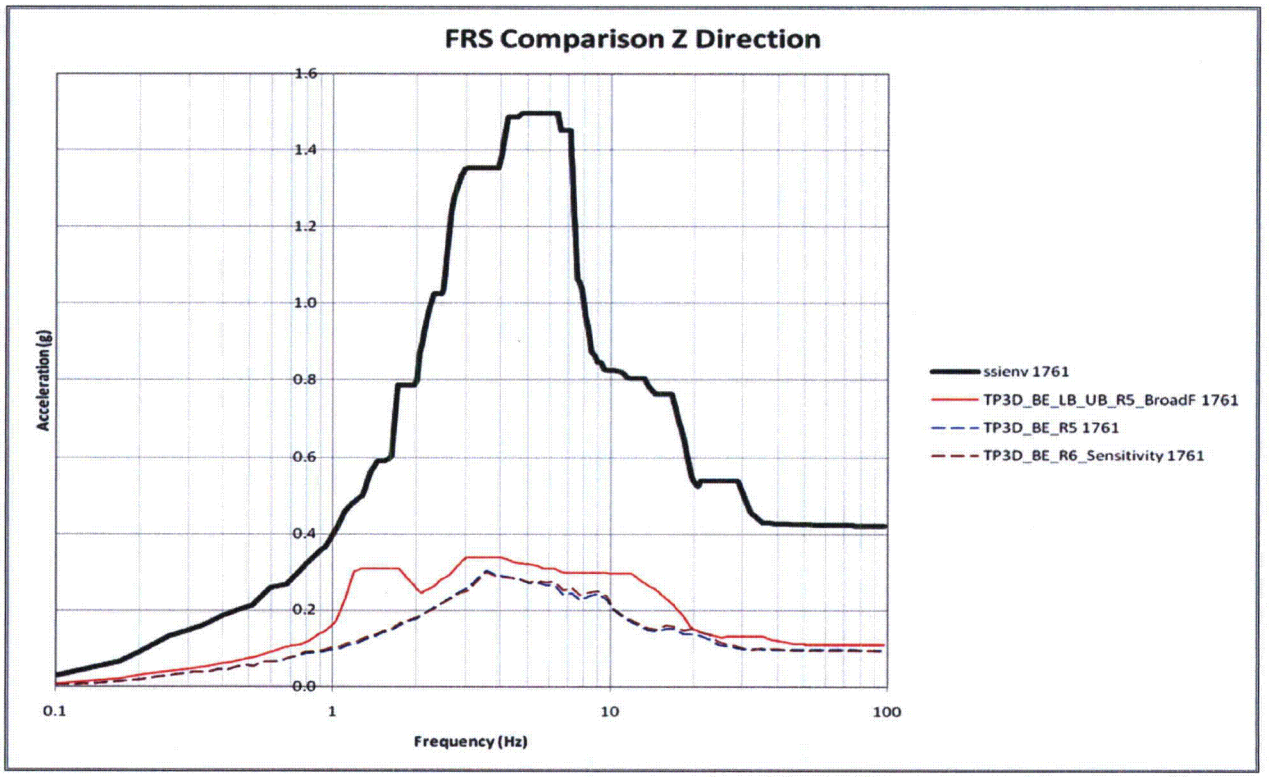

Figure D.1-9. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 1761

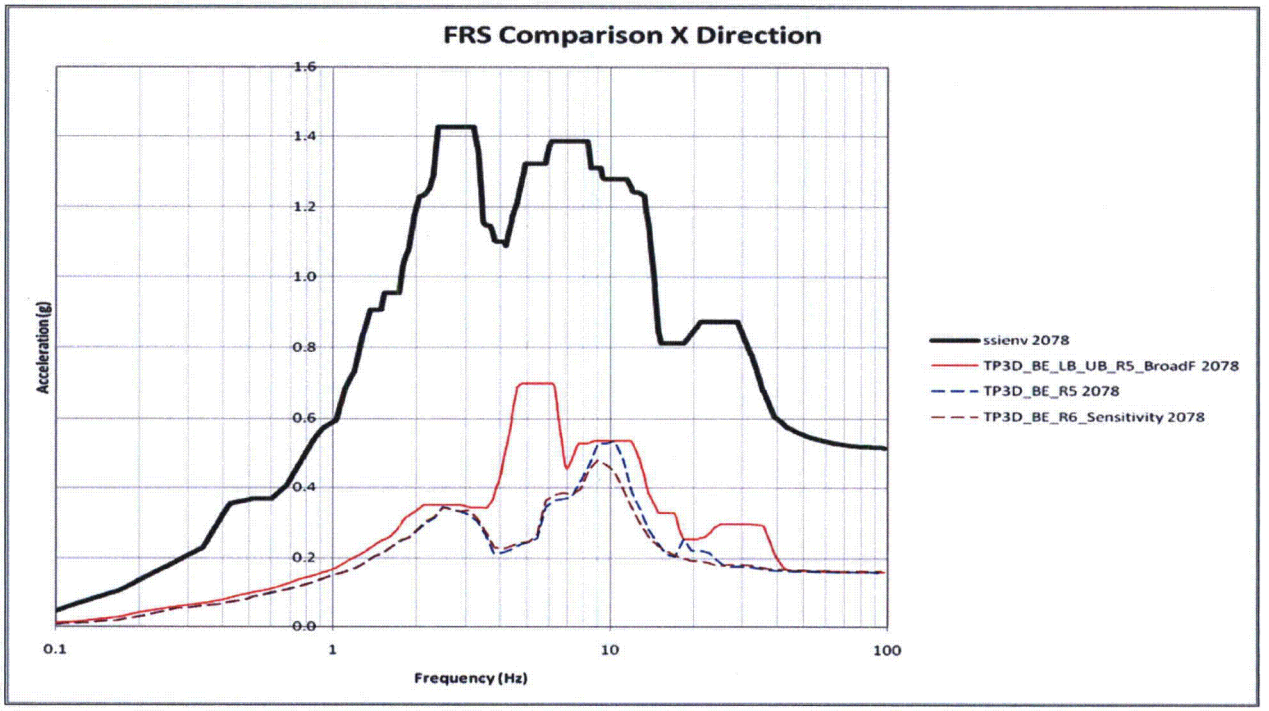

Figure D.1-10. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 2078

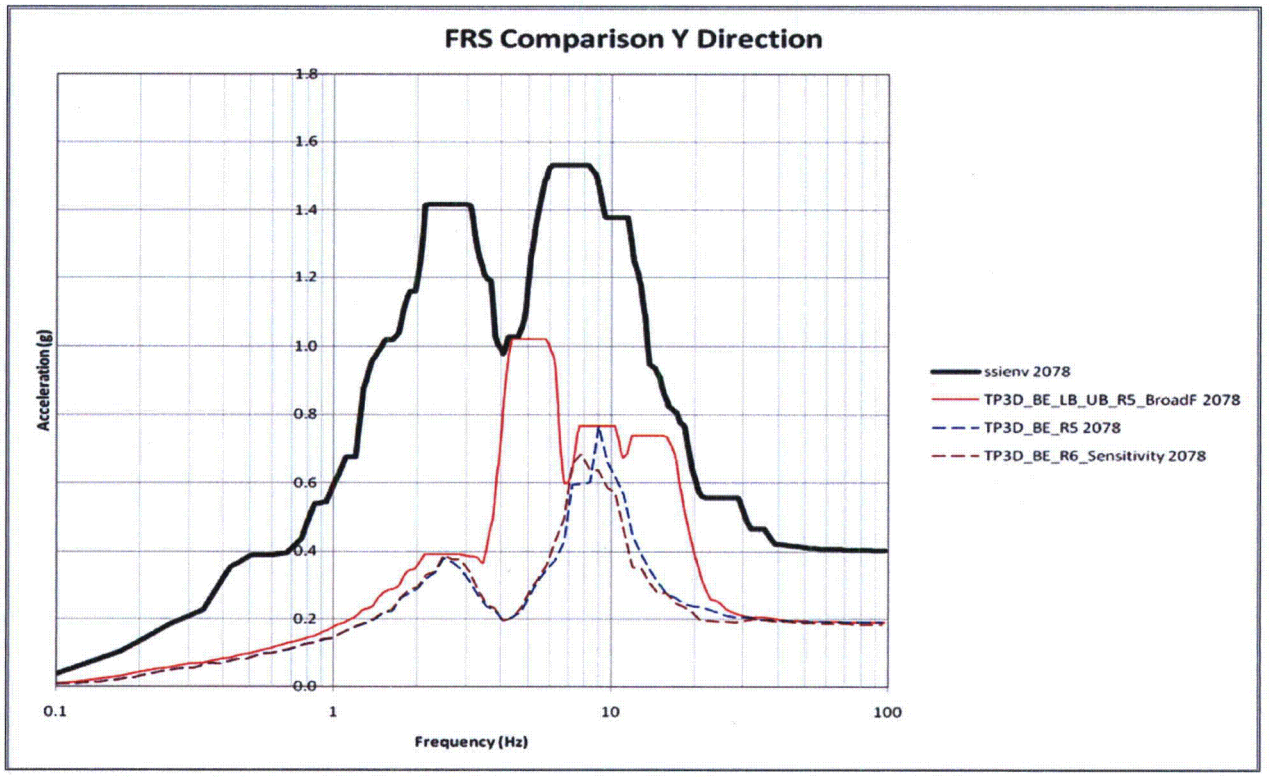

Figure D.1-11. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 2078

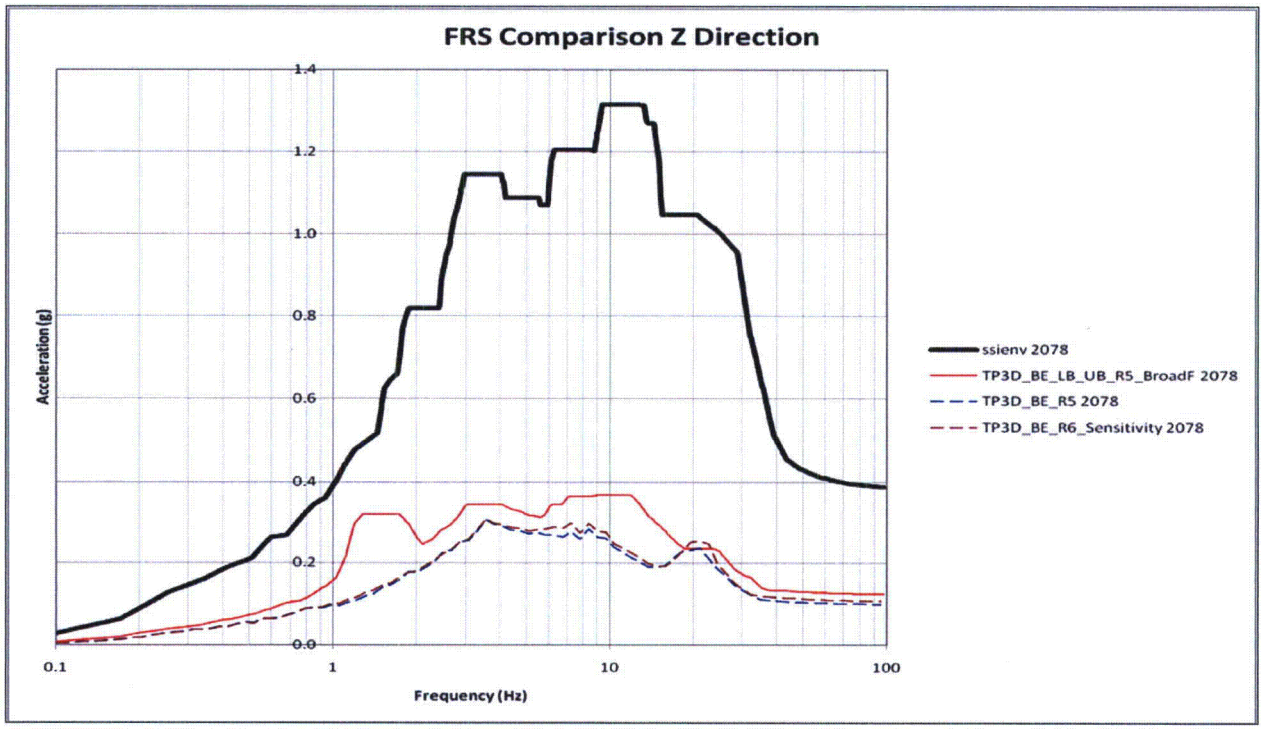

Figure D.1-12. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 2078

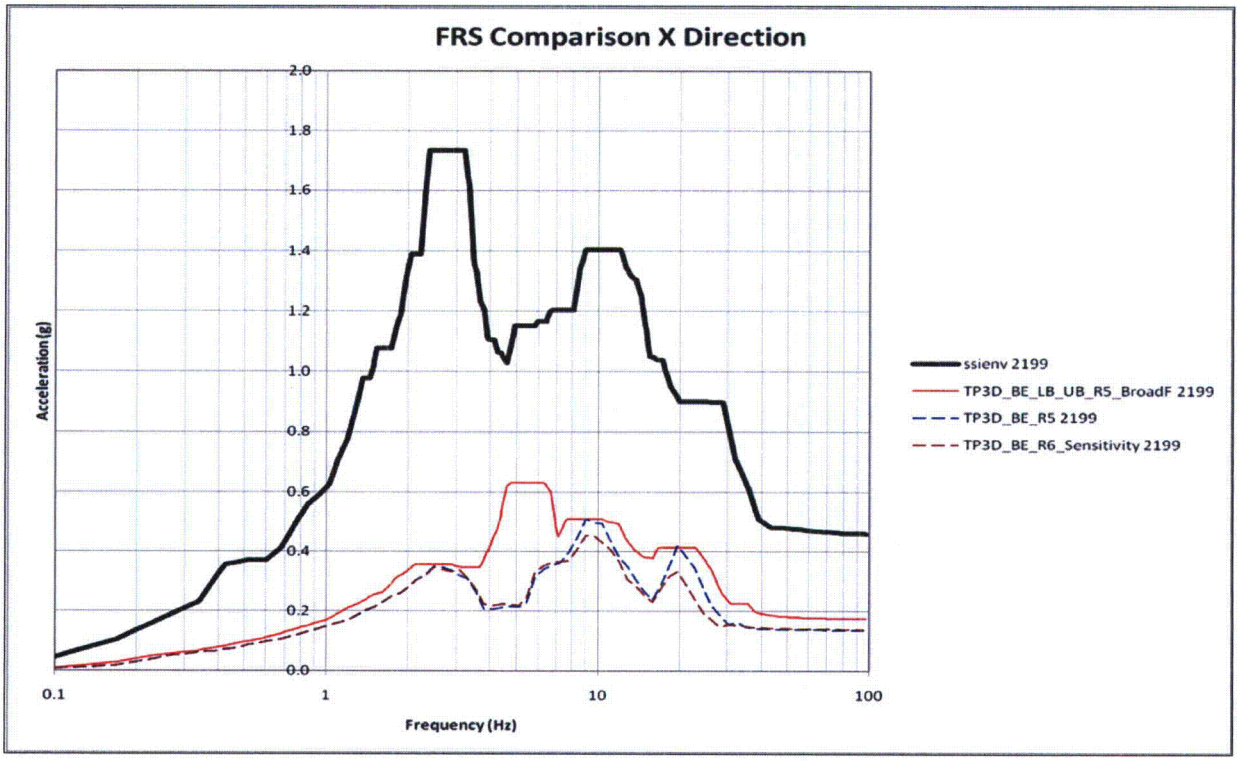

Figure D.1-13. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 2199

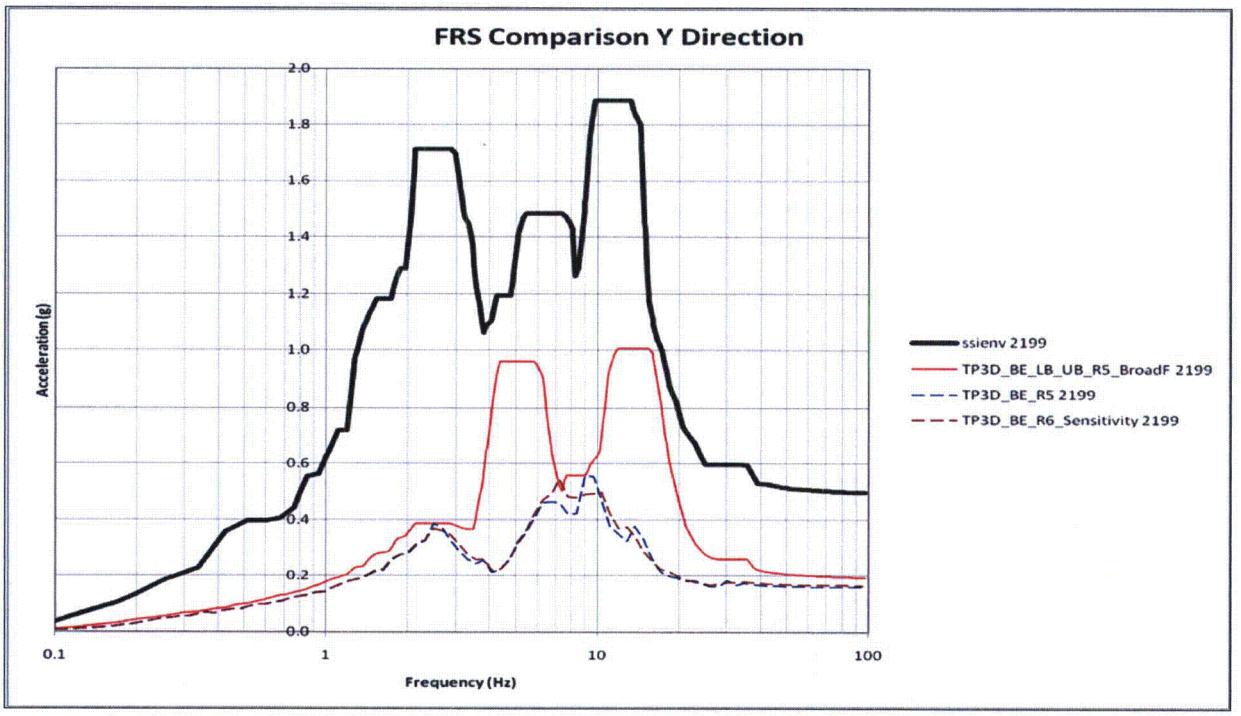

Figure D.1-14. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 2199

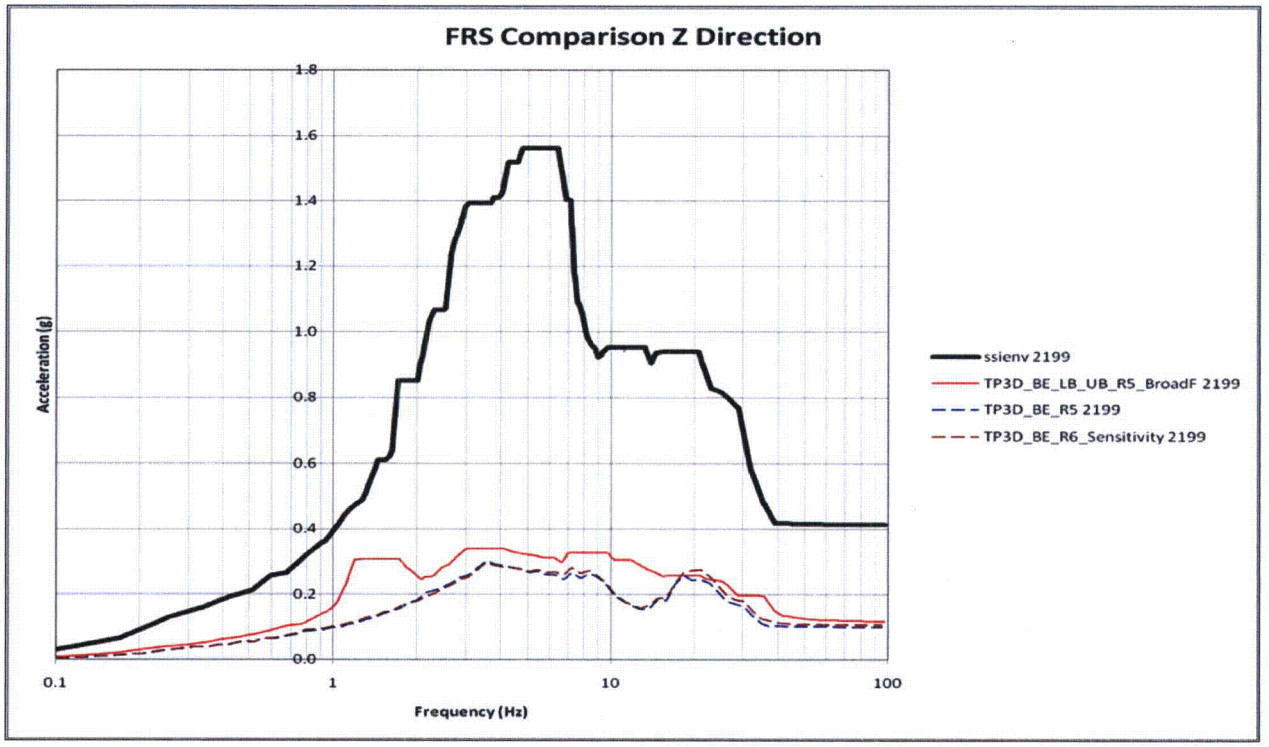

Figure D.1-15. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 2199

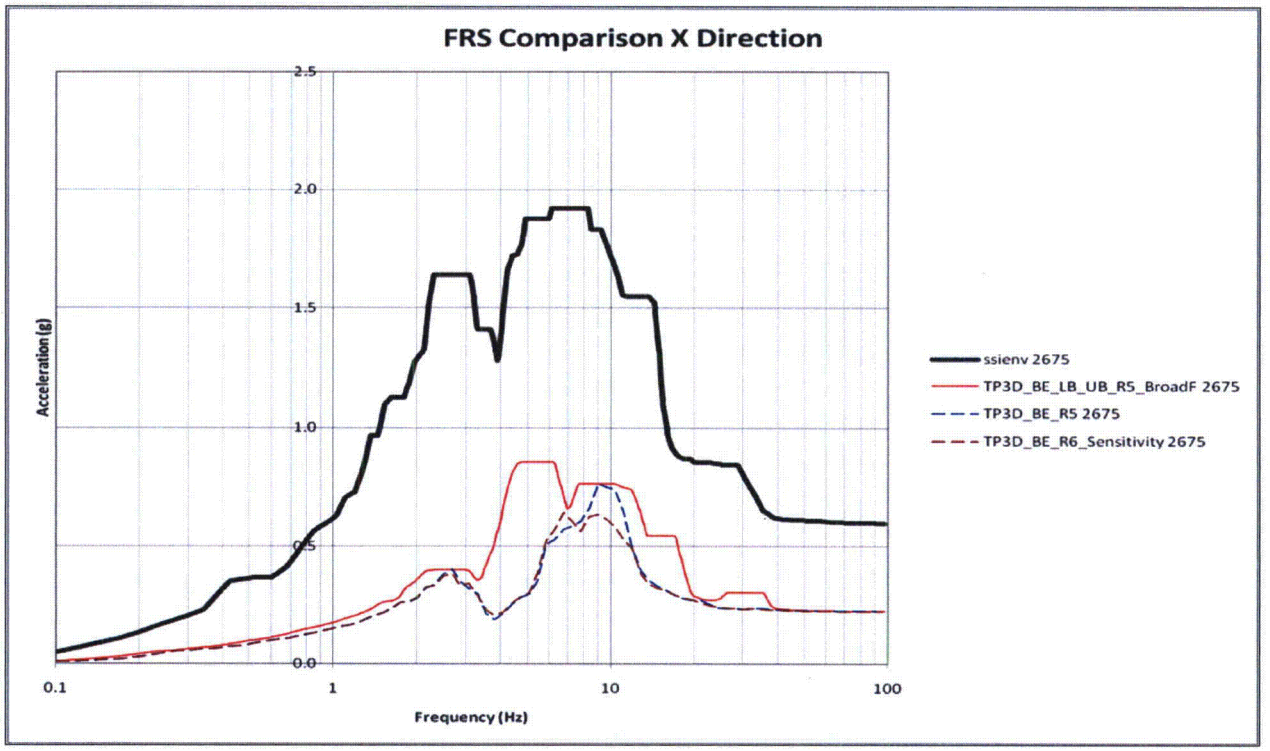

Figure D.1-16. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 2675

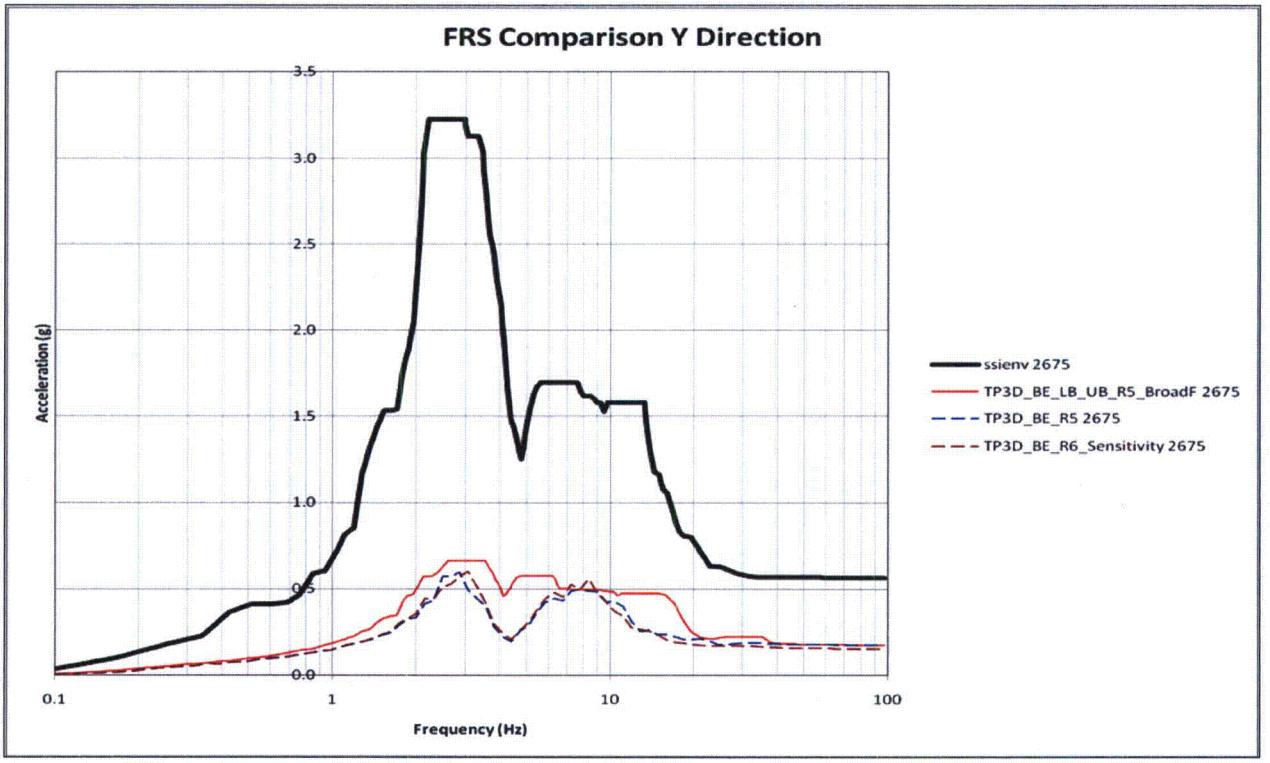

Figure D.1-17. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 2675

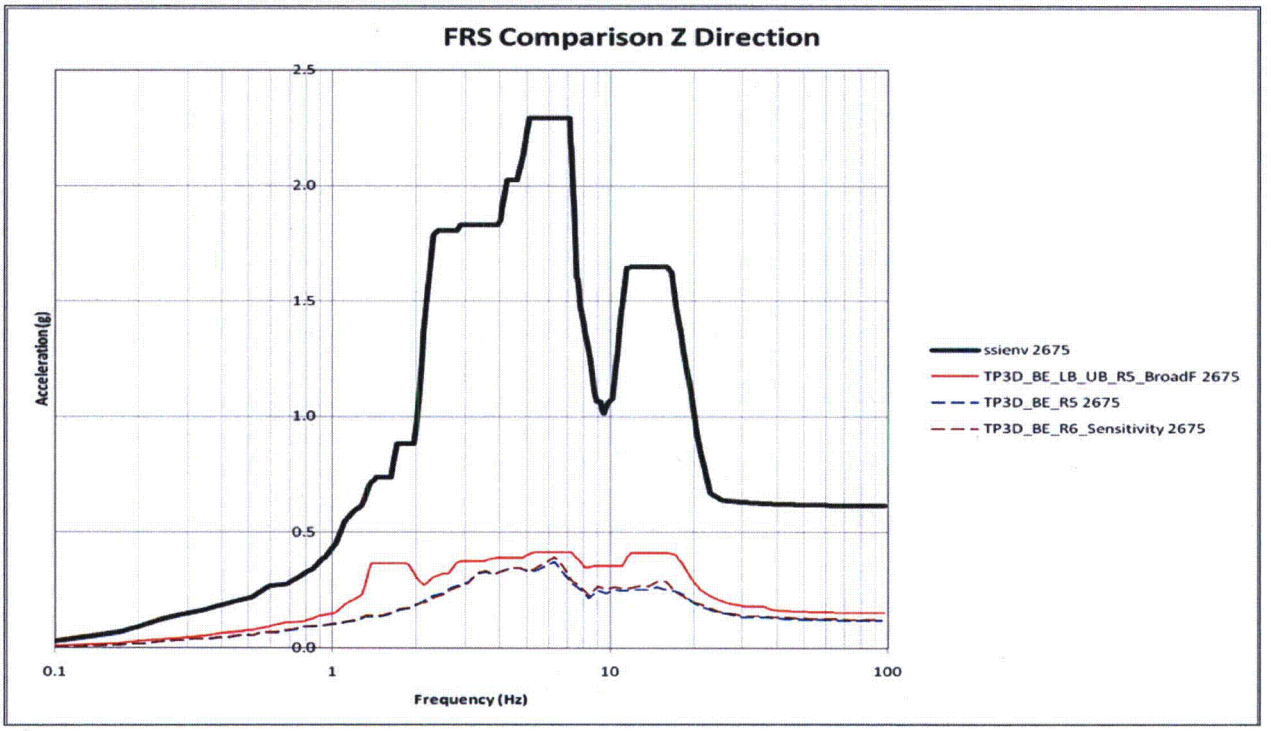

Figure D.1-18. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 2675

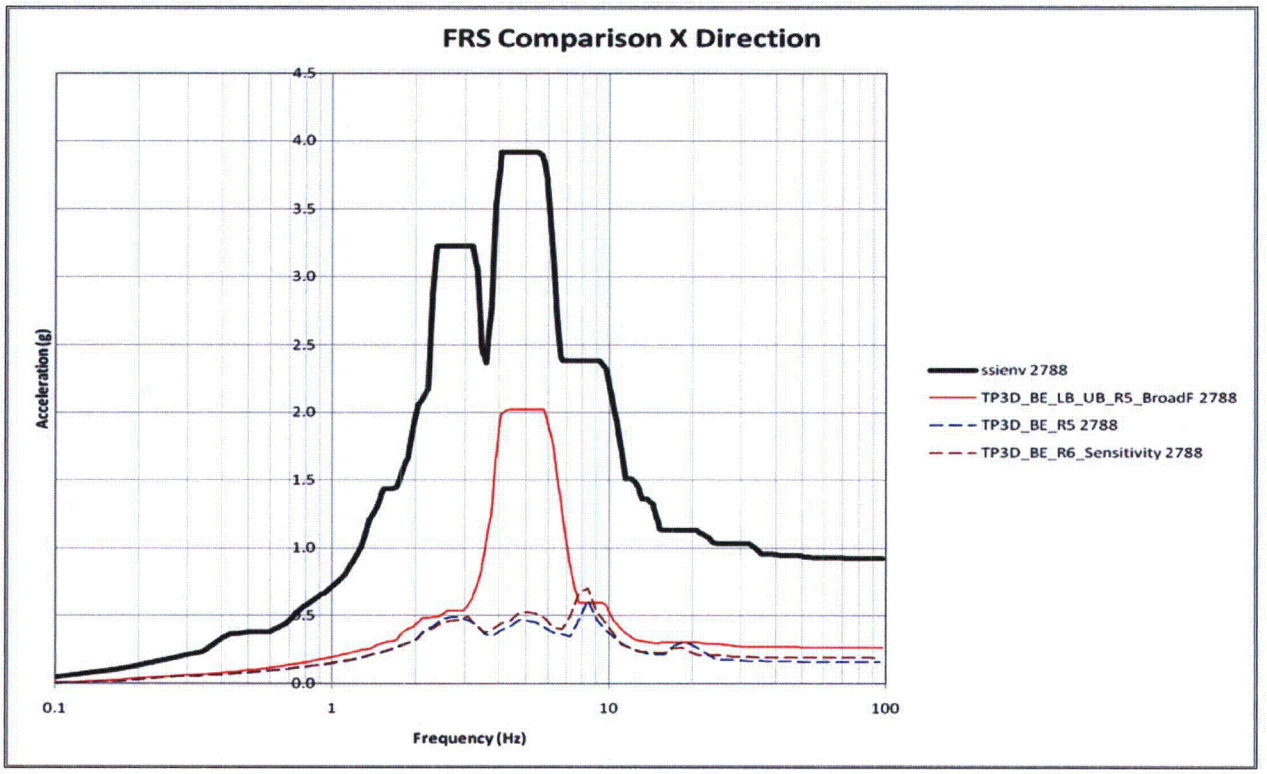

Figure D.1-19. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 2788

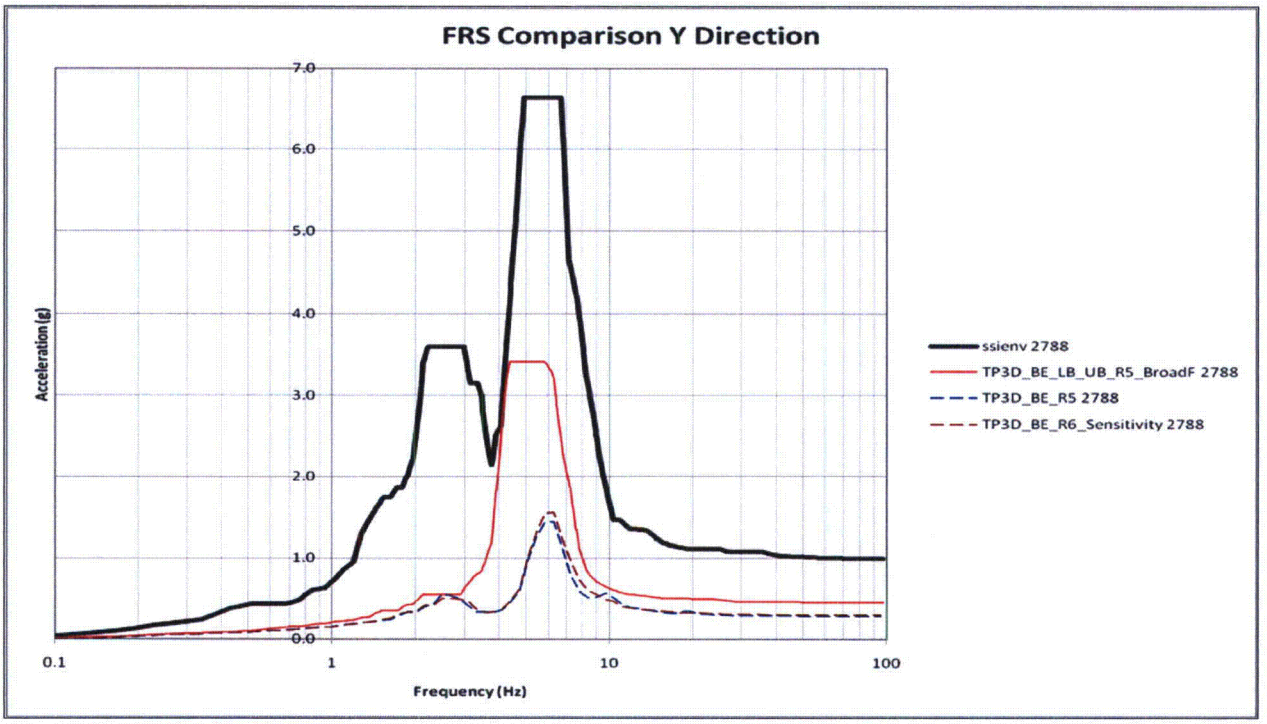

Figure D.1-20. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 2788

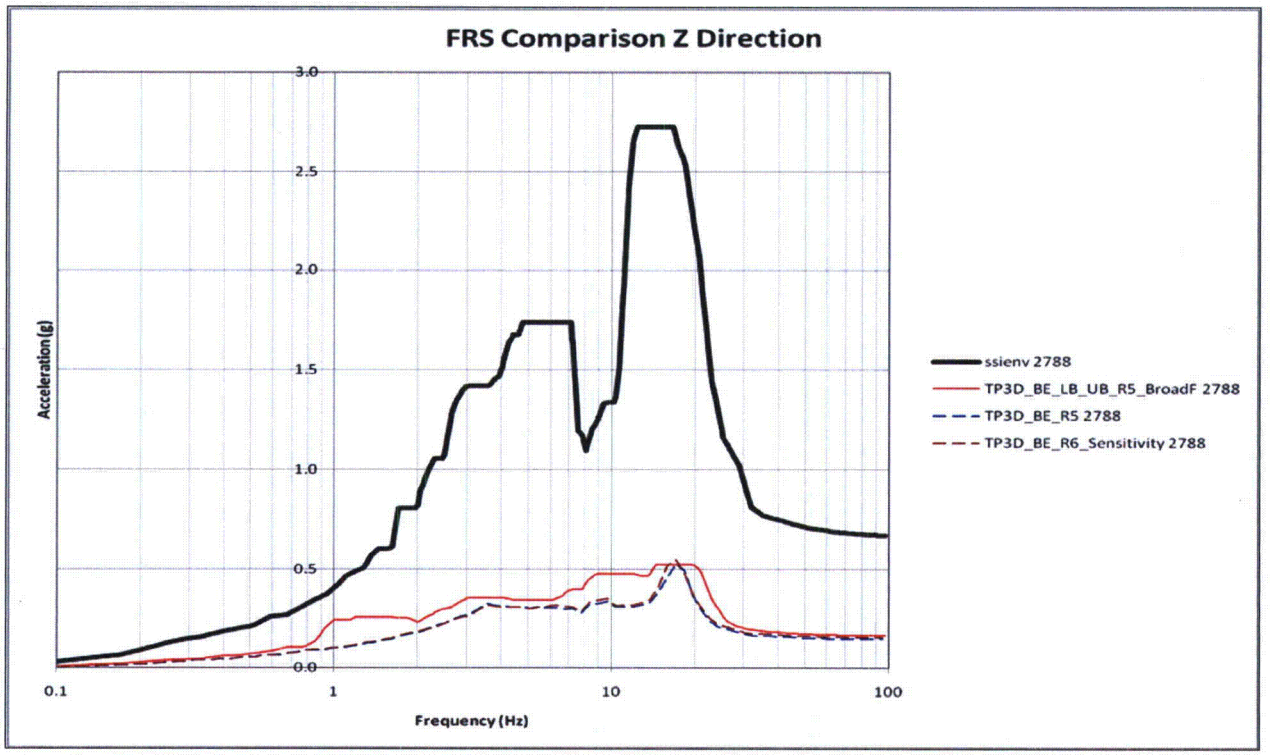

Figure D.1-21. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 2788

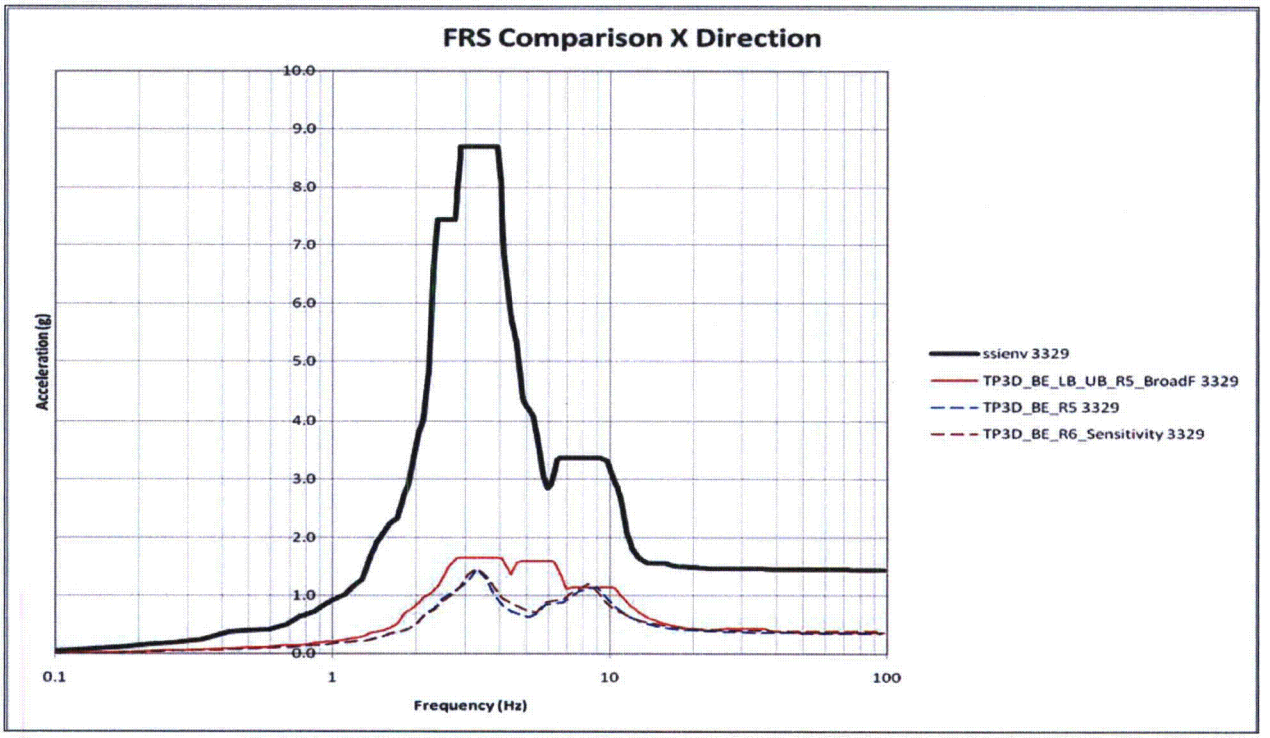

Figure D.1-22. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 3329

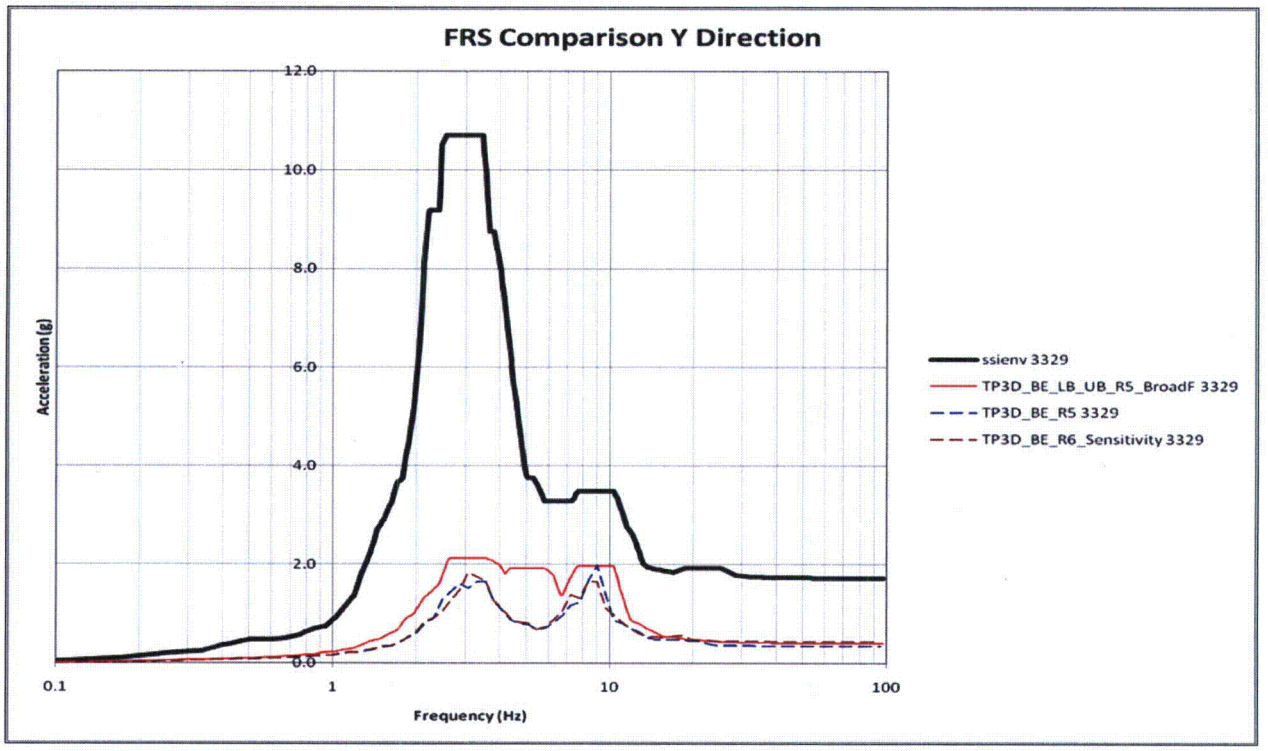

Figure D.1-23. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 3329

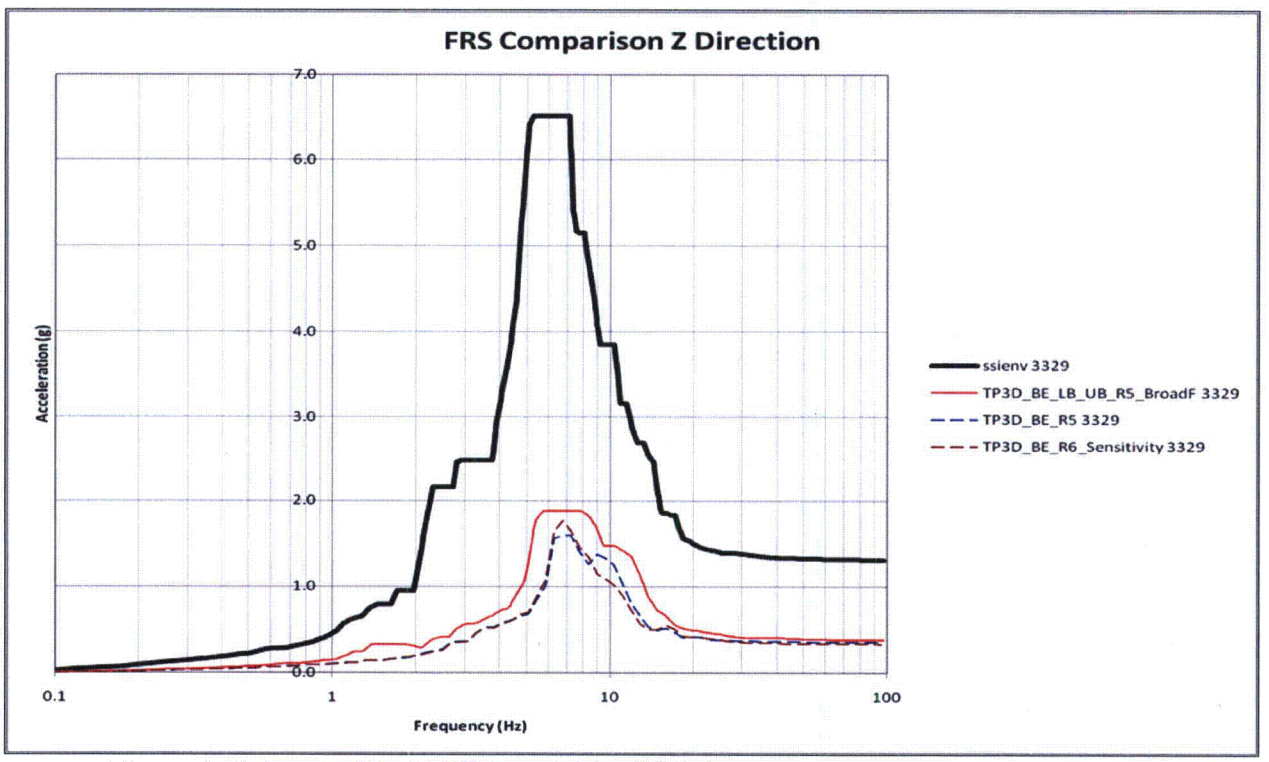

Figure D.1-24. TPNP 3D BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 3329

Part D.2 – Sensitivity Evaluation of Updated Site Characterization on SCII Turbine Building First Bay and Annex Building SSI Analysis

Updated two-dimensional (2D) SSI sensitivity analyses of the Turkey Point SCII Turbine Building First Bay and Annex Building adjacent structures were performed by Westinghouse utilizing the updated SCII site characterization data, which included the updated strain-compatible BE soil/rock, grouted rock and lean concrete fill properties. The layer thickness, unit weight, shear wave velocity (Vs), compression wave velocity (Vp) and damping values, from the ground surface to the simulated half-space at a depth of about 600 feet for the updated SCII BE NI and FAR updated case are presented in Tables D.2-1 to D.2-2. Figures D.2-1 through D.2-6 graphically present the Turkey Point SCII Vs, Vp and damping profiles over the approximately 600-foot depth. Updated BE concrete properties from Table D.2-3 were used, as well as an increased density of 155 pcf for the grouted rock zone as shown in Table D.2-3 between El. -35 to -60 feet (depth range 60.5 to 85.5 feet).

The 2D SSI sensitivity analyses also included incorporating updated seismic input, specifically updated surface design response spectra (DRS) and the corresponding foundation level time histories for the Turbine Building First Bay and Annex Building. Updated horizontal and vertical surface DRS for the Annex Building and Turbine Building First Bay are presented in Figures D.2-7 and D.2-8, respectively. The corresponding hazard consistent acceleration time histories from Reference 12 are presented in Figures D.2-9 to D.2-10 and are used as seismic input in X (North-South) and Z (Vertical) directions for the Turbine Building First Bay. The Annex Building seismic input in the Y (East-West) and Z (Vertical) directions are shown in Figures D.2-11 and D.2-12. Seismic input is applied at the ground surface (AP1000 El. 100 feet; TPNP El. +25.5 feet) in both analyses.

Turkey Point adjacent building SSI sensitivity analyses were performed to present FRS comparisons at the ground surface of the Turbine Building First Bay and Annex Building for the updated site characterization and corresponding updated BE seismic input. Also, relative displacements are compared to assess the interaction between the adjacent structures and the NI. Section F.2.1 presents the results of the relative displacement interaction evaluation.

Time history seismic sensitivity analyses using the 2D Turbine Building First Bay (NS) model, 2D Annex Building (EW) model, and the updated BE strain compatible soil profile were performed in one horizontal and one vertical direction (X and Z for the NS model, and Y and Z for the EW model). The updated, hazard consistent, seismic ground surface input time histories shown in Figures D.2-9 through D.2-12 were used in SASSI in conjunction with the Direct method of analysis. FRS for 5 percent damping were obtained at the ground surface for the Turbine Building First Bay (node 2951) and Annex Building (node 2942). FRS for 5 percent damping were also obtained at the six (6) key nodes of the NI to assess any influence of the adjacent structures updated seismic input on the key NI nodes (Table D.2-4).

Figures D.2-13 through D.2-16 compare the individual BE seismic FRS and the updated SSI sensitivity analysis, and both are compared to the Section 6.3 broadened TPNP SCII FRS. All of the individual and broadened TPNP FRS results are compared to the corresponding AP1000 FRS envelopes.

As shown in Figures D.2-13 through D.2-16, the sensitivity analysis results indicate that the FRS due to the updated properties from supplemental geotechnical data are very similar (within about $\pm$ 10 percent) of the Section 6.3 FRS at the same SCII surface locations. Also,

and most importantly, the individual TPNP site-specific FRS and TPNP broadened FRS are enveloped by the AP1000 FRS envelope at all locations.

Site specific FRS at the 2D Nuclear Island key nodes are also compared in Figures D.2-17 through D.2-34, which are shown to be negligibly influenced by the updated SCII BE seismic input and are enveloped by the corresponding 2D AP1000 envelope FRS.

Relative displacements at the base and top of the adjacent structures are presented in Table D.2-5 and indicate similar relative displacements, and that there is no contact between NI and SCII adjacent structures at the foundation and superstructure.

Therefore, based on the results of the Turkey Point 2D SSI sensitivity analyses presented in Part D.2 and comparisons with the initial design-basis SCII SSI analysis results, the effect of the updated site characterization and site response data at Turkey Point Units 6&7 on the SCII Turbine Building First Bay and Annex Building adjacent structures FRS, the NI FRS, and relative displacement is considered negligible. Therefore, the previous design-basis SCII adjacent structures analysis results/conclusions presented in TPG-1000-S2R-802 Rev. 6, Section 6.3, Figures 6.3-1 through 6.3-4, Table 6.4-1 and described in Section 7.0 are considered still valid.

Table D.2-1: Best-estimate SCII Near NI SSI Properties for the 'Updated' Profile

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
1	5.0	0.130	586.6	1097.3	1.8166
2	5.0	0.130	721.9	1350.6	2.3300
3	5.0	0.130	777.9	1455.4	2.5598
4	5.0	0.130	817.5	1529.4	2.7199
5	5.0	0.130	850.1	1590.4	2.8850
6	5.2	0.130	866.6	4418.9	3.0428
7	6.3	0.130	893.2	4554.4	3.1474
8	5.0	0.130	898.7	4582.5	3.2495
9	9.0	0.150	5000.0	7791.9	1.0000
10	10.0	0.150	5000.0	7791.9	1.0000
11	6.0	0.137	5554.5	10724.8	1.0000
12	8.4	0.137	6865.1	12675.1	0.8000
13	1.6	0.137	6859.0	12664.0	0.8000
14	10.0	0.137	5729.7	10828.8	0.8000
15	10.0	0.137	4696.5	9644.2	0.8000
16	10.0	0.137	4485.1	9279.7	0.8000
17	10.0	0.137	4565.3	9174.6	0.8000
18	10.0	0.137	4269.2	8677.5	0.8000
19	10.0	0.137	4456.0	8595.0	0.8000
20	4.4	0.137	2575.8	6826.8	0.8350
21	5.6	0.119	2583.6	6847.7	0.7079
22	10.0	0.119	1212.4	5295.0	0.9030
23	10.0	0.119	1737.7	5806.6	0.7721
24	10.0	0.119	1354.7	5349.8	0.8670
25	10.0	0.119	1460.0	5508.8	0.8430
26	6.6	0.119	1637.0	5663.8	0.7895
27	3.4	0.117	1632.2	5647.1	0.7895
28	10.0	0.117	1562.6	5605.6	0.8092
29	10.0	0.117	1546.4	5588.8	0.8212
30	10.0	0.117	1596.1	5637.8	0.8092
31	10.0	0.117	1736.8	5692.6	0.7869
32	6.8	0.117	2116.8	6187.2	0.7468
33	3.2	0.121	2116.5	6186.2	0.7468
34	10.0	0.121	2357.0	6478.8	0.7256
35	10.0	0.121	2016.8	6040.0	0.7658
36	10.0	0.121	2016.6	6024.9	0.7658
37	10.0	0.121	1843.2	5907.0	0.7869
38	10.0	0.121	1612.4	5739.3	0.8221
39	10.0	0.121	1670.5	5759.6	0.8221
40	10.0	0.121	1786.6	5857.6	0.8040
41	10.0	0.121	1735.6	5881.4	0.8159
42	10.0	0.121	1689.1	5770.5	0.8221

Table D.2-1: Best-Estimate SCII Near NI SSI Properties for the 'Updated' Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
43	10.0	0.121	1573.9	5630.2	0.8526
44	10.0	0.121	1414.6	5687.2	0.9081
45	10.0	0.121	1405.5	5537.5	0.9081
46	10.0	0.121	1387.7	5609.6	0.9114
47	10.0	0.121	1451.9	5663.5	0.9021
48	10.0	0.121	1445.9	5652.7	0.9052
49	10.0	0.121	1397.7	5601.1	0.9236
50	10.0	0.121	1450.8	5625.0	0.9052
51	10.0	0.121	1396.7	5575.8	0.9236
52	10.0	0.121	1406.2	5528.8	0.9236
53	10.0	0.121	1416.5	5595.4	0.9236
54	10.0	0.121	1428.9	5619.3	0.9236
55	10.0	0.121	1419.7	5587.8	0.9279
56	10.0	0.121	1409.7	5441.5	0.9467
57	3.8	0.121	3999.8	8787.5	0.6730
58	6.2	0.129	4007.2	8803.7	0.6587
59	10.0	0.129	4007.0	8803.3	0.6587
60	10.0	0.129	4227.3	8441.3	0.6587
61	10.0	0.129	3794.2	7688.1	0.6755
62	10.0	0.129	3939.2	7994.0	0.6755
63	10.0	0.129	3903.4	8089.3	0.6755
64	10.0	0.129	3938.4	8231.8	0.6755
65	10.0	0.129	3832.2	7808.4	0.6901
66	10.0	0.129	3905.5	8044.1	0.6755
67	10.0	0.129	3564.3	7791.9	0.6901
68	10.0	0.129	3437.0	7733.8	0.7100
69	10.0	0.129	3036.7	7191.4	0.7233
70	10.0	0.129	3056.8	7325.5	0.7233
71	10.0	0.129	3110.2	7409.2	0.7233
72	10.0	0.129	3655.3	8167.3	0.7051
73	10.0	0.129	3313.7	7805.7	0.7233
74	64.0	0.130	4027.0	8382.9	0.3000
75	100.0	0.130	4071.0	8474.5	0.3000
76	200.0	0.130	4356.0	8847.1	0.3000
77	200.0	0.130	4878.0	9481.1	0.3000
78	200.0	0.130	5080.0	9503.8	0.3000
79	200.0	0.130	5396.0	10095.0	0.3000
80	200.0	0.130	5700.0	10663.7	0.3000
81	200.0	0.130	5700.0	10663.7	0.3000
82	200.0	0.130	6500.0	12160.4	0.3000
83	200.0	0.130	6769.0	12663.6	0.3000
84	200.0	0.130	6900.0	12908.7	0.3000

Table D.2-1: Best-Estimate SCII Near NI SSI Properties for the 'Updated' Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
85	200.0	0.130	6950.0	13002.3	0.3000
86	200.0	0.130	6800.0	12721.6	0.3000
87	200.0	0.130	6450.0	12066.8	0.3000
88	200.0	0.130	6400.0	11973.3	0.3000
89	200.0	0.130	6403.0	11978.9	0.3000
90	200.0	0.130	6518.0	12194.1	0.3000
91	200.0	0.130	8397.0	15709.3	0.3000
92	200.0	0.130	8821.0	16502.6	0.3000
93	200.0	0.130	9273.0	17348.2	0.3000
94	200.0	0.130	9834.0	18397.7	0.3000
95	200.0	0.130	9152.0	17121.8	0.3000
96	200.0	0.130	8995.0	16828.1	0.3000
97	200.0	0.130	8670.0	16220.1	0.3000
98	200.0	0.130	8229.0	15395.1	0.3000
99	200.0	0.130	7993.0	14953.5	0.3000
100	200.0	0.130	7908.0	14794.5	0.3000
101	200.0	0.130	7607.0	14231.4	0.3000
102	200.0	0.130	7511.0	14051.8	0.3000
103	200.0	0.130	7340.0	13731.9	0.3000
104	200.0	0.130	7222.0	13511.1	0.3000
105	200.0	0.130	7207.0	13483.1	0.3000
106	200.0	0.130	7063.0	13213.7	0.3000
107	200.0	0.130	7118.0	13316.6	0.3000
108	200.0	0.130	7584.0	14188.4	0.3000
109	200.0	0.130	7787.0	14568.1	0.3000
110	200.0	0.130	7822.0	14633.6	0.3000
111	200.0	0.130	7741.0	14482.1	0.3000
112	200.0	0.130	8256.0	15445.6	0.3000
113	200.0	0.130	8219.0	15376.3	0.3000
114	200.0	0.130	8120.0	15191.1	0.3000
115	200.0	0.130	8388.0	15692.5	0.3000
116	200.0	0.130	8905.0	16659.7	0.3000
117	200.0	0.130	9265.0	17333.2	0.3000
118	200.0	0.130	9073.0	16974.0	0.3000
119	200.0	0.130	9227.0	17262.1	0.3000
120	200.0	0.130	9629.0	18014.2	0.3000
121	200.0	0.130	9938.0	18592.3	0.3000
122	200.0	0.130	9652.0	18057.2	0.3000
123	200.0	0.130	8777.0	16420.3	0.3000
124	200.0	0.130	8955.0	16753.3	0.3000
125	-	0.170	9200.0	17211.6	1.0000

Note: % = percent; ft. = feet; ft/sec = feet per second; pcf = pound per cubic foot; SSI = soil structure interaction

Table D.2-2: Best-Estimate SCII FAR SSI Properties for the "Updated" Profile

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
1	5.0	0.130	582.7	1090.1	1.8844
2	5.0	0.130	717.4	1342.2	2.3805
3	5.0	0.130	773.9	1447.9	2.6122
4	5.0	0.130	814.0	1522.8	2.7877
5	5.0	0.130	848.3	1587.1	2.9082
6	5.2	0.130	866.9	4420.5	2.9929
7	6.3	0.125	2258.2	5273.4	0.6000
8	5.0	0.125	3551.2	7526.9	0.6000
9	5.0	0.125	3551.2	7526.9	0.6000
10	5.9	0.125	4660.9	9298.6	0.6000
11	4.1	0.137	4659.2	9295.3	0.8000
12	4.0	0.137	5551.7	10719.3	0.8000
13	6.0	0.137	5551.5	10718.9	0.8000
14	8.4	0.137	6865.1	12675.2	0.8000
15	1.6	0.137	6859.2	12664.2	0.8000
16	10.0	0.137	5729.9	10829.0	0.8000
17	10.0	0.137	4696.6	9644.4	0.8000
18	10.0	0.137	4485.2	9279.9	0.8000
19	10.0	0.137	4565.4	9174.7	0.8000
20	10.0	0.137	4269.2	8677.6	0.8000
21	10.0	0.137	4456.0	8595.0	0.8000
22	4.4	0.137	2575.8	6826.9	0.8334
23	5.6	0.119	2583.6	6847.6	0.7084
24	10.0	0.119	1212.3	5294.9	0.9050
25	10.0	0.119	1737.5	5806.2	0.7733
26	10.0	0.119	1354.6	5349.2	0.8688
27	10.0	0.119	1459.9	5508.4	0.8445
28	6.6	0.119	1636.9	5663.4	0.7906
29	3.4	0.117	1632.0	5646.6	0.7906
30	10.0	0.117	1562.5	5605.1	0.8106
31	10.0	0.117	1546.2	5588.2	0.8225
32	10.0	0.117	1595.9	5637.2	0.8106
33	10.0	0.117	1736.7	5692.2	0.7880
34	6.8	0.117	2116.7	6186.9	0.7475
35	3.2	0.121	2116.4	6185.9	0.7475
36	10.0	0.121	2356.9	6478.6	0.7261
37	10.0	0.121	2016.7	6039.7	0.7618
38	10.0	0.121	2016.5	6024.7	0.7667
39	10.0	0.121	1843.1	5906.8	0.7880
40	10.0	0.121	1612.4	5739.0	0.8235
41	10.0	0.121	1670.4	5759.4	0.8235
42	10.0	0.121	1786.5	5857.3	0.8052
43	10.0	0.121	1735.6	5881.2	0.8170

Table D.2-2: Best-Estimate SCII FAR SSI Properties for the "Updated" Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
44	10.0	0.121	1689.1	5770.3	0.8207
45	10.0	0.121	1573.8	5629.9	0.8540
46	10.0	0.121	1414.5	5686.9	0.9082
47	10.0	0.121	1405.4	5537.2	0.9100
48	10.0	0.121	1387.6	5609.2	0.9114
49	10.0	0.121	1451.8	5663.0	0.9037
50	10.0	0.121	1445.8	5652.2	0.9070
51	10.0	0.121	1397.5	5600.6	0.9256
52	10.0	0.121	1450.7	5624.4	0.9070
53	10.0	0.121	1396.5	5575.1	0.9256
54	10.0	0.121	1406.0	5528.0	0.9256
55	10.0	0.121	1416.3	5594.6	0.9256
56	10.0	0.121	1428.7	5618.6	0.9256
57	10.0	0.121	1419.5	5587.0	0.9284
58	10.0	0.121	1409.5	5440.8	0.9488
59	3.8	0.121	3999.8	8787.3	0.6734
60	6.2	0.129	4007.1	8803.6	0.6592
61	10.0	0.129	4006.9	8803.1	0.6592
62	10.0	0.129	4227.3	8441.2	0.6592
63	10.0	0.129	3794.1	7687.9	0.6759
64	10.0	0.129	3939.1	7993.9	0.6734
65	10.0	0.129	3903.3	8089.2	0.6759
66	10.0	0.129	3938.4	8231.7	0.6759
67	10.0	0.129	3832.2	7808.3	0.6905
68	10.0	0.129	3905.4	8044.0	0.6759
69	10.0	0.129	3564.2	7791.7	0.6905
70	10.0	0.129	3436.9	7733.6	0.7104
71	10.0	0.129	3036.5	7191.1	0.7236
72	10.0	0.129	3056.7	7325.2	0.7236
73	10.0	0.129	3110.1	7408.9	0.7236
74	10.0	0.129	3655.2	8167.0	0.7053
75	10.0	0.129	3313.6	7805.5	0.7236
76	64.0	0.130	4027.0	8382.9	0.3000
77	100.0	0.130	4071.0	8474.5	0.3000
78	200.0	0.130	4356.0	8847.1	0.3000
79	200.0	0.130	4878.0	9481.1	0.3000
80	200.0	0.130	5080.0	9503.8	0.3000
81	200.0	0.130	5396.0	10095.0	0.3000
82	200.0	0.130	5700.0	10663.7	0.3000
83	200.0	0.130	5700.0	10663.7	0.3000
84	200.0	0.130	6500.0	12160.4	0.3000
85	200.0	0.130	6769.0	12663.6	0.3000
86	200.0	0.130	6900.0	12908.7	0.3000

Table D.2-2: Best-Estimate SCII FAR SSI Properties for the "Updated" Profile (cont'd)

Layer No.	Thickness [ft]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping [%]
87	200.0	0.130	6950.0	13002.3	0.3000
88	200.0	0.130	6800.0	12721.6	0.3000
89	200.0	0.130	6450.0	12066.8	0.3000
90	200.0	0.130	6400.0	11973.3	0.3000
91	200.0	0.130	6403.0	11978.9	0.3000
92	200.0	0.130	6518.0	12194.1	0.3000
93	200.0	0.130	8397.0	15709.3	0.3000
94	200.0	0.130	8821.0	16502.6	0.3000
95	200.0	0.130	9273.0	17348.2	0.3000
96	200.0	0.130	9834.0	18397.7	0.3000
97	200.0	0.130	9152.0	17121.8	0.3000
98	200.0	0.130	8995.0	16828.1	0.3000
99	200.0	0.130	8670.0	16220.1	0.3000
100	200.0	0.130	8229.0	15395.1	0.3000
101	200.0	0.130	7993.0	14953.5	0.3000
102	200.0	0.130	7908.0	14794.5	0.3000
103	200.0	0.130	7607.0	14231.4	0.3000
104	200.0	0.130	7511.0	14051.8	0.3000
105	200.0	0.130	7340.0	13731.9	0.3000
106	200.0	0.130	7222.0	13511.1	0.3000
107	200.0	0.130	7207.0	13483.1	0.3000
108	200.0	0.130	7063.0	13213.7	0.3000
109	200.0	0.130	7118.0	13316.6	0.3000
110	200.0	0.130	7584.0	14188.4	0.3000
111	200.0	0.130	7787.0	14568.1	0.3000
112	200.0	0.130	7822.0	14633.6	0.3000
113	200.0	0.130	7741.0	14482.1	0.3000
114	200.0	0.130	8256.0	15445.6	0.3000
115	200.0	0.130	8219.0	15376.3	0.3000
116	200.0	0.130	8120.0	15191.1	0.3000
117	200.0	0.130	8388.0	15692.5	0.3000
118	200.0	0.130	8905.0	16659.7	0.3000
119	200.0	0.130	9265.0	17333.2	0.3000
120	200.0	0.130	9073.0	16974.0	0.3000
121	200.0	0.130	9227.0	17262.1	0.3000
122	200.0	0.130	9629.0	18014.2	0.3000
123	200.0	0.130	9938.0	18592.3	0.3000
124	200.0	0.130	9652.0	18057.2	0.3000
125	200.0	0.130	8777.0	16420.3	0.3000
126	200.0	0.130	8955.0	16753.3	0.3000
127		0.170	9200.0	17211.6	1.0000

Note: % = percent; ft. = feet; ft/sec = feet per second; pcf = pound per cubic foot; SSI = soil structure interaction

Table D.2-3: Near NI SCII Backfill Soil, Fill Concrete and Grouted Rock Profile – BE Updated Profile

Material	Thickness [feet]	Unit Weight [kcf]	S-Wave Vel. [ft/sec]	P-Wave Vel. [ft/sec]	Damping
Engineered Fill	5.0	0.130	586.6	1097.3	1.8166
Engineered Fill	5.0	0.130	721.9	1350.6	2.3300
Engineered Fill	5.0	0.130	777.9	1455.4	2.5598
Engineered Fill	5.0	0.130	817.5	1529.4	2.7199
Engineered Fill	5.0	0.130	850.1	1590.4	2.8850
Engineered Fill	5.2	0.130	866.6	4418.9	3.0428
Engineered Fill	6.3	0.130	893.2	4554.4	3.1474
Engineered Fill	5.0	0.130	898.7	4582.5	3.2495
Lean Concrete	9.0	0.150	5000.0	7791.9	1.0000
Lean Concrete	10.0	0.150	5000.0	7791.9	1.0000
Grouted Rock	6.0	0.155	5554.5	10724.8	1.0000
Grouted Rock	8.4	0.155	6865.1	12675.1	0.8000
Grouted Rock	1.6	0.155	6859.0	12664.0	0.8000
Grouted Rock	10.0	0.155	5729.7	10828.8	0.8000

Table D.2-4: Key Nodes Selected

Nodes	Elevation (ft)	Description
4041	99.000	CIS at Reactor Vessel Support Elevation
4061	116.500	Auxiliary Shield Building at Control Room Floor
4120	179.560	ASB Auxiliary Building Roof Area
4310	327.410	ASB Shield Building Roof Area
4412	224.000	Steel Containment Vessel near Polar Crane
4535	134.250	Containment Internal Structure at Operating Deck
931	100.000	West end of the Annex Building
2901	100.000	East end of the Annex Building adjacent to the NI
2942	100.000	Base of the Annex Building Stick Model
2947	100.000	South end of the Turbine Building 1st Bay adjacent to the NI
2951	100.000	Base of the Turbine Building 1st Bay Stick Model
2955	100.000	North end of the Turbine Building 1st Bay

X/Y coordinates are -8.84 ft/-13.94 ft for all the nodes in X and Y 2D model, respectively.

Table D.2-5: SCII Adjacent Structures BE Sensitivity Relative Displacement Comparison

	North South Model		East West Model	
TPNP Soil Case	Turbine Building Foundation to Nuclear Island (inches)	Top of Turbine Building to Nuclear Island (El.170±) (inches)	Annex Building Foundation to Nuclear Island (inches)	Top of Annex Building to Nuclear Island (El.180±) (inches)
BE Sensitivity	0.049	0.174	0.020	0.091
BE	0.050	0.159	0.023	0.081

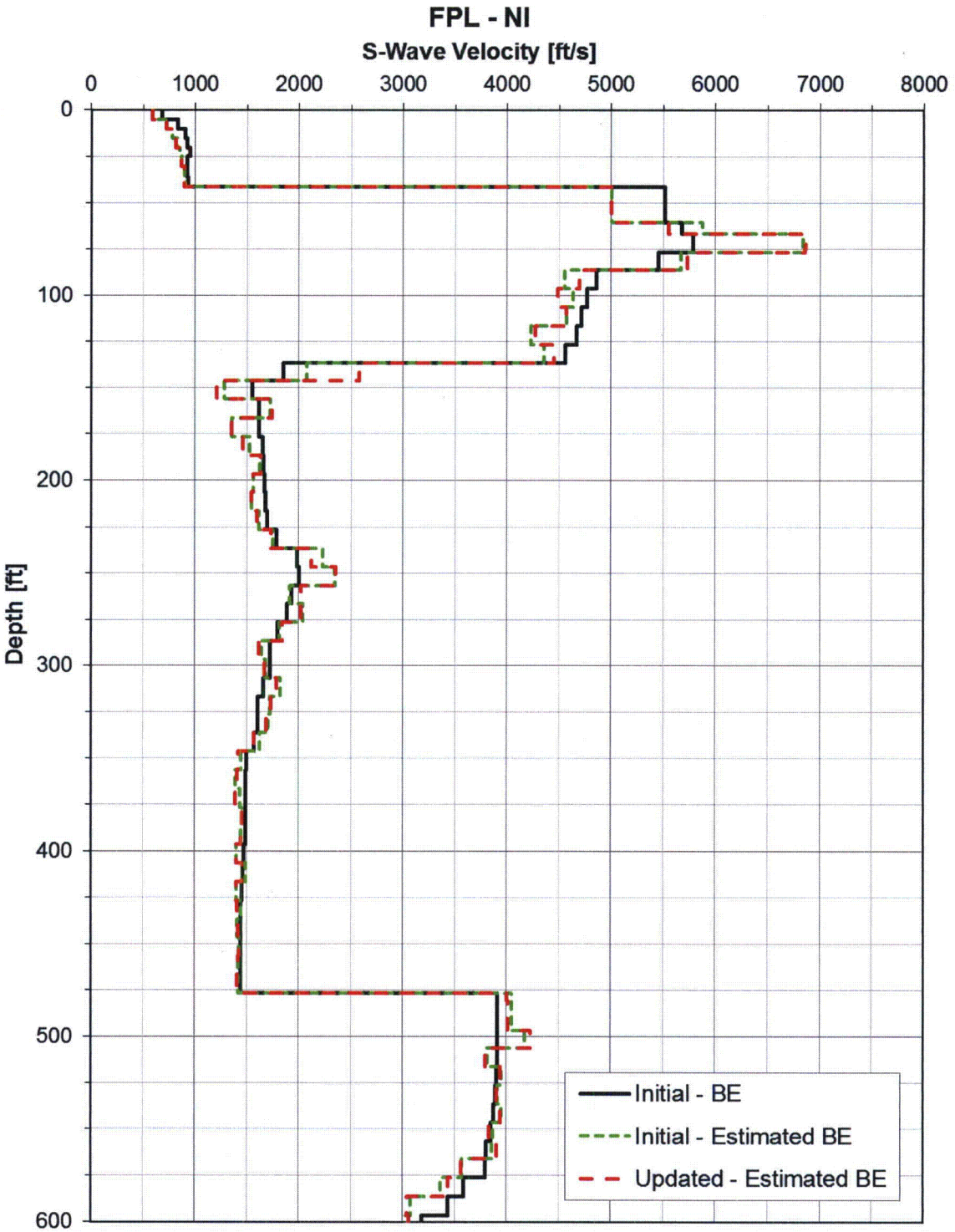

Figure D.2-1. Turkey Point Estimated Best-Estimate S-Wave Velocity Profile for the NI Site Column for the Site-Specific Motion

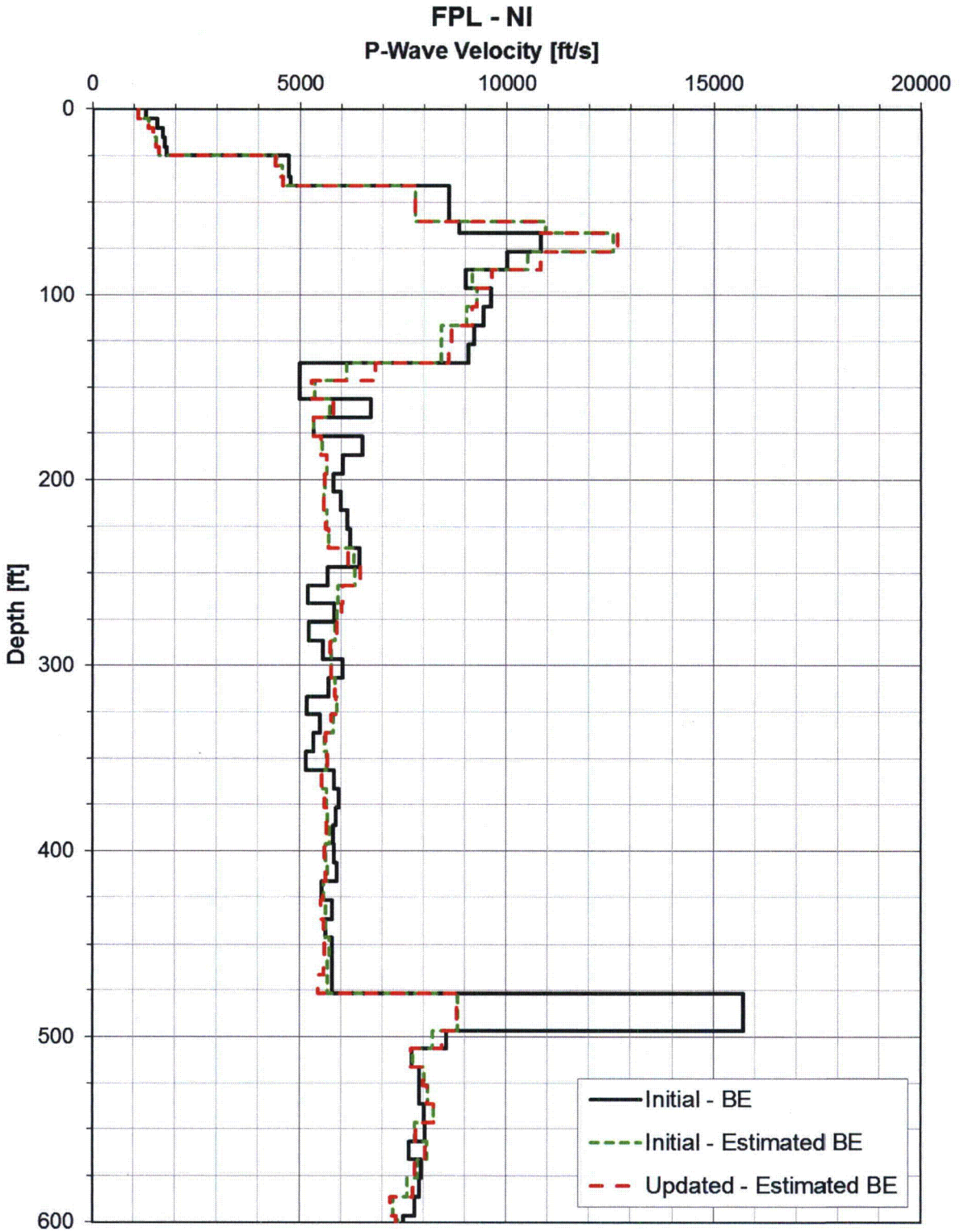

Figure D.2-2. Turkey Point Estimated Best-Estimate P-Wave Velocity Profile for the NI Site Column for the Site-Specific Motion

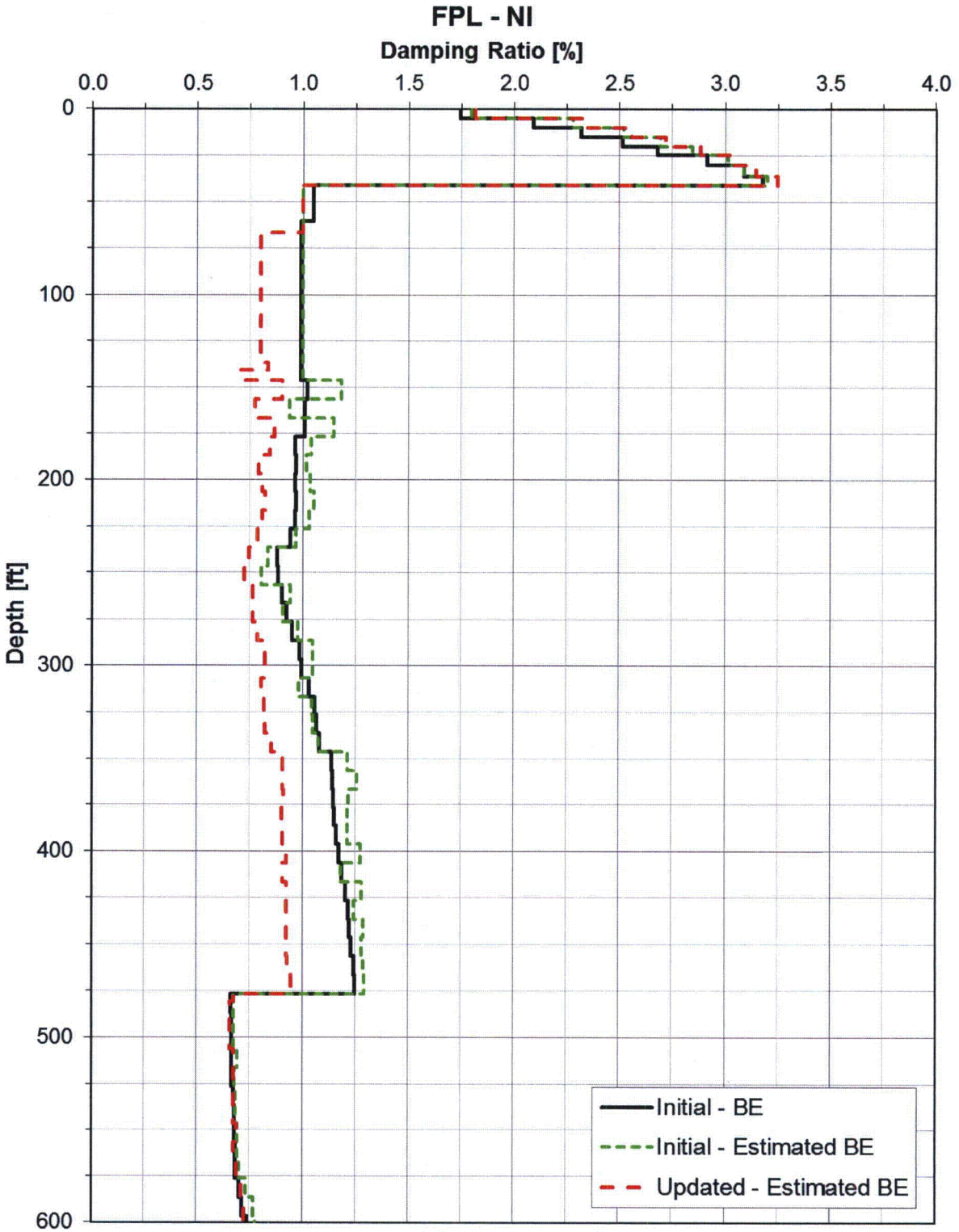

Figure D.2-3. Turkey Point Estimated Best-Estimate Damping Profile for the NI Site Column for the Site-Specific Motion

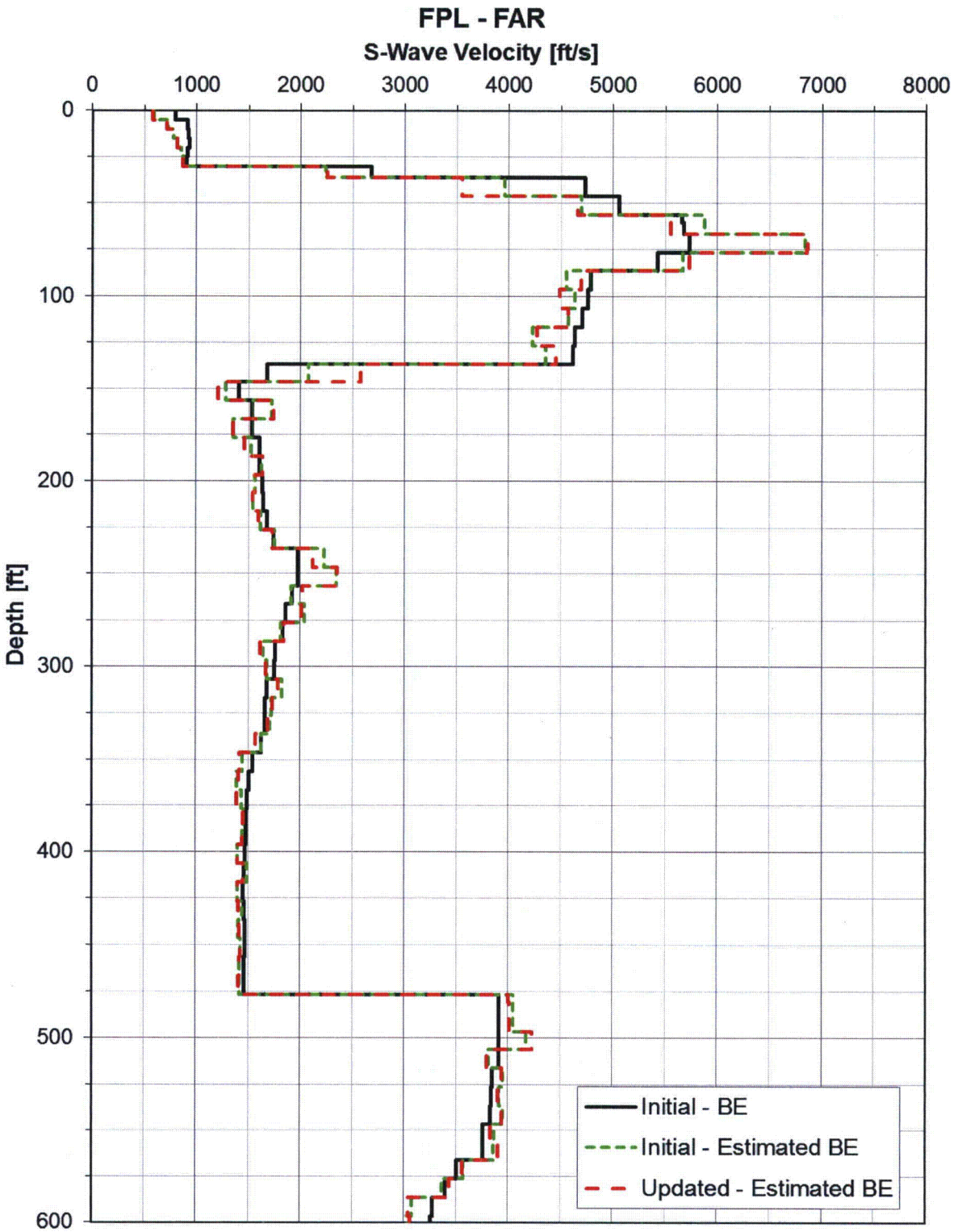

Figure D.2-4. Turkey Point Estimated Best-Estimate S-Wave Velocity Profile for the FAR Site Column for the Site-Specific Motion

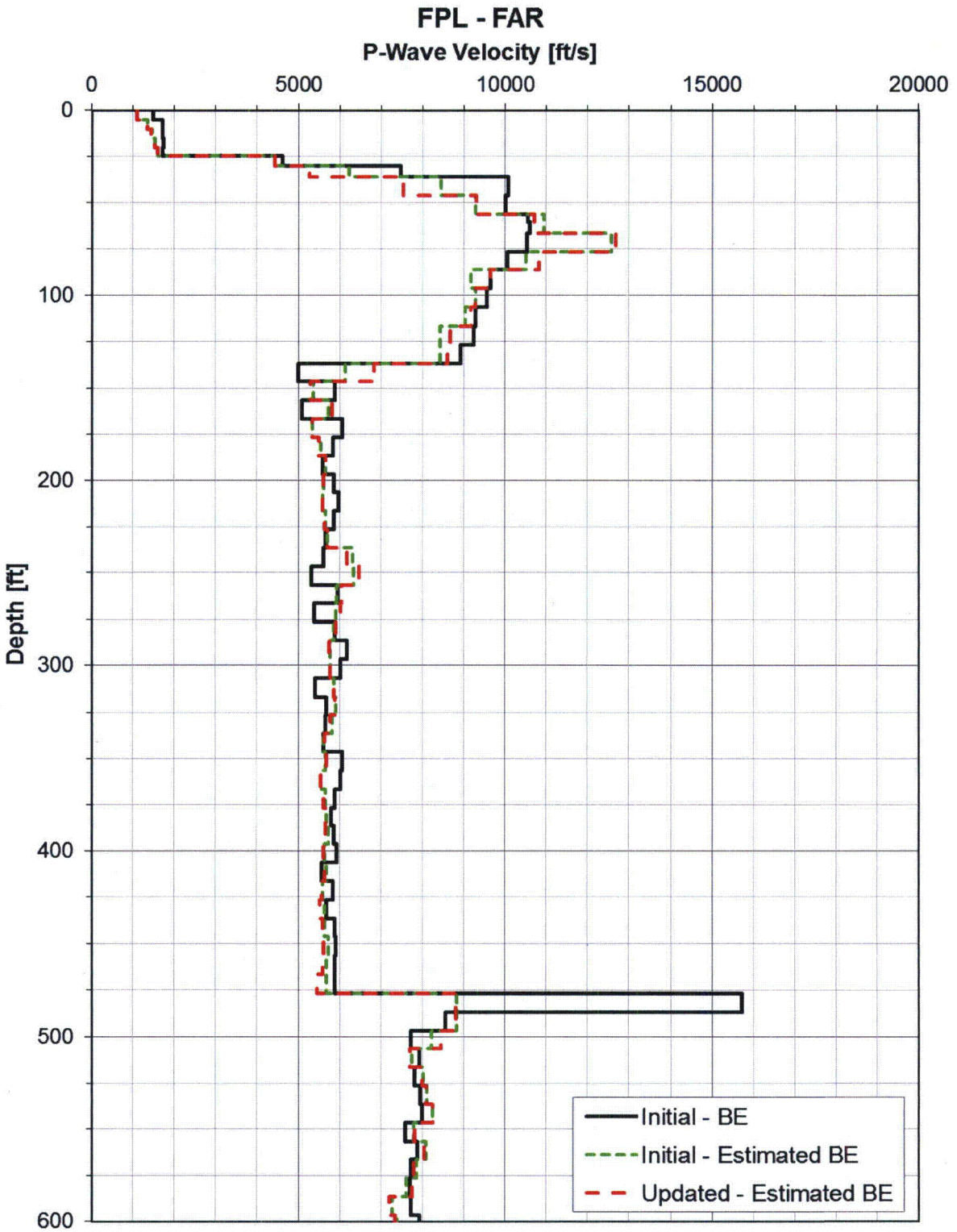

Figure D.2-5. Turkey Point Estimated Best-Estimate P-Wave Velocity Profile for the FAR Site Column for the Site-Specific Motion

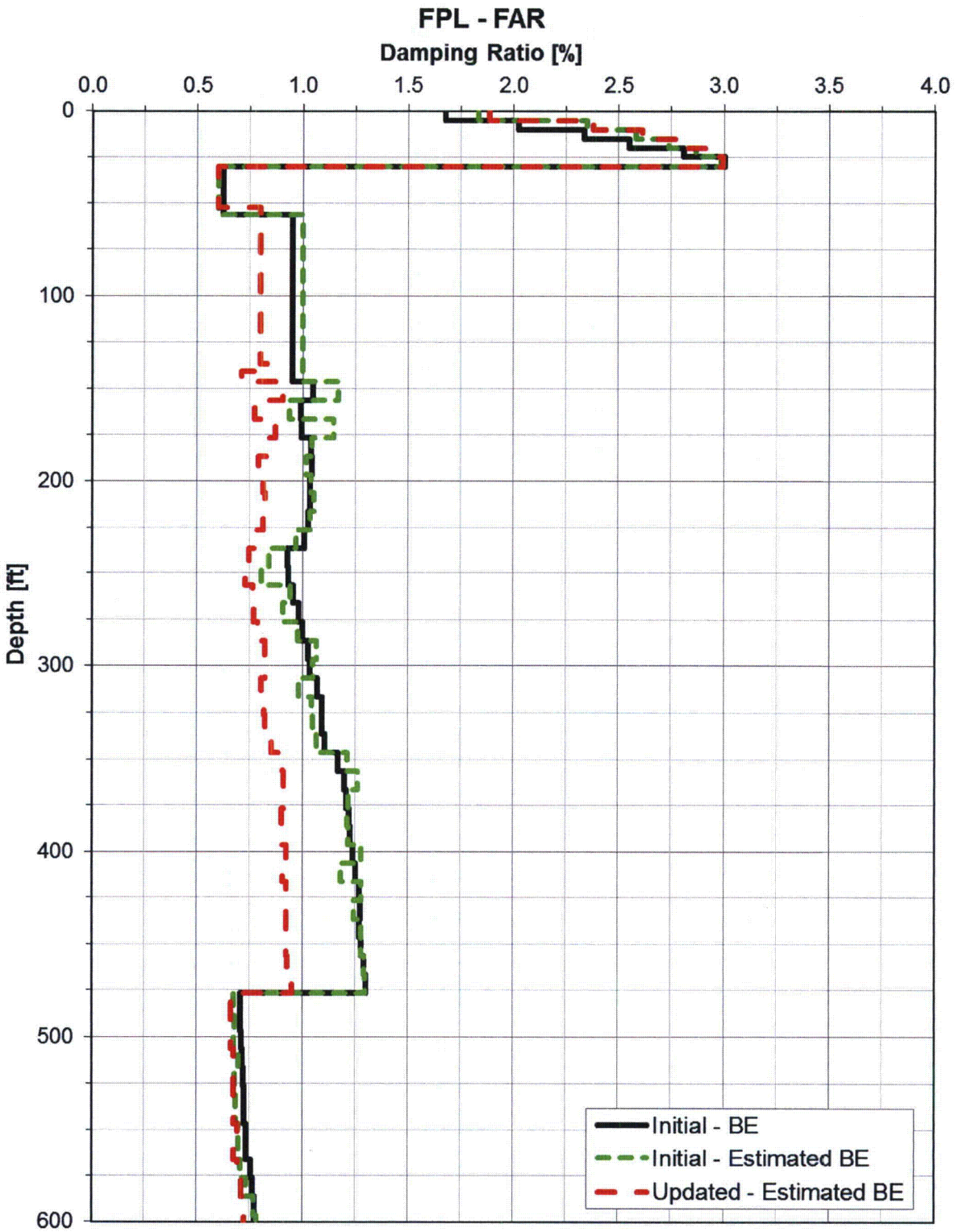

Figure D.2-6. Turkey Point Estimated Best-Estimate Damping Profile for the FAR Site Column for the Site-Specific Motion

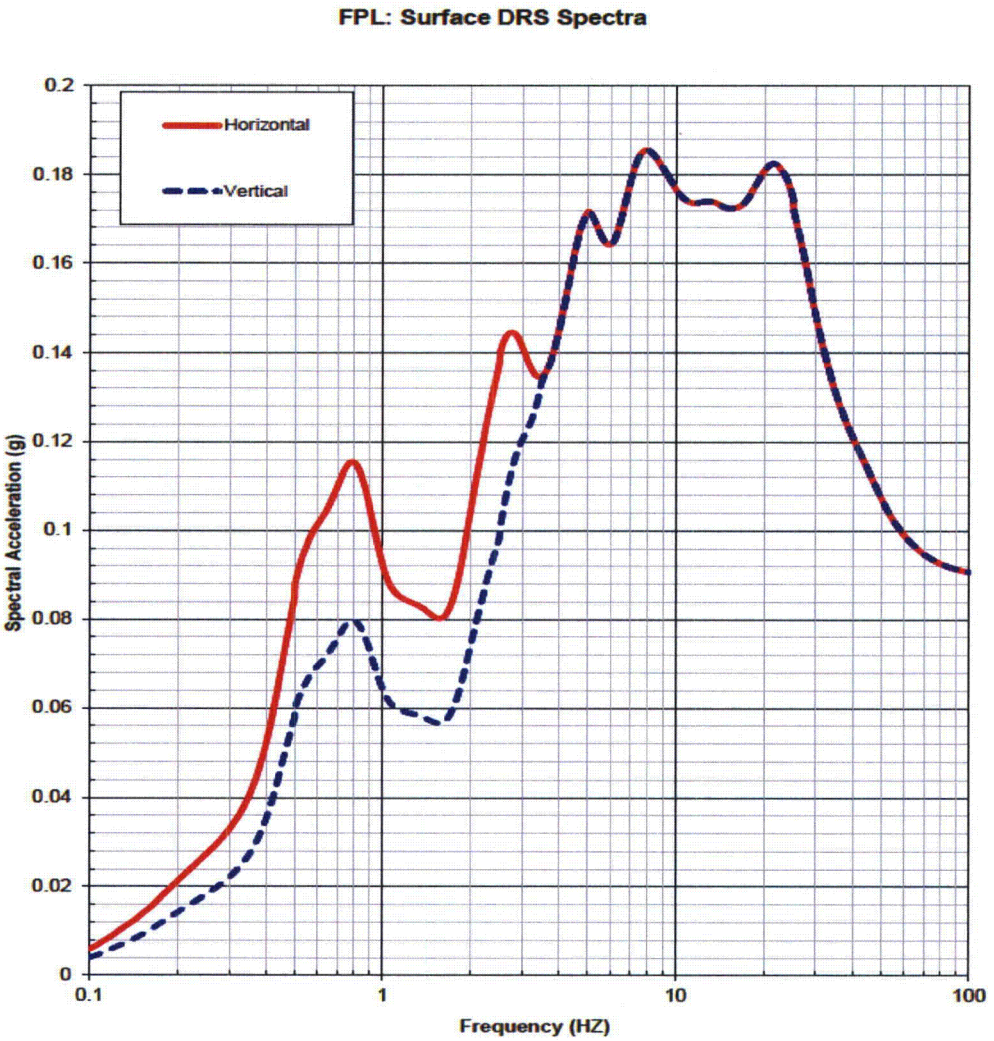

Figure D.2-7: TPNP Updated Annex Building Surface DRS (5% damping)

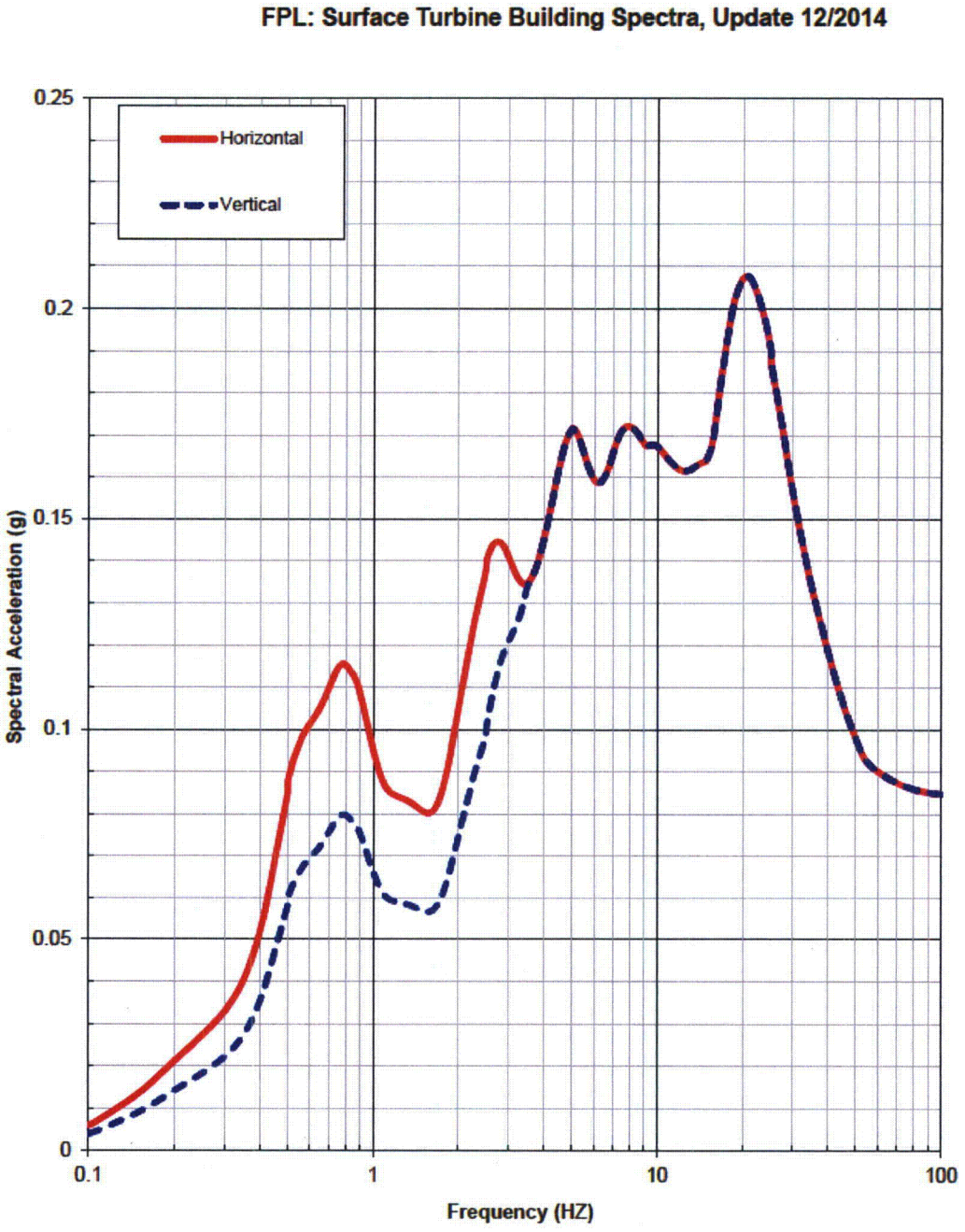

Figure D.2-8: TPNP Updated Turbine Building 1st Bay Surface DRS (5% damping)

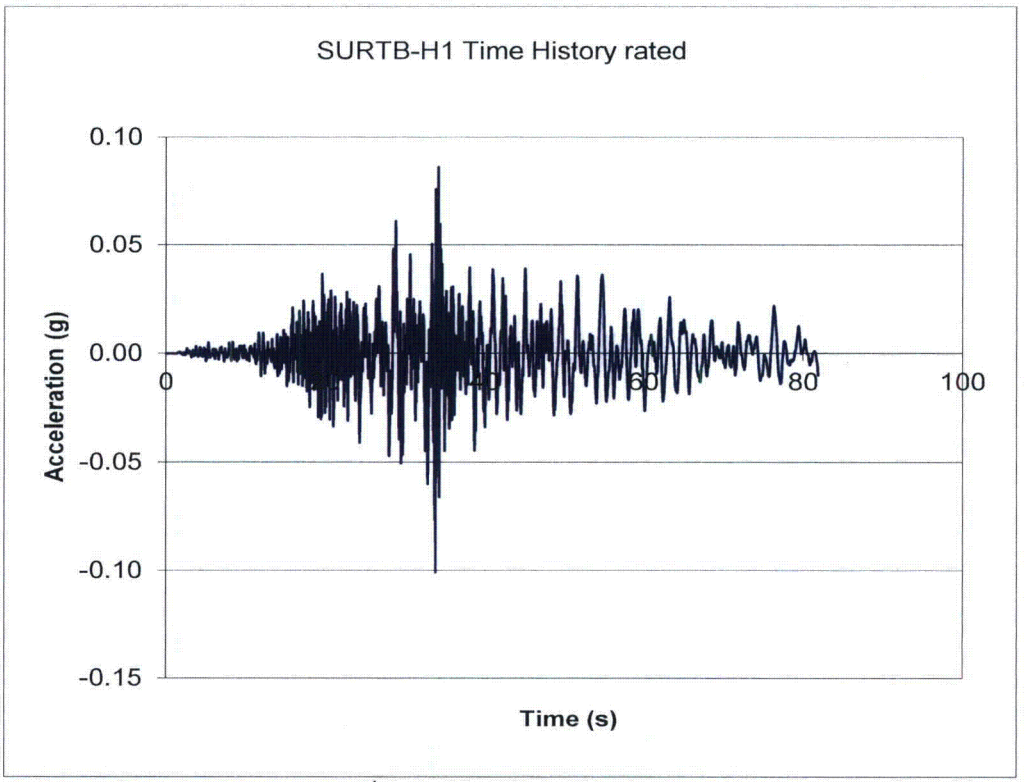

Figure D.2-9: TPNP Updated TB 1st Bay Seismic Input H1 in X-Direction (Scaled to 0.1g) – El. +25.5'

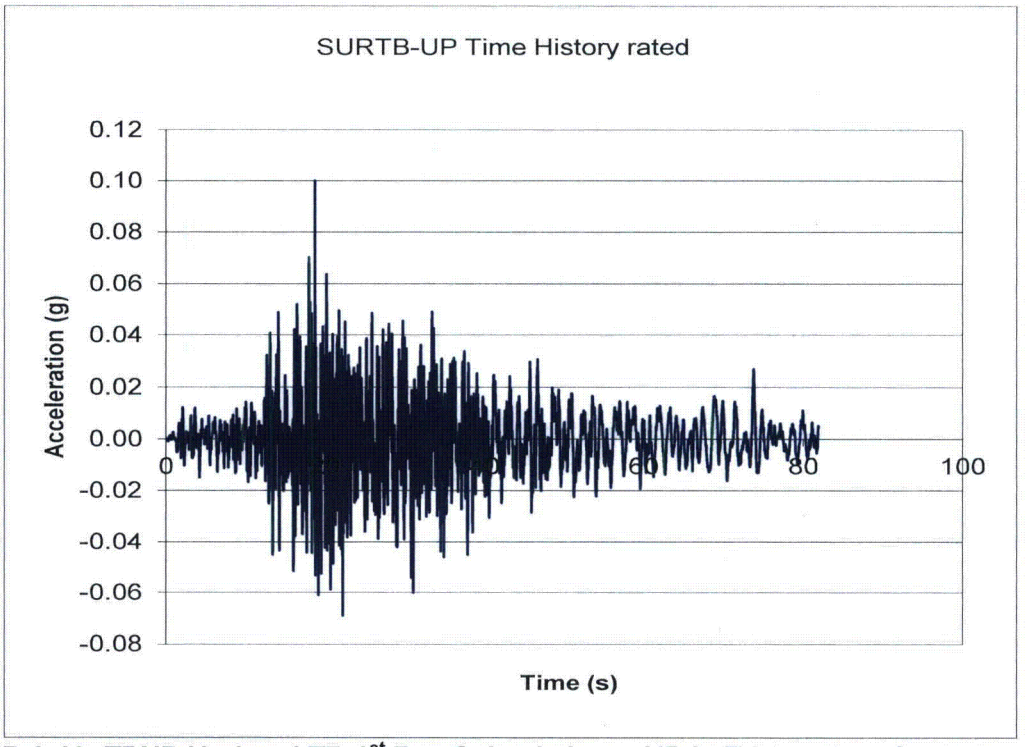

Figure D.2-10: TPNP Updated TB 1st Bay Seismic Input UP in Z-Direction (Scaled to 0.1g) – El. +25.5

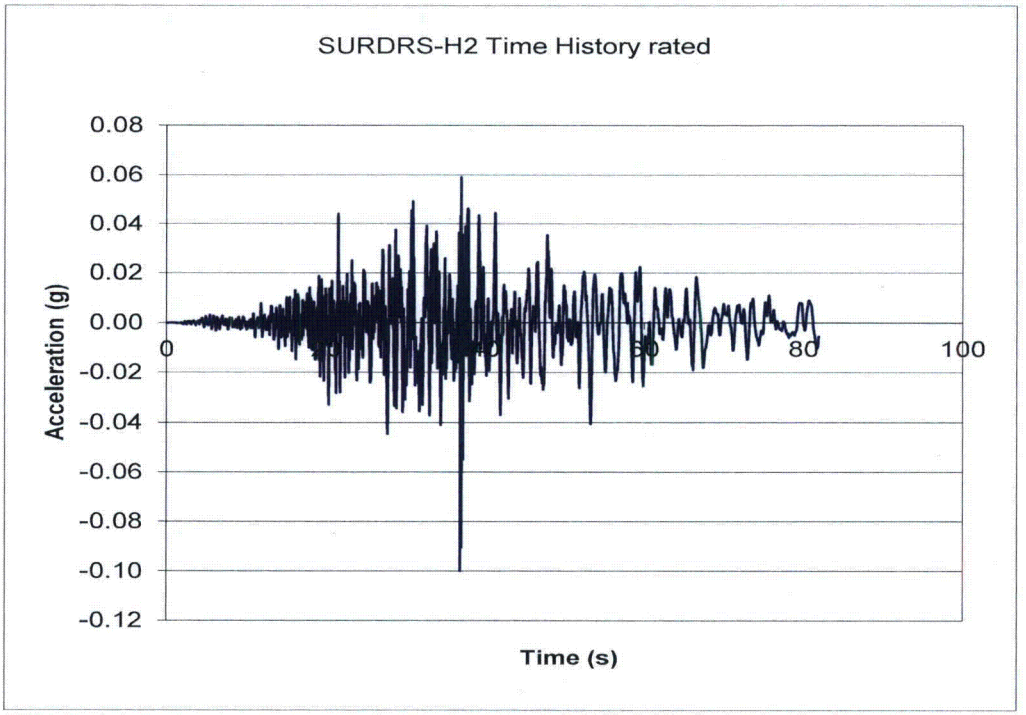

Figure D.2-11: TPNP Updated AB Seismic Input H2 in Y-Direction (Scaled to 0.1g) – El. +25.5'

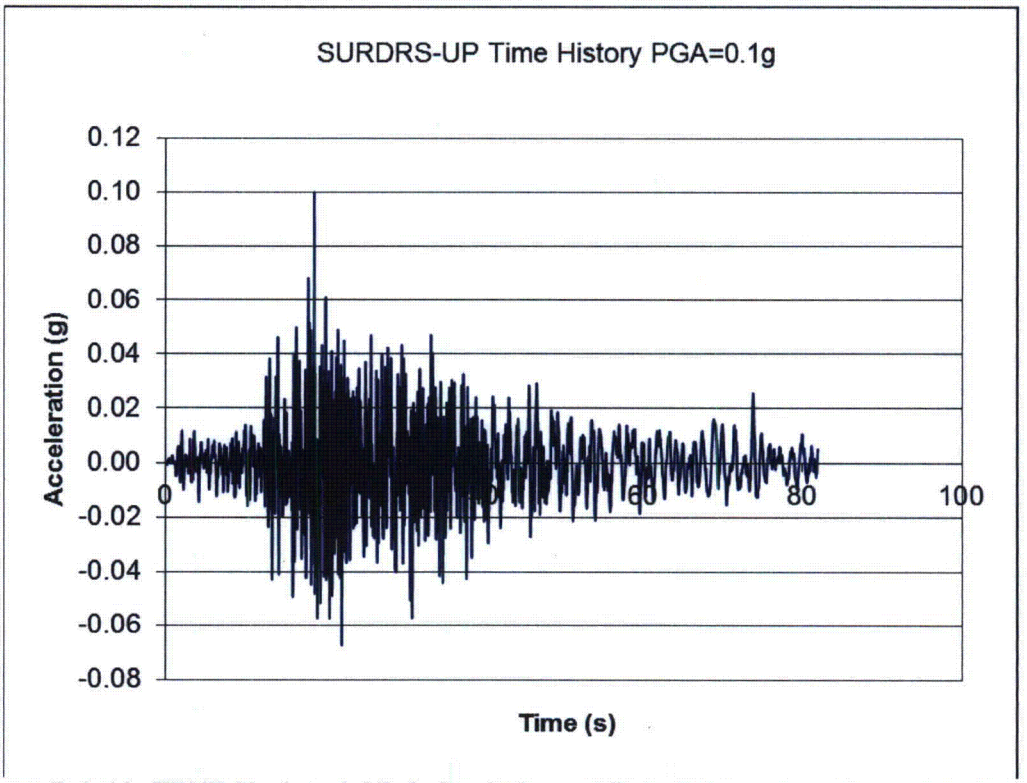

Figure D.2-12: TPNP Updated AB Seismic Input UP in Z-Direction (Scaled to 0.1g) – El. +25.5'

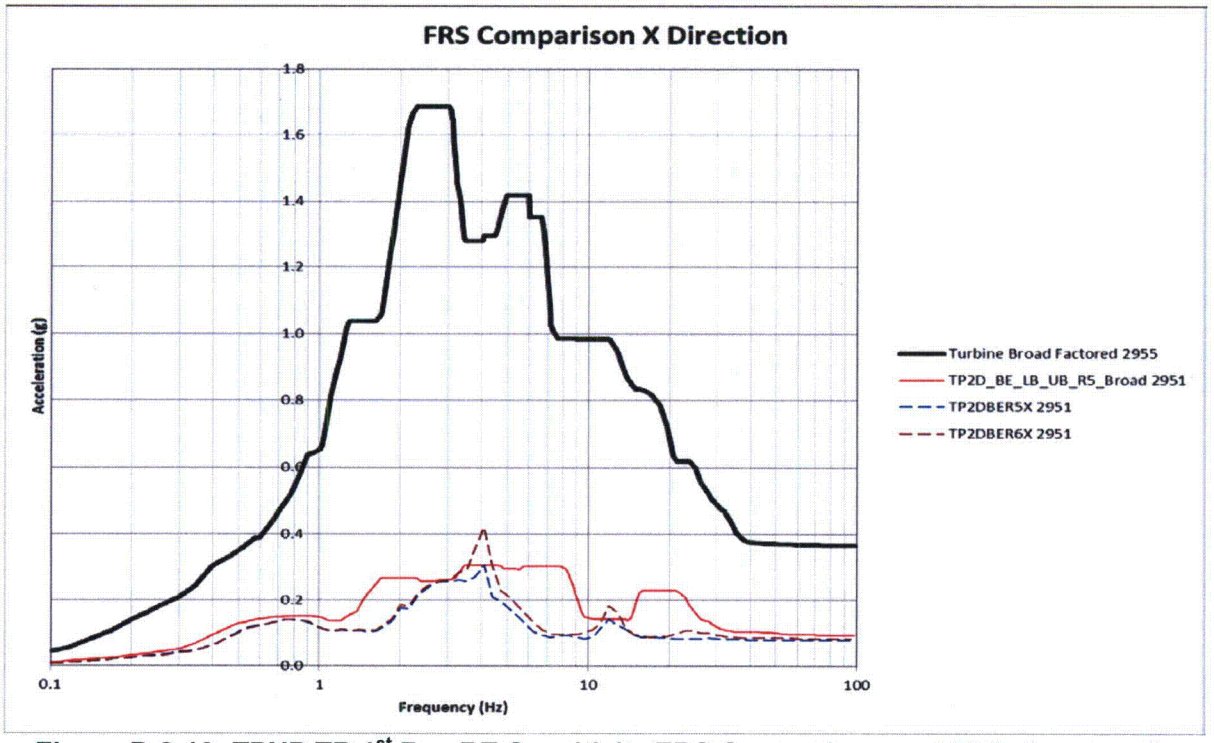

Figure D.2-13: TPNP TB 1st Bay BE Sensitivity FRS Comparison and FRS Envelope in X-Direction – Node 2951

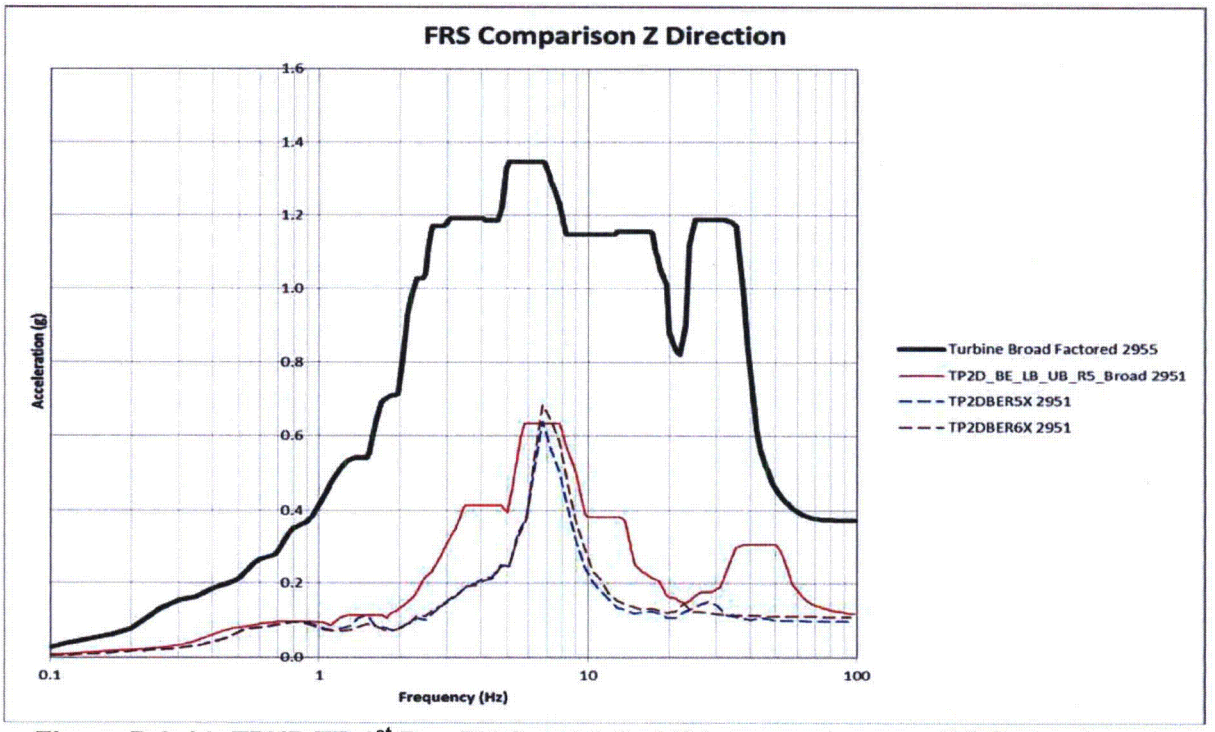

Figure D.2-14: TPNP TB 1st Bay BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 2951

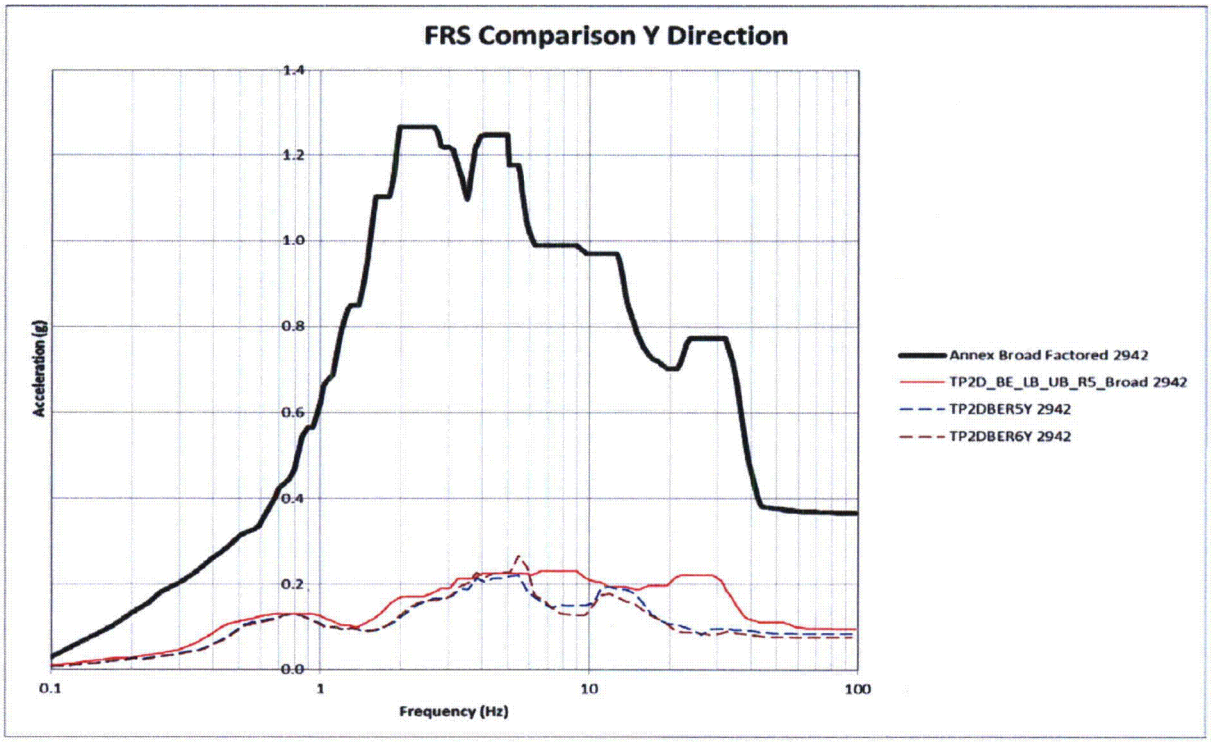

Figure D.2-15: TPNP AB BE Sensitivity FRS Comparison and FRS Envelope in Y-Direction – Node 2942

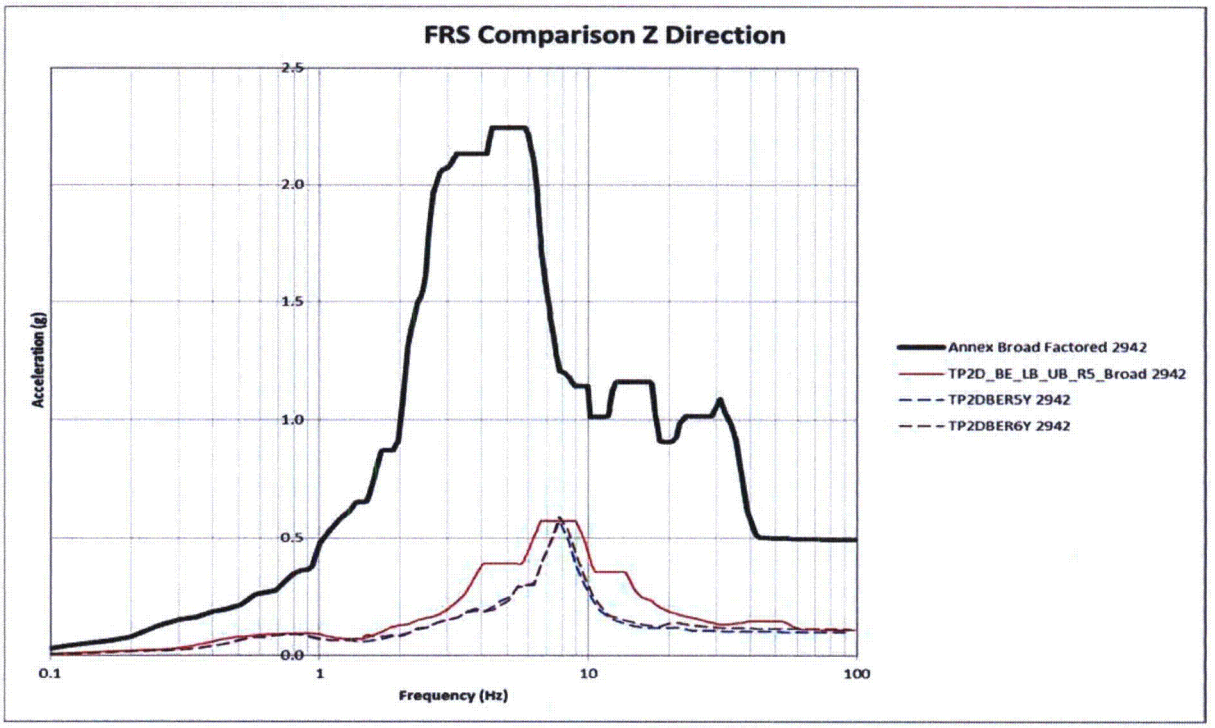

Figure D.2-16: TPNP AB BE Sensitivity FRS Comparison and FRS Envelope in Z-Direction – Node 2942

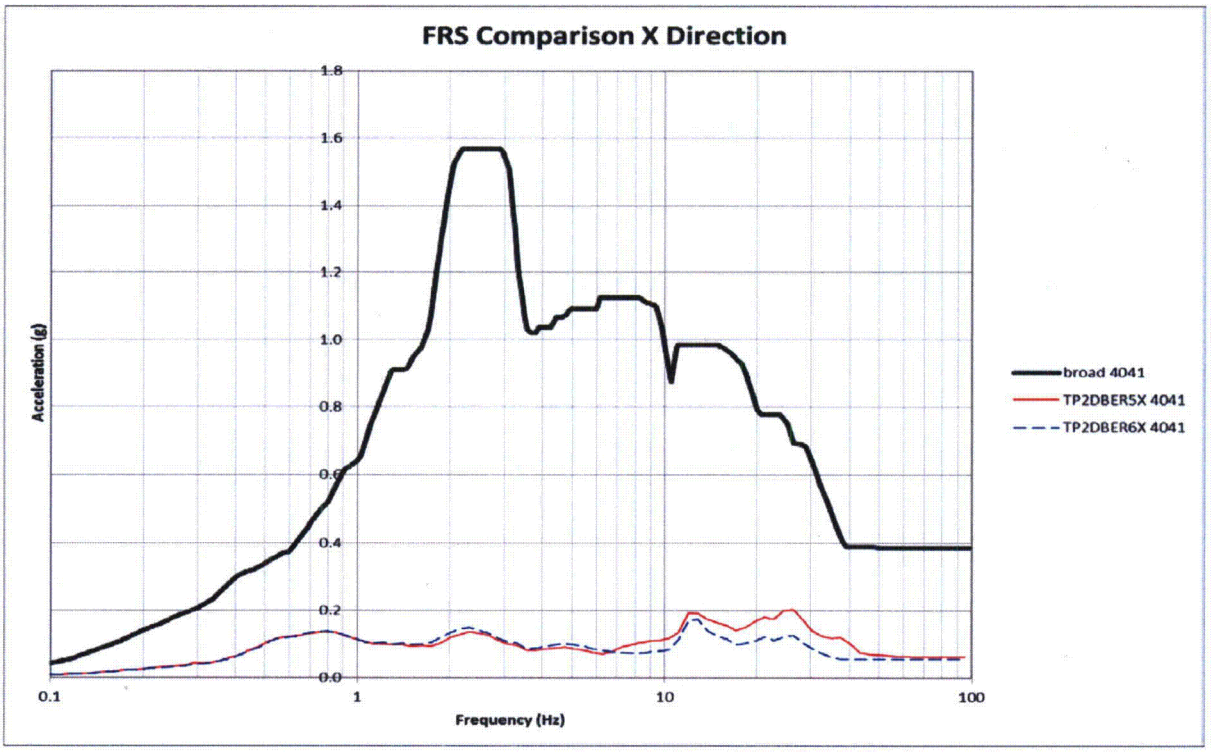

Figure D.2-17: TPNP 2D NI BE Sensitivity FRS Comparison, X Direction – Node 4041 (El. 99.0 ft)

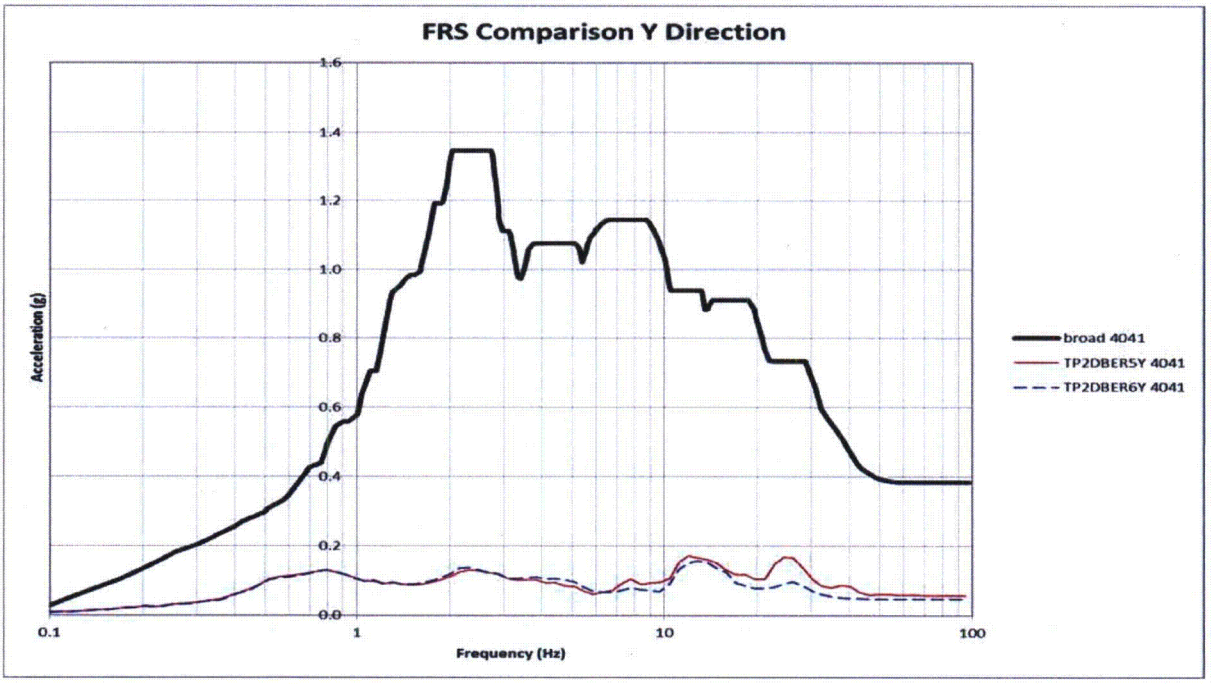

Figure D.2-18: TPNP 2D NI BE Sensitivity FRS Comparison, Y Direction – Node 4041 (El. 99.0 ft)

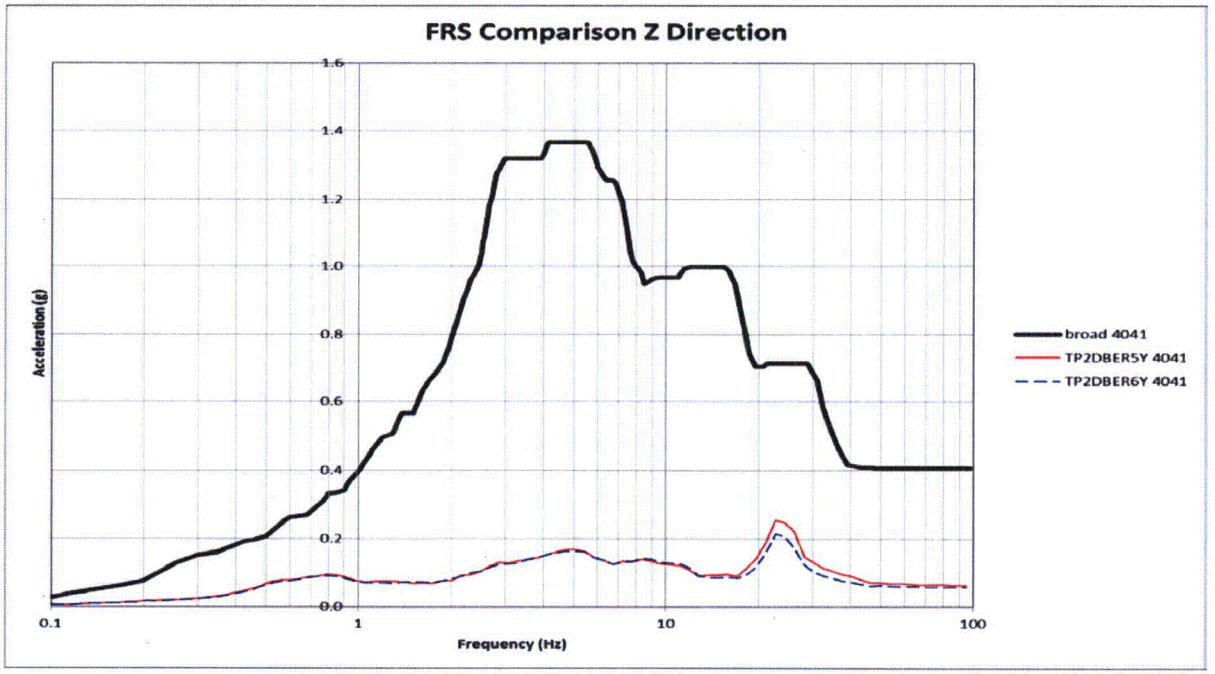

Figure D.2-19: TPNP 2D NI BE Sensitivity FRS Comparison, Z Direction – Node 4041 (El. 99.0 ft)

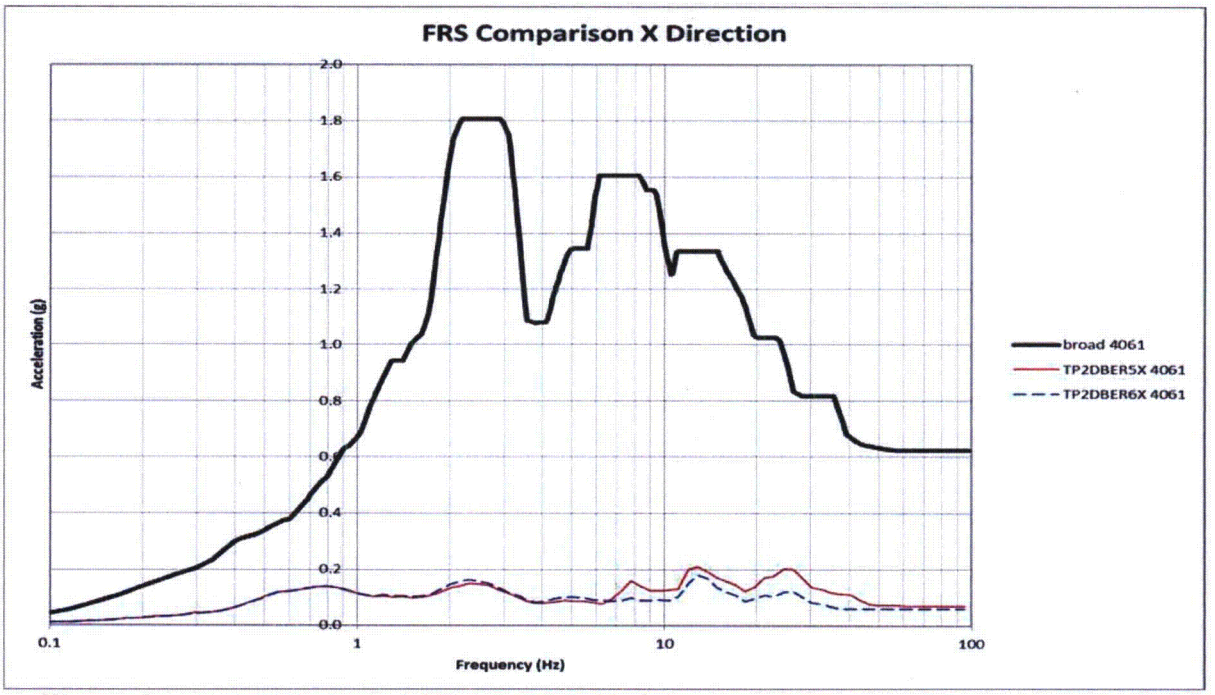

Figure D.2-20: TPNP 2D NI BE Sensitivity FRS Comparison, X Direction – Node 4061 (El. 116.5 ft)

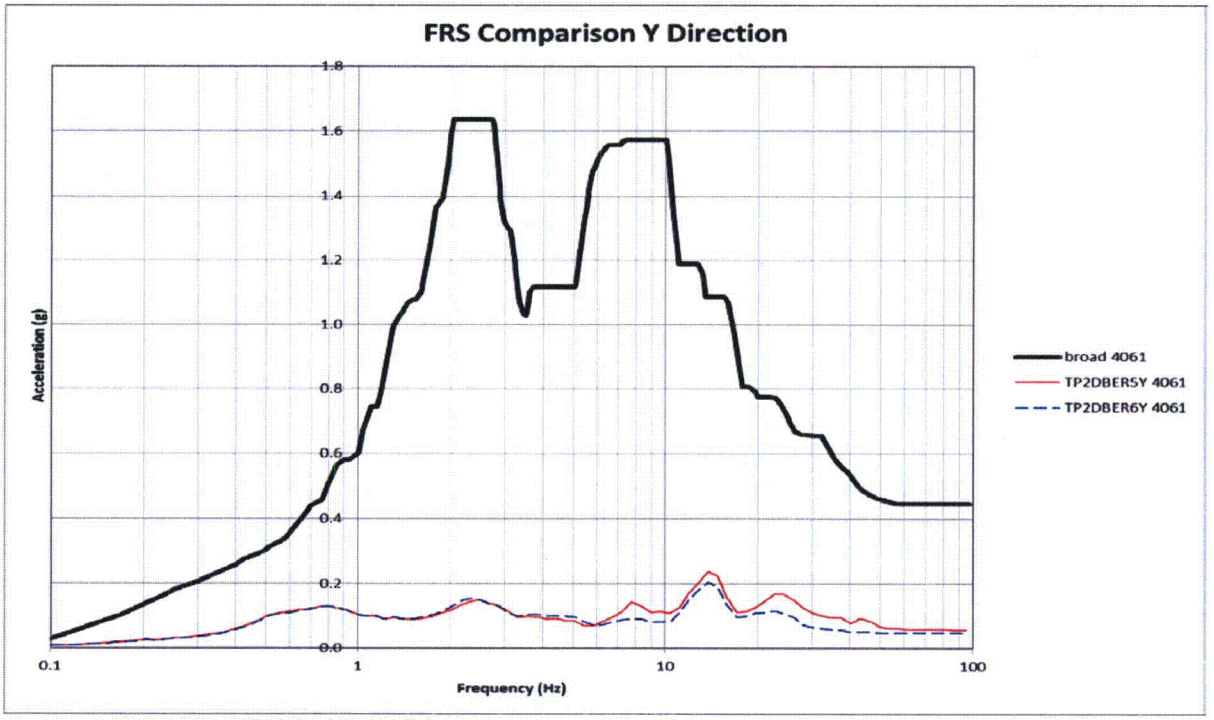

Figure D.2-21: TPNP 2D NI BE Sensitivity FRS Comparison, Y Direction – Node 4061 (El. 116.5 ft)

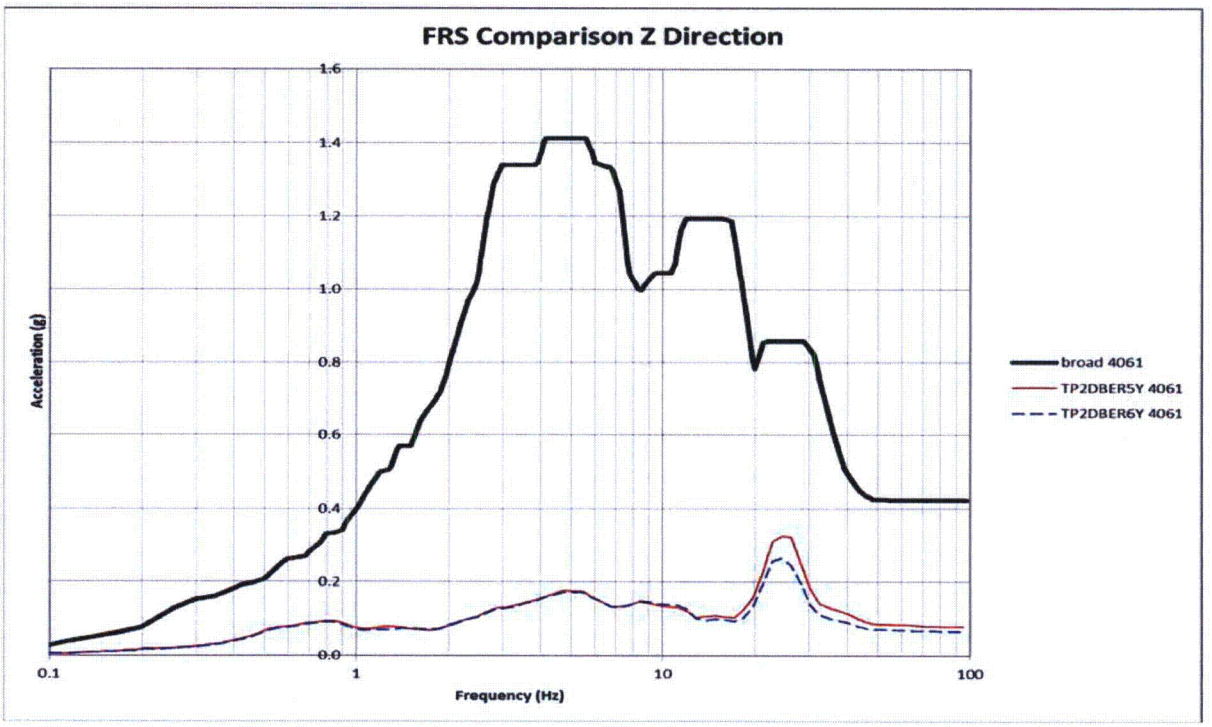

Figure D.2-22: TPNP 2D NI BE Sensitivity FRS Comparison, Z Direction – Node 4061 (El. 116.5 ft)

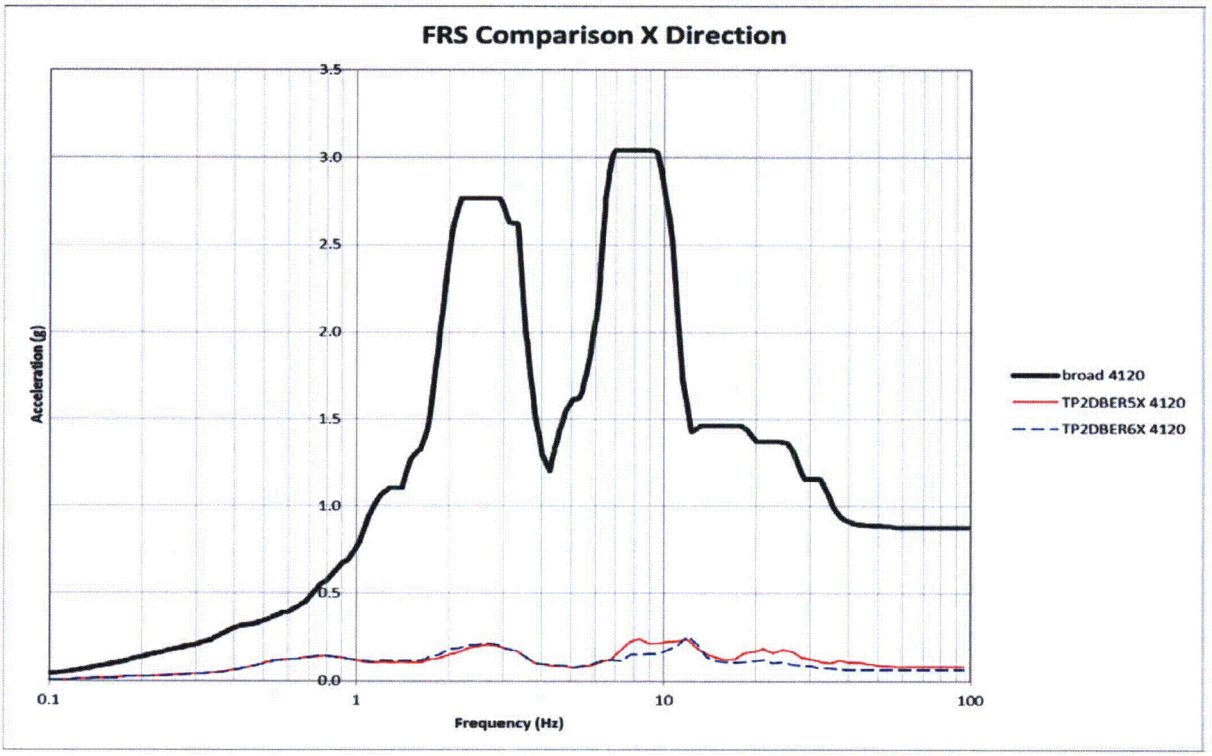

Figure D.2-23: TPNP 2D NI BE Sensitivity FRS Comparison, X Direction – Node 4120 (El. 179.56 ft)

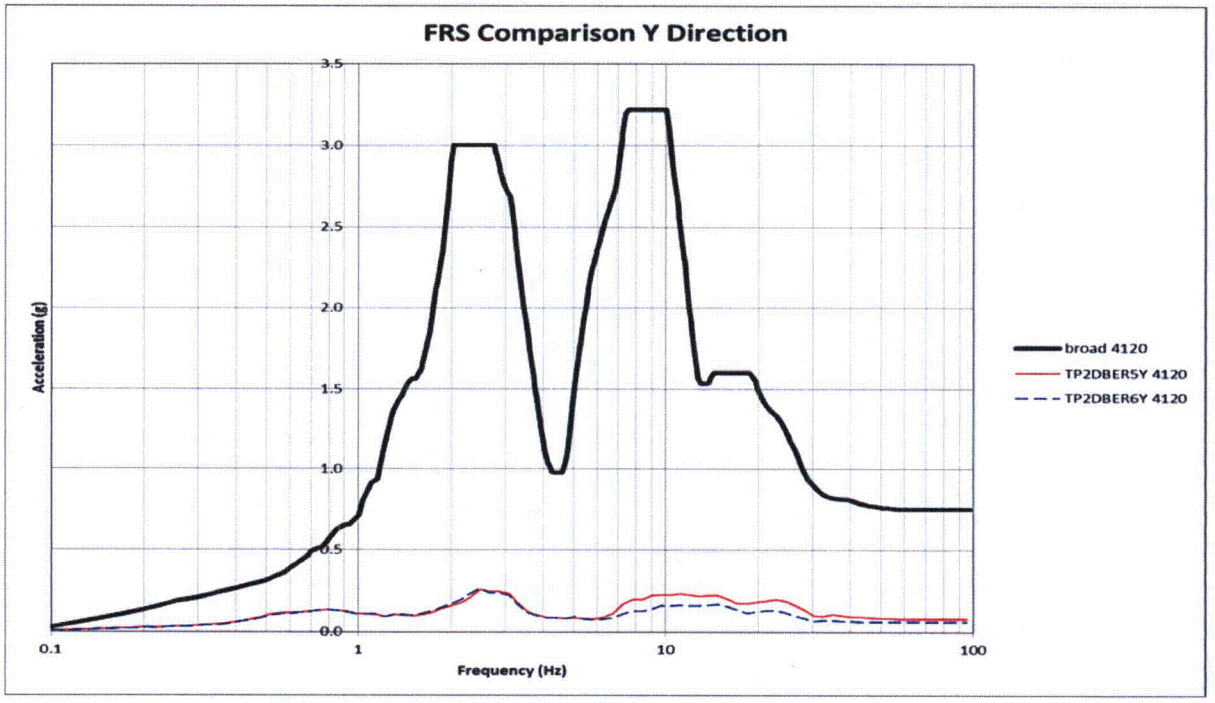

Figure D.2-24: TPNP 2D NI BE Sensitivity FRS Comparison, Y Direction – Node 4120 (El. 179.56 ft)

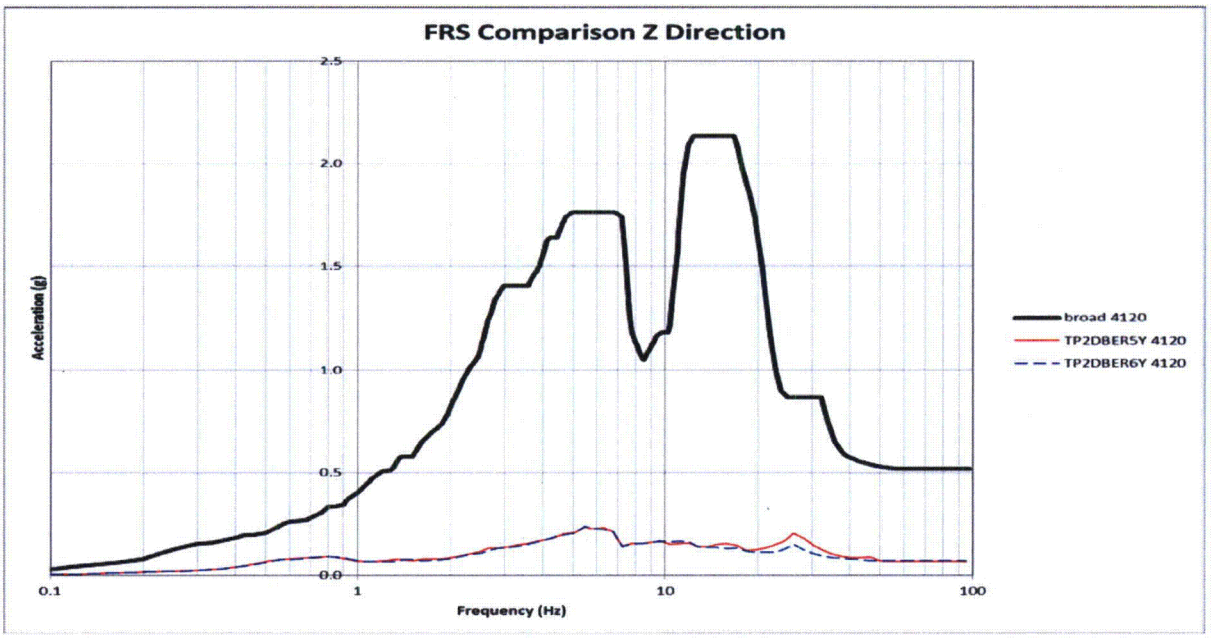

Figure D.2-25: TPNP 2D NI BE Sensitivity FRS Comparison, Z Direction – Node 4120 (El. 179.56 ft)

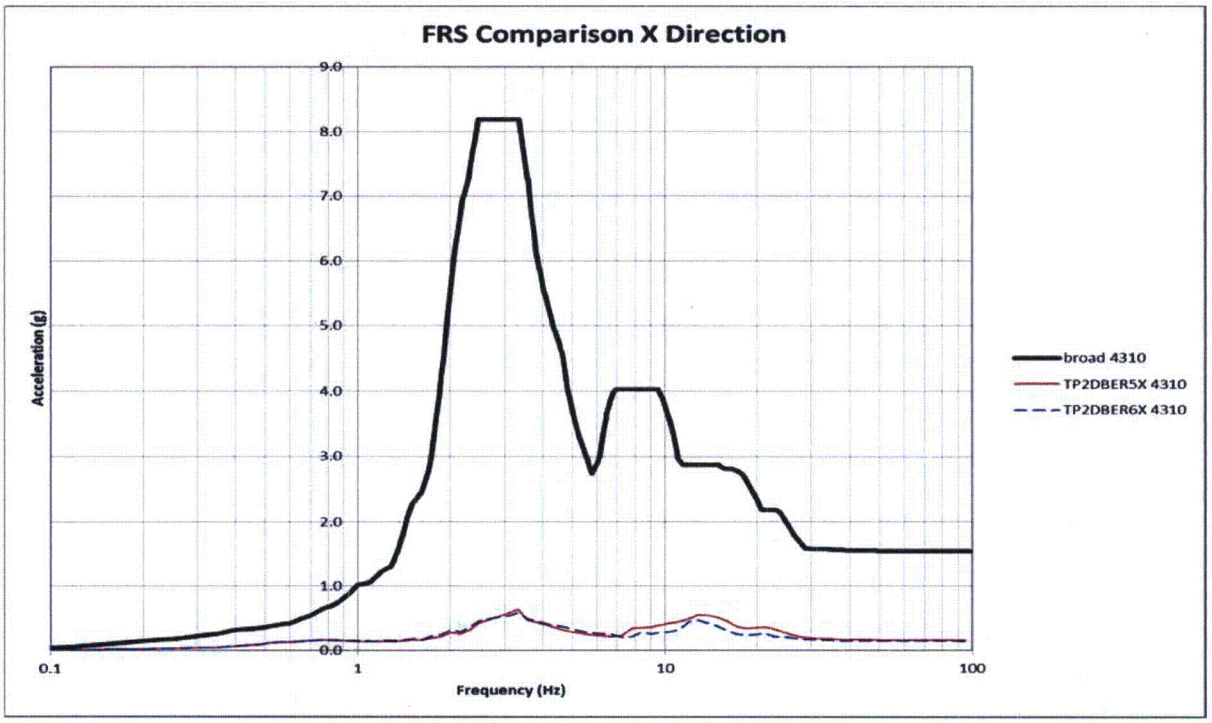

Figure D.2-26: TPNP 2D NI BE Sensitivity FRS Comparison, X Direction – Node 4310 (El. 327.41 ft)

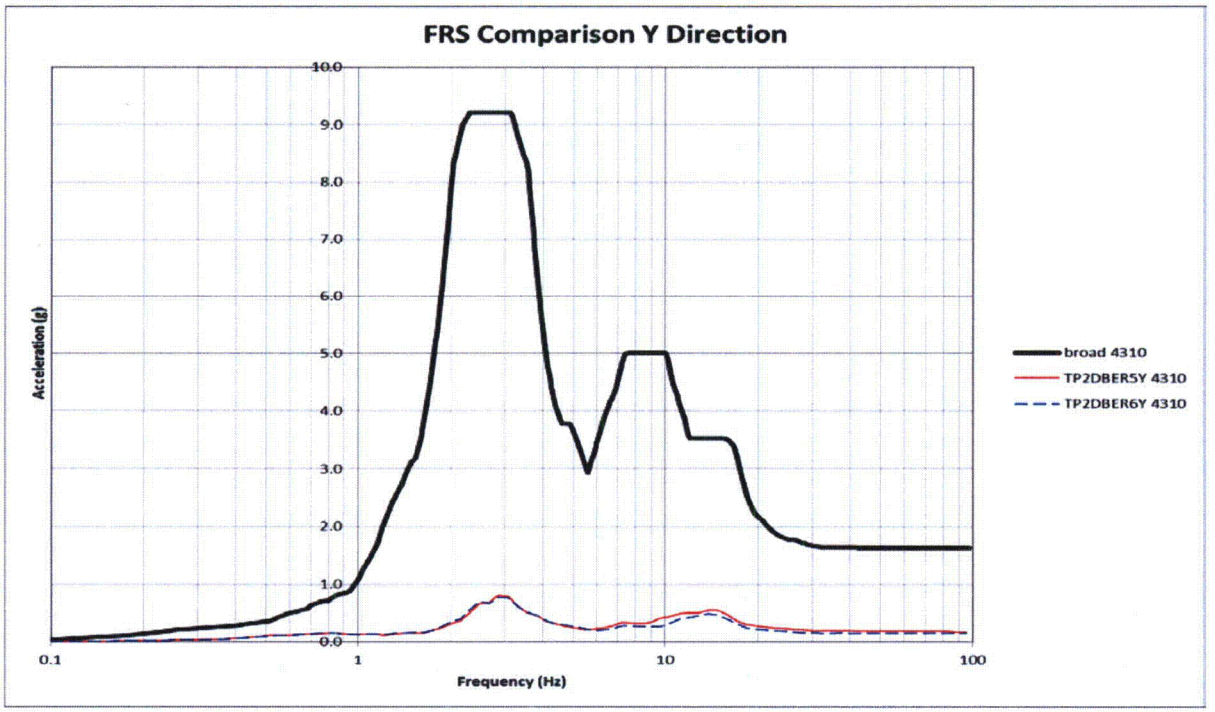

Figure D.2-27: TPNP 2D NI BE Sensitivity FRS Comparison, Y Direction – Node 4310 (El. 327.41 ft)

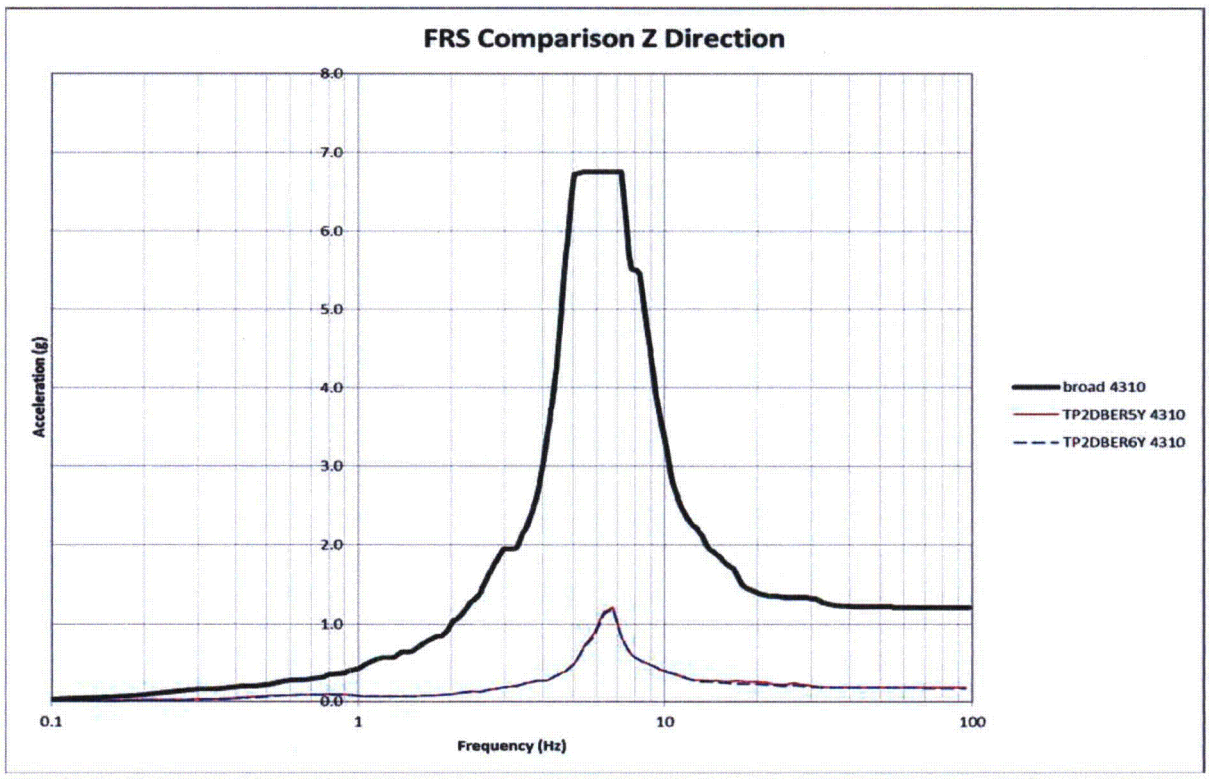

Figure D.2-28: TPNP 2D NI BE Sensitivity FRS Comparison, Z Direction – Node 4310 (El. 327.41 ft)

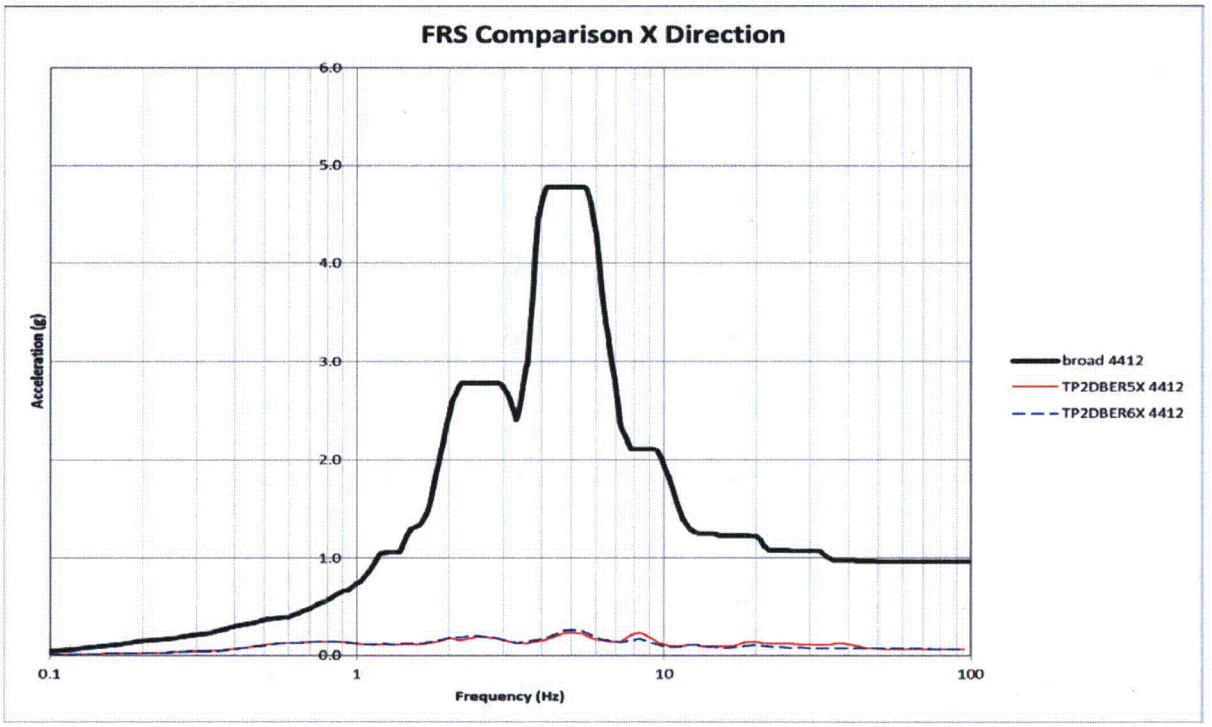

Figure D.2-29: TPNP 2D NI BE Sensitivity FRS Comparison, X Direction – Node 4412 (El. 224.0 ft)

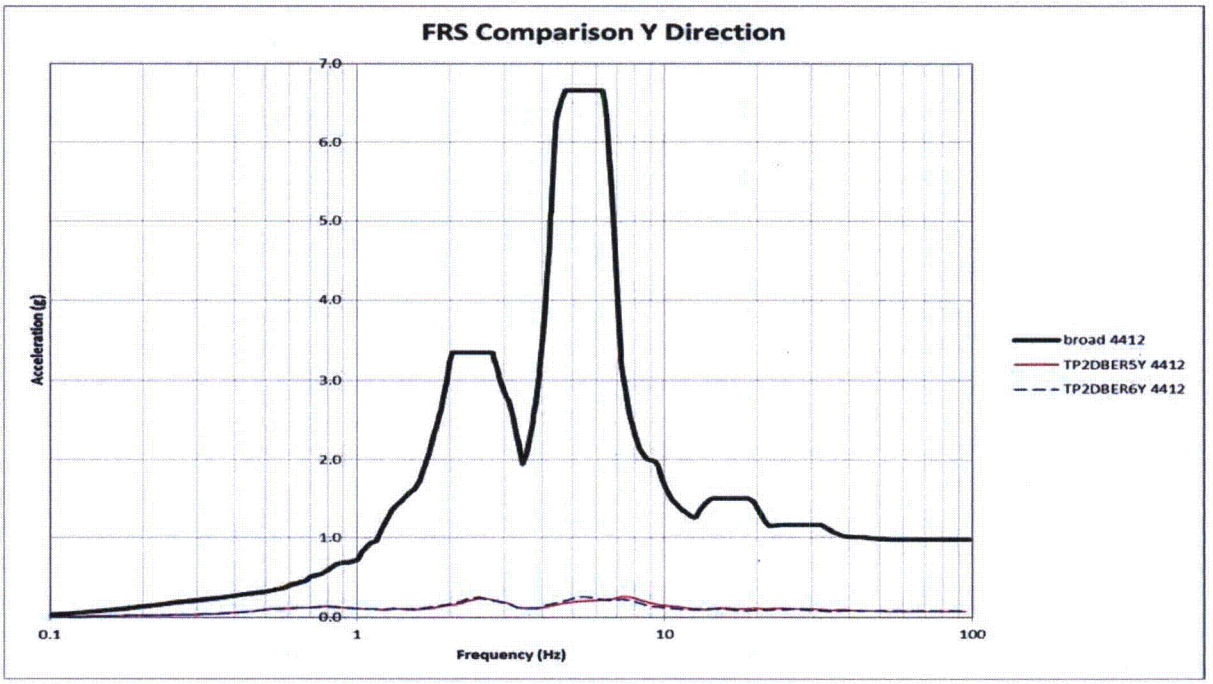

Figure D.2-30: TPNP 2D NI BE Sensitivity FRS Comparison, Y Direction – Node 4412 (El. 224.0 ft)

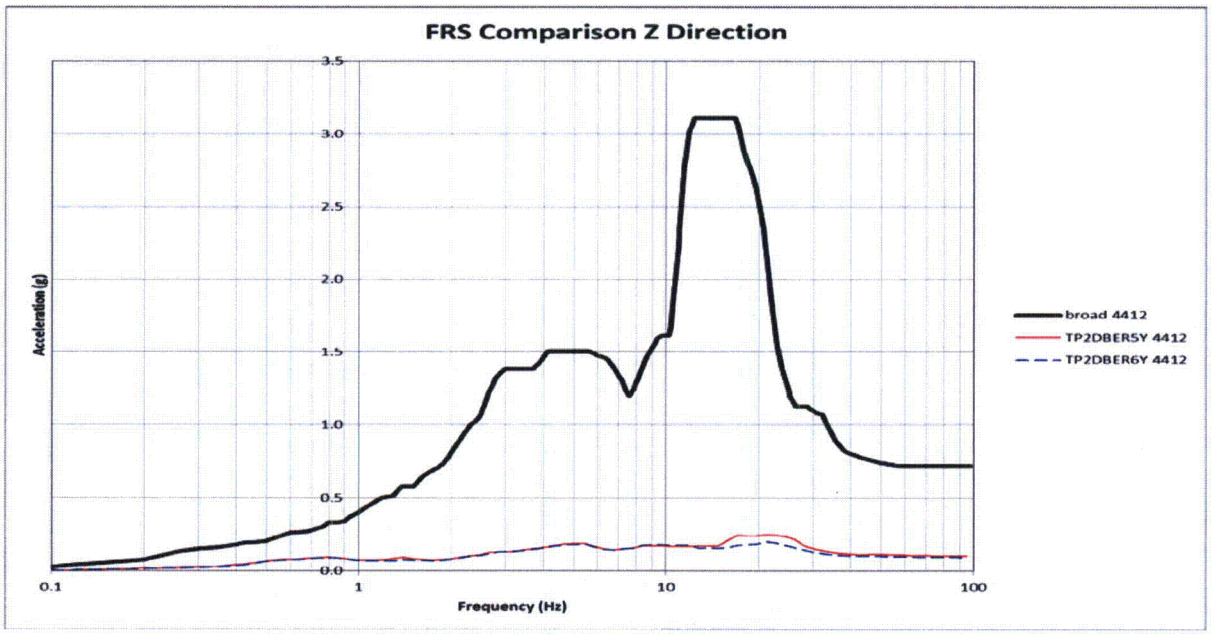

Figure D.2-31: TPNP 2D NI BE Sensitivity FRS Comparison, Z Direction – Node 4412 (El. 224.0 ft)

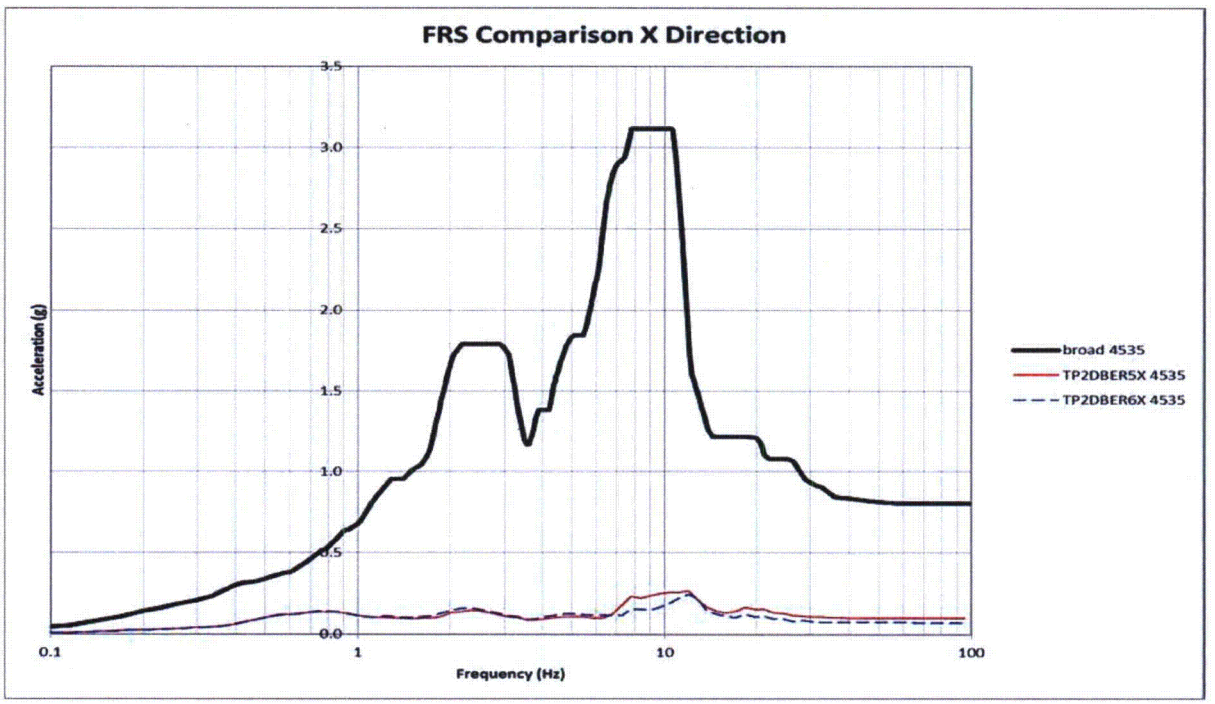

Figure D.2-32: TPNP 2D NI BE Sensitivity FRS Comparison, X Direction – Node 4535 (El. 134.25 ft)

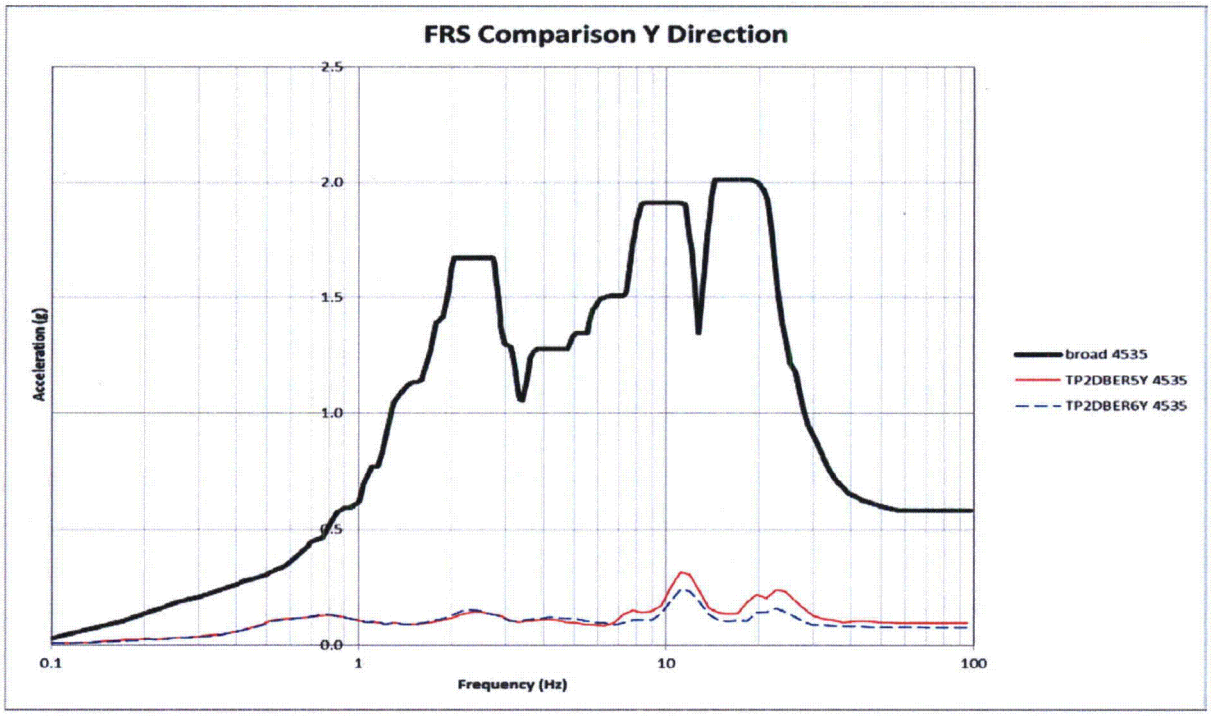

Figure D.2-33: TPNP 2D NI BE Sensitivity FRS Comparison, Y Direction – Node 4535 (El. 134.25 ft)

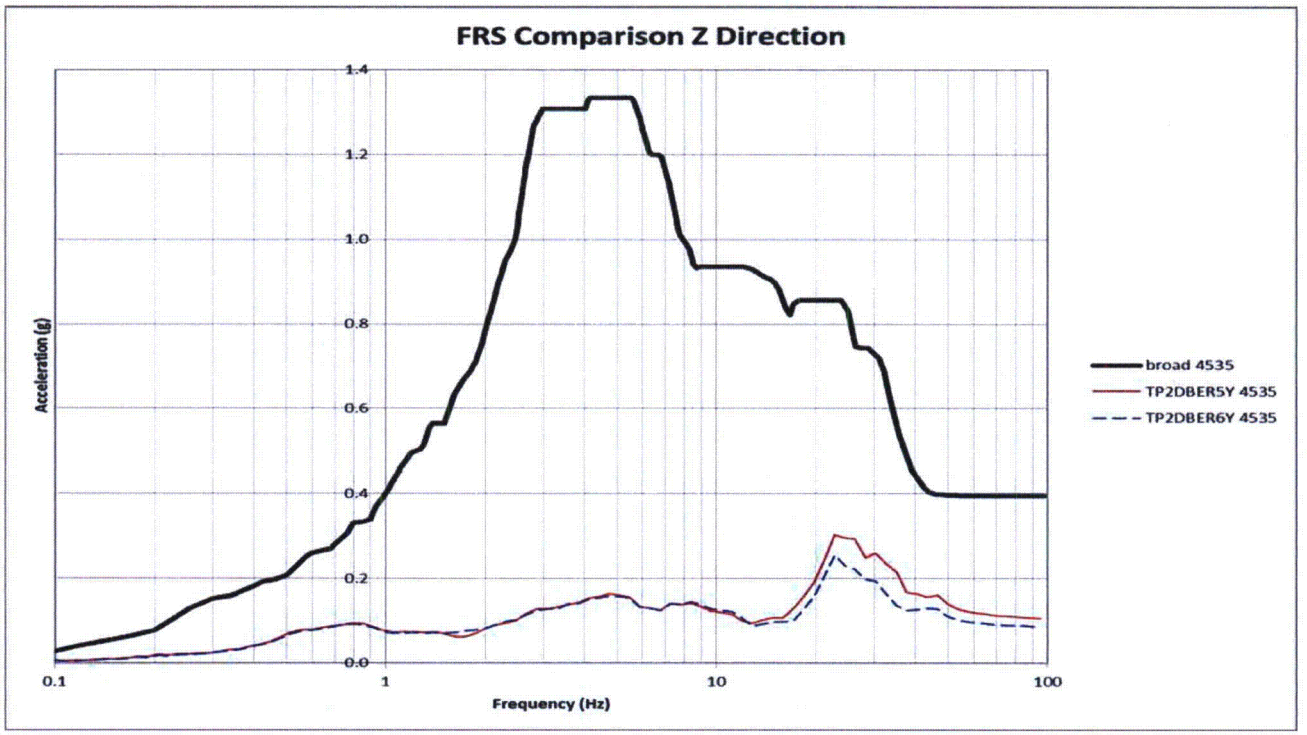

Figure D.2-34: TPNP 2D NI BE Sensitivity FRS Comparison, Z Direction – Node 4435 (El. 134.25 ft)