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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Joseph M. Farley Nuclear Plant
Verification Of Seismic Adequacy Of Mechanical And
Electrical Equipment In Operating Reactors
Unresolved Safety Issue (USI A-46), Generic Letter 87-02 RAI Response

Ladies and Gentlemen:

This letter is in response to the Request for Additional Information (RAI) dated May 15, 1997, concerning our submittal dated October 28, 1996, titled "Unresolved Safety Issue (USI) A-46, Generic Letter 87-02 RAI Response." The enclosure provides the Southern Nuclear Operating Company (SNC) response to the RAI.

If you have any questions, please advise.

Respectfully submitted,

Dave Morey

Enclosure

EWC:maf RAIA46.doc

A025

cc: Mr. L. A. Reyes, Region II Administrator
Mr. J. I. Zimmerman, NRR Project Manager
Mr. T. M. Ross, Plant Sr. Resident Inspector

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ENCLOSURE

SNC RESPONSE TO GL 87-02 RAI

1. **Question:**

In your Final Safety Analysis Report (FSAR), you have committed to Appendix A to 10 CFR Part 100, which requires, in part, that, "Where the maximum vibratory acceleration of the Safe Shutdown Earthquake at the foundations of the nuclear power plant structures are determined to be less than one-tenth the acceleration of gravity (0.1 g)...., it shall be assumed that the maximum vibratory accelerations of the Safe Shutdown Earthquake at these foundations are at least 0.1 g." Based on the CLASSI/SHAKE analysis referred to in your response to question 6 of the August 29, 1996, staff request for additional information (RAI), did the computed maximum ground accelerations at the foundation levels of the diesel generator building (DGB) and service water intake structure (SWIS), as well as at grade elevation 155 feet, comply with the above quoted regulatory requirement? If the requirement in 10 CFR Part 100 was not met, justify your deviation from your FSAR commitment.

Response

As part of the reduced-scope study for the IPEEE program at Farley Nuclear Plant (FNP), new seismic response analyses were conducted for selected structures to generate freefield and in-structure response spectra using the CLASSI/SHAKE computer programs. The analysis results have been documented in reference 6. The resulting response in the freefield at the Diesel Generator Building (DGB) and Service Water Intake Structure (SWIS) foundation elevations satisfy the 10 CFR Part 100 Appendix A requirement that the maximum ground motion is assumed to be at least 0.10g. The seismic input for FNP was the plant Safe Shutdown Earthquake (SSE), with the horizontal zero period acceleration (ZPA) at 33 Hz anchored at 0.10g as shown in Figure 3.0-2 of reference 6. Selected pages from reference 6 are included as Attachment 1.

<u>Diesel Generator Building and Plant Grade (EL 155')</u>

The Diesel Generator Building (DGB) is located in the Main Plant Area. The soffit of it's basemat is at Elevation 151', which is about 3.5' below grade. The basemat does not have any effective embedment. The control point for the Main Plant Area at the Farley site was defined at the top of the Compact Overburden soil layer at Elevation 130'. This definition of the location of the SSE Ground Response Spectrum (GRS) is more conservative than that specified in FNP FSAR Section 2.5.2.10, i.e., ground surface or plant grade; but was done to satisfy the current Standard Review Plan (SRP) requirements (reference 7). Figure 4.1-2 of reference 6, which is included in Attachment 1, schematically shows the location of the control point relative to the soil layers, and the convolved motions at the various levels of the soil column calculated by SHAKE. The surface motion, shown at location P1 of Figure 4.1-2, envelopes the SSE. Figure 4.1-4 of reference 6 provides a more detailed plot of the response spectra of the surface motions at grade at Elevation 154.5' for the 3 soil cases required by the SRP (reference 7) which significantly envelop the SSE, with a ZPA approximately at 0.15g. Therefore, at grade elevation (EL 155') the ZPA is greater than 0.1g.

Since the DGB was treated as a surface founded structure supported on caissons, these surface motions (Figure 4.1-4), including the lc site amplification effects, were used directly as input to the DGB's foundation level in the generation of new in-structure response spectra. Thus, the 10 CFR Part 100 Appendix A requirement of maximum ground motion assumed to be at least 0.10g at the foundation level in the freefield is satisfied for the DGB.

In regards to motion at plant grade, elevation 155', the foundation motion for the DGB in the freefield is the freefield motion at plant grade elevation 155' which has a ZPA approximately at 0.15g which is greater than the 10 CFR Part 100 Appendix A minimum of 0.1g.

Service Water Intake Structure

The Service Water Intake Structure (SWIS) is located in the Pond Intake Area. Figure 4.2-2 of reference 6, shows schematically the location of the control point in relation to the soil layers, and the convolved motions at the various levels of the soil column calculated by SHAKE. The grade is at Elevation 195', and the control point is specified on a hypothetical outcrop of the Lisbon layer at Elevation 110' to satisfy the current SRP (reference 7) requirements for this soil profile. The bottom of the SWIS base slab is founded at two levels, viz. Elevation 164' and Elevation 148.5'. The embedment depth ranges from 31' to 46.5', with an equivalent embedment ratio of 0.68 leading to considerable wave scattering effects.

Figure 4.2-7 (Attachment 1) shows the horizontal soil responses in the freefield at the various levels of the soil column calculated by SHAKE. The enveloping spectra of the 3 soil cases are depicted therein for the respective foundation levels at Elevations 166' and 148'. The existing soil column model has sublayer divisions at these elevations which essentially represent the motion in the freefield at the two SWIS foundation elevations. It is clear that the ZPAs at the foundation levels in the freefield are both higher than 0.10g. Thus, the 10 CFR Part 100 Appendix A requirement of maximum ground motion assumed to be at least 0.10g at the foundation level in the freefield is satisfied for the SWIS.

2. **Question:**

With respect to your response to question 6 of the August 29, 1996, staff's RAI, discuss the significance of changes in the amplitudes in the newly generated in-structure response spectra (IRS) for the DGB and SWIS as a result of using the CLASSI/SHAKE codes, which may have used a soil damping value different from the FSAR-specified limit of 7%. If a soil damping greater than the 7% value was used in the CLASSI/SHAKE-based analysis, provide justification for exceeding the FSAR value. Additionally, since you elected to employ the soil structure interactive approach, which is not referenced in your FSAR for performing the seismic analysis, discuss in detail how the following three provisions of Section 3.7.2 of the Standard Review Plan are incorporated in your analysis for generating the IRS: (1) limitation of the extent of reduction to foundation motion; (2) accounting of increased foundation rocking due to wave scattering; and (3) consideration of soil layering effects and frequency dependency of the foundation impedances. Also, discuss how the debonding of the top 20 feet of soil or half the embedment, whichever is less, was implemented in the embedded SWIS

foundation analysis. Lastly, provide a brief summary of the code verification process that validates the applicability of the CLASSI code for the IRS generation.
Response:

As discussed in the FNP Unresolved Safety Issue A-46 Summary Report (reference 1), the DGB and the SWIS are caisson supported structures. The simplified treatment of these structures in the original soil-structure interaction (SSI) analysis was state-of-the-art at that time. But due to the fact that this modeling technique was not able to capture the effect of the soil surrounding the caissons, new modern soil-structure interaction analyses were performed tc more accurately capture the response of these caisson supported structures. The new modern SSI analyses followed the guidance provided in the NRC Standard Review Plan, NUREG-0800, Revision 2, September 1989 (reference 7) using the Farley SSE spectral shape and the horizontal peak ground acceleration (pga) of 0.1g. Using the SSI techniques described in the FNP FSAR, including soil damping, would not, for these caisson supported structures, produce an accurate estimate of the structure's seismic response.

The following is a discussion of the significance of the changes in the amplitudes in the newly generated IRS for these caisson supported structures as compared to the original IRS.

Diesel Generator Building

The DGB is a stiff, single story shear wall structure with fundamental fixed base frequencies in excess of 27 Hz in the horizontal directions. Such a stiff building founded on soft soil is expected to result in a fundamental soil-structure mode where the structure responds as a rigid body.

The results of the new SSI analyses show that the fundamental soil-structure swaying mode is approximately 6.5 Hz for the best estimate soil case, as may be inferred from the spectral peak in Figure 7.1-1 of reference 6 (Attachment 1). This Figure also compares the current best estimate soil case with the original IRS. The most notable difference between the two analyses is a marked shift in the fundamental system frequency from about 1.6 Hz in the previous analysis to 6.9 Hz in the current analysis. This frequency shift is attributable to a major difference in the two analytical approaches -- the previous work modeled the entire 56' height of caissons as an equivalent freestanding column completely uncoupled from the surrounding soil. On top of this column was added the stick model of the DGB. Soil springs were then attached to the bottom of this column. Ignoring the lateral support provided by the soil surrounding the caissons resulted in an overly flexible system. The current analysis employed the impedance function approach and treated the caissons as a part of the soil medium. The frequency shift between the two approaches may be estimated by the simple calculation shown in Figure 7.1-2 of reference 6 (Attachment 1). In the FSAR analysis, the stiffness calculated based on the force required for unit displacement at the top of the caissons is 9.24E4 k/ft. This stiffness is derived mostly from the properties of the freestanding caisson. The total mass of the DGB including the basemat is 899.6 k-s^2/ft. Therefore, the fundamental soil-structure frequency of the FSAR model is computed to be 1.61 Hz. In the current analysis, the impedance stiffness term for translation at the base of the DGB is about 1.7E6 k/ft. Therefore, the fundamental soil-structure frequency of the current model is 6.9 Hz. The actual frequency shift obtained in the analyses is shown in Figure 7.1-1 and corresponds well to the computed value. Another phenomenon that is treated differently between the original FSAR seismic analysis and the current methods is the specification of seismic input. Applying the Farley SSE to the soil springs at the base of the caisson and propagating the motion up through the freestanding caissons over-simplified the actual physical phenomenon. The current study performed wave propagation analyses through the soil medium to establish the freefield surface motions for use in the SSI analyses. The spatial variation of seismic input along the height of the caissons may also be represented by wave scattering functions in the substructure method. However, the DGB caissons are flexible relative to the surrounding soil mass and wave scattering effects are minimal for horizontal excitation. Therefore, a surface foundation was assumed in the SSI analysis for the DGB.

The peak spectral acceleratic (SA) of the new DGB IRS is slightly lower than the peak SA of the original DGB IRS. This is due to the fact that the modern SSI analysis approach used to calculate the new IRS, which satisfies the current SRP (reference 7), properly models the behavior of the soil layers below the DGB and implicitly accounts for soil radiation of energy effects which is typically a major contributor to any reduction in the SA amplitude. Also strain compatible soil material damping or hysteretic soil damping was considered following SRP requirements, but this effect is less a contributor to any reduction in the SA amplitude.

Service Water Intake Structure

The SWIS is moderately stiff with fixed base frequencies in excess of 12 Hz in the horizontal directions. The structure is deeply embedded in the soil and therefore scatters vertically propagating shear waves. Generally, embedment reduces the translation and increases rocking response of the foundation. In the vertical direction, the caissons are anchored into the Lisbon formation at Elevation 110'. Since the caissons have high stiffness in the axial direction, the foundation input motion is similar to the vertical motion of the Lisbon layer at depth.

Comparisons of the original IRS with the current best estimate soil case IRS are shown in Figures 7.2-9 and 7.2-10 of reference 6 (Attachment 1). These Figures show significant reductions in peak spectral acceleration, as well as the zero period acceleration (ZPA) for the new IRS. Also, a frequency shift from about 1.17 Hz to 2 Hz is noted. The lower frequency obtained in the FSAR analysis is due to the modeling of caissons, i.e., caissons were represented as an equivalent freestanding column completely de-coupled from the surrounding soil. As discussed in the foregoing subsection on the DGB, ignoring the lateral support provided by the surrounding soil to the caissons resulted in an overly flexible system. The amount of frequency shift from inclusion of lateral soil support is estimated in Figure 7.2-11 of reference 6 which is enclosed. In the FSAR model, the stiffness calculated based on the force required for unit displacement at the top of the freestanding caissons is about 8.78E4 k/ft. This stiffness is derived mostly from the properties of the caissons. The total mass of the SWIS including basemat is 1.3E3 $k\text{-}s^2/ft$. Therefore, the fundamental soil-structure frequency of the FSAR model is computed to be 1.31 Hz. In the current/modern analysis, the impedance stiffness terms for translation at the base of the SWIS is about 5.0E5 k/ft. Therefore, the fundamental soil-structure frequency of the current model is 3.1 Hz. The actual frequency shift obtained in the analyses is shown in Figure 7.2-9. It is noted in Figure 7.2-9 that the current analysis has a spectral peak at about 2 Hz instead of at the soil-structure frequency of 3.1 Hz. This peak at 2 Hz corresponds to the foundation input motion. The proper treatment of the deep embedment of the SWIS in the layered soil and the associated reduction in motion due to soil radiation of energy effects is probably the primary reason for the suppression of the spectral peak associated with the soil-structure system. The 2 Hz peak is merely the foundation input motion propagated into the structure. Compared to the DGB, the frequency underestimate in the original FSAR analysis is less severe for the SWIS. To summarize, the current SWIS IRS differs from the original IRS in three important aspects:

- Caissons were treated as a part of the soil medium in the impedance calculation, instead of as a freestanding part of the structure model.

- Instead of applying the seismic input at soil springs attached to the base of the caissons, the variation of the freefield motion over the height of the caissons to the basemat was properly accounted for.

- Proper consideration was taken for soil radiation of energy effects which is inherent in the modern SSI analysis approach used for the SWIS as well as a reasonable strain dependent material or hysteretic soil damping that is not allowed to exceed the SRP limit, as opposed to the arbitrary limit of 7% on soil damping used in the original analysis.

The following is a discussion of the differences in the soil damping limits as specified for the original FSAR analyses versus that used for developing the new modern IRS for the DGB and SWIS.

The spectra generated for the DGB and SWIS were produced for utilization within the Seismic IPEEE and USI-A46 programs. As such, the methodology for developing response for these two programs does not necessarily require the use of FSAR requirements such as the 7% soil damping limitation. Developing new IRS for the DGB and SWIS follows the current accepted SSI methods including soil damping. The original FSAR in-structure response analyses employed the freestanding caisson columns with dashpots to account for the soil-structure interaction effects. There was a limit of 7% on soil damping used for the development of the original FSAR IRS.

The new CLASSI/SHAKE based analysis applies the frequency dependent compliance/impedance functions to model the supporting soil. At the seismic input level comparable to the Farley SSE, high strain-compatible soil properties including shear moduli and damping were developed, as documented in reference 6. The mean degradation curves for sand by Seed & Idriss (reference 8) were applied for the cohesionless soil type reported in the FSAR for the plant site. As indicated in Tables 4.1-1 an 4.2-1 of reference 6 (Attachment 1), the soil material damping for the 3 soil cases are all less than 14% hysteretic damping ratio, below the maximum level of 15% permitted in Section 3.7.2 of the Standard Review Plan (SRP), reference 7.

In regards to the request for details of how three provisions of Section 3.7.2 of the Standard Review Plan were incorporated in the analysis for generating the new IRS, the following discussion is provided:

(1) Limitation of the extent of reduction in foundation motion:

Since the DGB was treated as a surface founded structure supported on caissons, the new ground surface motions including the local site amplification effects were used directly as input at the DGB's foundation level. Therefore, there was no reduction of motion at the foundation level, but an amplified SSE motion due to the conservative definition of the control point. This can be seen in Figure 4.1-4 of reference 6 (Attachment 1).

For the SWIS, the control motion was placed at a hypothetical outcrop of the first competent soil layer; which is the Lisbon layer located at Elevation 110'. The ground motions at the soil surface at the finished grade (Elevation 195'), and at the SWIS foundation levels at Elevations 166' and 148', were generated for the freefield condition by convolving the control motion through the soil profile using SHAKE. See Figure 4.2-7 in Attachment 1. Since the structure foundation levels are at a higher elevation than the control point location, the amplified horizontal ground acceleration response spectra in the freefield at the foundation levels are calculated to be typically higher than the Farley SSE. Thus, as seen in Figure 4.2-7, the SRP criterion on limitation of the extent of reduction in foundation motion is satisfied for the SWIS. In fact, due to the conservative definition of the control point, the SWIS foundation response actually is amplified (rather than de-amplified) from the SSE motion over most of the frequency range of interest.

(2) Accounting of increased foundation rocking due to wave scattering; and (3) consideration of soil layering effects and frequency dependency of the foundation impedances:

In the calculation of foundation impedances for the subject Farley structures, the underlying soil was modeled as a horizontally layered viscoelastic medium. To account for the "primary nonlinearities" in soil behavior under seismic loading, soil properties consistent with the level of shear strain induced by the Farley SSE were developed. The high strain compatible soil properties then were used in the calculation of the impedance's and wave scattering functions. The caisson piles were modeled as a part of the soil medium considering the effects of pile-soil-pile interaction, also referred to as the group effects, using the computer program SASSI.

The impedance matrix describes the force-displacement relationship of the foundation (assumed massless for the calculation) supported by the soil. The impedance matrix is complex-valued and frequency dependent in its most correct form.

The scattering matrix relates foundation input motion to the freefield ground motion taking into account wave scattering and foundation averaging or integration effects.

The foundation input motion differs from the freefield ground motion in all cases, except for surface foundations subjected to vertically incident waves. First, the freefield motion varies with soil depth. Second, the soil-foundation interface scatters waves because points on the foundation are constrained to move according to its geometry and stiffness. For vertically propagating seismic waves impinging on rigid surface foundations, the foundation input motion is the same as the freefield motion.

The contribution of caissons to the horizontal soil impedance terms is less than 6% for the DGB, and the wave scattering effect is minimal for this surface founded structure and, therefore, was conservatively not considered.

The high embedment ratio for the SWIS leads to considerable wave scattering effects. The scattering functions were computed using SASSI models. The basemat and side walls of SWIS were assumed to be rigid. The computer program SASSI was then used to calculate horizontal translation (S11) and rocking (S15) at the foundation reference point due to horizontal translation at the freefield ground surface. Separate SASSI runs were performed for the three soil cases - the lower bound, best estimate, and upper soil cases respectively. Also, as described, the foundation impedances were calculated properly accounting for soil layering effects and frequency dependency.

The following is a discussion of how potential debonding between the soil and the embedded walls of the SWIS was addressed:

Because of the high embedment ratio for the SWIS, the side soil adjacent to the sidewalls contributes to the soil impedances in the SSI analysis. However, to account for the potential debonding of the side soil from the structure during an earthquake, only about 50% of the stiffness and damping values associated with the side soil was included in the total soil impedance functions. The average embedment depth is 41', therefore debonding of the top 20' of the embedment with the side soil was included in the model. This satisfies the embedment effect consideration of AISC Standard 4-86, reference 8, which states that half of the embedment or 20 feet, whichever is less, is acceptable.

Lastly, a brief summary of the code verification process that validates the CLASSI code for IRS generation is provided as follows:

EQE has conducted program validation for both the CLASSI and SHAKE codes as a part of their Quality Assurance program. Generally, features of the CLASSI code were validated independently and the combined code was validated by comparison to other program results and test data when available. Quality Assurance documentation is available for review if requested.

3 **Question:**

Discuss the basis for using the Compact Overburden layer that exists at 24.5 feet below grade at the main plant area as control point for the diesel building analysis. What is the shear wave velocity of the compact overburden layer? Also discuss the rationale for adopting the 85-feet below grade Lisbon formation as control point for the SWIS.

Response:

Main Plant Area

The DGB is located within the main plant area. The soil properties at the main plant area are given in Figure 2B5B-7 of the FSAR. Figure 4.1-1 of reference 6 (Attachment 1) summarizes the general soil profile and low strain dynamic properties. The top soil layers between grade (elevation 154.5') and elevation 130' comprise relatively soft material with initial shear wave velocity of 600-970 fps. Per the SRP (reference 7), the control point is defined either at grade or on a hypothetical outcrop of a competent layer at depth. The most logical location for establishing the control point for this profile is, therefore, on the Compact Overburden layer at elevation 130' which has a shear wave velocity, Vs, of 2520 fps.

Service Water Intake Area

The physical properties of the soil at the SWIS area are based on Figure 2B5B-7 of the FSAR and discussions with the site investigation firm of record (Weston Geophysical Survey). The subsurface condition in the outlying SWIS area is sufficiently different from the main plant area to warrant separate treatment. A best estimate soil profile is shown in Figure 4.2-1 of reference 6 (Attachment 1). The top layers between grade (elevation 195') and the Lisbon at elevation 110', comprise relatively soft material with an initial shear wave velocity of 550-900 fps. Hence, to satisfy the SRP (reference 7), the control point is specified on a hypothetical outcrop of the Lisbon at elevation 110', which has a shear wave velocity, Vs, of 2400 fps. This specification coincides with the original FSAR analysis of the SWIS.

4. **Question:**

With respect to the comparison of equipment seismic capacity and seismic demand, for those equipment located on floors within 40 feet above the effective grade and where the IRS exceeded the Reference Spectra (RS or 1.5 times Bounding Spectra) in the structures identified in Attachment 1 of the enclosure to Reference 3, you have elected to use Method A in Table 4-1 of the GIP-2. Identify, in Appendix A (composite Safe Shutdown Equipment List) of Reference 1, the list of equipment installed at floor elevations where the IRS exceeded the RS and Method A in Table 4-1 of the GIP-2 was used. Provide a technical justification for not using the IRS provided in your 120-day response as the seismic demand for those equipment. It appears that some A-46 licensees are making an incorrect comparison between their plants' safe shutdown earthquake (SSE) ground motion response spectrum and the Seismic Qualification Utilities Group (SQUG) Bounding Spectrum. The SSE ground motion response spectrum for most nuclear power plants is defined at the free field ground surface. For plants located at deep soil or rock sites, there may not be a significant difference between the ground motion amplitudes at the foundation level and those at the ground surface. However, for sites where a structure is founded on shallow soil, the amplification of the ground motion from the foundation level to the ground surface may be significant.

Response:

The floor elevations where the licensing basis IRS exceed the SQUG reference spectrum were identified in question 1 of reference 3 as follows:

- auxiliary building Elevation 121'
- auxiliary building Elevation 139'
- auxiliary building Elevation 155'
- auxiliary building Elevation 175'
- containment building Elevation 140'

- containment building Elevation 149'
- containment building Elevation 155'

A list of SSEL equipment located in these buildings and elevations that utilized GIP method A for the equipment capacity versus demand check is included as Attachments 2 and 3 for the auxiliary and containment buildings respectively.

The following provides our technical justification for not using the IRS provided in our 120-day response for the seismic demand for the equipment.

Method A of GIP Table 4-1 provides a methodology to evaluate the seismic adequacy of equipment by comparing equipment capacity based on earthquake experience ground response spectra at database sites with the plant's SSE ground response spectrum (GRS). The composite earthquake experience ground response spectrum from the database sites (reference spectrum) is reduced by a factor of 1/1.5 to account for possible additional amplification of motion in nuclear plants compared to database plants and is referred to as the "Bounding Spectrum" in the GIP.

The seismic capacity of equipment defined by the Bounding Spectrum is compared to the seismic demand at the effective grade using the plant licensing basis SSE GRS. The GIP method conservatively limits use of this approach to equipment which has natural frequencies above about 8 Hz and is located lower than about 40 feet above the effective grade of the building. These restrictions prohibit the use of GIP Method A for those equipment with lower natural frequencies and for those higher elevations in buildings where equipment amplified responses are typically higher.

Additional details justifying the use of the GIP Method A may be found in the report "Use of Seismic Experience in Nuclear Power Plants" prepared by the Senior Seismic Review and Advisory Panel (SSRAP), February 28, 1991. This report, included as Reference 5 in GIP-2, summarizes SSRAP's judgment on this subject by stating on pages 102 and 103:

> "...the use of very conservative floor response spectra should be avoided when assessing the seismic ruggedness of floor-mounted equipment ...Only for cases of equipment mounted more than 40 feet above grade or equipment with as-anchored-frequencies less than about 8 Hz is it necessary to use floor spectra."

Method A of GIP Table 4-1 is an approved and legitimate method for evaluating seismic capacity to seismic demand for resolving USI A-46. There are no requirements in the GIP or SSER No. 2 on the GIP, that prohibit the use of Method A in lieu if using existing IRS.

All the specific requirements for proper application of Method A were met for application at FNP. The location of the FNP SSE GRS is defined at the "surface", i.e., plant grade, as described in FSAR Section 2.5.2.10, and not at the plant foundation level. Therefore, no soil amplification needs to be considered when applying Method A. As was typical during the time of the original analysis and design of this plant, the SSE GRS was applied to the base of the seismic building models. Depending on the structure being analyzed, the SSE GRS was applied either at plant grade for surface mounted structures or at the top of the Lisbon layer some 60' below the ground surface for structures supported on that layer. We do not believe it is correct to state that the SSE GRS is "defined" at the plant foundation level simply because the analytical methods used to generate in-structure response spectra conservatively applied the input motion at the base of the building models. Of course, Method A was only applied for equipment which has natural frequencies above about 8 Hz and is located lower than about 40 feet above effective grade.

It should be noted that the new ground surface motion (Figure 4.1-4 of reference 6 provided in Attachment 1) developed for the surface founded tanks and used for seismic input for developing new DGB IRS is enveloped by the SQUG Bounding Spectrum. Therefore, using either the original SSE GRS defined at Plant Grade or the new ground surface motion based on defining the location of the SSE GRS some 24 feet below grade per the current SRP (reference 7) would not affect the results of using SQUG GIP Method A.1 seismic capacity to seismic demand screening for the equipment itself.

5. **Question:**

In Reference 1, you indicated that you intended to revise the licensing basis for Unit 1 to allow application of earthquake experience data as acceptable alternative for seismic qualification of safety-related mechanical and electrical equipment through 10 CFR 50.59 evaluations. If you have done so, we request that you submit for the staff's review the complete documentation associated with your evaluation of the unreviewed safety question associated with 10 CFR 50.59 for carrying out the FSAR changes for seismic qualification of equipment.

Response:

In early 1996, a change was approved to the FSAR to allow use of earthquake experience data as an alternative method for verifying the seismic adequacy of new and replacement equipment in accordance with the Generic Implementation Procedure (GIP) which was developed by the Seismic Qualification Utility Group (SQUG). The FSAR change was made in accordance with the provisions of 10 CFR 50.59. The 10 CFR 50.59 safety evaluation was performed by comparing the overall SQUG GIP methodology to the previously approved FNP license basis on a program level. The conclusion of the safety evaluation was that the GIP was overall a more conservative methodology for verifying the seismic adequacy of equipment. SNC recognized that certain isolated aspects of the SQUG GIP may be less conservative than the corresponding aspect in the previously approved method. However, due to the SQUG GIP being the more conservative method overall, no unreviewed safety questions were identified. SNC became aware of potential NRC questions relative to the use of the SQUG/GIP methodology. As a conservative measure, SNC initiated another FSAR change to withdraw the change that would have allowed the use of earthquake experience data for verifying the seismic adequacy of new and replacement equipment. This FSAR change deleted the previous change and effectively prohibited the use of the SQUG GIP methodology for verifying the seismic adequacy of new and replacement equipment. No new or replacement equipment was installed or used at FNP that relied on SQUG GIP methodology and no evaluations were performed during the time period that the FSAR had been changed to allow use of SQUG GIP methodology. Therefore, the earthquake experience data and SQUG GIP methodology will not be used as a general alternative method until the NRC questions associated with its utilization have been resolved. Any application of the SQUG GIP methodology will be implemented on a case-by-case method with the NRC staff approval.

6. **Question:**

In Reference 3, the response to NRC question 5 stated that evaluations of bolt performance for LC Transformer in DGB, MCC 1K in Service Water Intake, and 125-V-dc Service Water Building Battery No. 1, followed the procedure for anchors with excessive gaps provided in EPRI TR-10396(0), dated June 1994. This EPRI report has not been reviewed or endorsed by the staff. We request that you submit this report for staff's review.

Response:

Since the referenced EPRI report is a licensed and proprietary report, EPRI was contacted to obtain the necessary agreement to transmit the report to the NRC as part of the response to this RAI. EPRI recommended they formally transmit this report, EPRI TR-103960 entitled "Recommended Approaches for Resolving Anchorage Outliers," dated June 1994, to the NRC instead of the individual utility. This report was transmitted to the NRC by EPRI in a letter from Mark D. Fox, EPRI Intellectual Property Attorney, to Document Control Desk, U.S. Nuclear Regulatory Commission, dated June 16, 1997. Please refer to this transmittal to obtain the referenced report for your review.

7. **Question:**

Referring to your response to question 7 (Reference 3) with regard to cable and conduit raceways, provide two limited analytical review (LAR) evaluations that contain the least safety margins selected from the containment internal structure and auxiliary buildings, respectively.

Response:

The Limited Analytical Review (LAR) samples were analyzed per section 8.3 of reference 4. The seismic demand for the limited analytical review of cable and conduit raceways, as described in section 4.2.4.4 of reference 1, is equal to 2.5 times the zero period acceleration (ZPA) of the IRS at the attachment point of the raceway support as determined per section 8.3.4 of reference 4. The original FSAR IRS were used for the evaluation of raceways in the auxiliary and containment buildings and the newly generated IRS for the DGB and SWIS were used for raceways located in these buildings.

LAR selection number FNPCS5 is located at elevation 139' in the auxiliary building. This cable raceway support is a steel frame structure consisting of two 5" x 5" x 5/16" tube steel columns with 2" x 2" x 1/4" tube steel cable tray support arms connected to both columns. One of the columns is cantilevered, with the restrained end bolted to the reinforced concrete floor, while the other column is bolted to the floor and the ceiling. Each column is anchored by two 3/4" diameter expansion anchors at each attachment point. The LAR for this support indicates a total bolt pull-out load of 4.43 kips at the base of the columns. The allowable pull-out load for the anchors is 4.69 kips as taken from Table C.2-1 of reference 4, which results in the least safety margin (4.69/4.43=1.06) among the auxiliary building LARs. However, considering the conservatism of the LAR, the safety margin is actually much greater. The anchor bolt loads for support FNPCS5 were conservatively calculated by lumping the total tributary loads on the support to the cantilevered column and applying the proper lateral plus dead loads. This analysis approach was used to minimize the time and cost of analysis. This analysis did not consider the frame action of the support that would greatly reduce the anchorage loads nor did it consider the fact that some of the lateral load will be taken by the ceiling connection of the other column.

LAR selection number FNPCS12 is located at elevation 129' in the containment building. This cable raceway support is a steel frame structure connected to the wall of the containment building. The horizontal support arms and vertical members are constructed of 2" x 2" tube steel and 3" x 3" tube steel respectively. The LAR for this support indicates a maximum moment in the support arms of 8.04 in-kips versus an allowable moment of 10.72 in-kips, which results in a least safety margin (10.72/8.04=1.33) among the containment building LARs.

The evaluations described above are available for review at the SNC offices in Birmingham, AL.

8. **Question:**

Referring to your response to Question 11 (Reference 3), provide a summary calculation of the refueling water storage tank that shows a 5% less capacity in overturning moment when comparing with the SSE-induced overturning moment. Also, provide a summary of the calculations for the refueling water storage tank based on the seismic margin methodology that indicates a margin of 1.5 against the new ground spectra at elevation 154.5 feet.

Response:

Two seismic evaluations were performed for the refueling water storage tank (Q1F16T0501) as discussed in our October 28, 1996, RAI response on USI A-46 (reference 3). The first followed the GIP guidelines on vertical tanks (Section 7 of reference 4). This evaluation resulted in a slight exceedance of less than 5% when comparing overturning moment capacity to overturning moment. The tank shell capacity was the limiting condition. This GIP evaluation is considered conservative as discussed in our previous RAI response (reference 3). But to provide assurance of the seismic adequacy of this tank, the tank was also evaluated using the seismic margin methodology following Appendix H, "Flat-Bottom Vertical Fluid Storage Tanks," of reference 5. The seismic capacity was found to exceed the seismic demand of the new ground spectra by a margin of 1.5. This seismic margin is considered sufficiently high to screen out the tank for IPEEE and resolution of USI A-46. The following is a brief summary of each of the two seismic capacity calculations.

<u>GIP Evaluation</u>:

Section 7, "Tanks and Heat Exchangers Review," of the GIP (reference 4) for vertical tanks was followed. The input data was gathered following Step 1 and parameter ratios following Step 2 were calculated. In Step 3, the fluid-structure modal frequency (F_f) was calculated to be 5.07 Hz. In Step 4, spectral acceleration (S_{af}) was conservatively selected at the peak spectral acceleration, SA, for the 4% damped new ground response spectrum which equals 0.532g at 6 Hz. which occurs only for the lower bound soil stiffness case. See Figure 4.1-11 of reference 6 (Attachment 1). For the best estimate of the soil stiffness, the peak SA is 0.45g at 7 Hz and for the upper bound soil stiffness case the peak SA is even lower at 0.316g. Since soil-structure interaction (SSI) effects were not explicitly considered, the peak SA of 0.532g was used. This is a very conservative assumption for several reasons. One, the peak SA of 0.532g only occurs for the extreme lower soil stiffness condition. For the other two soil stiffness cases, the best estimate and upper bound soil stiffness, the peak SA is significantly less. Also, the fluid-structure natural frequency, based on a fixed based estimate, is lower than the frequencies of the peaks of the new ground spectra. If SSI effects were explicitly considered, the tank/foundation system would be less stiff. Therefore, one would expect the primary fluid-structure mode natural frequency to reduce and, therefore, move to an even lower spectral acceleration value. The primary fluid-structures modal frequency would not be expected to increase and move towards the peak SA that was conservatively used in this evaluation.

Proceeding to Steps 5 and 6, the base shear (Q) and base overturning moment (M) were calculated to be Q=1.6E3 kips and M=3.2167E4 ft-kips. The next series of steps relate to determining the overturning moment capacity. The allowable bolt stress from Step 7 (F_b) was calculated to be 61,545 psi. But the tank shell stress per Step 9 controlled the tank anchorage capacity which produced a reduced allowable tensile stress of the bolt (F_r) of 19,832 psi. Step 9 considers the tank shell stresses associated with the anchor bolt load transferred to the tank shell as a combination of direct vertical load and out-of-plane bending moment due to the eccentricity between the bolt centerline and the tank wall. The GIP equation is based on a very conservative elastic stress approach. Our consultant, Dr. Robert P. Kennedy, stated that one could perform a nonlinear finite element analysis and should be able to demonstrate a much higher tank anchorage capacity that would be acceptable for this evaluation. Next, the axial buckling stress capacity of the tank shell was evaluated, i.e., Steps 12 through 16. Elephant-foot buckling mode controlled producing an allowable stress for shell buckling of 7,865 psi. The overturning moment capacity (M_{cap}) was calculated per Step 17; M_{cap}=3.066E4 ft-kips and, finally in Step 18, overturning moment capacity (M_{cap}) is compared to the overturning moment (M); M_{cap}=3.066E4<M=3.2167E 4ft-kips. Next, in Steps 19 and 20, the base shear load capacity (Q_{cap}) is calculated and compared to the shear load (Q); Q_{cap}=2.056E3 kips > Q=1.6E3 kips. The final check is of the freeboard clearance versus the slosh height, Steps 21 and 22. The calculated slosh height (h_s) equals 15.5 in. and the available freeboard height (h_f) equals 25.36 in. Therefore, there is enough freeboard clearance to prevent forces being applied to the tank roof from the sloshing liquid.

Based on the above discussion about the fact that the calculated fluid-structure modal frequency would not increase but would decrease if SSI effects were explicitly considered, a more accurate upper bound impulsive mode seismic demand can be calculated. Defining the seismic demand as the envelop of the three soil cases for the 4% damped surface ground motion spectrum (Figure 4.1-11 of reference 6 provided in Attachment 1) and broadening the best estimate soil case by +/- 15%, the maximum SA demand at 5.07 Hz and below is 0.49g. This would reduce the base overturning moment by a factor of 0.49/0.532 = 0.92. With this improved but justified seismic demand, the overturning moment to overturning moment capacity evaluation would show the tank overturning moment capacity exceeds the demand by +3.5%. Even though this refinement was not originally applied, it is provided here as additional documentation that the FNP refueling water storage tank has sufficient seismic capacity at the FNP SSE level.

<u>Seismic Margin Assessment</u>

As previously discussed, to provide further assurance of the seismic adequacy of the refueling water storage tank, the tank was also evaluated using the seismic margin methodology following Appendix H, "Flat-Bottom Vertical Fluid Storage Tanks" of EPRI NP-6041 (reference 5). The evaluation follows the criteria of the Conservative Deterministic Failure Margin (CDFM) Approach as described in reference 5. Weights and centers of gravity were calculated. Next, the horizontal impulsive mode response was conservatively estimated by using the peak of the new GRS at 5% damping. As described in Appendix H, 5% damping is a conservative estimate of median damping for the type of response being evaluated, i.e., some nonlinear tank uplift and slight elephant-foot buckling. As discussed under the GIP evaluation, a lower spectral acceleration could be justified due to the fact that the calculated impulsive mode natural frequency is below the peak of the new broadened/enveloped ground spectrum at grade. The impulsive base shear was calculated to be 1481 kips and the impulsive base moment was 29,600 ft-kips. Also, the impulsive pressure was calculated to be 3.91 psi. Next, the convective (sloshing) mode response was calculated; the spectral acceleration for 0.5% damping at the convective mode natural frequency was determined. The convective mode base shear was calculated to be 65.6 k and the convective mode base overturning moment was determined to be 1905 ft-k. The convective pressure was also determined which varied over the height of the liquid and was an order of magnitude less than that calculated for static, impulsive, or vertical response. Next the vertical fluid response was determined and the associated additional pressure. This pressure increased with depth of the liquid. The impulsive, convective, and inertia loads associated with the tank itself were combined to produce a total base shear of 1.65E3 kips and an overturning moment of [illegible].33E4 ft-kips. A table of combined pressures that varied along the height of the tank wall was also developed.

Next, a capacity assessment of the tanks was made. First, the tensile capacity of the tank anchorage was determined. Again, the tank shell stress controlled, producing a TBC of 35,000 lbs or an equivalent bolt stress of 19,806 psi. This value is considered a conservative lower bound estimate since it is based on a narrow width of the bolt chair top plate which is actually continuous around the perimeter of the tank shell. On the compression side, elephant foot buckling controlled as before with a CB of 4760 lbs./in. Hold down forces resulting from fluid pressure acting on the tank bottom are considered as described in Appendix H, and these hold down forces can contribute significantly to the overturning moment capacity. The resulting overturning moment capacity, MSC, was calculated to be 4.879E4 ft-kips. Next the shear capacity, Vsc was calculated to be 3.625E3 kips using a median centered coefficient of friction of 0.7 per Appendix H. The tank is anchored to a concrete foundation with the tank bottom plate made up of slightly over-lapping plates setting on a sand layer.

Finally, capacity to demand evaluations were made in the terms of calculating a high-confidence-of-low-probability-of-failure (HCLFF) based on the FNP SSE GRS of 0.1g PGA being applied on a hypothetical outcrop of the Compact Overburden layer at El 130', which is approximately 24.5' below grade in the main plant area. The FNP SSE GRS of 0.1g PGA was applied at the plant grade for the FSAR original design of FNP surface mounted tanks. Also, the FNP SSE GRS is defined at the ground surface per the FSAR. But new ground response spectra at the plant grade were developed for evaluation of the surface mounted tanks in the plant yard as discussed in references 1 and 3 specifically to meet SNC commitments as a result of the FNP IPEEE response to NRC GL 88-20 Supplement 4 as documented in SNC letter to NRC dated September 14, 1992. The following are the calculated HCLPF values with the FNP SSE of 0.1 g PGA defined at a hypothetical outcrop of the Compact Overburden, El 130'; note the HCLPF values are defined at the same hypothetical outcrop:

Tank Overturning Moment: $\frac{\text{Msc}}{\text{Msh}}(0.1g) = \frac{4.879\text{E4 ft.-k}}{3.33\text{E4 ft.-k}}(0.1g) = 0.15g$

Tank Sliding: $\frac{\text{Vsc}}{\text{Vsh}}(0.1g) = \frac{3.625\text{E3k}}{1.65\text{E3k}}(0.1g) = 0.22g$

Slosh Height: $\frac{\text{hf}}{\text{hs}}(0.1g) = \frac{25.36"}{13.86"}(0.1g) = 0.18g$

Tank Hoop Stress: $\frac{\text{Capacity-static}}{\text{ku(Seismic)}} = \frac{18.7\text{psi}-6.965\text{psi}}{0.8(5.23\text{psi})}(0.1g) = 0.28g$

As previously stated, the lowest margin of 1.5 is considered sufficiently high to screen out the refueling water storage tank for IPEEE and for resolving USI A-46.

9. **Question:**

With respect to your response to question 12 (Reference 3), discuss in more detail the basis for screening out the 40,000 gallon buried tank in the outlier screening evaluation.

Response:

The diesel fuel oil storage tanks are buried in the plant yard. They are horizontal cylindrical tanks anchored to a common reinforced concrete mat foundation with a continuous reinforced concrete saddle for each tank. The tanks and the mat foundation are buried in well controlled/engineered backfill.

The Seismic Margin Assessment (SMA) criteria for buried tanks provided in EPRI Report NP-6041, reference 5, as well as the original seismic report for these tanks, were used as the basis to evaluate the buried tanks.

EPRI Report NP-6041 states that buried tanks are not particularly vulnerable to seismic damage. It was the opinion of the authors of the SMA methodology that damage could possibly occur at piping connections if there is large relative notion between the soil surrounding the buried tanks and the tank itself. Therefore, the SMA "panel" recommended that for a seismic margin earthquake up to a PGA of 0.5g, or 5% damped peak spectral acceleration of 1.2g, that only piping connections to the tank need be evaluated for possible large relative displacement of the surrounding soil.

The Seismic Review Team (SRT) walked down the buried fuel oil tanks to the extent possible. The manway covers were removed and the interior of the manway was inspected. No concerns were identified with the fuel oil pump or piping. The manway covers are bolted to the manway and; therefore, there is no possible way for a cover to fall into a manway.

The fuel oil tanks are in the area that will not experience any lateral slope displacement. The 1-1/2 in. diameter fuel oil lines will only experience forces and moments caused by ground shaking with no expected differential settlement between the fuel oil tanks and the diesel generator building. Therefore, no large relative displacement of the surrounding soil is expected due to the FNP SSE. The piping layout drawing for the fuel oil system show the 1-1/2 in. diameter lines exiting the manways. After exiting the manways, the lines, which are buried, have either long runs to the diesel generator building or interconnect to the five tanks that are supported on a common mat foundation. The effect of ground shaking is not considered to be significant because of the flexibility of the 1-1/2 in. lines. The fuel oil lines are classified as Seismic Category I. These lines are schedule 40 carbon steel pipe and the fittings are socket welded. These lines enter the diesel generator building through penetrations made of 4-in. diameter pipe sleeves that provide flexibility at that location. Due to the flexibility and the routing of these lines and no large relative displacement of the surrounding soil, the piping and their connections were determined to be adequate and could easily accommodate the expected ground motion. The original seismic stress report was also reviewed which showed the tank and its anchorage to the mat foundation to be adequate. The buried fuel oil tanks and the buried fuel oil lines were, therefore, screened out for the FNP SSE.

10. **Question:**

Questions 1 of your response dated October 11, 1995 (reference 2) included a memorandum which stated, in part, that the operations department had reviewed the lists and assumptions regarding the plant safe shutdown equipment list (SSEL). The operations department agreed that procedures exist that would allow safe shutdown of the plant assuming the SSEL equipment was available, and that operators were trained on the use of the procedures. The review was conducted using the "Desk Top" method.

As part of this Desk Top review, were any in-plant actions that need to be performed by the operators identified? Describe what, if any, barriers to successful operator performance of these actions were considered and dispositioned as part of the seismic and relay evaluation. How were factors such as ambient lighting and other potential hazards or environmental factors such as temperature, humidity, debris, or damaged structures, which could inhibit an operator from accomplishing procedural actions, evaluated?

Response:

The "desk top" review performed by the plant operations department did not reveal any new or additional in-plant operator actions that were not already addressed by existing procedures. The FNP A-46 shutdown paths allow ample time for any required in-plant operator actions. The potential for barriers such as damaged equipment or structures which could inhibit an operator's ability to access plant equipment was considered during the development of the SQUG GIP (reference 4) and found to be very unlikely. This is because earthquake experience has shown that typical industrial grade equipment and structures are inherently rugged and are not susceptible to damage which would inhibit operator access at A-46 plant SSE levels. Therefore, it is considered very unlikely that operators will be faced with hazardous or unfamiliar circumstances which are not covered by existing plant procedures and training. It is for this reason that the GIP, in Section 3.2.7, allows operator action to be used as a means of achieving and maintaining a safe shutdown condition provided procedures are available and the operators are trained in their use, which is the case at FNP.

In addition, it should be noted that all SSEL equipment requiring operator action is located in Seismic Category I structures. The FNP Seismic Margin Assessment (SMA) conducted for the Individual Plant Examination of External Events (IPEEE), demonstrated that these structures were easily screened out at the FNP Review Level Earthquake of 0.1g peak ground acceleration. In actuality, per EPRI NP-6041 (reference 5), these structures have a High-Confidence-Low-Probability-of-Failure (HCLPF) level of at least 0.3 g peak ground acceleration. Therefore, it has been demonstrated that these structures will remain intact with no structural damage that could hinder operator actions. All equipment and structures inside these structures, including masonry walls, are designed as either Seismic Category I or II/I, which assures that they will be prevented from falling or moving in such a way that they would hinder movement of the plant operators.

In the unlikely event that plant emergency lighting was not available following a loss of offsite power, operators would use hand-held battery operated lights as required.

Therefore, there are no barriers to successful operator performance of in-plant actions that may be required.

References:

1. Letter, with enclosures, from Dave Morey (SNC) to NRC, "Unresolved Safety Issue A-46 Summary Report for Farley Nuclear Plant - Unit 1," dated May 18, 1995.

2. Letter, with attachments, from Dave Morey (SNC) to NRC, Response to NRC USI A-46 Request for Additional Information for Farley Nuclear Plant - Unit 1, dated October 11, 1995.

3. Letter, with enclosures, from Dave Morey (SNC) to NRC, "Response to NRC USI A-46 Request for Additional Information for Farley Nuclear Plant - Unit 1," dated October 28, 1996.

4. "Generic Implementation Procedure for Seismic Verification of Nuclear Plant Equipment," Revision 2, Seismic Qualification Utility Group, February 14, 1992.

5. "A Methodology for Assessment of Nuclear Power Plant Seismic Margin (Revision 1)," EPRI NP-6041-SL, Revision 1, Final Report, Electric Power Research Institute, Palo Alto, California, August, 1991.

6. EQE Report No. 52197-R-001, "J. M. Farley Units 1 & 2: SSI Analysis of Selected Class I Structures," prepared for Southern Company Services, Inc., Rev. 0, May 1995.

7. "U.S. Nuclear Regulatory Commission Standard Review Plan," NUREG-0800, Revision 2, September, 1989.

8. "Seismic Analysis of Safety-Related Nuclear Structures and Commentary on Standard for Seismic Analysis of Safety Related Nuclear Structures," ASCE Standard 4-86, American Society of Civil Engineers, September, 1986.

ATTACHMENT 1

TABLE 4.1-1

CONTROL POINT ON COMPACT OVERBURDEN AT ELEVATION 130'
STRAIN COMPATIBLE SOIL PROPERTIES FOR MAIN PLANT AREA

Lower Bound Case

Layer	Thick	Weight Density	Poisson's Ratio	Material Damping	Vs	Vp	G	E'
1	4.5	0.100	0.36	0.035	395.9	846.4	486.7	2224.8
2	10.0	0.100	0.36	0.045	620.0	1325.6	1193.8	5457.3
3	10.0	0.100	0.36	0.066	568.9	1216.4	1005.1	4594.9
4	15.0	0.110	0.38	0.026	1709.5	3885.7	9982.8	51578.0
5	20.0	0.110	0.38	0.031	1683.6	3826.8	9682.9	50028.1
6	30.0	0.130	0.33	0.020	5360.0	10640.9	115989.1	457133.4
Halfspace		0.120	0.40	0.010	2600.0	6368.7	25192.6	151155.6

Best Estimate Case

Layer	Thick	Weight Density	Poisson's Ratio	Material Damping	Vs	Vp	G	E'
1	4.5	0.100	0.36	0.022	580.3	1240.8	1045.9	4781.1
2	10.0	0.100	0.36	0.028	924.9	1977.6	2656.8	12145.6
3	10.0	0.100	0.36	0.040	892.0	1907.2	2471.0	11296.2
4	15.0	0.110	0.38	0.016	2474.3	5624.1	20913.4	108052.8
5	20.0	0.110	0.38	0.021	2445.6	5559.0	20432.3	105567.1
6	30.0	0.130	0.33	0.020	5360.0	10640.9	115989.1	457133.4
Halfspace		0.120	0.40	0.010	2600.0	6368.7	25192.6	151155.6

Upper Bound Case

Layer	Thick	Weight Density	Poisson's Ratio	Material Damping	Vs	Vp	G	E'
1	4.5	0.100	0.36	0.014	837.0	1789.7	2175.9	9947.1
2	10.0	0.100	0.36	0.017	1343.3	2872.1	5603.8	25617.3
3	10.0	0.100	0.36	0.026	1316.1	2813.9	5379.2	24590.8
4	15.0	0.110	0.38	0.011	3537.2	8040.2	42742.9	220838.2
5	20.0	0.110	0.38	0.014	3516.6	7993.4	42246.4	218273.3
6	30.0	0.130	0.33	0.020	5360.0	10640.9	115989.1	457133.4
Halfspace		0.120	0.40	0.010	2600.0	6368.7	25192.6	151155.6

Table 4.2-1

CONTROL POINT ON LISBON AT ELEVATION 110 FT. STRAIN COMPATIBLE SOIL PROPERTIES FOR SERVICE WATER INTAKE AREA

Lower Bound Case

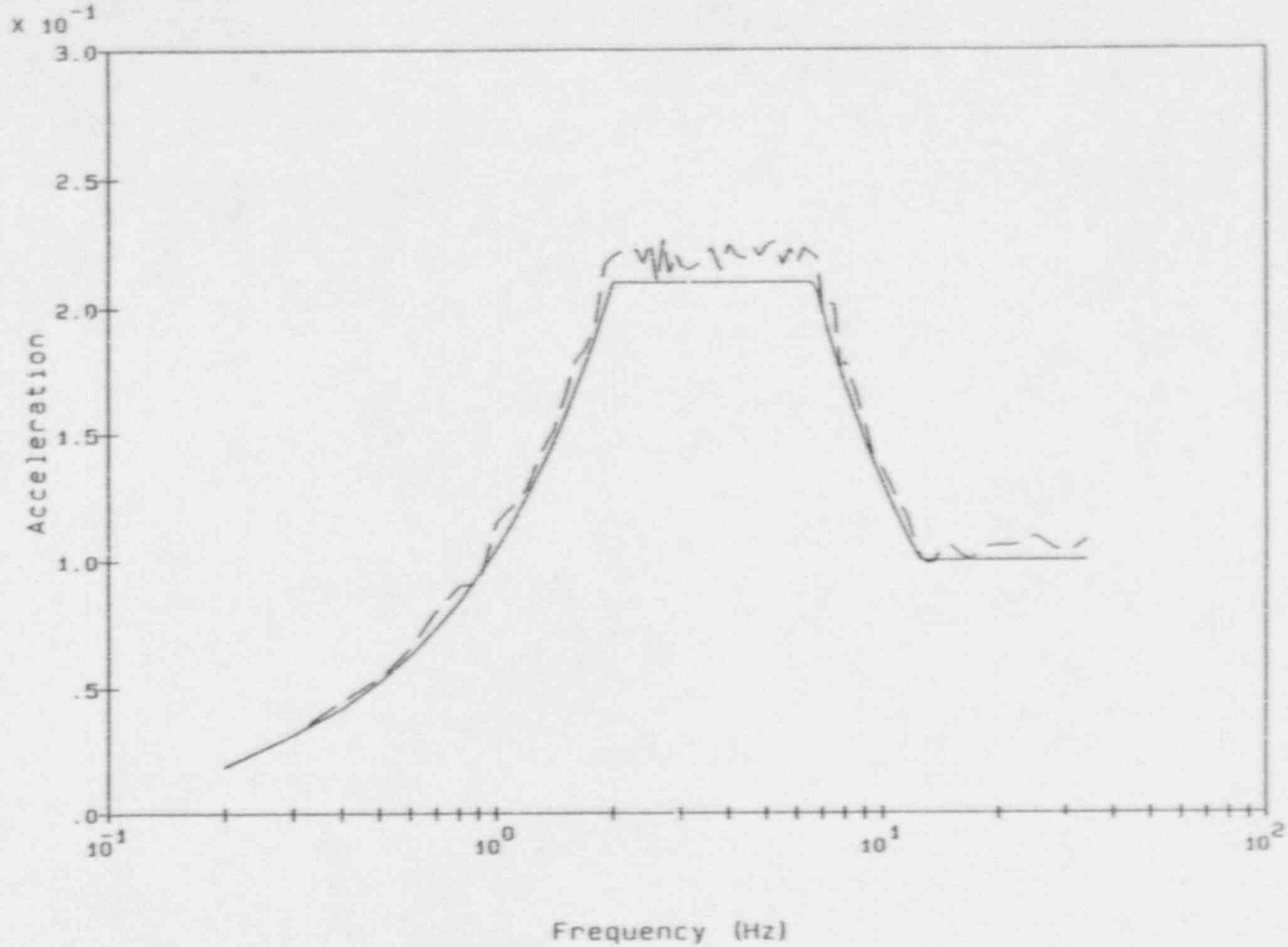
Layer No.	Thk (ft)	Density (kcf)	Poisson's Ratio	Material Damping	Vs (f/s)	Vp (f/s)	G (ksf)	E' (ksf)
1	5	0.125	0.367	0.039	357.9	780.7	497.1	2366.1
2	5	0.125	0.367	0.078	304.1	663.5	359.1	1709.1
3	5	0.125	0.367	0.112	266.3	580.9	275.2	1309.9
4	5	0.125	0.367	0.136	236.7	516.5	217.6	1035.4
5	9	0.125	0.418	0.080	494.1	1316.3	947.6	6725.8
6	9	0.125	0.418	0.096	464.2	1236.7	836.5	5937.0
7	9	0.125	0.418	0.107	443.9	1182.6	765.0	5429.5
8	9	0.125	0.418	0.114	431.6	1149.8	723.1	5132.0
9	9	0.125	0.418	0.122	415.3	1106.4	669.5	4752.1
10	3	0.125	0.483	0.129	402.3	2218.3	628.1	19102.8
11	17	0.125	0.483	0.139	382.3	2108.1	567.3	17252.3
12	Half Space	0.130	0.435	0.010	2400.0	7100.0	23254.7	202136.6

Best Estimate Case

Layer No.	Thk (ft)	Density (kcf)	Poisson's Ratio	Material Damping	Vs (f/s)	Vp (f/s)	G (ksf)	E' (ksf)
1	5	0.125	0.367	0.028	524.6	1144.4	1068.1	5083.7
2	5	0.125	0.367	0.052	484.4	1056.7	910.8	4334.6
3	5	0.125	0.367	0.071	442.4	965.2	759.8	3616.3
4	5	0.125	0.367	0.090	411.8	898.3	658.2	3132.8
5	9	0.125	0.418	0.055	784.2	2089.1	2387.1	16942.4
6	9	0.125	0.418	0.065	748.7	1994.5	2175.8	15442.9
7	9	0.125	0.418	0.075	711.7	1896.2	1966.5	13957.5
8	9	0.125	0.418	0.086	684.7	1824.0	1819.8	12915.9
9	9	0.125	0.418	0.094	663.9	1768.7	1710.9	12143.5
10	3	0.125	0.483	0.097	653.9	3606.1	1659.9	50480.0
11	17	0.125	0.483	0.102	642.6	3544.0	1603.2	48756.7
12	Half Space	0.130	0.435	0.010	2400.0	7100.0	23254.7	202136.6

Upper Bound Case

Layer No.	Thk (ft)	Density (kcf)	Poisson's Ratio	Material Damping	Vs (f/s)	Vp (f/s)	G (ksf)	E' (ksf)
1	5	0.125	0.367	0.018	760.2	1658.4	2243.3	10676.9
2	5	0.125	0.367	0.034	729.1	1590.6	2063.7	9821.7
3	5	0.125	0.367	0.045	701.8	1531.0	1911.9	9099.7
4	5	0.125	0.367	0.055	678.0	1479.2	1784.6	8493.6
5	9	0.125	0.418	0.037	1181.6	3147.8	5419.7	38466.3
6	9	0.125	0.418	0.043	1157.3	3083.3	5199.7	36905.5
7	9	0.125	0.418	0.049	1131.7	3015.1	4972.1	35289.7
8	9	0.125	0.418	0.054	1111.7	2961.6	4797.5	34050.3
9	9	0.125	0.418	0.059	1092.0	2909.2	4629.1	32855.0
10	3	0.125	0.483	0.061	1078.1	5945.5	4512.2	137223.8
11	17	0.125	0.483	0.065	1058.9	5839.5	4352.8	132377.0
12	Half Space	0.130	0.435	0.010	2400.0	7100.0	23254.7	202136.6



Legend:

ARTIFICIAL T/H ————————

FNP HORIZ SSE — — — — —

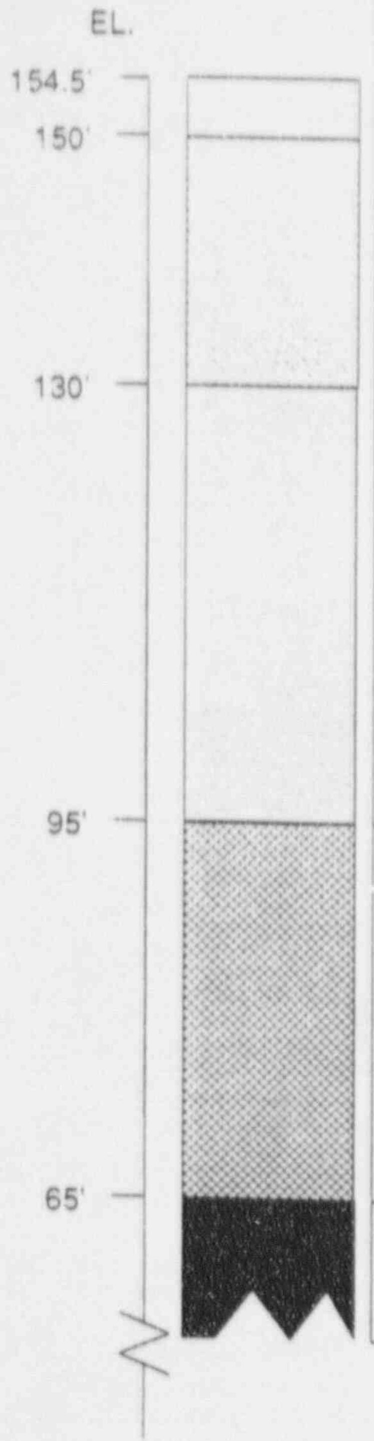
Notes:

Acceleration in g's

Spectral acceleration at D=0.05

Figure 3.0-2:

COMPARISON OF ARTIFICIAL T/H TO FARLEY SSE: X-COMPONENT



Soil Layers	V_s (fps)	ρ (k/ft^2)	Poisson's Ratio
Surficial	600	0.1	0.36
Overburden	970	0.1	0.36
Compact Overburden	2520	0.11	0.38
Lisbon	5360	0.13	0.33
Lisbon	2600	0.12	0.40

Figure 4.1-1: General Soil Profile at Main Plant Area
(Ref. Rig. 2B5B-7 of FSAR)

P:\52197-01\FIG-4-1-1

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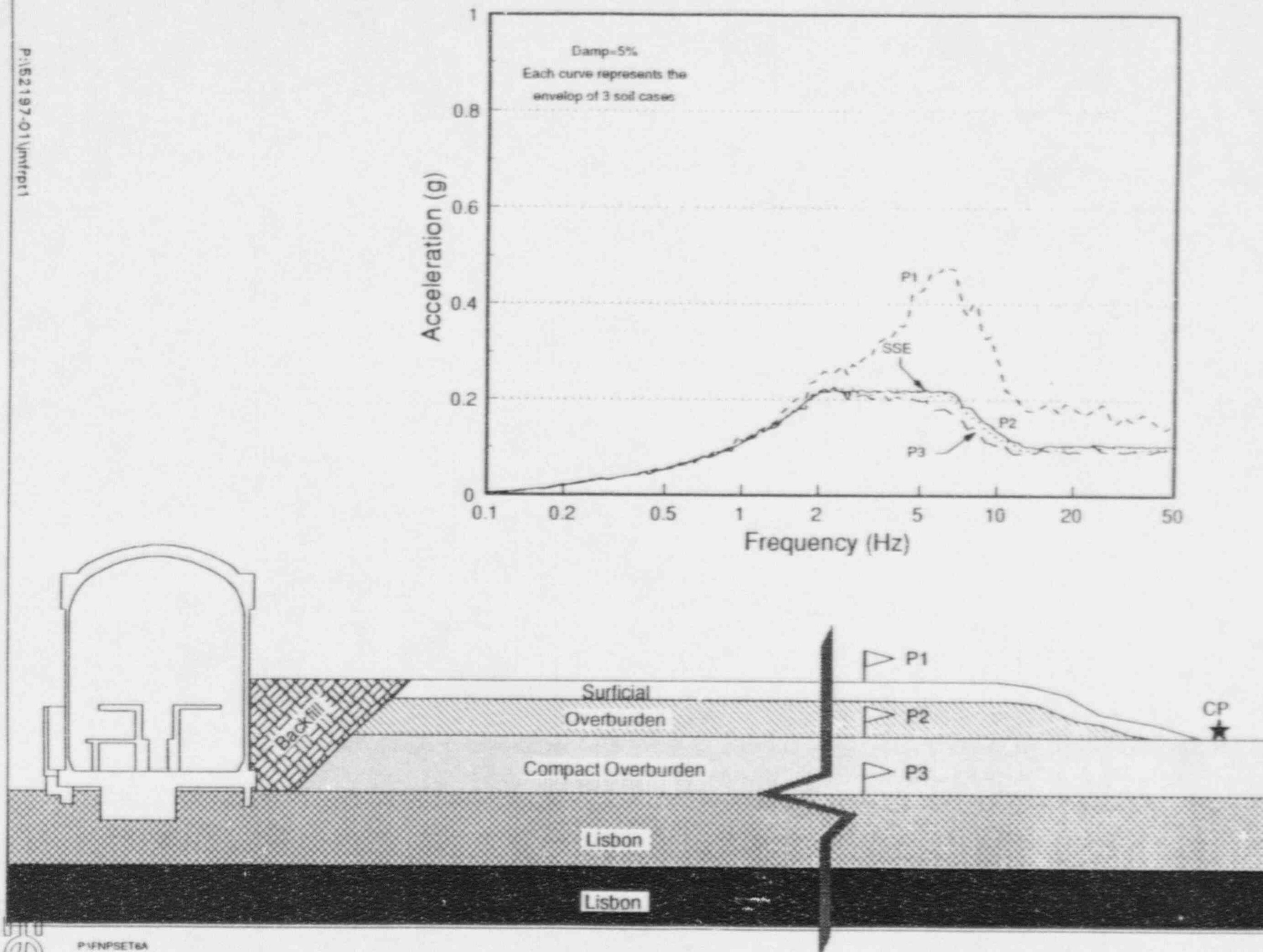

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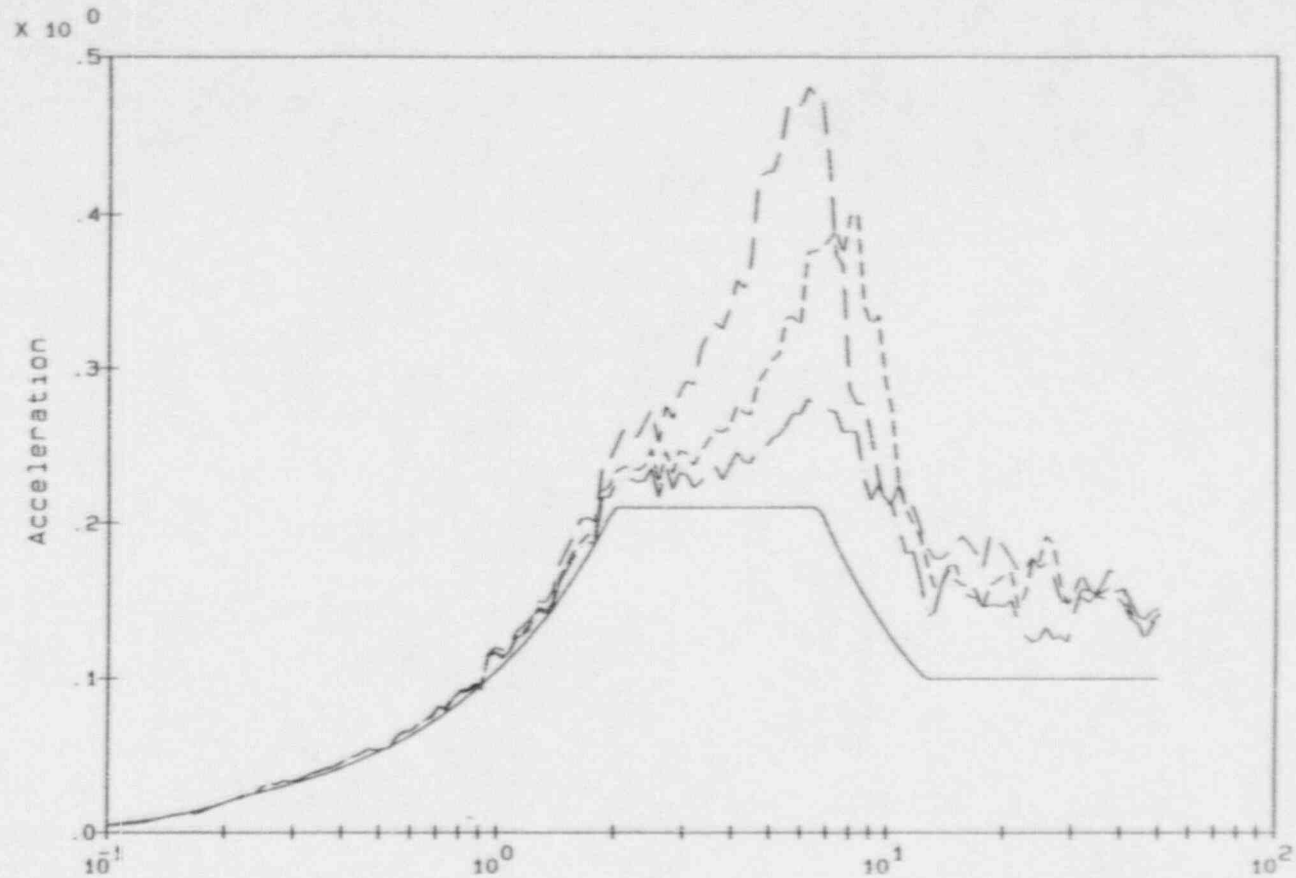
Figure 4.1-2: SHAKE Analysis of Main Plant Area,
Control Point On Outcrop of Compact Overburden at EL. 130'



Legend:

SSE @ Control Point ————————
Lower Bound Soil — — — — —
Best Estimate Soil ---------
Upper Bound Soil ——— ———

Notes:

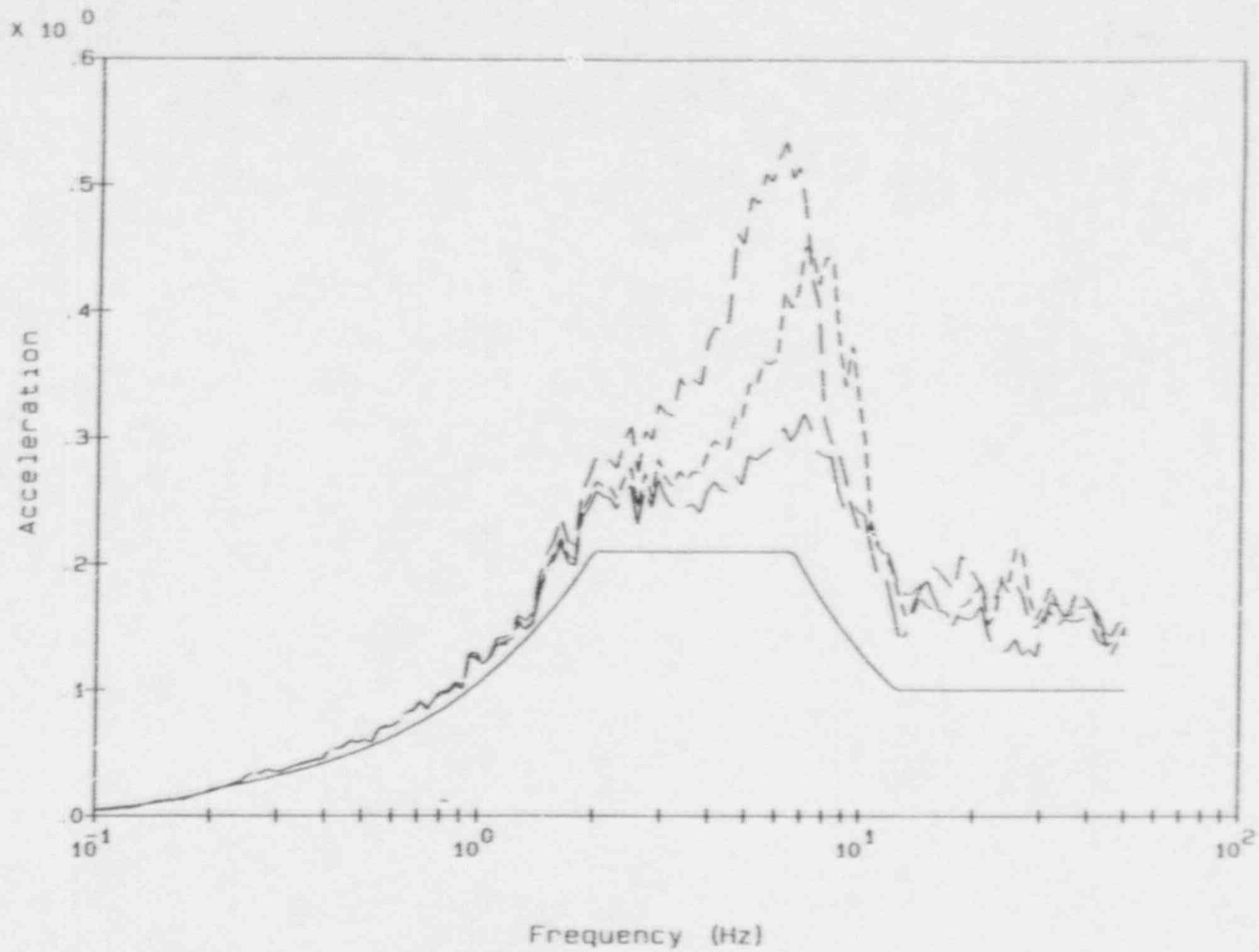
Acceleration in g's
Spectral acceleration at D=0.05

Figure 4.1-4

FNP: SHAKE ANALYSIS OF MAIN PLANT AREA (C.P. @ El. 130')
Horizontal Motions on Free Surface at Grade (El. 154.5')

fnpdgsh.1

P:\52197-01\jmfrpt1



Legend:

SSE @ Control Point ————————

Lower Bound Soil — — — — .

Best Estimate Soil ---------

Upper Bound Soil ——— ———— .

Notes:

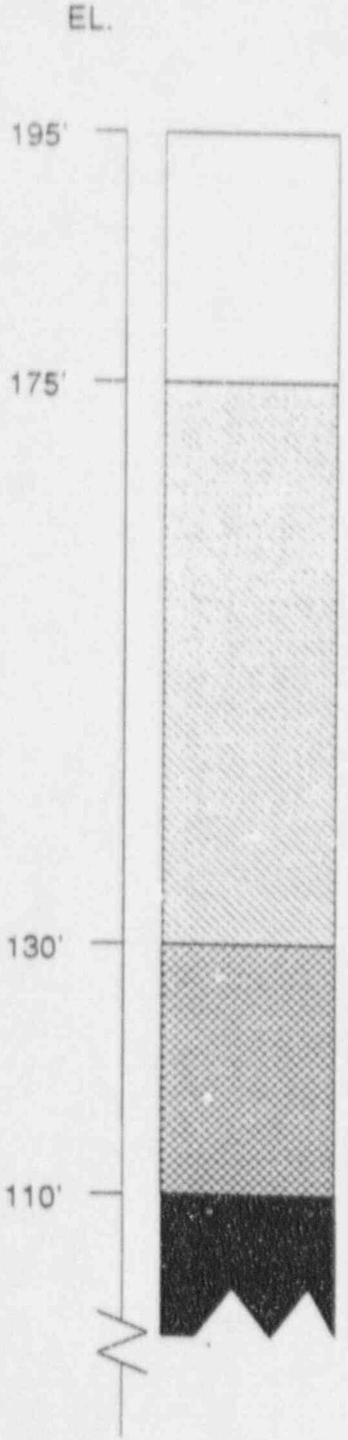
Acceleration in g's

Spectral acceleration at D=0.04

Figure 4.1-11

FNP: SHAKE ANALYSIS OF MAIN PLANT AREA (C.P. @ El. 130')
Horizontal Motinns on Free Surface at Grade (El. 154.5')

fnpdgsh.41

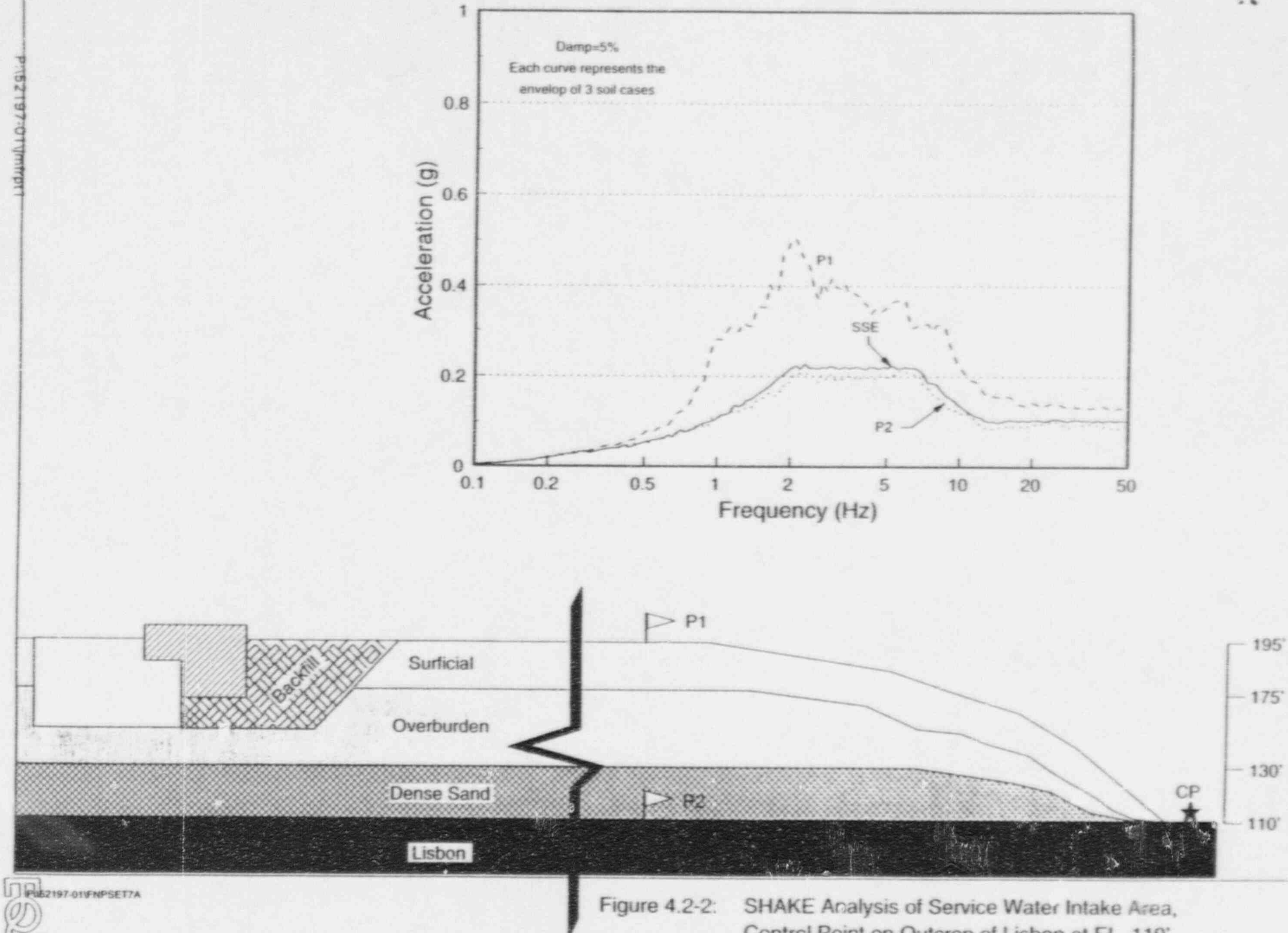


Soil Layers	V_s (fps)	ρ (k/ft^3)	Poisson's Ratio
Surficial	550	0.125	0.367
Overburden	900	0.125	0.418
Dense Sand	900	0.125	0.483
Lisbon	2400	0.130	0.435

Figure 4.2-1: General Soil Profile at Service Water Intake Area

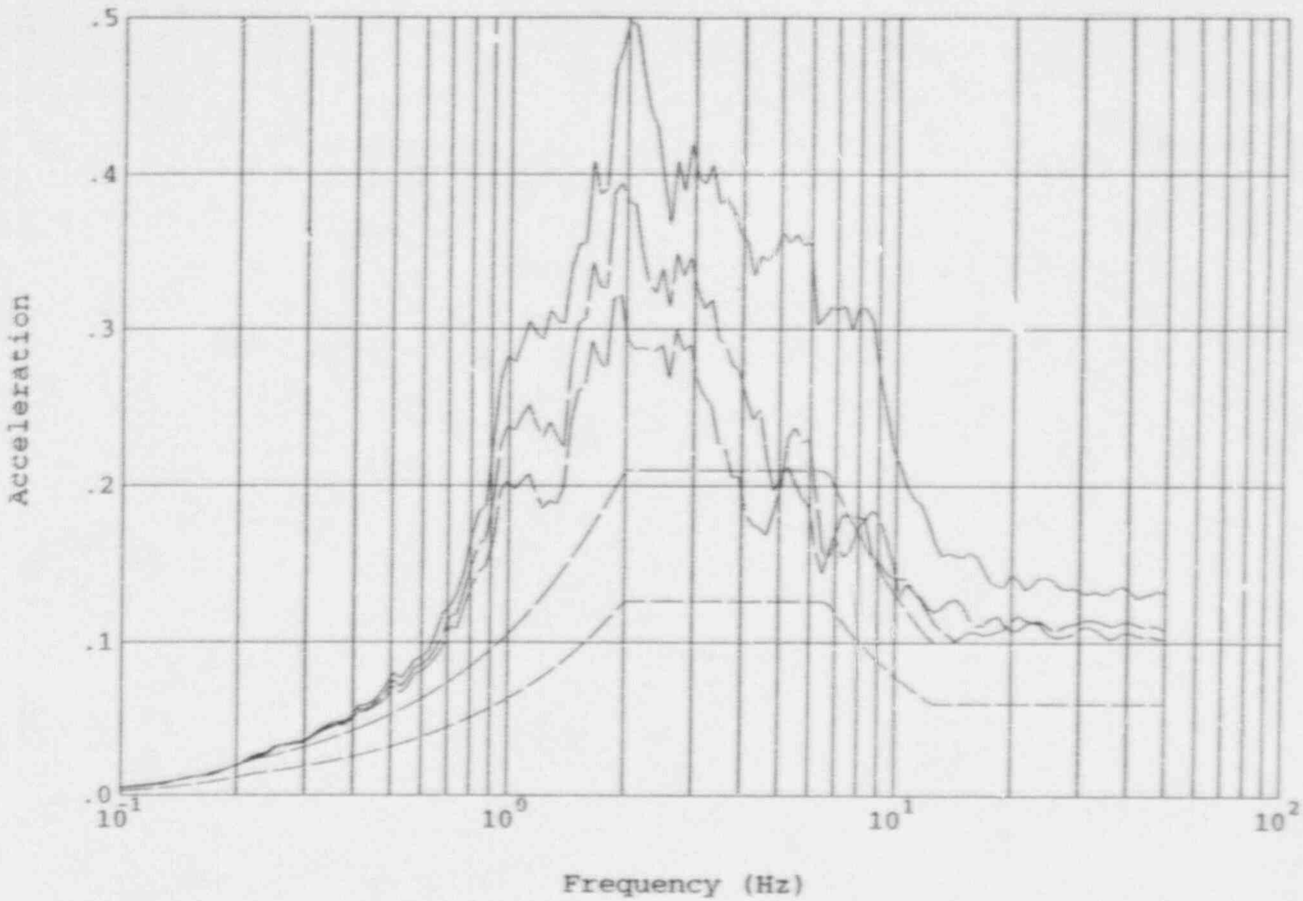
P:\52197-01\FIG4-2-1

P:\52197-01\mfrpt1



P:\52197-01\FNPSET7A

Figure 4.2-2: SHAKE Analysis of Service Water Intake Area, Control Point on Outcrop of Lisbon at EL. 110'



Legend:

Surface Motion Env	――――――
Env Resp @ Elv 166'	―― ― ―
Env Resp @ Elv 148'	――― ――― ―
FNP SSE GRS @ 0.10g	― ― ――
60% of FNP SSE GRS	― ― ― ― ―

Notes:

Acceleration in g's
Control Point @ Elev. 110'
Spectra calculated at 5% damping
Service Water Intake Area

Figure 4.2-7
J.M. Farley NPP: SHAKE Analysis - Freefield Horizontal Soil Response
Envelopes of 3 Soil-Case Responses @ Respective Elev.

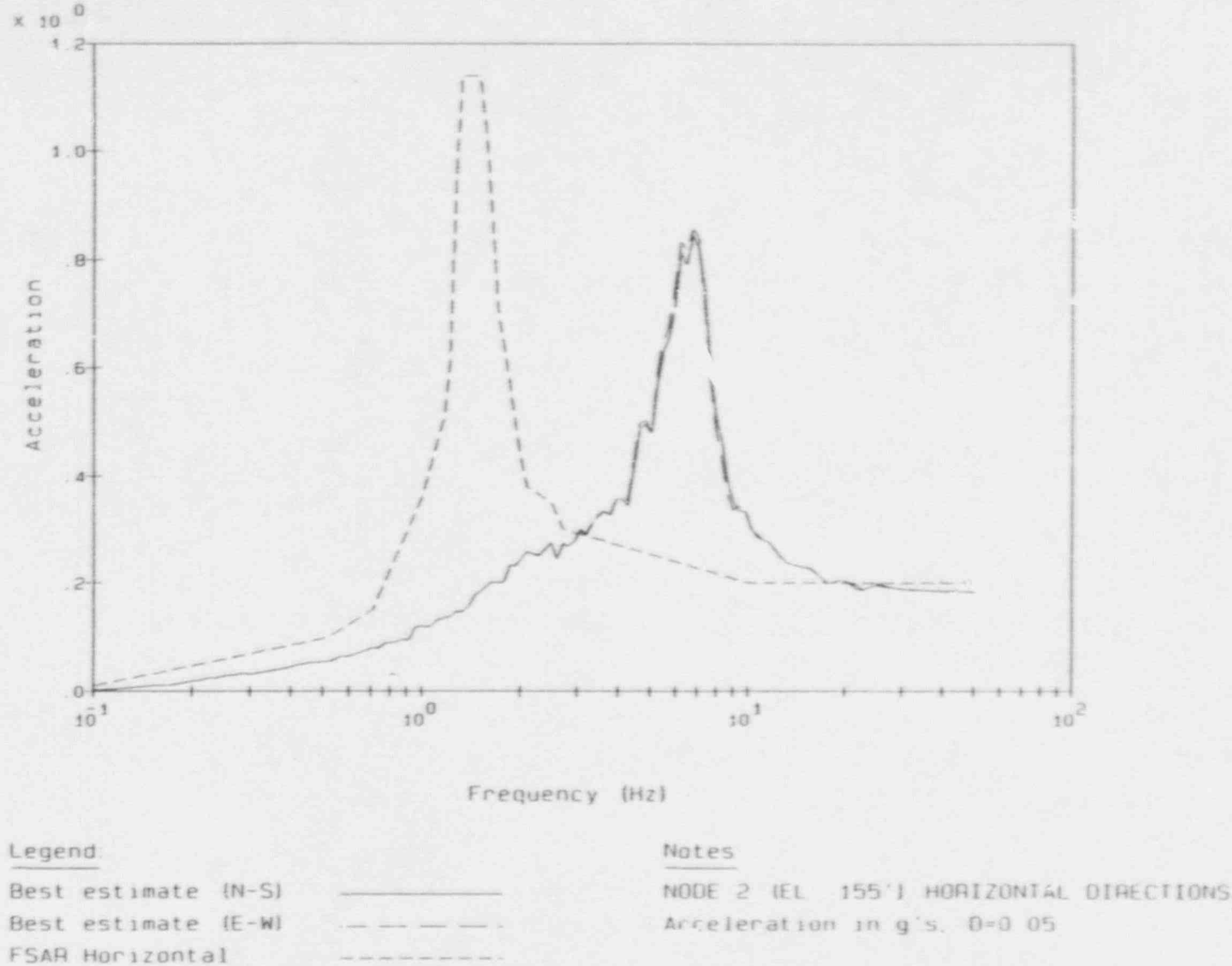
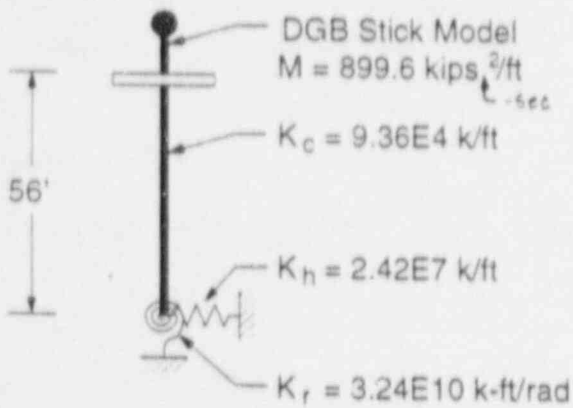


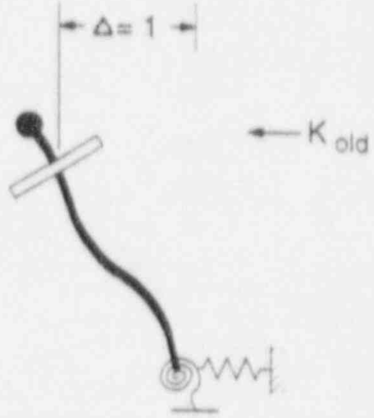
Figure 7.1-1:

FARLEY NUCLEAR PLANT DIESEL GENERATOR BLDG
COMPARISON OF ORIGINAL FSAR vs BEST ESTIMATE CASE

fsardg1

FSAR MODEL (See Ref. 23)



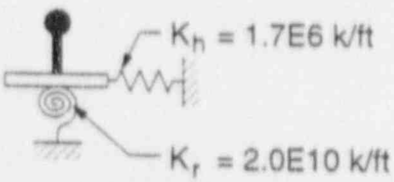


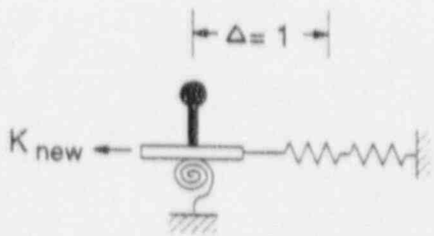
K_c = Caisson Stiffness
K_h = Horizontal Soil Spring
K_r = Rotational Soil Spring

$$K_{old} = \frac{K_h K_r K_c}{K_r K_c + 56^2 K_h K_c + K_h K_r} = 9.24E4 \text{ k/ft}$$

$$f_{old} = \frac{1}{2\pi}\sqrt{\frac{9.24E4}{8.99E2}} = 1.61 \text{ Hz}$$

CURRENT MODEL (See Ref. 6)





$$f_{new} = \frac{1}{2\pi}\sqrt{\frac{1.7E6}{8.99E2}} = 6.92 \text{ Hz}$$

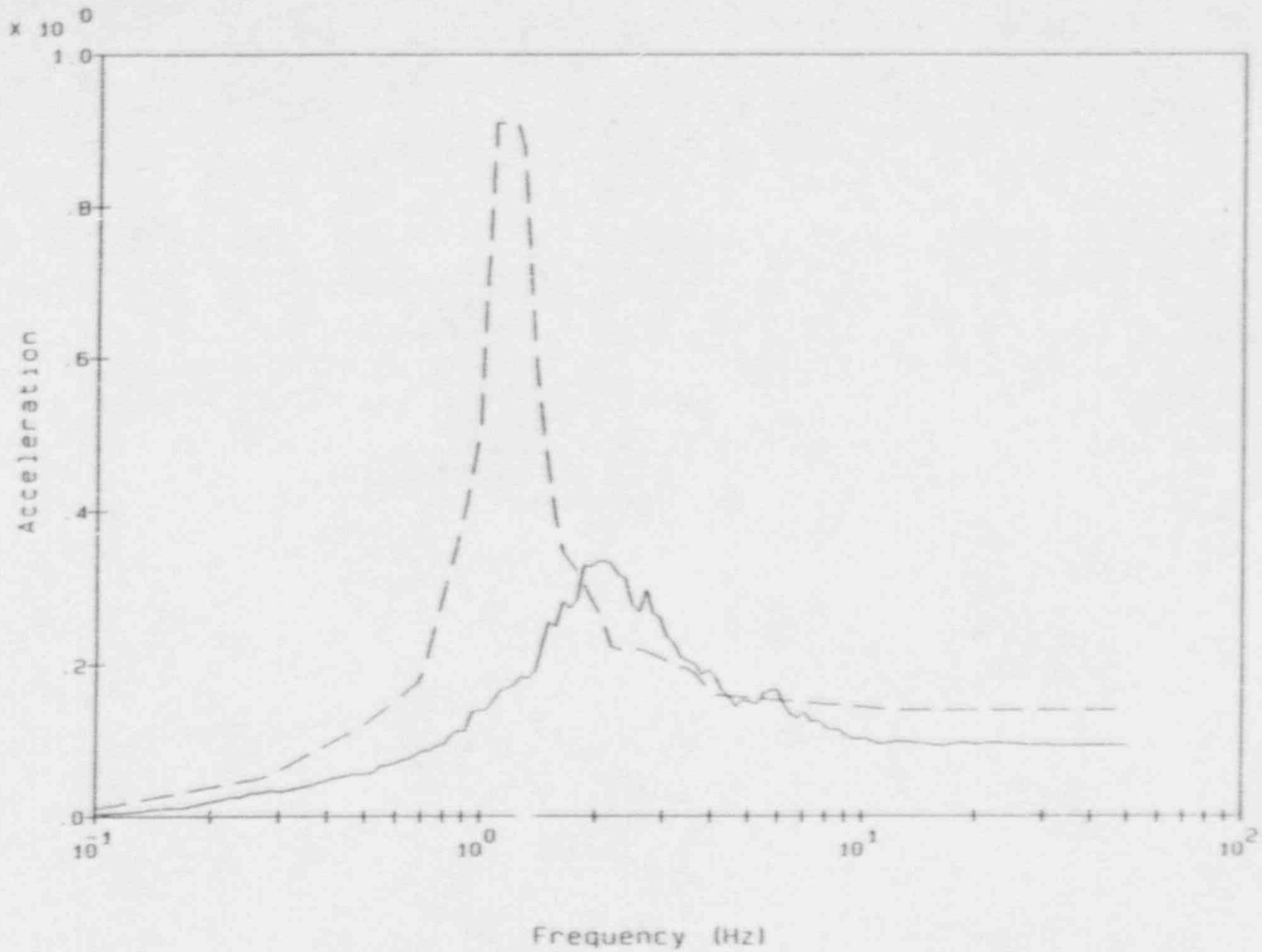
$$K_{new} = K_h = 1.7E6$$

FREQUENCY RATIO (TRANSLATION ONLY)

$$\frac{f_{new}}{f_{old}} = \frac{6.92}{1.61} = 4.3$$

Figure 7.1-2: Diesel Generator Building: Estimating Frequency Shift Between FSAR Model and Current Analysis

P:\52197-01\FIG7-1-2



Legend

Best Estimate ————

FSAR Horizontal — — — —

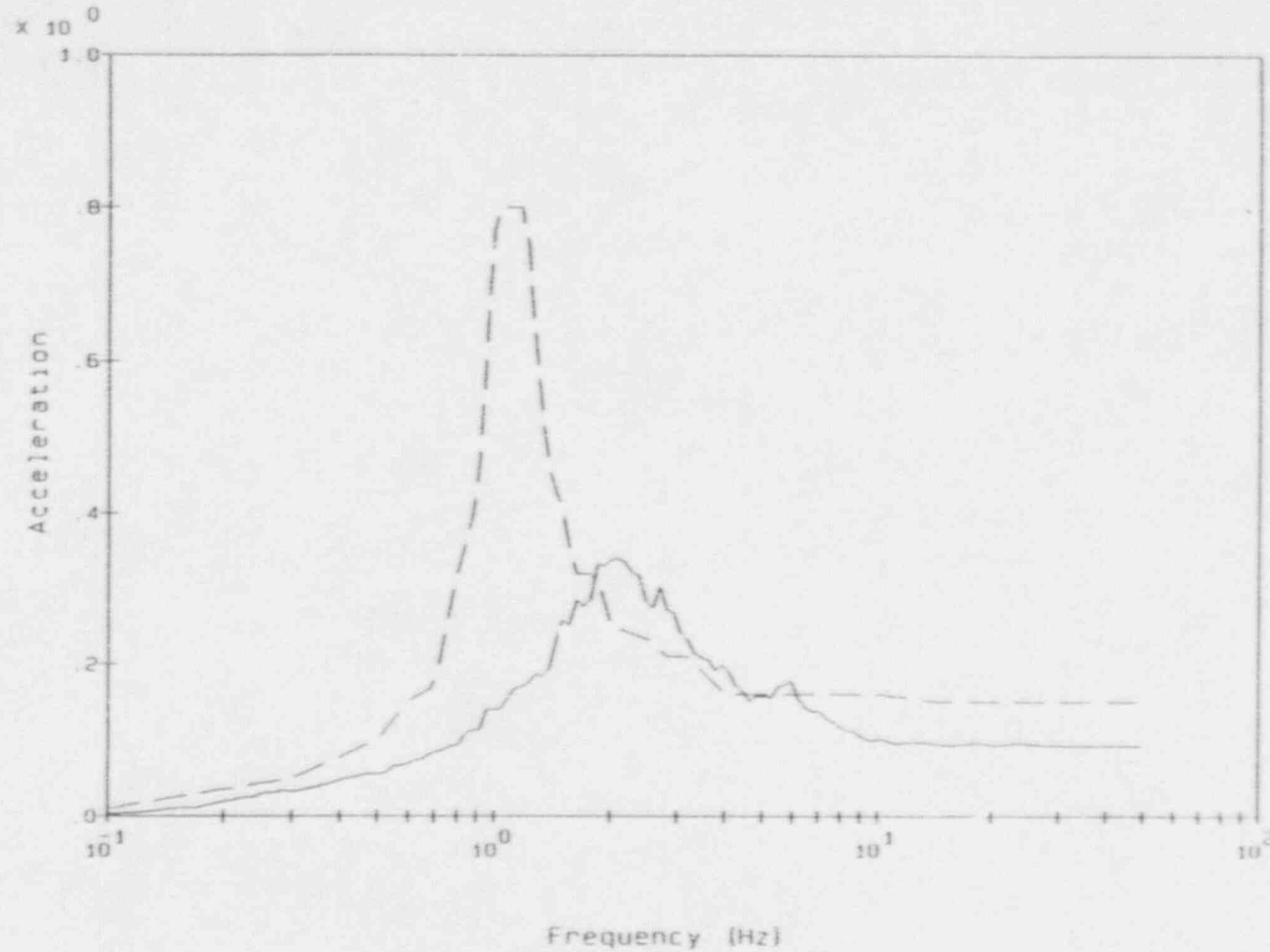
Notes

NODE 3 N-S DIRECTION (EL 167')

Acceleration in g's. D=0.05

Figure 7.2-9:
FARLEY NUCLEAR PLANT SERVICE WATER INTAKE STRUCTURE
COMPARISON OF ORIGINAL FSAR Vs BEST ESTIMATE CASE

fsarsw1



Legend

Current SAP ————————

FSAR Horizontal — — — — -

Notes

NODE 3 E-W DIRECTION (EL 167')

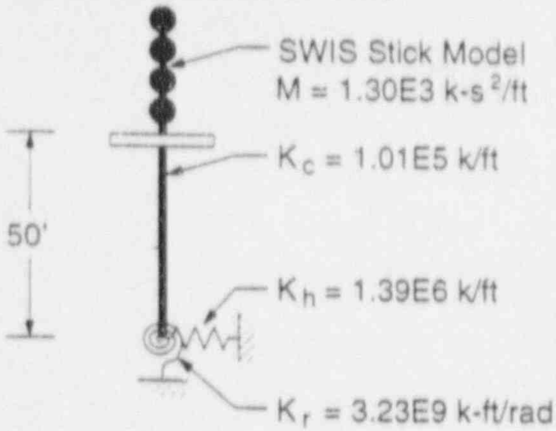
Acceleration in g's. D=0.05

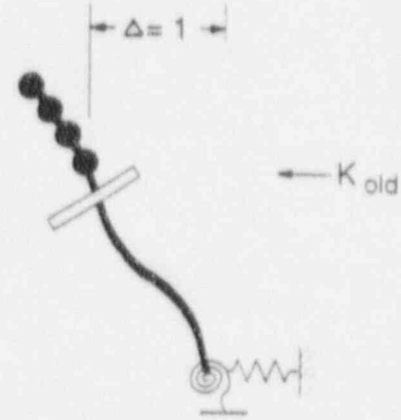
Figure 7.2-10:

FARLEY NUCLEAR PLANT SERVICE WATER INTAKE STRUCTURE
COMPARISON OF ORIGINAL FSAR Vs BEST ESTIMATE CASE

fsarsw2

FSAR MODEL (See Ref. 23)





K_c = Caisson Stiffness

K_h = Horizontal Soil Spring

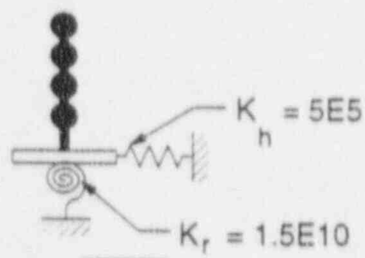
K_r = Rotational Soil Spring

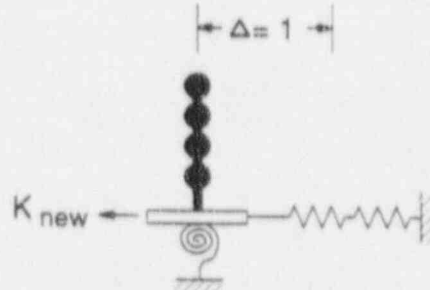
$$f_{old} = \frac{1}{2\pi}\sqrt{\frac{8.78E4}{1.3E3}} = 1.31 \text{ Hz}$$

$$K_{old} = \frac{K_h K_r K_c}{K_r K_c + 50^2 K_h K_c + K_h K_r}$$

$$= 8.78E4$$

CURRENT MODEL (See Ref. 7)





$$f_{new} = \frac{1}{2\pi}\sqrt{\frac{5E5}{1.3E3}} = 3.12 \text{ Hz}$$

$$K_{new} = K_h = 5E5$$

FREQUENCY RATIO

$$\frac{f_{new}}{f_{old}} = \frac{3.12}{1.31} = 2.4$$

Figure 7.2-11: Service Water Intake Structure: Estimating Frequency Shift Between FSAR Model and Current Model

P:\52197-01\FIG7-211

ATTACHMENT 2

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO. (1)	EQUIP CLASS (2)	MARK NO. (3)	SYSTEM/EQUIPMENT DESCRIPTION (4)	<---------- Building (5)	EQUIPMENT Flr.Elv. (6)	LOCATION -----> Rm. or Row/Col. (7)	Base Elev. (8)	<40'? (9)	Capacity Spectrum (10)	Demand Spectrum (11)	Cap. > Demand? (12)	Caveats OK? (13)	Anchor OK? (14)	Inter-act OK? (15)	Equip OK? (16)	Notes (17)
	20	A1TB006	TERMINAL BOX	AB	121-00	0223	126-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	B1TB002	TERMINAL BOX	AB	121-00	0235	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	N1E21LI0112-3	VCT LEVEL INDICATION	AB	121-00	0218	126-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	07	N1P19PCV2228A	PCV TO PORV BACKUP AIR SUPPLY BOTTLE	AB	121-00	0218	127-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	N1P19PCV2228B	PCV TO PORV BACKUP AIR SUPPLY PRESSURE CONTROL	AB	121-00	0218	127-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1B31HV8028-A	PRESSURE RELIEF TANK ISOLATION OUTSIDE CTMT VALVE	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	02	Q1C11E004A-AB	REACTOR TRIP SWITCHGEAR NO. 1	AB	121-00	0235	121-00	Y	BS	GRS	Y	N	Y	N	N	
	02	Q1C11E004B-AB	REACTOR TRIP SWITCHGEAR NO. 2	AB	121-00	0235	121-00	Y	BS	GRS	Y	N	Y	N	N	
	08A	Q1E11MOV8888A-A	LHSI TO RCS COLD LEG	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1E11MOV8888B-B	LHSI TO RCS COLD LEG	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	18	Q1E13PT0950-P1	CONTAINMENT PRESSURE PROTECTION TRANSMITTER	AB	121-00	0223	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1E13PT0951-P2	CONTAINMENT PRESSURE PROTECTION TRANSMITTER	AB	121-00	0223	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1E13PT0952-P3	CONTAINMENT PRESSURE PROTECTION TRANSMITTER	AB	121-00	0223	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1E13PT0953-P4	CONTAINMENT PRESSURE PROTECTION TRANSMITTER	AB	121-00	0223	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	Q1E16H006A-A	BATTERY CHARGING ROOM COOLERS	AB	121-00	0245	131-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	Q1E16H006B-B	BATTERY CHARGING ROOM COOLERS	AB	121-00	0244	131-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	Q1E16H008A-B	MCC 1B ROOM COOLER	AB	121-00	0209	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	Q1E16H008B-B	MCC 1B ROOM ACU	AB	121-00	0209	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	

FARLEY UNIT 1
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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	10	Q1E16H010-B	600V LOAD CENTER 1E ROOM COOLER	AB	121-00	0228	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	07	Q1E21HV8945A-A	BORON INJECTION SURGE TANK VALVE	AB	121-00	0222	122-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1E21LCV0115C-A	VOLUME CONTROL TANK OUTLET ISOLATION VALVE	AB	121-00	0216	123-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1E21LCV0115E-B	VOLUME CONTROL TANK OUTLET ISOLATION VALVE	AB	121-00	0216	123-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	18	Q1E21LT112-3	VOLUME CONTROL TANK LEVEL TRANSMITTER	AB	121-00	0217	126-06	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1E21LT115-1	VOLUME CONTROL TANK LEVEL TRANSMITTER	AB	121-00	0217	126-06	Y	BS	GRS	Y	Y	Y	Y	Y	
	08A	Q1E21MOV8100-B	RCP SEAL WATER RETURN ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1E21MOV8107-A	CHARGING PUMP TO RCS ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1E21MOV8108-B	CHARGING PUMP TO RCS ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1E21MOV8801A-A	BORON INJECTION TANK OUTLET ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1G24V003A	SG 1A BLOWDOWN ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1G24V003B	SG 1B BLOWDOWN ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1G24V003C	SG 1C BLOWDOWN ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	20	Q1H21E005-B	4.16KV SWITCHGEAR 1G LOCAL CONT PANEL	AB	121-00	0233	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H21NBAFP2605A-A	HOT SHUTDOWN PANEL A	AB	121-00	0254	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1H21NBMER2619-B	STEAM GENERATOR 1C WIDE RANGE LEVEL MCB ISOLATOR	AB	121-00	0227	126-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	07	Q1N11HV3369A	MAIN STEAM ISOLATION VALVE	AB	121-00	0241	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11HV3369B	MAIN STEAM ISOLATION VALVE	AB	121-00	0241	125-00	Y	BS	GRS	Y	Y	NA	Y	Y	

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	07	Q1N11HV3369C	MAIN STEAM ISOLATION VALVE	AB	121-00	0241	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11HV3370A-B	MAIN STEAM LINE ISOLATION VALVE	AB	121-00	0241	136-00+	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11HV3370B-B	MAIN STEAM LINE ISOLATION VALVE	AB	121-00	0241	125-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11HV3370C-B	MAIN STEAM LINE ISOLATION VALVE	AB	121-00	0241	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11PV3371A-A	MAIN STEAM ATMOSPHERIC RELIEF VALVE	AB	121-00	0241	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11PV3371B-A	MAIN STEAM ATMOSPHERIC RELIEF VALVE	AB	121-00	0241	[illegible]-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N11PV3371C-A	MAIN STEAM ATMOSPHERIC RELIEF VALVE	AB	121-00	0241	128-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08B	Q1N11SV3369AC-A	SOLENOID VALVE	AB	121-00	0241	136-00+	Y	BS	GRS	Y	Y	NA	Y	Y	
	08B	Q1N11SV3369BC-A	SOLENOID VALVE	AB	121-00	0241	125-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08B	Q1N11SV3369CC-A	SOLENOID VALVE	AB	121-00	0241	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	07	Q1N23HV3227A	MOTOR DRIVEN AUX FEEDWATER TO STEAM GENERATOR 1A	AB	121-00	0241	125-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N23HV3227B	MOTOR DRIVEN AUX FEEDWATER TO STEAM GENERATOR 1B	AB	121-00	0241	125-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1N23HV3227C	MOTOR DRIVEN AUX FEEDWATER TO STEAM GENERATOR 1C	AB	121-00	0241	125-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P13HV2866C-A	CONTAINMENT PURGE ISOLATION OUTSIDE CTMT VALVE	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P13HV2867C-A	CONTAINMENT PURGE ISOLATION OUTSIDE CTMT VALVE	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P15HV3332-B	PRESSURIZER SAMPLE	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P15HV3333-B	RCS HOT LEG SAMPLE LINE ISOLATION VALVE	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1P16MOV3149-A	BLOWDOWN HEAT EXCHANGER ISOLATION MOV	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	

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LINE NO.	EQUIP CLASS	MARK NO.	SYSTEM/EQUIPMENT DESCRIPTION	<---------- Building	EQUIPMENT Flr.Elv.	LOCATION -----> Rm. or Row/Col.	Base Elev.	<40'?	Capacity Spectrum	Demand Spectrum	Cap. > Demand?	Caveats OK?	Anchor OK?	Inter-act OK?	Equip OK?	Notes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	07	Q1P17HV3045-A	CCW RETURN FROM RCP THERMAL BARRIER ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P17HV3067-B	CCW RETURN FROM EXCESS LETDOWN	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P17HV3095-B	CCW SUPPLY TO EXCESS LETDOWN HEAT EXCHANGER	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1P17MOV3052-A	CCW TO RCP THERMAL BARRIER ISOLATION	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1P17MOV3182-A	CCW RETURN FROM RCPS	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	07	Q1P19HV2228-B	PRESSURIZER PORV BACK-UP AIR SUPPLY VALVE	AB	121-00	0223	121-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	04	Q1R11B005-B	LC TRANSFORMER 1E	AB	121-00	0229	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	03	Q1R15A007-B	4.16KV SWITCHGEAR 1G	AB	121-00	0233	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	02	Q1R16B007-B	600V LOAD CENTER 1E	AB	121-00	0229	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	01	Q1R17B002-B	MCC 1B	AB	121-00	0209	121-00	Y	BS	GRS	U	N	N	N	N	
	16	Q1R21E009A-1	INVERTER 1A	AB	121-00	0224	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R21E009B-2	INVERTER 1B	AB	121-00	0224	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R21E009C-3	INVERTER 1C	AB	121-00	0226	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R21E009D-4	INVERTER 1D	AB	121-00	0226	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R21E009F-A	INVERTER 1F	AB	121-00	0224	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R21E009G-B	INVERTER 1G	AB	121-00	0226	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21L005A-A	120V VITAL AC DISTRIBUTION PANEL 1J	AB	121-00	0224	125-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21L005B-B	120V VITAL AC DISTRIBUTION PANEL 1K	AB	121-00	0226	125-00	Y	BS	GRS	Y	Y	Y	Y	Y	

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO. (1)	EQUIP CLASS (2)	MARK NO. (3)	SYSTEM/EQUIPMENT DESCRIPTION (4)	Building (5)	EQUIPMENT Flr.Elv. (6)	LOCATION Rm. or Row/Col. (7)	Base Elev. (8)	<40'? (9)	Capacity Spectrum (10)	Demand Spectrum (11)	Cap. > Demand? (12)	Caveats OK? (13)	Anchor OK? (14)	Inter-act OK? (15)	Equip OK? (16)	Notes (17)
	14	Q1R41L001E-B	125VDC DISTRIBUTION PANEL 1E	AB	121-00	0233	124-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R41L001F-B	125VDC DISTRIBUTION PANEL 1F	AB	121-00	0209	124-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	02	Q1R42B001A-A	125VDC BUS 1A	AB	121-00	0224	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	02	Q1R42B001B-B	125VDC BUS 1B	AB	121-00	0226	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R42E001A-A	AUX BLDG BATTERY CHARGER 1A	AB	121-00	0224	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	16	Q1R42E001B-B	AUX BLDG BATTERY CHARGER 1B	AB	121-00	0226	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	15	Q1R42E002A-A	AUX BLDG BATTERY 1A	AB	121-00	0214	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	15	Q1R42E002B-B	AUX BLDG BATTERY 1B	AB	121-00	0212	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1R43E001B-B	SEQUENCER B1G	AB	121-00	0229	121-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1R43E002B-B	SEQUENCER B1G AUX RELAY PANEL	AB	121-00	0233	126-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1C55NM0048-A	ALTERN SHUTDOWN NEUTRON FLUX MON SIGNAL AMPLIFIER	AB	139-00	0332	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1E11LQ3594A-A	CTMT SUMP LEVEL TRANSMITTER POWER SUPPLY	AB	139-00	0318	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1E11LQ3594B-B	CTMT SUMP LEVEL TRANSMITTER POWER SUPPLY	AB	139-00	0318	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	Q1E16H007-A	MCC 1A ROOM COOLER	AB	139-00	0332	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	Q1E16H009-A	600V LOAD CENTER 1D ROOM COOLER	AB	139-00	0339	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H21E004-A	4.16KV SWITCHGEAR 1F LOCAL CONT PANEL	AB	139-00	0343	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H22L001E-A	MULTIPLYING RELAY CABINET 1E	AB	139-00	0318	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H22L001F-B	MULTIPLYING RELAY CABINET 1F	AB	139-00	0318	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO. (1)	EQUIP CLASS (2)	MARK NO. (3)	SYSTEM/[illegible] DESCRIPTION (4)	<---------- Building (5)	EQUIPMENT Flr.Elv. (6)	LOCATION -----> Rm. or Row/Col. (7)	Base Elev. (8)	<40'? (9)	Capacity Spectrum (10)	Demand Spectrum (11)	Cap. > Demand? (12)	Caveats OK? (13)	Anchor OK? (14)	Inter-act OK? (15)	Equip OK? (16)	Notes (17)
	20	Q1H22L002-A	TRANSFER RELAY CABINET 1	AB	139-00	034[illegible]	139-00	Y	BS	GRS	Y	N	Y	N	N	
	20	Q1H22L004-B	TRANSFER RELAY CABINET 3	AB	139-00	0334	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H25L008-A	TERMINATION CABINET	AB	139-00	0318	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H25L029-B	TERMINATION CABINET	AB	139-00	0318	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	04	Q1R11B004-A	LC TRANSFORMER 1D	AB	139-00	0335	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	03	Q1R15A006-A	4.16KV SWITCHGEAR 1F	AB	139-00	0343	139-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	01	Q1R17B001-A	MCC 1A	AB	[illegible]-00	0332	139-00	Y	BS	GRS	Y	N	N	Y	N	
	01	Q1R17B008-A	MCC 1B	AB	139-00	0347	139-00	Y	BS	GRS	U	U	N	Y	N	
	01	Q1R17B009-B	MCC 1V	AB	139-00	0334	139-00	Y	BS	GRS	Y	N	Y	Y	N	
	14	Q1R18B029-A	POWER DISCONNECT SWITCH	AB	139-00	0332	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B030-A	POWER DISCONNECT SWITCH	AB	139-00	0332	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B031-A	CIRCUIT BREAKER BOX	AB	139-00	0332	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B032-A	CIRCUIT BREAKER BOX	AB	139-00	0332	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B033-B	POWER DISCONNECT SWITCH	AB	139-00	0322	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B034-B	POWER DISCONNECT SWITCH	AB	139-00	0322	142-00	Y	BS	GRS	[illegible]	Y	Y	Y	Y	
	14	Q1R18B035-B	CIRCUIT BREAKER BOX	AB	139-00	0322	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B036-B	POWER DISCONNECT SWITCH	AB	139-00	0322	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B038-A	MOV POWER DISCONNECT SWITCH	AB	139-00	0332	142-00	Y	BS	GRS	Y	Y	Y	Y	Y	

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO. (1)	EQUIP CLASS (2)	MARK NO. (3)	SYSTEM/EQUIPMENT DESCRIPTION (4)	Building (5)	EQUIPMENT Flr.Elv. (6)	LOCATION Rm. or Row/Col. (7)	Base Elev. (8)	<40'? (9)	Capacity Spectrum (10)	Demand Spectrum (11)	Cap. > Demand? (12)	Caveats OK? (13)	Anchor OK? (14)	Inter-act OK? (15)	Equip OK? (16)	Notes (17)
	14	Q1R18B039-A	MOV POWER DISCONNECT SWITCH	AB	139-00	0332	142-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B040-A	MOV POWER DISCONNECT SWITCH	AB	139-00	0332	142-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B041-B	MOV POWER DISCONNECT SWITCH	AB	139-00	0312	142-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B042-B	MOV POWER DISCONNECT SWITCH	AB	139-00	0312	142-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R18B043-B	MOV POWER DISCONNECT SWITCH	AB	139-00	0312	142-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21B001C-3	VITAL AC BREAKER BOX	AB	139-00	0318	139-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21B001D-4	VITAL AC BREAKER BOX	AB	139-00	0318	139-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21L001C-3	VITAL AC DISTRIBUTION PANEL 1C	AB	139-00	0318	139-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21L001D-4	VITAL AC DISTRIBUTION PANEL 1D	AB	139-00	0318	139-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R41L001B-A	125VDC DISTRIBUTION PANEL 1B	AB	139-00	0343	144-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R41L001C-A	125VDC DISTRIBUTION PANEL 1C	AB	139-00	0312	139-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1R43E001A-A	SEQUENCER B1F	AB	139-00	0335	139-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1R43E002A-A	SEQUENCER B1F AUX RELAY PANEL	AB	139-00	0343	143-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	N1H11NGMCB2500A-AB	MAIN CONTROL BOARD SECTION A	AB	155-00	0401	155-0 0	Y	BS	GRS	Y	N	Y	N	N	
	20	Q1H11NGASC2506C-B	AUX SAFEGUARDS CABINET C	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGASC2506D-A	AUX SAFEGUARDS CABINET D	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGB2504J-A	BOP INSTRUMENTATION CABINET J	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	[illegible]	Y	N	N	
	20	Q1H11NGB2504K-B	BOP INSTRUMENTATION CABINET K	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO.	EQUIP CLASS	MARK NO.	SYSTEM/EQUIPMENT DESCRIPTION	<---------- Building	EQUIPMENT Flr.Elv.	LOCATION ------> Rm. or Row/Col.	Base Elev.	<40'?	Capacity Spectrum	Demand Spectrum	Cap. > Demand?	Caveats OK?	Anchor OK?	Inter-act OK?	Equip OK?	Notes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	20	Q1H11NGCCM2523A-A	ICCMS PROCESSOR CABINET TRAIN A	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGCCM2523B-B	ICCMS PROCESSOR CABINET TRAIN B	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGPIC2505A-1	PROCESS PROTECTION CABINET CHANNEL 1	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505B-2	PROCESS PROTECTION CABINET CHANNEL 2	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505C-3	PROCESS PROTECTION CABINET CHANNEL 3	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505D-4	PROCESS PROTECTION CABINET CHANNEL 4	AB	155-00	0416	[illegible] 0	[illegible]	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505E-1	PROCESS CONTROL CABINET CHANNEL 1	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505F-2	PROCESS CONTROL CABINET CHANNEL 2	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505G-3	PROCESS CONTROL CABINET CHANNEL 3	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1H11NGPIC2505H-4	PROCESS CONTROL CABINET CHANNEL 4	AB	155-00	0416	155-0 0	[illegible]	BS	GRS	Y	Y	Y	Y	Y	
	20	Q1[illegible]11NGR2504I-AB	RADIATION MONITOR PANEL	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGSSP2506G-B	SOLID STATE PROTECTION INPUT CABINET	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGSSP2506J-B	SOLID STATE PROTECTION TEST CABINET	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGSSP2506K-A	SOLID STATE PROTECTION INPUT CABINET	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	20	Q1H11NGSSP2506N-A	SOLID STATE PROTECTION TEST CABINET	AB	155-00	0416	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	18	Q1N11PT0474-P2	STEAM GENERATOR 1A PRESSURE	AB	155-00	0462	159-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0475-P3	STEAM GENERATOR 1A DISCHARGE PRESSURE	AB	155-00	0462	158-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0476-P4	STEAM GENERATOR 1A DISCHARGE PRESSURE	AB	155-00	0462	158-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO. (1)	EQUIP CLASS (2)	MARK NO. (3)	SYSTEM/EQUIPMENT DESCRIPTION (4)	<---------- Building (5)	EQUIPMENT Flr.Elv. (6)	LOCATION -----> Rm. or Row/Col. (7)	Base Elev. (8)	<40'? (9)	Capacity Spectrum (10)	Demand Spectrum (11)	Cap. > Demand? (12)	Caveats OK? (13)	Anchor OK? (14)	Inter-act OK? (15)	Equip OK? (16)	Notes (17)
	18	Q1N11PT0484-P2	STEAM GENERATOR 1B DISCHARGE PRESSURE	AB	155-00	0462	159-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0485-P3	STEAM GENERATOR 1B PRESSURE	AB	155-00	0462	159-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0486-P4	STEAM GENERATOR 1B DISCHARGE PRESSURE	AB	155-00	0462	158-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0494-P2	STEAM GENERATOR 1C DISCHARGE PRESSURE	AB	155-00	0464	159-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0495-P3	STEAM GENERATOR 1C DISCHARGE PRESSURE	AB	155-00	0464	159-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT0496-P4	STEAM GENERATOR 1C PRESSURE	AB	155-00	0464	158-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT3371A-A	STEAM GENERATOR 1A PRESSURE	AB	155-00	0462	159-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT3371B-A	STEAM GENERATOR 1B PRESSURE	AB	155-00	0462	158-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1N11PT3371C-A	STEAM GENERATOR 1C PRESSURE	AB	155-00	0464	158-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21B001A-1	VITAL AC BREAKER BOX	AB	155-00	0416	161-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21B001B-2	VITAL AC BREAKER BOX	AB	155-00	0416	161-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21L001A-1	VITAL AC DISTRIBUTION PANEL 1A	AB	155-00	0416	160-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R21L001B-2	VITAL AC DISTRIBUTION PANEL 1B	AB	155-00	0416	160-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R41L001A-A	125VDC DISTRIBUTION PANEL 1A	AB	155-00	0416	161-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	Q1R41L001D-B	125VDC DISTRIBUTION PANEL 1D	AB	155-00	0416	161-0 0	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	QSH11NGEPB2508-AB	EMERGENCY POWER BOARD	AB	155-00	0401	155-0 0	Y	BS	GRS	Y	Y	Y	N	N	
	01	QSR17B006-A	MCC 1F	AB	155-00	0409	155-0 0	Y	BS	GRS	U	N	N	N	N	
	01	QSR17B007-B	MCC 1G	AB	155-00	0409	155-0 0	Y	BS	GRS	U	N	N	N	N	

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
AUXILIARY BUILDING ELEVATIONS 121' to 175'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO.	EQUIP CLASS	MARK NO.	SYSTEM/EQUIPMENT DESCRIPTION	<---------- Building	EQUIPMENT Flr.Elv.	LOCATION -----> Rm. or Row/Col.	Base Elev.	<4G'?	Capacity Spectrum	Demand Spectrum	Cap. > Demand?	Caveats OK?	Anchor OK?	Inter-act OK?	Equip OK?	Notes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	14	QSR19L002A-A	120V AC CONTR. PWR. PANEL 1R	AB	155-00	0409	159-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	14	QSR19L002B-B	120V AC CONTR. PWR. PANEL 1S	AB	155-00	0409	159-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	QSV49HS3313AB-A	CTRL RM A/C LOCAL CONTROL STATION A	AB	155-00	0416	155-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	20	QSV49HS3313BB-B	CTRL RM A/C LOCAL CONTROL STATION B	AB	155-00	0416	155-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	09	Q1V47C012A-A	AUXILIARY BLDG A TRAIN BATTERY ROOM EXHAUST FAN	AB	175-00	0501	176-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	09	Q1V47C012B-B	AUXILIARY BLDG B TRAIN BATTERY ROOM EXHAUST FAN	AB	175-00	0501	176-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	QSV49K001A-A	CONTROL ROOM PACKAGE A/C UNIT	AB	175-00	0501	175-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	10	QSV49K001B-B	CONTROL ROOM PACKAGE A/C UNIT	AB	175-00	0501	175-00	Y	BS	GRS	Y	Y	Y	Y	Y	

ATTACHMENT 3

FARLEY UNIT 1
SCREENING VERIFICATION DATA SHEET (SVDS)
CONTAINMENT ELEVAIONS 140' to 155'
EQUIP CAPACITY VS DEMAND CHECK PER GIP METHOD A

LINE NO.	EQUIP CLASS	MARK NO.	SYSTEM/EQUIPMENT DESCRIPTION	<---------- Building	EQUIPMENT Flr.Elv.	LOCATION -----> Rm. or Row/Col.	Base Elev.	<40'?	Capacity Spectrum	Demand Spectrum	Cap. > Demand?	Caveats OK?	Anchor OK?	Inter-act OK?	Equip OK?	Notes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	07	Q1B31PCV0444B-B	PRESSURIZER POWER RELIEF VALVE	CB	155-00	CTMT	170-00+	Y	BS	GRS	Y	Y	NA	Y	Y	
	18	Q1C22LT0474-P1	STEAM GENERATOR 1A NARROW RANGE LEVEL	CB	155-00	CTMT	155-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0475-P2	STEAM GENERATOR 1A NARROW RANGE LEVEL	CB	155-00	CTMT	155-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0476-P3	STEAM GENERATOR 1A NARROW RANGE LEVEL	CB	155-00	CTMT	155-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0484-P1	STEAM GENERATOR 1B NARROW RANGE LEVEL	CB	155-00	CTMT	159-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0485-P2	STEAM GENERATOR 1B NARROW RANGE LEVEL	CB	155-00	CTMT	159-00	Y	BS	GRS	Y	Y	Y	N	N	
	18	Q1C22LT0486-P3	STEAM GENERATOR 1B NARROW RANGE LEVEL	CB	155-00	CTMT	159-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0494-P1	STEAM GENERATOR 1C NARROW RANGE LEVEL	CB	155-00	CTMT	158-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0495-P2	STEAM GENERATOR 1C NARROW RANGE LEVEL	CB	155-00	CTMT	158-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1C22LT0496-P3	STEAM GENERATOR 1C NARROW RANGE LEVEL	CB	155-00	CTMT	158-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1B31PT0455-P1	PRESSURIZER PRESSURE	CB	166-00	CTMT	145-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1B31PT0456-P2	PRESSURIZER PRESSURE	CB	166-00	CTMT	145-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	18	Q1B31PT0457-P3	PRESSURIZER PRESSURE	CB	166-00	CTMT	145-00	Y	BS	GRS	Y	Y	Y	Y	Y	
	07	Q1B31PCV0445A-A	PRESSURIZER POWER RELIEF VALVE	CB	173-00	CTMT	170-00+	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1B31MOV8000A-A	PRESSURIZER POWER RELIEF ISOLATION VALVE	CB	175-00	CTMT	170-00	Y	BS	GRS	Y	Y	NA	Y	Y	
	08A	Q1B31MOV8000B-B	PRESSURIZER POWER RELIEF ISOLATION VALVE	CB	175-00	CTMT	170-00	Y	BS	GRS	Y	Y	NA	Y	Y	